GENERAL

GROUP 1

CONTENTS

1. INTRODUCTION

1a. GENERAL

The instructions contained in this manual are for the guidance of servicemen responsible for the repair and overhaul of the 165 Loader.

Throughout the manual the terms LEFT, RIGHT, FRONT and REAR are applicable to a person seated in the driver's seat and facing the loader bucket.

1b. SERVICE TOOLS

International machines are so designed that few special tools are required. However, where the use of special tools will facilitate work such equipment is mentioned in the specifications section for the relevant GROUP. If this equipment can be easily made in the workshop, dimensional drawings are provided in the text.

1c. SERVICE PARTS

I.H. machines deserve genuine I.H. service parts. The best material obtainable and experience gained through many years of construction equipment manufacturing enable the International Harvester Company to produce quality that will not to be found in imitation or 'will fit' components. For the correct service parts always refer to the Parts Catalogue. These catalogues are continually brought up to date by issuing revisions.

1d. SERIAL NUMBERS

The engine serial number is stamped on a pad on the right side of the crankcase. The loader serial number is stamped on a plate attached to the rear of the right arm rest. The bucket serial number is stamped on the top right edge of the bucket.

These serial numbers should always be quoted when ordering service parts.

1e. ADJUSTMENTS

Where adjustments are necessary the GROUP will contain the relevant information. Reference to these paragraphs prior to dismantling a unit may prevent unnecessary work being carried out.

1f. ILLUSTRATION REFERENCES

The illustration references used in this manual are of the type (1-4). This refers to the item marked 1 in Fig. 4 of the GROUP in which the reference appears. Where more than one item is referred to the reference will be of the type (1 & 2-4).

Where reference is made to illustrations in another GROUP the reference will be followed by the GROUP number and if the GROUP is divided into sections this will be indicated by the Section letter after the GROUP number (1-4 GROUP 6B).

1g. INSPECTION AND REPAIR

The following notes should be used as a general guide to inspection and repair. Where a special procedure is necessary for a component or assembly full details will be found in the relevant paragraph of the GROUP.

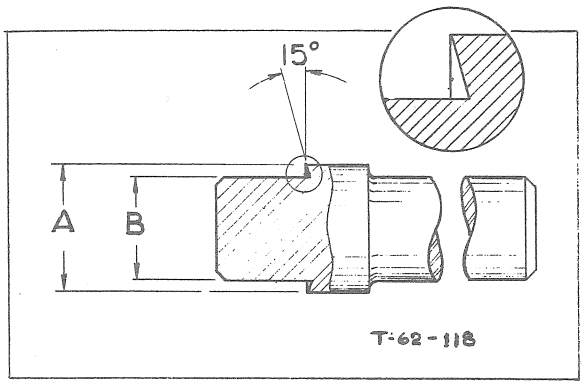
(a) RELIEF VALVES

Whenever a relief valve is re-set or a new relief valve fitted, the system pressure should be checked as detailed in the relevant GROUP of this Service Manual.

(b) BEARINGS

Inspect for evidence of overheating, cracks, scores, pitting and general wear and renew if necessary. Serviceable bearings must be cleaned, soaked in oil and wrapped in grease proof material until required for use.

When installing needle bearings, have the manufacturers markings outward and use a dolly made to the dimension in the diagram.



A - 1.5 mm (0.62 in) less than outer diameter
B - 0.07 mm (0.003 in) less than inner bore

(c) PINS AND BUSHES

Inspect for damage, scoring and pitting, check with mating part for wear. Renew as necessary.

(d) CLEVISES AND PINS

Check with mating part for wear.

(e) SEALERS

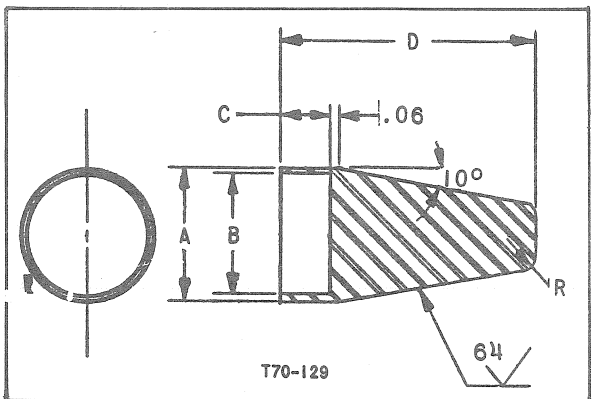
ALWAYS use new gaskets and oil seals during assembly and installation taking care not to damage them.

Pack lip type seals with grease and use sleeves or tape whenever a seal has to be passed over splines or threads. Felt dust seals must be soaked in oil before assembly.

The crankcase oil filler tube and/or dipstick tube and all studs and bolts which are assembled entering oil chambers are to be coated with thread sealing compound unless otherwise stated.

(f) 'O' RINGS

When installing 'O' rings over the threads of standard pipe fittings a tool made to the dimensions in the diagram MUST be used.



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PIPE SIZE	THREAD SIZE & T.P.I.	A ±.005	B ±.005	C ±.010	D ±.030
1/4	7/16-20	.523	.443	.280	1.000
5/16	1/2-20	.585	.506	.280	1.000
3/8	9/16-18	.648	.568	.300	1.500
1/2	3/4-16	.835	.756	.330	1.500
5/8	7/8-14	.960	.881	.380	1.500
3/4	1-1/16-12	1.147	1.068	.465	2.500
7/8	1-3/16-12	1.273	1.193	.465	2.500
1	1-5/16-12	1.397	1.318	.465	2.500
1-1/4	1-5/8-12	1.711	1.631	.465	2.500

Where special fittings are encountered the dimensions should be varied to suit.

'O' rings should be lubricated with the type of oil specified for the particular system.

If a backing ring is fitted this must be installed on the low pressure side of the 'O' ring.

Use sleeves or tape when installing 'O' rings over splines or serrations. Ensure that the 'O' ring is not left in a twisted condition. A mould mark is usually visable and will indicate if the ring is twisted.

Tighten plugs and swivel nuts sealed by an 'O' ring to the following torque.

JIC 37° SEAT				
THREAD SIZE	MIN. kgm	MIN. lbft	MAX. kgm	MAX. lbft
7/16 - 20	0.83	6	1.38	10
1/2 - 20	1.38	10	2.07	15
9/16 - 18	2.07	15	2.76	20
3/4 - 16	3.46	25	4.14	30
7/8 - 14	4.84	35	5.53	40
1-1/16 - 12	8.30	60	9.67	70
1-3/16 - 12	9.67	70	11.06	80
1-5/16 - 12	11.06	80	12.44	90
1-5/8 - 12	13.14	95	15.89	115
1-7/8 - 12	16.59	120	19.35	140
2-1/2 - 12	34.56	250	41.47	300

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(g) GEARS AND SPLINES

Check splines with their mating parts for wear. Check gears and splines for pitting, burrs, broken or missing teeth. Burrs can be removed with a fine carborundum stone but care must be taken to remove only the burr and that the gear or spline profile is not altered.

(h) WELDS

Check all welded assemblies for cracks, twisting or misalignment. Information concerning the use of special welding rods or procedures is detailed, where relevant in the appropriate GROUP. When welding operations are performed on items attached to the machine, it is advisable to disconnect the terminal block at the alternator to avoid any risk of damage to the alternator.

(i) CASTINGS

Check castings for cracks and distortion.

(j) FUEL TANKS

Check for leaks and corrosion.

(k) FUEL OIL & COOLANT PIPES & HOSES

Check unions for leaks, stripped threads or other faults. Check pipes for cracks or chafing, hoses for chafing, twisting, perishing or other damage. Tighten pipe and hose unions to the following torque.

JIC 37° FLARED FITTINGS					
PIPE SIZE	THREAD SIZE	MIN. kgm	MIN. lbft	MAX. kgm	MAX. lbft
1/4	7/16 - 20	1.38	10	2.76	20
5/16	1/2 - 20	2.07	15	3.46	25
3/8	9/16 - 18	3.46	25	4.84	35
1/2	3/4 - 16	5.53	40	7.60	55
5/8	7/8 - 14	7.60	55	10.38	75
3/4	1-1/16 - 12	10.38	75	13.14	95
7/8	1-3/16 - 12	13.14	95	15.89	115
1	1-5/16 - 12	15.89	115	20.04	145
1-1/4	1-5/8 - 12	20.74	150	24.88	180
1-1/2	1-7/8 - 12	27.66	200	34.56	250
2	2-1/2 - 12	41.47	300	48.38	350

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(l) LUBRICATION FITTINGS

Check for damaged or missing fittings. Check that grease and oil galleries are clear.

1h. LUBRICATION

During assembly, running or wearing surfaces must be coated with the specified lubricant. Use sufficient lubricant to prevent seizing. scoring or excessive wear on initial operation.

FAILURE TO PROVIDE STARTING LUBRICATION MAY RESULT IN SERIOUS DAMAGE.

1i. METRIC CONVERSION

The following table gives conversion factors for converting British Specifications to their metric equivalent.

To convert from	To	Multiply by
inches	mm	25.40
pounds	kg	0.4536
ounces	g	28.35
lb ft	kgm	0.1383
lb in	gm	11.5213
lb/in^2	kg/cm^2	0.07031
UK gal	litres	4.5459
UK pints	litres	0.5682
miles	km	1.6

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2. BOLT IDENTIFICATION

IH TYPE	BSS	TENSILE STRENGTH T/in^2	MANUFACTURERS MARKINGS					
5	S	50 - 55	BEES 50 S 55	NEWALL HITENSILE "S"	SPNS	NEWTON S	SPARTS S	TWLS
	T	55 - 65	BEES 55 T 65	NEWALLOY T or NEWALL HITENSILE T	SPNT	NEWTON T	SPARTS T	TWLT
8	V	65 - 75	BEES 65 V 75	NEWALLOY "V"	SPNV	NEWTON V	SPARTS V	TWLV

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3. STANDARD TORQUE DATA FOR NUTS AND BOLTS

Where no special torque data is quoted the following torque figures should be applied. Threads should be lubricated with engine oil or chassis grease. Apply the minimum figure to bolts that have previously been used.

BOLT SIZE (in)	TYPE 5				TYPE 8			
	MIN.		MAX.		MIN.		MAX.	
	kgm	lbft	kgm	lbft	kgm	lbft	kgm	lbft
1/4	1.24	9	1.26	10	1.66	12	1.93	14
5/16	2.62	19	2.90	21	3.73	27	4.14	30
3/8	4.56	33	5.11	37	6.22	45	6.91	50
7/16	7.32	53	8.30	60	10.37	75	11.75	85
1/2	11.06	80	12.44	90	15.90	115	17.97	130
9/16	15.90	115	17.97	130	22.81	165	25.58	185
5/8	22.12	160	24.89	180	30.42	220	34.56	250
3/4	40.09	290	44.24	320	55.30	400	62.21	450
7/8	58.07	420	64.98	470	89.87	650	100.93	730
1	87.10	630	98.16	710	134.11	970	150.70	1090
1-1/8	117.52	850	131.34	950	190.79	1380	214.30	1550
1-1/4	165.91	1200	186.64	1350	268.21	1940	301.40	2180

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4. SPECIFICATIONS

The following specifications are listed in GROUP order. During overhaul personal initiative must be excercised to determine whether or not a component is suitable for re-use. It is obviously uneconomical to return worn parts to service with a short life expectency which will involve labour costs at an early date.

2. CAB

Specifications not applicable.

3. BUCKET AND LIFT ARMS

Lift arm front bushes		
Internal diameter	mm (in)	50.80 to 50.90 (2.000 to 2.004)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Length	mm (in)	60 (2.362)
Pin diameter	mm (in)	50.56 to 50.62 (1.9905 to 1.9930)
Lift arm rear bushes		
Internal diameter	mm (in)	69.85 to 69.97 (2.750 to 2.755)
External diameter	mm (in)	82.67 to 82.71 (3.255 to 3.256)
Length	mm (in)	60 (2.362)
Pin diameter	mm (in)	69.62 to 69.67 (2.7410 to 2.7430)
Tilt link bushes		
Internal diameter	mm (in)	50.80 to 50.85 (2.000 to 2.002)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Length	mm (in)	37 (1.46)
Pin diameter	mm (in)	50.61 to 50.67 (1.9925 to 1.9950)
Tilt lever centre bushes		
Internal diameter	mm (in)	145 to 145.04 (5.708 to 5.710)
External diameter	mm (in)	160 to 160.03 (6.299 to 6.300)
Length	mm (in)	78 (3.071)
Tilt lever centre bush sleeves		
Internal diameter	mm (in)	120.13 to 120.16 (4.729 to 4.731)
External diameter	mm (in)	144.92 to 144.96 (5.7055 to 5.707)
Length	mm (in)	78 (3.071)
Clam pivot bushes		
Internal diameter	mm (in)	38.10 to 38.20 (1.500 to 1.504)
External diameter	mm (in)	50.89 to 50.92 (2.0035 to 2.0047)
Length	mm (in)	25.4 (1.00)
Pin diameter	mm (in)	37.95 to 37.99 (1.494 to 1.496)

4. COOLING SYSTEM

Capacity	litres (UK gal)	19.32 (4.3)
Radiator		
Type		Fin and flat tube
Cap pressure	kg/cm^2 (lb/in^2)	0.5 (7)
Oil cooler		
Type		Fin and tube
Thermostat		
Opens at	°C (°F)	80 to 84 (176 to 183)
Fully open at	°C (°F)	95 (203)
Fan		
Type		Blower
Number of blades		6
Diameter	cm (in)	57 (22.5)
Blade angle	degrees	22

5. INSTRUMENTS AND ELECTRICAL

Electrical system		
Type		negative earth
Voltage		12
Batteries		
Voltage		6
Capacity at 20 hour rate	amph	190
Cold start performance (to BS 3911/IEC)	amp	660
Starting motor		
Make		Lucas
Model		M50
Alternator		
Make		Lucas
Model		15ACR
Special torque values		
Alternator pulley nut	kgm (lbft)	2.76 to 4.84 (20 to 35)

6. FUEL SYSTEM

Tank capacity	litres (UK gal)	150 (33)
Injection pump		
Make		Bosch
Type		EPVA6 100H 1250CRV 3453/3
Injectors		
Make		Bosch
Nozzle type		DLL 150S 2641

7. ENGINE

Make		IH
Type		D-310
Number of cylinders		6
Bore	cm (in)	9.84 (3.88)
Stroke	cm (in)	11.11 (4.38)
Capacity	cm^3 (in^3)	5080 (310)
High speed idle	rev/min	2760
Rated speed	rev/min	2500
Low idle speed	rev/min	500 to 600
Firing order		1 - 5 - 3 - 6 - 2 - 4
Valve clearance (HOT)		
Inlet	mm (in)	0.25 (0.010)
Exhaust	mm (in)	0.30 (0.012)
Special tools		
Engine mounting bracket for use on Churchill 200B stand		IH 8254
Available from:		V.L. Churchill & Co. Ltd., P.O. Box No.3, London Road, DAVENTRY, Northants. NN11 4NF.
Special Torque Values		
Hydraulic pump bracket bolts		
12 mm	kgm (lbft)	10.5 to 11.75 (75 to 85)
5/8 in	kgm (lbft)	23.5 to 26 (170 to 190)

8. TORQUE CONVERTOR

Make		Twinsa
Type		Single phase 6-F-1133
Diameter	cm (in)	27.94 (11)
Stall ratio		2.81:1
Special torque values		
Pump gear to impellor bolts	kgm (lbft)	2.1 to 2.35 (15 to 17)
Drive spider nuts	kgm (lbft)	2.9 (21)

9. TRANSMISSION

Charge pump		
Make		British Twin Disc
Type		Gear
Output at 2700 rev/min	litres/min (UK gal/min)	86.4 (19)
and pressure of	kg/cm^2 (lb/in^2)	17.6 (250)
Lubrication pressure	kg/cm^2 (lb/in^2)	2.1 (30)
Drive pressure	kg/cm^2 (lb/in^2)	17.6 (250)
Cold oil relief valve pressure	kg/cm^2 (lb/in^2)	24.6 (350)
Clutch packs		
Number of sintered plates		6
Thickness	mm (in)	2.8 to 2.9 (0.111 to 0.115)
Number of steel plates		5
Thickness	mm (in)	1.5 to 1.6 (0.058 to 0.062)
Return springs		
Free length	mm (in)	26.4 (1.04)
Test length	mm (in)	12.2 (0.48)
Test load	kg (lb)	23.6 (52)
Pinion bearing pre-load		
Pinion bearing pre-load pull	kg (lb)	3.63 to 5.44 (8 to 12)
Bearing spacer thickness	mm (in)	4.75 to 5.15 (0.187 to 0.203)
in increments of	mm (in)	0.025 (0.001)
Bearing cage shim thickness		
Extra light	mm (in)	0.102 (0.004)
Light	mm (in)	0.208 (0.0082)
Medium	mm (in)	0.375 (0.0149)
Heavy	mm (in)	0.760 (0.0299)
Special torque values		
Pinion shaft nut	kgm (lbft)	18 to 21 (130 to 155)
Cold oil relief valve	kgm (lbft)	7.46 (54)
Idler gear nut	kgm (lbft)	40 to 44 (290 to 320)
Clutch spider nuts	kgm (lbft)	4.7 (34)
Clutch piston nuts	kgm (lbft)	3.6 (26)
Torque convertor retainer bolt	kgm (lbft)	2.9 to 3.3 (21 to 24)
Flywheel pilot nuts	kgm (lbft)	2.9 (21)

10. BEVEL GEAR

Hub dowel bolt holes diameter	mm (in)	12.69 to 12.71 (0.4995 to 0.5005)
Bearing pre-load pull	kg(lb)	1.8 to 2.7 (4 to 6)
Backlash		As etched on gear OD
Cone centre distance		As etched on pinion end
Special tools		
Parallel gauge block		IH 3452
Bolt wrench		IH 7444
Available from:		V.L. Churchill & Co. Ltd., P.O. Box.3, London Road, DAVENTRY, Northants. NN11 4NF.
Special torque values		
Bevel pinion shaft locknut	kgm (lbft)	18 to 21 (130 to 155)
Bevel gear dowel bolt nuts	kgm (lbft)	16 to 18 (115 to 130)

11. STEERING CLUTCHES AND BRAKES

Number of driving discs		20
Number of driven discs		22
Drum diameter	cm (in)	30.8 (12.12)
Clutch pressure spring		
Free length	mm (in)	132.94 (5.234)
Test length	mm (in)	90.14 (3.549)
Test load	kg (lb)	903 to 1045 (1990 to 2303)
Thrust washer thickness	mm (in)	3.05 to 3.30 (0.120 to 0.130)
Release fork pin bush		
Internal diameter	mm (in)	19.10 to 19.17 (0.752 to 0.755)
External diameter	mm (in)	28.56 (1.125)
Distance across flats	mm (in)	25.17 to 25.29 (0.991 to 0.996)
Flange diameter	mm (in)	34.925 (1.375)
Flange thickness	mm (in)	3.175 (0.125)
Steering clutch fork lower pivot bush		
Internal diameter (installed)	mm (in)	25.45 to 25.46 (1.0017 to 1.0022)
Steering clutch fork upper pivot bush		
Internal diameter (installed)	mm (in)	34.93 to 34.96 (1.3750 to 1.3766)
Steering clutch release lever bush		
Internal diameter (installed)	mm (in)	15.04 to 15.09 (0.592 to 0.594)
Steering and brake cylinders		
Bore	mm (in)	63.5 (2.50)
Stroke	mm (in)	34.72 (1.367)
Piston rod diameter		
Steering cylinder	mm (in)	31.75 (1.250)
Brake cylinder	mm (in)	28 (1.102)
Initial length setting	mm (in)	230 (9.05)
Brake pivot lever pivot bush		
Internal diameter (installed)	mm (in)	28.25 to 28.35 (1.112 to 1.116)
Brake pivot lever arm bush		
Internal diameter (installed)	mm (in)	12.7 (0.5)
Length	mm (in)	12.7 (0.5)

11. STEERING CLUTCHES AND BRAKES (Continued)

Brake pivot shaft		
Diameter	mm (in)	28.10 to 28.17 (1.106 to 1.109)
Length	mm (in)	117.4 (4.62)
Special torque values		
Steering clutch pilot bearing nuts	kgm (lbft)	34.6 to 41.4 (250 to 300)

12. FINAL DRIVE

Sprocket carrier bearing pre-load nip	mm (in)	0.015 to 0.065 (0.0006 to 0.0026)
Special torque values		
Sprocket drive carrier to mainframe		
Stud nuts 5/8''	kgm (lbft)	30.5 to 34.5 (220 to 250)
Stud nuts 1/2''	kgm (lbft)	16 to 18 (115 to 130)
Bolts	kgm (lbft)	18 to 20.7 (130 to 150)
Pivot shaft end bolts	kgm (lbft)	30.5 to 34.5 (220 to 250)
Sprocket carrier bolts	kgm (lbft)	16 to 18 (115 to 130)

13. TRACKS AND TRACK FRAMES

Track idler and bearing bush diameter (installed)	mm (in)	44.45 to 44.51 (1.7500 to 1.7526)
Track idler bearing shaft diameter	mm (in)	44.36 to 44.39 (1.7464 to 1.7480)
Track roller bush		
Internal diameter (installed)	mm (in)	50.88 to 50.90 (2.003 to 2.004)
Length	mm (in)	57.15 (2.25)
Track roller shaft diameter	mm (in)	50.60 to 50.64 (1.992 to 1.994)
Thrust washer thickness	mm (in)	2.11 to 2.21 (0.083 to 0.087)
Track spring		
Free length	mm (in)	552.2 (21.74)
Test length	mm (in)	464.34 (18.281)
Test load	kg (lb)	7552.3 (16650)
Installation length	mm (in)	459.74 (18.1)
Master track pin diameter	mm (in)	41.07 to 41.10 (1.617 to 1.618)
Track pin diameter	mm (in)	41.17 to 41.27 (1.621 to 1.625)
Track pin length	mm (in)	175.50 (6.90)
Track pin bush OD	mm (in)	59.99 to 60.09 (2.362 to 2.366)
Track pin bush ID	mm (in)	41.61 to 41.91 (1.638 to 1.650)
Track pin bush length	mm (in)	126.80 to 126.89 (4.992 to 4.996)
Master bush length	mm (in)	106.78 to 106.88 (4.204 to 4.208)
Belleville washers		
Outside diameter	mm (in)	60.2 to 60.45 (2.370 to 2.380)
Inside diameter	mm (in)	41.5 to 41.78 (1.635 to 1.645)
Thickness	mm (in)	1.57 to 1.83 (0.0623 to 0.0723)
Master bush spacer	mm (in)	
Outside diameter	mm (in)	60.0 to 61 (2.360 to 2.400)
Inside diameter	mm (in)	41.40 to 42.16 (1.630 to 1.660)
Thickness	mm (in)	9.95 to 10.05 (0.392 to 0.396)

(c) PINS AND BUSHES

Inspect for damage, scoring and pitting, check with mating part for wear. Renew as necessary.

(d) CLEVISES AND PINS

Check with mating part for wear.

(e) SEALERS

ALWAYS use new gaskets and oil seals during assembly and installation taking care not to damage them.

Pack lip type seals with grease and use sleeves or tape whenever a seal has to be passed over splines or threads. Felt dust seals must be soaked in oil before assembly.

The crankcase oil filler tube and/or dipstick tube and all studs and bolts which are assembled entering oil chambers are to be coated with thread sealing compound unless otherwise stated.

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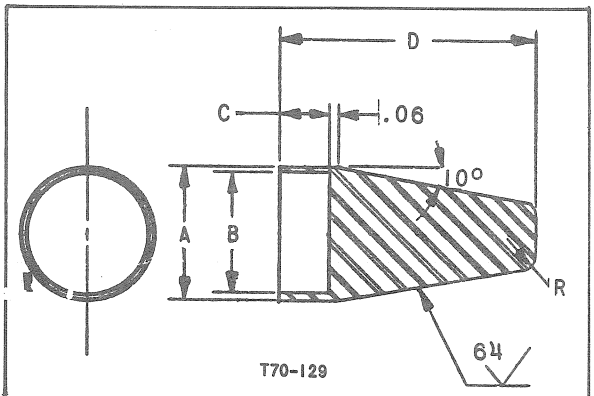

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Where special fittings are encountered the dimensions should be varied to suit.

'O' rings should be lubricated with the type of oil specified for the particular system.

If a backing ring is fitted this must be installed on the low pressure side of the 'O' ring.

Use sleeves or tape when installing 'O' rings over splines or serrations. Ensure that the 'O' ring is not left in a twisted condition. A mould mark is usually visable and will indicate if the ring is twisted.

Tighten plugs and swivel nuts sealed by an 'O' ring to the following torque.

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THREAD SIZE	MIN.		MAX.	
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7/8 - 14	4.84	35	5.53	40
1-1/16 - 12	8.30	60	9.67	70
1-3/16 - 12	9.67	70	11.06	80
1-5/16 - 12	11.06	80	12.44	90
1-5/8 - 12	13.14	95	15.89	115
1-7/8 - 12	16.59	120	19.35	140
2-1/2 - 12	34.56	250	41.47	300

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Check splines with their mating parts for wear. Check gears and splines for pitting, burrs, broken or missing teeth. Burrs can be removed with a fine carborundum stone but care must be taken to remove only the burr and that the gear or spline profile is not altered.

(h) WELDS

Check all welded assemblies for cracks, twisting or misalignment. Information concerning the use of special welding rods or procedures is detailed, where relevant in the appropriate GROUP. When welding operations are performed on items attached to the machine, it is advisable to disconnect the terminal block at the alternator to avoid any risk of damage to the alternator.

(i) CASTINGS

Check castings for cracks and distortion.

(j) FUEL TANKS

Check for leaks and corrosion.

(k) FUEL OIL & COOLANT PIPES & HOSES

Check unions for leaks, stripped threads or other faults. Check pipes for cracks or chafing, hoses for chafing, twisting, perishing or other damage. Tighten pipe and hose unions to the following torque.

JIC 37° FLARED FITTINGS					
PIPE SIZE	THREAD SIZE	MIN. kgm	MIN. lbft	MAX. kgm	MAX. lbft
1/4	7/16 - 20	1.38	10	2.76	20
5/16	1/2 - 20	2.07	15	3.46	25
3/8	9/16 - 18	3.46	25	4.84	35
1/2	3/4 - 16	5.53	40	7.60	55
5/8	7/8 - 14	7.60	55	10.38	75
3/4	1-1/16 - 12	10.38	75	13.14	95
7/8	1-3/16 - 12	13.14	95	15.89	115
1	1-5/16 - 12	15.89	115	20.04	145
1-1/4	1-5/8 - 12	20.74	150	24.88	180
1-1/2	1-7/8 - 12	27.66	200	34.56	250
2	2-1/2 - 12	41.47	300	48.38	350

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(l) LUBRICATION FITTINGS

Check for damaged or missing fittings. Check that grease and oil galleries are clear.

1h. LUBRICATION

During assembly, running or wearing surfaces must be coated with the specified lubricant. Use sufficient lubricant to prevent seizing. scoring or excessive wear on initial operation.

FAILURE TO PROVIDE STARTING LUBRICATION MAY RESULT IN SERIOUS DAMAGE.

1i. METRIC CONVERSION

The following table gives conversion factors for converting British Specifications to their metric equivalent.

To convert from	To	Multiply by
inches	mm	25.40
pounds	kg	0.4536
ounces	g	28.35
lb ft	kgm	0.1383
lb in	gm	11.5213
lb/in^2	kg/cm^2	0.07031
UK gal	litres	4.5459
UK pints	litres	0.5682
miles	km	1.6

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2. BOLT IDENTIFICATION

IH TYPE	BSS	TENSILE STRENGTH T/in^2	MANUFACTURERS MARKINGS					
5	S	50 - 55	BEES 50 S 55	NEWALL HITENSILE "S"	SPNS	NEWTON S	SPARTS S	TWLS
	T	55 - 65	BEES 55 T 65	NEWALLOY T or NEWALL HITENSILE T	SPNT	NEWTON T	SPARTS T	TWLT
8	V	65 - 75	BEES 65 V 75	NEWALLOY "V"	SPNV	NEWTON V	SPARTS V	TWLV

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3. STANDARD TORQUE DATA FOR NUTS AND BOLTS

Where no special torque data is quoted the following torque figures should be applied. Threads should be lubricated with engine oil or chassis grease. Apply the minimum figure to bolts that have previously been used.

BOLT SIZE (in)	TYPE 5				TYPE 8			
	MIN.		MAX.		MIN.		MAX.	
	kgm	lbft	kgm	lbft	kgm	lbft	kgm	lbft
1/4	1.24	9	1.26	10	1.66	12	1.93	14
5/16	2.62	19	2.90	21	3.73	27	4.14	30
3/8	4.56	33	5.11	37	6.22	45	6.91	50
7/16	7.32	53	8.30	60	10.37	75	11.75	85
1/2	11.06	80	12.44	90	15.90	115	17.97	130
9/16	15.90	115	17.97	130	22.81	165	25.58	185
5/8	22.12	160	24.89	180	30.42	220	34.56	250
3/4	40.09	290	44.24	320	55.30	400	62.21	450
7/8	58.07	420	64.98	470	89.87	650	100.93	730
1	87.10	630	98.16	710	134.11	970	150.70	1090
1-1/8	117.52	850	131.34	950	190.79	1380	214.30	1550
1-1/4	165.91	1200	186.64	1350	268.21	1940	301.40	2180

T70-127A

4. SPECIFICATIONS

The following specifications are listed in GROUP order. During overhaul personal initiative must be excercised to determine whether or not a component is suitable for re-use. It is obviously uneconomical to return worn parts to service with a short life expectency which will involve labour costs at an early date.

2. CAB

Specifications not applicable.

3. BUCKET AND LIFT ARMS

Lift arm front bushes		
Internal diameter	mm (in)	50.80 to 50.90 (2.000 to 2.004)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Length	mm (in)	60 (2.362)
Pin diameter	mm (in)	50.56 to 50.62 (1.9905 to 1.9930)
Lift arm rear bushes		
Internal diameter	mm (in)	69.85 to 69.97 (2.750 to 2.755)
External diameter	mm (in)	82.67 to 82.71 (3.255 to 3.256)
Length	mm (in)	60 (2.362)
Pin diameter	mm (in)	69.62 to 69.67 (2.7410 to 2.7430)
Tilt link bushes		
Internal diameter	mm (in)	50.80 to 50.85 (2.000 to 2.002)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Length	mm (in)	37 (1.46)
Pin diameter	mm (in)	50.61 to 50.67 (1.9925 to 1.9950)
Tilt lever centre bushes		
Internal diameter	mm (in)	145 to 145.04 (5.708 to 5.710)
External diameter	mm (in)	160 to 160.03 (6.299 to 6.300)
Length	mm (in)	78 (3.071)
Tilt lever centre bush sleeves		
Internal diameter	mm (in)	120.13 to 120.16 (4.729 to 4.731)
External diameter	mm (in)	144.92 to 144.96 (5.7055 to 5.707)
Length	mm (in)	78 (3.071)
Clam pivot bushes		
Internal diameter	mm (in)	38.10 to 38.20 (1.500 to 1.504)
External diameter	mm (in)	50.89 to 50.92 (2.0035 to 2.0047)
Length	mm (in)	25.4 (1.00)
Pin diameter	mm (in)	37.95 to 37.99 (1.494 to 1.496)

4. COOLING SYSTEM

Capacity	litres (UK gal)	19.32 (4.3)
Radiator		
Type		Fin and flat tube
Cap pressure	kg/cm^2 (lb/in^2)	0.5 (7)
Oil cooler		
Type		Fin and tube
Thermostat		
Opens at	°C (°F)	80 to 84 (176 to 183)
Fully open at	°C (°F)	95 (203)
Fan		
Type		Blower
Number of blades		6
Diameter	cm (in)	57 (22.5)
Blade angle	degrees	22

5. INSTRUMENTS AND ELECTRICAL

Electrical system		
Type		negative earth
Voltage		12
Batteries		
Voltage		6
Capacity at 20 hour rate	amph	190
Cold start performance (to BS 3911/IEC)	amp	660
Starting motor		
Make		Lucas
Model		M50
Alternator		
Make		Lucas
Model		15ACR
Special torque values		
Alternator pulley nut	kgm (lbft)	2.76 to 4.84 (20 to 35)

6. FUEL SYSTEM

Tank capacity	litres (UK gal)	150 (33)
Injection pump		
Make		Bosch
Type		EPVA6 100H 1250CRV 3453/3
Injectors		
Make		Bosch
Nozzle type		DLL 150S 2641

7. ENGINE

Make		IH
Type		D-310
Number of cylinders		6
Bore	cm (in)	9.84 (3.88)
Stroke	cm (in)	11.11 (4.38)
Capacity	cm^3 (in^3)	5080 (310)
High speed idle	rev/min	2760
Rated speed	rev/min	2500
Low idle speed	rev/min	500 to 600
Firing order		1 - 5 - 3 - 6 - 2 - 4
Valve clearance (HOT)		
Inlet	mm (in)	0.25 (0.010)
Exhaust	mm (in)	0.30 (0.012)
Special tools		
Engine mounting bracket for use on Churchill 200B stand		IH 8254
Available from:		V.L. Churchill & Co. Ltd., P.O. Box No.3, London Road, DAVENTRY, Northants. NN11 4NF.
Special Torque Values		
Hydraulic pump bracket bolts		
12 mm	kgm (lbft)	10.5 to 11.75 (75 to 85)
5/8 in	kgm (lbft)	23.5 to 26 (170 to 190)

8. TORQUE CONVERTOR

Make		Twinsa
Type		Single phase 6-F-1133
Diameter	cm (in)	27.94 (11)
Stall ratio		2.81:1
Special torque values		
Pump gear to impellor bolts	kgm (lbft)	2.1 to 2.35 (15 to 17)
Drive spider nuts	kgm (lbft)	2.9 (21)

9. TRANSMISSION

Charge pump		
Make		British Twin Disc
Type		Gear
Output at 2700 rev/min	litres/min (UK gal/min)	86.4 (19)
and pressure of	kg/cm^2 (lb/in^2)	17.6 (250)
Lubrication pressure	kg/cm^2 (lb/in^2)	2.1 (30)
Drive pressure	kg/cm^2 (lb/in^2)	17.6 (250)
Cold oil relief valve pressure	kg/cm^2 (lb/in^2)	24.6 (350)
Clutch packs		
Number of sintered plates		6
Thickness	mm (in)	2.8 to 2.9 (0.111 to 0.115)
Number of steel plates		5
Thickness	mm (in)	1.5 to 1.6 (0.058 to 0.062)
Return springs		
Free length	mm (in)	26.4 (1.04)
Test length	mm (in)	12.2 (0.48)
Test load	kg (lb)	23.6 (52)
Pinion bearing pre-load		
Pinion bearing pre-load pull	kg (lb)	3.63 to 5.44 (8 to 12)
Bearing spacer thickness	mm (in)	4.75 to 5.15 (0.187 to 0.203)
in increments of	mm (in)	0.025 (0.001)
Bearing cage shim thickness		
Extra light	mm (in)	0.102 (0.004)
Light	mm (in)	0.208 (0.0082)
Medium	mm (in)	0.375 (0.0149)
Heavy	mm (in)	0.760 (0.0299)
Special torque values		
Pinion shaft nut	kgm (lbft)	18 to 21 (130 to 155)
Cold oil relief valve	kgm (lbft)	7.46 (54)
Idler gear nut	kgm (lbft)	40 to 44 (290 to 320)
Clutch spider nuts	kgm (lbft)	4.7 (34)
Clutch piston nuts	kgm (lbft)	3.6 (26)
Torque convertor retainer bolt	kgm (lbft)	2.9 to 3.3 (21 to 24)
Flywheel pilot nuts	kgm (lbft)	2.9 (21)

10. BEVEL GEAR

Hub dowel bolt holes diameter	mm (in)	12.69 to 12.71 (0.4995 to 0.5005)
Bearing pre-load pull	kg(lb)	1.8 to 2.7 (4 to 6)
Backlash		As etched on gear OD
Cone centre distance		As etched on pinion end
Special tools		
Parallel gauge block		IH 3452
Bolt wrench		IH 7444
Available from:		V.L. Churchill & Co. Ltd., P.O. Box.3, London Road, DAVENTRY, Northants. NN11 4NF.
Special torque values		
Bevel pinion shaft locknut	kgm (lbft)	18 to 21 (130 to 155)
Bevel gear dowel bolt nuts	kgm (lbft)	16 to 18 (115 to 130)

11. STEERING CLUTCHES AND BRAKES

Number of driving discs		20
Number of driven discs		22
Drum diameter	cm (in)	30.8 (12.12)
Clutch pressure spring		
Free length	mm (in)	132.94 (5.234)
Test length	mm (in)	90.14 (3.549)
Test load	kg (lb)	903 to 1045 (1990 to 2303)
Thrust washer thickness	mm (in)	3.05 to 3.30 (0.120 to 0.130)
Release fork pin bush		
Internal diameter	mm (in)	19.10 to 19.17 (0.752 to 0.755)
External diameter	mm (in)	28.56 (1.125)
Distance across flats	mm (in)	25.17 to 25.29 (0.991 to 0.996)
Flange diameter	mm (in)	34.925 (1.375)
Flange thickness	mm (in)	3.175 (0.125)
Steering clutch fork lower pivot bush		
Internal diameter (installed)	mm (in)	25.45 to 25.46 (1.0017 to 1.0022)
Steering clutch fork upper pivot bush		
Internal diameter (installed)	mm (in)	34.93 to 34.96 (1.3750 to 1.3766)
Steering clutch release lever bush		
Internal diameter (installed)	mm (in)	15.04 to 15.09 (0.592 to 0.594)
Steering and brake cylinders		
Bore	mm (in)	63.5 (2.50)
Stroke	mm (in)	34.72 (1.367)
Piston rod diameter		
Steering cylinder	mm (in)	31.75 (1.250)
Brake cylinder	mm (in)	28 (1.102)
Initial length setting	mm (in)	230 (9.05)
Brake pivot lever pivot bush		
Internal diameter (installed)	mm (in)	28.25 to 28.35 (1.112 to 1.116)
Brake pivot lever arm bush		
Internal diameter (installed)	mm (in)	12.7 (0.5)
Length	mm (in)	12.7 (0.5)

11. STEERING CLUTCHES AND BRAKES (Continued)

Brake pivot shaft		
Diameter	mm (in)	28.10 to 28.17 (1.106 to 1.109)
Length	mm (in)	117.4 (4.62)
Special torque values		
Steering clutch pilot bearing nuts	kgm (lbft)	34.6 to 41.4 (250 to 300)

12. FINAL DRIVE

Sprocket carrier bearing pre-load nip	mm (in)	0.015 to 0.065 (0.0006 to 0.0026)
Special torque values		
Sprocket drive carrier to mainframe		
Stud nuts 5/8''	kgm (lbft)	30.5 to 34.5 (220 to 250)
Stud nuts 1/2''	kgm (lbft)	16 to 18 (115 to 130)
Bolts	kgm (lbft)	18 to 20.7 (130 to 150)
Pivot shaft end bolts	kgm (lbft)	30.5 to 34.5 (220 to 250)
Sprocket carrier bolts	kgm (lbft)	16 to 18 (115 to 130)

13. TRACKS AND TRACK FRAMES

Track idler and bearing bush diameter (installed)	mm (in)	44.45 to 44.51 (1.7500 to 1.7526)
Track idler bearing shaft diameter	mm (in)	44.36 to 44.39 (1.7464 to 1.7480)
Track roller bush		
Internal diameter (installed)	mm (in)	50.88 to 50.90 (2.003 to 2.004)
Length	mm (in)	57.15 (2.25)
Track roller shaft diameter	mm (in)	50.60 to 50.64 (1.992 to 1.994)
Thrust washer thickness	mm (in)	2.11 to 2.21 (0.083 to 0.087)
Track spring		
Free length	mm (in)	552.2 (21.74)
Test length	mm (in)	464.34 (18.281)
Test load	kg (lb)	7552.3 (16650)
Installation length	mm (in)	459.74 (18.1)
Master track pin diameter	mm (in)	41.07 to 41.10 (1.617 to 1.618)
Track pin diameter	mm (in)	41.17 to 41.27 (1.621 to 1.625)
Track pin length	mm (in)	175.50 (6.90)
Track pin bush OD	mm (in)	59.99 to 60.09 (2.362 to 2.366)
Track pin bush ID	mm (in)	41.61 to 41.91 (1.638 to 1.650)
Track pin bush length	mm (in)	126.80 to 126.89 (4.992 to 4.996)
Master bush length	mm (in)	106.78 to 106.88 (4.204 to 4.208)
Belleville washers		
Outside diameter	mm (in)	60.2 to 60.45 (2.370 to 2.380)
Inside diameter	mm (in)	41.5 to 41.78 (1.635 to 1.645)
Thickness	mm (in)	1.57 to 1.83 (0.0623 to 0.0723)
Master bush spacer	mm (in)	
Outside diameter	mm (in)	60.0 to 61 (2.360 to 2.400)
Inside diameter	mm (in)	41.40 to 42.16 (1.630 to 1.660)
Thickness	mm (in)	9.95 to 10.05 (0.392 to 0.396)

13. TRACKS AND TRACK FRAMES (Continued)

Special tools

Master track pin press

Available from: ... Defco Engineering, High Street, Grove Mills, HECKMONDWYKE, West Yorkshire.

Track spring compression bolt ... IH 7391

Available from: ... V.L. Churchill & Co. Ltd., P.O. Box.3, London Road, DAVENTRY, Northants, NN11 4NF.

Special torque values

Track adjuster check and relief valves	kgm (lbft)	6.3 to 7.6 (45 to 55)
Track roller shield bolts	kgm (lbft)	30.5 to 34.5 (220 to 250)
Track chain guide bolts	kgm (lbft)	30.5 to 34.5 (220 to 250)
Track idler shaft retaining bolts	kgm (lbft)	15.5 to 17.9 (115 to 130)
Track roller shaft lubrication plug	kgm (lbft)	2.1 to 3.4 (15 to 25)
Track shoe bolts	kgm (lbft)	23 to 25.5 (165 to 185)
Crossbar bolts (front and rear)	kgm (lbft)	90 to 100 (650 to 730)
Track roller shield spacer bolts	kgm (lbft)	11.8 to 13.1 (85 to 95)

14. HYDRAULICS

Equipment pump

Make		Cessna
Type		Double
Output at rated speed		
Front section	l/min (UK gal/min)	73.8 to 81.4 (16.2 to 17.9)
Rear section	l/min (UK gal/min)	54.5 to 60 (12 to 13.2)
Maximum pressure	kg/cm^2 (lb/in^2)	176 (2500)

Equipment control valve

Make		Hamworthy
Type		V1009 DDF/P4531/2A
Main relief valve setting	kg/cm^2 (lb/in^2)	158 (2250)
Service line relief valve setting	kg/cm^2 (lb/in^2)	193 (2750)
Unloader valve setting	kg/cm^2 (lb/in^2)	130 (1850)

Tilt cylinder

Bore	mm (in)	101.6 (4)
Stroke	mm (in)	366.01 (14.41)
Piston rod diameter	mm (in)	57.15 (2.25)
Piston rod bush ID (installed)	mm (in)	76.40 to 76.50 (3.008 to 3.012)
Cylinder end pin diameter	mm (in)	50.61 to 50.67 (1.9925 to 1.9950)
Rod end pin diameter	mm (in)	76.20 to 76.22 (3.000 to 3.0008)

Lift cylinder

Bore	mm (in)	107.95 (4.25)
Stroke	mm (in)	787.4 (31.0)
Piston rod dimater	mm (in)	63.5 (2.50)
Piston rod bush ID	mm (in)	50.80 to 51.05 (2.000 to 2.009)
Cylinder eye bush ID	mm (in)	50.80 to 50.90 (2.000 to 2.004)
Pin diameter (both ends)	mm (in)	50.61 to 50.67 (1.9925 to 1.9950)

14. HYDRAULICS (Continued)

Clam cylinder		
Bore	mm (in)	101.6 (4.0)
Stroke	mm (in)	257.0 (10.12)
Piston rod diameter	mm (in)	50.8 (2.0)
Piston rod bush ID	mm (in)	38.61 to 38.68 (1.520 to 1.523)
Cylinder operating times		
Lift cylinder		
Float down (bucket empty)	sec	5.0
Raise (With 1350 kg (3000 lb) in bucket)	sec	6.0
Tilt cylinder		
Roll back	sec	2.5
Dump	sec	2.0
Clam cylinder		
Open	sec	1.5
Close	sec	2.0
Special torque values		
Equipment valve mounting bolts	kgm (lbft)	7.8 to 8.7 (56 to 63)

15. LOADER FRAME

Rear pin		
Large diameter	mm (in)	75.88 to 76.00 (2.987 to 2.992)
Small diameter	mm (in)	50.47 to 50.57 (1.987 to 1.991)
Large bush		
Internal diameter	mm (in)	76.25 to 76.37 (3.002 to 3.007)
External diameter	mm (in)	89.03 to 89.06 (3.505 to 3.506)
Small bush (front and rear)		
Internal diameter	mm (in)	50.85 to 50.95 (2.002 to 2.006)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Front pin diameter	mm (in)	50.47 to 50.57 (1.987 to 1.991)
Crossbar bushes (front and rear)		
Internal diameter	mm (in)	50.8 to 50.9 (2.000 to 2.004)
External diameter	mm (in)	63.60 to 63.63 (2.504 to 2.505)
Special torque values		
Loader frame rear pin locknuts	kgm (lbft)	131.3 to 145.2 (950 to 1050)

CAB
GROUP 2

1. DESCRIPTION

The driving compartment is formed by a welded assembly clad internally with a plastic cover at the front, which also supports the instrument panel, and at the rear with a plastic base which not only forms the seat decking but also provides the covers for the control levers. Externally, front and rear doors are fitted on each side. The front doors provide access to the driving compartment while the rear doors are service doors for such items as the batteries, water trap and fuel shut-off etc. Floor plates are also provided for servicing purposes. The assembly is bolted at the front to the top of the loader frame and at the rear to the top of the integrated hydraulic/fuel tank. This assembly is referred to as the cab base whether or not a cab is fitted.

The cab, when fitted, bolts directly onto the cab base and is provided with hinged windows at each side which line up with, and can be latched to, the front doors of the cab base or can be latched back in the fully open position. Windscreen wipers are provided for both the front and rear windscreens and the cab is equipped with an interior light. A sound absorbent trim of heavy padding lines the cab roof. Lifting eyes, which are also utilized as brackets for the front and rear work lights, are welded at each top corner of the cab.

2. CAB

2a. REMOVAL

(a) Attach lifting equipment to the cab lifting eyes and just take the strain.

(b) Latch the windows in the open position.

(c) Isolate the batteries.

(d) Remove the bolts (3-1) to remove the front door striker plate mountings (4-1) taking care not to lose the shims behind.

(e) Remove the bolts (1-1) and ease back the front cover (2-1) until the connector blocks for the instrument panel can be disconnected.

(f) Remove the bolts (1-2) to free the rear cover (2-2).

(g) Remove the bolts along the front and rear of the cab and the side bolts (4-3) then lift the cab clear, noting that there may be shims (14-4) between the cab and base at the rear.

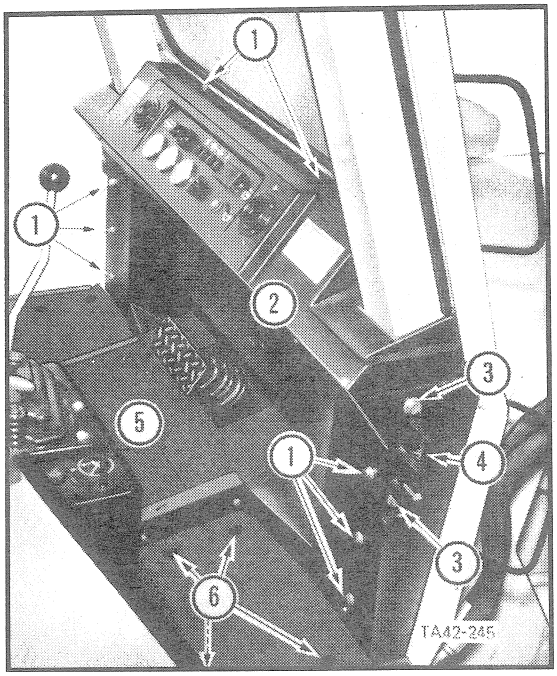


Fig. 1

2b. DISMANTLING

(a) Remove the windscreen wipers and lights referring to GROUP 5.

(b) Lift off the windows (6-4) taking care not lose the brass washers (15-4) from the hinge pins. To remove the latch handle (4-4) remove the split pin, nut, plain washer, outer belleville washer, handle and inner belleville washer (5-4).

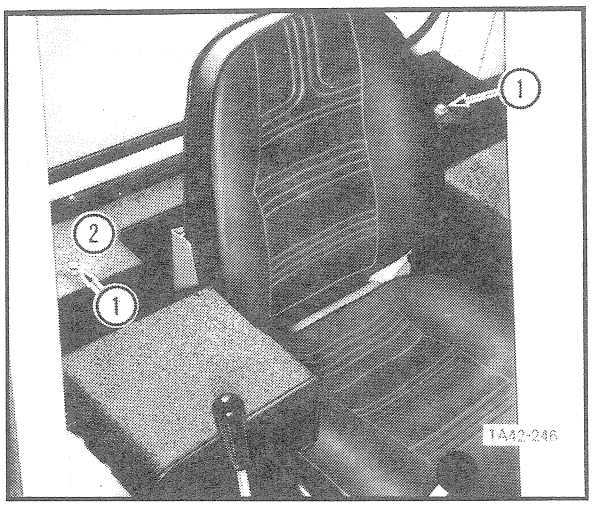


Fig. 2

(c) To remove the window retaining catches (9-4) remove the locknuts. Remove the bolts to free the bumpers (8-4) from the catches. These catches are handed.

(d) To remove a glass (1-4) remove the filler strip (12-4) from the weather strip (13-4) then ease the glass outward from the weather strip. Peel the weatherstrip from the panel.

(e) To remove the grab handles (2-4) screw off the protective caps then remove the locknuts.

(f) The door seals (7-4) and edge mouldings (16-4) can be peeled off if this is required.

(g) The roof trim (10-4) is secured with an adhesive which will require a suitable solvent to remove if the roof trim is removed.

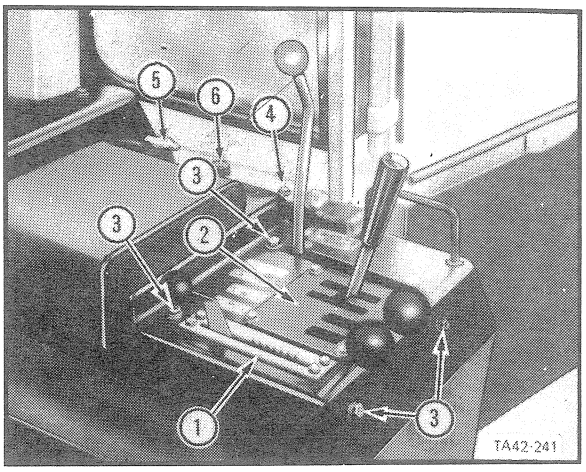


Fig. 3

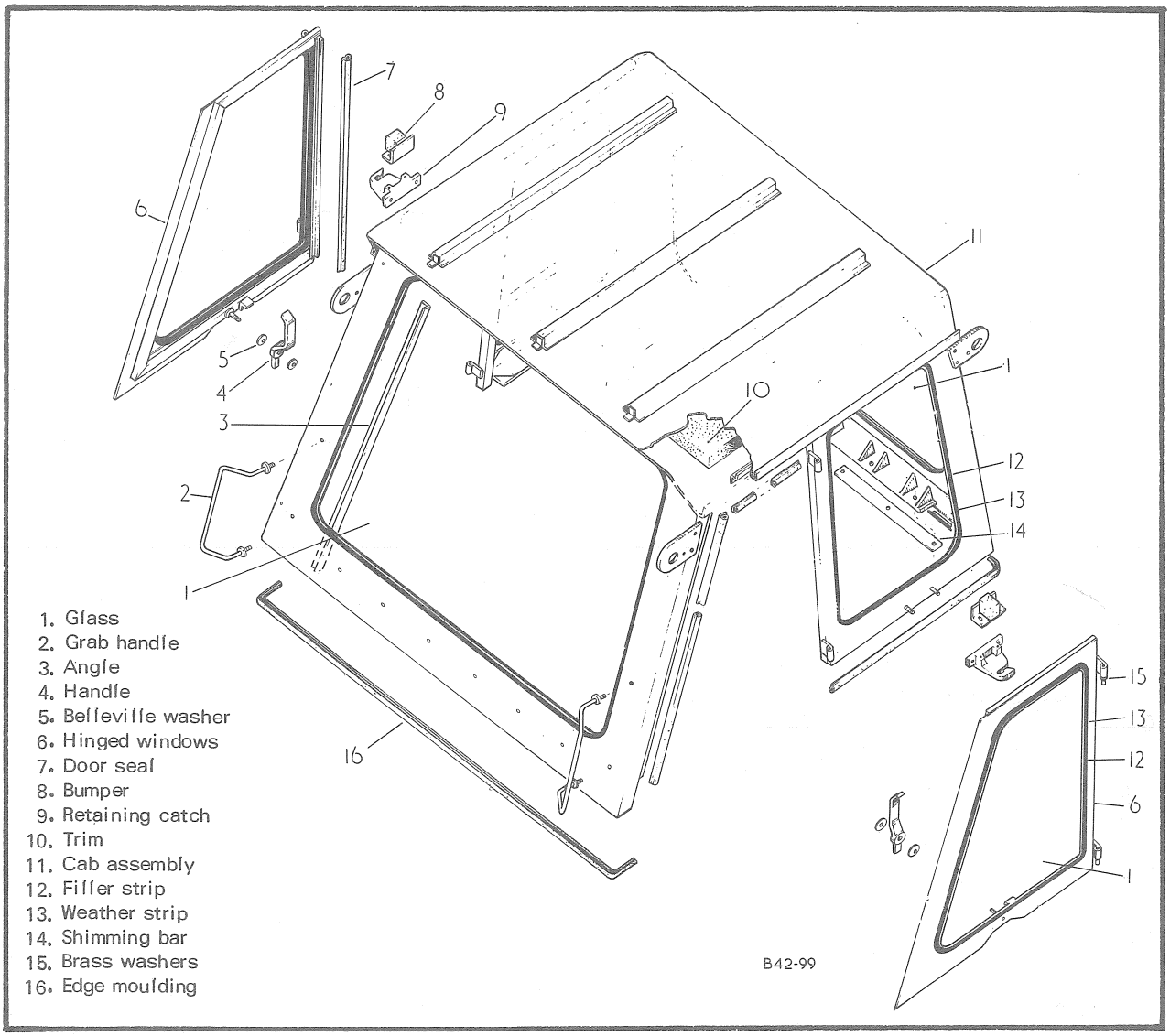


Fig. 4

2c. ASSEMBLY

(a) If new roof trim (10-4) is to be fitted ensure all old adhesive has been removed and use the adhesive according to the manufacturer's instructions.

(b) Install new door seals (7-4) and edge mouldings (16-4) if these were removed.

(c) If these were removed, install the grab handles (2-4) to face outward then secure with the nuts. Cover the exposed threads with the protective caps.

(d) Weather strip (13-4) and filler strip (12-4) will be supplied either in bulk, which must be cut to length, or in lengths as follows:

	Weather strip		Filler strip	
	mm	in	mm	in
Front windscreen	3740	147.25	3731.5	147
Rear windscreen	3450	135.81	3447	135.7
Front of door glass	1738	68.5	1724	67.87
Rear of side glass	1571	61.87	1558	61.37
Front of side glass	822	32.37	808	31.81
Rear of door glass	822	32.37	808	31.81

The strip for the front and rear windscreens must be cut square to the strip whereas the strips for the door and side glasses must be mitred at 45°.

Ensure that the filler strip groove is to the outside and use a suitable soap solution to aid installation.

On the front and rear windscreens start at the top centre and position the weather strip around the panel ensuring that it is well pressed into the corners. Bring the ends together away from the panel then firmly press home (refer to Fig. 5).

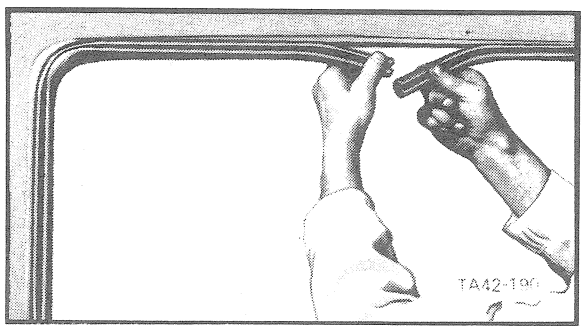


Fig. 5

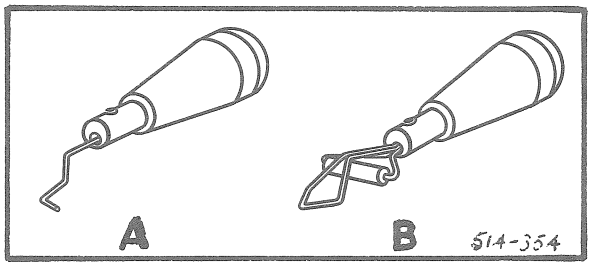


Fig. 6

On the door and side window panels start at the top square corner with the long strip and position this strip around the panel ensuring that it is well pressed into the corners. Position the straight strip to obtain a tight joint at top and bottom corners then press home the rest of the strip.

Insert the glass, from the outside, into the lower run of the weather strip, then, using the tool hook (A-6), lift the lip of the weather strip as the glass is pressed into position (refer to Fig. 7).

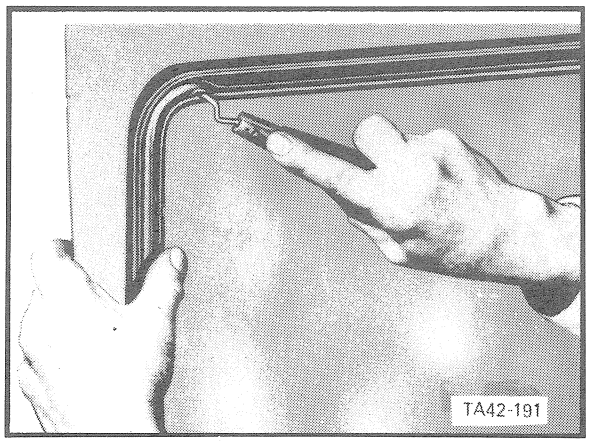


Fig. 7

Change the tool hook for the roller and filler strip eye (B-6).

On the front and rear windscreens start well away from the weather strip joint. On the door and side windows start at the top square corner. Insert the tool into the groove then feed in the filler strip from the front of the tool but on the door and side windows allow the mitred corner to overlap by about 6 mm (0.25 in). Work the tool along the groove (refer to Fig. 8) ensuring that the filler strip is not stretched, especially on

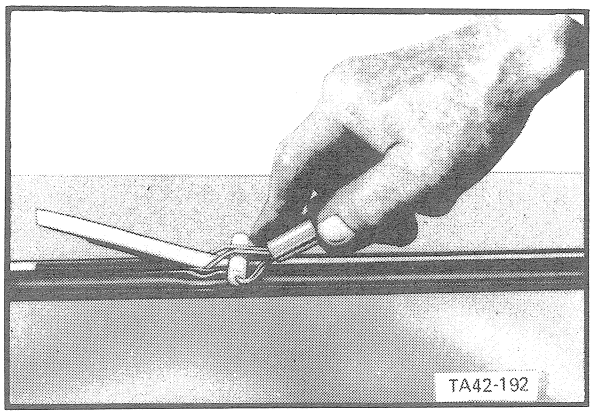


Fig. 8

corners. When the circuit has been completed there will be approximately 12 mm (0.5 in) of overlap on the front and rear windscreens or 6 mm (0.25 in) on the door and side windows. Use the rounded nose of the tool to push this overlap into the groove to form a tight joint.

(e) Install the door catches (9-4) and bumpers (8-4) noting that the catches are handed.

(f) Install a belleville washer (5-4) handle (4-4), outer belleville washer, plain washer and nut. If the handle is loose on the shaft with the nut tightened, install extra plain washers under the nut. Install the split pin.

(g) Lift the window (6-4) into position ensuring that a brass washer (15-4) is fitted on each hinge pin. Latch the windows in the open position, if necessary adjusting the bumpers (8-4) to ensure that the window is firmly held.

(h) Install the windscreen wipers and lights referring to GROUP 5.

2d. INSTALLATION

(a) Suitably sling the cab and lift into position.

(b) Install the side bolts (4-3) and the bolts along the front.

(c) Select shims (14-4) to fill the gap at the rear then install the bolts.

(d) Install the rear cover (2-2) securing with the bolts (1-2).

(e) Connect the connector block at both sides of the front cover (2-1) then position the front cover and secure with the bolts (1-1).

(f) Install the front door striker plate mountings (4-1) referring to para. 3e for correct adjustment.

(g) Remove the lifting equipment.

3. CAB BASE

3a. REMOVAL

(a) Remove the cab, if fitted, referring to para. 2a. If a cab is not fitted remove the bolts (1-2) to free the rear cover (2-2). Remove the bolts (3-1) to remove the front door striker plate mountings taking care not to lose the shims behind. Remove the bolts (1-1) and ease back the front cover (2-1) far enough to allow the connector blocks and air hoses to be disconnected then lift the front cover clear of the machine.

(b) Lift off the rear doors taking care not to lose the washers on the hinge pins.

(c) Remove the batteries referring to GROUP 5.

(d) Free the battery isolation switch (5-3) and pre-heater switch (6-3) from the seat decking.

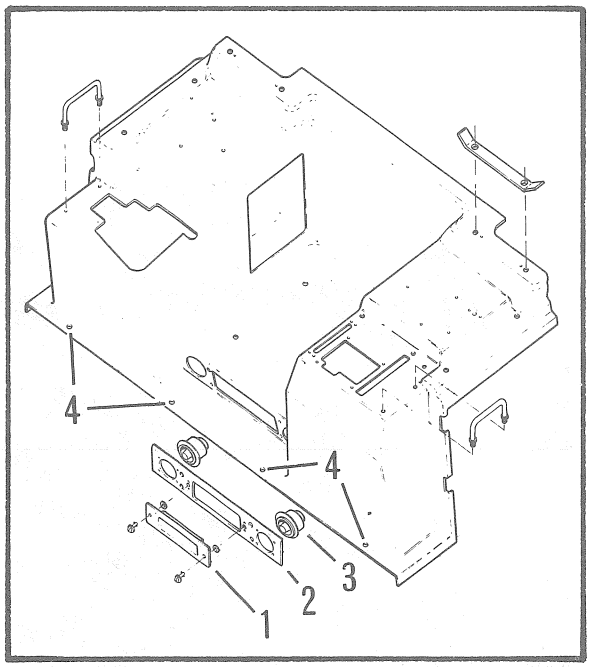


Fig. 9

(e) Remove the seat and seat support as an assembly.

(f) Remove the access panel (1-9) and withdraw the element.

(g) Remove the bolts and withdraw the ventilation panel (2-9) far enough to allow the air hoses to be disconnected from the vents (3-9).

(h) Remove the screws (1-10) to free the boot over the boom and bucket control levers then push the boot down toward the control valve to ensure that it is clear of the seat decking.

(i) Remove the knobs from the drive control levers, remove the bolts to free the quadrants (1 & 2-3) then remove the bolts (3-3) to free the control levers housing from the seat decking.

(j) Remove the bolts and bars (80-12) securing the rear of the welded assembly to the hydraulic/ fuel tank and the bolts securing the front of the welded assembly to the loader frame.

(k) Lift out the centre deck plate (5-1).

(l) Remove the bolts (6-1) to free the side deck plates.

(m) Remove the bolts (1-11) securing the welded assembly to the loader frame top deck.

(n) Disconnect the hand brake cable at the foot pedal.

(o) Suitably sling the cab base and lift clear of the machine taking care with the control levers housing and brake cable as the cab base is lifted.

3b. DISMANTLING

(a) To remove the seat decking disconnect the rear door lock cables (31-12) at the levers then remove the bolts (4-9). If a cabless machine there will also be two bolts at the top on each side to remove.

(b) To remove a rear door lock remove the screws to free the spring (28-12), remove the centre screw to free the lever (30-12) then remove the mounting bolts to free the lock (29-12).

(c) To remove a complete front door remove the centre door pillar (14-12) which is secured by a bolt, spring washer and plain washer, top and bottom inserted from the inside, then lift off the door. Take care not to lose the torsion springs (13-12) in the hinge brackets or the washers on the hinge pins.

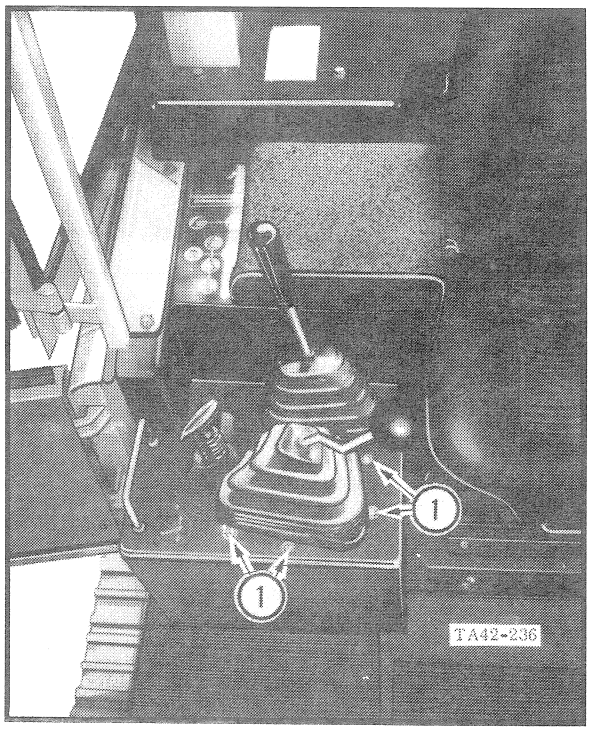


Fig. 10

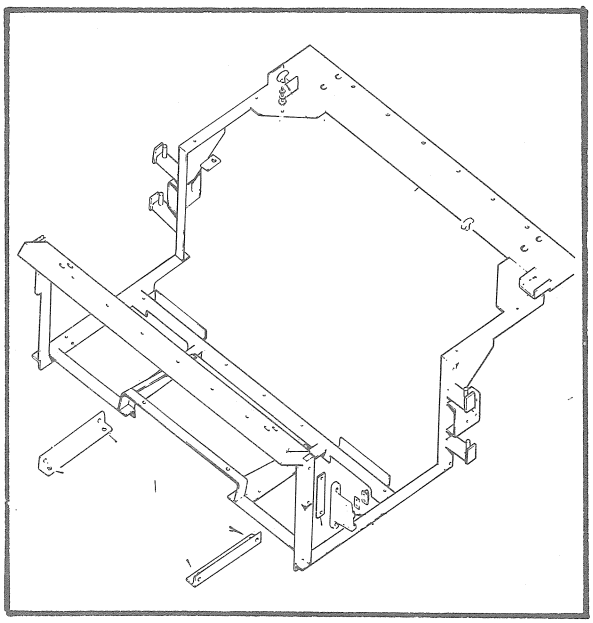
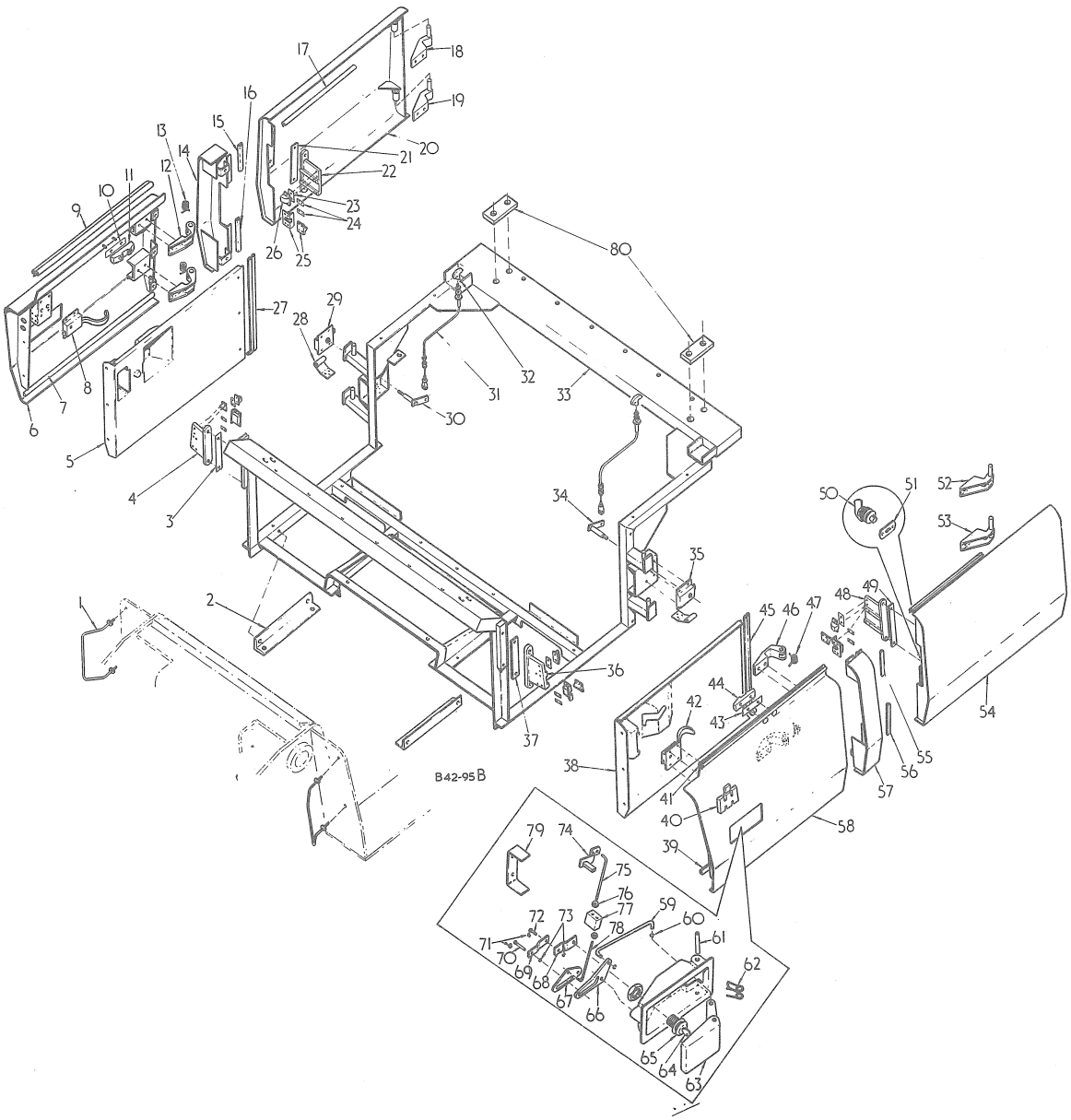


Fig. 11



1. Grab handle
2. Angle
3. & 37. Shim
4. & 36. Striker plate mounting
5. & 38. Inner panel
6. & 58. Front door
7. & 39. Seal
8. & 42. Front door lock
9. & 41. Seal
10. & 43. Shim
11. & 44. Latch bar
12. & 46. Hinge bracket
13. & 47. Torsion spring
14. & 57. Centre pillar
15. & 55. Seal
16. & 56. Seal
17. Seal
18. & 52. Hinge
19. & 53. Hinge
20. & 54. Rear door
21. & 49. Shim
22. & 48. Striker plate mounting
23. Spacer
24. Shim
25. Dovetail and wedge
26. Striker plate
27. & 45. Seal
28. Spring
29. & 35. Rear door lock
30. & 34. Lever
31. Cable
32. Handle
33. Welded assembly
40. I.H. Emblem
50. Fastener
51. Recepticle
59. Converting rod
60. Circlip
61. Hinge pin
62. Spring
63. Handle
64. Key
65. Compartment lock
66. Bellcrank
67. Bellcrank
68. Latch bar
69. Link
70. Pin
71. Circlip
72. Pin
73. Circlip
74. Lever
75. Rod
76. Nut
77. Slider block
78. Rod
79. Clamp
80. Bar

Fig. 12

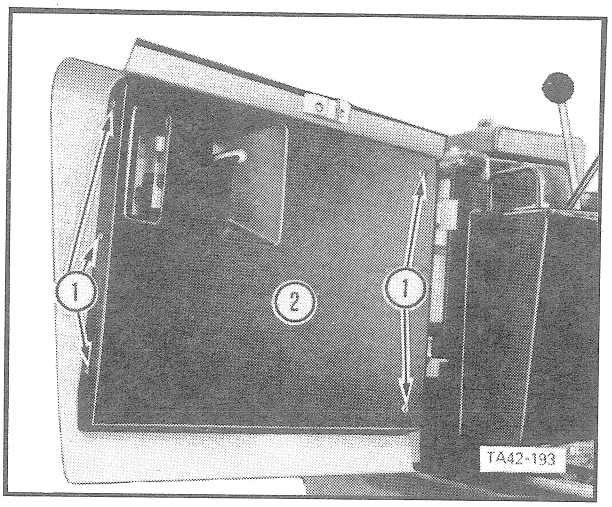


Fig. 13

(d) For access to the front door components remove the screws (1-13) to free the inner panel (2-13).

(e) To remove the hinge brackets remove the bolts (4-14).

(f) To remove the window latch bar remove the nuts (3-14) and spring washers. There may be shims under the bar.

(g) To remove the lock remove the centre screw (1-14) which will free the lever (74-12). Remove the mounting bolts (2-14) to free the lock.

(h) To remove the handle assembly remove the circlip (6-14) and swing the rod aside. Remove the split pin (7-14) and washer to free the upper rod from the bellcrank. Remove the bolts (5-14) and clamp then withdraw the handle assembly from the outside.

(i) To dismantle the handle assembly remove the circlip behind the rod (1-15) and remove the rod. Remove the circlip behind the pin (3-15) and withdraw the link (4-15). Remove the bolt (2-15) to free the latch bar. Remove the locknut to free the compartment lock (65-12). Remove the screw (5-15) washer, bellcrank (6-15), copper washer, second bellcrank (7-15) and washer. Drive out the hinge pin (61-12) to free the lever (63-12) and spring (62-12).

(j) If the striker plate mountings (22-12) are removed from the rear doors take care not to lose the shims (21-12) behind. Similarly, if the striker plate (26-12) and/or dovetail (25-12) are removed from the mounting take care not to lose the spacer (23-12) or shims (24-12) behind.

3c. ASSEMBLY

(a) To assemble the front door handle assembly, insert the lever (63-12) from the outside, insert the spring (62-12) from the inside so that the loop is against the lever arm and the coils are in line with the pivot holes then insert the hinge pin (6-12) through body, spring coils and lever. Install the compartment lock (65-12) ensuring that the key turns forward from the upright position then secure with the locknut. Install the latch bar, securing with the bolt (2-15) then check that the latch bar is in the vertical down

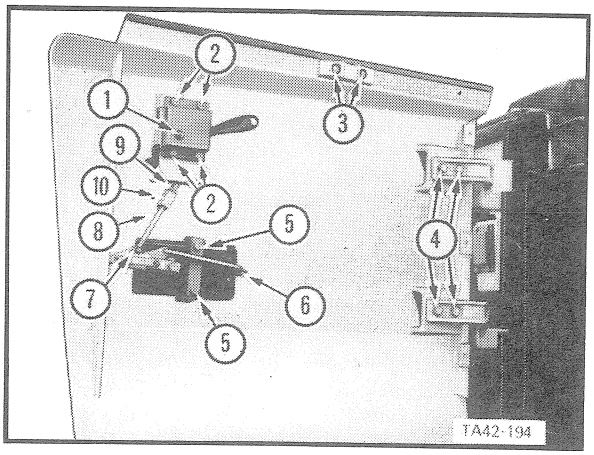


Fig. 14

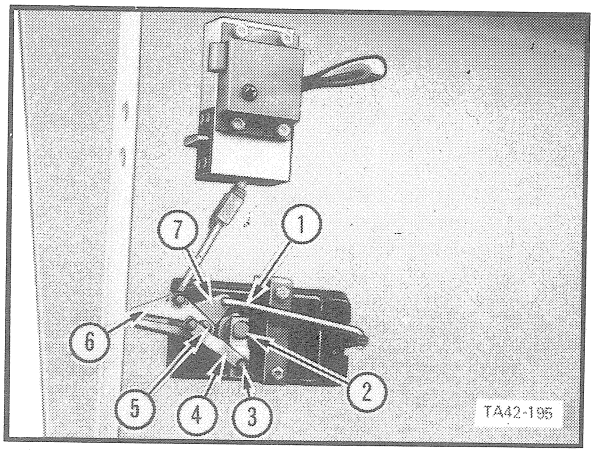


Fig. 15

position with the key horizontal and turns to the horizontal forward position when the key is turned to the upright position. Leave the latch bar in the vertical position. Position the two bellcranks (6 & 7-15) with the copper washer between and a plain washer either side then apply Loctite 270 to the threads of the screw (5-15) and tighten until the bellcranks can move freely without end float. Insert the front pin of the link (4-15) through the slots in both bellcranks, position the rear pin (3-15) in the latch bar and secure with the circlip.

(b) To install the handle assembly, insert the assembly into the door from outside with the bellcranks (6 & 7-15) to the front then secure with the clamp and bolts (5-14). Position the rod (1-15) between the bellcrank (7-15) and lever arm then secure with the circlips. Position the upper rod in the bellcrank (6-15) and secure with the washer and split pin (7-14). Turn the key to the upright (unlocked) position so that the latch bar is forward as shown in Fig. 14 then check the free play in the linkage passing through the nylon slide block (10-14). If necessary tighten the nuts (8 & 9-14) until all free play has been taken up without moving the hand lever away from the boss in the door handle body.

(c) To install the lock, locate on the mounting plate and secure with the bolts (2-14). Locate the lever (74-12) in the lock and secure with the centre screw (1-14).

(d) If the hinge brackets were removed locate these on the door with the bolts (4-14), position a washer on each hinge pin, position the torsion springs (13-12) in the forks of the hinge brackets adjusting as necessary to align with the pins. The springs act to hold the doors in the open position. Do not install the centre door pillars (14-12) or the door inner panel (2-13) until the cab base is installed on the machine.

(e) To install a rear door lock (29-12), locate on the mounting plate and secure with the mounting bolts. Install the lever (30-12) with the arm to the rear and secure with the centre screw. Position the spring (28-12) so that it curves upward toward the lock and secure with the screws. This spring acts to throw open the rear door when the lock is released.

(f) If the seat decking is to be installed, lift into position and secure with the bolts (4-9). If a cabless machine there will also be two bolts at the top on each side. Connect the rear door lock cables (31-12) at the levers.

(g) If the window latch bar (11-12), dovetail (25-12), striker plate (26-12) and/or striker plate mountings (22-12) were removed, these are best left until the cab is installed to ensure correct adjustment.

3d. INSTALLATION

(a) Suitably sling the cab base and lift into position on the machine taking care with the control levers housing and brake cable as the cab base is lowered.

(b) Install the bolts (1-11) securing the welded assembly to the loader frame top deck.

(c) Install the bolts securing the front of the welded assembly to the loader frame and the bolts and bars (80-12) securing the rear of the welded assembly to the hydraulic/fuel tank.

(d) Locate the control levers housing in the seat decking and secure with the bolts (3-3). Install the quadrants and the control lever knobs.

(e) Connect the hand brake cable at the foot pedal.

(f) Position the boom and bucket control lever boot and secure with the screws (1-10).

(g) Secure the air hoses to the air vents (3-9) in the ventilation panel (2-9) then secure the panel to the front of the seat decking. Install the element and access panel (1-9).

(h) Secure the pre-heater switch (6-3) and battery isolation switch (5-3) to the seat decking.

(i) Install the seat and seat support assembly.

(j) Lift the front cover (2-1) into place and connect the air hoses. If a cabless machine couple the connector blocks and secure the front cover with the bolts (1-1) then install the rear cover (2-2). If a cab is to be fitted leave the front cover loose and leave off the rear cover.

(k) Install the cab, if fitted, referring to para. 2d.

(l) Check the alignment of the front doors in relation to the loader frame top deck. Adjust-

ment can be made by slackening the hinge bracket bolts (4-14) and aligning the doors as necessary.

(m) Install the striker plate mountings (4-1) with one shim behind then adjust the lock mechanisms referring to para. 3e.

(n) Install the inner panel (2-13).

(o) Install the centre door pillar (14-12) which is secured by a bolt, spring washer and plain washer, top and bottom inserted from inside.

(p) Install the rear doors, positioning a washer on each hinge pin and adjust the hinge brackets as necessary to align the doors with the loader frame top deck and front doors.

(q) If this was removed, install the striker plate mountings (22-12) to the rear doors with one shim behind then adjust the lock mechanisms referring to para. 3e.

(r) Install the batteries referring to GROUP 5.

(s) Run the engine and check the correct functioning of the instruments and controls.

(t) Install the side deck plates and secure with the bolts (6-1). Install the centre deck plate (5-1).

3e. ADJUSTMENTS

(a) Using moderate hand pressure on the door, check that the latch engages the striker plate. If too much pressure is required, add shims under the mounting.

(b) Check the amount of latch engagement, this must be at least 5.0 mm (0.2 in). Add shims as necessary behind the striker plate to ensure correct engagement.

(c) Assemble the door dovetail to the striker plate mounting then vertically adjust the mounting as necessary to ensure that the door wedge is centralised in the dovetail.

(d) Add shims as necessary behind the door dovetail to bring the mounting faces of the wedge and dovetail as close together as possible allowing sufficient clearance for the door to open and close without fouling.

(e) On cab installations, shim the window latch bar so that when the window is latched to the closed front door the horizontal gap between upper and lower door, created by the seal, is approximately 10 mm (0.4 in). This ensures that the window is retained in a firm position and in all round contact with the seals.

(f) Check that the inner door handles open the front doors when the outer door handle is locked.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

BUCKET & LIFT ARMS GROUP 3

1. DESCRIPTION

The lift arm assembly consists of a pair of large steel beams joined together at the front by a steel formed section. The front and rear pivot housings are welded to the ends of the beams. The assembly pivots on large pins which are secured to the loader frame.

Large diameter pins welded to the lift arms form the pivots for the bucket tilt levers. The top ends of the tilt levers are connected directly to the tilt cylinders while the bottom ends connect to tilt links which in turn connect to the bucket.

All exposed pivots are protected against the entry of dirt etc. by sealing rings.

Self levelling characteristics are designed into the lift arm linkage so that a rolled back bucket when raised from ground level will retain the same position in relation to the ground thus avoiding spillage over the rear of the bucket.

The lift arm pivot points at the loader frame are shimmed to reduce end float and centralise the lift arms about the radiator.

The majority of the servicing of the bucket and lift arms can be carried out without detaching the lift arms from the loader. This allows the bucket or lift arms to be positioned exactly as required by using the loader hydraulic system. However, adequate safety precautions must be taken against inadvertent movement of the control levers when working with the lift arms raised or the bucket clam open.

When welding operations are in progress on items attached to the loader, it is advisable to disconnect the terminal block at the alternator to avoid the risk of damage to the alternator. Hydraulic pipes and cylinders must be protected against heat.

2. BUCKET TEETH POINTS

2a. REMOVAL

(a) Drive out the anchor (1-1).

(b) Withdraw the point (2-1).

(c) If inspection proves it necessary, push out the retainer (2-2).

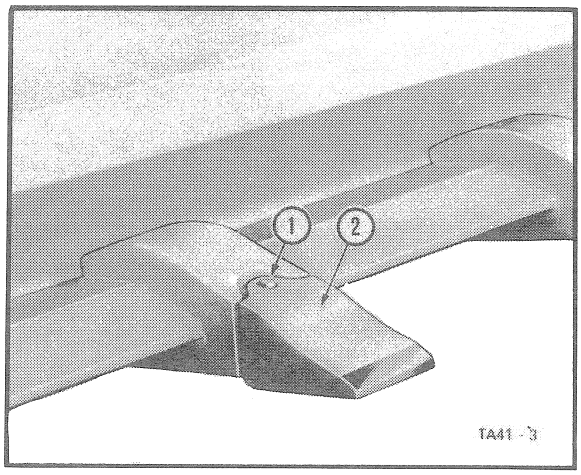


Fig. 1

2b. INSTALLATION

(a) Position the retainer (2-2) in the tooth adaptor.

(b) Position the point (2-1) on the tooth adaptor.

(c) Drive in the anchor (1-1).

3. CLAM CUTTING EDGE

3a. REMOVAL

(a) Flame cut or grind through all the welds which secure the tooth adaptors (1-3) and cutting edge (2-3) to the clam bottom.

(b) Clean off all the old welds.

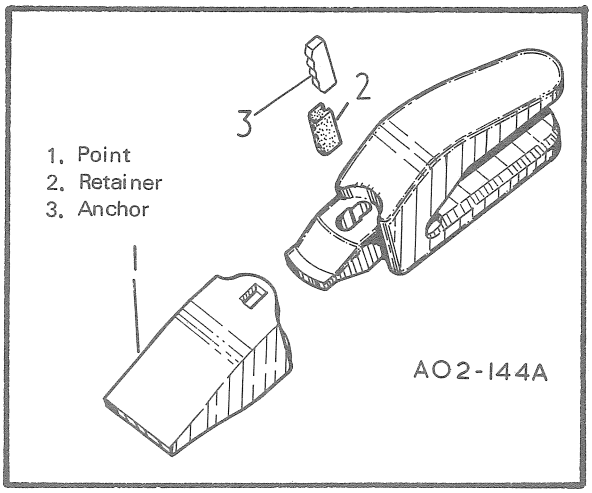


Fig. 2

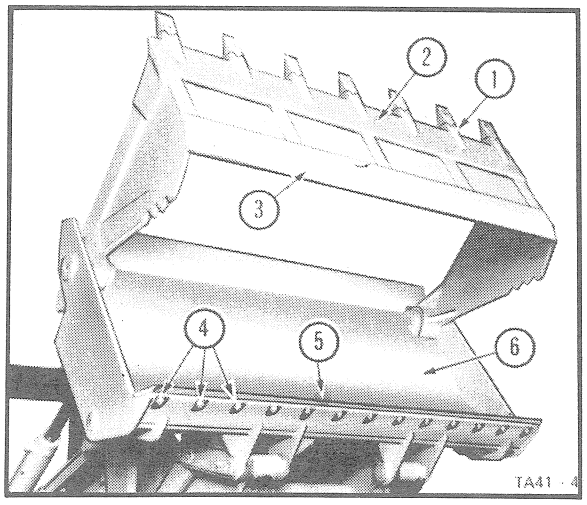


Fig. 3

3b. INSTALLATION

(a) Clamp the cutting edge to the clam bottom.

(b) Use low hydrogen rods to weld the cutting edge into position locating the welds as near as possible to the old welds.

(c) Equally space the tooth adaptors (1-3) along the cutting edge and weld these in position.

4. COMPACTION PLATE
4a. REMOVAL

(a) Flame cut or grind through the welds which secure the compaction plate (3-3) to the clam bottom.

(b) Clean off all old welds.

4b. INSTALLATION

(a) Clamp the compaction plate (3-3) to the clam bottom ensuring that it seats correctly along its full length.

(b) Use low hydrogen rods to weld the plate to the clam bottom and position the welds as near as possible to the old welds.

5. BLADE CUTTING EDGE
5a. REMOVAL

NOTE: This cutting edge is reversible.

(a) Remove the nuts (4-3) and plough bolts which secure the cutting edge (5-3) to the blade (6-3).

5b. INSTALLATION

(a) Position the cutting edge (5-3) to the blade and install the bolts and nuts (4-3).

(b) As the nuts are being tightened hammer the bolt heads to ensure correct seating.

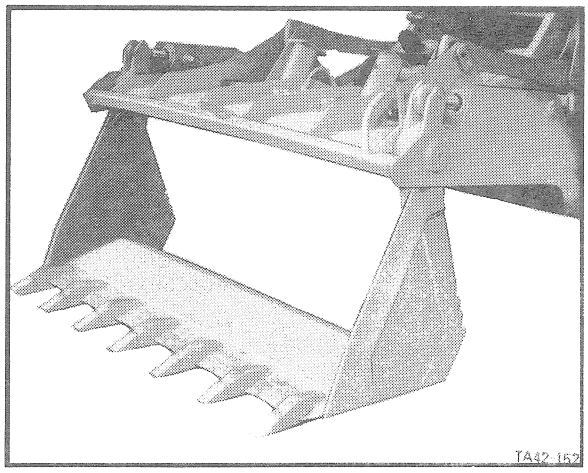


Fig. 4

6. CLAM ASSEMBLY
6a. REMOVAL

(a) Open the clam then position the bucket so that the bottom edge of the clam is flat on the ground as shown in Fig. 4.

(b) Remove the split pin (1-5) and headed pin (3-5) then drive out the cylinder pivot pin (2-5) to free the cylinder from the clam. Repeat on the other side of the bucket.

(c) Remove the split pin (4-5) and headed pin at each side of the clam.

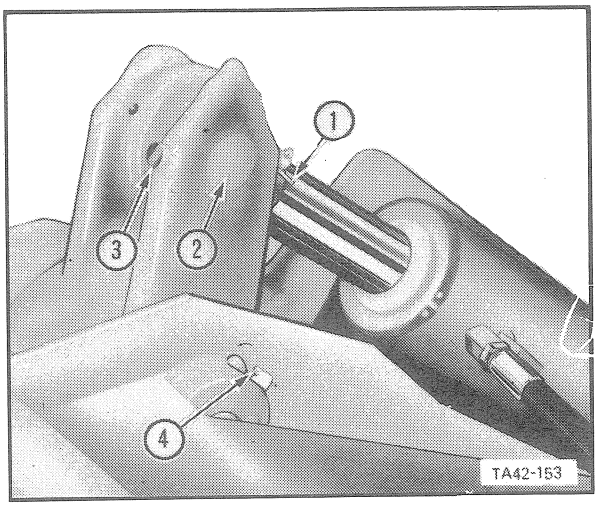


Fig. 5

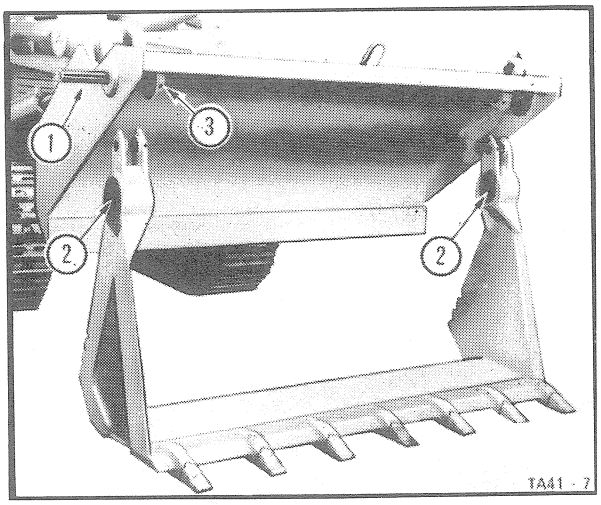


Fig. 6

(d) Drive out the clam pivot pins (1-6) at each side of the bucket. It may be necessary to adjust the height of the lift arms to ease the load on the clam pivots.

(e) Raise the lift arms and reverse the machine clear of the clam.

(f) If inspection proves it necessary remove the bushes (2-6) from the clamp pivots.

6b. INSTALLATION

(a) If these were removed, install new bushes (2-6) to the clam pivots.

(b) Position the blade directly over the clam then lower the blade into position until the pivots are aligned.

(c) Use a soft hammer or wooden block to drive in the pins (1-6) ensuring that the holes in the pins are aligned with the holes (3-6) in the blade.

(d) Install the headed pin and split pin (4-5) at each side.

(e) Align the cylinders and install the pivot pins (2-5) aligning the holes in the pins with the holes in the clam ears.

(f) Install the headed pins (3-5) and split pins (1-5).

7. BUCKET
7a. REMOVAL

(a) Position the bucket so that the lower edge is flat on the ground.

(b) Disconnect the hydraulic hoses at the unions (1 & 2-7) and loop the hoses as shown in Fig. 8.

(c) Remove the bolts (2 & 3-8), lock washers and plain washers on each side of the bucket.

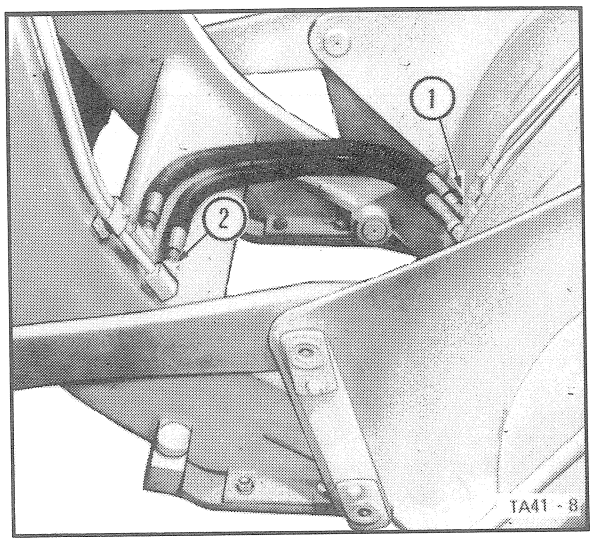


Fig. 7

(d) Extract the pivot pins (1-8) to disconnect the tilt links (5-8). Remove the sealing rings and shims.

(e) Extract the pivot pins (4-8) on each side of the bucket. It may be necessary to adjust the height of the lift arms to ease the load on the pins. Remove the sealing rings and shims.

(f) Drive the machine rearward clear of the bucket.

7b. INSTALLATION

(a) Position the loader so that the lift arms are behind and square to the bucket pivots. Support the tilt links so that they are clear of the bucket when the machine is moved then drive the machine forward until the lift arms and bucket pivot points are aligned. Position the sealing rings.

(b) Insert and align shims as established in para. 9e., then install the pins (4-8).

(c) Align the tilt links, install shims as established in para. 9e., position the sealing rings then install the pins (1-8).

(d) Install the plain washers, lockwashers and bolts (2 & 3-8).

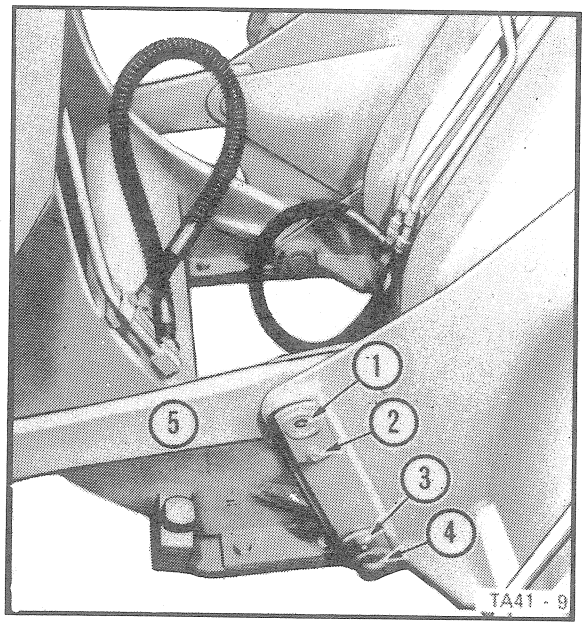


Fig. 8

(e) Connect the hydraulic hoses at the unions (1 & 2-7).

8. TILT LEVERS

8a. REMOVAL

(a) Remove the tilt cylinders referring to GROUP 14.

(b) Remove the bolt, (3-9) lockwasher and plain washer then withdraw the pivot pin (2-9) and sealing rings (1-9).

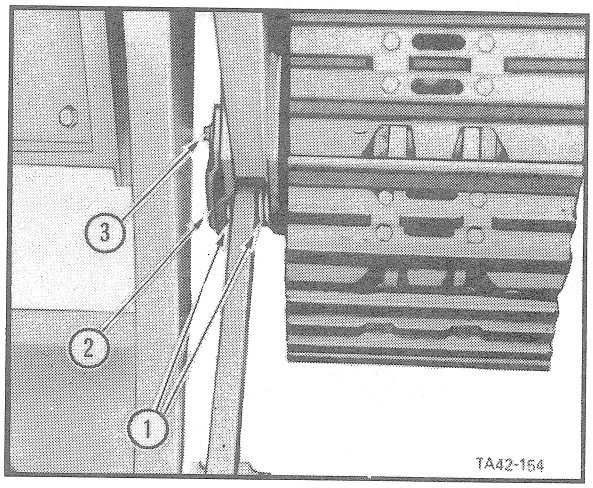


Fig. 9

(c) Remove the bolts, retainer (1-10) and sealing ring (2-10).

(d) Suitably support the tilt lever (3-10) then slide it from the pivot (1-11). Remove the inner seal ring (2-11).

(e) If inspection proves it necessary draw the bush (3-11) from the pin.

(f) If inspection proves it necessary press the bushing (1-12) from the tilt lever.

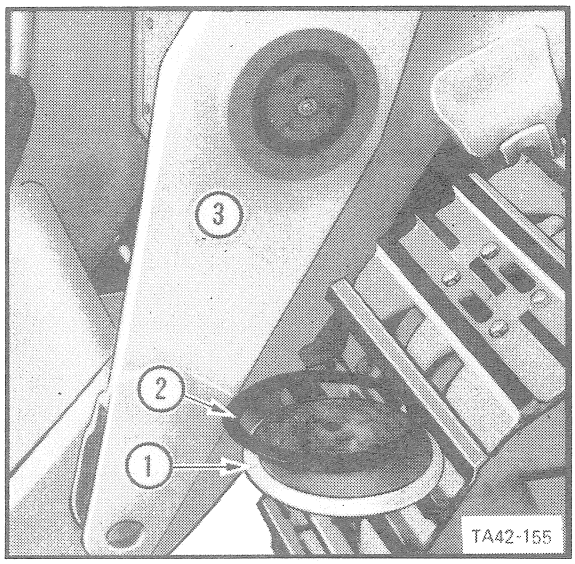


Fig. 10

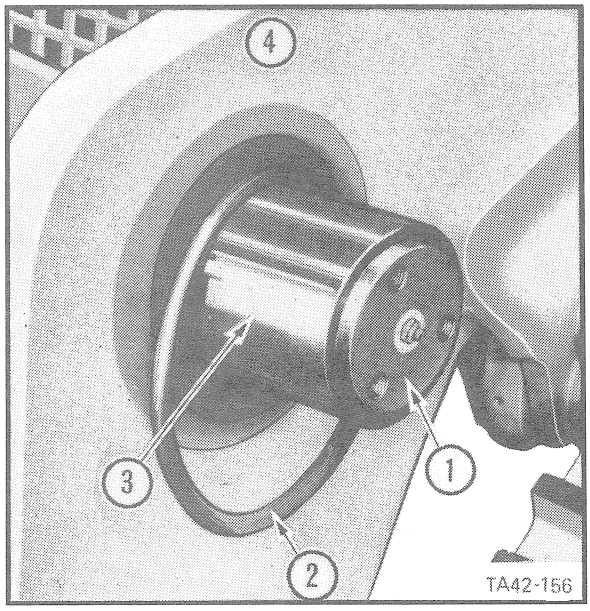


Fig. 11

8b. INSTALLATION

(a) If this was removed, heat the bush (3-11) in oil or an oven to 150 to 180°C (300 to 350°F), treat the pivot pin with an anti-scuffing agent then press on the bush with the chamfer toward the lift arm.

(b) If this was removed press the bushing (1-12) into the tilt lever.

(c) Position the inner seal ring (2-11) on the pivot pin boss. A smear of grease on the bevel will retain the ring in position.

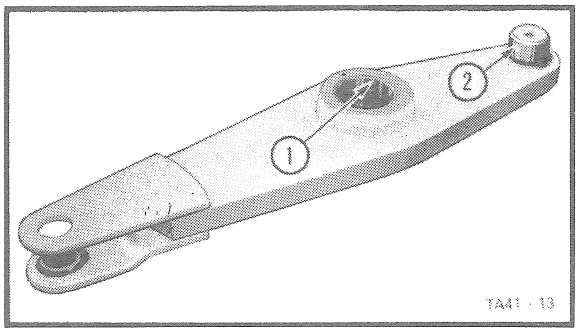


Fig. 12

(d) Position the tilt lever on the pivot pin ensuring that the tilt cylinder pivot is upward and facing outward.

(e) Degrease the securing bolt and bolt holes and apply Loctite 221 to the bolts. Position the outer seal ring on the retainer (1-10) then install the retainer and secure with the bolts.

(f) Position the tilt link sealing rings (1-9) on the fork at the bottom of the tilt lever, position the tilt link then install the pivot pin (2-9) and securing bolt (3-9), plain and lockwasher.

(g) Install the tilt cylinder referring to GROUP 14.

9. LIFT ARMS

9a. REMOVAL

(a) Remove the bucket referring to para. 7.

(b) Remove the tilt cylinders referring to GROUP 14.

(c) Remove the bolts (1-13) which secure the hydraulic pipes to the right lift arm then move the pipes clear of the loader.

(d) Raise the lift arms until the lift cylinder front pivots are accessible then block the lift arms in this position and release the hydraulic pressure.

(e) Remove the bolt (2-13), lockwasher and plain washer, support the cylinder (4-13), extract the pivot pin (3-13) then lower the cylinder clear of the lift arms. Repeat on the other lift cylinder.

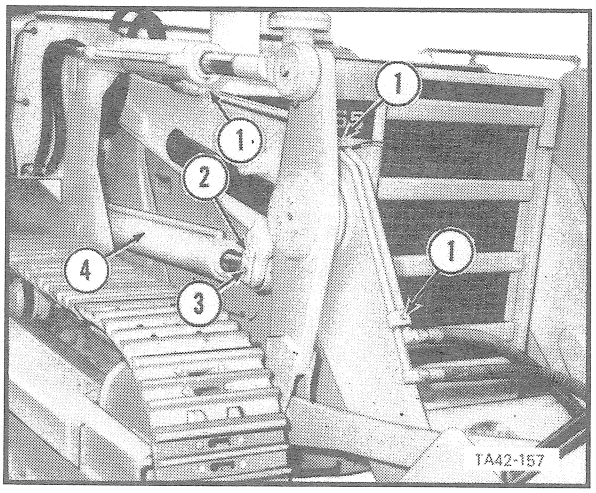


Fig. 13

(f) Remove the top nut then swing the grab handles (1-14) clear.

(g) Remove the bolt, lockwasher and plain washer from each pivot pin (2-14), support the rear of the lift arms then withdraw the pivot pins. Shims between the loader frame and lift arms must be taped together until required for installation.

(h) Reverse the loader clear of the lift arms and lower the lift arms to a safe position.

9b. DISMANTLING

(a) Remove the tilt levers referring to para. 8.

(b) Remove the bolts which secure the lift arm shoes (1-15).

(c) Remove the bucket roll stops (31-15) and shims (30-15).

(d) Remove the bumpers (33-15) and plates (32-15).

(e) If inspection proves it necessary press the bushes (2 & 24-15) from the lift arms.

(f) If inspection proves it necessary press the bushes (5-15) from the tilt links (9-15).

9c. ASSEMBLY

(a) If these were removed press new bushes (5-15) into the tilt links (9-15).

(b) If these were removed press new bushes (2 & 24-15) into the lift arms.

(c) Install the lift arm shoes. As the nuts are being tightened hammer the heads to ensure correct seating of the bolts.

(d) Install the tilt levers referring to para. 8.

(e) Install the plates and bumpers (32 & 33-15).

(f) Refer to para. 9e. for installation of the bucket roll stop.

9d. INSTALLATION

(a) Raise the rear of the lift arms to the height of the loader frame locations.

(b) Carefully drive the loader into the lift arms adjusting the lift arm height as necessary to line up the pin holes.

(c) Position shims as established in para. 9e. then install the pins (2-14) and secure with the bolts, plain washers and lockwashers.

(d) Swing the grab handles (1-14) into position.

(e) Raise the front of the lift arms until the lift cylinder front pivots are accessible, raise the lift cylinders into position adjusting their lengths as necessary to align the pivots and install the pins (3-13). Lock the pins with the bolts (2-13) lockwashers and plain washers.

(f) Position the pipes along the right lift arm and install the clamps and bolts (1-13).

(g) Install the tilt cylinder referring to GROUP 14.

(h) Install the bucket referring to para. 7.

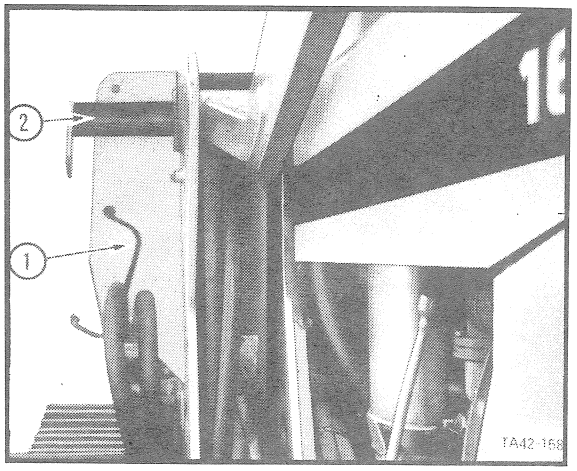


Fig. 14

9e. ADJUSTMENTS

1. LIFT ARMS TO LOADER FRAME

Select shims so that the lift arms are equally located about the radiator guard but with a free movement of 1.5 to 2.5 mm (0.060 to 0.100 in).

2. BUCKET TO LIFT ARMS

Select shims so that the bucket is equally located about the lift arms but with a free movement of 1.5 to 2.5 mm (0.060 to 0.100 in).

3. TILT LINKS

Position an equal number of shims each side of each tilt link to provide a free movement of 1.5 to 2.5 mm (0.060 to 0.100 in).

4. BUCKET ROLL STOPS

(a) Install the bucket stops without shims.

(b) Raise the bucket until the distance between the ground and the centre of the bucket pivots is 381 mm (15.0 in).

(c) Carefully roll back the bucket until the tilt cylinders are fully extended.

(d) Measure the gap between the tilt links and stops on each side. This measurement plus 1.5 mm (0.060 in) is the thickness of the shim pack which must be installed under the heads of the bucket stops.

(e) Roll forward the bucket so that the stops can be removed then install the shim packs and secure the stops to the lift arms.

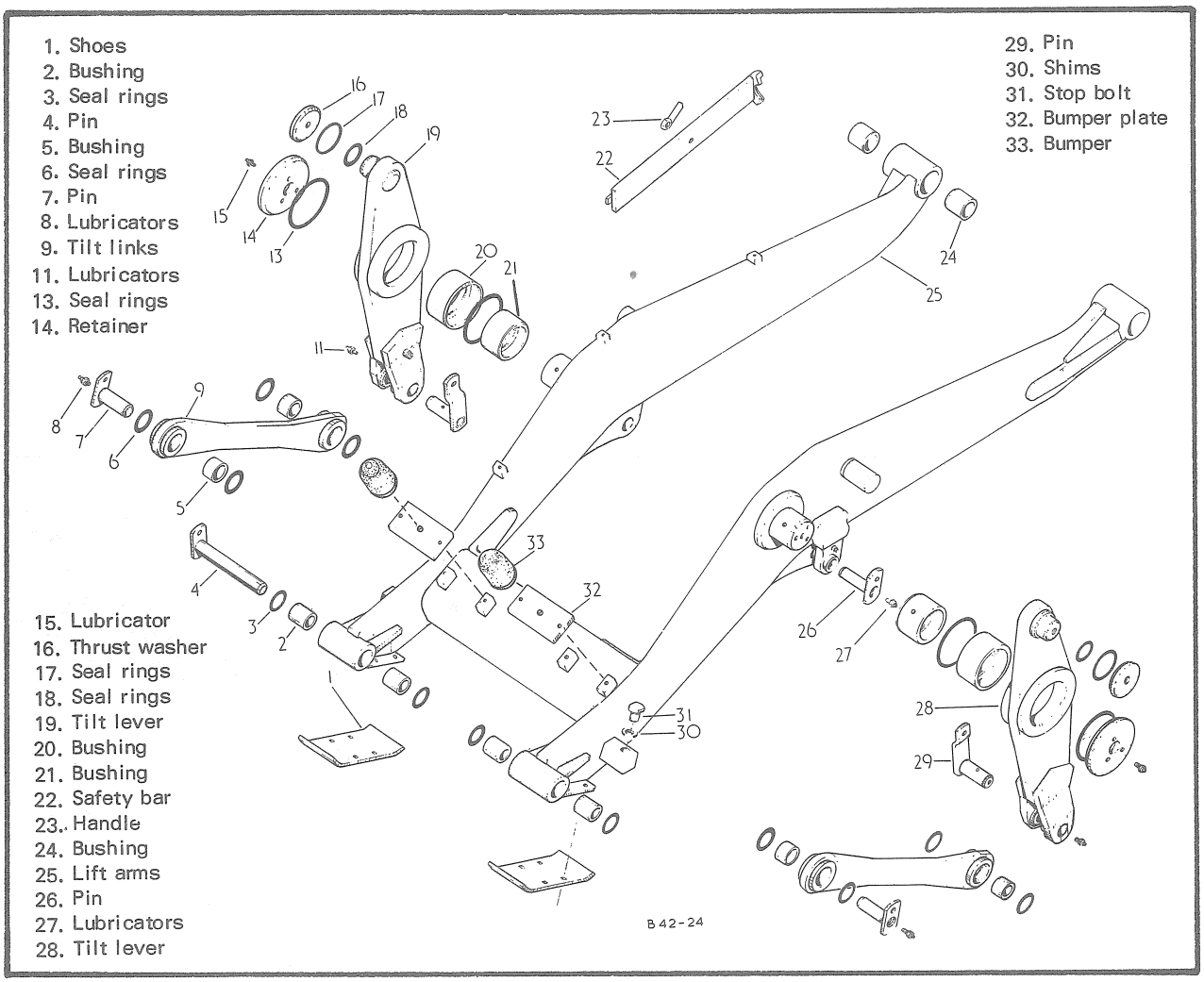


Fig. 15

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

COOLING SYSTEM

GROUP 4

1. DESCRIPTION

The cooling system is of the closed type which permits machine operation at various angles without loss of coolant.

The radiator cap is fitted with a pressure valve which opens when the pressure in the cooling system exceeds 0.48 kg/cm^2 (7 lb/in^2). This allows higher operating temperatures without boiling. A thermostat is provided so that coolant circulation is restricted until the working temperature of 95^{o}C (203^{o}F) is attained.

A centrifugal pump driven by twin V belts from the engine crankshaft is used to circulate the coolant. A blower type fan is mounted on the coolant pump hub.

The transmission system oil cooler is mounted forward of the radiator.

2. SIDE SHEETS

2a. REMOVAL

(a) Raise the lift arms and position the safety bar on the lift cylinder. Stop the engine and slowly allow the lift arms to lower onto the safety bar.

(b) Remove the bolts (1-1).

(c) Lift out the side sheet.

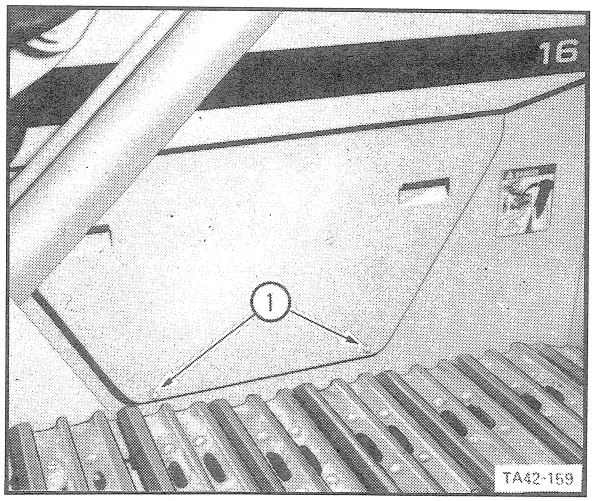


Fig. 1

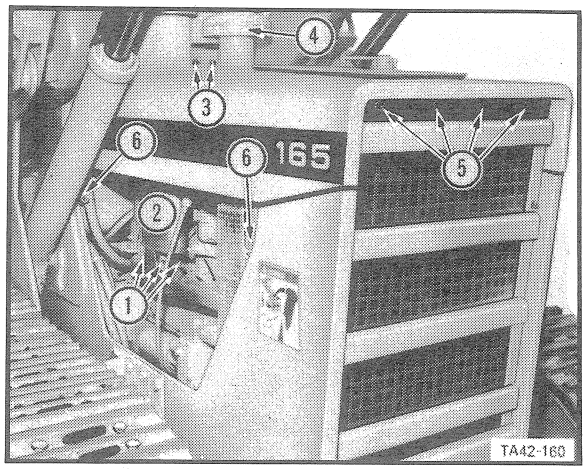


Fig. 2

2b. INSTALLATION

(a) Lift the side sheet into position locating the front and rear pegs in the channel pieces, (6-2).

(b) Secure with the bolts (1-1).

(c) Remove the safety bar and lower the lift arms.

3. HOODSHEET

3a. REMOVAL

(a) Remove the right side sheet referring to para. 2a.

(b) Remove the bolts (1-2) around the exhaust flange and lift off the silencer (2-2).

(c) Remove the pre-cleaner (4-2).

(d) Remove the front and rear bolts (5 & 3-2).

(e) Lift off the hoodsheet.

3b. INSTALLATION

(a) Position the hoodsheet and secure with the bolts (3 & 5-2).

(b) Install the pre-cleaner (4-2).

(c) Install the silencer and secure with the bolts (1-2).

(d) Install the right side sheet referring to para. 2b.

4. FANGUARDS
4a. REMOVAL

(a) Remove the side sheets referring to para. 2a.

(b) Slacken the bolts (2 & 3-3).

(c) Remove the bolts (1-3) from either side and lift out the guard section.

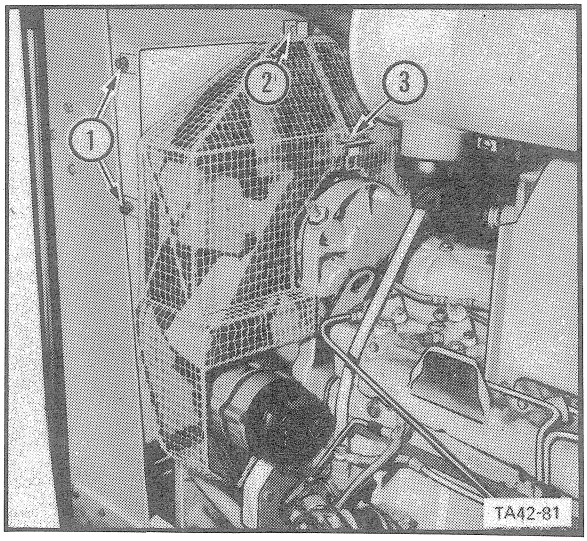


Fig. 3

4b. INSTALLATION

(a) Position the left section of the guard and locate with the bolts (1-3) finger tight.

(b) Position the right section locating the slotted lugs on the bolts (2 & 3-3) then tighten the side bolts.

(c) Tighten the bolts (2 & 3-3) and the side bolts (1-3).

(d) Install the side sheets referring to para. 2b.

5. OIL COOLER
5a. REMOVAL

(a) Remove the front plate (1-4).

(b) Remove the bolts (2 & 3-4) and lift off the grille and screen assembly.

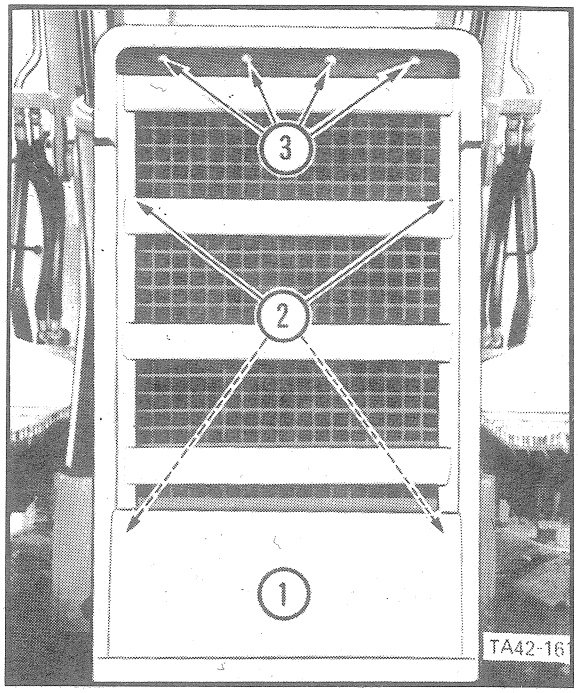


Fig. 4

(c) Slacken the hose clips and slide the hoses (2 & 3-5) from the cooler pipes. Identify these hoses so that they can be returned to their correct locations and plug them as quickly as possible to prevent loss of transmission oil and the entry of dirt.

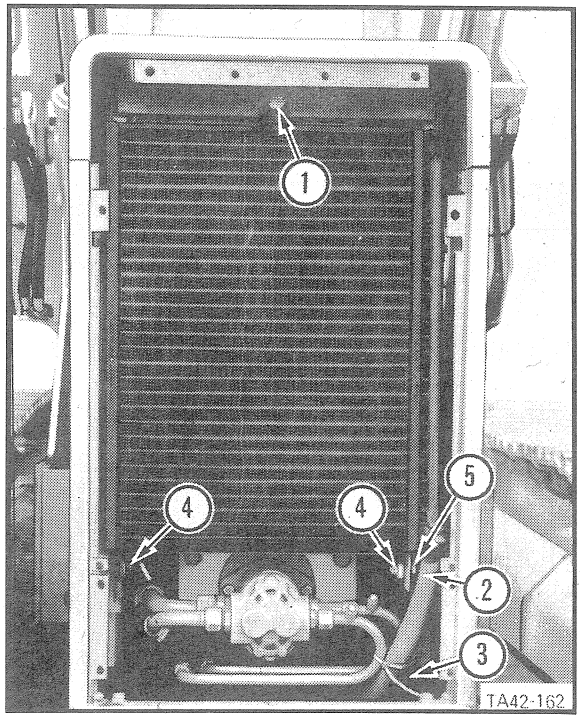


Fig. 5

(d) Remove the nuts (4-5) from the shoulder bolts (5-5).

(e) Disengage the locking stud (1-5).

(f) Support the cooler then withdraw the bolts (5-5) and lift out the cooler.

5b. INSTALLATION

(a) Position the oil cooler and thread in the shoulder bolts (5-5).

(b) Lift the oil cooler into position and engage the locking stud (1-5).

(c) Install the nuts (4-5) onto the shoulder bolts.

(d) Connect the hoses (2 & 3-5) and tighten the hose clips.

(e) Top up and bleed the transmission system then install the grille and screen assembly.

6. RADIATOR

6a. REMOVAL

(a) Remove the side sheets, hoodsheet and fan guard sections referring to paras. 2, 3 and 4.

(b) Drain the cooling system referring to the Operator's Manual.

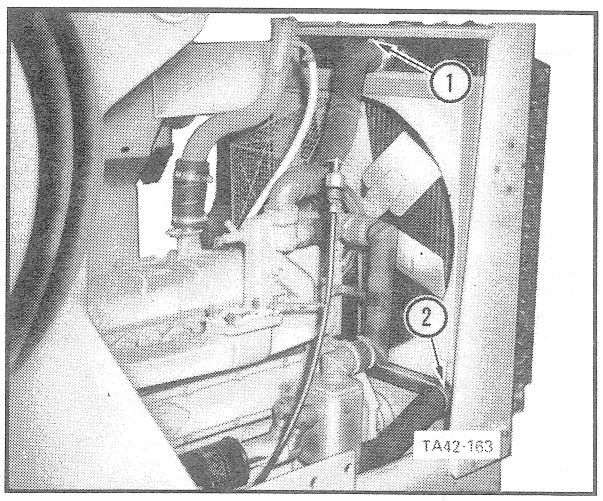


Fig. 6

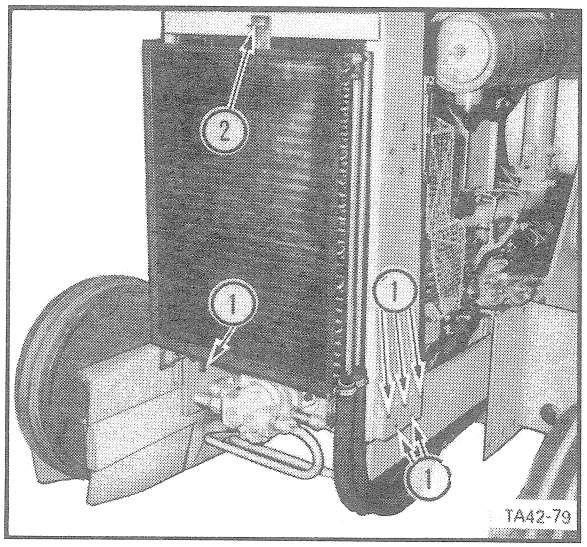


Fig. 7

(c) Remove the grille then disconnect the oil cooler hoses referring to para. 5a.

(d) Slacken the hose clips (1 & 2-6) on the top and bottom hoses.

(e) Suitably sling the radiator and mounting frame assembly then take the strain.

(f) Remove the bolts (1-7) then as the assembly is eased forward disconnect the top and bottom radiator hoses. Lift the assembly clear of the machine.

6b. DISMANTLING

(a) Remove the oil cooler referring to para. 5a.

(b) Remove the nuts (1-8) on the inside and lift off the fan shroud.

(c) Remove the bolts (2-8) on each side and withdraw the trunnions.

(d) Remove the bolts (3-8) on each side to free the bottom support (4-8). Remove the base mounting rubbers (5-8) if these have adhered to the radiator.

(e) Remove the radiator from the mounting frame.

6c. ASSEMBLY.

(a) Slide the radiator into the mounting frame ensuring that the hose connections are on the opposite side to the oil cooler locking stud hole (2-7).

(b) If these were disturbed, position the base mounting rubbers (5-8) in the bottom support then install the bottom support ensuring that the oil cooler hinge bars (6-8) are on the same side as the locking stud hole (2-7). Secure with the bolts (3-8).

(c) Stand the assembly upright ensuring that the pegs on the radiator are correctly located in the base mounting rubbers then install the trunnions and secure with the bolts (2-8).

(d) Install the fan shroud and secure with the nuts (1-8).

6d. INSTALLATION

(a) Lift the assembly and connect the top and bottom hoses as the assembly is eased back into position. Install the bolts (1-7).

(b) Tighten the hose clips (1 & 2-6).

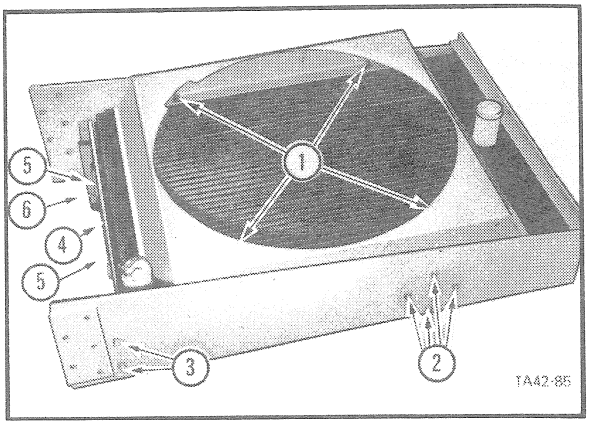


Fig. 8

(c) Fill the cooling system.

(d) Install the fan guard and hood sheet referring to paras. 3 and 4.

(e) Install the oil cooler referring to para. 5 and check the cooling system for leaks as the engine is running.

(f) Install the side sheets.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

INSTRUMENTS & ELECTRICAL GROUP 5

1. DESCRIPTION

The electrical system is a 12 volt negative earth type. Two six volt batteries are used and a battery isolation switch is provided.

The batteries are charged by an alternator, with built-in rectifier and regulator, driven by twin V-belts from the engine crankshaft. An indicator light on the instrument panel warns if a fault develops in the charging circuit while the engine is running above low idle speed.

THE ALTERNATOR, BATTERIES OR ANY TERMINAL IN THE CHARGING CIRCUIT MUST NOT BE CONNECTED OR DISCONNECTED WHILE THE ENGINE IS RUNNING. TO DO SO WILL CAUSE DAMAGE TO THE ALTERNATOR.

The starting circuit includes the batteries, starting motor, keyswitch, safety start switch, manifold heater switch and two manifold heating elements. The safety start switch is mounted on the drive control housing and is operated by the safety lock lever which ensures that the circuit is broken whenever the drive control lever is in any position other than neutral.

The instrument and auxiliaries circuit, fed through the keyswitch, is protected by a fuse. A further fuse protects the lighting circuit.

In addition to the alternator warning light the instrument panel also has warning lights for the engine oil pressure, transmission oil pressure, and fuel reserve.

Gauges are provided for the aircleaner restriction, transmission oil temperature and engine coolant temperature. A service meter and panel light are on the left of the panel while the work light switch, keyswitch, fuse box, wiper and cab heater switch are on the right side of the panel. An adjustable air vent is provided at either end of the panel. Where a horn circuit is provided the horn push is incorporated in the centre of the work light switch.

BEFORE WORKING ON ANY PART OF THE ELECTRICAL SYSTEM, DISCONNECT THE BATTERY EARTH (NEGATIVE) TERMINAL OR ISOLATE THE BATTERIES. DO NOT RUN THE ENGINE WITH THE BATTERY DISCONNECTED AS SERIOUS DAMAGE TO THE ALTERNATOR WILL RESULT.

When welding operations are being performed on items attached to the machine, it is advisable to disconnect the alternator to avoid any risk of damage to the alternator.

Fig. 1

2. BATTERIES

2a. REMOVAL

(a) Release the catch and open the left rear door (1-1).

(b) Disconnect the earth lead (1-2) supply lead (4-2) and one end of the interconnecting lead (3-2).

(c) Remove the nuts (2-2) and lift off the battery clamp.

(d) Lift out the batteries.

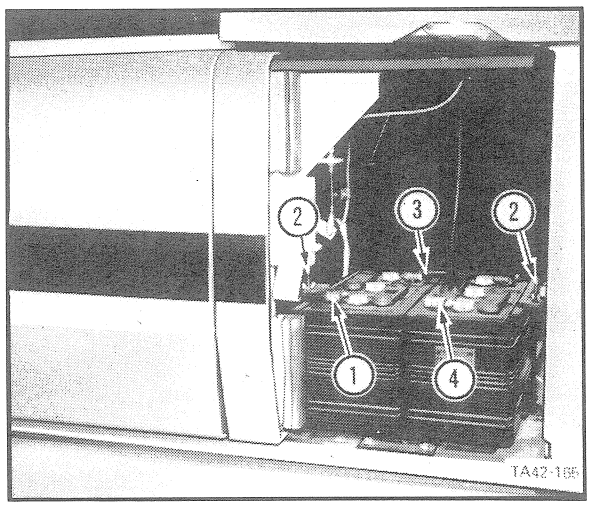


Fig. 2

2b. INSTALLATION

(a) Position the batteries in the battery tray with the negative (earth) terminal (1-2) to the front.

(b) Position the battery clamp and tighten the nuts (2-2).

(c) Connect the interconnecting link (3-2), supply lead (4-2) and earth lead (1-2) in that order.

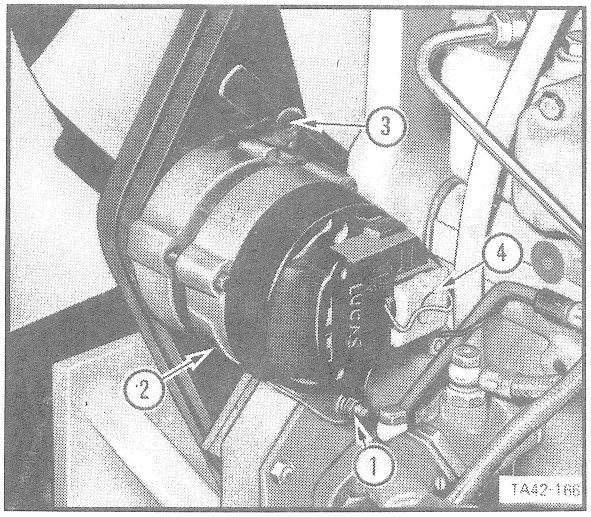


Fig. 3

3. ALTERNATOR
3a. REMOVAL

(a) Remove the engine left side sheet referring to GROUP 4

(b) Remove the left section of the fan guard.

(c) Release the spring clip and withdraw the terminal block (4-3).

(d) Remove the bolt (3-3) and slacken the bolt at the inner end of the adjusting brace.

(e) Remove the nut (1-3), support the alternator and withdraw the bolt (2-3) then thread the alternator pulley from the drive belts to remove the alternator.

3b. INSTALLATION

(a) Thread the pulley into the belts, ensuring that the belts are correctly located on the crankshaft and fan pulleys, then locate the alternator on its mounting bracket and insert the bolt (2-3). Screw on the nut (1-3) finger tight.

(b) Install the brace bolt (3-3), adjust the belt tension then tighten the bolt (3-3) and nut (1-3). Tighten the bolt at the inner end of the brace.

(c) Connect the terminal block (4-3) and secure with the spring clip.

(d) Install the left section of the fan guard.

(e) Install the left side sheet.

4. STARTING MOTOR
4a. REMOVAL

(a) Remove the left side sheet referring to GROUP 4.

(b) Disconnect the bracket (2-4) which supports the engine fuel control cable.

(c) Disconnect the bracket (1-4) which supports the oil cooler hoses.

(d) Remove the nut (4-4) to disconnect the supply lead and remove the nut (3-4) to disconnect the earth lead.

(e) Remove the bolts at the mounting flange (5-4) and lift out the starting motor.

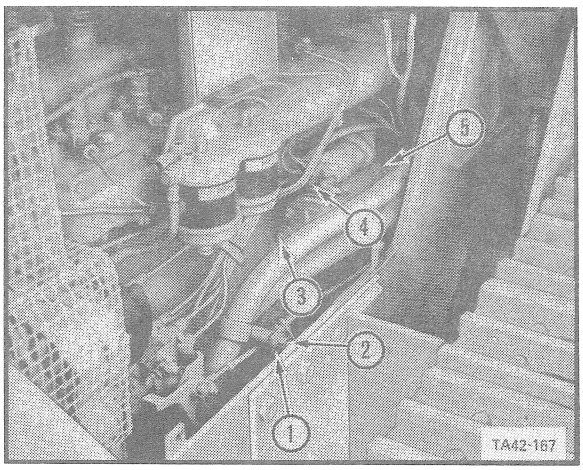


Fig. 4

4b. INSTALLATION

(a) Locate the starting motor on the engine with the solenoid at the top then secure with the bolts at the mounting flange (5-4)

(b) Connect the earth lead at the nut (3-4) and the supply lead at the nut (4-4).

(c) Position and secure the fuel control cable bracket (2-4) and the oil cooler hose bracket (1-4).

5. MANIFOLD HEATERS
5a. REMOVAL

(a) Remove the left side sheet referring to GROUP 4.

(b) Unscrew the terminal nut (1-5) and remove the lead (2-5).

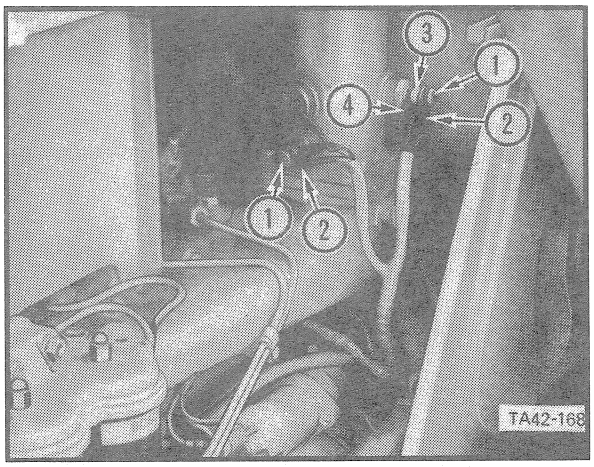


Fig. 5

(c) Remove the insulator (3-5) and lead (4-5).

(d) Unscrew the heater unit from the manifold.

5b. INSTALLATION

(a) Screw the heater unit into the manifold.

(b) Install the lead (4-5), insulator (3-5), lead (2-5) and terminal nut (1-5).

(c) Install the left side sheet.

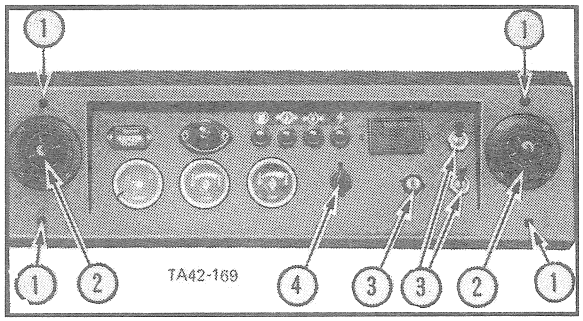


Fig. 6

6. INSTRUMENTS
6a. REMOVAL

(a) Remove the screws (1-6) and ease the instrument panel from the support until the hoses behind the air vents (2-6) are accessible, then disconnect the hoses so that access can be gained to the rear of the panel.

(b) Disconnect the leads at the relevant instrument, switch or warning light and identify the leads to aid assembly.

(c) To remove the gauges, remove the nuts (1-7) and clamps and withdraw the instrument from the panel.

(d) To remove switches, remove the locknuts (3-6) and withdraw the switch from the rear of panel. For access to the work light switch locknut, depress the spindle plunger through the hole in the side of the knob (4-6) and pull off the knob.

NOTE: Items on the instrument panel are not repairable and if faulty must be changed for new.

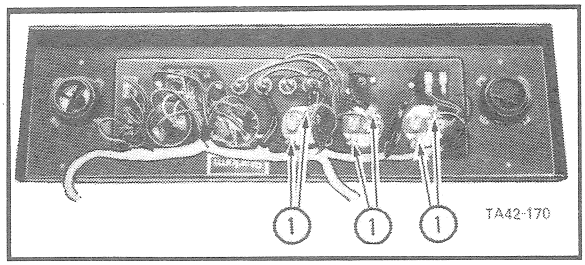


Fig. 7

6b. INSTALLATION

Reverse the removal procedure.

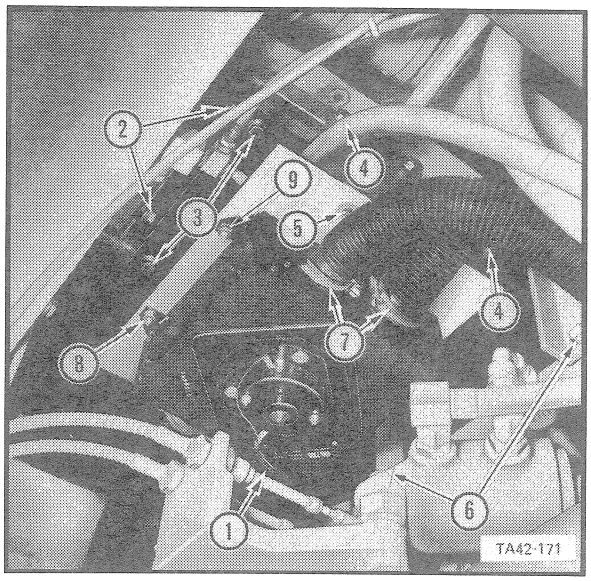


Fig. 8

7. CAB HEATER

7a. REMOVAL

1. MOTOR UNIT

(a) Disconnect the leads (1-8) at the snap connectors.

(b) Slacken the hose clips (7-8) at each side and disconnect the air hoses.

(c) Remove the nuts (8 & 9-8) to free the motor unit. The machine can still be used without the motor unit provided the air hoses are made safe and the nuts (8 & 9-8) are screwed onto the bolts to secure the radiator to the separator plate.

2. RADIATOR

(a) Remove the left side sheet and close the water tap (1-9).

(b) Remove the motor unit referring to sub-para. 1.

(c) Slacken the hose clips on the coolant hoses (4-8) then disconnect and loop or plug the coolant hoses as quickly as possible to prevent too much coolant loss.

(d) Remove the bolts (5-8) at both sides to remove the separator plate and radiator.

3. AIR FILTER HOUSING

(a) Remove the air filter element through the panel under the seat.

(b) Remove the radiator referring to sub-para. 2.

(c) Remove the bolts (3-8) to free the housing from the bracket.

4. AS A UNIT ASSEMBLY

(a) Remove the filter element through the panel under the seat.

(b) Remove the cab base referring to Group 2.

(c) Remove the left side sheet and close the water tap (1-9).

(d) Disconnect the leads (1-8) at the snap connectors.

(e) Slacken the hose clips on the coolant hoses (4-8) then disconnect and loop or plug the coolant hoses to prevent too much coolant loss.

(f) Slacken the hose clips (7-8) at both sides and disconnect the air hoses.

(g) Remove the bolts (2 & 6-8) and lift the assembly clear.

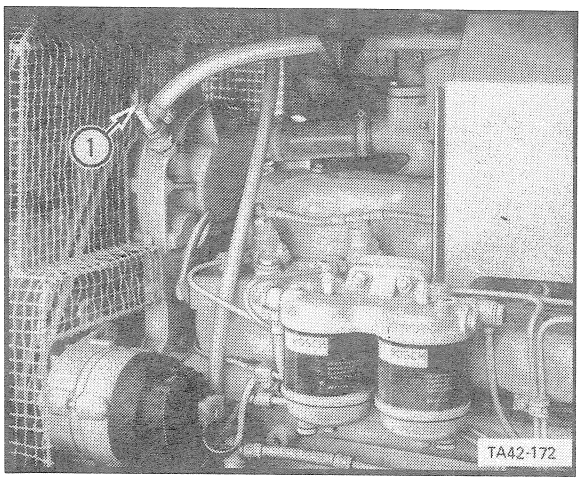


Fig. 9

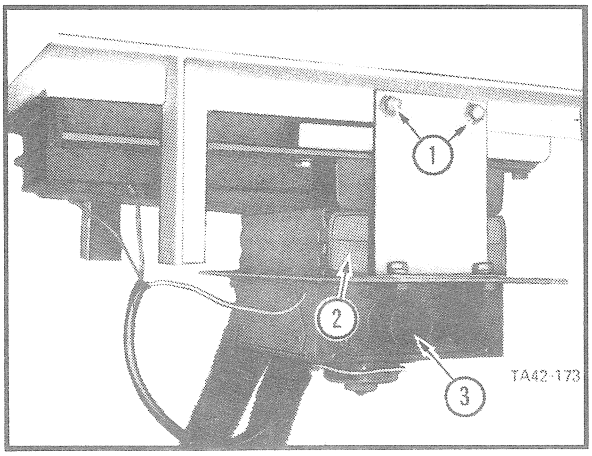


Fig. 10

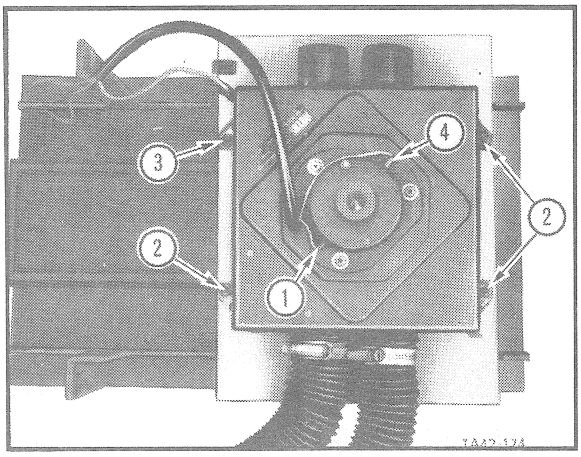


Fig. 11

7b. DISMANTLING

(a) If the unit has been removed as an assembly remove the bolts (1-10) on both sides to free the radiator and motor unit from the assembly.

(b) Remove the nuts (2 & 3-11) and bolts to separate the motor unit (3-10) from the radiator (2-10).

(c) To dismantle the motor unit remove the speed nut (2-12) and lift the fan (3-12) from the spindle.

(d) Remove the screws (1-12) around the mounting plate and remove the wraps.

(e) To remove the harness disconnect the leads (1 & 4-11) at the motor and unsolder the connections at the resistor.

7c. INSPECTION AND REPAIR

(a) Clean dirt from the radiator core with water or steam under pressure ensuring that the radiator fins are not damaged.

(b) Flush the inside of the radiator with clean water.

(c) Blank off one of the radiator connections and adapt an air supply and pressure gauge to the other connection. Immerse the radiator in water and pressurise to 1.05 to 1.27 kg/cm^2 (15 to 18 lb/in^2). If air leaks are apparent, reject the radiator.

(d) Ensure that the seals on the motor are in good condition.

7d. ASSEMBLY

(a) To install a new harness thread the brown and green leads through the grommet in the mounting plate, then knot these leads to leave approximately 475 mm (18.75 in) of free length outside the plate. Thread the brown motor supply lead through the grommet then solder both brown leads to one resistor terminal and the green lead to the other terminal. Connect the supply and earth leads (1 & 4-11) to the motor.

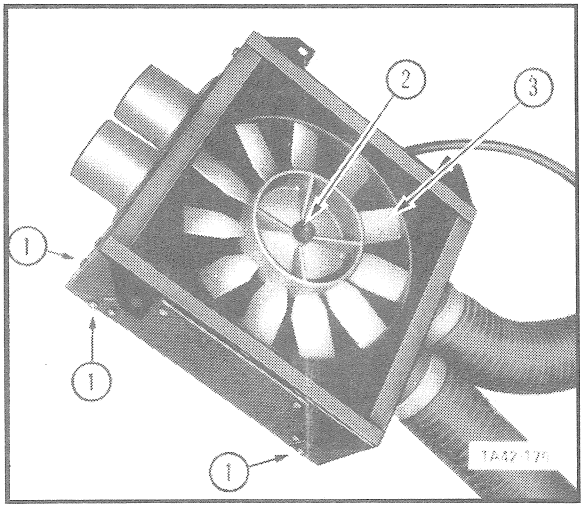


Fig. 12

(b) To assemble the motor unit install the fan on the motor spindle and press on the speed nut (2-12). Position the wraps so that the harness is on the same side as a pair of mounting holes, then secure with the screws (1-12).

(c) Mount the radiator and motor unit either side of the separator plate and secure with the bolts and nuts (2 & 3-11). The earth lead is secured by the nut (3-11).

(d) Position the motor unit and radiator assembly on the mounting bracket and secure with the bolts (1-10).

7e. INSTALLATION

1. AS A UNIT ASSEMBLY

(a) Position the assembly and secure with the bolts (2 & 6-8).

(b) Connect the leads (1-8) at the snap connectors.

(c) Connect the air hoses and tighten the hose clips (7-8).

(d) Connect the radiator hoses and tighten the hose clips (4-8).

(e) Install the cab base referring to Group 2.

(f) Install the filter element through the panel under the seat.

(g) Open the water tap (1-9) then top up the engine cooling system while the engine is running at low idle. Run the engine at a higher speed for a few minutes to expel air from the system and check for leaks. Top up the system as necessary.

(h) Install the left side sheet.

2. AIR FILTER HOUSING

(a) Position the housing up to the bracket and secure with the bolts (3-8).

(b) Install the radiator referring to sub-para. 3.

(c) Install the air filter through the panel under the seat.

3. RADIATOR

(a) Position the radiator and separator plate on the bracket and secure with the nuts (5-8).

(c) Connect the coolant hoses and tighten the hose clips (4-8).

(c) Install the motor unit referring to sub-para. 4 or, if the machine is to be used without the motor unit, install the bolts and nuts (8 & 9-8).

(d) Open the water tap (1-9) then top up the cooling system while the engine is running at low idle. Run the engine at a higher speed for a few minutes to expel air from the system and check for leaks. Top up the system as necessary.

(e) Install the left side sheet.

4. MOTOR UNIT

(a) Position the motor unit on the separator plate and secure with the bolts and nuts (8 & 9-8). The earth lead is located under the nut (9-8).

(b) Connect the air hoses and tighten the hose clips (7-8).

(c) Connect the leads (1-8) at the snap connectors.

8. FRONT WINDSCREEN WIPER

8a. REMOVAL

(a) Remove the screw (2-13) to free the cover then remove the nut beneath.

(b) Screw the nut (3-13) out of the pantograph arm.

(c) Prise the wiper arm (1-13) from the spindle then remove the serrated driver from the wiper arm or spindle, whichever applies.

(d) Remove the nut (1-14) and washer.

(e) Remove the interior light referring to para. 10.

(f) Disconnect the wiper motor lead (2-15).

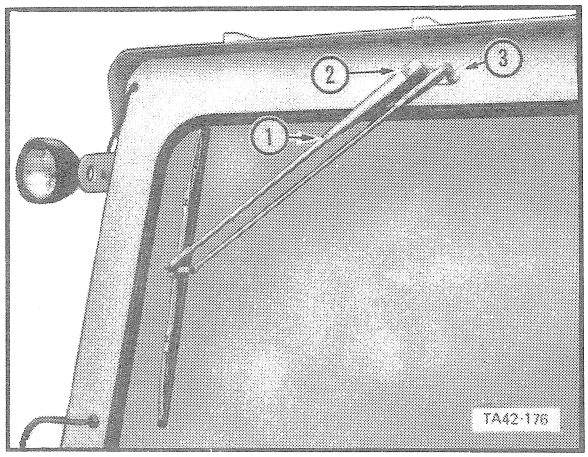


Fig. 13

(g) Remove the nuts, washers and bolts (1-15) then lift the wiper motor clear. Remove the spacer from the spindle.

8b. DISMANTLING

(a) Remove the horse-shoe clip (3-16) to separate the link (1-16) from the motor crank taking care not to lose the spacer under the clip and spring disc under the link.

(b) Remove the bolts (2-16) and lift the motor from the mounting bracket.

8c. ASSEMBLY

(a) If there is a need to run the motor, attach battery leads to the GREEN and GREEN/RED leads in the connector.

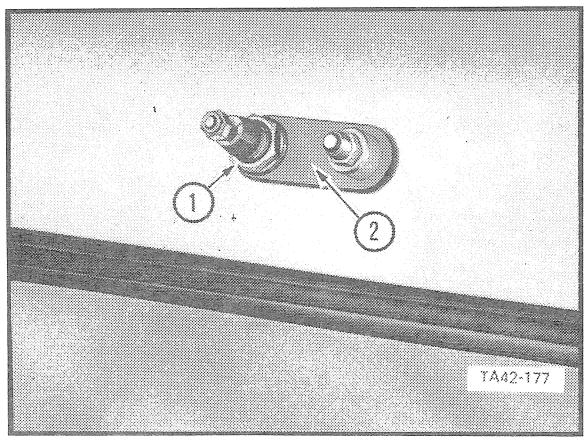


Fig. 14

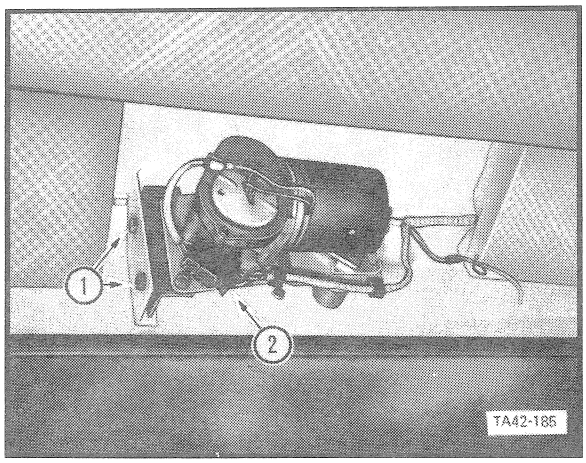


Fig. 15

(b) Position the motor on the mounting bracket and secure with the bolts (2-16).

(c) Position the spring disc on the motor crank with the dished side of the disc towards the crank then install the link (1-16), spacer and horseshoe clip (3-16).

8d. INSTALLATION

(a) Position the spacer on the spindle, insert the spindle through the hole in the front panel then secure the motor to the mounting bracket with the bolts (1-15), washers and nuts. Ensure that the nuts are to the outside.

(b) Connect the wiper motor lead (2-15).

(c) Ensure that the interior light cables are

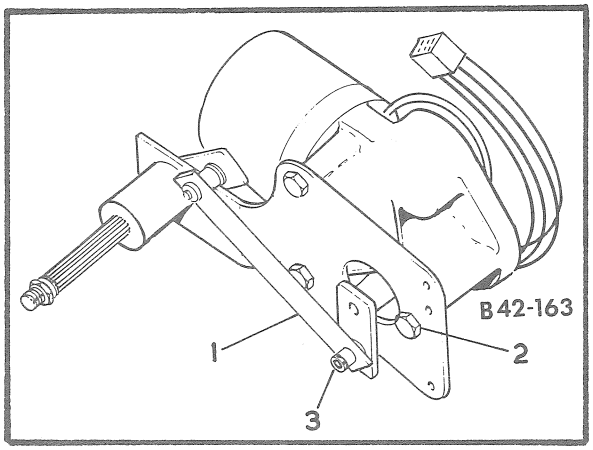


Fig. 16

insulated to prevent a short circuit, then connect the battery and run the wiper motor. Use the wiper switch to stop the motor and park the spindle. If the motor is stopped by means other than the wiper switch, the spindle will not come to rest in the park position. Disconnect the battery.

(d) If these were removed, install the seal, plate (2-14), spacer, washer and bolt.

(e) Install the washer and nut (1-14).

(f) Position the serrated driver on the spindle.

(g) Screw the nut (3-13) into the pantograph arm then position the wiper arm (1-13) on the serrated driver so that the wiper blade is in the park position as shown in Fig. 13.

(h) Install the nut to retain the wiper arm then install the cover and secure with the screw (2-13).

(i) Again connect the battery and check that the wiper motor runs and parks correctly. Disconnect the battery.

(j) Install the interior light referring to para. 10.

9. REAR WINDSCREEN WIPER

9a. REMOVAL

(a) Remove the screws (1-17) to disconnect the leads.

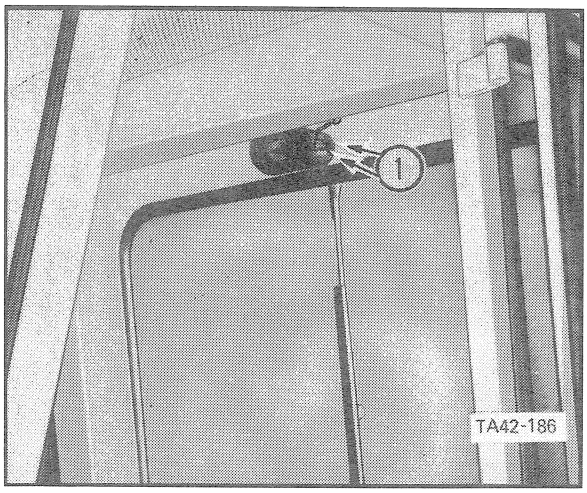


Fig. 17

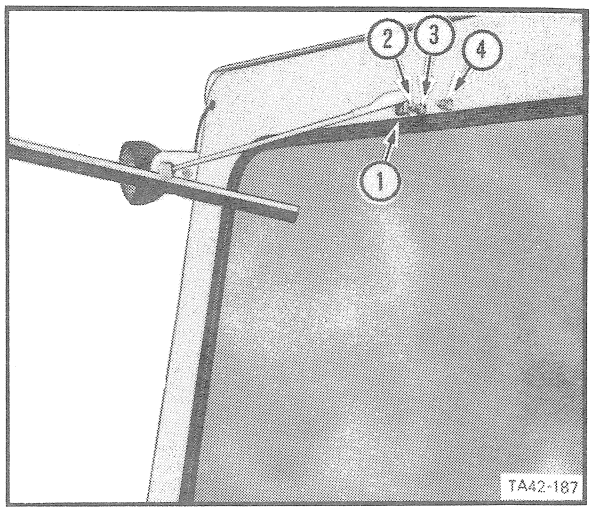


Fig. 18

(b) Remove the screw (1-18) and prise the wiper arm from the spindle.

(c) Remove the seal nut (2-18) and the locknuts (3-18) from the spindle.

(d) Remove the locknuts (4-18) and lift the wiper motor clear.

9b. INSTALLATION

(a) Insert the spindle and the mounting bolt through the holes in the rear panel then secure the motor with the locknuts (3 & 4-18).

(b) Screw on the seai nut (2-18).

(c) Connect the leads at the screws (1-17) then connect the battery and run the motor noting the extremes of movement of the spindle.

(d) Position the wiper arm on the spindle and secure with the screw (1-18).

(e) Run the motor and check that the wiper blade gives an even sweep, if necessary adjust the wiper arm on the spindle to achieve this.

(f) Disconnect the battery if further electrical work is to be carried out.

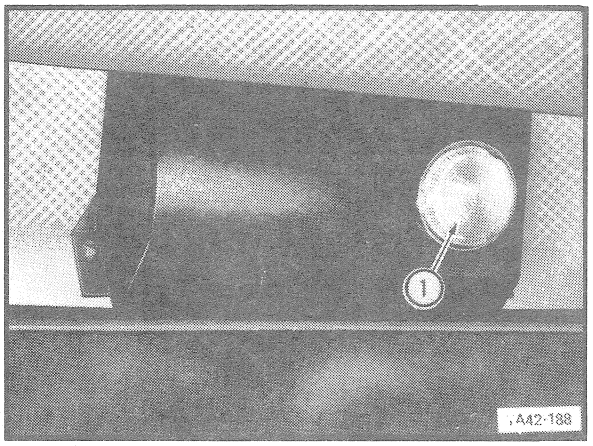


Fig. 19

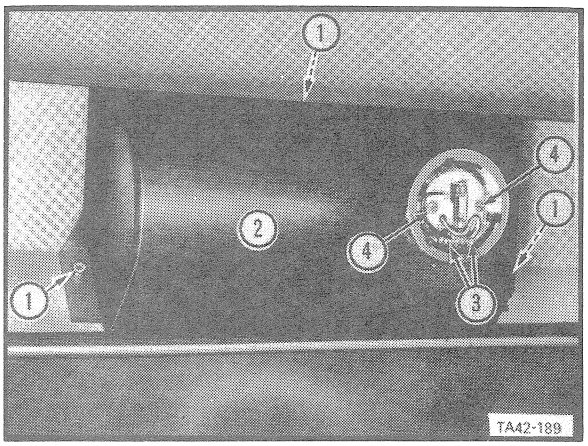


Fig. 20

10. INTERIOR LIGHT

10a. REMOVAL

(a) Turn the lens (1-19) anti-clockwise from the 'light off' position until the pegs line up with the slots in the surround then lift out the lens.

(b) Disconnect the leads at the screws (3-20).

(c) Remove the nuts (1-20) and lift off the cover (2-20) complete with interior light.

(d) To remove the light from the cover, remove the nuts from the screws (4-20) and lift out the light unit.

10b. INSTALLATION

(a) If this was removed, position the light unit in the cover with the switch at the top and secure with the screws (4-20) and nuts.

(b) Thread the leads through the unit then position the cover (2-20) and secure with the nuts (1-20).

(c) Connect the leads at the screws (3-20).

(d) Line up the pegs on the lens with the slots in the surround then press in the lens and turn clockwise. The lower peg and slot are wider than the other two pegs and slots.

(e) Connect the battery and check for satisfactory operation. Disconnect the battery if further electrical work is to be carried out.

11. MISCELLANEOUS ITEMS

Removal of these items is self-evident, their locations being as follows:

(a) Engine coolant temperature transmitter. This is screwed into the coolant manifold at the top right front of the engine.

(b) Engine oil pressure transmitter.
This is screwed into the right side of the engine to the rear of the oil filter.

(c) Fuel reserve transmitter.
This is screwed into the front of the fuel tank.

(d) Air filter restriction transmitter.
This is screwed into the induction manifold.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

FUEL SYSTEM

GROUP 6

1. DESCRIPTION

The fuel system consists of fuel filters, injection pump and injectors mounted on the engine, and a water trap and fuel tank mounted at the rear of the loader frame. The fuel tank has a lockable cap, fuel strainer and sight level gauge.

This GROUP contains information required for servicing the water trap and fuel controls. Information for servicing the fuel tank, which forms an integral structural member with the hydraulic reservoir, is contained in GROUP 14. For information on the remainder of the system refer to the relevant Engine Service Manual.

Absolute cleanliness is essential to the efficient operation of the fuel system. When connections are broken they must immediately be sealed against the entry of dirt. After reconnection it will be necessary to vent the air from the system referring to the Operator's Manual.

2. FUEL TANK

Refer to 'Hydraulic Reservoir' in GROUP 14.

3. WATER TRAP

3a. REMOVAL

(a) Close the fuel shut-off tap.

(b) Disconnect the fuel feed and supply tubes (6 & 8-9 GROUP 14).

(c) Remove the bolts securing the water trap to the reservoir and lift out the water trap.

3b. DISMANTLING

(a) Slacken the nut on the retainer (8-1) then swing the retainer clear of the bowl (7-1) to free the bowl.

(b) Remove the gasket (6-1) and filter gauze (5-1).

(c) Remove the valve screws (2-1).

(d) If inspection proves it necessary remove the pipe (4-1).

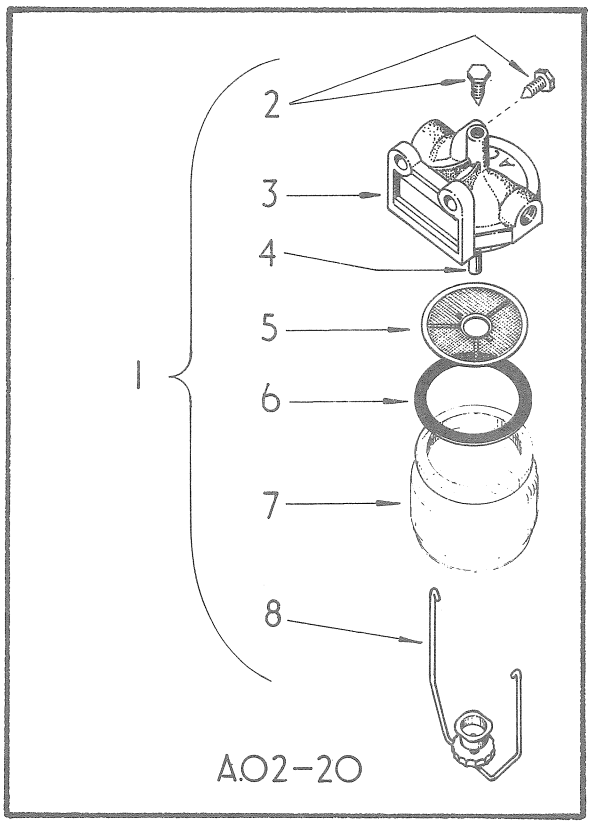


Fig. 1

3c. ASSEMBLY

(a) If this was removed, install a new pipe (4-1).

(b) Install the valve screws (2-1) in the water trap top.

(c) Invert the top and position the gauze (5-1). Position a new gasket (6-1) then the bowl (7-1). Engage the retainer on the top then swing the retainer into position and tighten the nut.

3d. INSTALLATION

(a) Position the water trap on the front face of the hydraulic/fuel tank and secure with the bolts.

(b) Connect the fuel feed tube (8-9 GROUP 14) and the fuel supply tube (6-9 GROUP 14).

(c) Open the fuel shut-off tap and check for leaks. Vent the system.

4. FUEL CONTROL CABLE

4a. REMOVAL

1. PEDAL TO PUMP

(a) Remove the engine left side sheet referring to GROUP 4

(b) Remove the centre floor plate referring to GROUP 2.

(c) Remove the nut (1-2) to free the ball joint from the injection pump lever.

(d) Slacken the nuts (3-2) and slide the cable out of the support.

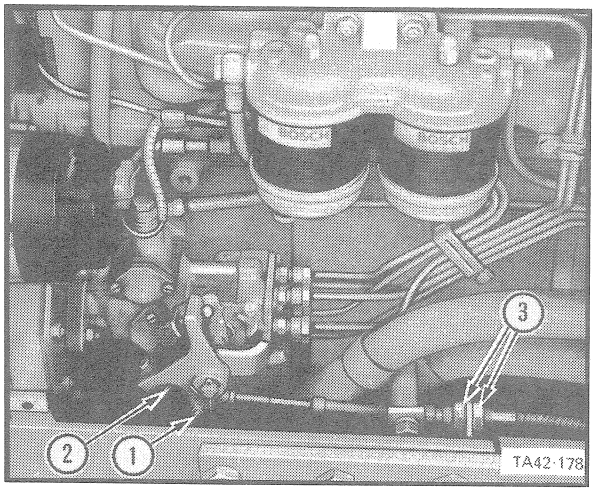


Fig. 2

(e) Remove the split pin and headed pin (10-3) to free the clevis from the inner arm.

(f) Slacken the locknuts then slide the cable out of the support bracket (4-3) and clear of the machine.

2. LEVER TO PEDAL

(a) Remove the centre floor plate referring to GROUP 2.

(b) Remove the split pin and headed pin (2-3) to free the clevis.

(c) Slacken the nuts and slide the cable (1-3) from the support bracket.

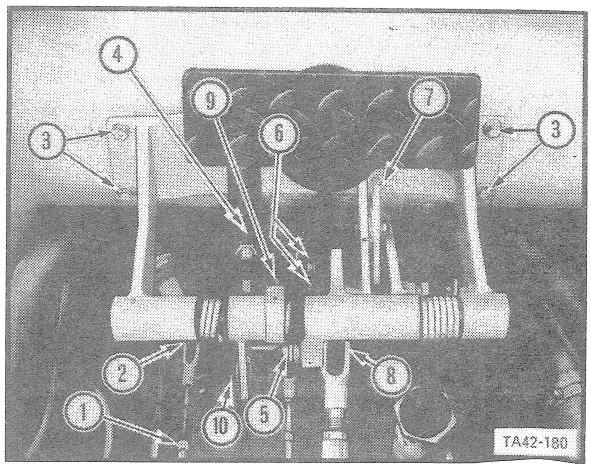


Fig. 3

(d) Remove the batteries referring to GROUP 5.

(e) Remove the control lever knobs and quadrants (1 & 2-4).

(f) Remove the bolts (3-4) then, from inside the battery compartment manipulate the control carrier until the end of the fuel control cable is accessible. Remove the side cover from the control carriers.

(g) Remove the nut to free the ball joint (1-5) from the lever then slacken the locknut (2-5) and screw the ball joint from the end of the cable.

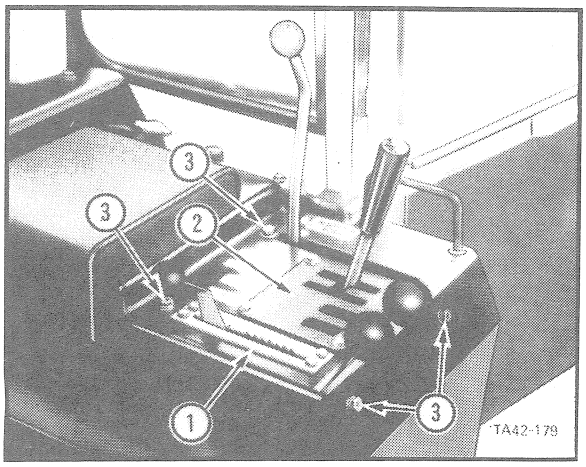


Fig. 4

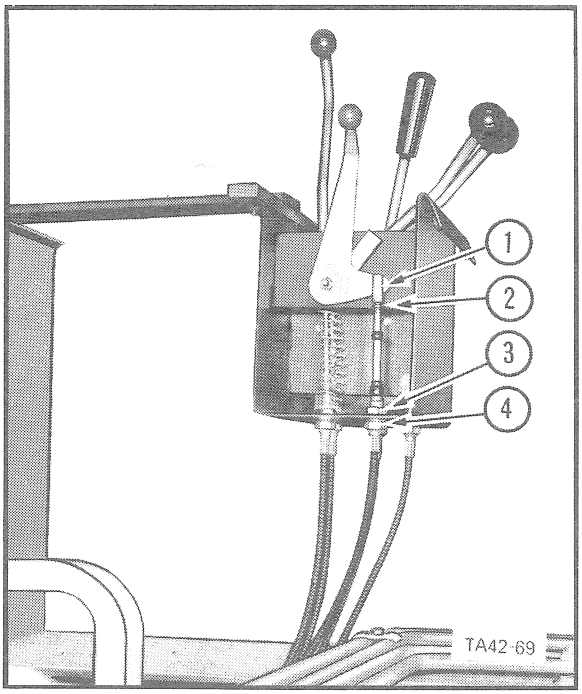


Fig. 5

(h) Slacken the nuts (3 & 4-5) then screw off the upper nut (3-5), remove the washer and withdraw the cable from the carrier and from the machine. Take care not to lose the washer on the nut (4-5).

4b. DISMANTLING

1. PEDAL TO PUMP

(a) Slacken the locknuts and screw off the clevis from one end and the ball joint from the other end.

(b) Screw off the locknuts.

(c) Screw off the outer conduit locknuts and washers.

2. LEVER TO PEDAL

(a) Slacken the locknut and screw off the clevis.

(b) Screw off the outer conduit locknuts and washers.

4c. ASSEMBLY

1. PEDAL TO PUMP

(a) Check that the correct cable has been selected. The swivel ends should measure 68 mm (2.68 in) and the overall length of the inner cable should measure 1400 mm (55.12 in).

(b) Screw on the outer conduit inner locknuts, install two washers at each end then screw on the outer locknuts.

(c) Screw on the inner cable locknuts.

(d) Screw a ball joint and clevis 13.0 mm (0.5 in) onto the ends of the inner cable.

2. LEVER TO PEDAL

(a) Check that the correct cable has been selected. The Swivel ends should measure 94 mm (3.7 in) and the overall length of the inner cable should measure 1400 mm (55.12 in).

(b) Screw on the outer conduit inner locknuts then at one end only install two washers and screw on the outer locknut.

(c) At the same end screw on the inner cable locknut and screw the clevis 13.0 mm (0.5 in) onto the cable.

4d. INSTALLATION

1. PEDAL TO PUMP

(a) Thread the cable assembly into position on the machine so that the clevis end is at the pedal.

(b) Slide the cable into the support (4-3) such that the support is between the two washers then just nip up the locknuts.

(c) Turn the clevis as necessary to line up then install the headed pin (10-3) and split pin. Tighten the clevis locknut.

(d) Slide the cable into the support such that the support is between the two washers then just nip up the locknuts (3-2).

(e) Turn the ball joint as necessary to line up then secure to the injection pump lever with the nut (1-2). Tighten the inner cable locknut up to the ball joint.

(f) Adjust the cable referring to para. 4e.

(g) Install the centre floor plate referring to GROUP 2.

(h) Install the engine left side sheet referring to GROUP 4.

2. LEVER TO PEDAL

(a) Thread the cable assembly into position on the machine so that the clevis end is at the pedal.

(b) Slide the cable (1-3) into the support such that the support is between the two washers then just nip up the locknuts.

(c) Turn the clevis as necessary to line up then install the headed pin (2-3) and split pin. Tighten the locknut up to the clevis.

(d) Position a washer up to the nut (4-5), thread the cable through the hole in the base of the control carrier, thread on the washer and inner nut (3-5).

(e) Screw on the locknut (2-5) then screw the ball joint (1-5) 13.0 mm (0.5 in) onto the cable. Turn the ball joint as necessary to line up then secure to the lever with the nut. Tighten the locknut (2-5) up to the ball joint.

(f) Adjust the cable referring to para. 4e.

(g) Manipulate the control carrier into position and secure with the bolts (3-4).

(h) Install the quadrants (1 & 2-4) and control lever knobs.

(i) Install the batteries referring to GROUP 5.

(j) Install the centre floor plate referring to GROUP 2.

4e. ADJUSTMENTS

(a) Slacken the bolt (5-3) and pull the free end of the spring as far forward as possible to take up clearance around the shaft, then tighten the bolt. Release the spring.

(b) Remove the split pin and clevis pin (2-3) to free the lever to pedal cable clevis.

(c) Move the injection pump lever to touch the high idle stop then adjust the cable nuts (3-2) and the nuts at the bracket (4-3), as necessary to provide a 2.0 mm (0.080 in) clearance (A-6) between the spring and the lug on the inner arm.

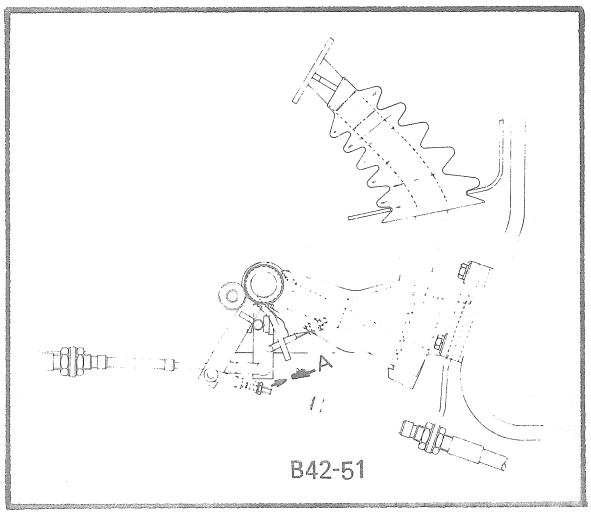


Fig. 6

(d) Connect the lever to pedal clevis with the headed pin (2-3) and split pin.

(e) Set the control lever to the high idle position and adjust the cable nuts (1-3 and 3 & 4-5) until the injection pump lever just touches the high idle stop.

(f) Move the control lever to the start position then adjust the bolt (2-2) to make the injection pump stop lever just touch the stop plunger.

(g) With the engine running at high idle speed, depress the pedal and adjust the hook bolt (9-3) to give an engine speed of 1600 rev/min.

(h) If insufficient adjustment is available on the outer cable locknuts, the ball joints and/or clevises may be screwed further onto the cables to provide additional adjustment.

5. DECELERATOR/BRAKE PEDAL

5a. REMOVAL

(a) Remove the centre floor plate referring to GROUP 2.

(b) Remove the split pin and headed pin (2-3) to free the lever to pedal cable clevis.

(c) Remove the split pin and headed pin (10-3) to free the pedal to pump cable clevis then slacken the nuts at the bracket (4-3) and slide the cable from the support bracket.

(d) Remove the split pin and headed pin to free the brake pedal lock cable clevis from the pawl (7-3) then free the cable from the anchor.

(e) Remove the split pin and headed pin (8-3) to free the brake rod from the pedal hub.

(f) Remove the bolts (6-3) to free the pedal from the hub then lift out the pedal.

(g) Remove the bolts (3-3) and lift the bracket assembly from the machine.

5b. DISMANTLING

(a) Remove the bolt (5-7) to free the decelerator spring (6-7).

(b) Free the ends of the return spring (3-7) from the pins.

(c) Drive out the roll pins (8 & 12-7).

(d) Tap out the shaft (13-7) removing the outer arm (11-7), spring (10-7), inner arm (9-7), hook bolt anchor (7-7), spring (6-7), hub (4-7) and spring (3-7) as they become free to do so.

(e) Remove the bolts (1-7) to free the cable support.

(f) Remove the bolt (2-7) to free the pawl, spring and washers.

(g) Slacken the locknut and screw off the outer nut to free the hook bolt from the anchor.

(h) If inspection proves it necessary, press the bushes from the outer arm, inner arm, hub and pawl.

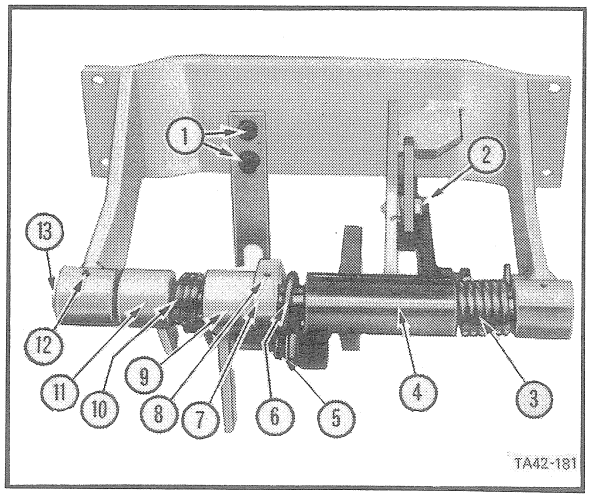


Fig. 7

5c. ASSEMBLY

(a) If these were removed, press new bushes into the outer arm, inner arm, hub and pawl.

(b) Screw a locknut onto the hook bolt, thread the hook bolt into the anchor then screw on the outer nut.

(c) Secure the cable support to the bracket with the bolts (1-7).

(d) Position a plain washer on the bolt (2-7). Position the pawl so that the slotted hole is uppermost and the point is forward then pass the bolt through the bush from the right. Position the thick washer and spring on the bolt then bolt the pawl to the right side of the inner support locating the spring in such a manner that the point of the pawl is pulled rearward.

(e) Insert the rod (13-7) into the right boss then thread on the spring (3-7), hub (4-7), spring (6-7), hook bolt anchor (7-7), inner arm (9-7) and spring (10-7) as the rod is pushed in. Thread on the outer arm (11-7) at the same time manipulating the lug on the arm under the leg of the spring (10-7) so that the contacting lugs on the inner and outer arms are firmly clamped together by the spring. Push the rod through into the left boss, align the holes and drive in the roll pin (12-7).

(f) Drive in the roll pin (8-7).

(g) Secure the decelerator spring with the bolt (5-7).

(h) Spring the legs of the spring (3-7) over the pins in such a manner that the hub is held against its stop by the spring force.

5d. INSTALLATION

(a) Position the assembly on the machine and secure with the bolts (3-3).

(b) Thread the boot onto the pedal then position the pedal on the hub and secure with the bolts (6-3).

(c) Locate the brake rod on the cross shaft then secure to the pedal hub with the headed pin (8-3) and split pin. With the brakes correctly adjusted (GROUP 11) and the pedal against its stop there must be 3.00 mm (0.125 in) clearance between the brake rod and cross rod. If necessary adjust the length of the brake rod to suit.

(d) Position the brake pedal lock cable in its anchor then secure the clevis to the pawl (7-3) with the headed pin and split pin.

(e) Slide the pedal to pump cable into the support such that the support is between the two washers then just nip up the locknuts (4-3).

(f) Connect the clevis with the headed pin (10-3) and split pin.

(g) Adjust the fuel control cables referring to para. 4e. The lever to pedal cable clevis pin (2-3) will be installed during this procedure.

(h) Install the centre floor plate referring to GROUP 2.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

ENGINE

GROUP 7

1. DESCRIPTION

The engine used in the 165 Loader is an International 6 cylinder, 4 stroke, overhead valve, direct injection diesel. The engine is mounted to the transmission case and is given additional support by the use of side bars.

Instructions in this group cover the removal and installation of the engine. For detailed information of engine servicing refer to the Engine Service Manual.

2. ENGINE

2a. REMOVAL

(a) If suitable lifting and transporting equipment is available the engine can be removed without removing the lift arms. Alternatively, remove the lift arms referring to GROUP 3.

(b) Remove the radiator referring to GROUP 4.

(c) Remove the bolts (3-1) to free the oil drain.

(d) Suitably sling the radiator guard assembly (2-1) then remove the bolts (1-1) on each side and lift the radiator guard clear.

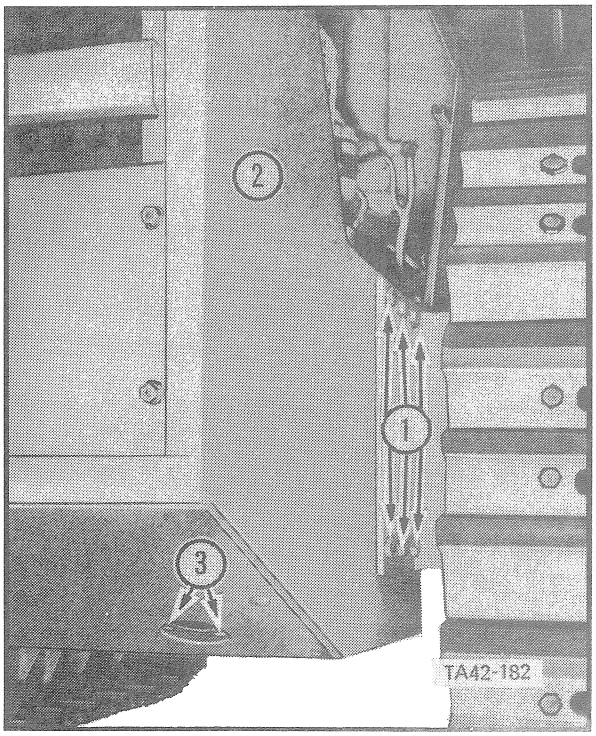


Fig. 1

(e) Refer to GROUP 14 to disconnect the hydraulic pump suction and pressure hoses.

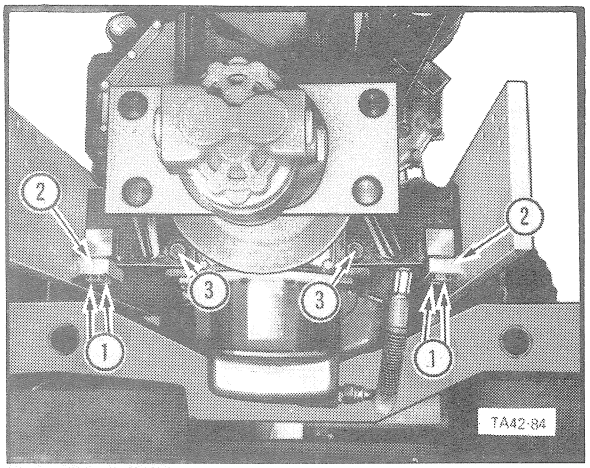


Fig. 2

(f) Remove the bolts (1-2) to free the pump/engine mounting from the side bars taking care not to lose the shims (2-2).

(g) On the engine right side disconnect the oil pressure transmitter (1-3), coolant temperature transmitter (4-3), and cab heater hose (3-3).

(h) Remove the starting motor referring to GROUP 5.

(i) On the engine left side disconnect the alternator (1-4), the manifold heaters (4-4) and the restriction indicator transmitter (5-4) then unclip the harness and lay clear of the engine.

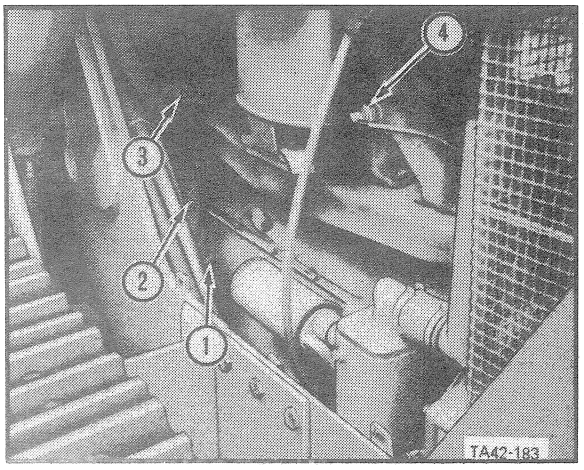


Fig. 3

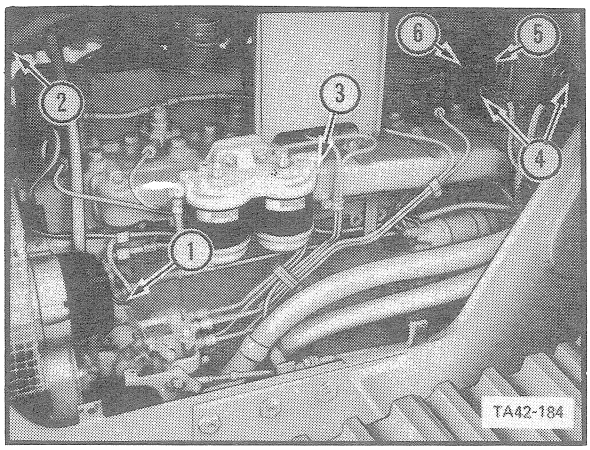


Fig. 4

(j) Close the fuel shut-off tap then disconnect the fuel supply (3-4) at the filter and the spill return (6-4) at the T junction behind the inlet manifold.

(k) Disconnect the cab heater hose (2-4).

(l) Securely sling the engine then remove the bolts (2-3) on both sides.

(m) Carefully ease forward the engine until the flywheel is clear of the mainframe then lift the engine onto a suitable stand.

(n) If removal of the hydraulic pump is necessary remove the bolts (3-2) to free the mounting bracket from the engine.

2b. INSTALLATION

(a) If this was removed, secure the hydraulic pump mounting bracket to the engine with the bolts (3-2). Tighten the 12 mm bolts to 10.5 to 11.75 kgm (75 to 85 lbft) and the 5/8 in bolts to 23.5 to 26 kgm (170 to 190 lbft).

(b) Securely sling the engine and position it in front of and square to the mainframe. Long studs screwed into two opposite holes in the mainframe will help to maintain squareness.

(c) Ease the engine rearward turning the crankshaft as necessary to engage the coupling. Install the bolts (2-3) on both sides then remove the sling.

(d) Measure the gap (A-5) between the block on the side bar and the block on the pump/engine mounting at both sides. Add 1.00 mm (0.040 in) to these measurements and make up a shim pack for each side. If the measurements differ DO NOT equalize the shim packs.

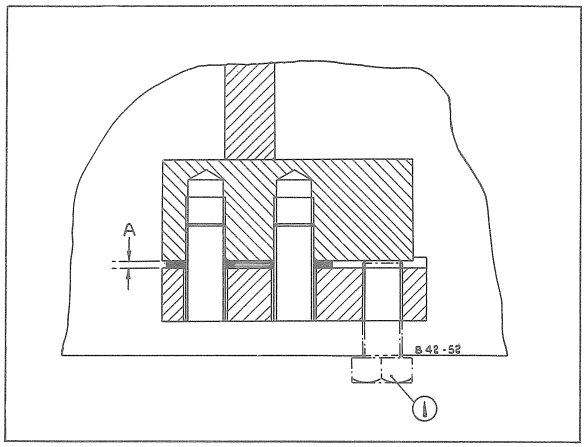


Fig. 5

(e) Screw a spare mounting bolt into the rear hole of each side bar block to act as jacking bolts (1-5) then jack up the engine far enough to allow the selected shims to be inserted. Screw in the mounting bolts (1-2) finger tight then remove the jacking bolts and tighten the mounting bolts.

(f) Refer to GROUP 14 to connect the hydraulic pump suction and pressure hoses.

(g) Position the wiring harness then on the engine right side connect the coolant temperature transmitter (4-3), oil pressure transmitter (1-3) and cab heater hose (3-3).

(h) Install the starting motor referring to GROUP 5.

(i) On the engine left side connect the manifold heaters (4-4), the restriction indicator transmitter (5-4) and the alternator (1-4).

(j) Connect the spill return (6-4) and the fuel supply (3-4).

(k) Connect the cab heater hose (2-4).

(l) Position the radiator guard (2-1) and secure with the bolts (1-1).

(m) Position the oil drain and secure with the bolts (3-1).

(n) Install the radiator referring to GROUP 4.

(o) Open the fuel shut-off tap, vent the fuel system and check the functioning of the fuel control. Refer to GROUP 6 if adjustment is required.

(p) Install or lower the lift arms as appropriate.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

TORQUE CONVERTER GROUP 8

1. GENERAL

1a. DESCRIPTION

A torque convertor is a means of transmitting power hydraulically. It depends for its operation on the energy produced from fluid in motion. This is known as kinectic energy. The oil movement is induced centrifugally and systems operating on this principle are called hydrodynamic drives.

Another type of hydrodynamic drive is the fluid coupling. The difference between the two units is that if a load is applied to the output shaft of a fluid coupling the speed and torque of both input and output shaft would be reduced, whereas a load applied to the output shaft of a torque convertor will reduce output shaft speed and increase output shaft torque with little or no change in input shaft speed and torque. Thus a torque convertor will allow an engine to run consistently at its most economical speed under varying load conditions.

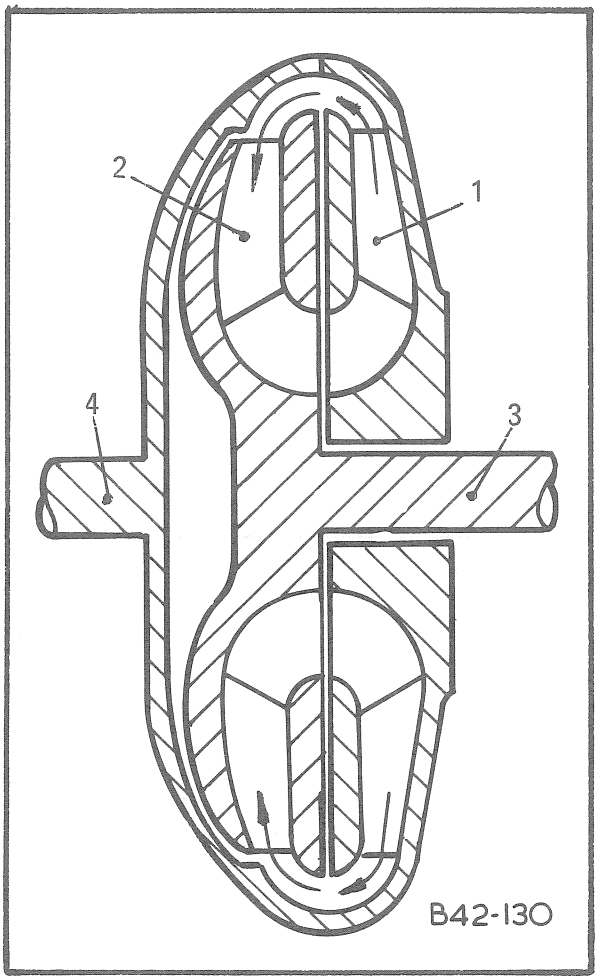


Fig. 1

1b. OPERATION

1. FLUID COUPLING

A fluid coupling consists of a casing, one half of which is divided by radial vanes to form the impellor (1-1). This is driven by the engine. The turbine (2-1) is similar in appearance to the impellor but is free to rotate within the casing and is connected to the output shaft (3-1). The casing is almost full of fluid.

A fluid coupling will always slip which means that the turbine is always slower than the impellor. Thus, the centrifugal pressure induced at the outer edge, or tip, of the impellor is higher than the centrifugal pressure induced at the tip of the turbine so that circulation can take place in the direction of the arrows in Fig. 1. This circulation, however is not the main driving force. Drive is due almost entirely to the rapid change in speed of the fluid in the path of engine rotation as distinct from flow round the circuit.

Fluid is pushed by the vanes of the impellor in the direction of engine rotation and in so doing absorbs energy from the engine in moving rapidly from the centre, or eye, to the tip. The vanes of the turbine are in the way of the fast moving fluid and rapidly slow it down as it moves from the tip to the eye. The energy absorbed by the fluid in the impellor is given up in the turbine in the form of turning torque.

Due to the close relationship between the turbine and impellor, speed and torque at the output shaft will be almost the same as the speed and torque at the input shaft (4-1) apart from losses due to slip and friction. As the load on the output shaft increases, slowing down the turbine, the effect will be to resist the movement of fluid which in turn will resist the impellor and so require more effort from the engine to maintain torque.

As the load increases, the tendency to slip also increases, so that if the output shaft is stalled the engine will keep on running but at a greatly reduced speed.

2. TORQUE CONVERTOR

The operation of the torque convertor is basically the same as for the fluid coupling. It is still dependent on the gain in the kinetic energy in the fluid moving across the impellor and the circulation of fluid between impellor and turbine but use is now made of the kinectic energy remaining in the fluid as it passes from the eye of the turbine to the eye of the impellor. This is achieved by introducing a series of vanes between the turbine and impellor and known as a stator or guide wheel. Fig. 2 shows a diagramatic cross section of a torque convertor.

The guide wheel (1-2) is bolted to the guide carrier (4-2) and does not rotate. It can be seen that fluid leaving the turbine (2-2) must pass through the guide wheel in order to reach the impellor (3-2). The vanes of the guide wheel direct the fluid leaving the turbine onto the impellor vanes in the direction of impellor rotation so helping to drive the impellor.

As load on the output shaft increases, slowing down the turbine, the heavier the jet of fluid being forced through the guide wheel to drive the impellor and maintain impellor speed.

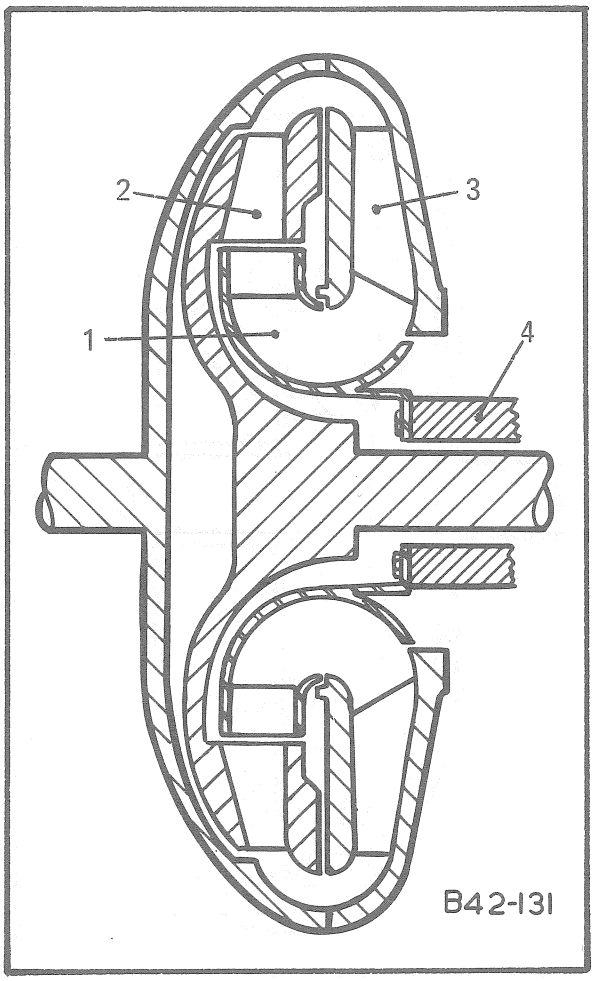


Fig. 2

1c. FLOW IN THE SYSTEM

Fluid is drawn from the transmission case, through a suction strainer, by the pump (7-3) which delivers it via the oil cooler (2-3) and pressure filter (1-3) to the control valve (3-3). The pressure is regulated in the control valve by the drive pressure regulating valve (4-3) so that an adequate supply to the torque convertor is maintained. The fluid then passes to the transmission pump housing where it is ducted forward by the guide carrier to enter the torque convertor at the junction of the turbine and guide wheel. Oil leaves the torque convertor at the junction of the guide wheel and impellor to be ducted by the guide carrier to the lubrication pressure regulation valve (5-3) in the control valve and back to the transmission case. The non-return valve (6-3) provides a return passage for drive fluid from the directional spool when in neutral.

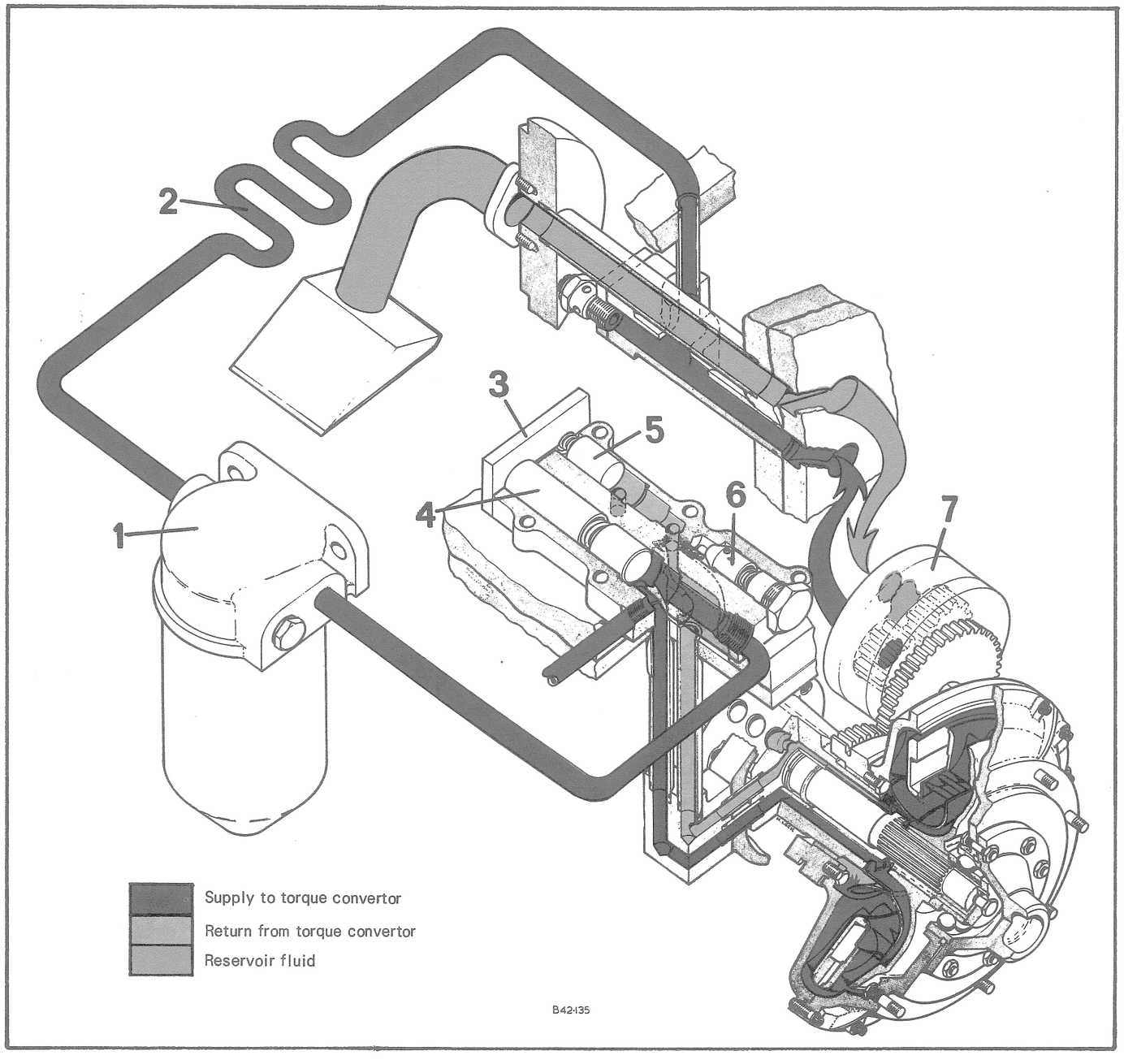


Fig. 3

2. TORQUE CONVERTOR

2a. REMOVAL

Remove the transmission pump housing and torque convertor assembly referring to GROUP 9.

2b. DISMANTLING

(a) Remove the screws (2-4) and lockwashers securing the rotating housing (1-4) to the impellor (3-4) then lift off the rotating housing.

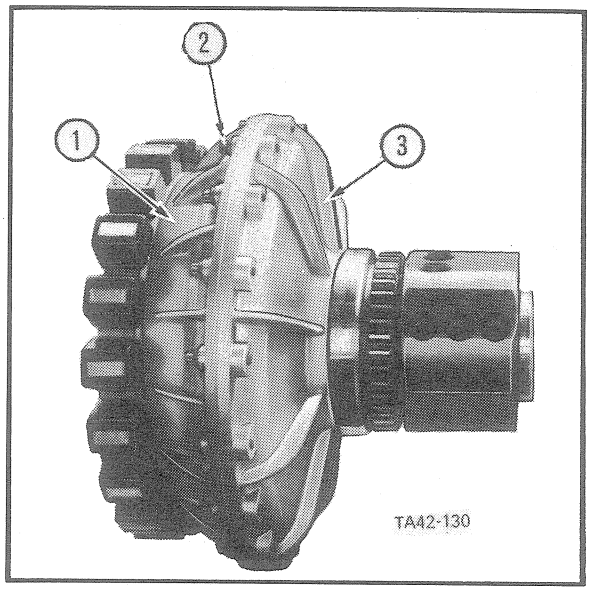


Fig. 4

(b) To remove the drive spider (2-5) remove the nuts (1-5) and spacing washers beneath.

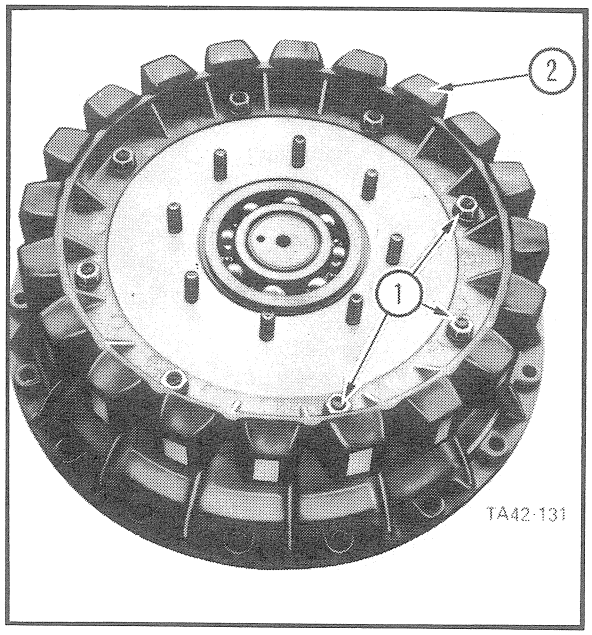


Fig. 5

(c) Remove the circlip (1-6) and lift out the turbine (2-6). If the turbine is tight on the hub, flame heat the turbine bore to 100 to 120°C (212 to 248°F) to aid removal.

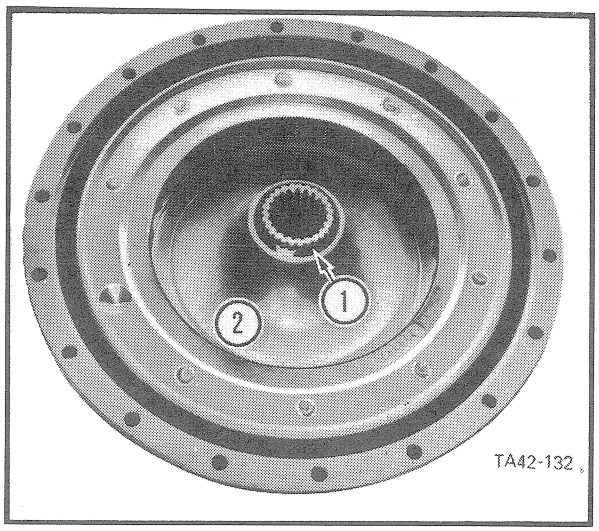


Fig. 6

(d) Press the hub assembly (1-7) from the rotating housing (2-7). If inspection proves it necessary press the shaft (3-8) from the bearing (1-8) and remove the spacer (2-8).

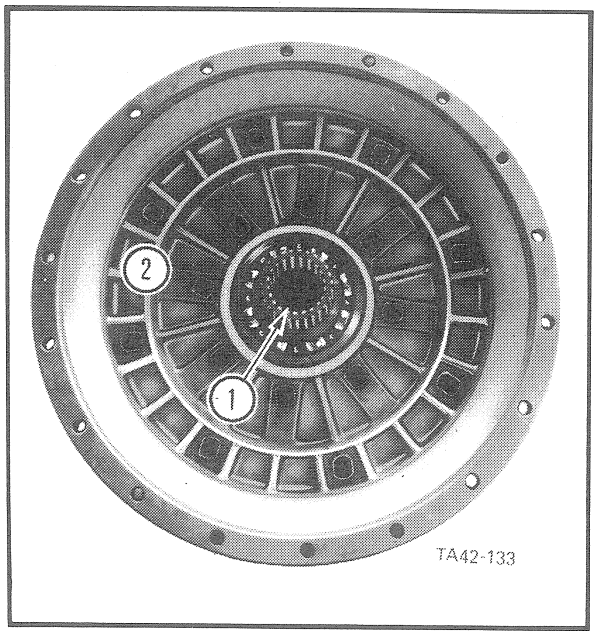


Fig. 7

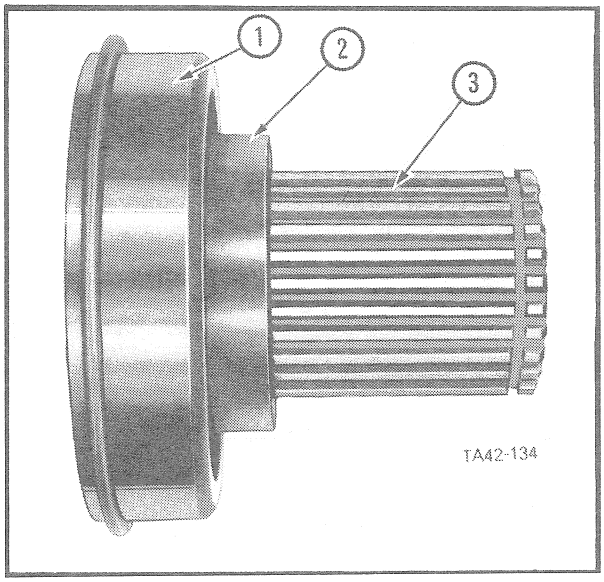


Fig. 8

(e) Remove the socket headed screws (1-9) inside the guide wheel to free the clamp plates (2-9). Lift the guide wheel off the roll pins (3-9).

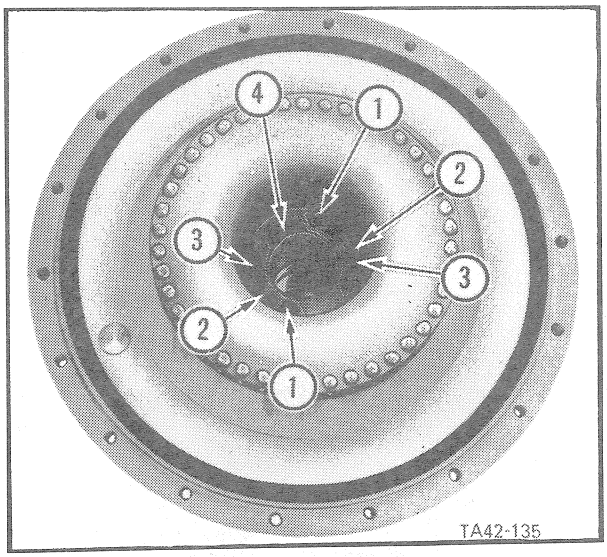


Fig. 9

(f) Lift the impellor (1-10) from the guide carrier (2-10). The pump drive gear is bolted to the impellor.

(g) Remove the bolts (3-10) and clamp plates (4-10) from inside the impellor, remove the pump drive gear (1-11) and discard the gasket.

2c. INSPECTION

(a) Thoroughly clean all parts and clean all gasket material from mounting faces.

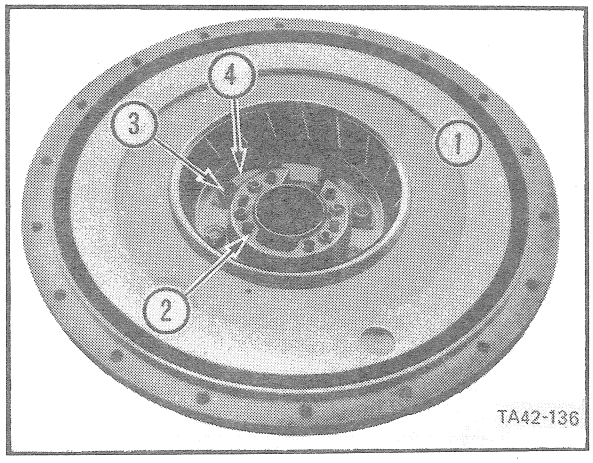


Fig. 10

(b) Inspect the impellor, guide wheel and turbine for damage or fracture.

2d. ASSEMBLY

(a) Position a new gasket on the impellor then install the pump drive gear aligning the bolt holes. Position the clamp plates (4-10) then press the impellor, gear and clamp plates together with 20 000 to 30 000 kg (20 to 30 ton). Oil the threads of the bolts (3-10) then screw in and tighten to 2.1 to 2.35 kgm (15 to 17 lbft).

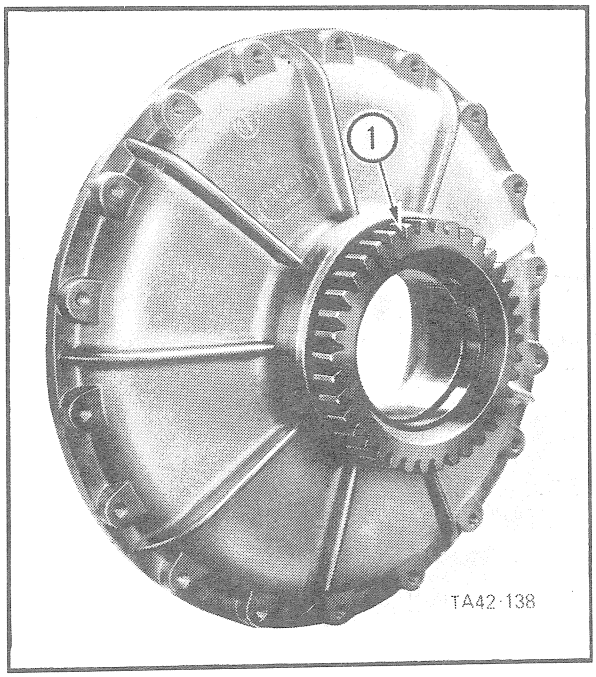


Fig. 11

(b) Position the impellor assembly (1-10) on the guide carrier (2-10). If the guide carrier is in position in the pump housing take care not to damage the oil seal with the pump drive gear.

(c) Locate the guide wheel on the guide carrier roll pins (3-3) noting that these holes and the bolt holes are offset to ensure correct alignment of the oilway (4-9). Install the clamp plates (2-9) then install and tighten the socket headed screws (1-9).

(d) If these were removed, position the spacer (2-8) on the shaft (3-8) then press on the bearing (1-8).

(e) Press the hub assembly (1-7) into the rotating housing (2-7).

(f) Flame heat the turbine bore to 100 to 120°C (212 to 248°F) then locate the turbine (2-6) on the hub and secure with the circlip (1-6).

(g) Coat the mating faces of the impellor and rotating member with Loctite Superflex Silicone Sealant RTV2 then position the gasket on the impellor face and position the rotating member on the spigot and gasket aligning the screw holes. Screw in the screws (2-4) and lockwashers. Tighten each screw a little at a time in a diagonal sequence until the final torque is reached on each screw.

(h) Position the drive spider (2-5) and secure with the spacing washers and nuts (1-5) tightened to 2.9 kgm (21 lbft).

2e. INSTALLATION

Install the torque convertor and transmission pump housing assembly referring to GROUP 9.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

TRANSMISSION

GROUP 9

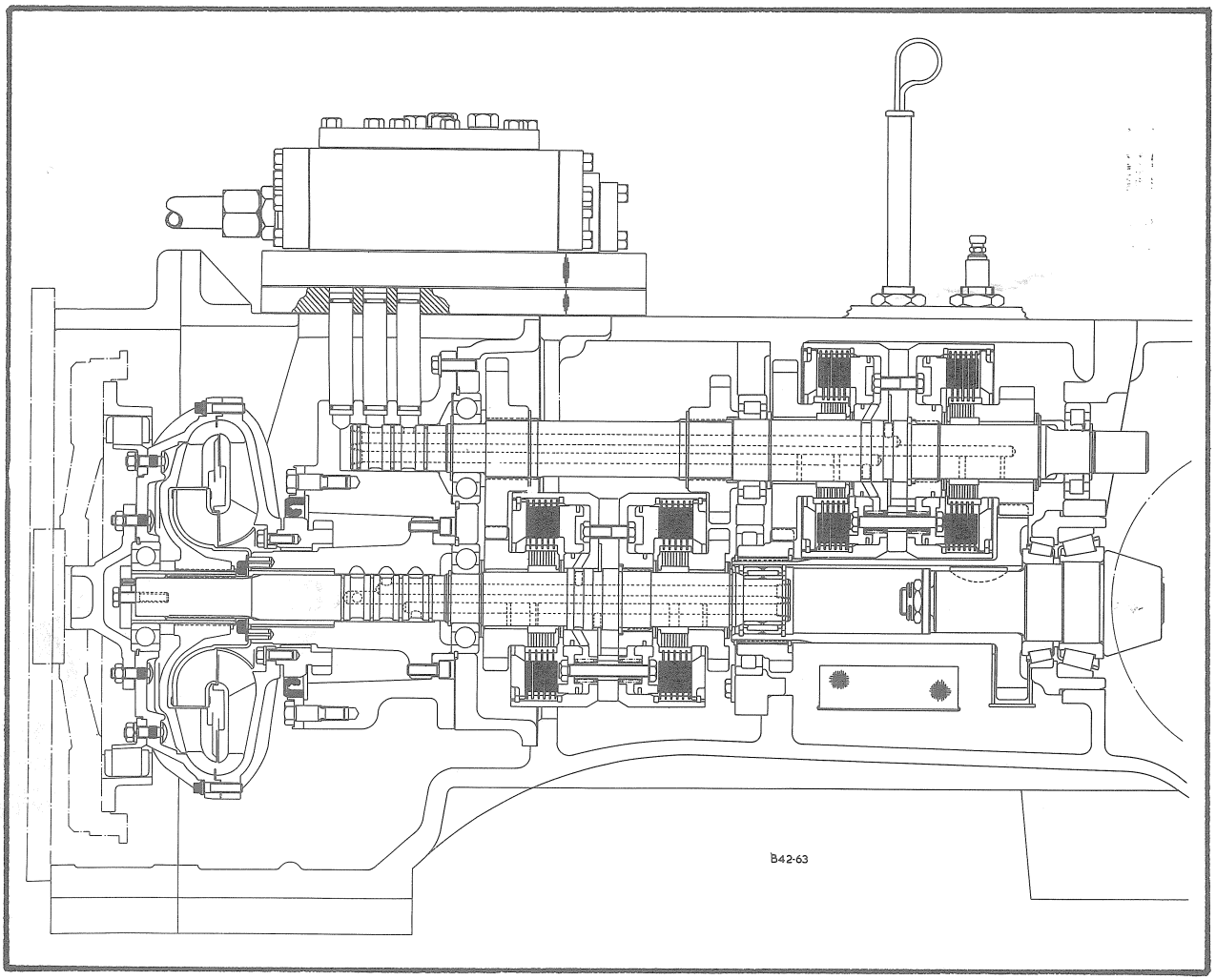


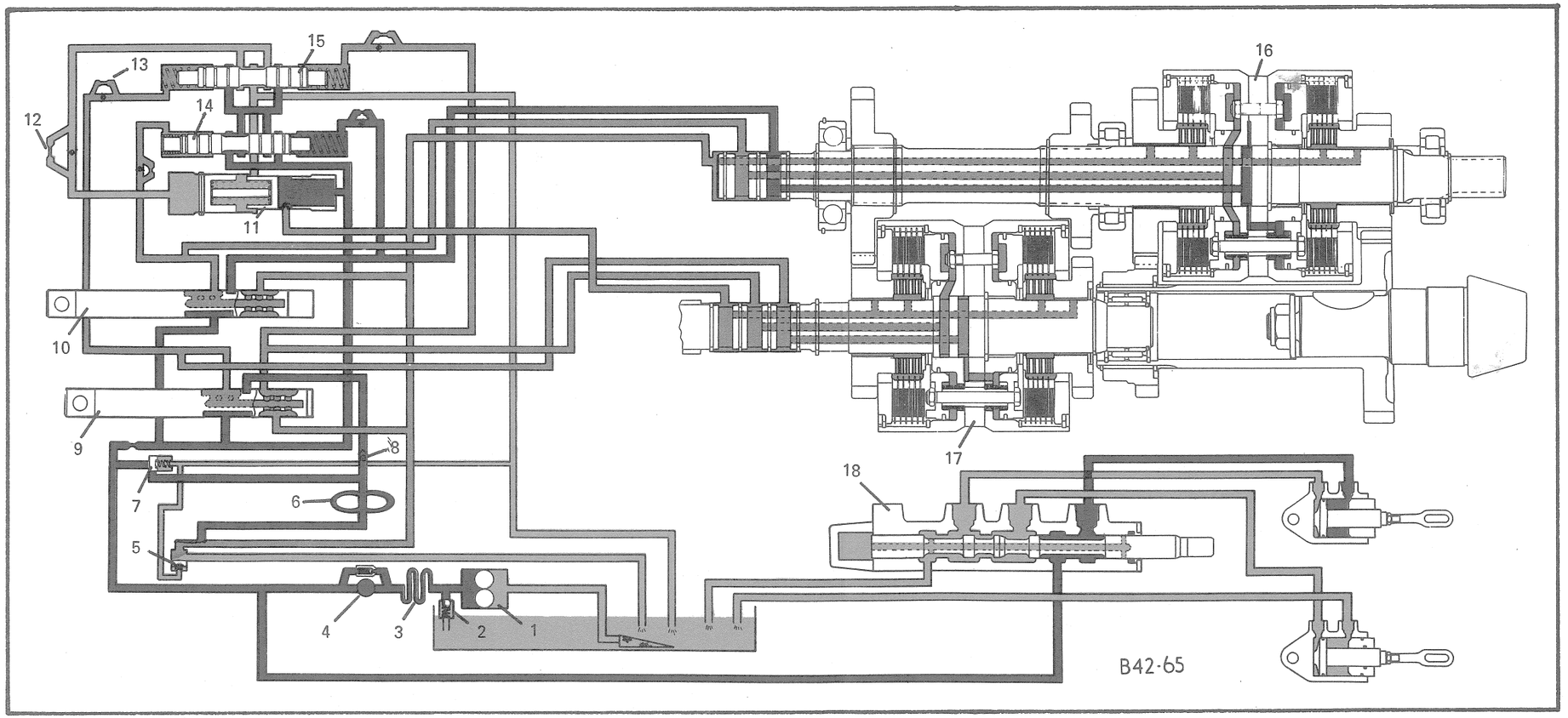
Fig. 1

1. GENERAL

1a. DESCRIPTION

The power shift transmission is designed to provide high speed directional and range changes by the use of multi-plate, hydraulically operated clutches.

The transmission has a high and low speed range with forward and reverse in each range. The range is selected by movement of the control lever across the centre of the H gate, while direction is selected by forward or rearward movement, consequently the range is automatically selected before the direction is engaged.



Drive pressure

Lubrication pressure

Reservoir return

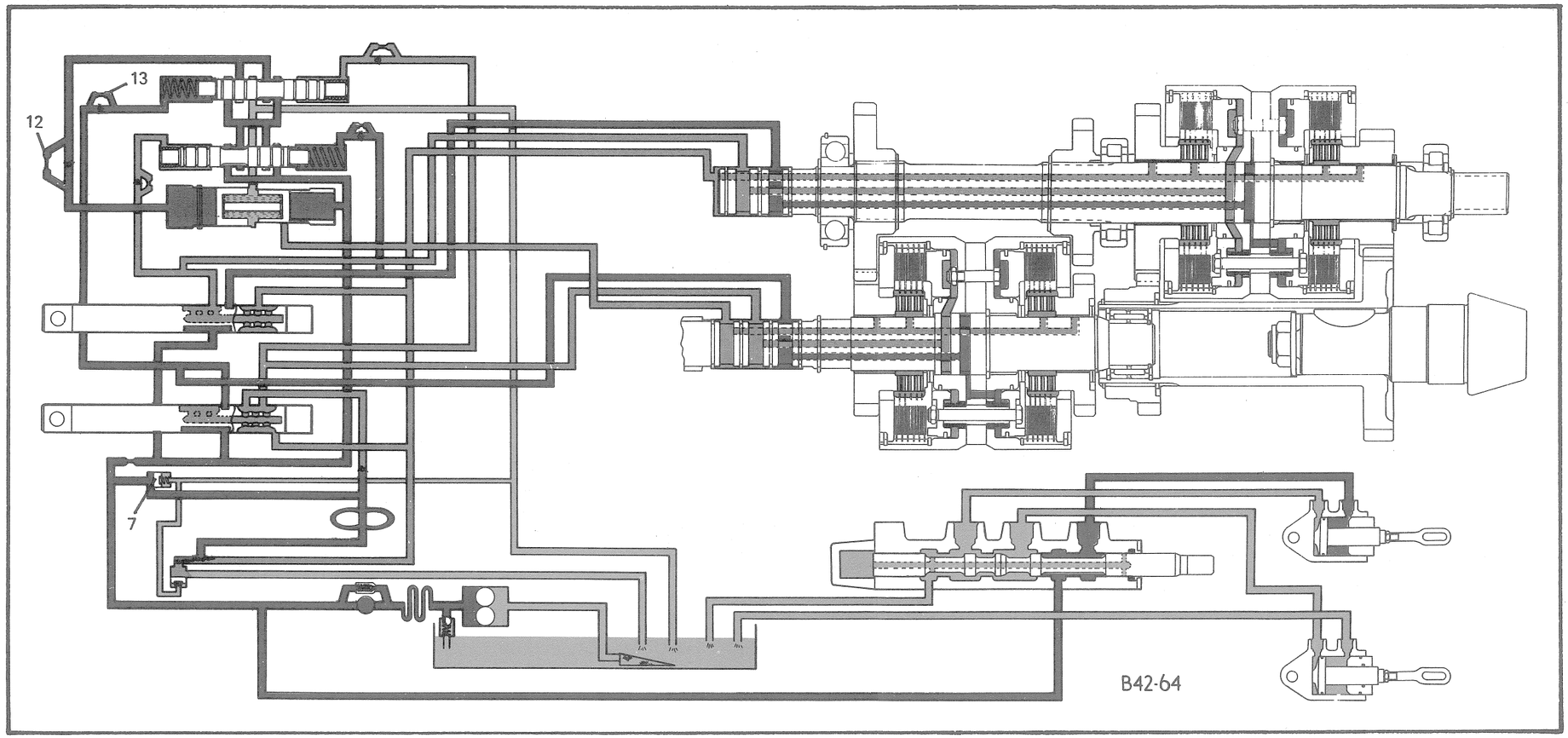
1b. OPERATION

1. NEUTRAL (Refer to Fig. 2)

Oil is drawn from the reservoir by the transmission pump (1) and delivered past the cold oil relief valve (2) through the oil cooler (3) and pressure filter (4) to the transmission control valve. A tapping in the control valve supplies oil to the steering/brake control valve (18).

In the Neutral position the pump flow passes through the directional spool (9), check valve (8) and torque convertor (6) to the lubrication galleries and also to the range spool (10), the smaller piston of the rate of rise valve (11) and across the range sequencing spool (14) to the directional sequencing spool (15). The range spool is in either high or low position at all times and directs oil to the other side of the range sequencing valve and to the selected side of the range clutch packs (16).

The larger piston in the rate of rise valve is open to reservoir so that the pump flow lifts the smaller piston and oil passes into the lubrication galleries. Oil at lubrication pressure is supplied to the lubrication galleries in the clutch packs and through the spool centre drillings to the unselected side of the clutch packs. Excess oil exhausts through the lubrication pressure regulating valve (5).



2. LOW/REVERSE (Refer to Fig. 3)

When the directional spool is moved to the reverse position the oil flow is directed through the orifice (13) to the directional sequencing spool.. The increased pressure moves this spool from the central position allowing the oil flow to the other side of the sequencing spool to pass to the small orifice (12) in the rate of rise valve line. The small orifice allows a steady build up of pressure against the larger piston in the rate of rise valve. Due to the greater face area of the larger piston it is forced down and the central pin moves the smaller piston to close the lubrication gallery port. This causes a rapid rise in the pressure in both clutch packs but when this pressure reaches 17.6 kg/cm^2 (250 lb/in^2) the drive pressure regulating valve (7) opens allowing excess oil to be diverted through the torque convertor and lubrication pressure regulation valve to the reservoir.

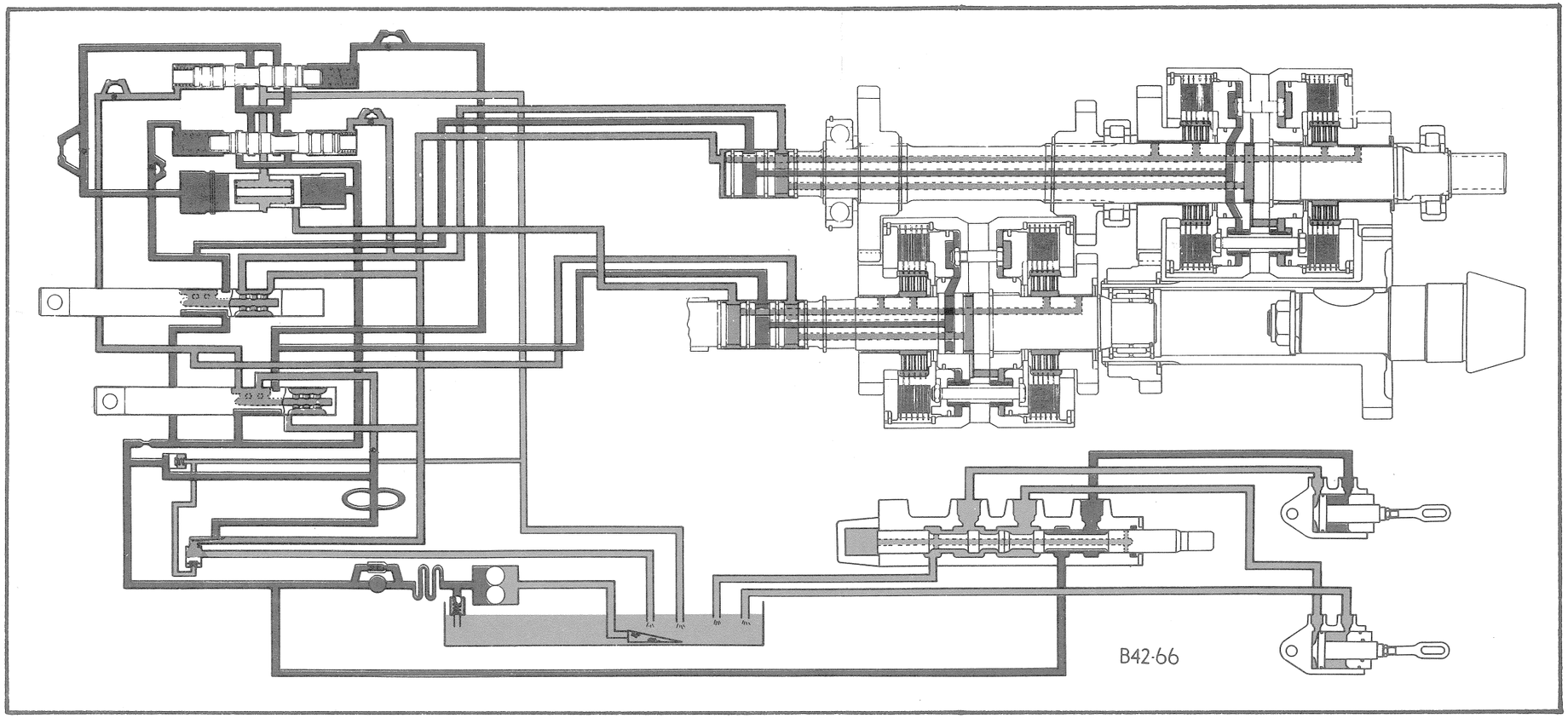
The time taken for the oil to pass through the orifices to move the directional sequencing spool and the rate of rise pistons, ensures a smooth clutch take-up and eliminates shock loads on the transmission when making directional changes.

When the directional spool is moved back to Neutral the pressure on the directional sequencing spool drops allowing the spool to move back to the central position, thus opening the line behind the larger piston in the rate of rise valve to reservoir. The smaller piston in the rate of rise valve lifts, allowing the pump flow to pass into the lubrication galleries and the drive pressure regulating valve closes. The oil flow is then as shown in Neutral.

Drive pressure

Lubrication pressure

Reservoir return



3. HIGH/FORWARD (Refer to Fig. 4)

When the selector lever is moved across to the high range position of the gate the range spool directs oil flow to the range sequencing spool and to the selected side of the range clutch packs.

Further movement of the lever to the forward position of the gate positions the directional spool to direct oil to the directional sequencing spool. The increased pressure moves the spool from the central position allowing the oil flow to the other side of the sequencing spool to pass to the small orifice in the rate of rise valve line. The small orifice allows a steady build up of pressure against the larger piston in the rate of rise valve. Due to the greater face area of the larger piston it is forced down and the central pin moves the smaller piston to close the lubrication gallery port. This causes a rapid rise in the pressure in both clutch packs but when this pressure reaches 17.6 kg/cm^2 (250 lb/in^2) the drive pressure regulating valve opens allowing excess oil to be diverted through the torque convertor and lubrication pressure regulation valve to reservoir. The time taken for the oil to pass through the orifices to move the directional sequencing spool and rate of rise pistons, ensures a smooth clutch take-up and eliminates shock loads on the transmission when making directional changes.

When the directional spool is moved back to Neutral, the pressure on the directional sequencing spool drops allowing the spool to move back to the central position thus opening the line behind the larger piston in the rate of rise valve to reservoir. The small piston in the rate of rise valve lifts allowing the pump flow to pass into the lubrication galleries.

Drive pressure

Lubrication pressure

Reservoir return

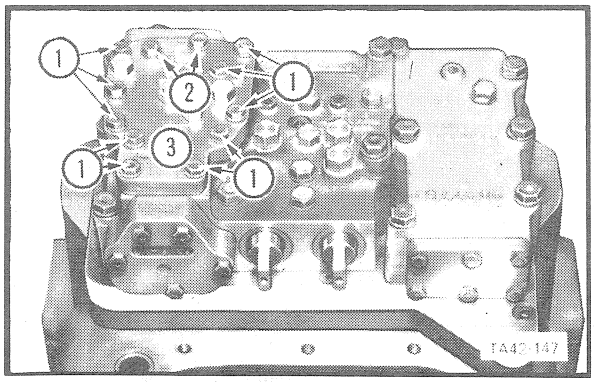
2. TRANSMISSION PUMP HOUSING
2a. REMOVAL

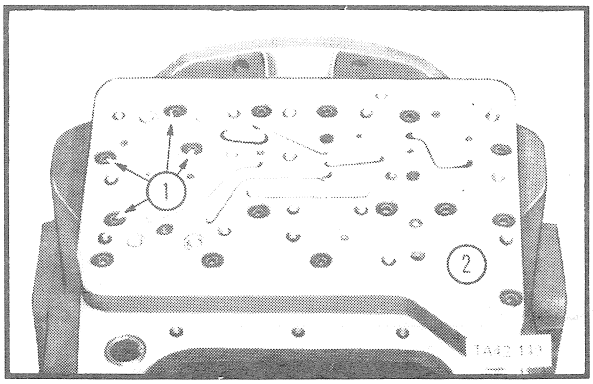
(a) Remove the engine referring to GROUP 7 then remove the mainframe spacer. Remove the floorplates in the cab. Removing the cab base, referring to GROUP 2, will give better access but is not essential.

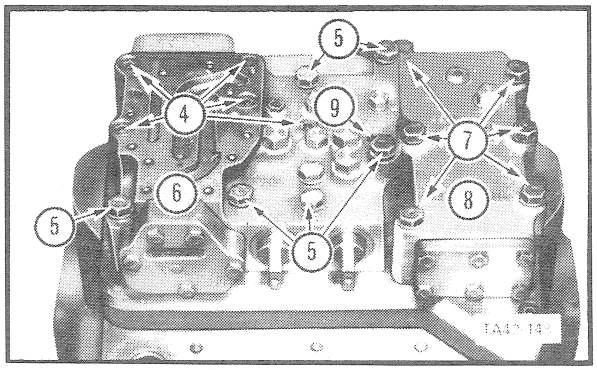
(b) Disconnect the control cables at the spools and disconnect the hoses at the selector valve.

(c) Remove the bolts (1 & 2-5), top cover (3-5) and gasket. Remove the socket headed bolts (4-5) and bolts (5-5) then lift off the selector valve (6-5). If the valve is difficult to lift off, a jacking hole (9-5) is provided. Remove the bolts (7-5) and lift off the control valve (8-5). Discard the gaskets.

(d) Remove the socket headed bolts (1-6), sandwich plate (2-6) and gasket beneath. Remove the recessed socket headed bolts (3-6), base plate (4-6) and gasket.







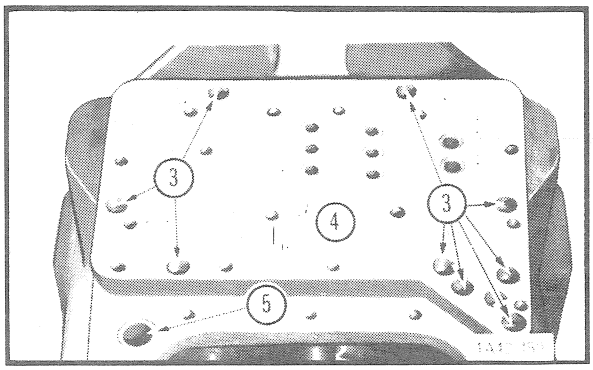


Fig. 5

Fig. 6

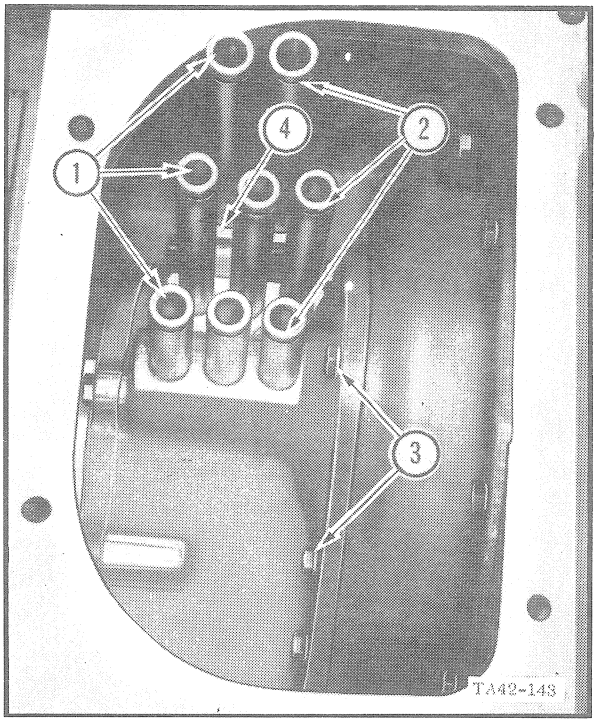


Fig. 7

(e) Remove the oil tubes (1-7) and discard the 'O' rings (2-7). Remove the connecting block (4-7) to provide better access to the mounting bolts (3-7).

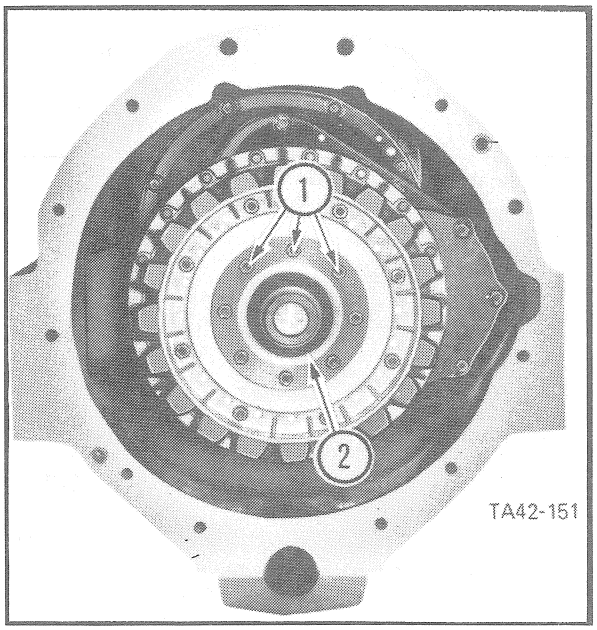


Fig. 8

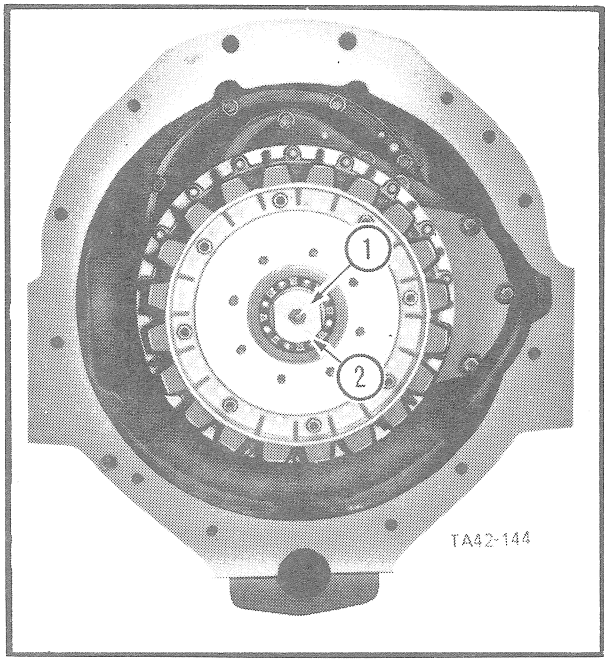


Fig. 9

(f) Remove the nuts (1-8) to free the flywheel pilot.(2-8). Discard the gasket.

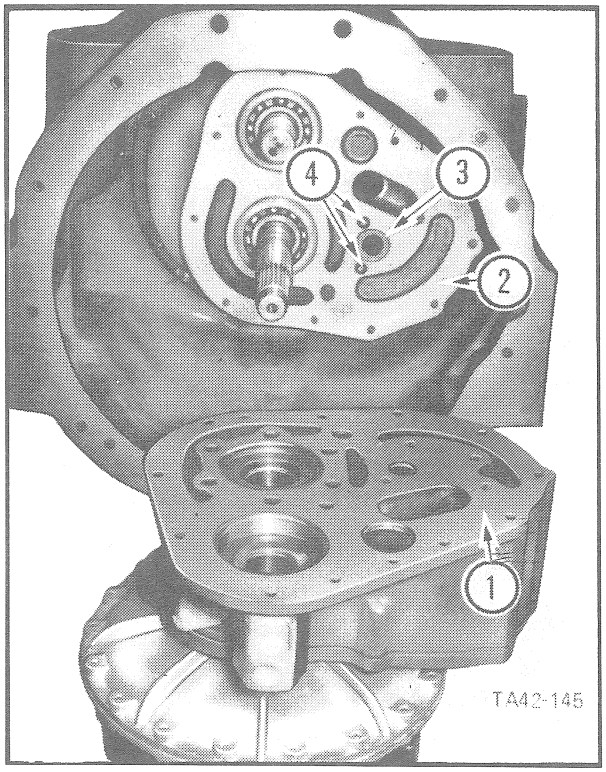


Fig. 10

(g) Remove the bolt (1-9) and retainer plate (2-9) from the end of the driving shaft.

(h) Remove the bolts (3-7), remove the torque convertor and pump housing assembly (1-10) from the front bearing carrier (2-10) and discard the gasket and 'O' ring (3-10).

NOTE: The following operations detail the procedure for removing the torque convertor and guide carrier assembly from the pump housing. If only the torque convertor requires dismantling this can be done at this stage referring to GROUP 8.

(i) Remove the bolts (1-11) and connecting block (2-11) then discard the gasket beneath.

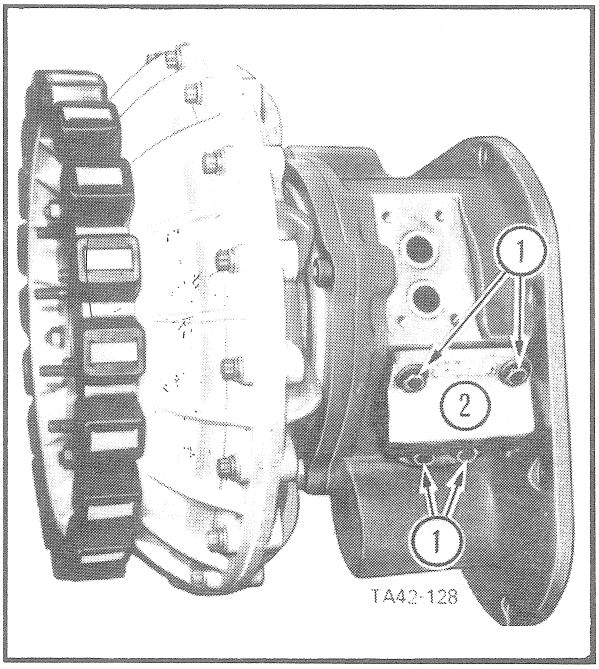


Fig. 11

(j) Withdraw the five tubes (1-12) and discard the 'O' rings.

(k) Remove the six screws (1-13) and withdraw the torque convertor assembly (1-14) from the housing.

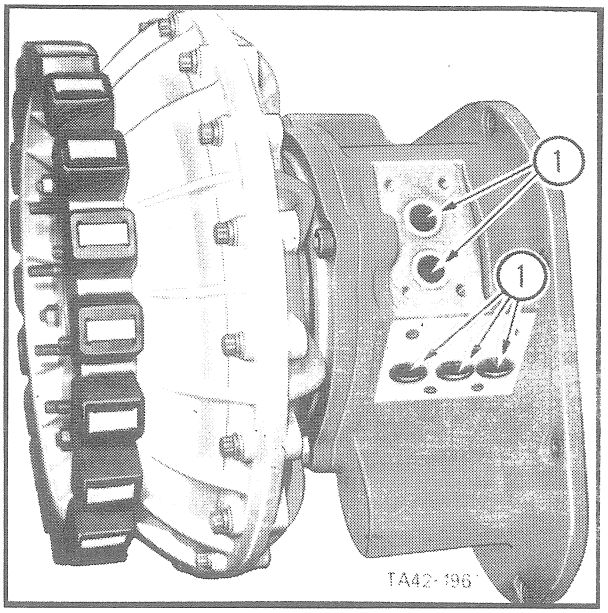


Fig. 12

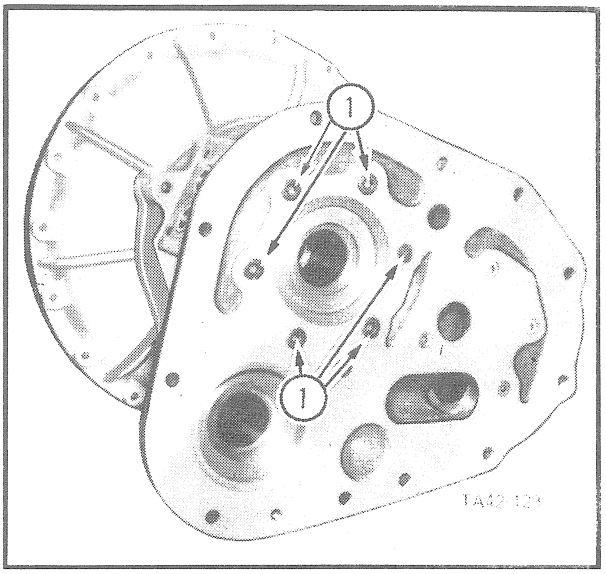


Fig. 13

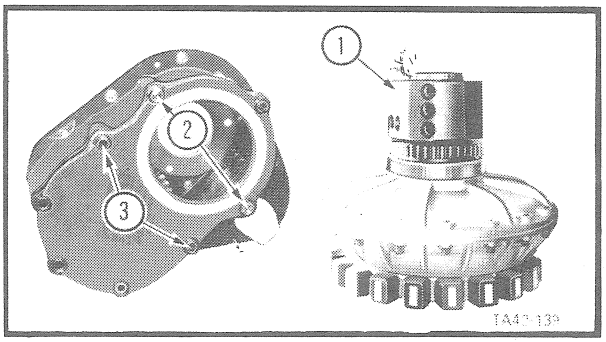


Fig. 14

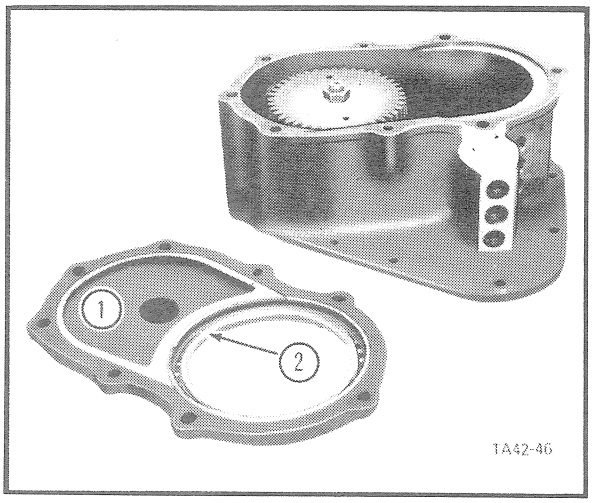


Fig. 15

2b. DISMANTLING

(a) Remove the dowel bolts (2-14) and standard bolts (3-14) then remove the seal carrier (1-15). Discard the gasket.

(b) If inspection proves it necessary, press the oil seal (2-15) from the carrier.

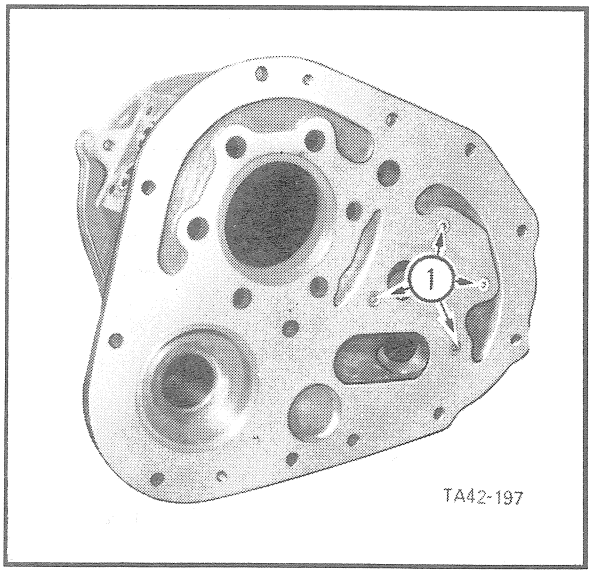


Fig. 16

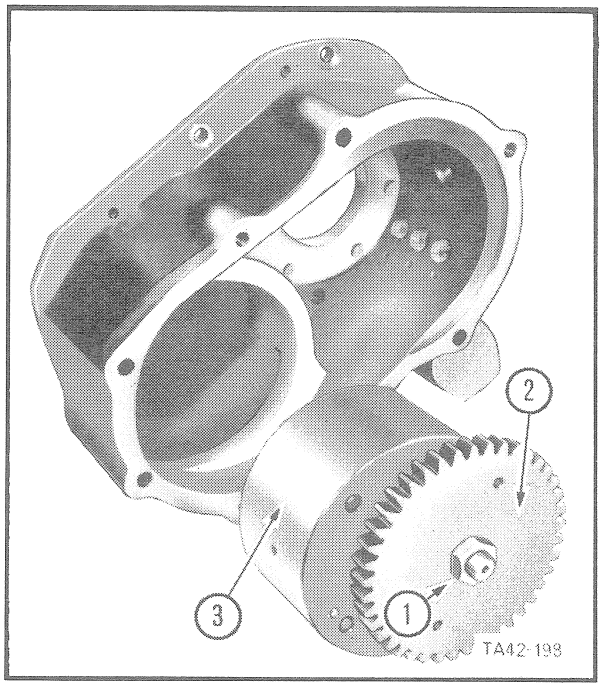


Fig. 17

(c) Remove the screws (1-16) and withdraw the pump assembly (3-17) from the housing. Discard the gasket.

(d) Remove the nut (1-17) and draw the gear (2-17) from the shaft. Remove the key from the shaft.

2c. INSPECTION AND REPAIR

(a) Clean off all traces of gasket from mounting faces.

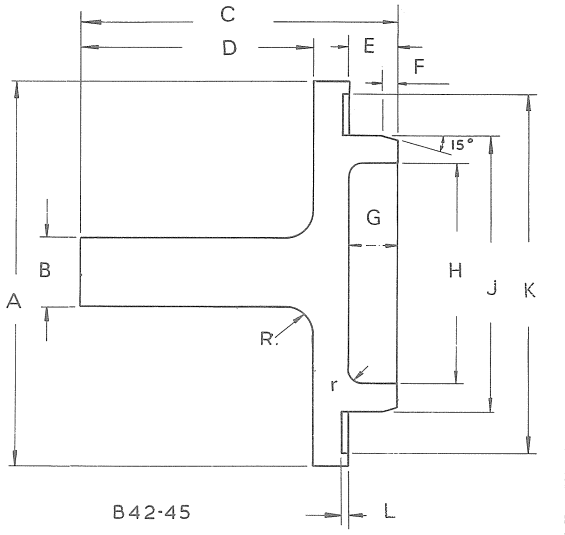
(b) Check the pump driven gear for damage.

2d. ASSEMBLY

(a) Install the key to the pump shaft then install the gear and nut (1-17).

(b) Position a new gasket on the pump mounting face then install the pump and secure with the mounting screws (1-16).

(c) Using a special tool manufactured to the dimensions shown in Fig. 18 press a new oil seal into the seal carrier referring to Fig. 19.



A. 178 mm (7.00 in)
B. 32 mm (1.25 in)
C. 146 mm (5.75 in)
D. 108 mm (4.25 in)
E. 24 mm (0.94 in)
F. 6 mm (0.25 in)
G. 22 mm (0.88 in)
H. 101 mm (4.00 in)
J. 131 to 132 mm (5.16 to 5.19 in)
K. 165.48 to 165.73 mm (6.515 to 6.525 in)
L. 2.79 to 3.55 mm (0.110 to 0.140 in)

R. 13 mm (0.50 in)
r. 6 mm (0.25 in)

Fig. 18

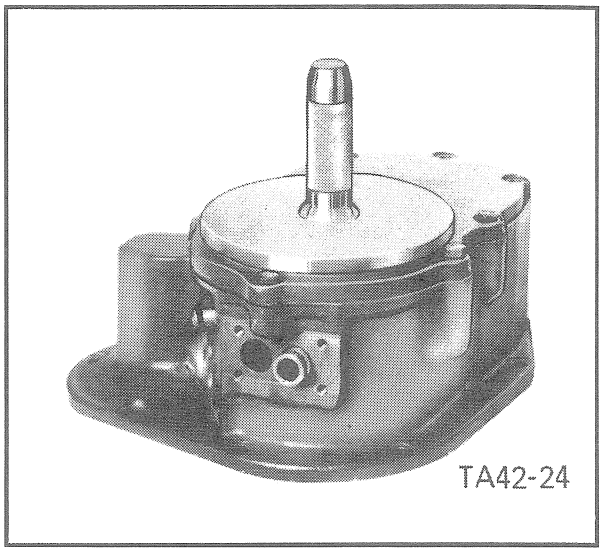


Fig. 19

(d) Position a new gasket on the seal carrier mounting face and locate the seal carrier on the housing.

(e) Install and tighten first the dowel bolts (2-14) then the standard bolts (3-14).

2e. INSTALLATION

NOTE: If the guide carrier was not removed from the transmission pump housing ignore operations (a) to (f).

(a) Insert the special tool, manufactured to the dimensions shown in Fig. 20, through the pump housing from the opposite side to the oil seal locating the tool flange in the housing bore. This special tool guides the torque convertor into position and prevents the oil seal lips from being damaged by the pump drive gear. Refer to Fig. 21.

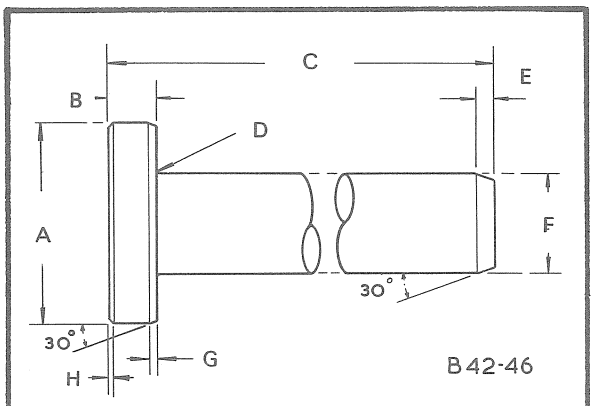
(b) Position the torque convertor assembly over the pump housing and carefully lower onto the tool shaft meshing the pump gears as the assembly is lowered.

(c) Turn the guide carrier as necessary to align the connecting tube holes then carefully invert the assembly. As the guide carrier spigot enters its bore the tool will be pushed out and can then be removed.

(d) Install and tighten the six screws (1-16).

(e) Install new 'O' rings on the tubes (1-12) and install the tubes into the housing and guide carrier.

(f) Using a new gasket install the connecting block (2-11).



A. 89.966 to 89.992 mm. (3.542 to 3.543 in)
B. 19 mm (0.75 in)
C. 197 mm (7.75 in)
D. 2.5 mm (0.1 in)
E. 4.8 mm (0.19 in)
F. 37.9 to 38.05 mm (1.496 to 1.498 in)
G. 3 mm (0.12 in)
H. 45° x 1.5 (0.06 in)

Fig. 20

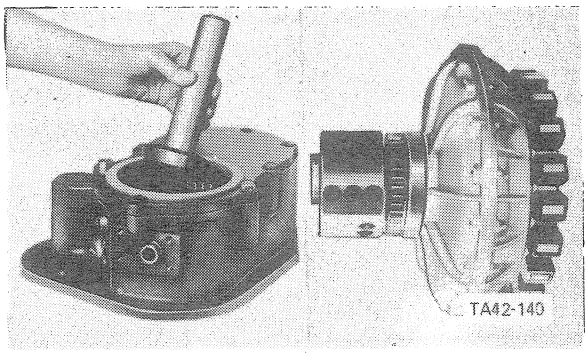


Fig. 21

(g) Check the condition of the sealing rings (1-22) on both clutch shafts then position a new gasket and 'O' ring (3-10) on the front bearing carrier (2-10). Using Loctite R.T.V. (Part No. 3120 158R1) form a 0.7 mm (0.030 in) bead around the suction and discharge slots in the gasket.

(h) Lift the torque convertor and pump housing assembly (1-10) into position, taking care not to damage the sealing rings, then secure to the front bearing carrier with the bolts (3-7).

(i) Install the retainer plate (2-9) on the end of the driving shaft and secure with the bolt (1-9) tightened to 2.9 to 3.3 kgm (21 to 24 lbft).

(j) Coat both sides of the flywheel pilot gasket with Loctite Superflex silicone sealant RTV2 and position the gasket on the studs. Install the flywheel pilot (2-8) and secure with the nuts (1-8) tightened to 2.9 kgm (21 lbft).

(k) Position a new gasket and install the connecing block (4-7).

(l) Install new 'O' rings (2-7) to both ends of the oil tubes (1-7) then locate the tubes in the connecting blocks and pump housing.

(m) Clean the mainframe, baseplate and sandwich plate mounting faces then install a new gasket and baseplate (4-6) aligning the tubes to feed into the plate. Install a new gasket and the sandwich plate (2-6).

(n) Position new gaskets then install the selector valve (6-5) and control valve (8-5). Install a

new gasket and the top cover (3-5) noting that the bolts (2-5) are shorter than the other bolts (1-5).

(o) Connect the hoses at the selector valve and the control cables at the spools.

(p) Install the engine referring to GROUP 7.

(q) Check the correct functioning and adjustment of the transmission controls, referring to para. 2f. then install the cab floor plate.

2f. ADJUSTMENTS

(a) It is possible to cross the cables to the transmission control valves during installation. To check this, run the engine at a fast idle and slowly move the control lever from centre to left or right. Any tendency for the loader to move will indicate that the cables are crossed. If this occurs, disconnect the cables at the transmission control valves, uncross them and connect to the correct spools.

(b) It is important that applying the safety lock lever does not move the forward/reverse spool from the neutral position. To check this, position the control lever in the neutral position then slowly apply the safety lock lever. Any tendency for the control lever to move forward or rearward can be corrected by adjusting at the cable lock-nuts near the valve.

3. DIRECTIONAL CLUTCH

3a. REMOVAL

(a) Remove the transmission pump housing assembly referring to para. 2b.

(b) Remove the discharge tube (5-6) through the top of the main frame and discard the 'O' rings.

(c) Remove the two socket headed screws (4-10) to free the discharge connecting block from the rear of the front bearing carrier then lay the connecting block in the rear frame.

(d) Remove the sealing rings (1-22) from both clutch shafts and the outer snap rings (3-22) from both bearings (2-22).

(e) Remove the securing bolts (4-22), install extractor bolts into the tapped holes then evenly and progressively tighten the bolts to remove the front bearing carrier. Discard the gasket. Remove the suction tube (4-23), which may have come away with the front bearing carrier, and discard the 'O' rings.

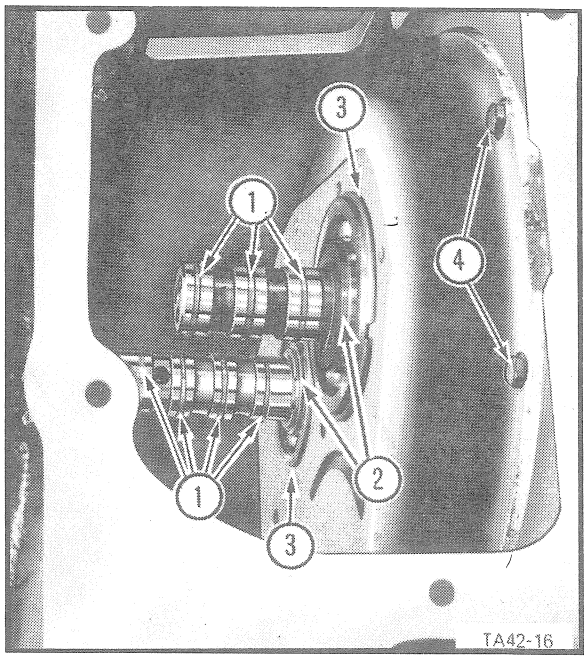


Fig. 22

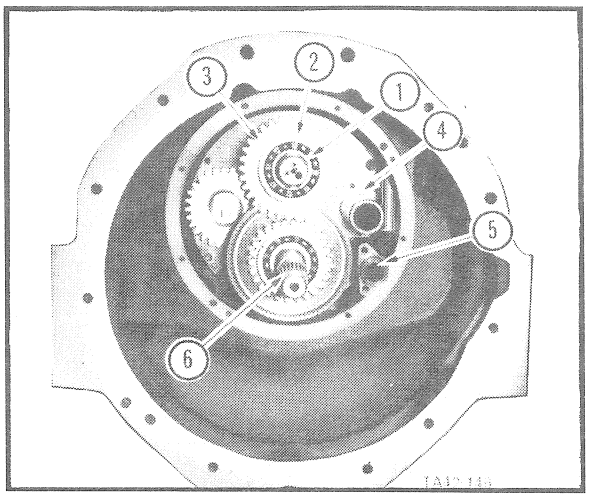


Fig. 23

(f) Remove the circlip (1-23), bearing (2-23), spacer and gear (3-23) from the range clutch shaft.

(g) Withdraw the directional clutch shaft assembly (6-23).

3b. DISMANTLING

(a) Remove the circlip (1-24), thrust race (2-24) and thrust washer (3-24).

(b) Remove the reverse gear (1-25), thrust washer (2-25) and thrust race (3-25).

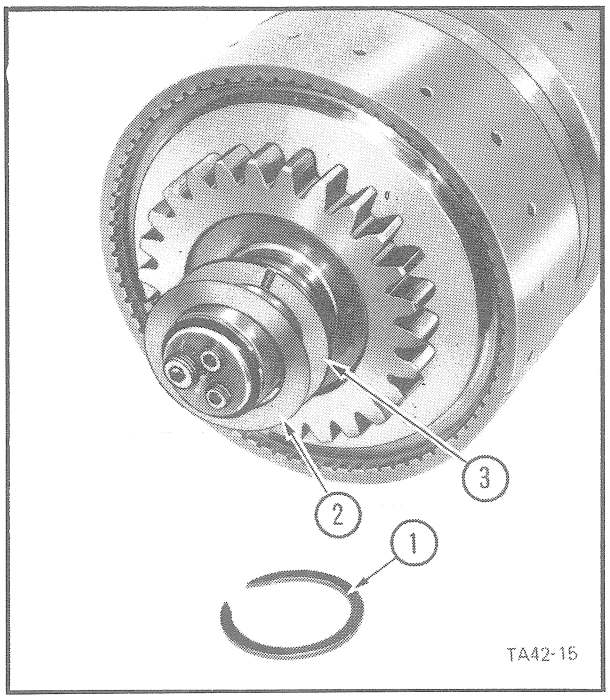


Fig. 24

(c) Remove the snap ring (4-25 & 1-26) and withdraw the backplate (2-26).

(d) Remove the clutch plates (3-26) from the spider.

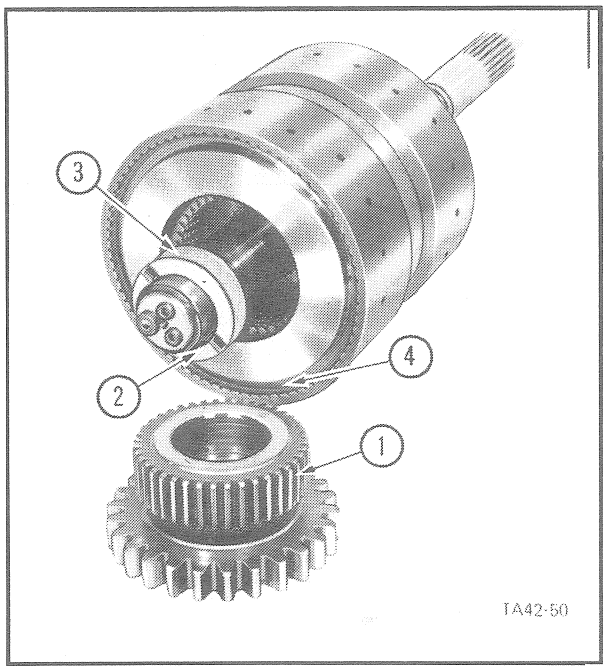


Fig. 25

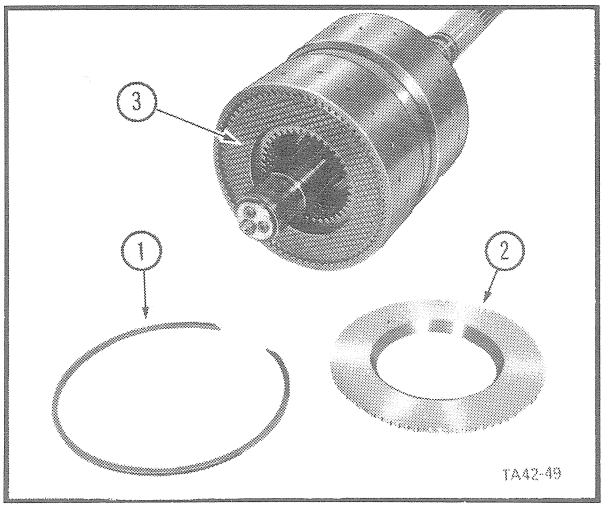


Fig. 26

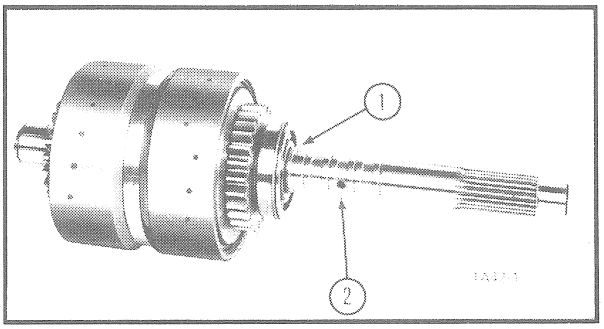


Fig. 27

(e) Remove the circlip (1-27), bearing (1-28), bearing spacer (2-28) and thrust washer (3-28).

(f) Remove the forward gear (4-28), thrust washer (1-29) and thrust race (2-29).

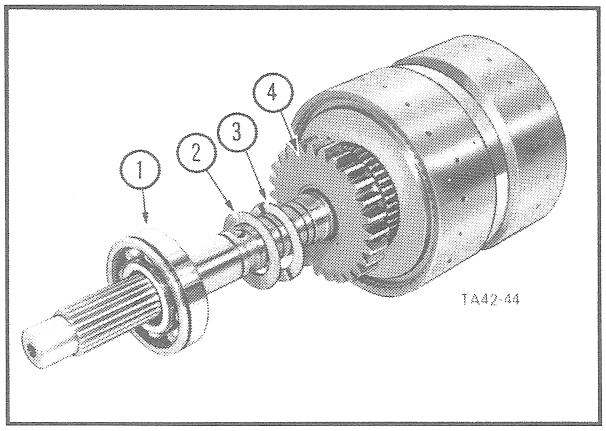


Fig. 28

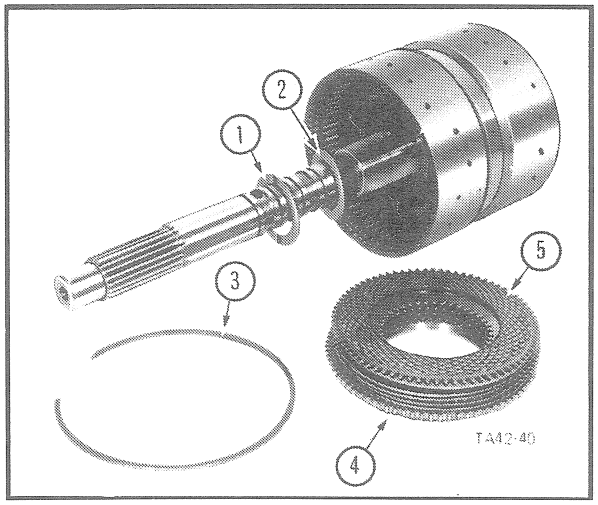


Fig. 29

(g) Remove the snap ring (3-29), back plate (4-29) and clutch plates (5-29) from the spider.

(h) Progressively and evenly slacken the nuts (1-30) until the spring pressure is relieved then remove the nuts and withdraw the pistons from the clutch spiders.

(i) Remove the springs (1-31), spring retainers (2-31) and the washers (3-31) from the spring retainers.

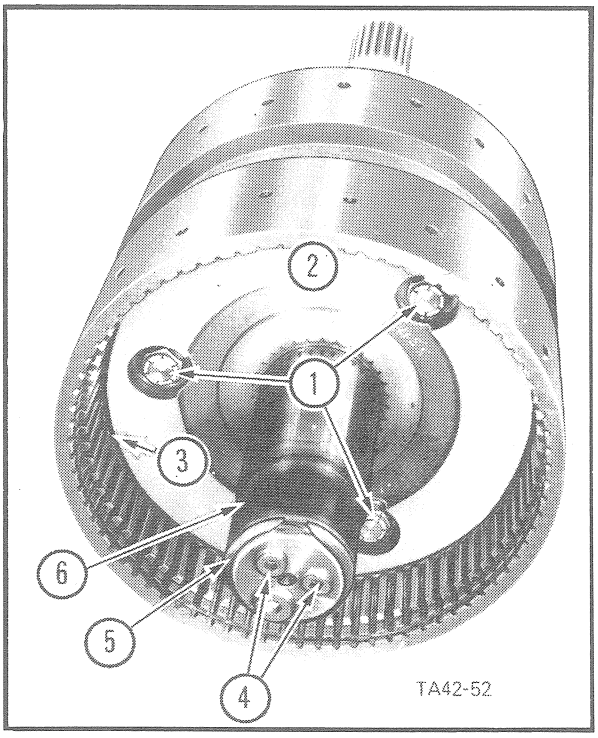


Fig. 30

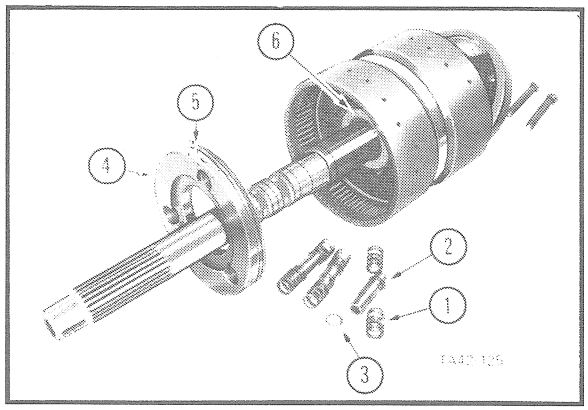


Fig. 31

(j) Remove the piston rings (5-31) and expander rings from the pistons and the piston rings (6-31) from the spiders.

(k) Remove the inner snap ring (3-30) from both spiders.

(l) If it is nccessary to separate the two clutch spiders scribe a mark across both spiders and the clutch carrier to aid alignment during assembly then remove the nuts (1-32) and bolts. Remove the circlip and splined spider then press the remaining spider and clutch carrier from the shaft.

(m) If inspection proves it necessary remove the circlip (5-30) and remove the bearing inner race (6-30).

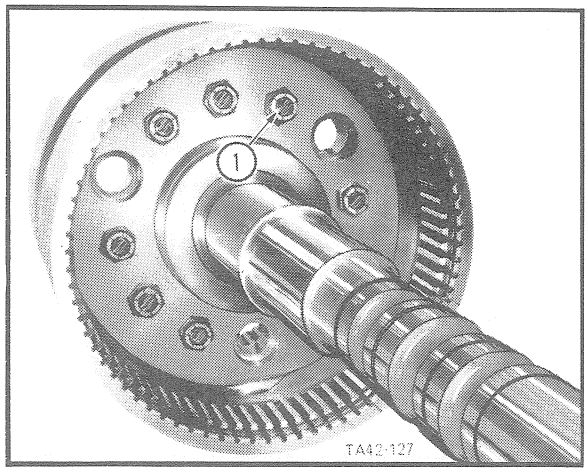


Fig. 32

3c. INSPECTION

(a) Thoroughly clean all parts paying particular attention to the oil galleries in the shaft ensuring that they are free from obstruction.

(b) Check the clutch pack return springs, these must be of equal length, if in doubt fit a new set of springs.

(c) Inspect bearings for excessive wear or damage. Serviceable bearings must be cleaned, oiled and wrapped until required for assembly.

(d) Check the clutch spiders, gears and shafts for wear and damage.

(e) Check the clutch plates for signs of wear, overheating or distortion. Comparison with new plates will give some indication of the amount of wear.

3d. ASSEMBLY

(a) If new plates are to be fitted these must be pre-soaked in recommended transmission fluid for at least one hour before assembly. This will prevent the possibility of damage to the plates on initial start up after rebuild before lubrication pressure builds up. Applying a coat of oil during assembly is NOT sufficient.

(b) If this was removed press on a new bearing inner race (6-30) and secure with the circlip (5-30).

(c) Install the circlip (1-33) onto the shaft then install the splined spider to contact the circlip. Lubricate the bores of the clutch carrier and plain bore spider with a smear of grease.

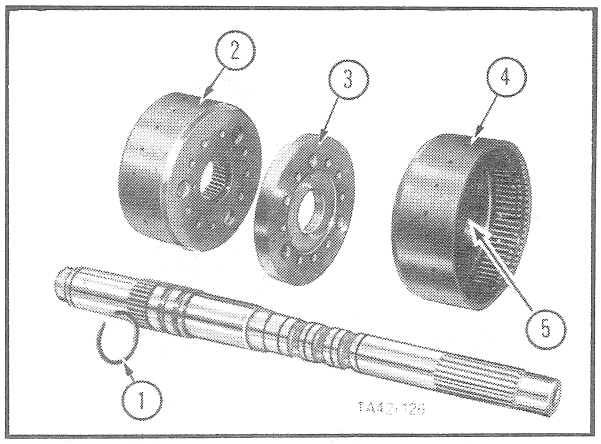


Fig. 33

(d) Position the clutch carrier on the bed of a press with the recess in the face, which mates with the face of the plain bore spider, toward the bed then lower the shaft into position aligning the small oil holes in the splined spider with the oil holes in the clutch carrier or the marks made during dismantling.

(e) Install two dowels, manufactured to the dimensions in Fig. 34, through two diametrically opposed bolt holes in the splined spider and clutch carrier then carefully press in the shaft. Remove the assembly from the press then carefully check for run-out between the shaft and clutch carrier. Tap the clutch carrier as necessary to eliminate any run-out.

(f) Position the plain bore spider under the press with the press bed supporting the spider on the central boss (5-33). The spider must be supported in this way to avoid distortion during the pressing.

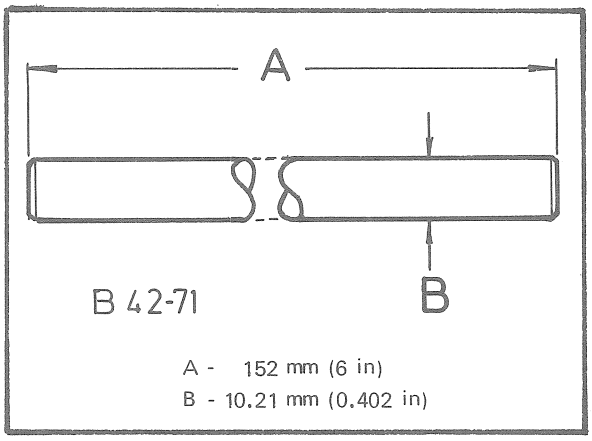


Fig. 34

(g) Lower the shaft into position aligning the bolt holes or the marks made during dismantling, insert the dowels through two diametrically opposed bolt holes in both spiders and clutch carrier then carefully press in the shaft. Remove the assembly from the press and again check for run-out between the shaft, plain bore spider and clutch carrier. Tap the spider as necessary to eliminate any run-out.

(h) Remove the two dowels, install the nine nuts and bolts (1-32) and tighten to 4.7 kgm (34 lbft).

(i) Install the inner circlips (3-30) into both spiders ensuring that both circlips are seated in the bottom of their grooves and do not stand proud of the piston bores.

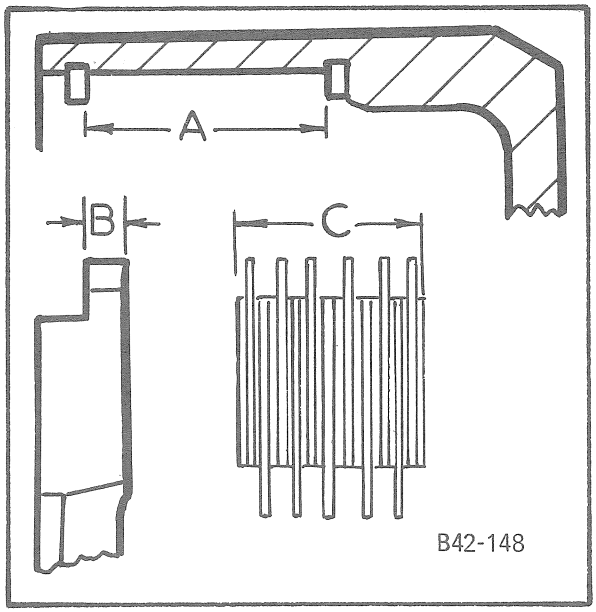


Fig. 35

(j) The clutch plates must have a minimum interface clearance of 0.15 mm (0.006 in) which means that the stack height of the clutch plates must provide a minimum of 1.5 mm (0.060 in) clearance within the spider. Install the outer circlips (3-29) to both spiders then measure the distance (A-35) between the inner and outer circlips. Measure the thickness (B-35) of the backplates at the area of contact with the outer circlips. Deduct B from A for each spider then deduct a further 1.5 mm (0.060 in) from these figures. This will give the maximum stack height (C-35) for each set of clutch plates. It may be necessary to select clutch plates to obtain these figures, there are six sintered plates and five steel plates in each pack.

EXAMPLE	mm	in
A - distance between circlips	= 32	1.260
B - thickness of backplate	= 4.6	0.181
difference	= 27.4	1.079
minimum clearance	= 1.5	0.060
C - maximum stack height	= 25.9	1.019

Set the selected clutch packs aside noting for which spider they are intended then remove the outer circlips (3-29) from each spider.

(k) Install new expander rings and piston rings (5-31) onto the pistons and new piston rings (6-31) to the spiders ensuring that the split ends of the spider piston rings are away from the oil pressure inlet holes.

(l) Install the spring retainers (2-31) and ensure that they are free in their bores. Install the washers (3-31) then the springs (1-31) onto both ends of the retainers.

(m) Lightly smear the piston rings with grease then carefully position both pistons into the spiders aligning the bolt holes with the spring retainers and taking extreme care to keep the pistons square to avoid damage to the piston rings and bores.

(n) Install three fine thread bolts of sufficient length to enable nuts to be installed finger tight then tighten each nut in turn a little at a time until the pistons contact the spring retainers.

(o) Exchange the three bolts one at a time for bolts of the correct length then tighten each nut to 3.6 kgm (26 lbft). Check that the bolt heads and the nuts are at least 0.20 mm (0.008 in) below the surface of the pistons after assembly.

(p) Using an air line with a minimum pressure of 6 kg/cm^2 (80 lb/in^2), pressurise each piston through the oil galleries in the shaft to ensure that the pistons move freely in both directions. If the pistons do not move freely, dismantle the assembly, rectify the fault, assemble and re-test.

(q) Install the selected clutch plates (5-29).

(r) Install the back plates (4-29) and circlips (3-29) to both clutch packs.

(s) Install the thrust race (2-29), thrust washer (1-29) and forward gear (4-28).

(t) Install the thrust washer (3-28), bearing spacer (2-28), bearing (1-28) and circlip (1-27).

(u) Install the thrust race (3-25), thrust washer (2-25) and reverse gear (1-25).

(v) Install the thrust washer (3-24), thrust race (2-24) and circlip (1-24).

(w) Pressure check the clutch assembly before installation as detailed in para. 3f.

3e. INSTALLATION

(a) Carefully install the directional clutch assembly (6-23). To prevent damage to the needle bearing in the pinion shaft the clutch shaft must be supported at the front until the front bearing carrier is installed.

(b) Remove the outer snap ring from the front bearing and retain for later assembly.

(c) Install the gear (3-23), spacer with its internal chamfer toward the gear, bearing (2-23) and circlip (1-23) on the range clutch shaft. Remove the outer snap ring from the bearing and retain for later assembly.

(d) Install new 'O' rings on the suction tube (4-23) and install the tube into the front of the centre section.

(e) If the cold oil relief valve has been removed, from the discharge connecting block, the valve must be installed using Loctite 221 and tightened to 7.46 kgm (54 lbft). The valve should be bench tested and set to crack at 24.6 kg/cm^2 (350 lb/in^2).

(f) Fit a new 'O' ring to the discharge connecting block and lay the assembly in the main frame adjacent to the directional clutch pack and beneath the suction tube.

(g) Position a new gasket on the main frame mounting flange then install the front bearing carrier taking care to correctly locate the clutch shaft bearings, suction tube, dowels and spigot.

(h) Secure the front bearing carrier with the bolts (4-22) then install the bearing outer snap rings (3-22)

(i) Locate the discharge connecting block in the back of the front bearing carrier and secure with the socket headed screws (4-10).

(j) Install new 'O' rings on the discharge tube (5-6) then carefully feed the tube through the top of the main frame into the counterbore in the discharge connecting block.

(k) Install sealing rings (1-22) onto both clutch shafts.

(l) Install the transmission pump housing assembly referring to para. 2e.

3f. TESTING

(a) Remove the sealing plugs (4-30) from the shaft and install worm drive clips around the shaft to seal the oil feed holes (2-27).

(b) Using a hand pump filled with transmission fluid and equipped with a pressure gauge, pressurise each clutch pack in turn to 17.6 kg/cm^2 (250 lb/in^2) through the shaft centre drillings.

(c) While maintaining this pressure the leakage rate from the clutch assembly should not exceed

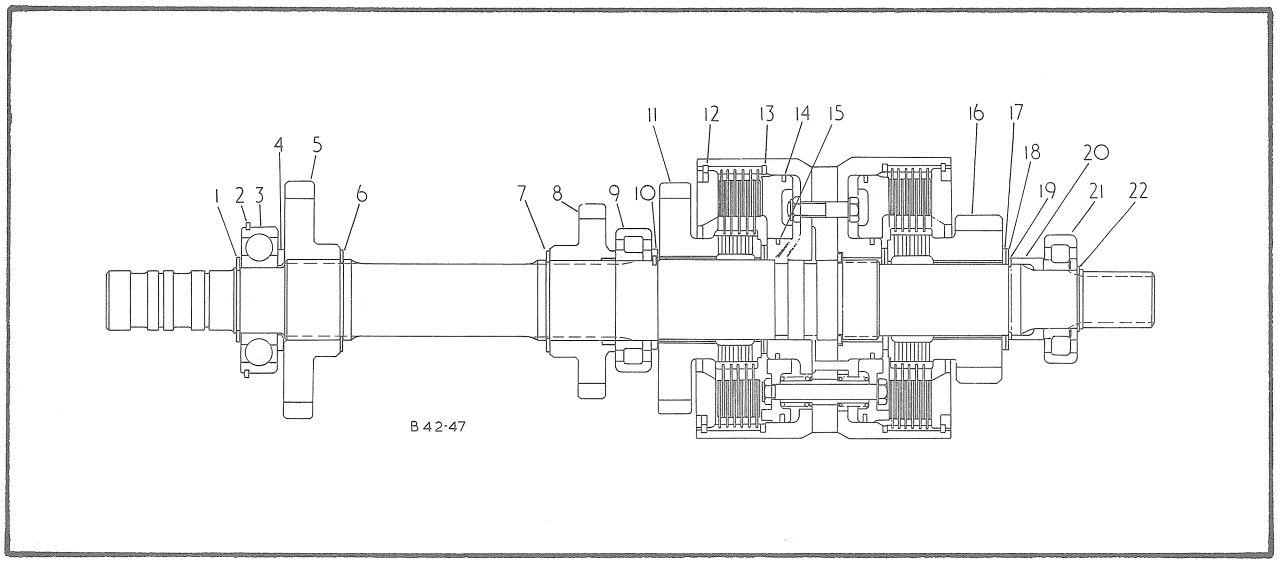


Fig. 36

0.85 litre/min (1.5 UK pint/min). If leakage exceeds this rate dismantle the clutch assembly, rectify the fault, assemble and re-test.

(d) Remove the clips from the oil drillings and install the plugs (4-30).

4. CENTRE SECTION

4a. REMOVAL

(a) Remove the directional clutch pack assembly referring to para. 3a., suction tube (4-23) and discharge connecting block (5-23). Discard the 'O' rings.

(b) Remove the circlip (6-36) from the range clutch shaft.

(c) Remove the circlip (7-36) and gear (8-36) from the range clutch shaft.

(d) Remove the bolts (1-37) securing the suction tube and screen assembly to the rear of the centre section and remove the assembly.

NOTE: The suction tube and screen assembly can be removed through the top cover hole without dismantling the transmission.

(e) Remove the bolts (2-37) securing the centre section assembly, install extractor bolts into the tapped holes then evenly and progressively tighten the bolts to remove the centre section. Support the range clutch assembly while the centre section is off.

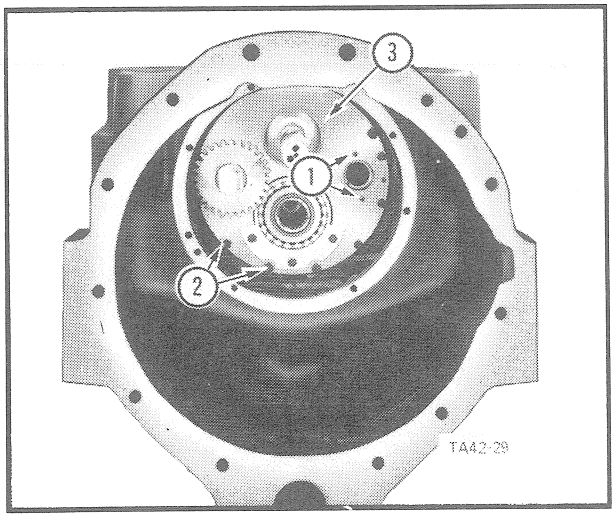


Fig. 37

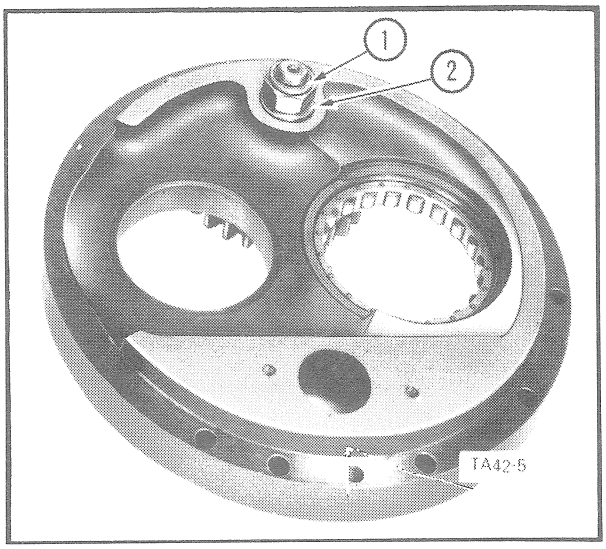


Fig. 38

4b. DISMANTLING

(a) Remove the nut (1-38) and washer (2-38) then withdraw the gear (5-39) and shaft from the centre section.

(b) Remove the thrust washer, gear and thrust washer from the shaft. Remove the needle roller bearing from the gear.

(c) Remove the bolts (1-39) and retainer plate (3-39) then press the bearing (2-39) from the centre section.

(d) Press the bearing outer race (4-39) from the centre section.

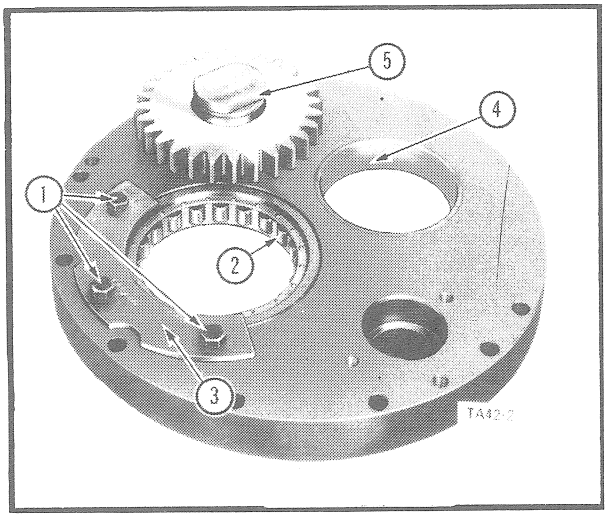


Fig. 39

4c. INSPECTION

(a) Inspect the gear and bearings for excessive wear and damage.

(b) Inspect the thrust washers for signs of wear or damage.

4d. ASSEMBLY

(a) Press the bearing outer race (4-39) into the centre section.

(b) Press the roller bearing (2-39) into the centre section and secure with the retainer plate (3-39) and bolts (1-39).

(c) Install the needle roller bearing into the idler gear (5-39), fit a thrust washer to the shaft and pass the shaft through the gear.

(d) Install the second thrust washer then pass the shaft through the centre section.

(e) Install the washer (2-38) and nut (1-38). Tighten the nut to 40 to 44 kgm (290 to 320 lbft).

4e. INSTALLATION

(a) Lift the centre section assembly (3-37) into position, taking care when fitting the rollers of the lower bearing over the gear on the drive sleeve, and secure with the bolts (2-37).

(b) Locate the suction tube and screen assembly on the rear of the centre section and secure with the bolts (1-37)

(c) Install the reverse driven gear (8-36) onto the range clutch shaft and secure with the circlip (7-36).

(d) Install the circlip (6-36).

(e) Install the directional clutch pack referring to para. 3e.

5. RANGE CLUTCH PACK

5a. REMOVAL

(a) Remove the centre section assembly referring to para. 4a.

(b) Remove the circlip and gear (1-40) from the pinion shaft drive sleeve then withdraw the range clutch assembly (1-41).

If difficulty is experienced in withdrawing the assembly, DO NOT drive out. Remove the circlip (1-42) and outer spacer (2-43) which will allow the shaft to be withdrawn from the bearing. Carefully drive the bearing from the mainframe.

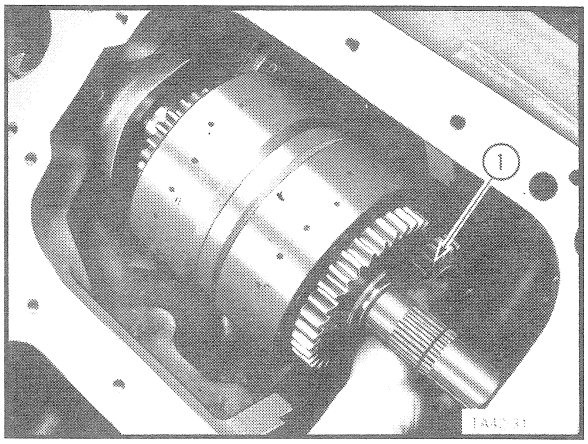


Fig. 40

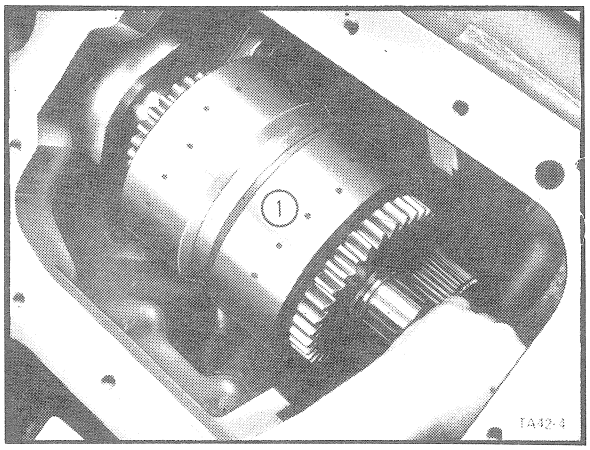


Fig. 41

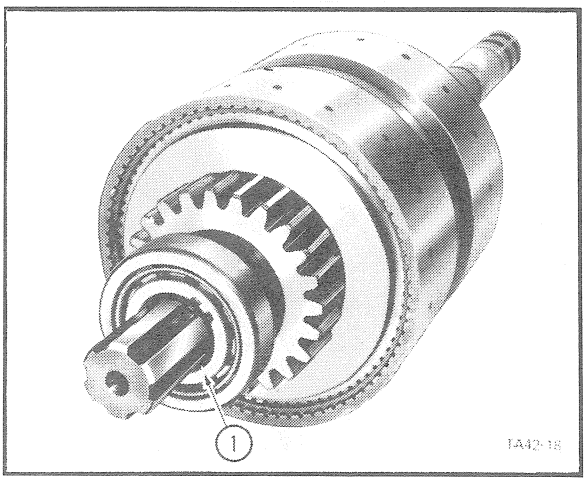


Fig. 42

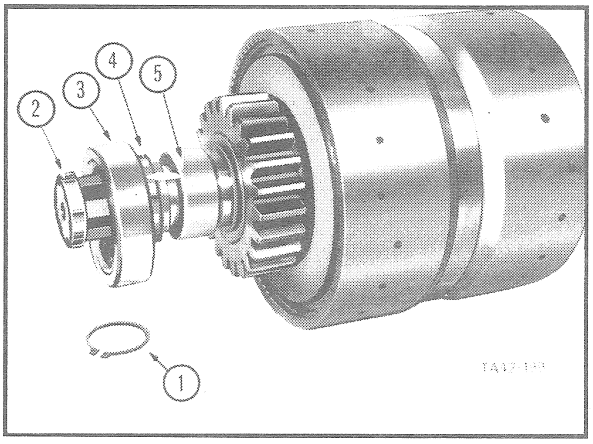


Fig. 43

5b. DISMANTLING

(a) Remove the circlip (1-42), outer spacer (2-43 and bearing (3-43), if in position. Draw the bear ing inner race (4-43) from the shaft.

(b) Remove the spacer (5-43), circlip (1-44), thrust race (2-44) and thrust washer (3-44).

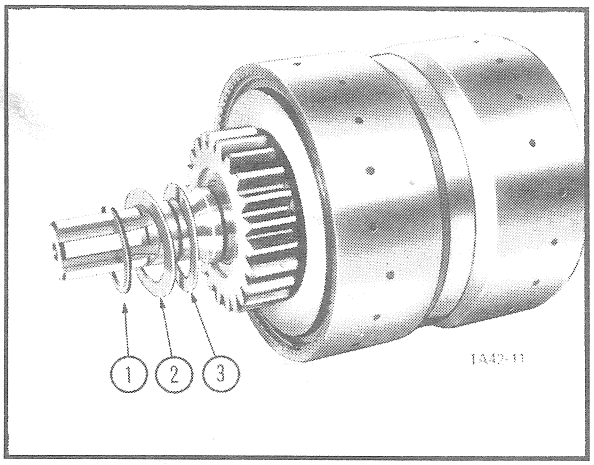


Fig. 44

(c) Withdraw the low range driving gear (1-45) from the clutch pack then remove the inner thrust washer (2-45) and thrust race (3-45).

(d) Remove the snap ring (4-45) from the clutch spider, withdraw the back plate (5-45) and remove the clutch plates.

(e) Remove the bearing from the opposite end of the shaft and remove the spacer (1-46).

(f) Remove the high range driving gear (2-46) from the clutch pack.

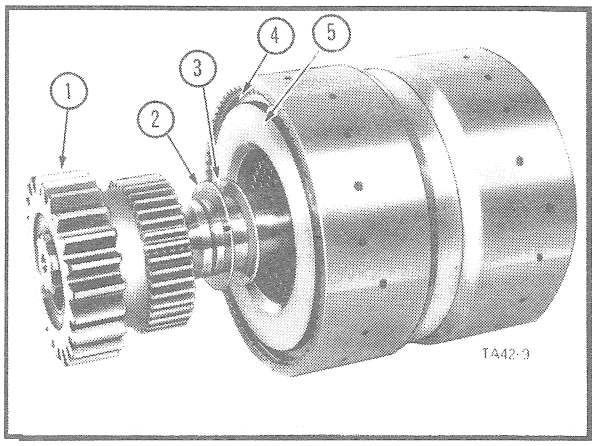


Fig. 45

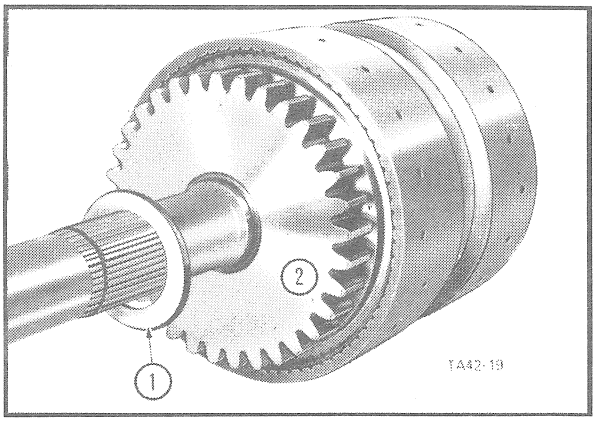


Fig. 46

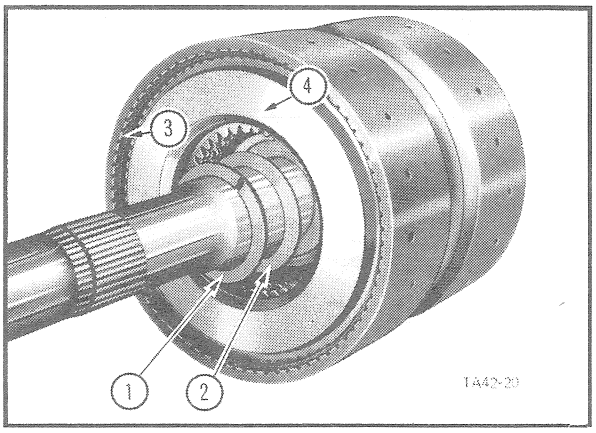


Fig. 47

(g) Remove the thrust washer (1-47) and thrust race (2-47) from the shaft.

(h) Remove the snap ring (3-47) from the clutch spider then remove the backplate (4-47).

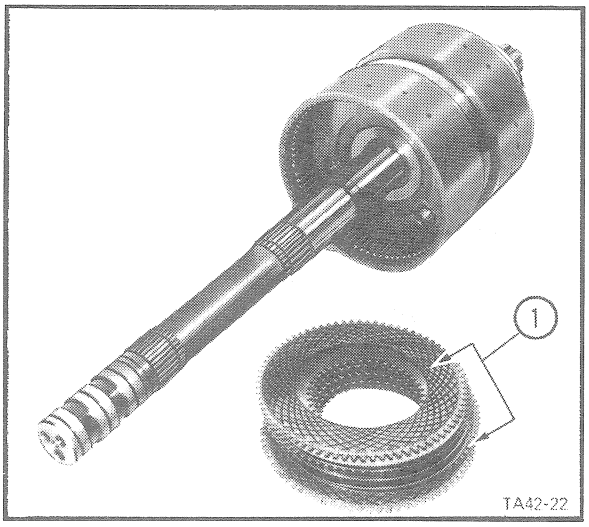


Fig. 48

(i) Remove the clutch plates (1-48) from the spider.

(j) Progressively and evenly slacken the nuts (2-49) until the spring pressure is relieved, then remove the nuts and withdraw the pistons from the clutch spiders.

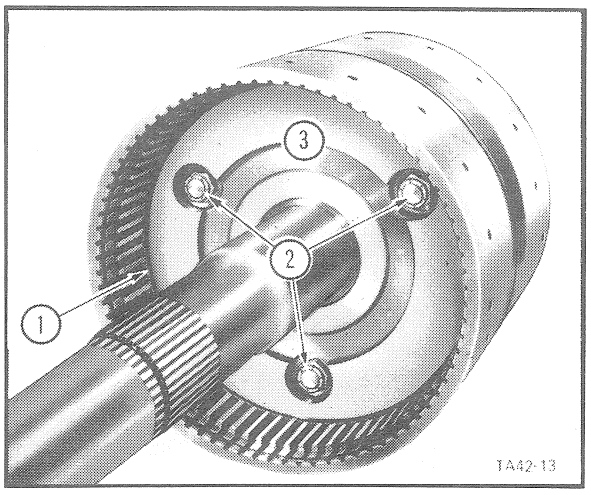


Fig. 49

(k) Remove the springs (1-50), spring retainers (2-50), and the washers (3-50) from the spring retainers.

(l) Remove the piston rings (5-50) and expander rings from the piston and the piston rings (6-50) from the spiders.

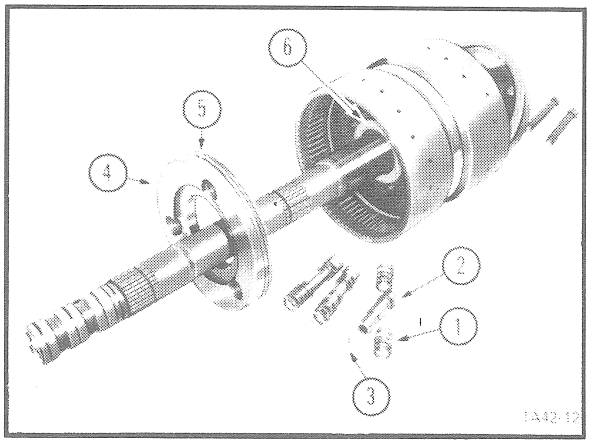


Fig. 50

(m) Remove the inner snap ring (1-49) from both spiders.

(n) If it is necessary to separate the two clutch spiders scribe a mark across both spiders and the clutch carrier to aid alignment during assembly then remove the nuts (1-51) and bolts. Remove the circlip and splined spider then press the remaining spider and clutch carrier from the shaft.

5c. INSPECTION

(a) Thoroughly clean all parts paying particular attention to the oil galleries in the shaft ensuring that they are free from obstruction.

(b) Check the clutch pack return springs, these must be of equal length, if in doubt fit a new set of springs.

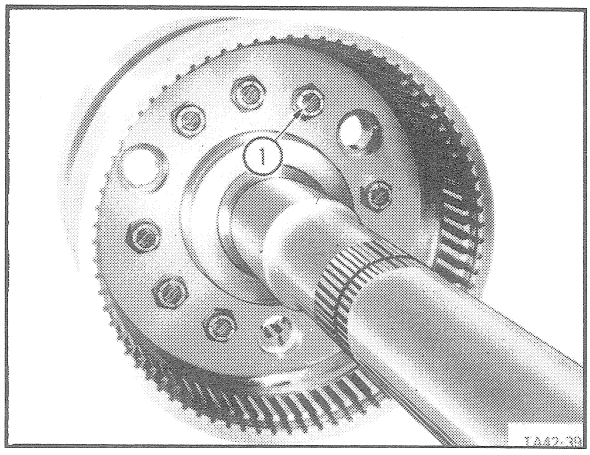


Fig. 51

(c) Inspect bearings for excessive wear or damage. Serviceable bearings must be cleaned, oiled and wrapped until required for assembly.

(d) Check the clutch spiders, gear and shafts for wear and damage.

(e) Check the clutch plates for signs of wear, overheating or distortion. Comparison with new plates will give some indication of the amount of wear.

5d. ASSEMBLY

(a) If new plates are to be fitted these must be pre-soaked in recommended transmission fluid for at least one hour before assembly. This will prevent the possibility of damage to the plates on initial start up after rebuild before lubrication pressure builds up. Applying a coat of oil during assembly is NOT sufficient.

(b) Install the circlip (1-52) onto the shaft then install the splined spider to contact the circlip. Lubricate the bores of the clutch carrier and plain bore spider with a smear of grease.

(c) Position the clutch carrier (3-52) on the bed of a press with the recess in the face, which mates with the face of the plain bore spider, toward the bed then lower the shaft into position aligning the small oil holes in the splined spider with the oil holes in the clutch carrier or the marks made during dismantling.

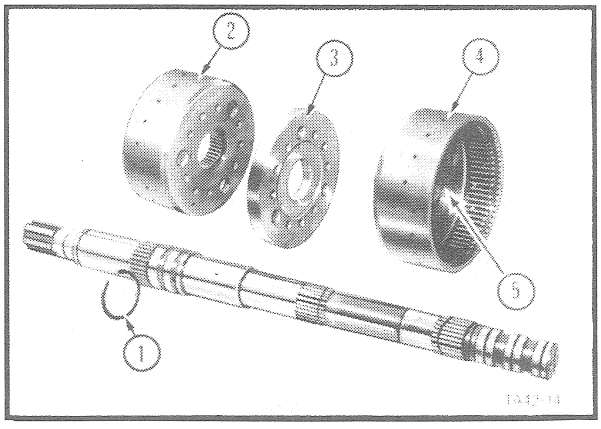


Fig. 52

(d) Install two dowels, manufactured to the dimensions in Fig. 34, through two diametrically opposed bolt holes in the splined spider and clutch carrier then carefully press in the shaft. Remove the assembly from the press then carefully check for run-out between the shaft and clutch carrier. Tap the clutch carrier as necessary to eliminate any run-out.

(e) Position the plain bore spider under the press bed supporting the spider on the central boss (5-52). The spider must be supported in this way to avoid distortion during pressing.

(f) Lower the shaft into position aligning the bolt holes or the marks made during dismantling, insert the dowels through two diametrically opposed bolt holes in both spiders and the clutch carrier then carefully press in the shaft. Remove the assembly from the press and again check for run-out between the shaft, plain bore spider and clutch carrier. Tap the spider as necessary to eliminate any run-out.

(g) Remove the two dowels, install the nine nuts and bolts (1-51) and tighten to 4.7 kgm (34 lbft).

(h) Install the inner circlips (1-49) into both spiders ensuring that both circlips are seated in the bottom of their grooves and do not stand proud of the piston bores.

(i) The clutch plates must have a minimum interface clearance of 0.15 mm (0.006 in) which means that the stack height of the clutch plates must provide a minimum of 1.5 mm (0.060 in) clearance within the spider. Install the outer circlips (4-45 & 3-47) to both spiders then measure the distance (A-35) between the inner and outer circlips. Measure the thickness (B-35) of the backplate at the area of contact with the outer circlips. Deduct B from A for each spider then deduct a further 1.5 mm (0.060 in) from these figures. This will give the maximum stack height (C-35) for each set of clutch plates. It may be necessary to select thinner clutch plates to obtain these figures, there are six sintered plates and five steel plates in each pack.

EXAMPLE	mm	in
A - distance between circlips	32	1.260
B - thickness of backplate	- 4.6	0.181
difference	- 27.4	1.079
minimum clearance	- 1.5	0.060
C - maximum stack height	- 25.9	1.019

Set the selected clutch packs aside noting for which spider they are intended then remove the outer circlips (4-45 & 3-47) from each spider.

(j) Install new expander rings and piston rings (5-50) onto the pistons and new piston rings (6-50) to the spiders ensuring that the split ends of the spider piston rings are away from the oil pressure inlet holes.

(k) Install the spring retainers (2-50) and ensure that they are free in their bores. Install the washers (3-50) then the springs (1-50) onto both ends of the retainers.

(l) Lightly smear the piston rings with grease then carefully position both pistons into the spiders aligning the bolt holes with the spring retainers and taking extreme care to keep the pistons square to avoid damage to the piston ring and bores.

(m) Install three fine thread bolts of sufficient length to enable the nuts to be installed finger tight then tighten each nut in turn a little at a time until the pistons contact the spring retainers.

(n) Exchange the three bolts one at a time for bolts of the correct length then tighten each nut to 3.6 kgm (26 lbft). Check that the bolt heads and the nuts are at least 0.20 mm (0.008 in) below the surface of the pistons after assembly.

(o) Using an air line with a minimum pressure of 6 kg/cm^2 (80 lb/in^2), pressurise each piston through the oil galleries in the shaft to ensure that the pistons move freely in both directions. If the pistons do not move freely, dismantle the assembly, rectify the fault, assemble and re-test.

(p) Install the selected clutch packs (1-48).

(q) Install the back plates (5-45 & 4-47) and circlips (4-45 & 3-47) to both clutch packs.

(r) Install the thrust race (3-45), thrust washer (2-45) and low range driving gear (1-45).

(s) Install the thrust washer (3-44), thrust race (2-44) and circlip (1-44).

(t) Install the spacer (5-43). Carefully press the bearing inner race (4-43) up to the spacer ensuring that the spacer does not distort the circlip (1-44). Install the bearing (3-43), spacer (2-43) and circlip (1-42). Check that a minimum running clearance of 0.23 mm (0.009 in) exists between the thrust washer (3-44) and low range driving gear (1-45).

(u) Install the thrust race (2-47), thrust washer (1-47), high range driving gear (2-46) and spacer (1-46). Install the bearing.

(v) Pressure check the clutch assembly before installation as detailed in para. 3f.

5e. INSTALLATION

(a) Carefully install the range clutch assembly (1-41). To prevent damage to the rear bearing this clutch shaft must be supported at the front until the centre section is installed.

(b) Install the gear (1-40) on the pinion shaft drive sleeve and secure with the circlip.

(c) Install the centre section assembly referring to para. 4e.

6. PINION SHAFT

6a. REMOVAL

(a) Remove the range clutch assembly referring to para. 5e.

(b) Remove the bolts (1-53) and withdraw the pinion shaft assembly (2-53) complete with shim pack (3-53) and oil deflector (4-53). Tape the shim pack together for reference during installation.

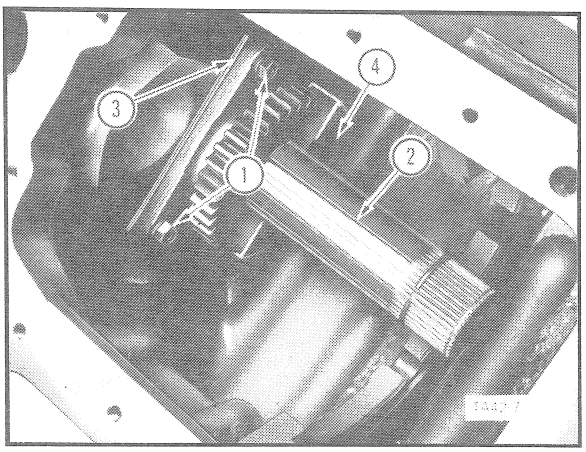


Fig. 53

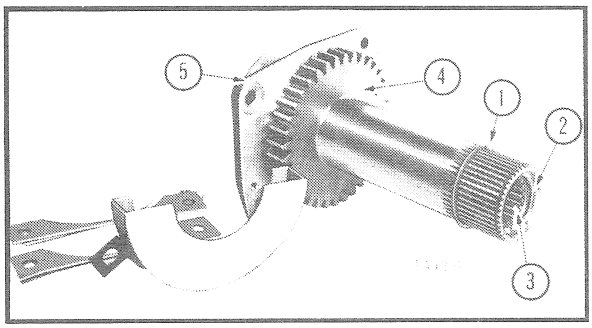


Fig. 54

6b. DISMANTLING

(a) Remove the circlip (1-54) from the pinion drive sleeve.

(b) Remove the circlip (2-54), needle roller bearing (3-54) and inner circlip from inside the pinion drive sleeve.

(c) Remove the nut (1-55) and washer (2-55).

(d) Heat the drive sleeve and gear (3-55) to 180°C (350°F) and place the assembly under a press so that the support is under the gear then press the pinion assembly from the drive sleeve. DO NOT support the assembly under the bearing cage (6-55) or the key (10-55) will foul the bearing assembly.

(e) Remove the key (10-55) from the shaft then press the shaft from the bearing cage.

(f) Remove the bearing spacer (9-55) then press the shaft from the rear bearing cone (7-55).

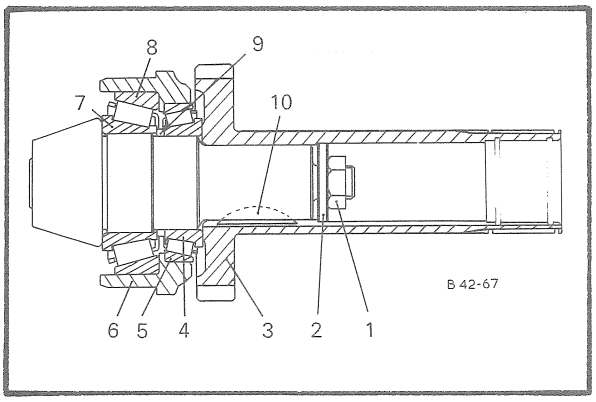


Fig. 55

(g) Lift the front bearing cone (4-55) from the bearing cage then press out the front and rear bearing cups (5 & 8-55).

6c. INSPECTION

(a) Inspect all bearings for signs of overheating damage or excessive wear.

(b) Check gears for damage or excessively worn teeth.

NOTE: The bevel pinion and bevel gear are a matched set. If either item shows signs of wear or damage BOTH items must be changed.

6d. ASSEMBLY

(a) Having obtained the correct bearing pre-load as detailed in para. 6f., sub-para. 1, install the key (10-55) into the shaft.

(b) Heat the drive sleeve and gear (3-55) to a temperature of 180°C (350°F), preferably in an oven or oil bath.

(c) Press the drive sleeve firmly onto the pinion shaft and install the washer (2-55).

(d) Apply Loctite 241 to the retaining nut (1-55) then install the nut and tighten to 18 to 21 kgm (130 to 155 lbft).

(e) After cooling check that the bearing pre-load has been maintained. If any pre-load has been lost during cooling the drive sleeve should be pressed home until the correct pre-load is obtained, fresh Loctite 241 applied to the nut and the nut again tightened to 18 to 21 kgm (130 to 155 lbft).

(f) After allowing the drive sleeve to cool install the inner circlip, needle roller bearing (3-54), outer circlip (2-54) and external circlip (1-54).

6e. INSTALLATION

(a) Having established the shim pack required to provide the correct cone centre distance as detailed in para. 6f. sub-para. 2, install the shim pack (3-53) and bevel pinion assembly (2-53).

(b) Position the oil slinger (4-53) under the range driven gear then install and tighten the bolts (1-53). Ensure that the shim pack has been correctly fitted by re-checking the cone centre distance.

(c) Install the range clutch shaft assembly referring to para. 5e.

6f. ADJUSTMENTS

1. BEVEL PINION BEARING PRE-LOAD

(a) Press the front and rear bearing cups (1 & 8-56) into the bearing cage. Ensure that both cups are pressed firm and square against the shoulders of the cage.

(b) Press the rear bearing cone (7-55) onto the pinion shaft (7-56).

(c) Install a spacer (9-56) of 4.953 mm (0.195 in) thickness up to the rear bearing then position the bearing cage and press the front bearing cone (3-56) onto the shaft at the same time rotating the cage to ensure even seating of the cones in their cups.

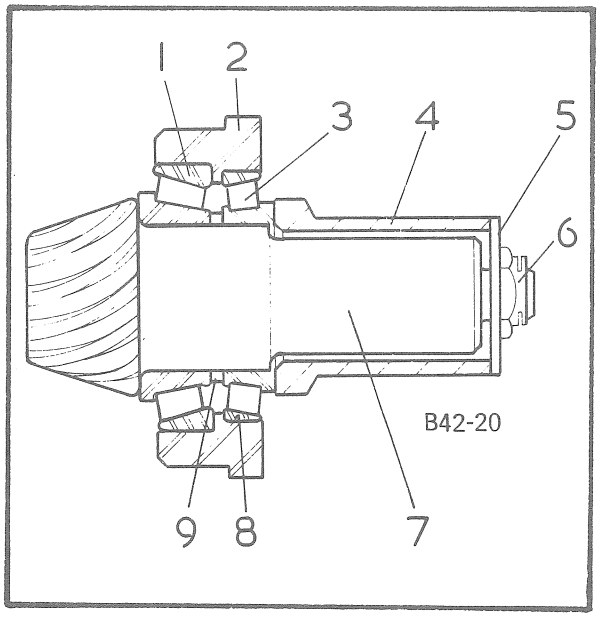


Fig. 56

(d) Install a spacer tube (4-56) onto the shaft in place of the low range driven gear then install the washer and nut. As the nut is being tightened rotate the bearing cage to ensure correct seating of the bearings and at the same time to ensure that the bearings are not being overloaded, until a final torque of 18 to 21 kgm (130 to 155 lbft) is reached. If overloading does occur, dismantle the assembly and install a thicker spacer.

Spacers are available in increments of 0.025 mm (0.001 in) between 4.75 and 5.15 mm (0.187 and 0.203 in).

(e) Wrap a length of cord around the machined diameter of the bearing cage and attach a spring balance to the free end.

(f) Pull the spring balance and note the effort required to maintain an even rotation of the bearing cage. The effort required should be 3.63 to 5.44 kg (8 to 12 lb). To increase the effort install a thinner spacer. To decrease the effort install a thicker spacer.

(g) When the correct bearing pre-load has been obtained remove the nut, washer and spacer tube.

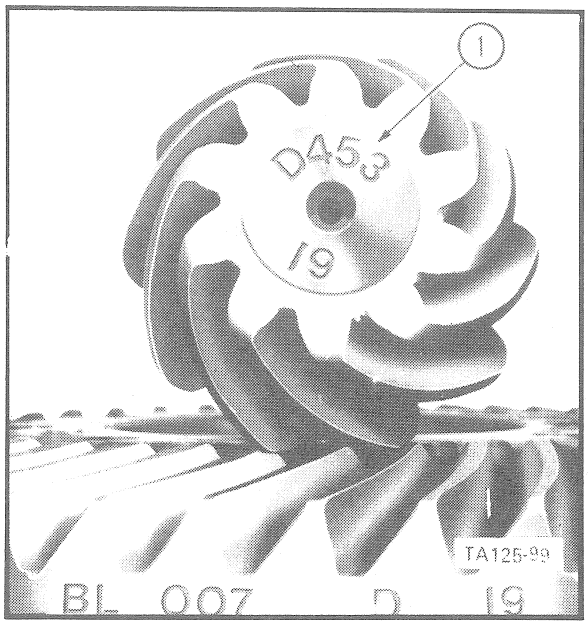


Fig. 57

2. BEVEL PINION CONE CENTRE DISTANCE

(a) Note the dimension (1-57) which is etched on the end of the pinion. This dimension will vary between bevel gear sets and is the distance

(A-58) required between the pinion face (1-58) and the machined outer diameter (2-58) of the bevel gear hub.

(b) Using a shim pack (3-53) of equal thickness to that removed, install the shims and pinion assembly. Install and tighten the bolts (1-53) to the correct torque.

(c) Measure the distance (A-58) using slip gauges or special tool IH 3452.

(d) If the dimension (A-58) is greater than the dimension (1-57) etched on the pinion reduce the thickness of the shim pack accordingly, conversely if the dimension is smaller increase the thickness of the shim pack. Ensure that the upper and lower shim packs are of equal thickness.

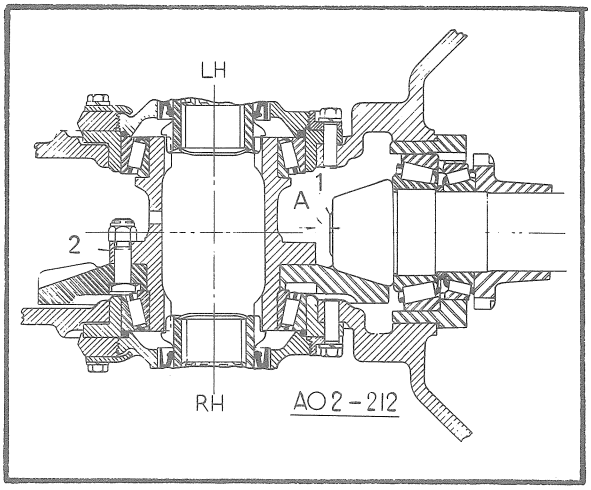


Fig. 58

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

BEVEL GEAR
GROUP 10

CONTENTS	PAGE NUMBERS					
	REMOVAL	DISMANTLING	INSPECTION & REPAIR	ASSEMBLY	INSTALLATION	ADJUSTMENTS
BEVEL GEAR	1	1	2	2	2	2

1. DESCRIPTION

The bevel gear is located in a separate compartment between the steering clutch compartments. The gear is bolted to a hub which is mounted on tapered roller bearings. Bearing pre-load and gear tooth backlash are obtained by means of threaded adjusters which contact the bearing cones. The gear and bearings are lubricated from the main transmission case.

The bevel gear and bevel pinion are a matched set and must both be changed if either is rejected. Servicing the bevel pinion is dealt with in GROUP 9.

2. BEVEL GEAR

2a. REMOVAL

(a) Remove the steering clutches referring to GROUP 11.

(b) Support the bevel gear then remove the bearing cage (1-1) on both sides by screwing bolts into the threaded holes (2, 3 & 4-1) provided.

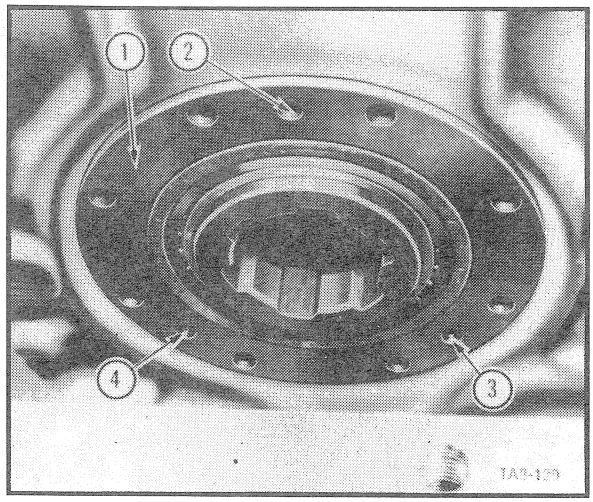


Fig. 1

(c) Remove the self locking nuts which secure the bevel gear to the hub.

(d) If the bevel pinion has not been removed, position blocks between the bevel gear and compartment wall to keep the bevel gear away from the pinion and block across the bull pinion drive shaft flange so that the load is not applied to the steering clutch support bearing then, using

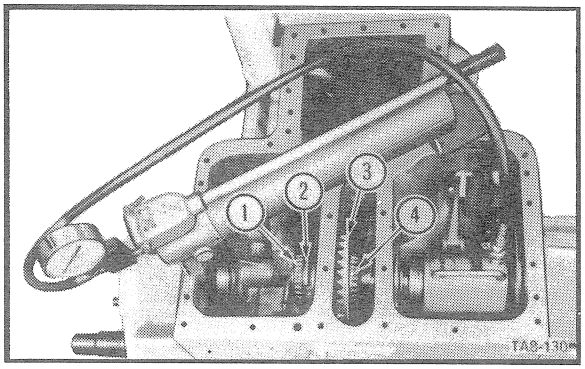


Fig. 2

suitable jacking equipment as shown in Fig. 2, press the hub (2-2) and left bearing cone (1-2) from the bevel gear (3-2) and right bearing cone (4-2). The hub is removed through the left clutch compartment, the bevel gear and right bearing cone from the centre compartment.

2b. DISMANTLING

(a) Press the left bearing cone (1-3) from the hub (2-3).

(b) Use a soft faced hammer to drive the dowel bolts (3-3) from the gear (4-3).

(c) Remove the adjuster assemblies from the steering clutches then remove the clutch coupling, remove the adjuster lock and screw the adjuster (1-4) from the adjuster ring.

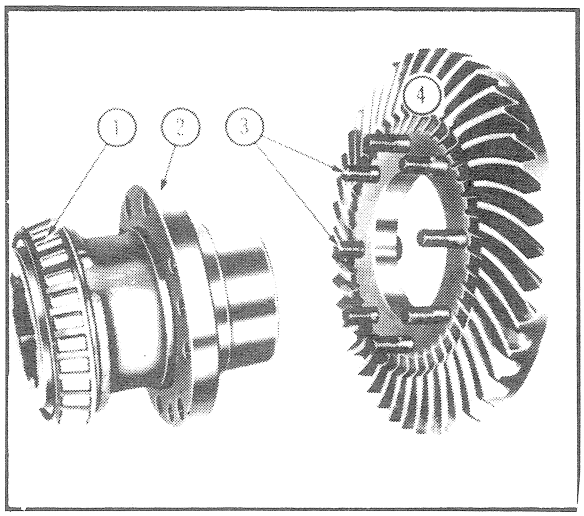


Fig. 3

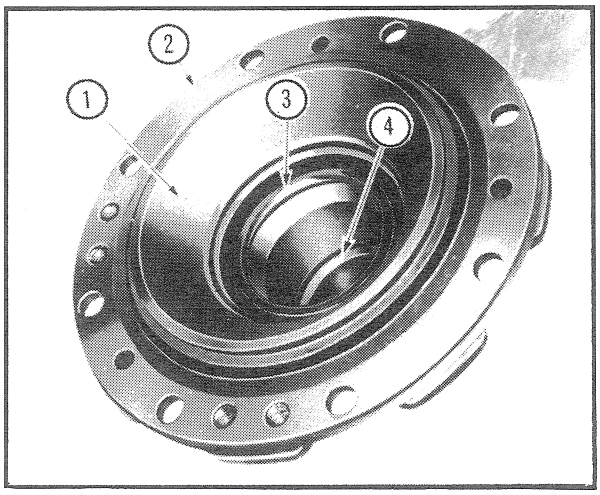


Fig. 4

(d) Remove the thrust ring (4-4) and oil seal (3-4) from the adjuster.

(e) Remove and discard 'O' rings and gaskets.

(f) Remove the bearing cups from the bearing cages. These cups are only a hand press fit in the cages.

2c. INSPECTION AND REPAIR

(a) Inspect the bevel gear for cracks, chipping, worn or broken teeth. If any of these conditions exist, change the bevel gear and pinion as a matched set.

(b) Check the hub splines for burrs and wear.

(c) Check the hub mounting faces for burrs. If a new hub is to be fitted, the bolt holes must be reamed to suit the bevel gear noting that one hole is offset.

(d) Remove burrs with a fine carborundum stone.

2d. ASSEMBLY

(a) Press the left bearing cone (1-3) up to the small flange on the hub (2-3).

(b) Install the bearing cups into the bearing cages. These bearings are a hand press fit in the bearing cages.

(c) Install new oil seals (3-4) into the adjusters with the seal lips facing the bevel gear.

2e. INSTALLATION

(a) Carry out the necessary adjustments detailed in para. 2f.

(b) Install the thrust rings and clutch couplings in the adjuster assemblies and install new 'O' rings. Install the adjuster assemblies on the clutches.

(c) Install the steering clutches referring to GROUP 11.

2f. ADJUSTMENTS

1. BEVEL GEAR BEARING PRE-LOAD

(a) Lower the bevel gear into the centre compartment then engage the hub in the bevel gear from the left compartment. Align the bolt holes, noting that one hole is offset, then install the dowel bolts and nuts tightening to 16 to 18 kgm (115 to 130 lbft). Block between the bevel gear and compartment wall and press the right bearing cone onto the hub.

(b) Assemble new gaskets to the bearing cages (1-1), support the bevel gear and install the bearing cages to the main frame noting that the mounting holes are offset.

(c) Screw the right adjuster (1-4) into the adjuster ring (2-4) until two full threads are showing on the clutch side of the ring.

(d) Assemble a new gasket to the adjuster ring but omit the 'O' ring at this stage then position the ring in the main frame with the adjuster lock locations (1 & 4-5) at the top. Install the dowty washers (3-5) and bolts (2-5).

(e) Similarly install the left adjuster ring assembly but as the bolts (2-5) are being tightened ensure that no pre-load is being applied to the bearings and, if the bevel pinion is in position, ensure that some backlash does exist. If pre-loading is becoming evident screw out the left adjuster or if backlash is being lost as well, screw out the right adjuster so that the bolts can be tightened.

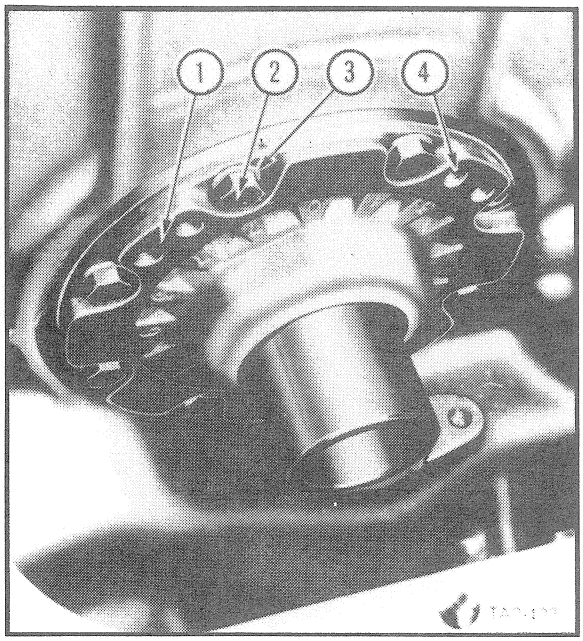


Fig. 5

(f) Wrap a length of cord around the machined OD of the hub flange and attach a spring balance to the free end as shown in Fig. 6.

(g) Pull the spring balance and note the effort required to maintain steady rotation of the bevel gear once it has started from rest.

(h) Screw in the left adjuster and again check the pull required until the effort is 1.8 to 2.7 kg (4 to 6 lb) above that in op (g).

(i) Mark the adjusters and adjuster rings so that the exact amount of movement can be seen when setting the backlash.

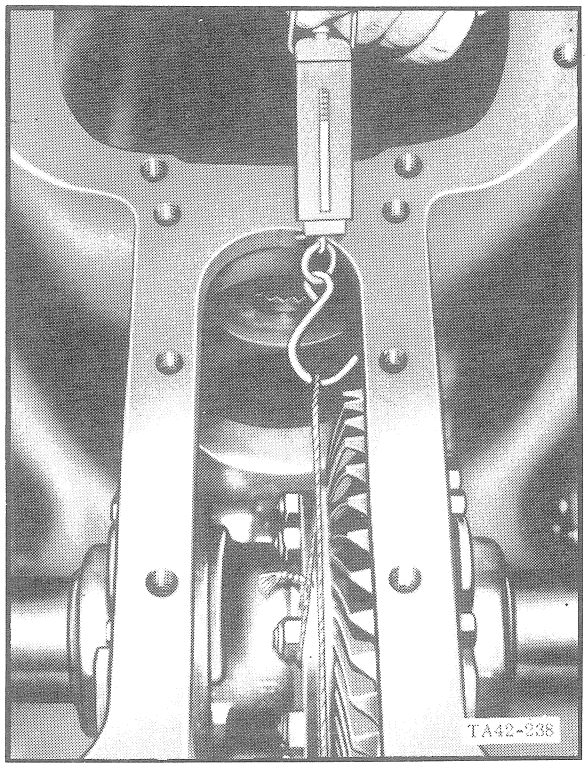


Fig. 6

2. GEAR AND PINION BACKLASH

NOTE: This adjustment can only be made after bevel gear bearing pre-load and pinion cone centre distance have been correctly established.

(a) Note the backlash figure which is etched on the outer surface of the bevel gear.

(b) Mount a dial indicator so that the stylus is resting on and at 90° to a bevel gear tooth flank.

(c) Rock the bevel gear back and forth so that it contacts the bevel pinion on both flanks of a tooth, then check the total indicator reading. Repeat the check at 1/4 revolutions of the bevel gear and use the average of the four readings.

(d) To INCREASE the backlash, screw OUT the RIGHT adjuster and screw IN the LEFT adjuster by exactly the same amounts. Conversely to REDUCE backlash screw OUT the LEFT adjuster and screw IN the RIGHT adjuster by exactly the same amounts.

(e) When the backlash is correct install the adjuster locks (1-7) so that the tab (2-7) enters one of the recesses (3-7), slight movement of the adjuster is permissible to achieve this. A new lock offers four possible positions to line up the tab with a recess before the tab is bent to enter the recess.

(f) Remove the adjuster assemblies from the main frame.

(g) Measure the EXACT amount of protrusion of the adjusters from the adjuster rings. Screw out the adjusters and apply Loctite 572 Pipe Seal to the threads. Screw the adjusters back into their respective adjuster rings to the measured position and lock with the adjuster locks.

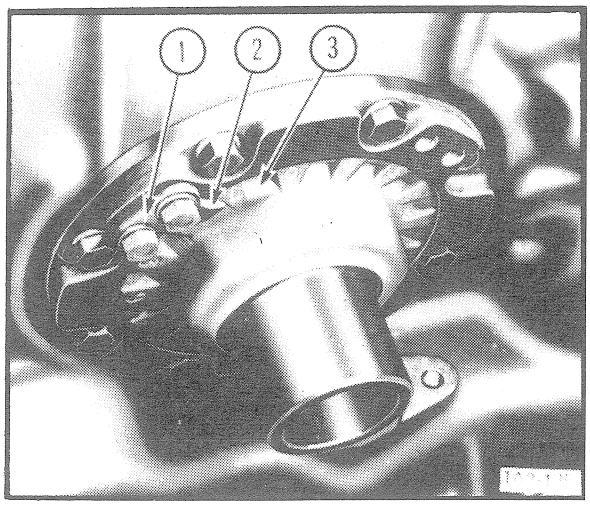


Fig. 7

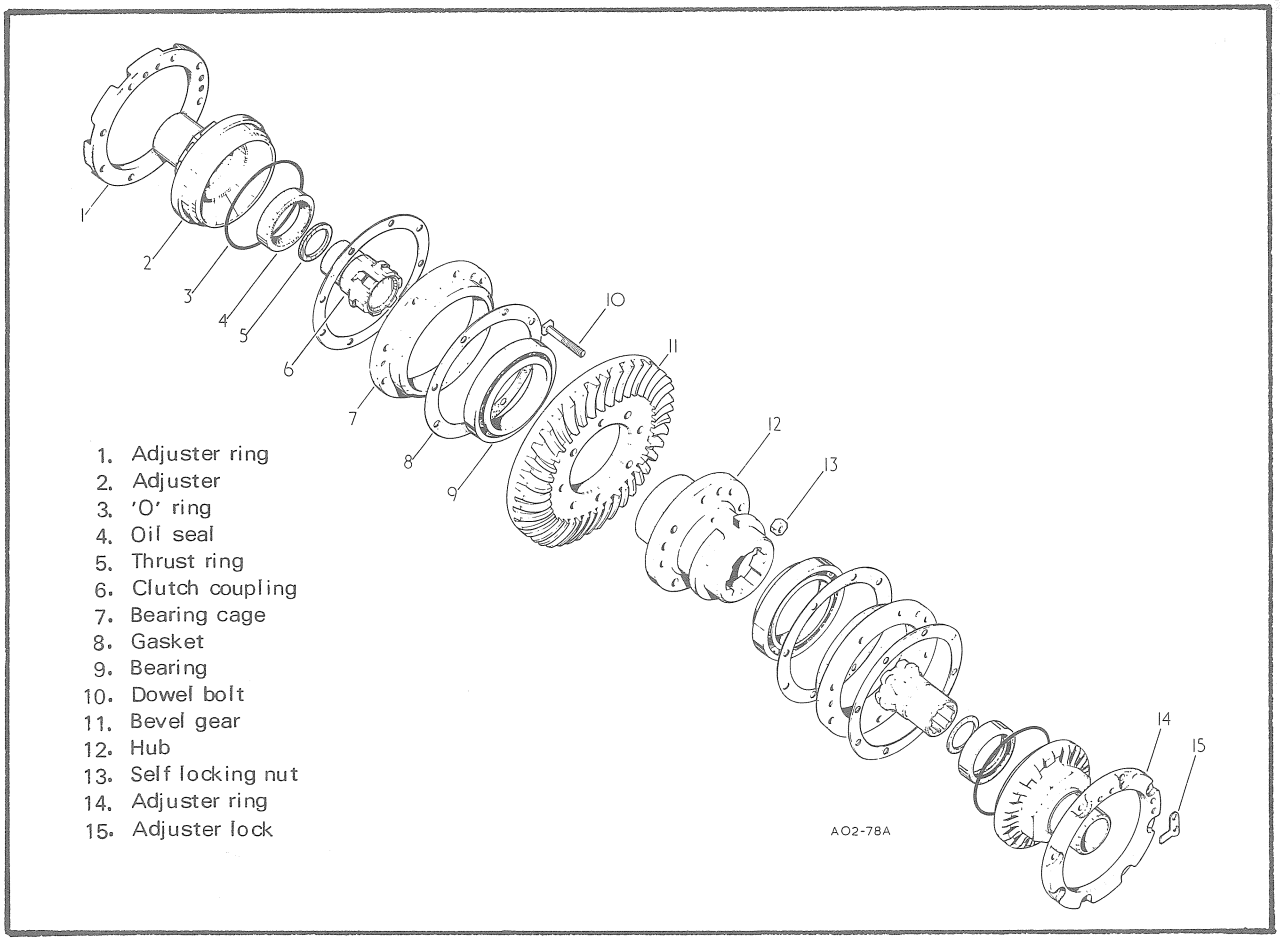


Fig. 8

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

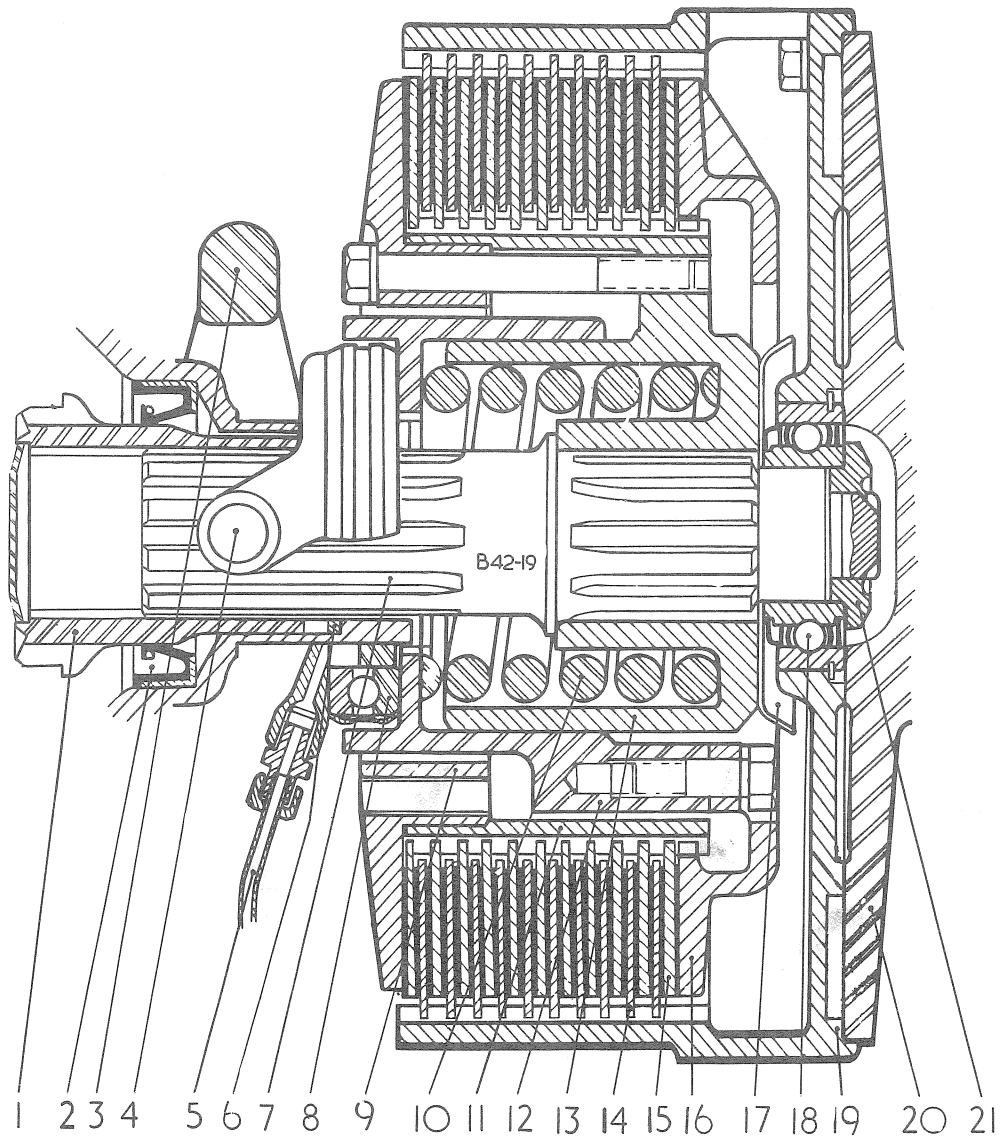
STEERING CLUTCHES & BRAKES GROUP 11

1. DESCRIPTION

1a. GENERAL

The steering clutches are dry, multiple disc, spring loaded units located in individual compartments between the bevel gear and final drives. Lip type seals in the bevel gear adjusters ensure that the compartments remain dry. Braking is by bands which contract onto the clutch drums. Fig. 1 shows a cross section of the steering clutch.

The steering clutches and brakes are hydraulically operated, in sequence, from the one control valve. The steering and brake circuit in relation to the transmission circuit is shown in GROUP 9.



1. Coupling
2. Seal
3. Release fork
4. Release bearing pivot
5. Lubrication pipe
6. Thrust ring
7. Clutch shaft
8. Release bearing
9. Hub plate
10. Pressure spring
11. Hub splines
12. Spring retainer
13. Hub
14. Driving disc
15. Driven disc
16. Pressure plate
17. Oil slinger
18. Pilot bearing
19. Clutch drum
20. Bull pinion drive shaft
21. Staked nut

Fig. 1

1b. STEERING/BRAKE VALVE
(Refer to Fig. 2A.)

The valve contains two spools, one to control the left steering clutch and brake, and the other to control the right steering clutch and brake.

Ports (A, B & C) over each spool connect to the face side of the clutch cylinder piston and to both sides of the brake cylinder piston for that side of the machine. A supply port (D) and return port (E) are provided which are common to both spools.

The spools have hollow centres and cross drillings to provide a passage for the return oil from the rod side of the brake cylinder when in the maximum brake position.

DRIVE POSITION
(Refer to Fig. 2B.)

When the spool is in this position supply fluid is directed to the rod side of the brake cylinder piston to ensure that the brake is held off, while fluid from the face sides of the clutch and brake cylinder pistons is directed to the return port.

CLUTCH POSITION
(Refer to Fig. 2C.)

When the spool is moved to this position supply fluid is still directed to the rod side of the brake cylinder piston and is now also directed to the face side of the clutch cylinder piston to disengage the clutch. Fluid from the face side of the brake cylinder piston is still directed to the return port.

CLUTCH AND NOMINAL BRAKE POSITION
(Refer to Fig. 2D.)

When the spool is further moved to this position full supply fluid is directed to the face side of the clutch cylinder piston and to the rod side of the brake cylinder piston as before but now supply fluid is also directed to the face side of the brake cylinder piston. Due to the difference in areas between the two sides of the brake cylinder piston, the piston moves to apply the brake. Because of the restriction created by the chamfer on the spool, the pressure build up on the face side of the brake cylinder piston will be slightly delayed.

CLUTCH AND MAXIMUM BRAKE POSITION
(Refer to Fig. 2E.)

When the spool is fully depressed to this position supply fluid is directed to the face sides of the clutch and brake cylinder pistons so that the clutch is disengaged and the brake is hard on. At the same time fluid from the rod side of the brake cylinder piston is directed to the return port via the spool centre and cross drillings.

1c. DECELERATOR BRAKE PEDAL

Both brakes are operated simultaneously by mechanical linkage when the decelerator pedal is depressed. A cable operated pawl locks the decelerator/brake pedal in the down positions for parking purposes.

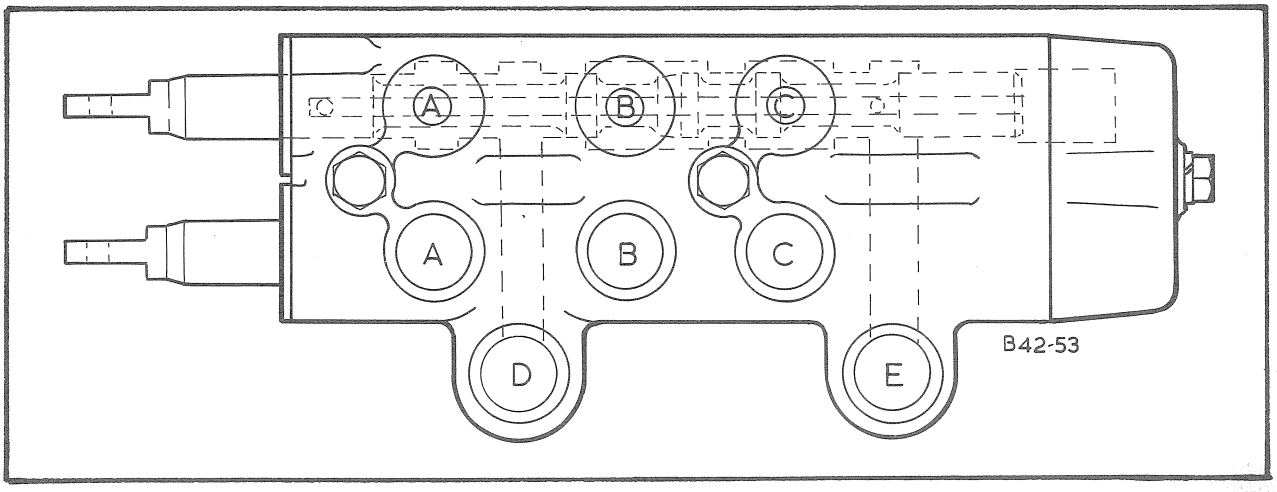


Fig. 2A

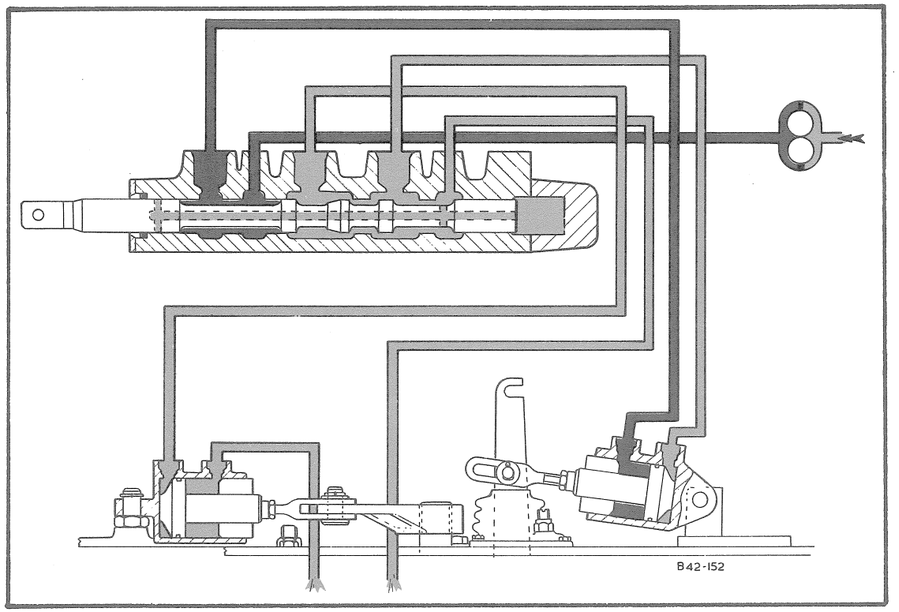


Fig. 2B

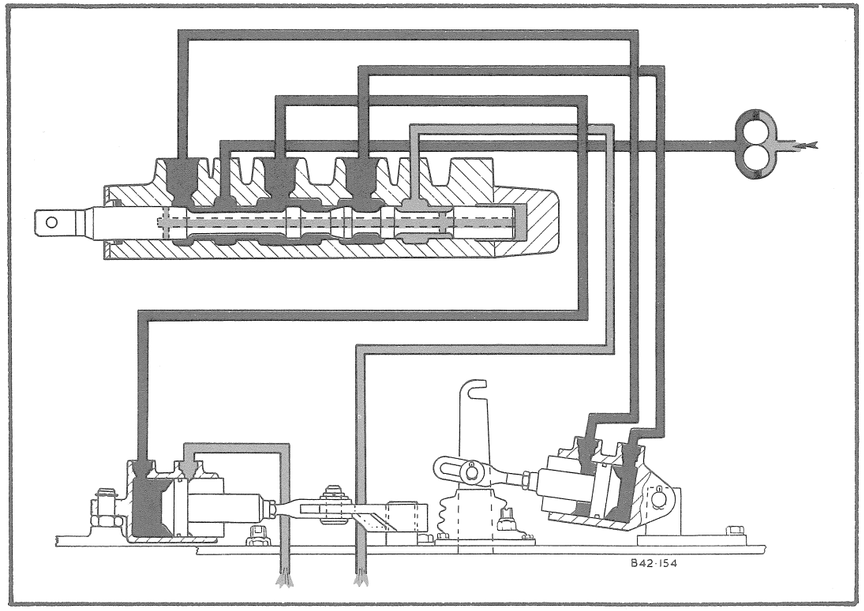


Fig. 2D

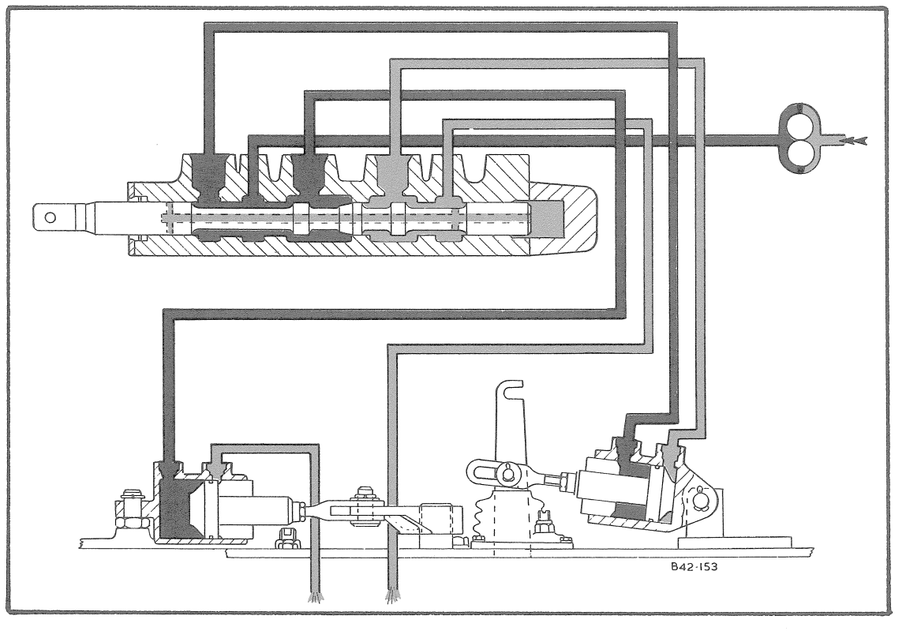


Fig. 2C

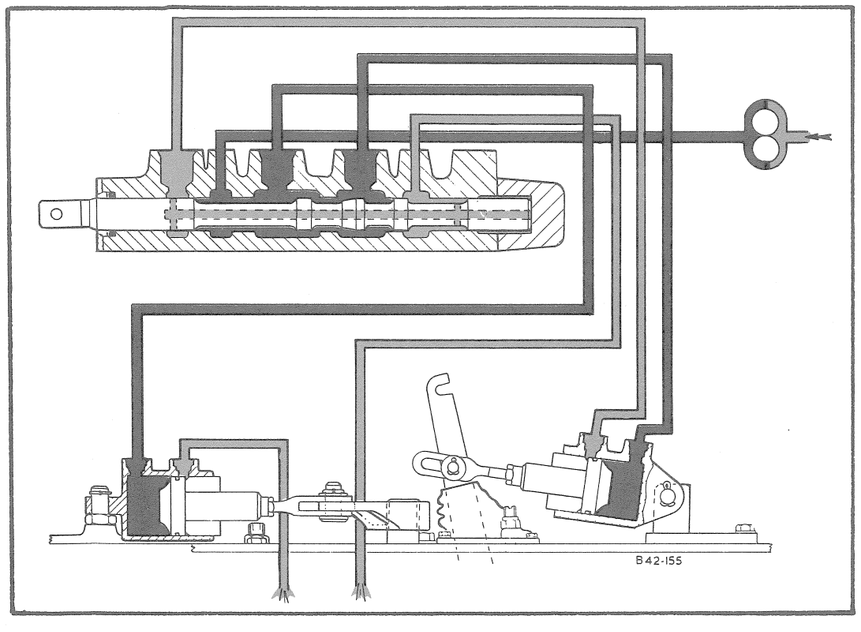


Fig. 2E

Supply fluid

Return to reservoir

2. STEERING CYLINDERS

2a. REMOVAL

(a) Remove the cab base referring to GROUP 2.

(b) Disconnect the hoses (3-3).

(c) Remove the nut (1-3) to release the spring (5-3).

(d) Remove the split pin (2-3).

(e) Remove the split pin and washer from the underside of the pin (4-3) and withdraw the pin.

(f) Swing the cylinder clear of the release lever and lift from the rear pivot.

(g) To remove the release lever (1-4) check that the alignment marks are clearly visible, or scribe new ones if not, then remove the pinch bolt (6-3), nut and lockwasher.

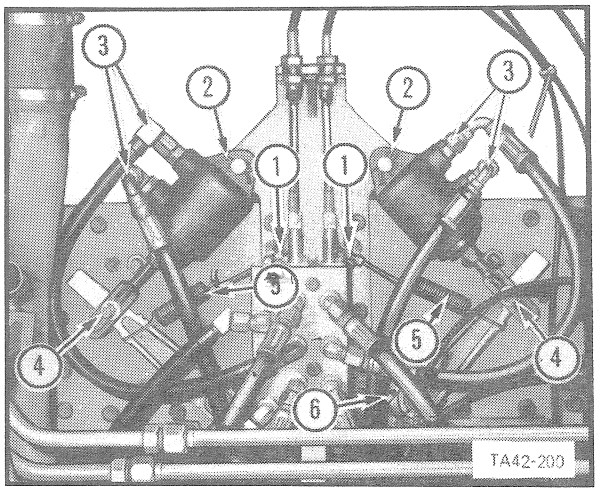


Fig. 3

(h) Lift the release lever from the splined shaft.

(i) If inspection proves it necessary press the bush (2-4) from the lever.

2b. DISMANTLING

(a) Grip the cylinder in a vice so that the slot is in an accessible position.

(b) Turn the bearing (5-5) until the end of the retainer wire (9-5) appears in the slot. A hole is provided in the bearing to facilitate this.

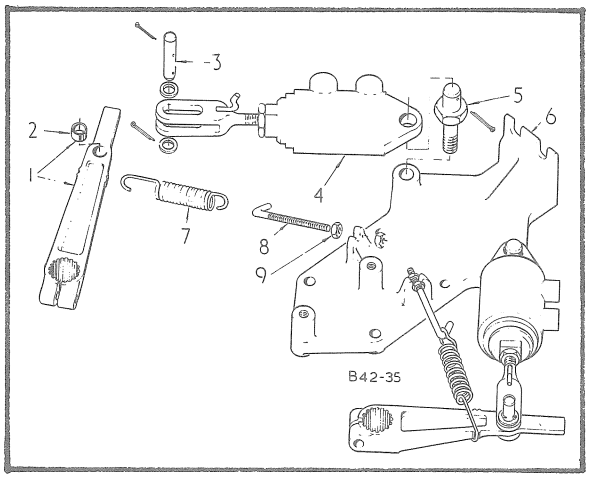


Fig. 4

(c) Insert a thin screwdriver under the end of the retainer wire then turn the bearing to wind out the wire.

(d) Withdraw the piston rod assembly from the cylinder.

(e) Slacken the locknut (2-5) and screw the adjuster fork (1-5) from the piston rod (7-5).

(f) Pull the piston rod from the bearing (5-5).

(g) Remove and discard the scraper ring (3-5) and 'O' ring (4-5) from the bearing.

(h) Remove and discard the 'O' ring (6-5).

(i) Remove and discard the compression ring (8-5) from the piston.

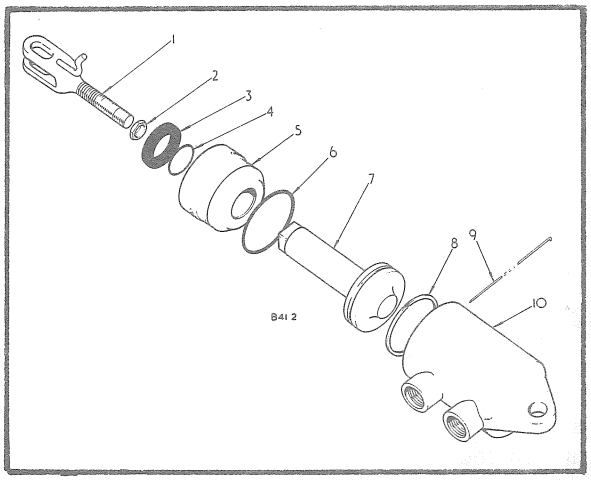


Fig. 5

2c. INSPECTION AND REPAIR

(a) Inspect the piston and rod for wear and damage.

(b) Inspect the cylinder bore for wear and damage.

(c) Inspect the port threads for damage.

(d) Inspect welds for cracks.

2d. ASSEMBLY

(a) Fit a new 'O' ring (4-5) to the bearing bore.

(b) Fit a new scraper ring (3-5). The seal lips must face outward and the larger diameter of the seal must be correctly located under the rim of the bore.

(c) Fit a new 'O' ring (6-5) to the bearing OD.

(d) Lubricate the piston rod and insert this into the bearing bore.

(e) Fit a new compression ring (8-5) to the piston.

(f) Lubricate the piston compression ring and the OD of the bearing then insert these into the cylinder ensuring that the small hole in the retainer wire groove is in line with the slot in the cylinder.

(g) Grip the cylinder in a vice then insert the hooked end of the wire into the hole in the groove. Rotate the bearing to wind in the wire.

(h) Screw the locknut (2-5) onto the adjuster fork then screw the adjuster fork into the piston rod until the distance from the centre of the rear pivot hole to the centre of the inner end of the slot measures 230 mm (9.05 in). Tighten the locknut.

2e. INSTALLATION

(a) If this was removed, press a new bush (2-4) into the lever.

(b) Position the release lever on the splined shaft aligning the marks made during removal.

(c) Install and tighten the pinch bolt (6-3).

(d) Locate the cylinder on the rear pivot and install the split pin (2-3).

(e) Swing the cylinder onto the release lever then install the pin (4-3) complete with a washer either side of the clevis and install the split pin .

(f) Adjust free play as detailed in para. 2f.

(g) Locate the spring on the lever arm and on the anchor rod (8-4), then locate the anchor rod in the bracket and run on the nut (1-3) until the slack has been taken up. Tighten the nut until the spring has extended 11 mm (0.44 in) then tighten the locknut.

(h) Connect the hoses (3-3).

(i) Install the cab base referring to GROUP 2 but omit the deck plates.

(j) Start the engine and operate the steering/ brake levers several times to purge air from the system and check for leaks.

(k) Install the deck plates.

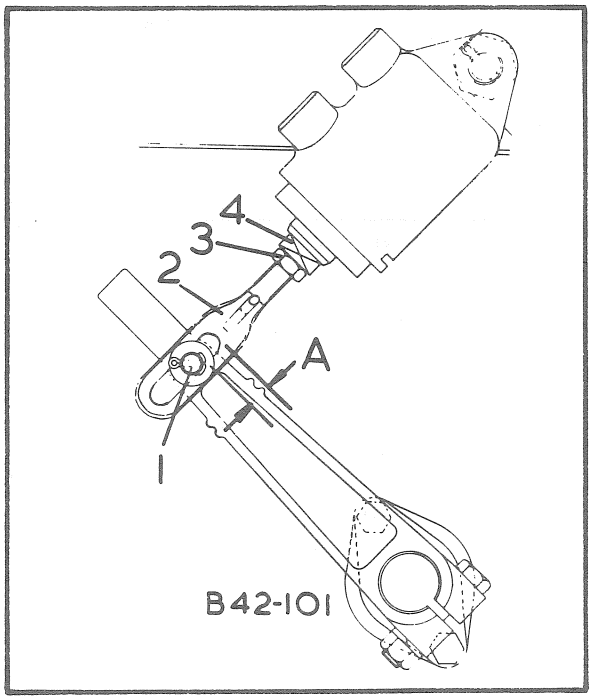


Fig. 6

2f. ADJUSTMENTS

(a) Free play is the distance (A-6) that the connecting pin (1-6) can move in the slot in the adjusting fork (2-6).

(b) Ensure that the cylinder is fully retracted.

(c) Push the lever away from the cylinder.

(d) Slacken the locknut (3-6) then turn the piston rod (4-6) until the dimension (A-6) from the inner end of the slot to the side of the connecting pin is 13 mm (0.5 in). Tighten the locknut.

(e) If free play cannot be obtained in the above manner lift the cylinder and lever assembly and adjust the fork length so that the lever can be installed one spline forward of the scribed line then repeat operation (b) to (d).

3. BRAKE CYLINDERS

3a. REMOVAL

(a) Remove the cab base referring to GROUP 2.

(b) Disconnect the hoses (2-7).

(c) Disconnect the spring (5-7).

(d) Remove the split pin (3-7) and washer then withdraw the pin (4-7).

(e) Remove the split pin (1-7) and lift the cylinder clear of the machine.

3b. DISMANTLING

Refer to para. 2b.

3c. INSPECTION AND REPAIR

Refer to para. 2c.

3d. ASSEMBLY

Refer to para. 2d.

3e. INSTALLATION

(a) Position the cylinder on the pivot pin, ensuring that the clevis fork is around the brake lever, then install the split pin (1-7).

(b) Install the pin (4-7) and secure with the washer and split pin (3-7).

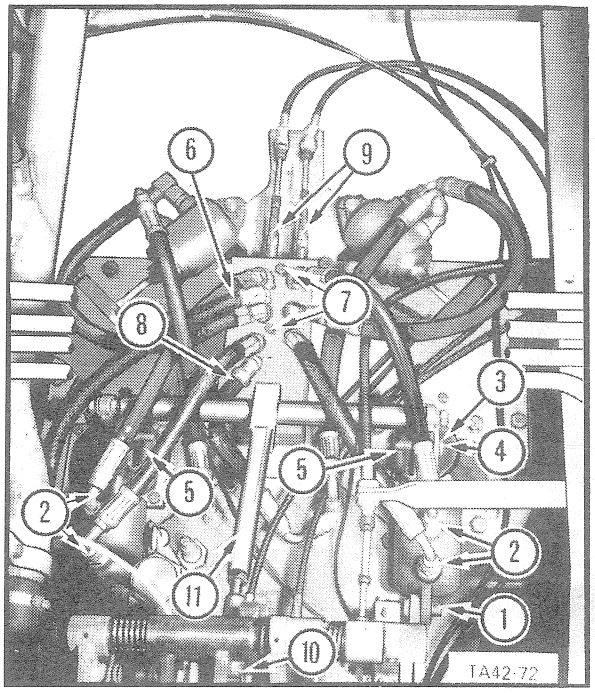


Fig. 7

(c) Check the brakes and adjust as necessary referring to para. 4e.

(d) Install the spring (5-7).

(e) Connect the hoses (2-7).

(f) Install the cab base referring to GROUP 2 but omitting the deck plates.

(g) Start the engine and operate the steering/brake levers several times to purge air from the system and check for leaks.

(h) Install the deck plates.

4. BRAKES

4a. REMOVAL

(a) Remove the steering and brake cylinders referring to para. 2 and 3. Remove the steering/brake valve referring to para. 8.

(b) Remove the split pin and clevis pin (10-7) and lift out the brake rod (11-7).

(c) Slacken the nuts (3-8) at both ball ends and withdraw the brake cross rod (1-8). Take care not to lose the springs in the ends of the cross rod.

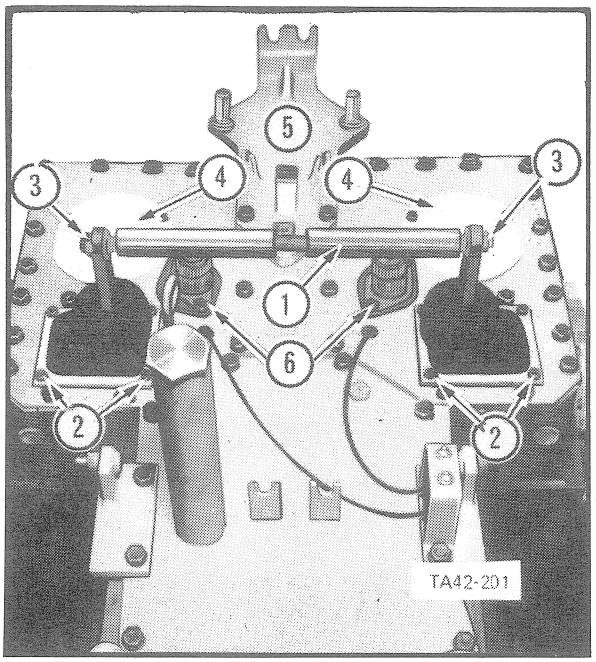


Fig. 8

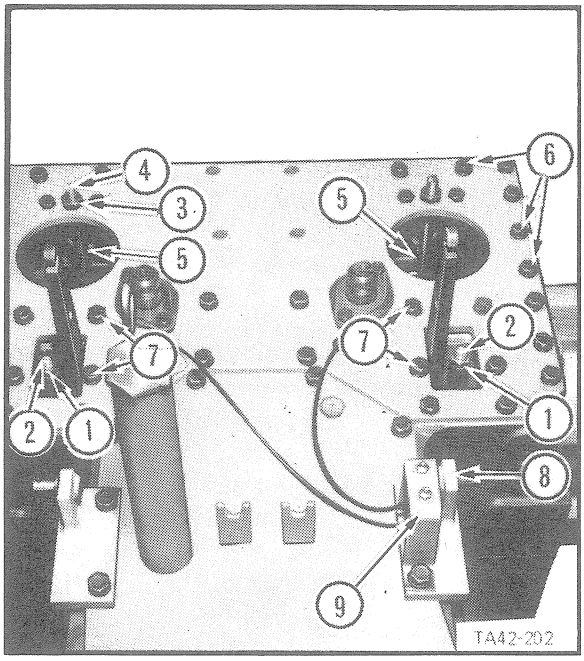


Fig. 9

(d) Remove the steering cylinder support bracket (5-8).

(e) Remove the bolts (2-8) and lift off the rubber boots and retainers.

(f) Remove the clutch release shaft upper bearings (6-8).

(g) Remove the panels (4-8).

(h) Slacken the locknuts (3-9) and screw out the brake band set screws (4-9).

(i) Slacken the locknuts (1-9) until the springs (5-9) are free to be removed.

(j) Remove the brake lever support bolts (7-9).

(k) Remove the left brake cylinder bracket (8-9) to free the lubricator bracket (9-9).

(l) Remove the top cover bolts (6-9) and lift off the top cover as far as the lubricator tubes will allow. To completely remove the top cover, disconnect the lubricator tubes at the clutch release bearings.

(m) Slacken the locknuts (8-10), screw the adjuster screws (9-10) from the collars (10-10) then thread the brake band and lever assemblies out of the main frame.

4b. DISMANTLING

(a) Remove the split pins and push out the joint pins (1-10) to separate the band sections.

(b) Remove the locknut (3-10), spacer tube (4-10), adjuster screw (9-10) with nut (8-10), spring (7-10) and spacer (6-10) from the adjuster pin (5-10).

(c) Remove the screw (11-10) and spring washer then push out the pivot shaft (2-10) to free the lever and front band section from the support bracket.

(d) Push out the pivot joint pin (12-10) to free the front band section from the lever.

(e) Push the adjuster pin (5-10) out of the lever.

(f) Drill out the rivets to separate the brake linings from the band sections.

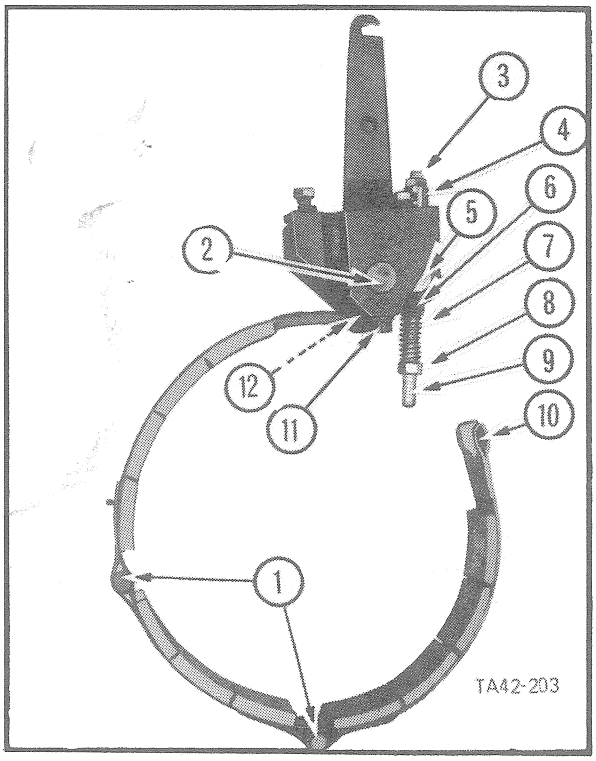


Fig. 10

4c. ASSEMBLY

(a) Position the brake linings on the bands locating with the rivets ensuring that the linings and rivet heads are correctly seated before setting the outer ends of the rivets.

(b) Locate the front band section in the lever and push in the pivot pin (12-10).

(c) Push the adjuster pin (5-10) into the lever then position the lever in the support bracket and locate with the pivot shaft (2-10). Secure the pivot shaft with the screw (11-10) and spring washer.

(d) Join the sections of the band together with the joint pins (1-10) and split pins ensuring that the head of the pin will be to the outside when the bands are installed on the clutch drum.

(e) Screw the nut (8-10) onto the adjuster screw. Thread the spring (7-10) and spacer (6-10) onto the screw then insert the screw through the adjuster pin (5-10). Thread on the spacer tube (4-10) and nut (3-10) finger tight.

4d. INSTALLATION

(a) Thread the brake band and lever assemblies into the mainframe and screw the adjusting screws into the collars (10-10). Tighten the locknuts (8-10).

(b) Position the top cover so that the lubricator tubes can be connected, if these were disconnected, then locate the top cover and secure with the bolts (6-9).

(c) Secure the brake lever supports to the top cover with the bolts (7-9).

(d) Connect the springs (5-9).

(e) Install the panels (4-8).

(f) Install the clutch release shaft upper bearings (6-8).

(g) Install the rubber boots, retainers and bolts (2-8).

(h) Install the steering cylinder support bracket (5-8).

(i) Install the lubricator bracket (11-8), and left brake cylinder bracket (10-8).

(j) Install the steering/brake valve referring to para. 8. Install the steering and brake cylinders referring to para. 2 and 3.

(k) Adjust the brakes referring to para. 4e.

(l) Position the springs and ball ends at each end of the cross rod (1-8) then position the ball ends in the slots of the brake levers ensuring that there is a plain washer either side of each lever. Tighten the nuts (3-8).

(m) Locate the brake rod on the cross rod then secure to the brake/decelerator pedal with the pin (10-7) and split pin. There must be 3.00 mm (0.125 in) clearance between the brake rod and cross rod when in the normal operating position. If necessary adjust the length of the brake rod (11-7) to suit.

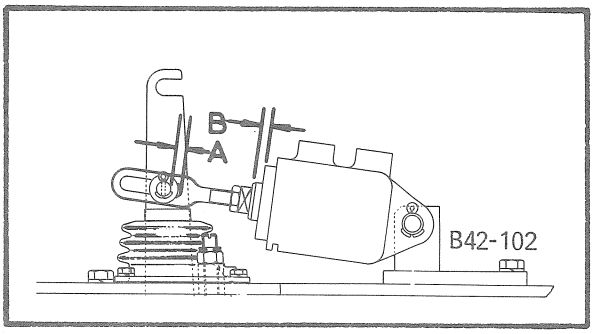


Fig. 11

4e. ADJUSTMENTS

(a) Ensure that the brake cylinder is fully retracted and that the clevis is fully screwed into the piston rod.

(b) Tighten the locknut (1-9) until the distance (A-11) between the side of the pin and the end of the slot is 6 to 8 mm (0.25 to 0.31 in).

(c) Push the brake lever away from the cylinder to hold the brake in the ON position and screw in the set screw (4-9) until it contacts the brake band then back off one half turn. Tighten the locknut (3-9).

(d) With maximum hydraulic power operate the brake cylinder and measure the extension (B-11) of the piston rod. This must be 12 to 15 mm (0.5 to 0.62 in). If necessary further adjust the locknut (1-9) to achieve this.

5. DECELERATOR/BRAKE LINKAGE

Refer to GROUP 6.

6. STEERING CLUTCHES
6a. REMOVAL

(a) Remove the brakes referring to para. 4a.

(b) On the underside of the mainframe, remove the bolt (1-12) lockplates (2 & 3-12) and nut (4-12). Screw out the clutch release shaft lower pivot (5-12) then remove the release shaft (6-12) and bushings (7-12) from the release bearing.

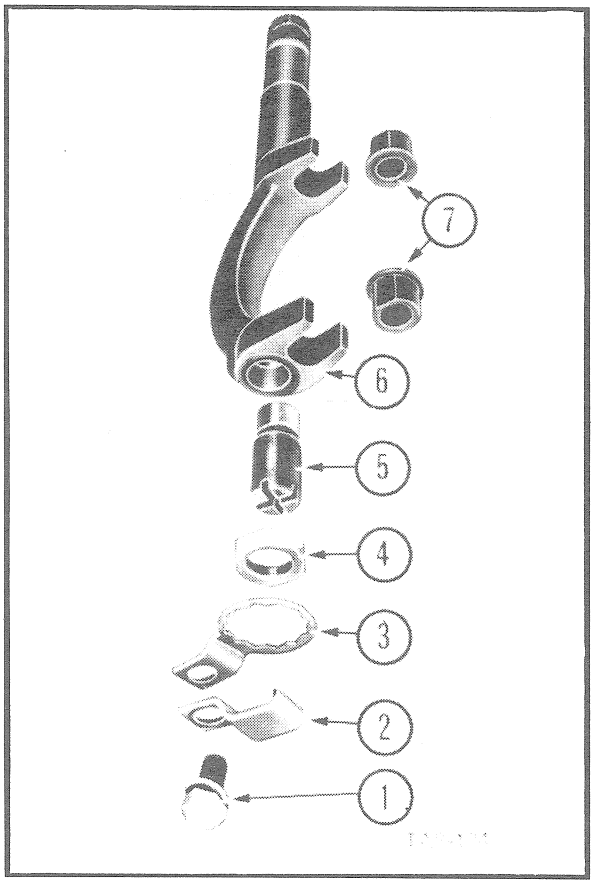


Fig. 12

(c) Install and tighten three compression bolts (2-13), part number 704 221R1 into the clutch, then remove the bolts and Dowty washers which secure the bevel gear adjuster ring (3-13). DO NOT remove the bolts (5-13) which lock the adjuster to the ring.

(d) Lever the adjuster ring (3-13) toward the clutch to expose the clutch coupling (4-13) then lever the coupling into the clutch.

(e) Remove the bolts (1-13), Unless the track is clear of the ground, or disconnected, turning the drum (6-13) for access to these bolts will move the loader.

(f) Securely sling the clutch assembly and lift it clear of the machine.

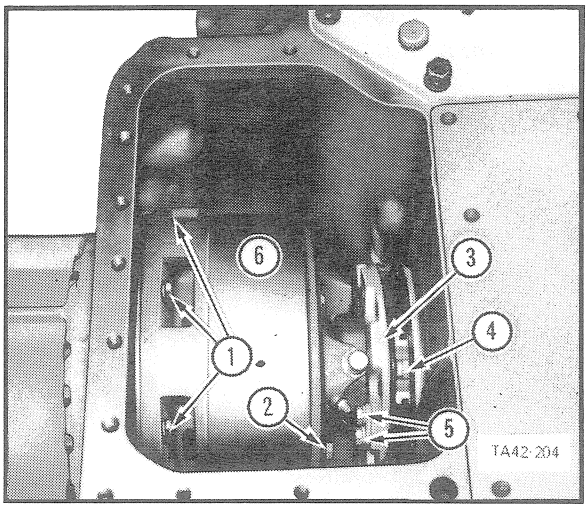


Fig. 13

6b. DISMANTLING

(a) Remove the coupling (1-14), adjuster ring assembly (2-14) and release bearing (3-14). Remove the thrust ring, 'O' ring, gasket and oil seal from the adjuster assembly.

(b) Knock out the indentations (2-15) then remove the nut (1-15). Lift off the clutch drum (3-15) and oil slinger beneath. Press the pilot bearing from the drum. Withdraw the clutch shaft from the other end of the assembly.

(c) Remove the compression bolts (4-14) from the hub plate and screw them into the tapped holes in the pressure plate as shown in Fig. 16.

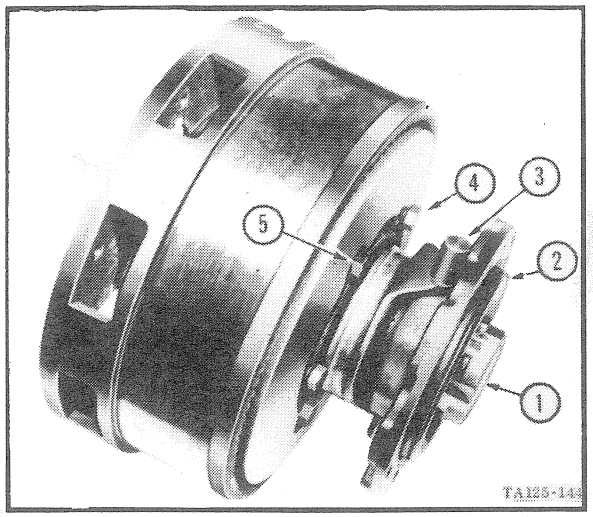


Fig. 14

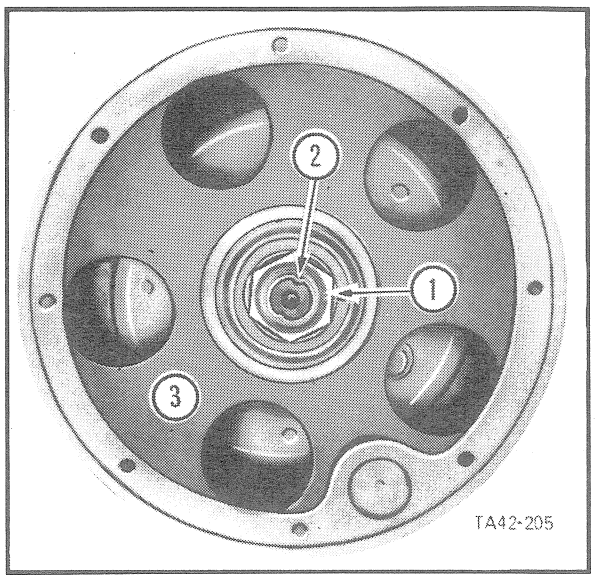


Fig. 15

CAUTION: DO NOT ATTEMPT TO REMOVE THE HUB PLATE UNLESS THE COMPRESSION BOLTS (1-16) ARE INSTALLED INTO THE PRESSURE PLATE.

(d) Remove the bolts (5-14) then lift off the hub plate and clutch discs.

(e) Position the hub and pressure plate on a press and apply a load to the hub as shown in

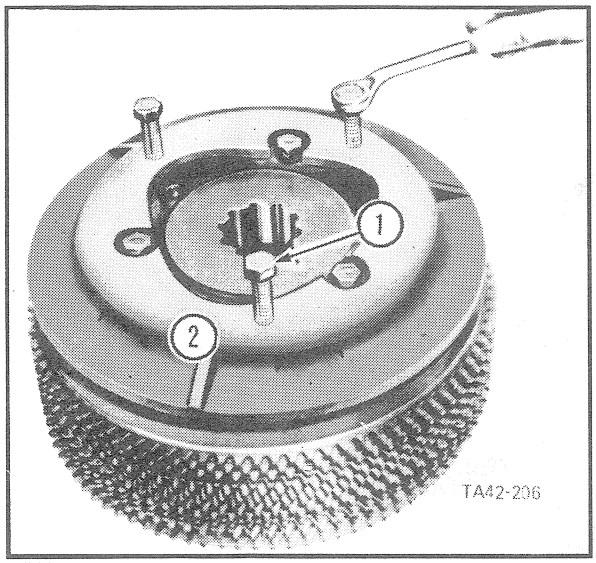


Fig. 16

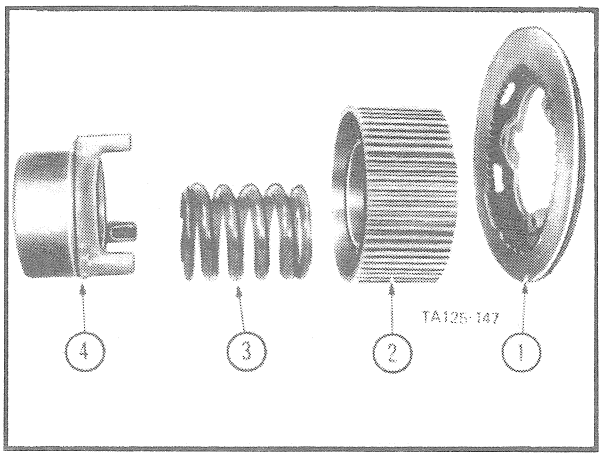


Fig. 17

Fig. 18. Remove the compression bolts (1-16) and dowel bolts (2-16).

(f) Slowly release the press then lift off the pressure plate (1-17) and hub (2-17). Remove the spring (3-17) from the retainer (4-17).

6c. INSPECTION AND REPAIR

(a) Inspect the brake contact area of the clutch drum for scoring and cracks. If necessary skim the drum but do not reduce the drum diameter to less than 305.56 mm (12.030 in). If this diameter is reached before the surface has cleaned up, the drum must be rejected.

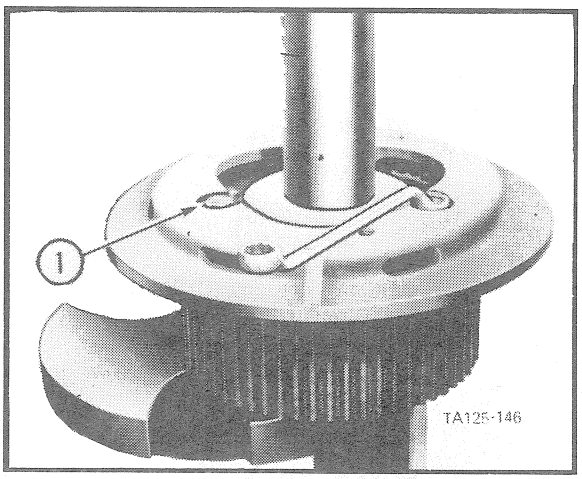


Fig. 18

(b) Inspect splines for wear. Clean off small burrs with a fine carborundum stone.

(c) Inspect the pilot and release bearings for wear.

(d) Inspect the clutch driving discs for distortion. If a 0.38 mm (0.015 in) feeler gauge can be inserted between the disc and a surface plate, the disc must be rejected.

(e) Change all friction discs that have broken teeth or glazed surfaces.

(f) Check the spring to specifications.

(g) Check the thickness of the clutch coupling thrust washer.

6d. ASSEMBLY

(a) Position the spring (3-17) in the retainer (4-17) then position the hub (2-17) on the spring aligning the legs of the retainer with the slots in the hub.

(b) Position the pressure plate (1-17) on the hub splines selecting the best position to align the dowel bolt holes, apply a load to the hub centre to compress the spring then install the dowel bolts (1-18) and their lockwashers. Release the load.

(c) Insert the shaft in the hub and position the oil slinger on the end of the shaft.

(d) Fit the pilot bearing in the clutch drum, install the drum on the shaft then screw on a new nut (2-15) and tighten to 34.6 to 41.4 kgm (250 to 300 lbft). Stake the nut into the indentations of the shaft.

(e) Install the clutch discs alternately starting with a friction disc.

(f) Position the hub plate on the hub then compress the clutch assembly and tighten the bolts (5-14). Use the press to check the operation of the clutch then compress the clutch and install the compression bolts (4-14).

(g) Press a new oil seal (3-19) into the adjuster assembly (6-19). The seal lips must face the bevel gear.

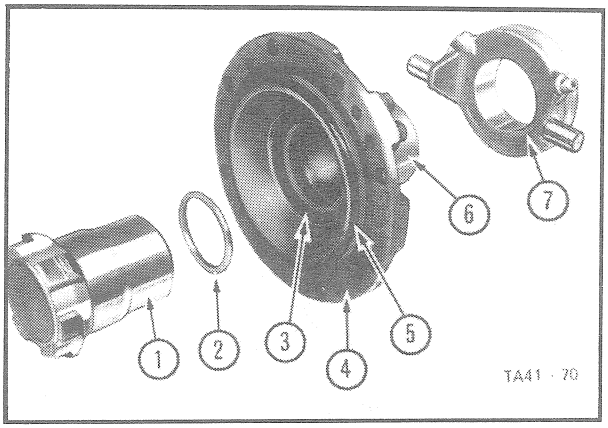


Fig. 19

(h) Install the thrust washer (2-19) with the chamfer toward the clutch then carefully insert the coupling (1-19) through the seal and up to the thrust washer.

(i) Locate the release bearing (7-19) on the bevel gear adjuster, fit a new gasket (4-19) and 'O' ring (5-19) then position the adjuster assembly on the clutch shaft turning the coupling as necessary to engage the splines. Push the coupling fully home.

6e. INSTALLATION

(a) Securely sling the clutch and lower it into the compartment.

(b) Install and tighten the bolts (1-13) turning the drum as necessary.

(c) Lever the coupling (4-13) into the mating splines in the bevel gear hub.

(d) Position the adjuster ring assembly (3-13) so that the bolts (5-13) are in approximately the 1 o'clock position. Install the Dowty washers and bolts using special spanner IH 7444 to tighten the bolts. Remove the compression bolts (2-13).

(e) Install the bushings (7-12) on the release bearing arms then locate the release shaft (6-12) on the bushings. Screw the lower pivot (5-12) into the mainframe to engage the end of the release shaft then adjust the lower pivot so that

1. Lockplate
2. Lockplate
3. Nut
4. Lower pivot
5. Bushing
6. Release fork
7. Bushing
8. Gasket
9. Release bearing
10. Washer
11. Retainer
12. Bushing
13. Collar
14. Shaft
15. Release bearing
16. Hub plate
17. Driven plate
18. Friction drive
19. Retainer
20. Spring
21. Hub
22. Pressure plate
23. Dowel bolt
24. Oil slinger
25. Clutch drum
26. Bearing
27. Nut
28. Clutch assembly

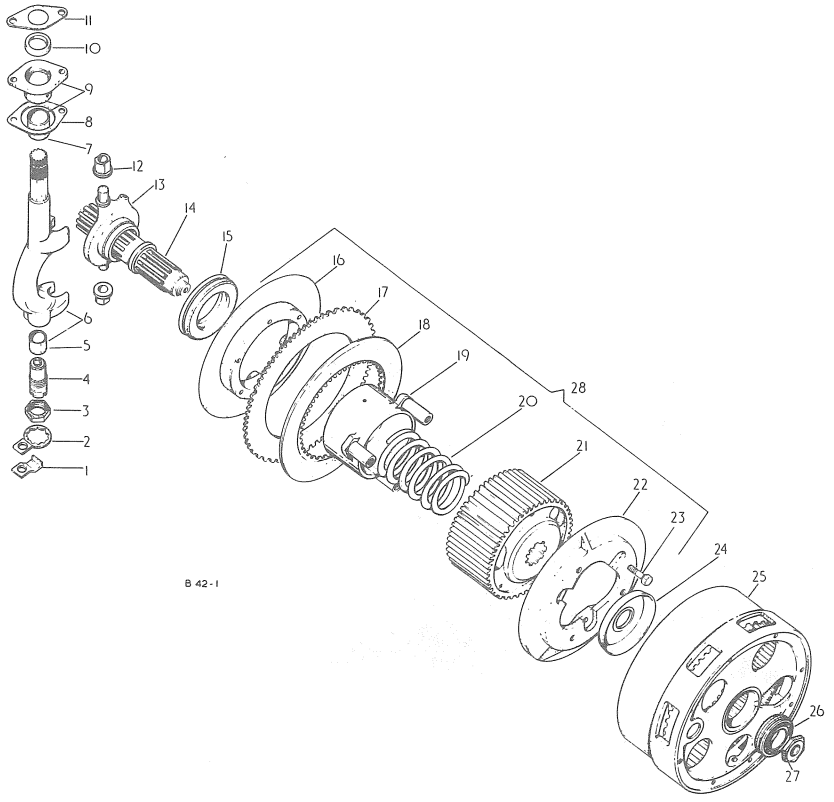


Fig. 20

the release shaft is equally disposed about the release bearing. Tighten the locknut (4-12) then install the lockplates (2 & 3-12) and secure with the bolt (1-12).

(f) Install the brakes referring to para. 4d.

7. BULL PINION DRIVE SHAFT

7a. REMOVAL

(a) Remove the bull pinion referring to GROUP 12.

(b) Remove the steering clutch referring to para. 6a.

(c) Turn the shaft as necessary to remove the four bolts (1-21).

(d) Withdraw the shaft assembly (2-21) from the clutch compartment.

7d. DISMANTLING

(a) Remove the circlips (1 & 2-22).

(b) Withdraw the bearing and cage assembly (3 & 4-22) from the shaft.

(c) Remove the circlip which secures the bearing in the cage and press the bearing from the cage.

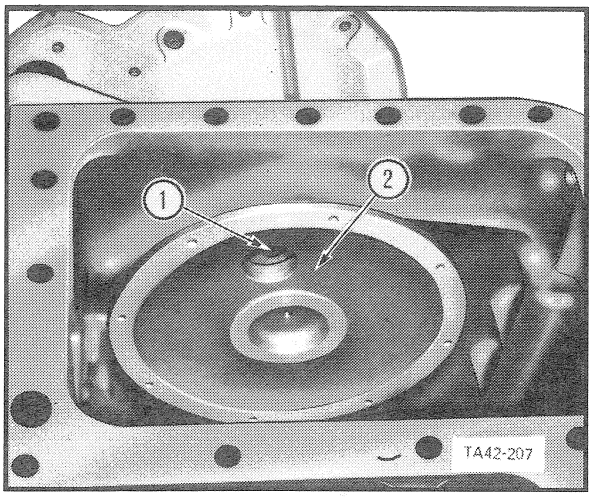


Fig. 21

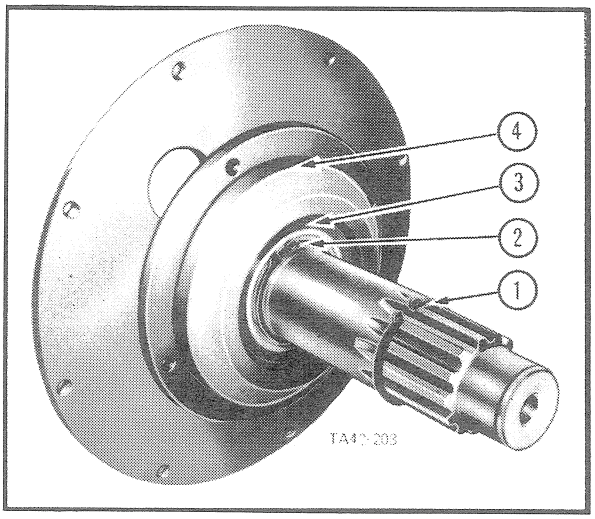


Fig. 22

7c. ASSEMBLY

(a) Apply a film of Loctite 270 to the OD of the bearing and press the bearing into the cage. Secure with the circlip.

(b) Install the bearing and cage assembly (3 & 4-22) on the shaft and secure with the circlip (2-22).

(c) Install the circlip (1-22).

7d. INSTALLATION

(a) Position a new gasket on the bearing cage, position the shaft assembly in the clutch compartment then secure with the bolts (1-21).

(b) Install the steering clutch referring to para. 6e.

(c) Install the bull pinion referring to GROUP 12.

8. STEERING/BRAKE VALVE

8a. REMOVAL

(a) Disconnect the control cables (9-7), supply hose (6-7) and return hose (8-7).

(b) Identify and disconnect each of the cylinder hoses at the valve.

(c) Remove the bolts (7-7) and lift the valve clear.

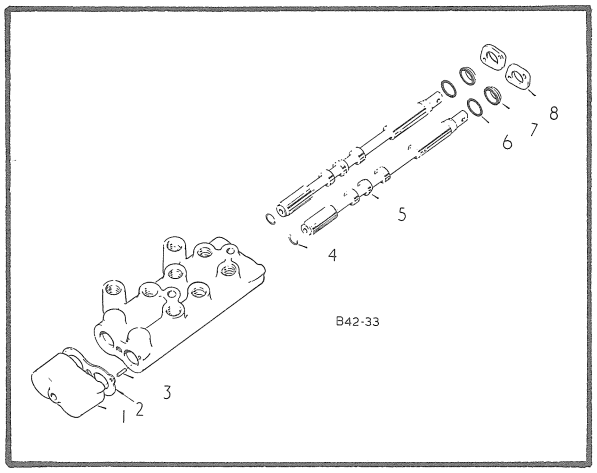


Fig. 23

8b. DISMANTLING

(a) Remove the centre bolt to free the end cover (1-23) and gasket (2-23) from the roll pin (3-23).

(b) Withdraw the spools (5-23) from the cover end noting the bore to which each spool belongs.

(c) Remove the circlips (4-23) from the end of the spools.

(d) Remove the screws to free the seal retainers (8-23) then remove the wiper seals (7-23) and 'O' rings (6-23).

8c. INSPECTION AND REPAIR

(a) Check spools for straightness, wear and damage.

(b) Check that the grooves in the centre lands are clear.

(c) Check that the spool hollow centres and cross drillings are free from obstruction.

8d. ASSEMBLY

(a) Install new circlips (4-23) on the ends of spools then install the spools in their respective bores from the cover end. If new spools are being installed select the bores which provide the closest fit.

(b) Install new 'O' rings (6-23) and wiper seals (7-23) on the eye ends of the spools and carefully enter these into position in the valve body.

(c) Install the seal retainers (8-23).

(d) Install a new gasket (2-23) and the end cover (1-23).

8e. TESTING

(a) The test rig must be capable of supplying up to 23 to 32 litre/min (5 to 7 UK gal/min) with a regulator between the pump and the valve set at 16.2 to 17.5 kg/cm^2 (230 to 250 lb/in^2).

(b) Retract the spools and fill the valve with oil.

(c) Connect the supply port and plug all other ports then supply 8 to 10 litre/min (1.8 to 2.2 UK gal/min) to the valve. Select all spool positions with each spool in turn. There must be no external leakage.

(d) Remove the return port plug. With the spools in the position specified in the table check that the leakage from the return port does not exceed the figures listed.

SPOOL POSITION		litre/min (UK gal/min)
1. Drive	2. Drive	2.0 (0.44)
	2. Clutch	2.5 (0.55)
	2. Maximum Brake	2.0 (0.44)
2. Drive	1. Clutch	2.5 (0.55)
	1. Maximum Brake	2.0 (0.44)

(e) Plug the return port. Run the rig to supply 23 to 32 litre/min (5 to 7 UK gal/min) then first with one then the other spool in drive, check the flow from each service port in turn over the opposite spool. The table shows the percentage of the supply flow, 10% tolerance permitted.

VALVE PORT	SPOOL POSITIONS			
	Drive	Clutch	Nominal Brake	Max. Brake
Clutch Faceside	0	100	100	100
Brake Faceside	0	0	*	100
Brake Rodside	100	100	100	0

* Flow checks for spools in this position consist of checking each spool location for commencment of flow and 50% flow. The spool will be retracted 19.0 mm (0.75 in) and 20 mm (0.79 in) respectively from the fully extended position with a tolerance of ± 2.0 mm (0.08 in) on each figure but only ± 0.5 mm (0.02 in) on the difference.

(f) Plug the supply port, supply 8 to 10 litre/min (1.8 to 2.2 UK gal/min) to each brake cylinder rod side port in turn and with the respective spool in the maximum brake position check that the flow from the return port is 80 to 100% of supply flow.

8f. INSTALLATION

(a) Position the valve and secure with the bolts (7-7).

(b) Connect the cylinder hoses as identified during removal.

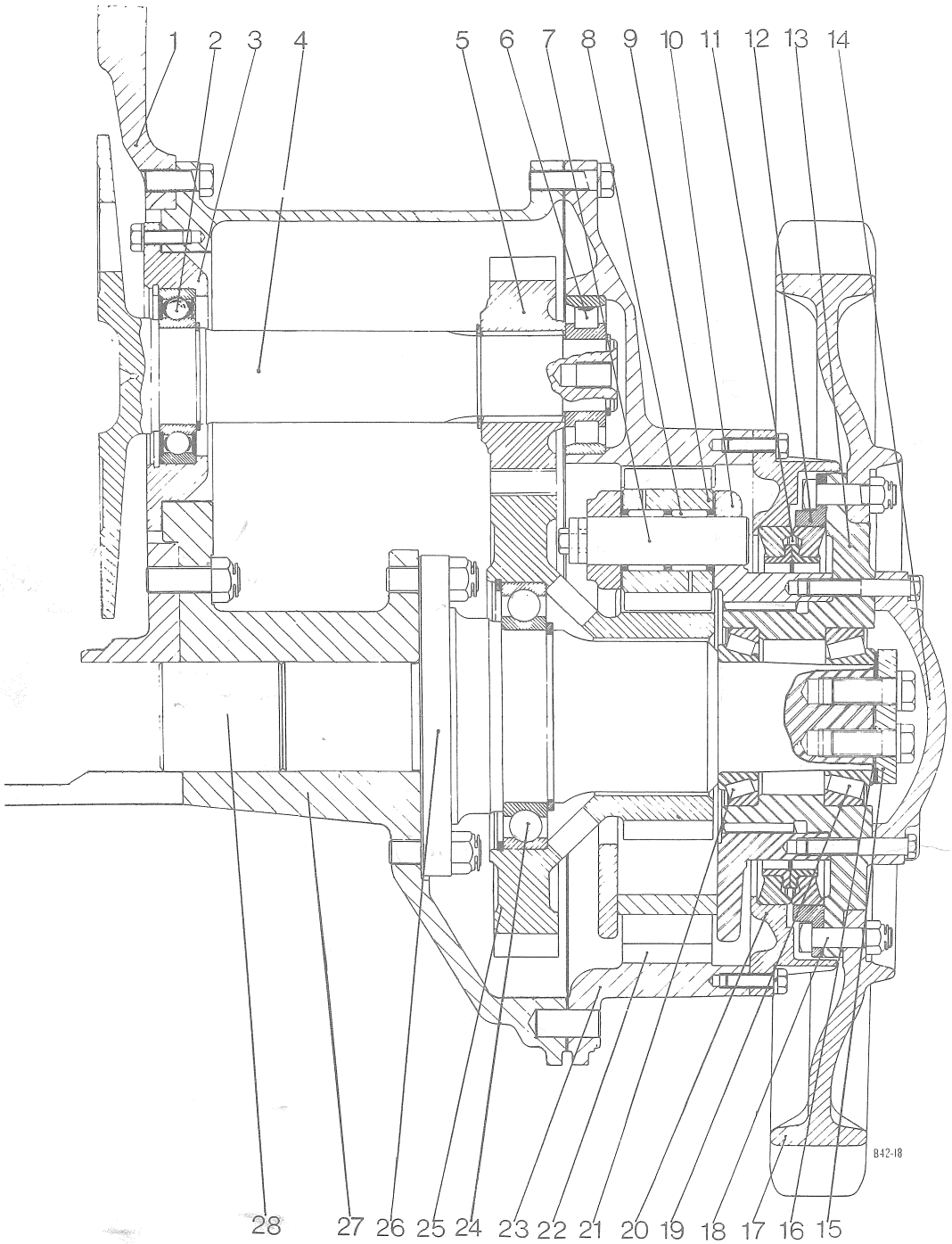
(c) Connect the supply hose (6-7), return hose (8-7) and control cables (9-7).

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

SPROCKETS & SPROCKET DRIVES

GROUP 12



1. Mainframe
2. Steering clutch support bearing
3. Bearing cage
4. Pinion shaft
5. Bull pinion
6. Bull pinion outer bearing
7. Planet pinion shaft
8. Needle roller bearing
9. Planet pinion
10. Planet carrier
11. Seal assembly
12. Seal retaining ring
13. Sprocket carrier
14. End cap
15. Bearing retainer
16. Shims
17. Sprocket
18. Dowel bolt
19. Sprocket carrier outer bearing
20. Seal housing
21. Sprocket carrier inner bearing
22. Planetary ring gear
23. Ring gear housing
24. Bull gear bearing
25. Bull gear
26. Stub pivot shaft
27. Sprocket drive carrier
28. Spigot bar

Fig. 1

1. DESCRIPTION

The final drive units consist of double reduction gear trains in sealed housings. First stage reduction is by a bull pinion which drives a bull gear. Second stage reduction is by a sungear, formed integrally with the bullgear, which drives planet pinions housed in a fabricated carrier, the planet pinions being in mesh with a stationary ring gear cast into the drive carrier. The sprocket carrier is splined and bolted to the planet pinion carrier.

The bull pinion is splined onto the clutch drive shaft which is supported at its inner end by the steering clutch support bearing and at its outer end by a roller bearing. The bull and sungear is mounted on a large diameter ball bearing. Opposed pre-loaded taper roller bearings support the sprocket carrier. Pre-loading is achieved by the shims between the end of the stub pivot shaft and the bearing retainer. Fig. 1 shows a cross section of the final drive.

2. SPROCKET

2a. REMOVAL

(a) Split the track referring to GROUP 13 then drive the loader rearward until the sprocket is clear of the track. Alternatively, when the track is flat on the ground raise the rear of the machine so that the sprocket is clear of the track.

(b) Remove the nut and bolt (3-2), bolts (1 & 2-2) and nut (4-2) to remove the sprocket outer guard (5-2).

(c) Remove the self locking nuts (6-2) then drive the sprocket from the dowel bolts.

2b. INSPECTION AND REPAIR

Inspect the sprocket teeth for signs of excessive wear. This may have been indicated during use by the track jumping the sprocket teeth even though track adjustment was correct. Sprockets may be interchanged to increase their life.

2c. INSTALLATION

(a) Position the sprocket on the dowel bolts and install the nuts (6-2).

(b) Ensure that the spacer (1-3) is on the bolt (3-3) then position the sprocket guard (2-3) and install the bolts (1 & 2-2) finger tight.

(c) Thread the bolt (3-3) through the sprocket guard and install the nut (4-2) finger tight.

(d) Install and tighten the nut and bolt (3-2). Tighten the bolts (1 & 2-2) and the nut (4-2).

(e) Connect the track chain referring to GROUP 13.

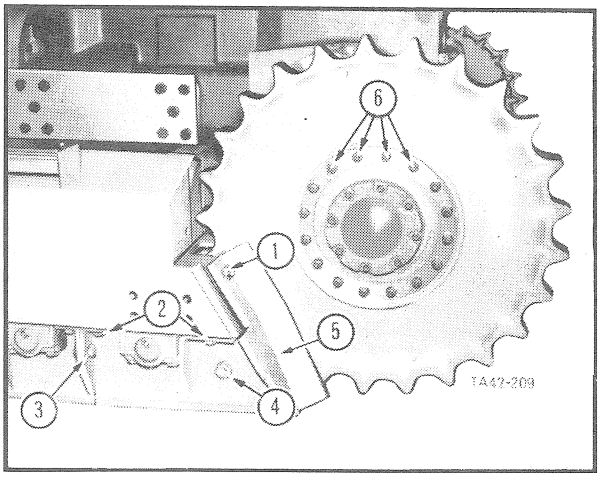


Fig. 2

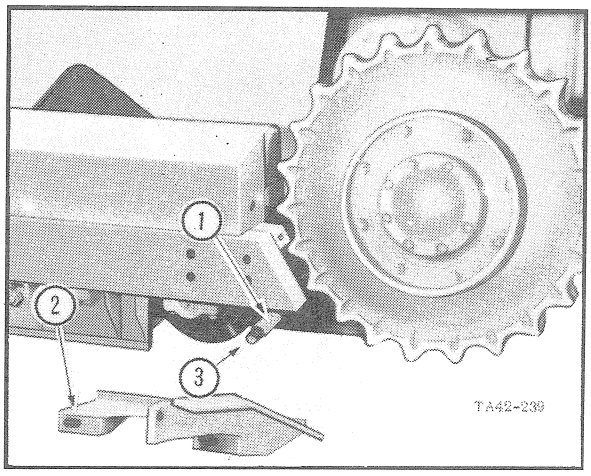


Fig. 3

3. SPROCKET DRIVE GEARS

3a. REMOVAL

(a) Remove the sprockets referring to para. 2a.

(b) Drain the final drive housings referring to the Operator's Manual.

(c) Remove the bolts (1-4) to free the end cover (2-4).

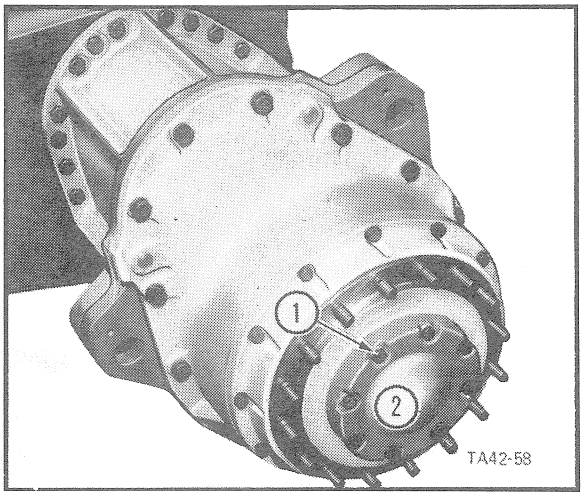


Fig. 4

(d) Remove the bolts (1-5) and retainer (2-5). Shims under the retainer must be taped together until required for assembly.

(e) Withdraw the sprocket carrier assembly (4-5) from the shaft, ensuring that the bearing (3-5) is not damaged as it leaves the shaft.

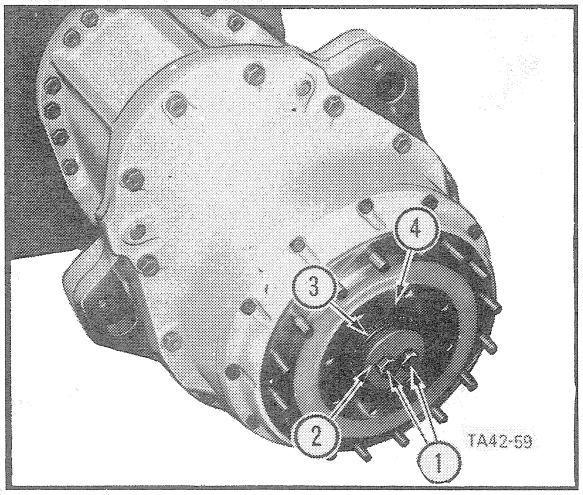


Fig. 5

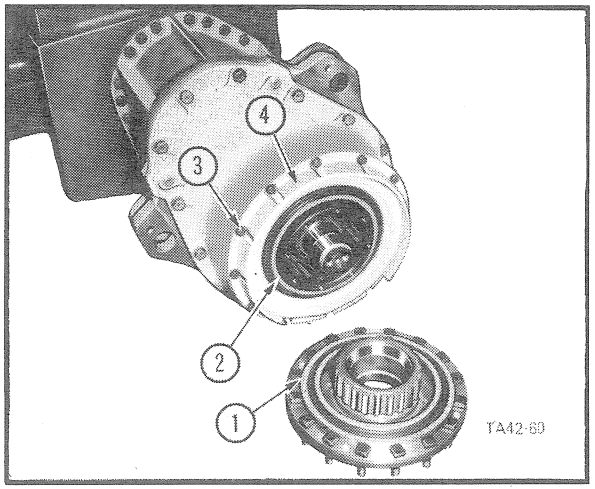


Fig. 6

(f) Remove the oil seal components (1 & 2-6) from their respective housings. Discard the rubber rings and store the steel rings safely to avoid damage to the sealing faces.

(g) Remove the bolts (3-6) to remove the seal housing (4-6).

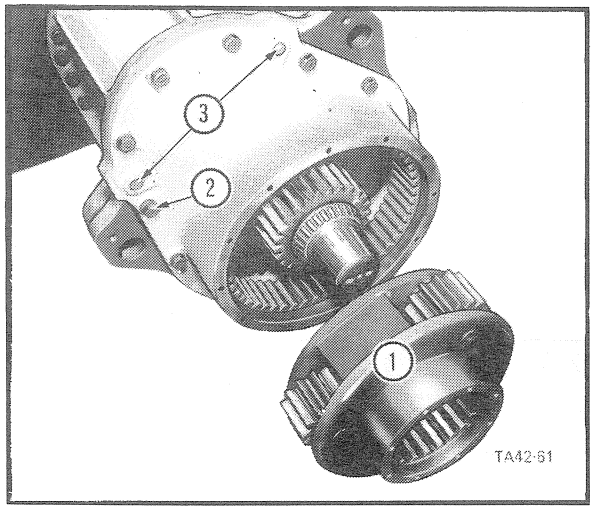


Fig. 7

(h) Withdraw the planet pinion carrier assembly (1-7).

(i) Drive the dowels (3-7) from their locations then remove the bolts (2-7) and lift off the ring gear housing.

(j) Draw-off the bearing (1-8).

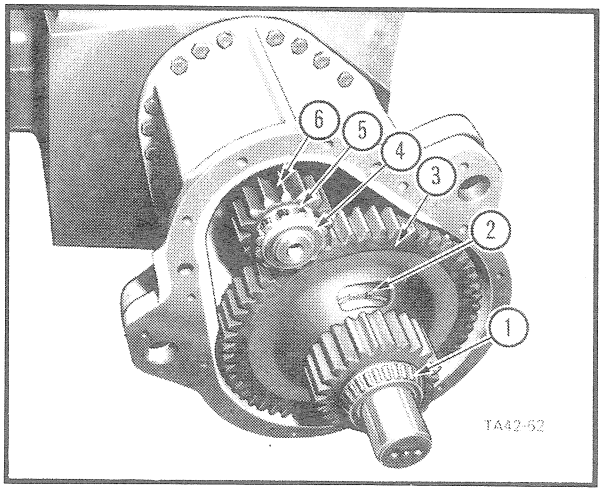


Fig. 8

(k) Disengage the circlip (2-8) from its groove in the stub pivot shaft.

(l) Withdraw the bull and sun gear (3-8).

(m) Remove the circlip (4-8) and draw-off the pinion outer bearing race (5-8) and pinion (6-8).

3b. DISMANTLING

1. SPROCKET CARRIER

(a) Remove the dowel bolts (1-9).

(b) Remove the screws (2-9) and lift off the oil seal retaining ring (3-9).

(c) Press the bearing cups from each end of the sprocket carrier.

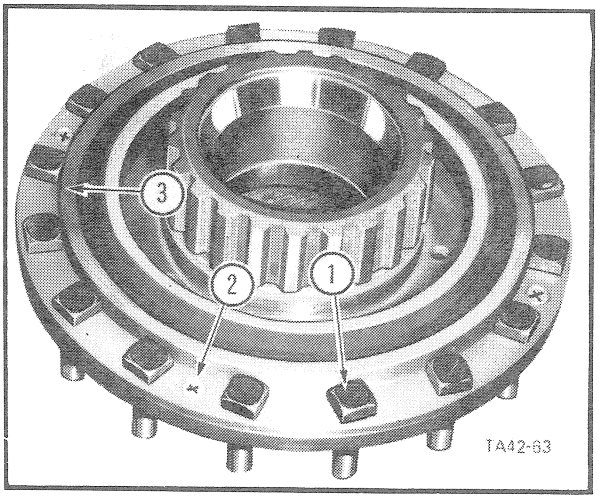


Fig. 9

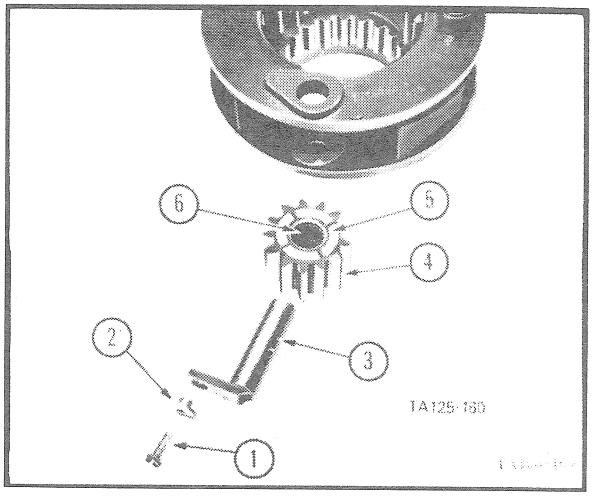


Fig. 10

2. PLANETARY GEAR ASSEMBLY

(a) Remove the bolts (1-10), pivot washers (2-10) and planet pinion shaft (3-10) from the carrier.

(b) Lift out the pinions (4-10).

(c) Remove the outer spacers (5-10), needle rollers (6-10) and centre spacers from the pinions.

(d) If inspection proves it necessary draw the bull pinion outer bearing race (1-11) from the planetary ring gear.

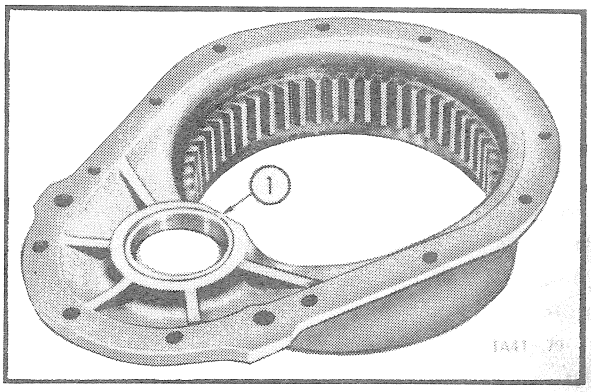


Fig. 11

3. BULL AND SUN GEAR

(a) Remove the circlip (1-12).

(b) Press out the bearing (2-12).

(c) Remove the circlip (3-12).

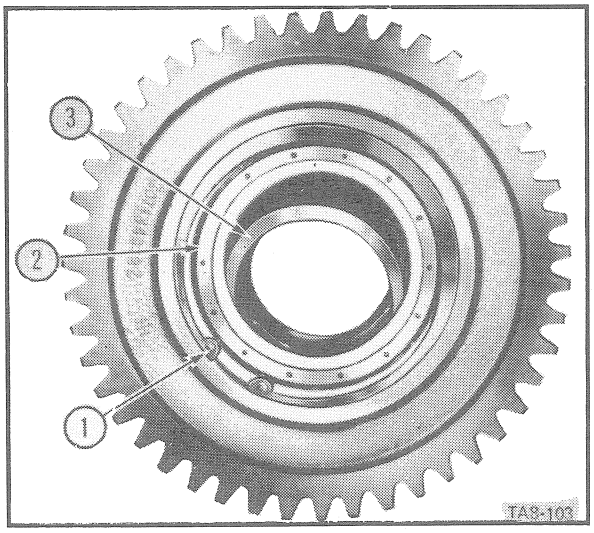


Fig. 12

3c. INSPECTION AND REPAIR

(a) Inspect gear teeth and splines for excessive wear or damage.

(b) Inspect the planet pinion carrier for cracks at the welds.

(c) Inspect the planetary ring gear for cracks or damage.

(d) Inspect the steel components of the seal assembly. The lapped sealing faces (Fig. 13) must be undamaged and free from contamination. They must also be within the outer half of the ring and concentric to the circumference as shown in Fig. 14.

Rings which do not conform to these conditions and appear as shown in Fig. 15 or 16 must be rejected and a new seal assembly fitted. Metal rings are NOT interchangeable and original pairs of rings must be kept as a matched set.

(e) If the rings are to be used again remove all corrosion or hardened material from the exterior surfaces (A-13). Clean the rings in a non-flam-

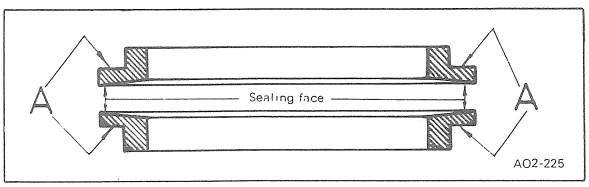


Fig. 13

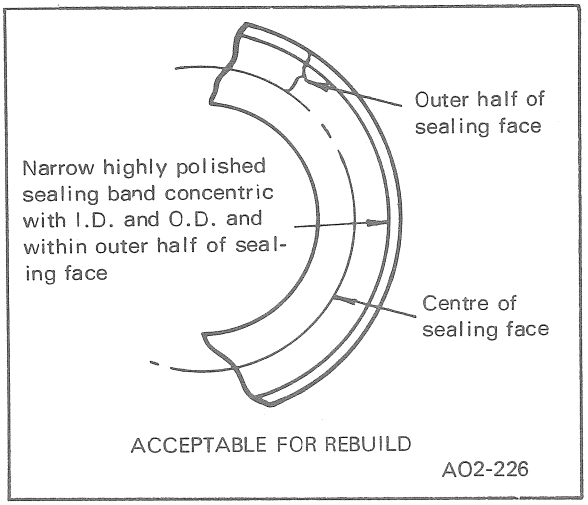


Fig. 14

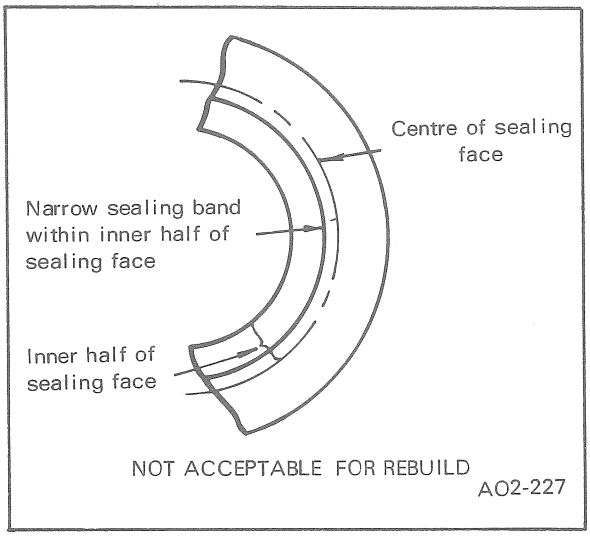


Fig. 15

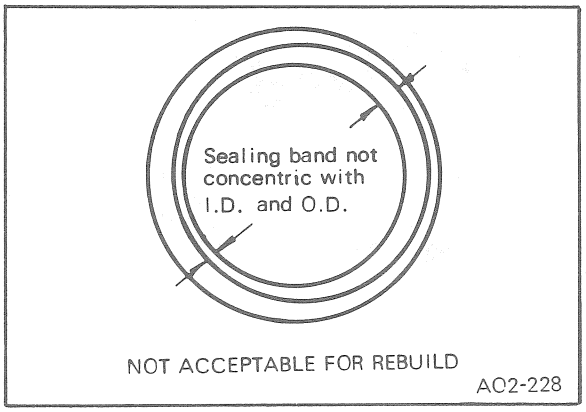


Fig. 16

mable solvent and dry with a lint free wiper.

(f) Fit new rubber rings to the steel rings and store safely until required for installation.

3d. ASSEMBLY

1. BULL AND SUN GEAR

(a) Position the circlip (3-12) into the bull and sun gear then press in the bearing (2-12).

(b) Install the circlip (1-12).

2. PLANETARY GEAR ASSEMBLY

(a) Apply a thin film of loctite 270 to the outside diameter of the bull pinion outer bearing race (1-11) then press the race into the planetary ring gear. Remove all excess loctite solution.

(b) Install needle rollers to one end of the planet pinions, a light smear of grease will retain the rollers in position. Install the centre spacers then the rollers at the other end of the bores.

(c) Install the outer spacers (5-10) to each end of the pinions and position the pinions in the carrier.

(d) Install the shafts (3-10) and pilot washers (2-10). Apply a few drops of Loctite 221 to the bolts (1-10) before installation.

3. SPROCKET CARRIER

(a) Press the bearing cups into each side of the sprocket carrier.

(b) Position the oil seal retaining ring (3-9) and locate with the screws finger tight.

(c) Install the dowel bolts (1-9) through the retaining ring and sprocket carrier, ensure that the bolt heads are correctly seated then tighten the screws (2-9).

3e. INSTALLATION

(a) Install the bull and sun gear assembly (3-8) to the stub pivot shaft and engage the circlip (2-8) in the shaft groove.

(b) Position the sprocket carrier inner bearing cone (1-8) on the shaft ensuring that the cone is fully home.

(c) Adjust bearing preload as detailed in para. 3f.

(d) Install the bull pinion (6-8) on its shaft.

(e) Heat the bull pinion outer bearing (5-8) in an oven or oil bath to a temperature between 150 and 177°C (300 and 350°F) then install the bearing to the bull pinion shaft. If heating facilities are not available use spacers and a bolt on the threaded hole in the end of the shaft to draw the bearing into position. DO NOT drive on the bearing, this may result in damage to the steering clutch support bearing.

(f) Install the circlip (4-8).

(g) Using a new gasket, position the planetary ring gear and locate with the bolts (2-7) finger tight.

(h) Drive in the dowels (3-7) then tighten the bolts (2-7).

(i) Install the planet pinion carrier assembly (1-7) rotating the pinions as required to mesh with the ring gear.

(j) Using a new gasket install the seal housing (4-6) with the relieved part of the seal housing flange downward, then secure with the bolts (3-6).

(k) Ensure that the seal housings are perfectly clean and dry and that the rubber rings of the seal assembly are correctly seated on the steel rings. If new seal assemblies are being fitted the unitization bands which hold the two steel rings together MUST BE REMOVED.

(l) Position the oil seal half (1-6) with the protruding lip in the sprocket carrier and position the inner half (2-6) of the seal assembly in the housing ensuring that the rubber rings are correctly seated.

(m) Thoroughly clean the sealing faces of the steel rings with the lint free wiper provided in the seal kit then apply a thin film of SAE 30 oil to ONE SEALING FACE ONLY. DO NOT ALLOW OIL TO CONTACT RUBBER COMPONENTS OF THE SEAL.

(n) Asterisks are stamped on the outer edges of the planet carrier assembly (1-7) and sprocket carrier (4-5) to ensure bolt hole alignment. Align the asterisks and enter the sprocket carrier splines into the planet carrier splines.

(o) Fit the sprocket carrier outer bearing cone (3-5) to the shaft.

(p) Apply loctite 241 to the threads of the bolts (1-5) then secure the shim pack, determined in para. 3f, and retainer plate to the end of the shaft with the bolts tightened to 30.5 to 34.5 kgm (220 to 250 lbft).

(q) Use a new gasket and install the end cover (2-4).

(r) Install the sprocket referring to para. 2c and fill the final drive housing as detailed in the Operator's Manual. Connect the track chain referring to GROUP 13.

3f. ADJUSTMENTS

(a) With the bull and sun gear assembly and the sprocket carrier inner bearing cone installed position the sprocket carrier assembly (1-17) and install the outer bearing cone.

(b) Select a shim pack or use the original shim pack if still available then install the shim pack and retainer plate to the shaft end with the bolts finger tight.

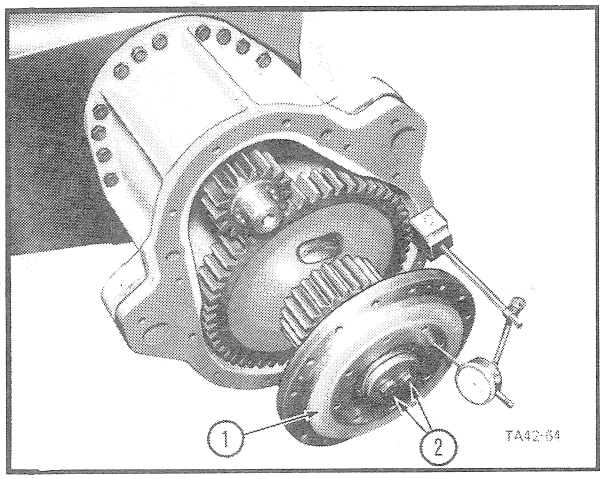


Fig. 17

(c) Evenly and progressively tighten the bolts (2-17) at the same time rotating the sprocket carrier to ensure that the bearings are seating correctly and not being overloaded.

At this stage end float must be present. If over loading becomes apparent add shims to provide an end float of 0.05 to 0.30 mm (0.002 to 0.012 in).

(d) Mount a dial indicator to the assembly as shown in Fig. 17 with the stylus acting on an approximate radius of 63 mm (2.5 in) from the pivot shaft centre.

(e) Accurately measure the end float. Add 0.064 mm (0.0025 in) to the measured end float and deduct shims equal to the total figure from the shimpack. This will provide the required pre-load nip of 0.064 mm (0.0025 in).

(f) Remove the dial guage. Remove the retainer and shim pack taping the shims together until required for assembly.

(g) Remove the outer bearing cone and sprocket carrier.

4. STUB PIVOT SHAFT

4a. REMOVAL

(a) Remove the track frame referring to GROUP 13.

(b) Remove the sprocket drive gears referring to para. 3a.

(c) Remove the bull pinion drive shaft referring to GROUP 11.

(d) Remove the self locking nuts (1 & 5-18). Some of the studs may screw out with the nuts.

(e) Support the carrier and remove the bolts (2-18) then withdraw the carrier from the main-frame.

4b. DISMANTLING

(a) Press the spigot bar (1-19) to press the stub pivot shaft (6-18) from the sprocket drive carrier.

(b) Press out the spigot bar (1-19).

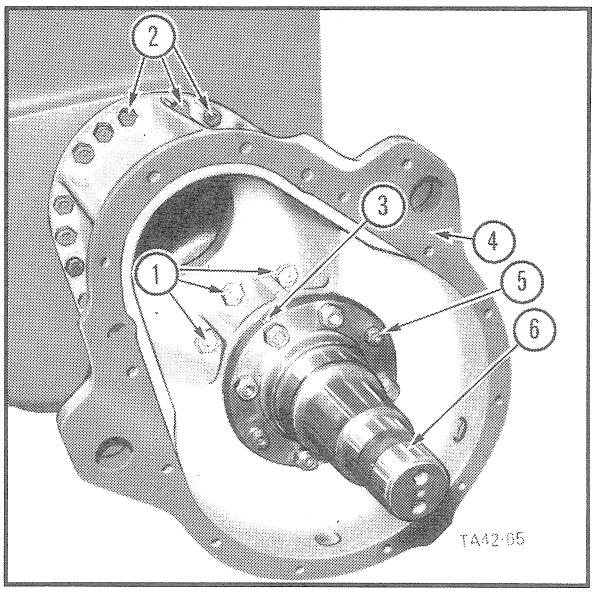


Fig. 18

4c. ASSEMBLY

(a) Position the stub pivot shaft so that the mark (3-18) is aligned with the centre of the bull pinion shaft bore and the stud holes are aligned.

(b) Press the stub pivot shaft into the sprocket drive carrier.

(c) Invert the carrier and press in the spigot bar (1-19) up to the stub pivot shaft.

4d. INSTALLATION

(a) Apply Loctite 270 to the threads of any of the studs that screwed out of the mainframe and screw these back into position.

(b) Thoroughly clean the mainframe and carrier mounting faces then apply a coat of 'Wellseal' jointing compound to each face.

(c) Position the carrier assembly on the mainframe locating the spigots in their respective holes.

(d) Install the bolts (2-18) and self locking nuts (1 & 5-18).

(e) Install the bull pinion drive shaft referring to GROUP 11.

(f) Install the sprocket drive gears referring to para. 3e.

(g) Install the track frame referring to GROUP 13.

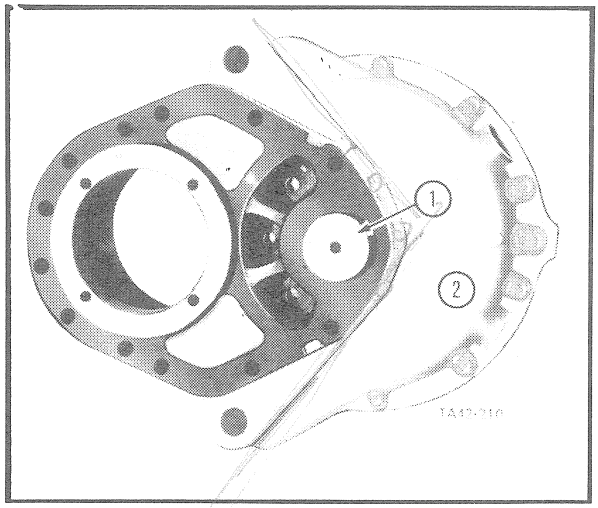


Fig. 19

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

TRACKS & TRACK FRAMES GROUP 13

1. DESCRIPTION

1a. TRACK FRAMES

The track frames are fabricated structures to which are attached the various items of the suspension and running gear. The frames are held parallel to the loader axis by a pair of heavy steel crossbars, the rear crossbar being morticed to the track frame to take the loader frame thrust. A cradle is pin mounted to the centre of the front crossbar and bolts to pads on the underside of the sidebars. The crossbars also house the mountings for the loader frame. The track frames are pivot mounted to the front of the sprocket drive carrier.

1b. TRACK CHAINS

The track chains consist of drop forged heat treated steel links joined together by hardened steel bushes and pins which are a press fit in the links. Spring steel discs fitted to each end of the bushes exclude dirt from the pin and bush assembly.

The track shoes are attached to the links by high tensile bolts and self locking nuts.

Track chain tension is achieved by extending an hydraulic cylinder one end of which is attached to the front idler guides and the other end engaging in the track spring front seat. This arrangement allows any shock loads applied to the front idler to be absorbed by the track spring.

1c. FRONT IDLERS

The front idlers are mounted on pre-loaded opposed taper roller bearings which are sealed by metal faced seals and 'O' rings. Guides are pressed onto the idler shaft which operate in slides in the track frame.

1d. TRACK IDLERS

The track idlers support the top section of the track chains and are mounted on brackets which bolt to the loader frame. The roller is mounted on Glacier metal bushes and side loads are taken by a roller thrust race. The unit is sealed at the mounting bracket by a metal faced seal.

1e. TRACK ROLLERS

Six rollers in each track frame support the weight of the loader. Three rollers on each side have double flanges to prevent snaking of the track chain. The rollers are heat treated steel forgings equipped with heavy duty phosphor bronze bushes which rotate on hardened steel shafts. The rollers are sealed by metal faced seals and 'O' rings.

2. TRACK CHAINS

2a. REMOVAL

(a) Drive the machine on to level ground and position the track so that the master pin (1-1) is is to the front. The master pin is identified by a slightly raised boss and a dimple in each end.

(b) Relieve the tension on the track as detailed in the Operator's Manual.

(c) Remove the nuts and bolts which secure the track shoe (2-1) adjacent to the master pin. Remove the shoe.

(d) Press out the master pin (5-3). A suitable pressing arrangement is shown in Fig. 2.

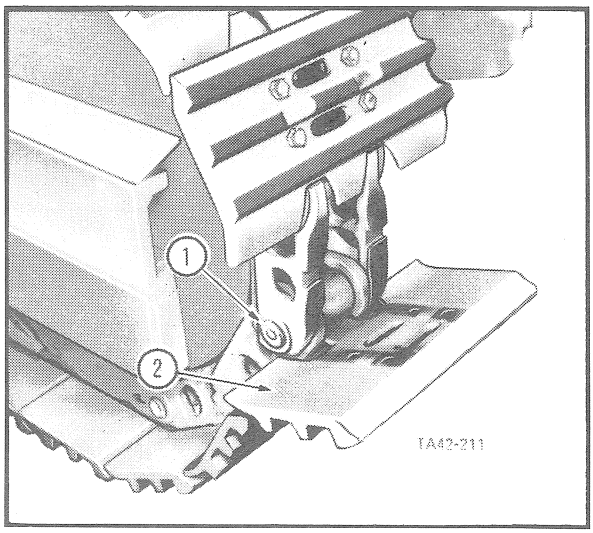


Fig. 1

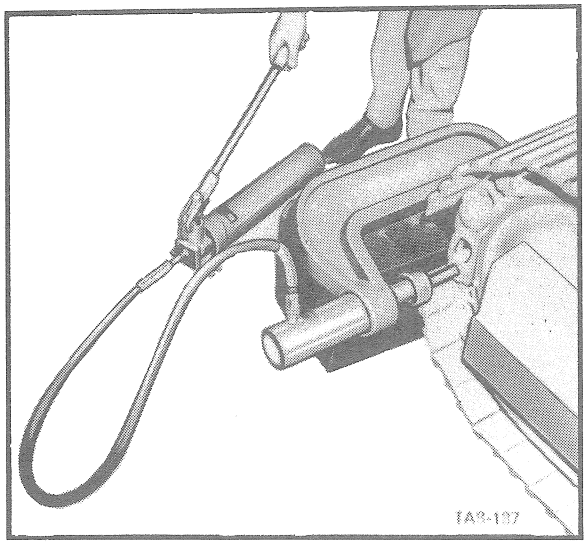


Fig. 2

(e) Lever the lower links (1-3) away from the upper links (4-3). Ensure that the spacers (2-3) and sealing washers (3-3) at each side of the link are not lost.

(f) Slowly and carefully drive the loader rearward until the track is flat on the ground as shown in Fig. 4

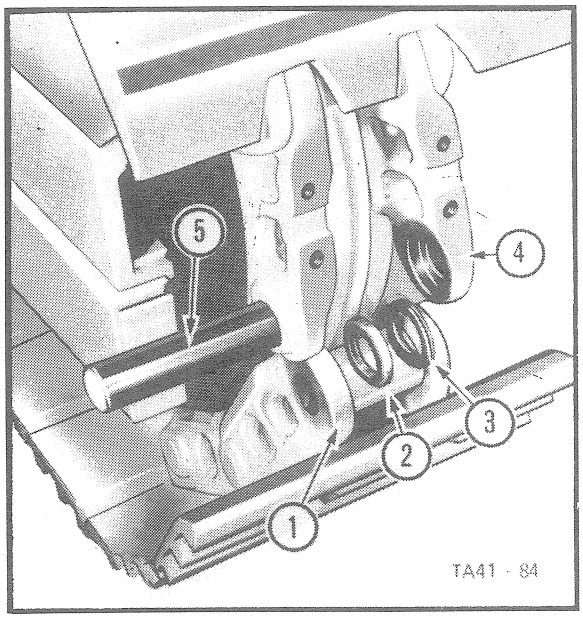


Fig. 3

(g) Position a plank to the rear of and flush with the track, or if the track is to be changed position the new track in place of the plank, then drive the loader on to the plank or new track. If a plank is used this must be the same height as the track frame and narrow enough to fit between the track roller shields.

If both tracks are disconnected, traction will be lost as the tracks leave the sprockets. Consequently whenever possible work on one track at a time unless adequate towing or lifting equipment is available.

2b. DISMANTLING

Remove the self locking nuts and bolts which secure the track shoes to the links. Lift off the shoes.

2c. INSPECTION AND REPAIR

(a) Inspect the running surfaces of the track links. If these are excessively worn it is probable that the pins and bushes are also worn. In this case the track chains must be changed.

(b) Wear on track pins and bush internal diameters is not visible and can only be judged on the amount of stretch in the tracks. If wear is evident, press out the pins and bushes and turn them through 180°. Coat the pins with KERNS UNITED LUBRICANT DO7373 and reassemble as shown in the assembly drawing Fig. 4. Unworn surfaces of the pins will then be working on unworn surfaces of the bushes as shown in Fig. 5. NEVER reduce the track length by removing links in order to bring the track adjustment within the hydraulic adjuster.

When track chains are rebuilt or changed the sprocket must also be turned or renewed so that unworn surfaces are presented to unworn sprocket teeth surfaces.

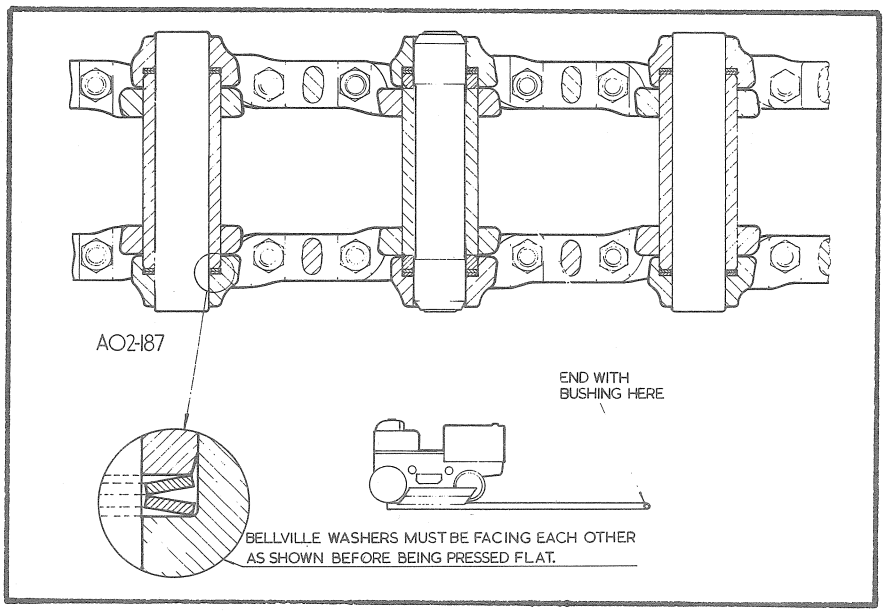


Fig. 4

(c) To change a damaged track section or link remove the track shoes adjacent to the damage and flame cut through the bushes and pins of the links to be removed as close as possible to the inside edges of the links. Use extreme care to avoid damage to adjacent links and bushes during cutting. Weld the remaining pieces of bush and pin together ensuring that the weld is strong enough to withdraw the bush as the pin is pressed out (Refer to Fig. 6). Press out the pin and bush portions. Fit new links and assemble as shown in Fig. 7 using master bushes and spacers and standard pins. Coat the pins with KERNS UNITED LUBRICANT DO7373 before installation.

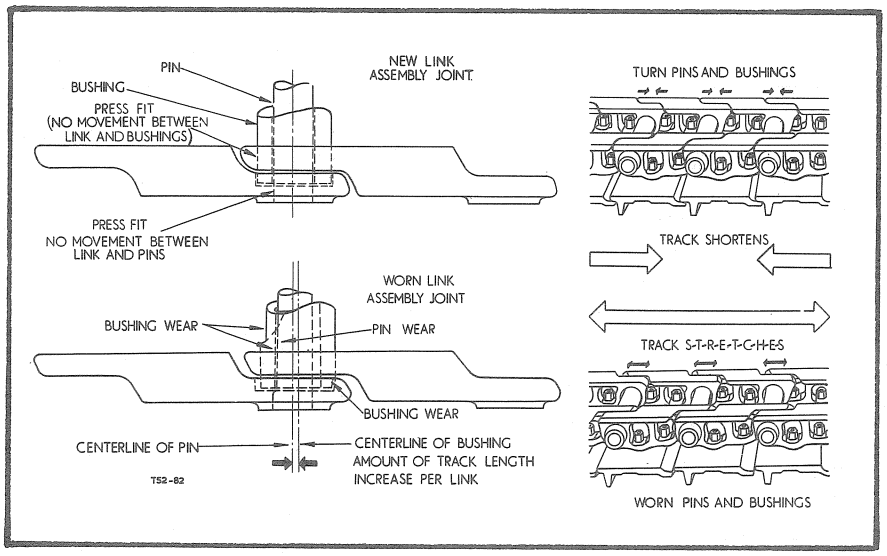


Fig. 5

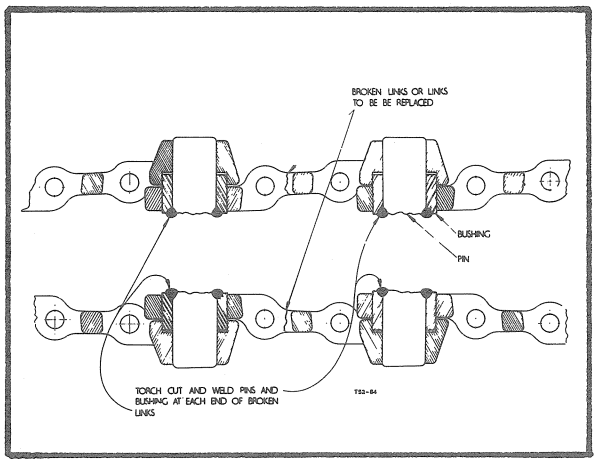


Fig. 6

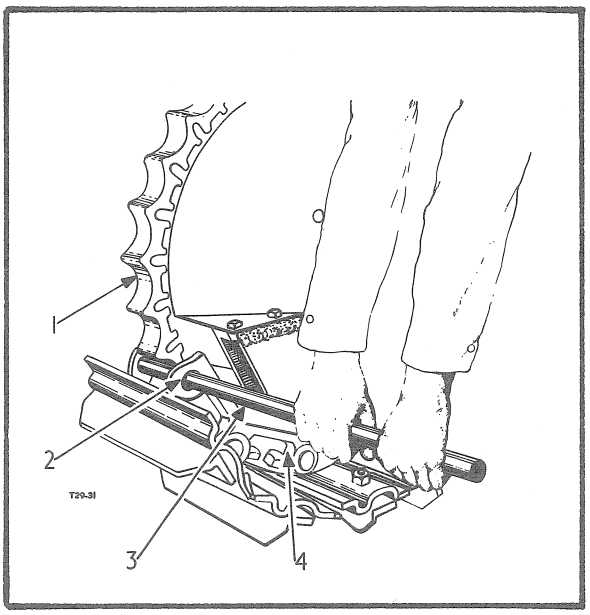


Fig. 8

2d. ASSEMBLY

Position the track shoes on the track links and tighten the bolts to 23 to 25.5 kgm (165 to 185 lbft).

2e. INSTALLATION

(a) Position the track in front of the track frame so that the master bush is at the front then position a block 20 to 25 cm (8 to 10 in) high under the front track shoe grouser.

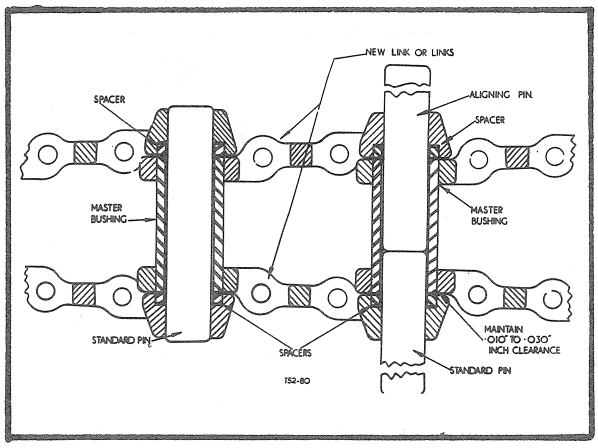


Fig. 7

(b) Drive the machine forward on to the track so that the sprocket is slightly forward of the rear-most track link (Refer to Fig. 4).

(c) Insert a suitable bar (3-8) into the holes (2-8) in the rear link then lift the track (4-8) up to the sprocket (1-8).

(d) Slowly drive the machine forward and at the same time lift the track around the sprocket then forward over the track idler and front idler. As the machine reaches the block under the front grouser the slackness in the lower section of the chain will be taken up.

(e) Install the sealing washers (3-3) to the track link on each side with the seal centres together as shown in Fig. 4

(f) Position the spacers (2-3) to the track links then align the lower links (1-3) with the upper links (4-3) using an undersize pin.

(g) Press in the master pin (5-3).

(h) Install the track shoe (2-1).

(i) Adjust track tension as detailed in the Operator's Manual.

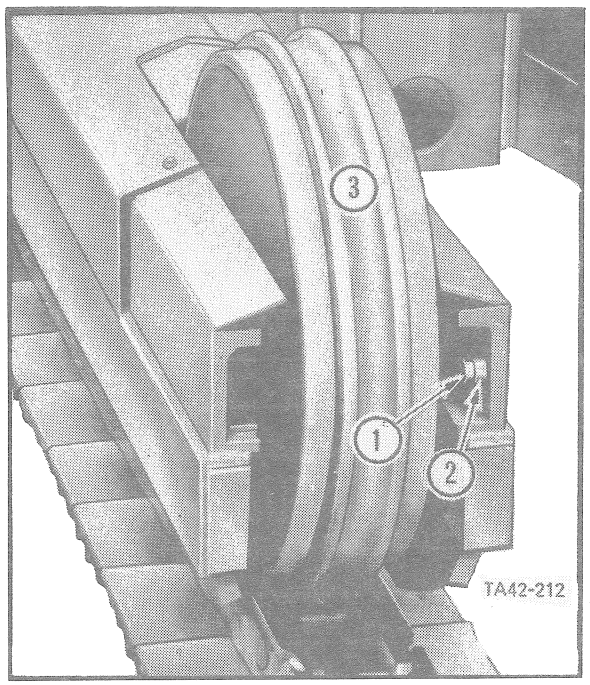


Fig. 9

3. FRONT IDLER

3a. REMOVAL

(a) Split the track chain referring to para. 2a.

(b) Drive the machine slowly rearward until the track is clear of the front idler.

(c) Remove the bolt (1-9) and spacer (2-9).

(d) Draw the idler (3-9) complete with the hydraulic track adjuster from the track frame.

3b. DISMANTLING

(a) Remove the bolts which secure the track adjuster to the idler guides.

(b) Remove the idler guide (1-10) from the shaft (2-10). Threaded holes are provided in the guides for this purpose.

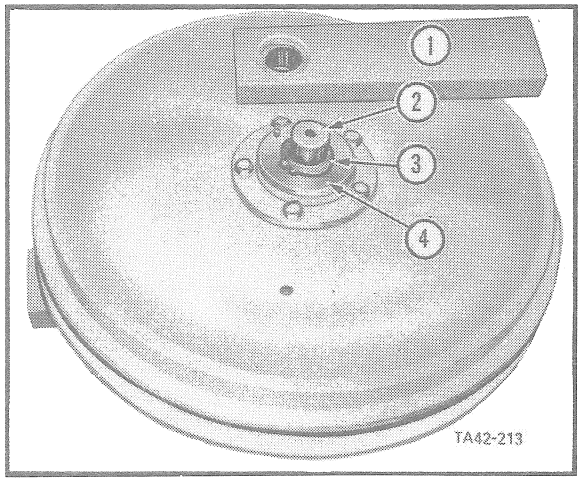


Fig. 10

(c) Remove the circlip (3-10) and lift off the seal retainer (4-10) and seal assembly (2-11). Discard the rubber washers from the seal assembly.

(d) Drain the oil from the idler.

(e) Remove the bolts (3-11) and lift off the bearing retainer (1-12) and shim pack (2-12). Tape the shims together until required for assembly.

(f) Repeat operations (b) (c) and (e) on the other side of the idler.

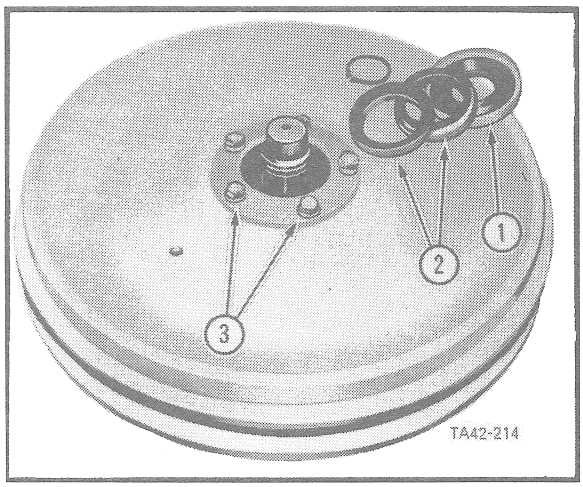


Fig. 11

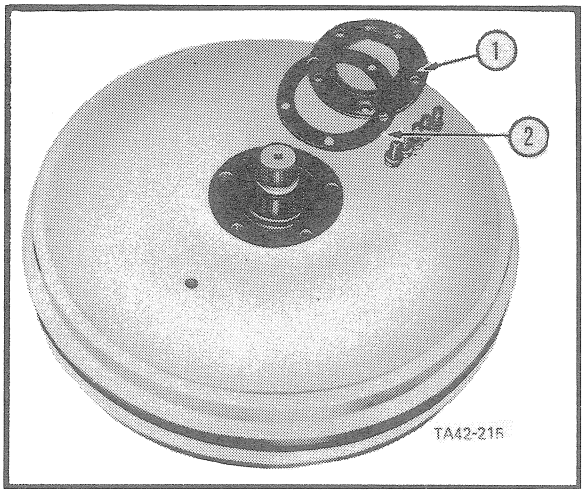


Fig. 12

(g) Press the shaft (1-13) complete with both bearing cones (2 & 3-13) and one bearing cup (4-13) from the idler. Press out the other bearing cup (5-13).

(h) Remove the 'O' rings and inner circlips from the shaft.

(i) Remove the bearing cones (2 & 3-13) from the shaft. Ensure that bearing components are not mixed so that on assembly the cones are fitted to their original cups.

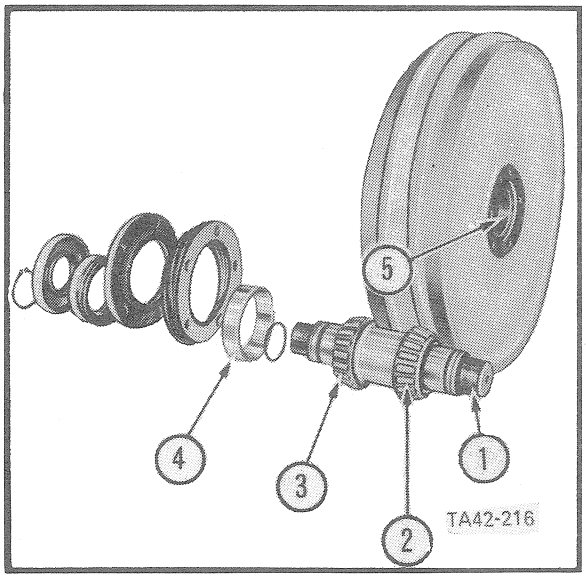


Fig. 13

3c. INSPECTION AND REPAIR

(a) Change bearings which show signs of excessive wear.

(b) Inspect the steel components of the seal assembly. The conditions referred to in GROUP 12 para. 3c also apply to these seals.

(c) If the steel sealing rings are suitable for re-use, immerse a plastic unitization band (as supplied in the repair kit) in a container of clean warm water in order to soften the material.

Apply a film of SAE 30 oil to one of the sealing faces then slide the sealing rings together. Position the unitization band (3-14) around the outer periphery of the rings using a feeler gauge or shim material to help. Ensure that the band is positioned uniformly on the rings and that the rings are accurately centred, minor adjustments to the band position can be made while the band is still pliable. Allow approximately 30 minutes for the band to dry out and shrink then remove all traces of oil from the exterior surfaces with the lint free wiper supplied in the repair kit. Position new rubber rings (1 & 4-14) to the seal rings (5-14) ensuring that they are correctly seated at (B-14).

If a new seal assembly is to be installed DO NOT REMOVE THE UNITIZATION BAND.

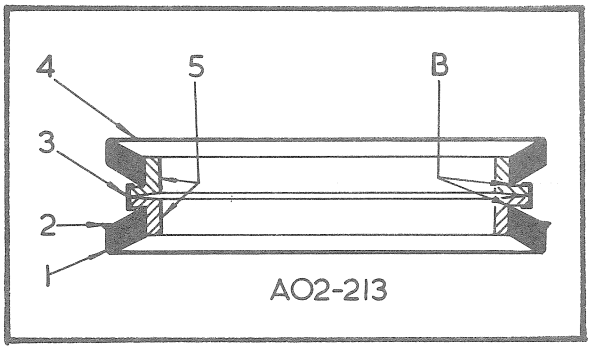


Fig. 14

3d. ASSEMBLY

(a) Press the bearing cones (2 & 3-13) onto the shaft.

(b) Apply a coat of 'Wellseal' jointing compound to the mounting faces of the bearing retainers and idler.

(c) Install a shim pack of 0.89 mm (0.035 in) thickness to one bearing retainer and use this assembly to press the bearing cup (5-13) to one side of the idler. Install and tighten the bolts (3-11) noting that one bolt hole is drilled through into the centre cavity for filling purposes and the bolt for this hole has a dowty washer.

(d) Insert the assembled shaft.

(e) Install a shim pack of 1.47 mm (0.058 in) thickness to the other bearing retainer and use this assembly to press the other bearing cup (4-13) to the other side of the idler. Install and tighten the bolts.

(f) Check and adjust the pre-load referring to para. 3f.

(g) Install the inner circlips to the shaft. Install new 'O' rings.

(h) Thoroughly clean and dry the components in which the seals are housed.

(i) With the idler shaft in a vertical position install the oil seal assembly (2-11) to one side. The rubber ring with the protruding lip (2-14) must fit into the bearing retainer.

(j) Install the seal outer housing (1-11) ensuring that the rubbers are not tilted then install the outer circlip (3-10).

(k) Invert the idler and repeat ops (i) and (j).

(l) Pressure test the idler referring to para. 3g.

(m) Coat the bores of the idler guides (1-10) with 'Lubriplate' No. 130A or its equivalent.

(n) Support the idler shaft then align the shaft key and keyway also the peg on the seal outer housing with the hole in the guide and press the guide into position. Repeat with the other guide.

(o) The shaft is offset in the guides. Position the guides so that the shaft is in the lower half of the guides then secure the track adjuster to the guides.

(p) Position the filler hole on the horizontal centre line then add SAE 30 Series III non EP additive oil until the oil overflows from the filler hole. Install the filler bolt and its dowty washer.

3e. INSTALLATION

(a) Position the idler and track adjuster assembly engaging the guides in the track frame slides then move the assembly fully rearward.

(b) Install the spacer (2-9) and bolt (1-9).

(c) Connect the track referring to para. 2c.

3f. ADJUSTMENTS

(a) Oscillate the idler on the shaft several times under slight hand pressure to seat the bearings.

(b) Use a dial gauge to accurately measure the end float of the shaft.

(c) Add 0.203 mm (0.008 in) to the measured dimension then subtract the resulting figure from the 1.47 mm (0.058 in) shim pack. Re-assemble the bearing retainer and new shim pack to the idler.

(d) To check the bearing pre-load wrap a length of cord around the shaft and with a spring balance at the free end check the pull required to keep the shaft rotating. This should be 9.1 to 11.7 kg (20 to 26 lb).

(e) If the effort is less than 9.1 kg (20 lb) remove shims from the thicker shim pack. If the effort is more than 11.7 kg (26 lb) add shims to the thinner shim pack until the effort required is within the specified range.

3g. TESTING

(a) Prior to fitting the idler guides adapt a pressure gauge and air line into the filler hole.

(b) Immerse the assembly in a container of 'Genklene' cold cleaning solvent or its equivalent as shown in Fig. 15.

(c) Pressurise the idler to 0.7 kg/cm^2 (10 lb/in^2) for a minimum period of 30 seconds and check for air leaks.

(d) Seals which show evidence of leaks must be re-assembled or changed.

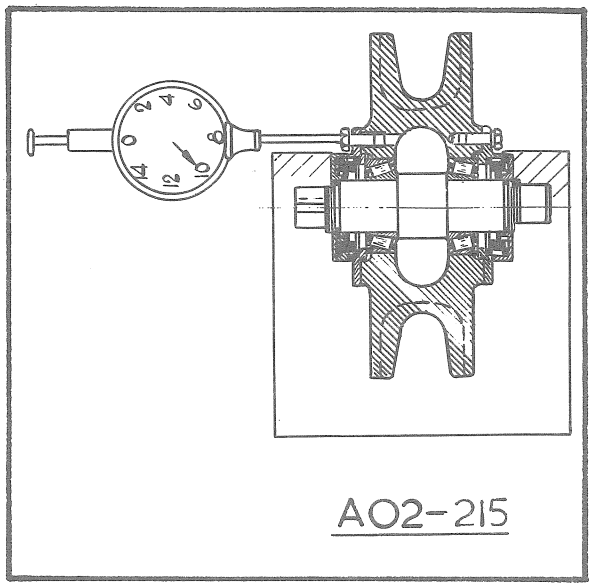


Fig. 15

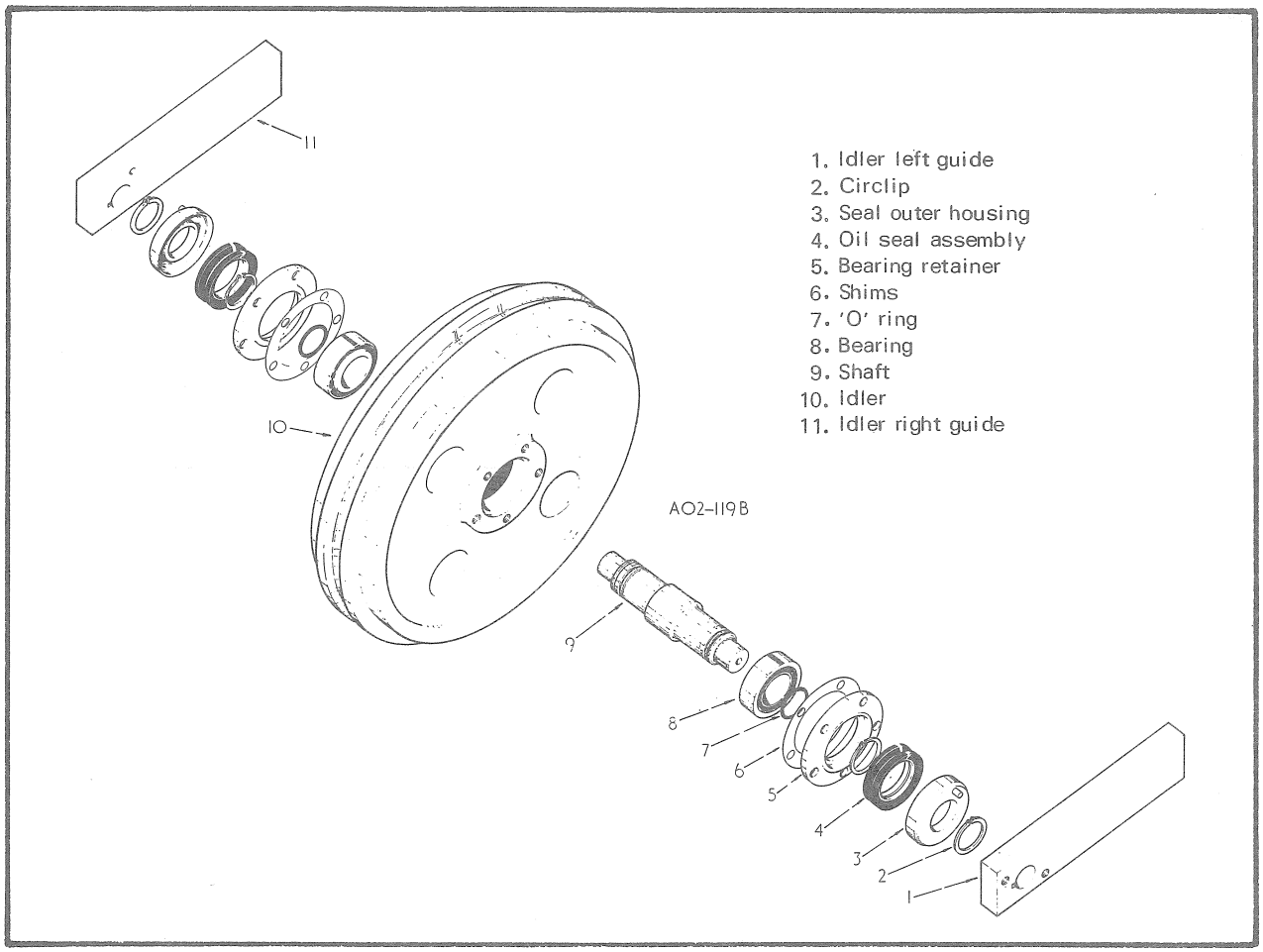


Fig. 16

4. TRACK IDLER
4a. REMOVAL

(a) Remove all tension from the track chain referring to the Operator's Manual.

(b) Raise the top section of the track chain so that it is clear of the track idler and block in this position as shown in Fig. 17.

(c) Remove the bolts (1-17) to free the idler assembly from the loader frame.

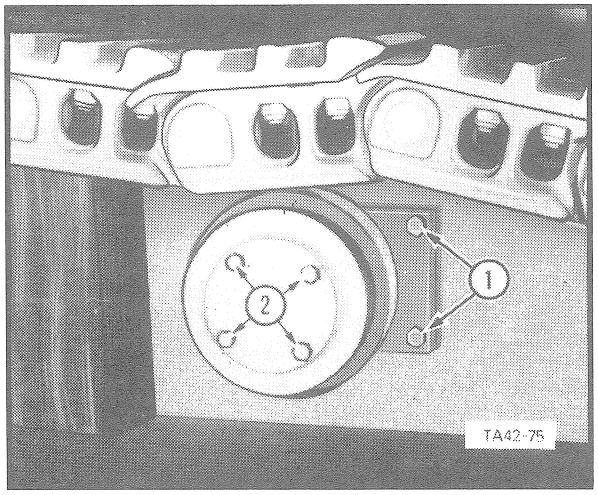


Fig. 17

4b. DISMANTLING

(a) Remove the bolts (2-17), end cap (1-18) and gasket (2-18) and drain the idler. One of the holes (3-18) is drilled through into the cavity for filling purposes.

(b) Remove the bolt (4-18) and retainer plate (5-18).

(c) Withdraw the outer thrust washer (1-19), thrust bearing (2-19) and inner thrust washer (3-19).

(d) Withdraw the idler (4-19) from the shaft.

(e) Withdraw the components of the seal assembly (3-20) from the shaft or idler recess, whichever applies.

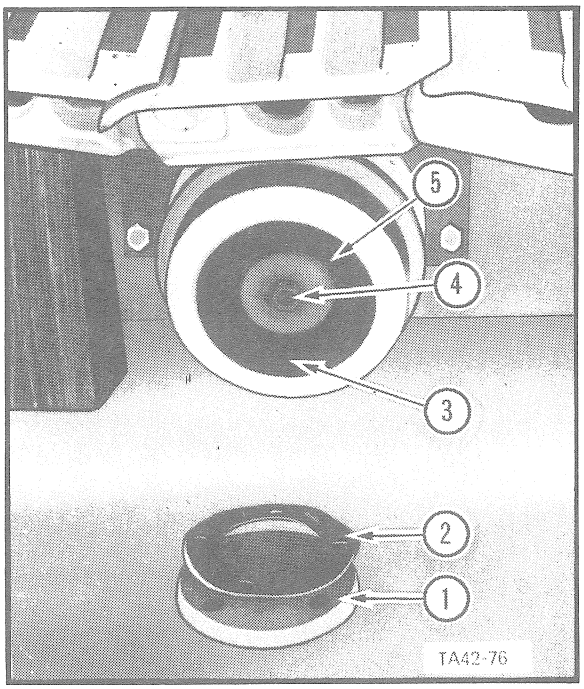


Fig. 18

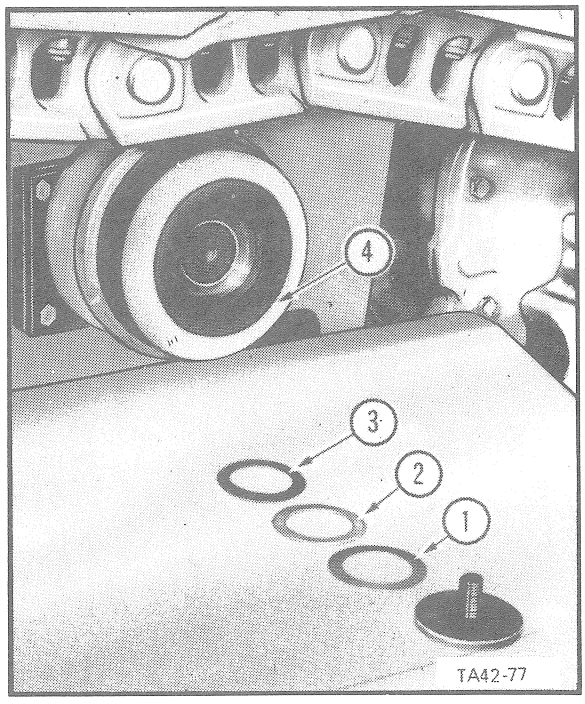


Fig. 19

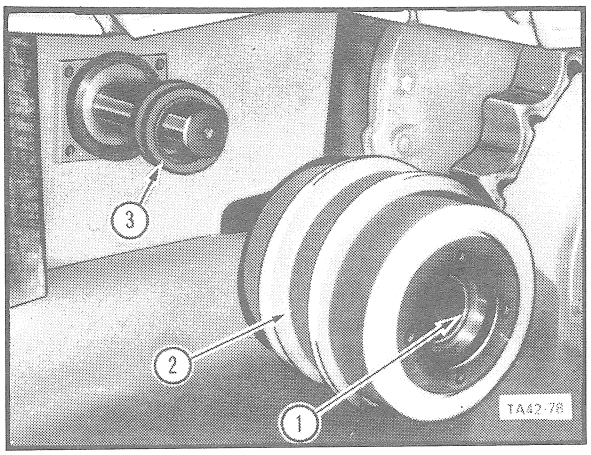


Fig. 20

(f) If inspection proves it necessary press the bushes (1-20) from the idler (2-20).

4c. INSPECTION AND REPAIR

(a) Inspect the shaft and bushes for excessive wear.

(b) Inspect the seal assembly referring to para. 3c.

4d. ASSEMBLY

(a) Press new bushes (1-20) into the idler.

(b) Position the idler bracket so that the shaft is vertical.

(c) Install the seal assembly. The rubber ring with the protruding lip (2-14) must fit in the idler recess.

(d) Install the idler on the shaft ensuring that the seal outer rubber is correctly seated in the bracket.

(e) Fit the inner thrust washer (3-19) thrust bearing (2-19) and outer thrust washer (1-19).

(f) Apply a thin film of Loctite 241 to the threads of the bolt (4-18), install the retainer plate (5-18), bolt (4-18) and tighten to 16 to 18 kgm (115 to 130 lbft).

(g) Fit a new gasket (2-18) and install the end cap (1-18). Note the position of the filler bolt hole.

(h) Test the assembly as detailed in para. 4f.

4e. INSTALLATION

(a) Position the idler assembly to the loader frame and secure with the bolts (1-17).

(b) Position the filler hole on the horizontal centre line then add SAE 30 Series III non EP additive oil until the oil overflows from the filler hole. Install the filler bolt and its dowty washer.

(c) Remove the track chain supports and adjust the track chain tension referring to the Operator's Manual.

4f. TESTING

(a) Adapt an air line and pressure gauge into the oil filler hole then immerse the assembly into a container of 'Genklene' cold cleaning solvent or its equivalent as shown in Fig. 21.

(b) Pressurize the assembly to 0.7 kg/cm^2 (10 lb/in^2) and maintain this pressure for at least 30 seconds and check for air leaks.

(c) Seals which show signs of leaks must be re-assembled or changed.

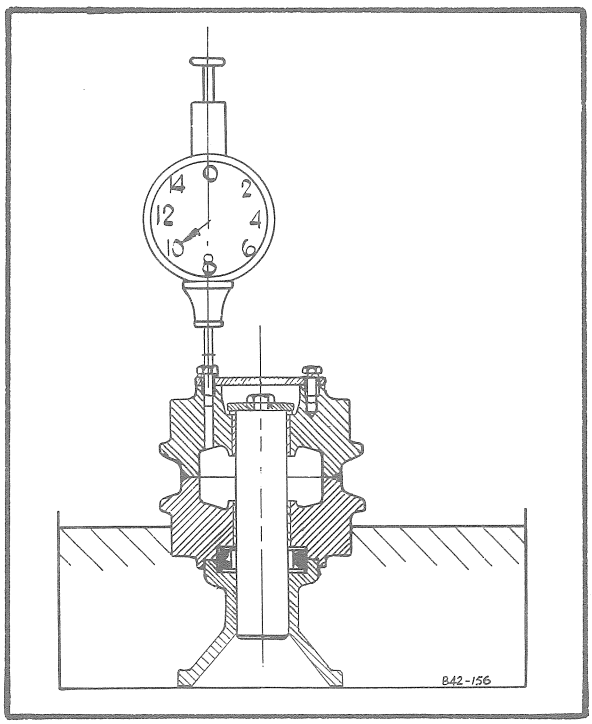


Fig. 21

5. TRACK ROLLERS

5a. REMOVAL

(a) Remove all tension from the track referring to the Operator's Manual.

(b) Jack up the loader then position blocks, not less than 152 mm (6 in) high, centrally under the sprocket and the front idler so that all the slackness in the chain is concentrated at the bottom.

(c) Remove the bolts (1-22). Remove the spacer bolt nut (2-22) and the nut and bolt (3-22) then lift out the sprocket guard.

(d) Remove the spacer bolt nuts (4-22). Remove the bolts (5-22) and remove the Track roller outer shield.

(e) Remove the spacer tubes and bolts then remove the bolts which secure the sprocket inner guard and track roller inner shield to the track frame.

(f) Support the roller then remove the bolts (6-22) at each side of the roller to free the roller from the track frame.

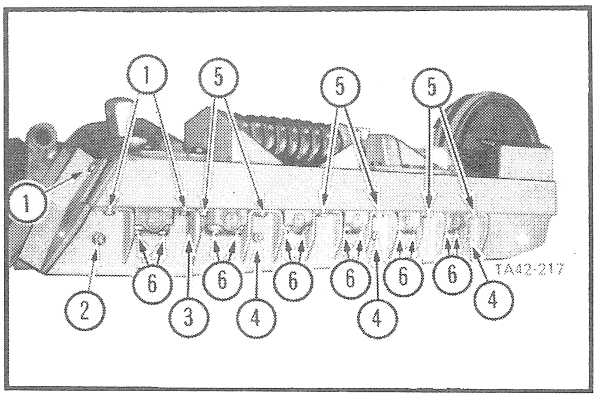


Fig. 22

5b. DISMANTLING

(a) Drive the roll pins (1-23) from the roller brackets and shafts and remove the brackets (2-23).

(b) Remove and discard the 'O' rings (2-24) from each bracket.

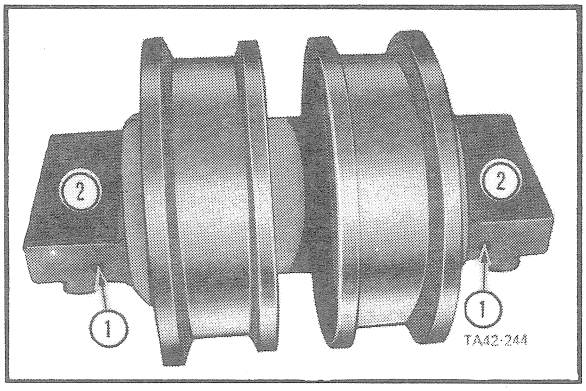


Fig. 23

(c) Remove the thrust washers (3-24) and withdraw the shaft (4-24).

(d) Remove the components of the seal assemblies (1-24) and discard the rubber rings.

(e) If inspection proves it necessary press the bushes (5-24) from the roller.

5c. INSPECTION AND REPAIR

(a) Inspect the shaft and bushes for excessive wear.

(b) Inspect the seal assemblies referring to para. 3c.

5d. ASSEMBLY

(a) If these were removed press new bushes (5-24) into the roller.

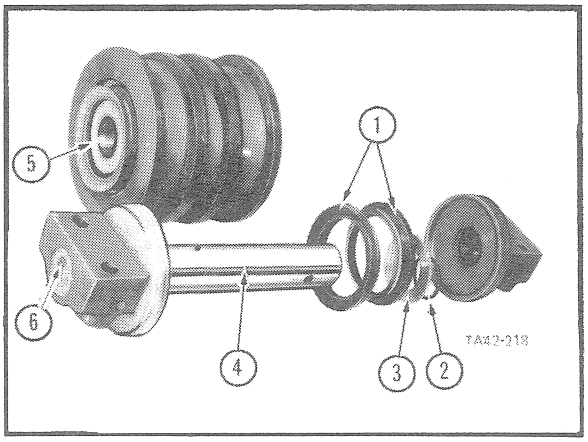


Fig. 24

(b) Install the oil seal assemblies. The rubber with the projecting lip (2-14) must fit into the roller recess.

(c) Install new 'O' rings (2-24) in the recesses of the brackets.

(d) Position the bracket on the shaft ensuring that the lubrication hole (6-24) is adjacent to the bracket mounting face then drive in the roll pin (1-23). Peen over the material of the bracket hole.

(e) Stand the roller upright, position a thrust washer then thread the shaft through the thrust washer into the roller and correctly locate the seal rubber in the bracket.

(f) Invert the assembly, thread on the other thrust washer and bracket ensuring that the seal rubber is correctly seated in the bracket and that the bracket mounting faces are in the same plane, then drive in the roll pin. It may be necessary to compress the seals to align the roll pin holes. Peen over the material at the bracket hole.

(g) Test the roller as detailed in para. 5f.

5e. INSTALLATION

NOTE: Counting from the front, double flanged rollers are located at the number 1, 3 and 6 positions and single flanged rollers at the number 2, 4 and 5 positions.

(a) Thoroughly clean the track roller mounting faces on the track frame.

(b) Position the track roller on the track frame with the filler plug to the outside and secure with the bolts (6-22).

(c) Install the track roller inner shield and sprocket guard.

(d) Position the spacer bolts in the inner shield and sprocket guard then thread on the spacer tubes.

(e) Install the outer section of the roller shield and sprocket guard. Secure these with the bolts (1 & 5-22) and nut and bolt (3-22).

(f) Push through the spacer bolts, install the nuts (2 & 4-22) and tighten to 11.8 to 13.1 kgm (85 to 95 lbft).

(g) Using a lubricator tube 7.14 mm (0.281 in) outside diameter and 159 mm (6.25 in) in length, inject SAE 30 Series III non EP additive oil until oil freely flows along the outside of the lubricator tube.

(h) Remove the lubricator tube, apply thread sealing tape to the pipe plug then, when oil has stopped flowing from the filler plug hole, install the pipe plug and tighten to 2.1 to 2.75 kgm (15 to 20 lbft).

(i) Remove the blocks from under the track then adjust the track tension referring to the Operator's Manual.

5f. TESTING

(a) Adapt a pressure gauge and air line into the filler plug hole then immerse the assembly into a container of 'Genklene' cold cleaning solvent as shown in Fig. 25.

(b) Pressurize the assembly to 0.07 kg/cm^2 (10 lb/in^2) for 30 seconds.

(c) Change seals which show signs of leaks.

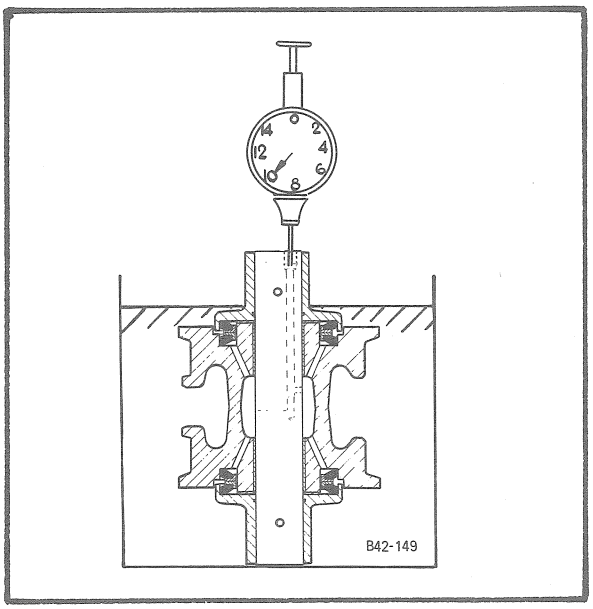


Fig. 25

6. HYDRAULIC TRACK ADJUSTER

6a. REMOVAL

(a) Remove the front idler as detailed in para. 3a.

(b) Remove the bolts which secure the track adjuster to the front idler guides.

6b. DISMANTLING

(a) Withdraw the piston rod (12-26) from the cylinder.

(b) Remove the scraper seal (7-26) and 'O' ring (16-26).

(c) Screw the check and relief valves (2 & 4-26) from the cylinder.

(d) Draw the piston (11-26) and seal assembly (8-26) from the cylinder. The piston (11-26) is tapped 5/16 UNF for removal purposes.

(e) Remove the seal keeper ring (9-26) and seal (10-26) from the piston.

6c. ASSEMBLY

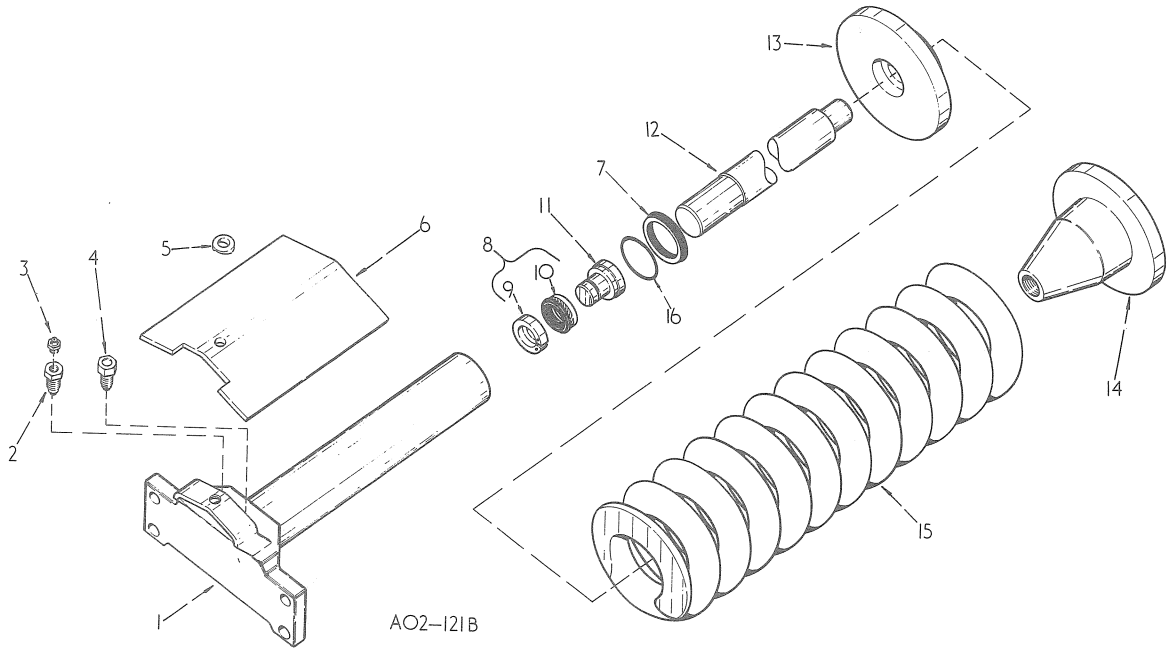
(a) Fit the seal (10-26) to the piston (11-26) and secure with the keeper ring (9-26).

(b) Screw the check and relief valve onto their seats and unscrew them two full turns.

(c) Insert a quantity of grease into the cylinder then push in the piston assembly until grease discharges from the bleed holes in the front cross plate. Tighten the check and relief valves.

(d) Install the 'O' ring (16-26) and scraper seal (7-26) in the grooves at the open end of the cylinder.

(e) Liberally grease the longer reduced section of the piston rod (12-26) then carefully insert this end into the cylinder.



1. Cylinder assembly
2. Check valve
3. Lubricator
4. Relief valve
5. Spacer washer
6. Track adjuster cover
7. Wyclip scraper seal
8. Seal assembly
9. Keeper ring
10. Seal
11. Piston
12. Piston rod
13. Spring front seat
14. Spring rear seat
15. Track spring
16. 'O' ring.

Fig. 26

6d. INSTALLATION

(a) The front idler shaft is offset in the guides. Position the guides so that the shaft is in the lower half of the guides then secure the track adjuster to the guides.

(b) Lubricate the parts of the piston rod in contact with the cylinder and front spring seat with a suitable anti-sieze compound.

(c) Install the front idler and track adjuster referring to para. 3e.

7. TRACK SPRING
7a. REMOVAL

(a) Remove the front idler referring to para. 3a but ensure that the track chain is clear of the track frame guards.

(b) Remove both sections of the track frame guard.

(c) Lubricate the threads in the spring rear seat (14-26) and the thread of the compression bolt IH 7391 with a suitable anti-sieze compound.

(d) Fit the thrust washer to the bolt then thread the bolt throught the spring and screw into the rear seat.

(e) Tighten the bolt to compress the spring (15-26) until the assembly can be removed from the track frame.

(f) Using a press, compress the spring assembly just sufficient to allow removal of the compression bolt.

(g) Release the load and remove the spring seats and spring.

NOTE: The free length of the track spring and seats is approximately 584 mm (23 in). Ensure that this length can be accomodated on the press.

7b. INSTALLATION

(a) Apply a suitable anti-sieze compound to the compression bolt threads and to the threads in the spring rear seat (14-26).

(b) Position the front seat (13-26) on the press bed so that the compression bolt can be passed through it. Position the spring and rear seat on the front seat.

(c) Compress the assembly, ensure that the thrust washer is on the compression bolt, then screw in the bolt until the length over the spring seats is 457 mm (18 in).

(d) Release the press load.

(e) Position the assembly in the track frame ensuring that the rear seat is located in the rear plate to prevent turning as the compression bolt is removed.

(f) Remove the compression bolt and thrust washer.

(g) Install the track frame guards.

(h) Install the front idler referring to para. 3e.

8. TRACK FRAMES
8a. REMOVAL

(a) Disconnect the track chain then drive the loader rearward until the track chain is flat on the ground.

(b) Remove the front idler.

(c) Remove the track frame guards.

(d) Raise the machine until the track frame is clear of the track then position supports under the loader frame mounting points.

(e) Jack under the rear frame and just take the weight.

(f) Remove the bolt and spacer (5-27) then withdraw the flag pin (4-27). Block under the mainframe or alternatively pack between the mainframe and rear crossbar then remove the trolley jack.

(g) Securely sling the track frame and remove

the bolts securing the front and rear crossbars.

(h) Manoeuvre the track frame clear of the machine.

8b. DISMANTLING

(a) Remove the track spring referring to para. 7a.

(b) If inspection proves it necessary remove the pivot bush (3-27)

(c) Invert the track frame and remove the inner and outer sprocket guards.

(d) Remove the spacer bolt nuts (4-22), remove the bolts (5-22) and lift off the outer shield.

(e) Remove the inner shield.

(f) Remove the bolts (6-22) on each side of the rollers and lift out the rollers.

8c. ASSEMBLY

(a) Install the track rollers so that the first, third and sixth rollers are double flanged and the second, fourth and fifth are single flanged. Ensure that the filler plugs are to the outside. Install and tighten the bolts (6-22).

(b) Position and secure the track roller inner shield.

(c) Insert the spacer bolts and thread on the spacer tubes.

(d) Position the outer shield and secure with the bolts (5-22). Thread the spacer bolts through the outer shield and tighten the nuts (4-22).

(e) Install the sprocket inner and outer guards.

(f) Turn the track frame and install the track spring referring to para. 7b.

(g) If this was removed press in a new pivot bush (3-27).

8d. INSTALLATION

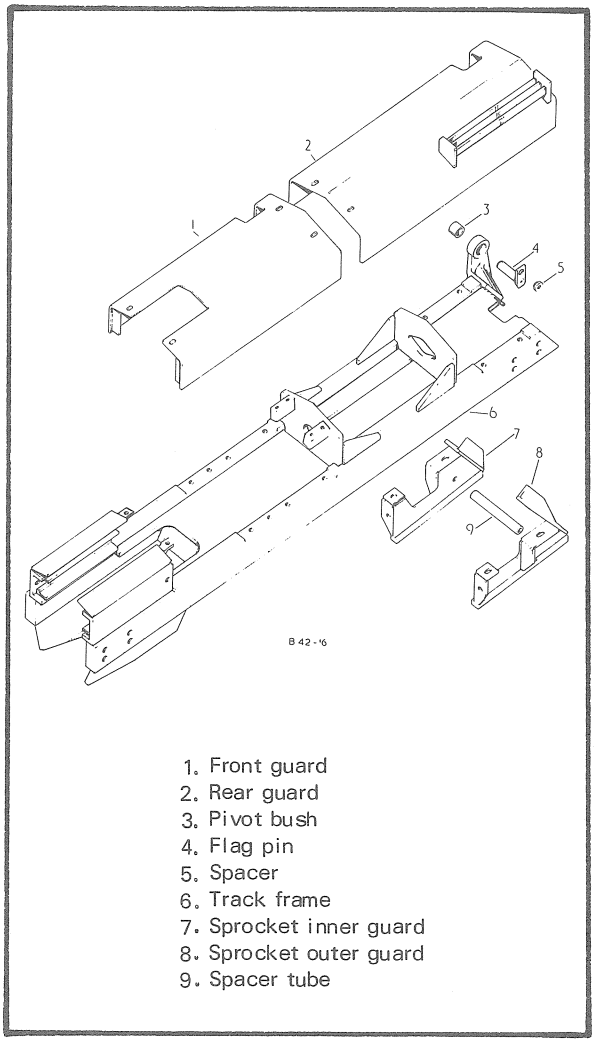
(a) Position the track frame assembly and align the rear pivot. Install the flag pin (4-27), spacer washer (5-27) and bolt.

(b) Remove the mainframe support.

(c) Align the front and rear crossbars and tighten the bolts to 90 to 100 kgm (650 to 730 lbft).

(d) Lower the machine on to the tracks.

(e) Install the front idler referring to para. 3e.



1. Front guard
2. Rear guard
3. Pivot bush
4. Flag pin
5. Spacer
6. Track frame
7. Sprocket inner guard
8. Sprocket outer guard
9. Spacer tube

Fig. 27

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

HYDRAULICS

GROUP 14

CONTENTS	PAGE NUMBERS						
	REMOVAL	DISMANTLING	INSPECTION & REPAIR	ASSEMBLY	INSTALLATION	TESTING	ADJUSTMENTS
HYDRAULIC RESERVOIR	7	7	8	8	9	–	–
HYDRAULIC PUMP	9	9	11	11	12	12	–
UNLOADING VALVE	12	13	–	13	14	–	14
CONTROL VALVE	14	14	18	18	20	–	20
LIFT CYLINDERS	21	22	22	23	23	–	–
TILT CYLINDERS	23	24	24	24	24	–	–
CLAM CYLINDERS	24	24	24	24	25	–	–

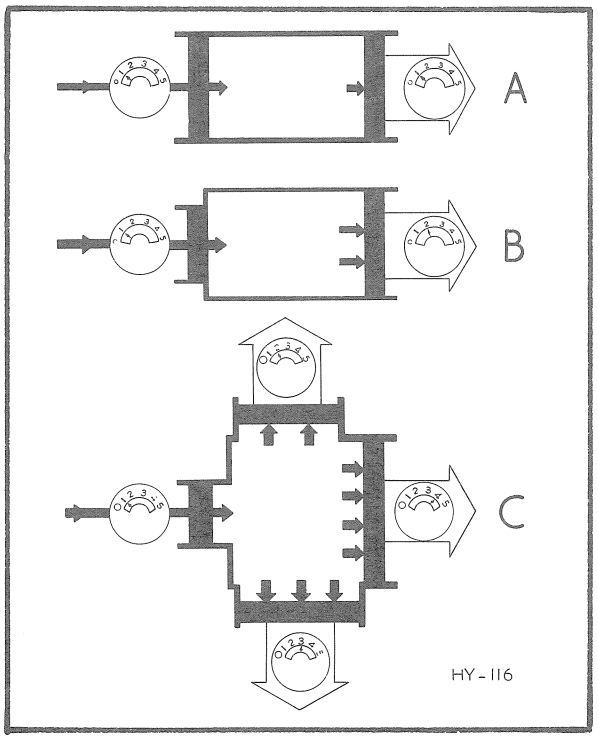
1. INTRODUCTION

1a. GENERAL

Hydraulics may be defined as the science of fluid forces. The fundamental law on which machine hydraulics is based is that the pressure at any point in a static liquid is the same in all directions and acts with equal force on equal areas. This is known as 'Pascal's Law'.

As liquids are almost incompressible the application of this law means that mechanical forces can be transmitted, multiplied or controlled by means of liquid under pressure.

Fig. 1 shows the application of 'Pascal's Law'. Each arrow representing one square unit of piston area.



A - Pistons of equal area - output force equals input force

B - Output piston increased - output force increased

C - Multiple pistons - output force proportional to piston areas.

Fig. 1

'Pascal's Law' explains the ability of confined liquids to multiply forces. If, for example the pressure in a closed system is 100 units of force per unit area, then this pressure will exert 500 units of force on a piston area of 5 square units. Thus a small force may be multiplied into a greatly increased work force.

Hydraulics offer a simple method of applying large forces with a flexibility of control that is almost limitless. Hydraulic equipment is so versatile that it can be easily adapted to provide multiples of independant but co-ordinated motions of force which would be economically impossible by mechanical means.

1b. PHENOMENA

There are certain scientific facts which are responsible for some of the breakdowns in hydraulic systems that are difficult to discover or explain.

(a) SIMPLE THERMAL EXPANSION

This is one of the two basic reasons for the bursting of hoses, pipes or cylinders in a system not in use and is caused by oil expanding in the system due to a change in outside temperature.

Depending on many variable conditions a one degree rise in outside temperature may cause an increase of as much as 4.2 kg/cm^2 (60 lb/in^2) in a tightly closed system. Unless there is some external leakage or unless there is a thermal relief valve installed some part of the system is likely to burst.

The possibility of this kind of failure can be diminished if the operator ensures that the pressure in the 'blocked off' system is reduced to a minimum by leaving the equipment in the down position when parked.

(b) INTERNAL LEAKAGE PAST THE PISTON

This is the second of the two basic reasons for the bursting of hoses, pipes or cylinders in a system not in use.

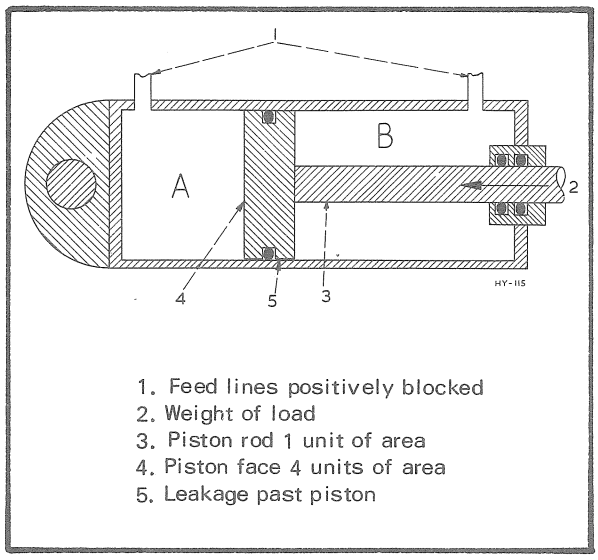


Fig. 2

Referring to Fig. 2 assume that with no internal leakage a pressure (A-2) of 1000 units of force per unit area is required to support the load. The pressure (B-2) is at return line or zero pressure. As the piston face has an area of 4 units, then 4000 units of force are required to support the load. If internal leakage takes place pressure will transfer past the piston until a hydraulic balance is achieved between both faces of the piston with little or no movement of the piston in the cylinder. Because of the hydraulic balance across the piston the area of the piston rod is all that is available to support the load.

Thus it can be seen that the 4000 units of force required to support the load are acting on only the 1 unit of area of the piston rod. This is a simple application of 'Pascal's Law'.

It is obvious that such a pressure increase may well exceed the designed maximum pressure of the system in which case a hose or cylinder may burst or external seals be blown.

A thermal relief valve will often prevent this. The best way, however, is to ALWAYS leave the equipment in the down position when parked.

(c) COLLAPSED SUCTION HOSE

When a suction hose starts to deteriorate it is possible that the inner skin will collapse inward without any outward signs.

This collapse results in restriction to or complete blockage of the oil to the pump. A noisy pump, low pressure, spongy action or no action at all are all possible indications of a collapsed suction hose.

(d) EFFECT OF HAMMER IN THE SYSTEM

Fluid hammer will take place in any system involving moving fluid when the fluid flow is suddenly stopped.

It is overcome in hydraulic systems by valve design but may become apparent if the system is operated at higher than the specified pressure.

When hammer becomes apparent an investigation should immediately be made to determine the cause as, if allowed to continue, rupture of parts may take place through metal fatigue.

1c. SERVICING

It is essential that all servicing of hydraulic components be undertaken in clean conditions. Before dismantling a unit the outside must be thoroughly cleaned. If steam is used ensure that all ports are securely capped, plugged or taped.

After dismantled components are cleaned they should be smeared with oil and stored in a clean dust free location, preferably wrapped in greaseproof paper.

Care must be taken that any cloth used to wipe parts is lint free. Lint, left adhering to threads or rough castings, can lodge under valves or block filters. Whenever possible parts should be blown dry using compressed air.

After assembly all ports should be capped, plugged or taped. Do not uncover the ports until the unit is installed on the machine and the hose or pipe connections are ready to be made.

All components should be lubricated during assembly. This lubrication, particularly in the case of oil seals and 'O' rings makes for ease of assembly and reduces the possibility of damage during assembly and when starting up.

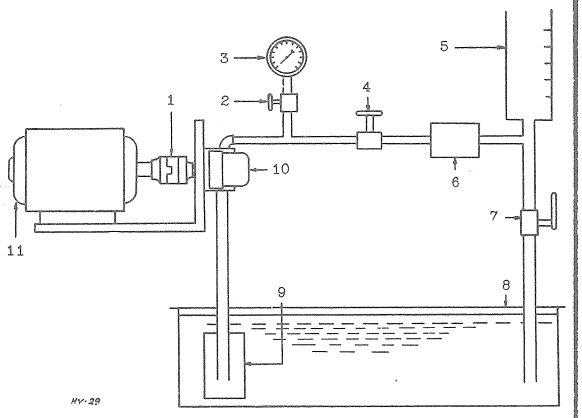
1d. TESTING

Detailed instructions for testing the various hydraulic units are given in the test appropriate to that unit.

After installation of a unit to the machine a functional test must be carried out and a close inspection made for leaks. Relief valve settings can be checked using a pressure gauge in the pressure line.

(a) TEST EQUIPMENT

All pressure gauges should be good quality instruments of the Bourdon tube type and with a good safety margin over the pressures listed for the system.

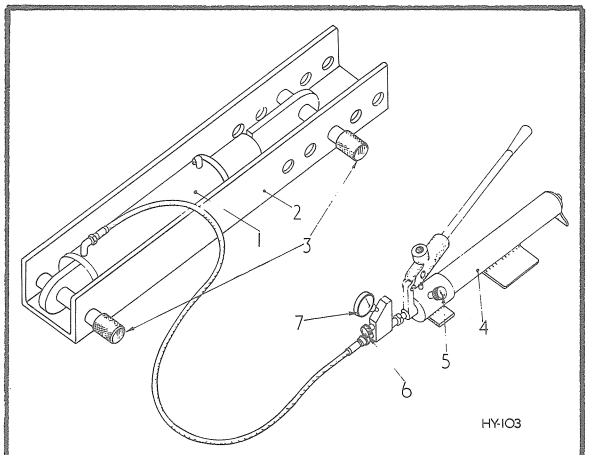


1. Oldham type coupling
2. Gauge restrictor
3. Pressure gauge
4. Pressure control valve
5. Measuring vessel
6. Pressure filter
7. Quick release valve
8. Oil reservoir
9. Suction strainer
10. Pump under test
11. Constant speed reversible motor

Fig. 3

Pumps should be tested on a test rig, see Fig. 3.

If no test rig is available, a functional test may be made on the machine but this would be only a general indication of the efficiency of the pump.



1. Cylinder under test
2. Frame or channel
3. Mounting pins
4. Hand pump
5. Pressure relief valve
6. Gauge isolating valve
7. Pressure gauge

Fig. 4

Leakage tests on cylinders and valves may be made using a simple hand pump, see Fig. 4. When this type of pump is used it is essential that sufficient oil is available either from an auxiliary reservoir or by pre-filling the component under test; air in the system will give false readings.

Relief valves may be tested for leakage by means of a hand pump but they must be set either on the machine or on a test rig capable of a delivery approximating to that of the equipment system.

(b) INITIAL TEST

Fault diagnosis will, in many cases, be assisted if the serviceman can perform a functional test of the machine before the system is disturbed.

With a suitable gauge tapped into an appropriate pressure line check the maximum pressure. If this is below specified relief valve setting check that the relief valve is correctly set.

If adjustment of the relief valve will not give the correct pressure it may be assumed that the pump is faulty.

If the correct pressure is obtained in the above tests, check the speed of operation and compare the results with the figures quoted in specifications.

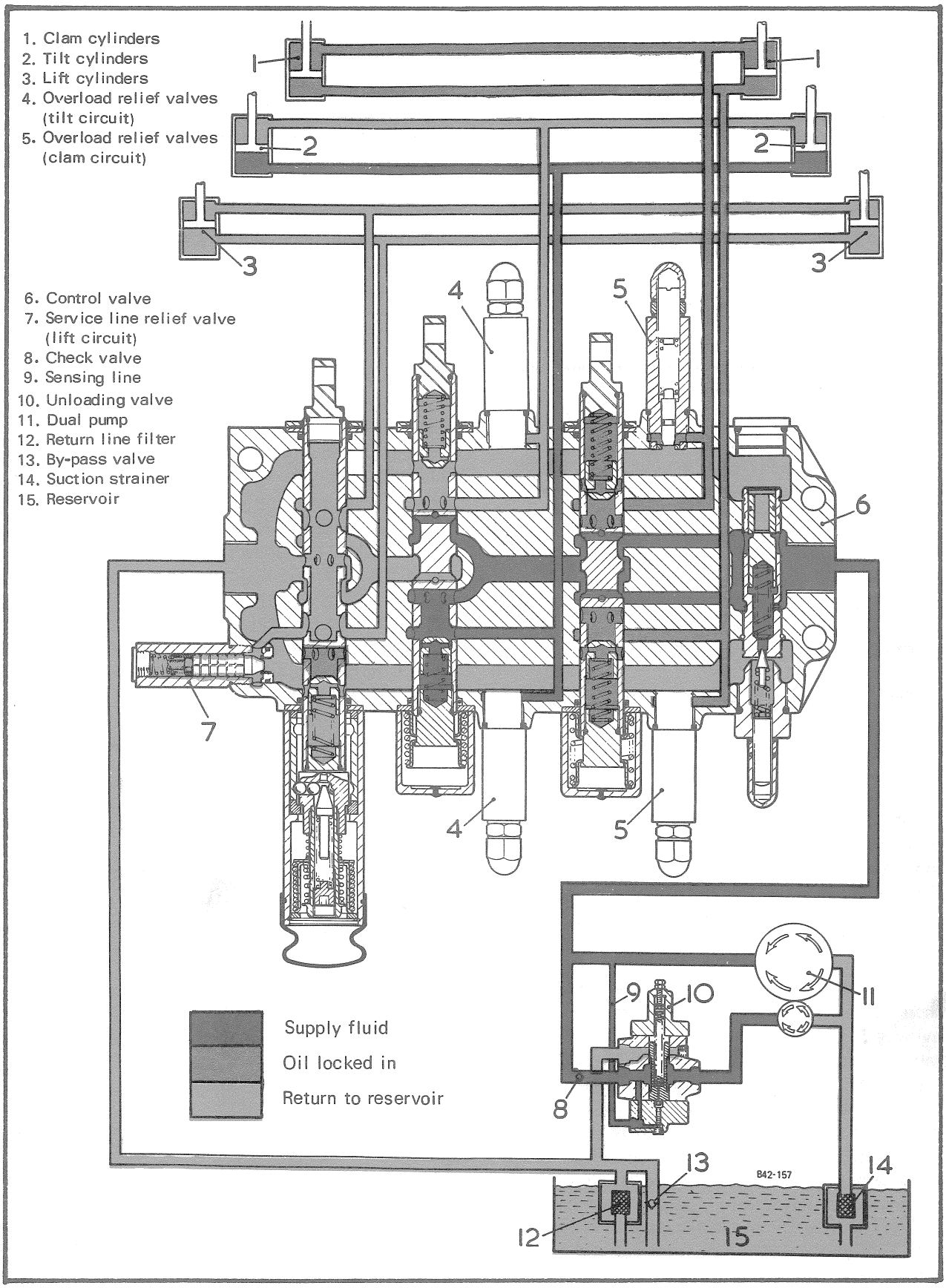

1. Clam cylinders
2. Tilt cylinders
3. Lift cylinders
4. Overload relief valves (tilt circuit)
5. Overload relief valves (clam circuit)
6. Control valve
7. Service line relief valve (lift circuit)
8. Check valve
9. Sensing line
10. Unloading valve
11. Dual pump
12. Return line filter
13. By-pass valve
14. Suction strainer
15. Reservoir
Supply fluid
Oil locked in
Return to reservoir
B42-157

Fig. 5

If the system will not operate or if the speed of operation is below the specified figure it may be assumed that the pump output is low taking into account the age of the machine and the general history of maintenance.

With the system suitably loaded and the valve in neutral check the rate of fall of the cylinder. It should be noted that this test does not isolate any particular fault but rapid fall indicates a leak in either the control valve or the cylinder seals.

(c) UNIT TEST

After removing the units from the machine and before dismantling they should be cleaned and visually inspected. If no damage is obvious they should be tested as detailed in this group. The results of these tests should indicate the need for dismantling and repair. They will also act as a guide to establishing the effectiveness of repairs.

2. EQUIPMENT HYDRAULICS

2a. DESCRIPTION

The equipment hydraulic system consists of a reservoir with suction strainer and return line filter, a dual hydraulic pump, unloading valve, control valve and the cylinders necessary to perform the various functions of the bucket and lift arms. Fig. 5 is a schematic diagram of the equipment hydraulic system with the bucket shown being rolled back under pressure, the clam cylinders in HOLD and the lift cylinders in FLOAT.

2b. RESERVOIR

The hydraulic reservoir forms an integral structural member with the fuel tank. Fluid leaving the reservoir passes through a suction strainer on its way to the pump. Fluid returning to the reservoir passes through a changeable element filter. A by-pass relief valve ensures an adequate oil flow if the return line filter becomes contaminated. Both the strainer and filter are housed within the reservoir. Also fitted to the reservoir are a check valve, access hole cover, magnetic drain plug and filler plug. A transparent tube on the side of the reservoir indicates the fluid level.

2c. HYDRAULIC PUMP

This is a gear type dual element pump which provides the necessary flow and pressure to operate the hydraulic cylinders and is driven directly from the engine crankshaft. Both elements supply the circuit until, at a predetermined pressure, the small element is unloaded. This releases more engine power to traction without impairing the function of the hydraulic system.

2d. UNLOADING VALVE

The unloading valve is fitted in the circuit before the small element pump supply joins the large element pump supply. The flow (4-6) from the small element passes across the spool (3-6), through a check valve (8-5) then joins the large element supply to feed the circuit. A circuit pressure sensing line (9-5) connects to the valve at the port (6-6). The operating pressure of the valve is set by the adjusting screw (1-6). The spool is held in the flow position by the spring (2-6). Pressure in the circuit is felt in the sensing line and is acting on the piston (5-6). At a predetermined setting this pressure lifts the piston which in turn lifts the spool (3-6) to connect the flow (4-6) to the return port (7-6) thereby dumping the small element supply.

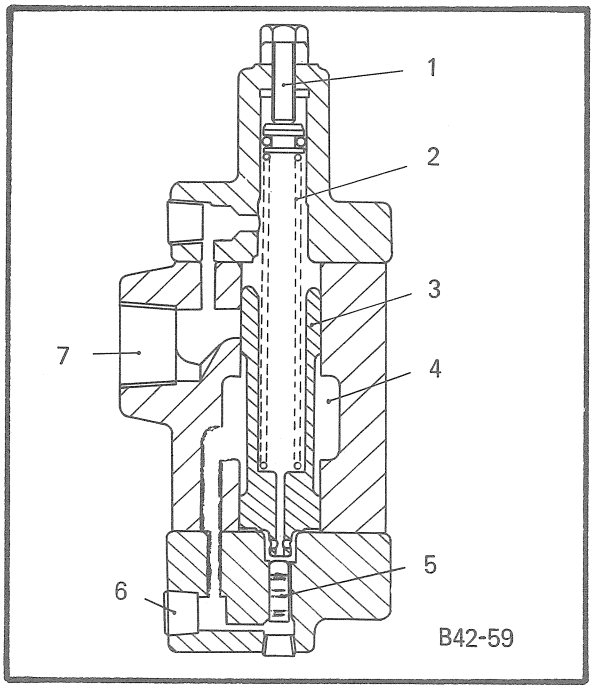


Fig. 6

2e. CONTROL VALVE

The valve has three spools, one for operating the lift cylinders, one for the tilt cylinders and one to operate the 4-in-1 bucket or auxiliary rear mounted equipment. When a standard bucket and no auxiliary equipment is fitted the control linkage for this spool is omitted. The control valve also houses the main relief valve and overload relief valves. A high pressure carryover tapping into the reservoir gallery is also provided. Drillings in the spools allow the spool centres to be used as oil galleries. Check valves are fitted in the detent end of the lift spool and both ends of the other two spools.

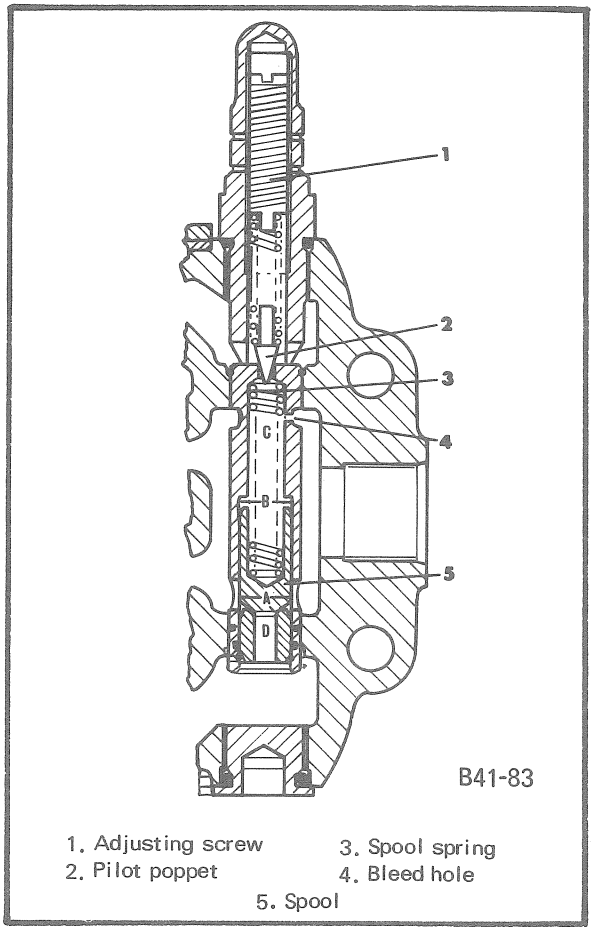
In the neutral or HOLD position oil to and from the cylinders is stopped by the spool. This 'locked-in' oil will hold the cylinders in the last selected position and oil from the pump will flow into the reservoir gallery. Movement of the spool in either direction from the neutral position directs the oil flow to one side of a cylinder and at the same time directs the return from the other side of the cylinder to the reservoir gallery.

In addition to the LIFT, LOWER AND HOLD positions, the lift spool is provided with a FLOAT position. When FLOAT is selected both sides of the cylinder are connected to each other and to the reservoir gallery through the spool centre so that the lift arms are free from any hydraulic restraint. A detent mechanism is also built onto the lift spool so that when LIFT OR FLOAT is selected the spool will remain in the selected position until manually released. The check valves in the spools prevent the load from moving, when a selection is made, until the pump has built up sufficient pressure to overcome the spring force and back pressure from the load which together are holding the check valve on its seat.

2f. MAIN RELIEF VALVE

This is of the pressure differential type and is designed to allow excess pressure in the system to be returned to reservoir. Adjustment of the valve is by the screw (1-7) which changes the tension on the pilot poppet spring.

Both ends of the main relief valve spool (5-7) are exposed to system pressure which acts directly on areas A and B. Because the area A is smaller than the area B by the area of the port



1. Adjusting screw
2. Pilot poppet
3. Spool spring
4. Bleed hole
5. Spool

Fig. 7

D, the spool is hydraulically unbalanced in the direction of its seat.

The pressure acting on area B enters the cavity C by way of a small bleed hole (4-7), which is further reduced in size by the leg of a spring clip, and is prevented from escaping by the pilot poppet (2-7). As the system pressure increases, the spool seating force increases until, at the preset figure, the pilot poppet is lifted from its seat. Pressure escapes from cavity C so that the force acting on area A is now sufficient to lift the spool from its seat and provide a large opening for oil to escape into the reservoir gallery. When the relief flow has reduced the system pressure below the pre-set figure, the pilot poppet reseats so that the pressure builds up in cavity C until the spool is again hydraulically unbalanced and returns to its seat.

The spool spring (3-7) as well as assisting the hydraulic force seating the spool will ensure that the pressure necessary to reseat the spool against the relief flow is kept to a minimum.

2g. OVERLOAD OR SERVICE LINE RELIEF VALVES

Mechanical retraction or extension of the cylinders while the control levers are in neutral will create a build up in pressure in the system. This can occur when the bucket strikes a solid object. Since the main relief valve is isolated from the cylinders, excess pressure is vented to the reservoir galleries via the overload relief valves (4 & 5-5) or pilot operated service line relief valve (7-5).

2h. CYLINDERS

All cylinders are double acting which means that pressure can be directed to either side of the piston to provide powered linear motion in either direction.

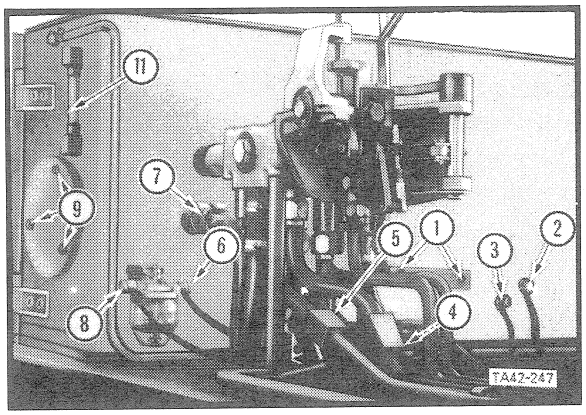


Fig. 9

3. HYDRAULIC RESERVOIR

3a. REMOVAL

(a) Remove the drain plug (1-8) and drain off the hydraulic fluid.

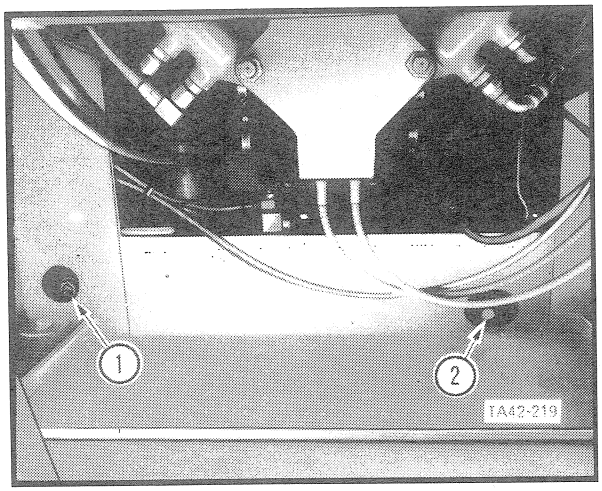


Fig. 8

(b) Remove the banjo bolt (2-8) and allow the fuel to drain.

(c) Lift off the rear doors.

(d) Remove the rear cover (2-2 GROUP 2) then remove the bolts and bars (80-12 GROUP 2).

(e) Disconnect the fuel reserve transmitter (2-9), the spill return (3-9), suction hose (5-9), return hose (7-9) and fuel supply tube (6-9).

(f) Remove the bolts (1-9) from the rear of the heater mounting bracket.

(g) Suitably sling the reservoir then remove the bolts (1-10) and lift the assembly from the machine.

3b. DISMANTLING

(a) Disconnect the fuel tube (8-9) then remove the bolts to free the water trap.

(b) Slacken the hose clip, remove the spill hose then screw out the check valve (10-9).

(c) Slacken the bolts (9-9) which secure the access cover. This cover is under spring tension. Press in the cover, remove the bolts then carefully release the spring tension and lift off the cover. Discard the 'O' ring.

Fig. 10

(d) Withdraw and discard the return line filter element.

(e) Withdraw the suction strainer and discard the 'O' ring.

(f) Screw off the relief valve cap, remove the spring and plunger then screw out the relief valve seat.

(g) To remove the sight tube (11-9) ease the collars out of the blocks at either end then remove the tube and discard the 'O' rings.

(h) Screw the fuel tap (4-9) from the tank.

(i) To remove the fuel level sight tube slacken the hose clips at either end.

3c. INSPECTION AND REPAIR

(a) Inspect the check valve ball seat for wear or damage.

(b) Inspect the relief valve plunger and seat for wear or damage.

(c) Thoroughly clean the suction strainer and ensure that there are no breaks in the gauze.

(d) Inspect the tank for cracked welds or damage.

(e) Pressure test the fuel side. This must withstand 0.35 kg/cm^2 (5 lb/in^2) for at least five minutes without leaking.

(f) Pressure test the hydraulic side. This must withstand 0.21 kg/cm^2 (3 lb/in^2) for at least five minutes without leaking.

3d. ASSEMBLY

(a) To install the fuel level sight tube, thread the hose clips onto the tube, position the tube on each elbow then tighten the hose clips.

(b) Apply Loctite 225 to the threads then screw in the fuel tap (4-9).

(c) To install the hydraulic level sight tube (11-9), thread the collars onto the tube, apply a thin film of hydraulic fluid to the bore at each end, position an 'O' ring on each elbow then install the tube ensuring that the 'O' rings are just nipped by the tube. Slide the collars into position so that they pass over the 'O' rings and touch the ends of the recesses. Ensure that the 'O' rings are not trapped between the ends of the collars and the ends of the recesses.

(d) Screw in the relief valve seat, install the plunger and spring then screw on the relief valve cap.

(e) Install a new 'O' ring on the suction strainer then install the strainer.

(f) Install a new return line filter element.

(g) Position a new 'O' ring on the access cover, position the cover over the return line filter element, line up the bolt holes then push in the cover against the spring pressure and install the bolts (9-9).

(h) Screw in the check valve (10-9) so that the spill hose pipe is pointing forward then install the spill hose and tighten the hose clip.

(i) Secure the water trap to the mounting bracket then connect the fuel tube (8-9).

(j) Install the drain plug (1-8) and the fuel tube banjo bolt (2-8).

3e. INSTALLATION

(a) Lift the reservoir into position and locate with the bolts (1-10) finger tight.

(b) Install the heater mounting bracket bolts (1-9) finger tight.

(c) Install the bars (80-12 GROUP 2) and tighten the bolts. Tighten the bolts (1-9) and the bolts (1-10).

(d) Connect the fuel supply tube (6-9), suction hose (5-9), return hose (7-9), spill return (3-9) and fuel reserve transmitter (2-9).

(e) Install the rear cover (2-2 GROUP 2).

(f) Install the rear doors.

(g) Fill the fuel tank and hydraulic reservoir.

4. HYDRAULIC PUMP

4a. REMOVAL

(a) Raise the lift arms and install the safety bar. Stop the engine then slowly allow the lift arms to lower onto the safety bar.

(b) Drain the hydraulic reservoir at the drain plug (1-8).

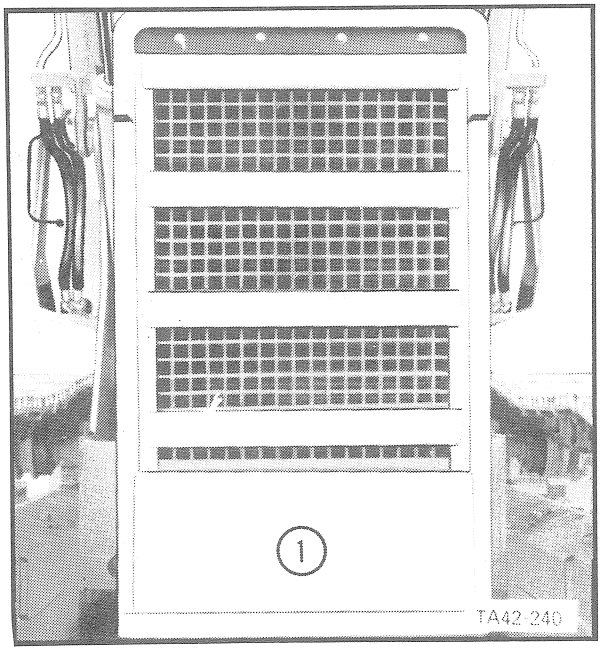


Fig. 11

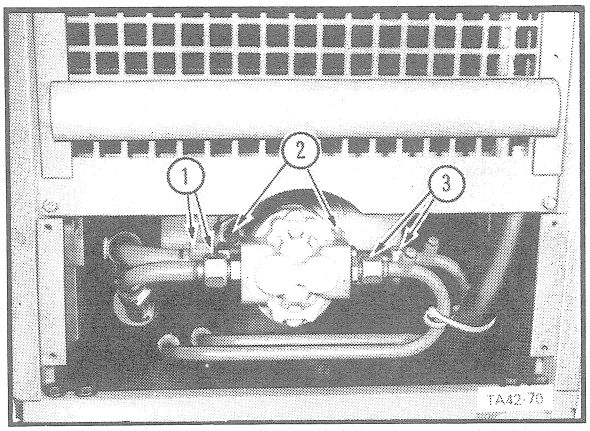


Fig. 12

(c) Remove the front plate (1-11).

(d) Disconnect the suction pipes (1-12) anc pressure pipes (3-12).

(e) Remove the bolts (2-12) then withdraw the pump complete with front section of the coupling.

4b. DISMANTLING

(a) Remove the nut and withdraw the front section of the coupling (3-13). Remove the spacer (2-13) and key.

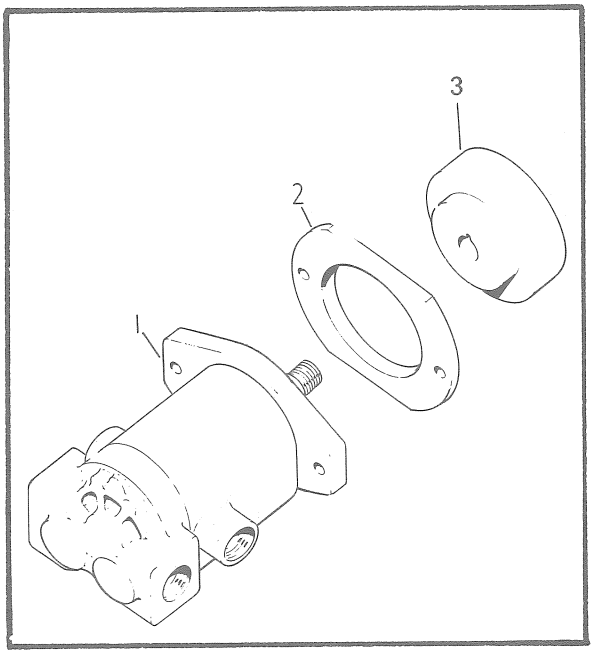


Fig. 13

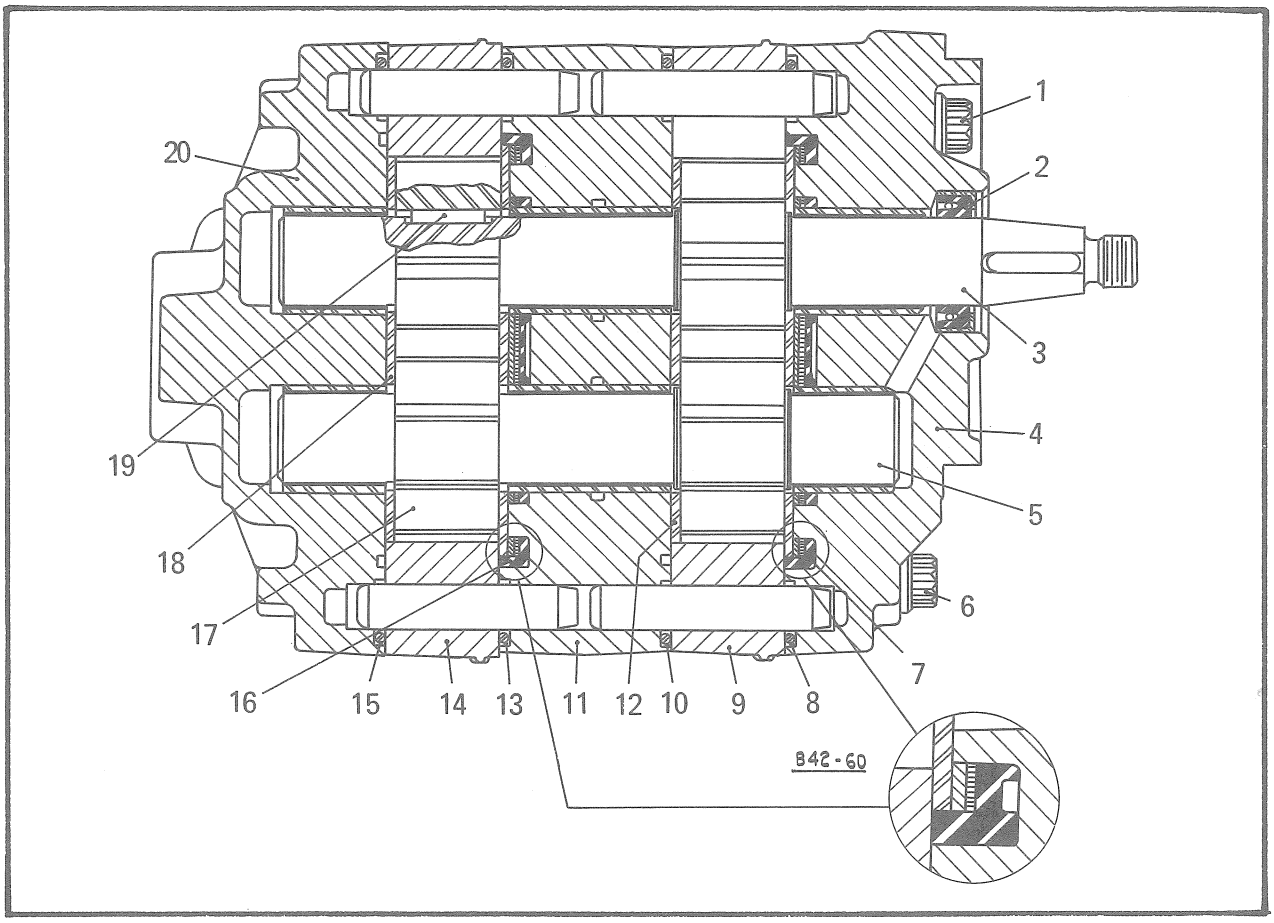


Fig. 14

(b) Remove the bolts (1 & 6-14).

(c) Separate the front plate (4-14) from the body. A few gentle taps with a soft hammer may be necessary to free the plate from the dowels. Remove and discard the shaft seal (2-14).

(d) Remove the 'O' ring (1-15) from the recess in the front plate.

(e) Prise out the diaphragm (5-15) then lift out the back-up gasket (4-15) and protector gasket (3-15). Prise out the diaphragm seal (2-15) then remove the spring (6-15) and ball beneath.

(f) Remove the front body (9-14).

(g) Separate the back plate (20-14) from the body. A few gentle taps with a soft hammer may be necessary to free the plate from the dowels.

(h) Remove and discard the 'O' ring (15-14). Remove the thrust plate (18-14).

(i) Remove the rear body (14-14).

(j) Press the idler gear assembly (5-14) out of the rear idler gear (17-14).

(k) Remove the rear drive gear from the key (19-14) remove the key from the shaft then withdraw the drive gear assembly (3-14).

(l) Remove the thrust plate (12-14).

(m) From the rear of the adaptor plate (11-14) remove the rear seal assembly (16-14) in the same manner as the front seal assembly (7-14) was removed in operation (e).

(n) Remove and discard the 'O' rings (10 & 13-14) from the adaptor plate.

(o) Remove the dowels from the adaptor plate.

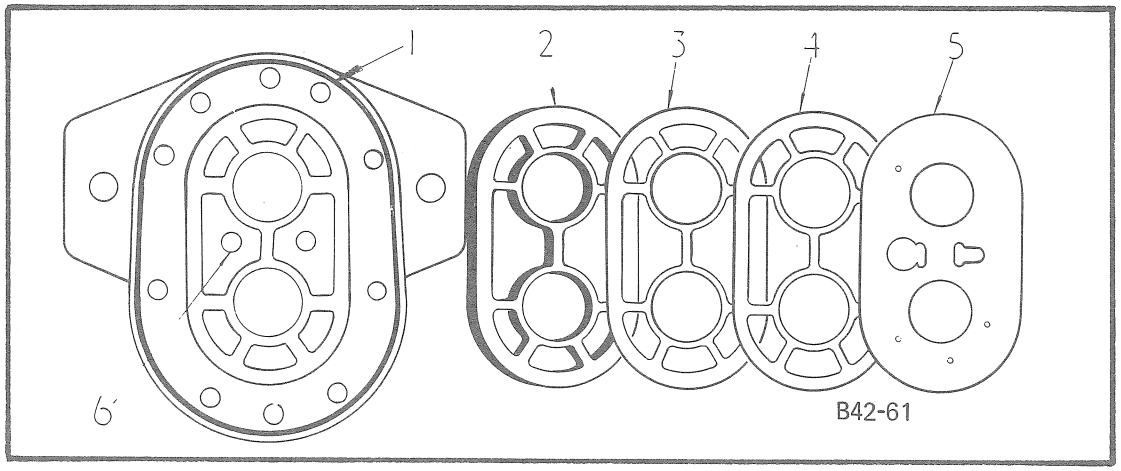


Fig. 15

4c. INSPECTION AND REPAIR

(a) Inspect the drive gear and idler gear assemblies at bearing points and seal areas for rough surfaces and excessive wear. If the shafts measure less then 22.17 mm (0.873 in) in the bearing areas the gear assembly must be changed.

(b) Inspect gear faces for scoring and excessive wear.

(c) Measure the gear widths. For the front pump these should not be less than 27.10 mm (1.067 in) and for the rear pump not less than 19.61 mm (0.772 in).

(d) If the inside diameters of the bearings in the front plate, adaptor plate or back plate are more than 22.33 mm (0.879 in), the plate must be changed as the bearings are not available as separate items.

(e) Inspect the front and rear bodies for excessive wear and scoring in the gear pockets. If the inside diameter of the gear pockets exceeds 53.52 mm (2.107 in) the body must be changed.

4d. ASSEMBLY

(a) Using a blunt tool tuck a new diaphragm seal (2-15) into the grooves in the front plate with the open part of the 'V' section toward the drive end.

(b) Press a new protector gasket (3-15) and back-up gasket (4-15) onto the diaphragm seal.

(c) Install the ball and spring (6-15) then position the diaphragm (5-15) with the bronze face toward the pump gears and the rounder of the two small centre holes over the spring. Ensure that the entire diaphragm is inside the raised rim of the diaphragm seal.

(d) Press the dowels into the front plate then install the 'O' ring (1-15) in the recess provided.

(e) Smear a thin film of heavy grease to both faces of the front body (9-14) then position the body on the dowels and up to the front plate with the arrow on the side pointing in the direction of pump rotation (anti-clockwise when facing the drive end).

(f) Dip the gear assemblies in hydraulic fluid then position the drive gear assembly (3-14) and idler gear assembly (5-14) in the front plate bearings.

(g) Slide the thrust plate (12-14) onto the gears with the bronze side toward the gears and the cut-away section to the suction side.

(h) Install the 'O' ring (10-14) in the groove in the front body.

(i) Install the seal assembly (16-14) to the adaptor plate (11-14) in the same manner as the front seal assembly (7-14) was installed in operations (a), (b) and (c) noting that there is no ball and spring in the adaptor plate.

(j) Carefully install the adaptor plate over the gear shafts and onto the dowels in the front body.

(k) Position the key (19-14) in the drive gear shaft and slide on the drive gear. Slide the idler gear (17-14) onto its shaft.

(l) Press the rear dowels into the adaptor plate and install the 'O' ring (13-14). Smear a thin film of heavy grease on both faces of the rear body (14-14) then position the rear body over the gears and dowels ensuring that the arrow on the side is pointing in the same direction as the arrow on the front body.

(m) Install the thrust plate (18-14) with the bronze side toward the gears and the cutaway mid-section to the suction side.

(n) Install the 'O' ring (15-14) then position the backplate (20-14) on the pump.

(o) Install the bolts (1 & 6-14) finger tight. The four bolts (1-14), inside the mounting spigot, are longer than the bolts (6-14).

(p) Progressively and diametrically tighten the bolts until a final torque of 5.5 to 6.9 kgm (40 to 50 lbft) is achieved.

(q) Dip the shaft seal (2-14) in hydraulic fluid and work onto the drive shaft. Tap into position.

(r) If bench testing equipment is available test the pump referring to para. 4f.

(s) Position the key in the shaft, position the spacer (2-13) then install the front section of the coupling (3-13) and tighten the nut to a torque of 5.5 kgm (40 lbft).

4e. INSTALLATION

(a) Locate the pump on the mounting bracket turning the pump as necessary to align the coupling, then secure with the bolts (2-12).

(b) Connect the suction pipes (1-12) and pressure pipes (3-12).

(c) Fill the hydraulic reservoir then run the engine a little faster than low idle to check for leaks.

(d) Install the front plate (1-11) then remove the safety bar.

(e) If bench testing equipment was not available test the pump referring to para. 4f.

4f. TESTING

1. ON A TEST RIG

(a) Start the pump and run for three minutes at zero pressure.

(b) Intermittently load the pump to 35 kg/cm^2 (500 lb/in^2) for three minutes.

(c) Intermittently load the pump to 70 kg/cm^2 (1000 lb/in^2) for three minutes.

(d) Intermittently load the pump to 140 kg/cm^2 (2000 lb/in^2) for three minutes.

(e) If leaks are apparent at seals or joints the pump must be stripped and faults rectified. The pump must then be retested.

(f) Check the pump for freedom of rotation by hand.

(g) Torque check the through bolts.

2. ON THE MACHINE

(a) Run the pump at 1500 rev/min and zero pressure for three minutes.

(b) By operating the control valve intermittently build up pressure for three minutes.

(c) Increase engine speed to high idle and intermittently build up pressure for three minutes.

(d) Reduce engine speed to low idle and check for leaks.

5. UNLOADING VALVE

5a. REMOVAL

(a) Drain the hydraulic reservoir.

(b) Remove the right side deck plate.

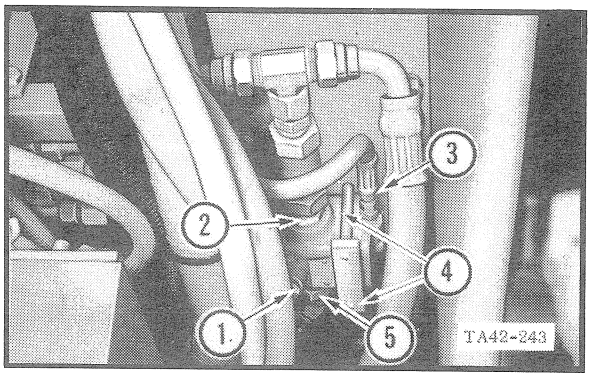


Fig. 16

(c) Disconnect the return hose (1-16), the hose to the control valve (2-16), and the sensing hose (3-16) at the rear, and the supply hose (5-16).

(d) Remove the bolts (4-16) to free the support strap then lift the unloading valve clear of the machine.

5b. DISMANTLING

(a) Slacken the locknut (2-17) then screw out the adjusting screw (1-17).

(b) Progressively, slacken the socket headed screws (15-17), holding the top cover (4-17) against the spring pressure until the bolts are free. Remove the cover and gasket (5-17).

(c) Remove the spring seat (7-17) from the top cover then remove and discard the 'O' ring (6-17) from the spring seat.

(d) Withdraw the spring (8-17) and spool (9-17) from the body (10-17).

(e) Remove the socket headed screws (16-17) to free the lower cover (13-17) and gasket (12-17). Remove the piston (11-17) from the lower cover.

(f) If inspection proves it necessary screw the plug (14-17) out of the lower cover and the plug (3-17) out of the top cover.

5c. ASSEMBLY

(a) If this was removed install the plug (14-17) into the base of the lower cover.

(b) Position the piston (11-17) in the lower cover.

(c) Install a new gasket then position the body (10-17) on the lower cover so that when facing the outlet port (19-17) the sensing port (17-17) is to the right, then install the bolts (16-17).

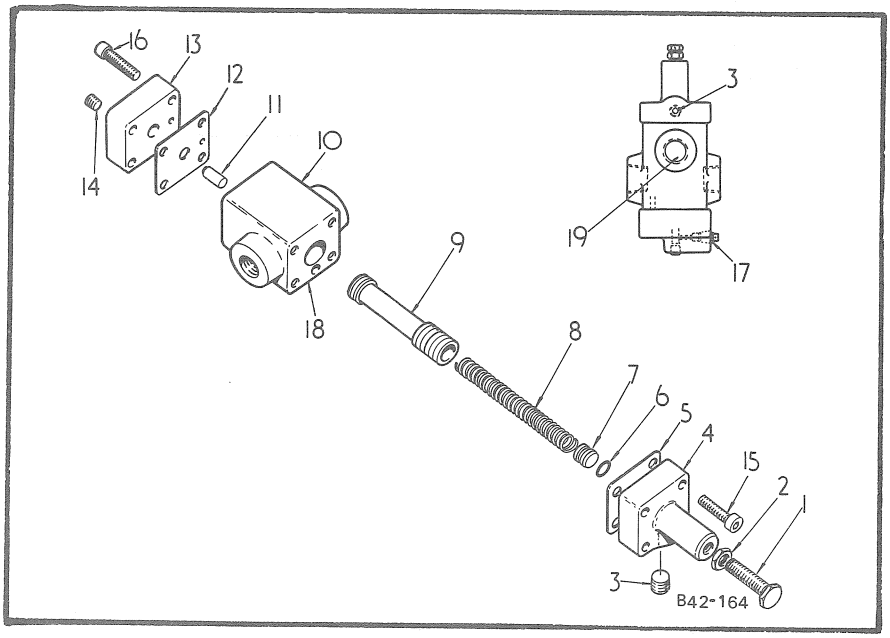


Fig. 17

(d) Insert the spool (9-17) and spring (8-17) into the body.

(e) Install the 'O' ring (6-17) on the spring seat (7-17) then, with the chamfer toward the adjusting screw, push the spring seat into the top cover.

(f) Position the gasket (5-17) on the body ensuring that the hole in the gasket aligns with the hole (18-17) on the outlet side of the body face.

(g) Position the top cover (4-17) on the body ensuring that the plug (3-17) is in line with the outlet. Press down on the top cover and install the bolts (15-17).

(h) Screw in the adjusting screw (1-17) and tighten the locknut (2-17).

(i) If bench equipment is available set the valve referring to para. 5e.

5d. INSTALLATION

(a) Position the valve under the mounting bracket with the outlet pointing downward and the adjusting screw (1-17) pointing to the centre of the machine.

(b) Install the support strap and secure with the bolts (4-16).

(c) At the front connect the supply hose (5-16), at the rear connect the hose to the control valve (2-16) and the sensing hose (3-16), and underneath connect the return hose (1-16).

(d) Fill the hydraulic reservoir.

(e) Set the valve referring to para. 5e.

(f) Install the right side deck plate.

5e. ADJUSTMENTS
1. ON A TEST RIG

(a) Connect a supply to one pressure port and connect the other pressure port to the rig reservoir.

(b) Connect a pressure line to the sensing port.

(c) Connect a hose to the outlet port and position in such a manner that flow from the hose can be seen.

(d) Run the rig and check the pressure in the sensing line at which flow from the outlet hose takes place.

(e) Adjust the screw (1-17) as necessary to set the pressure required in the sensing line at 130 kg/cm^2 (1850 lb/in^2).

2. ON THE MACHINE

(a) Adapt a pressure gauge between the valve and the supply hose (5-16) from the pump.

(b) Run the engine and operate the boom and bucket to expel air and check for leaks.

(c) Run the engine at high idle speed and operate the control lever to close the bucket clam. Note the reading on the gauge at which the pressure from the pump falls off, this will be the system pressure at the time the unloading valve opens.

(d) Adjust the screw (1-17) as necessary to set the opening pressure at 130 kg/cm^2 (1850 lb/in^2).

6. CONTROL VALVE
6a. REMOVAL

(a) Remove the cab base referring to GROUP 2.

(b) Drain the hydraulic reservoir.

(c) Disconnect the pipes and hoses underneath the valve identifying each to aid assembly.

(d) Remove the bolts (1-18) and lift out the valve complete with control levers.

6b. DISMANTLING
1. CONTROL LEVERS

(a) Remove the split pin and headed pin (10-19) from the tilt lever plate.

(b) Remove the split pin and headed pin (13-19) from the lift spool links.

(c) Remove the split pin and headed pin (8-19) from the auxiliary control lever, if fitted.

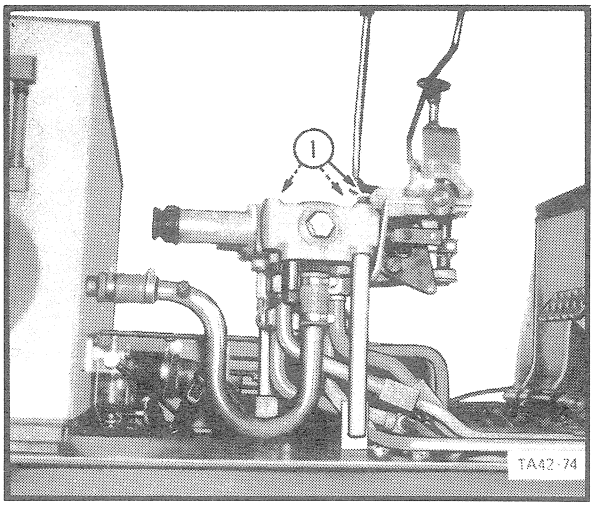


Fig. 18

(d) Remove the bolts (12-19) and lift the control levers assembly from the control valve. Re-install the bolts finger tight to hold the wiper retainers in position.

(e) Remove the split pins and headed pins to free the links from the spools.

(f) Remove the bolts (14-19) to free the safety lock bracket from the mounting bracket.

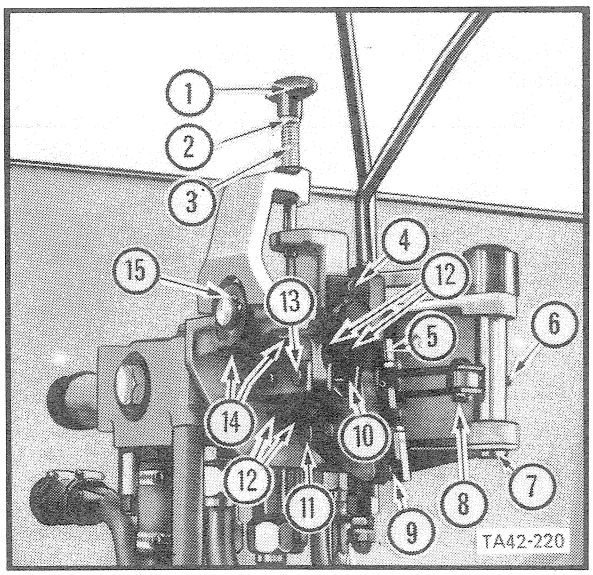


Fig. 19

(g) Slacken the locknut (2-19) then screw off the knob (1-19). Screw off the locknut to free the spring (3-19) then withdraw the shaft from the bracket.

(h) Screw the ball joint (5-19) out of the lift and tilt lever boss, remove the bolt (4-19) and withdraw the flag pin to free the lever assembly from the pivot.

(i) Remove the circlip (15-19) and washer beneath then withdraw the pivot. If inspection proves it necessary press the bushes from the pivot.

(j) Remove the circlip from the inner end of the tilt lever plate shaft (11-19) then withdraw the assembly from the mounting bracket. Screw the ball joint (9-19) from the plate.

(k) If an auxiliary lever is fitted, remove the locknut (6-19) and screw the eye from the shaft. Remove the circlip (7-19) and washer beneath then lift out the lever assembly.

(l) If inspection proves it necessary, press the bushes from the mounting bracket.

2. MAIN RELIEF VALVE

(a) Screw the relief valve adjuster assembly (3-20) from the valve body.

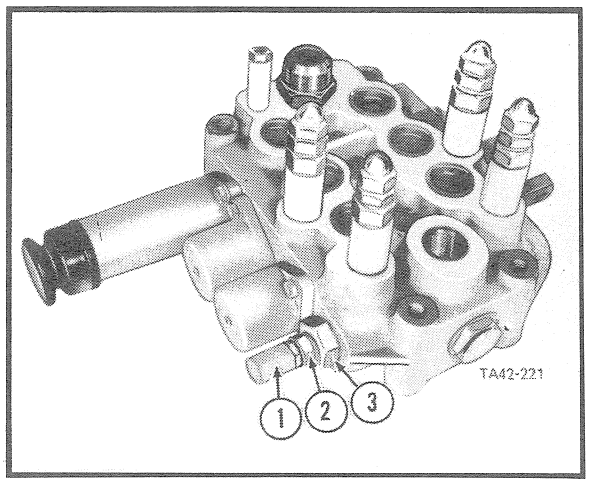


Fig. 20

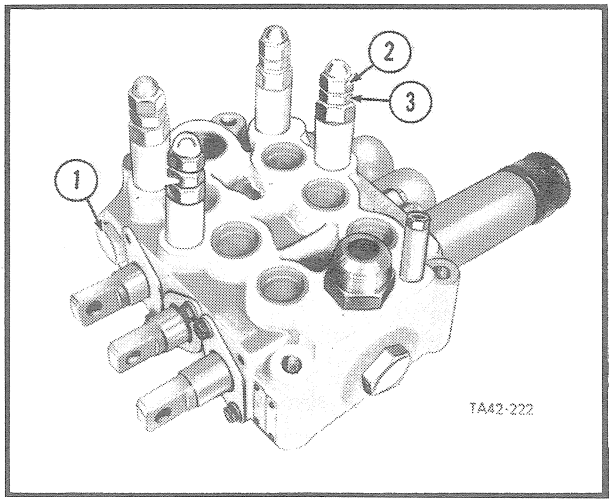


Fig. 21

(b) Remove the plug cap (1-21) from the other end.

(c) Use a soft drift in the spool eye side to lightly tap out the relief valve assembly (4-22).

(d) Remove the 'O' ring (1-22) from the plug cap and the 'O' rings (2 & 3-22) from the relief valve assembly.

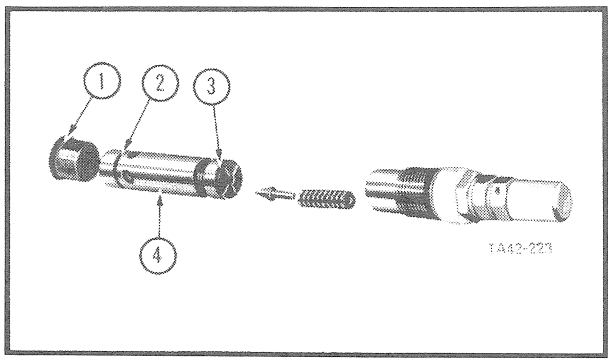


Fig. 22

(e) Remove the pilot poppet (7-23) and spring (6-23).

(f) Remove the 'O' ring (9-23) from the adjuster assembly.

(g) Remove the acorn nut (1-23) washer (2-23), locknut (3-23) and washer (4-23) then screw the adjuster (5-23) from the pilot valve cap (8-23).

3. LIFT SPOOL

(a) Remove the bolts (1-24), wiper retainer (2-24), wiper (3-24), 'O' ring retainer (4-24) and 'O' ring (5-24).

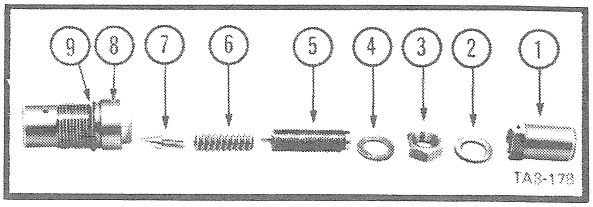


Fig. 23

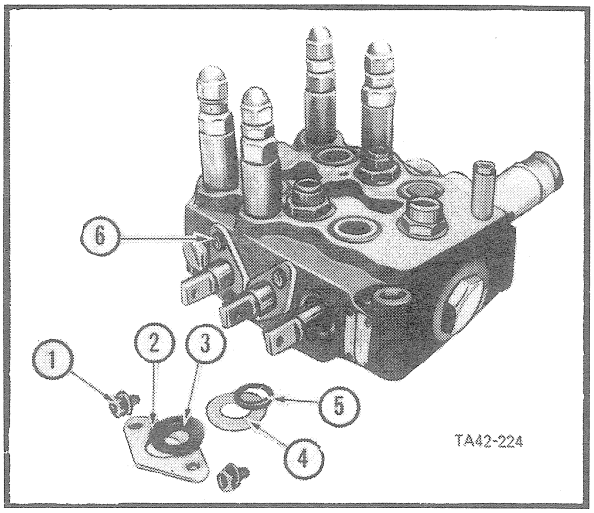


Fig. 24

(b) Remove the rubber cap (1-25), circlip (2-25) and cover plate (3-25).

(c) Screw out the detent assembly (4-25). A bar through the spool eye will prevent the spool from turning but if the spool eye slackens before the dentent assembly, remove the bolts (5-25) and withdraw the spool and detent assembly from the valve. Grip the spool between wooden blocks in a vice and slacken the detent assembly. Withdraw the detent assembly from the cover.

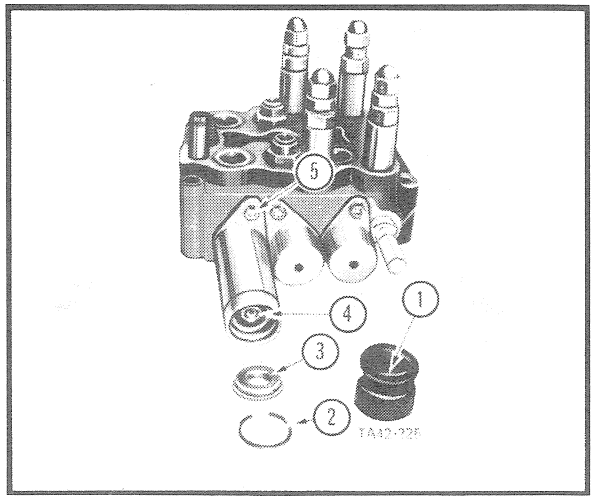


Fig. 25

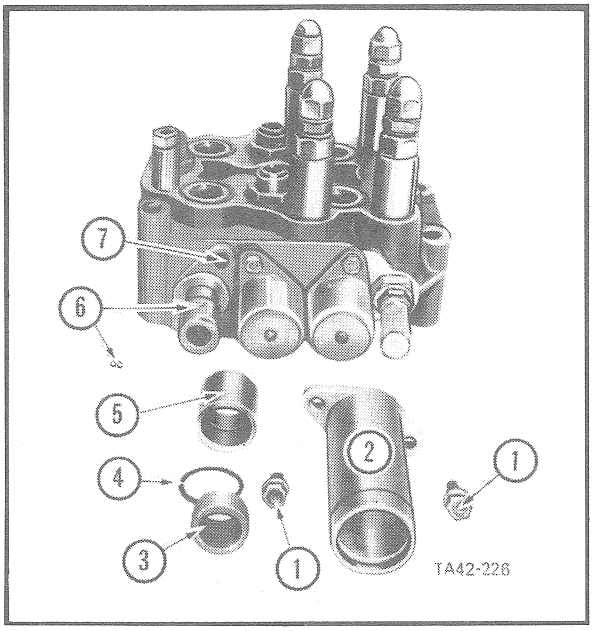


Fig. 26

(d) Assuming that the spool eye has remained tight and the cover is still in position, remove the bolts (1-26) and withdraw the cover (2-26). Remove the spacer (3-26) and 'O' ring (4-26).

(e) Remove the detent sleeve (5-26) ensuring that the balls (6-26) are not lost.

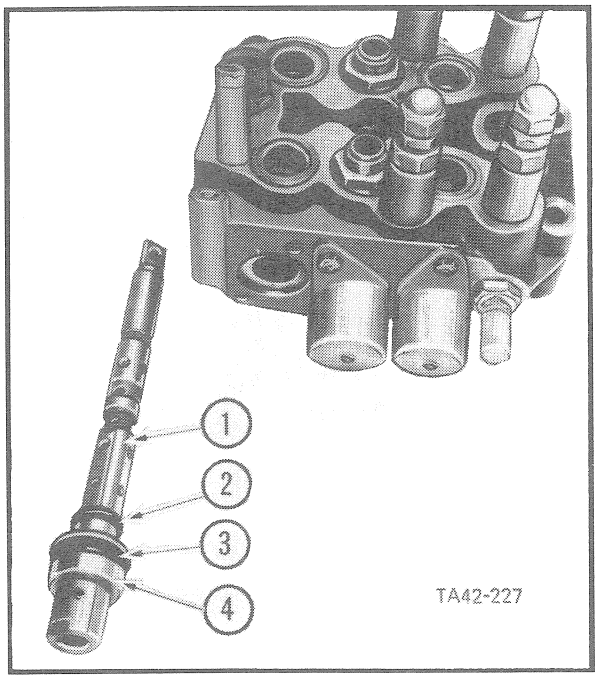


Fig. 27

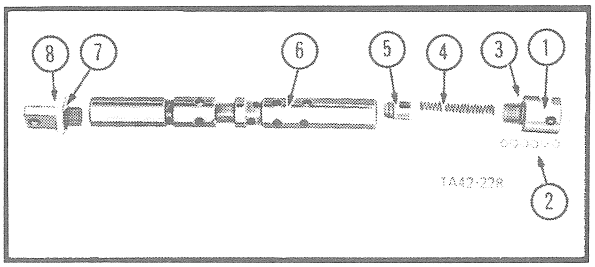


Fig. 28

(f) Withdraw the spool (1-27) complete with spacing sleeve (4-27), seal retainer (3-27) and 'O' ring (2-27). Remove these items from the spool.

(g) Grip the spool in wooden blocks in a vice then screw out the detent cap (1-28) to free the check valve spring (4-28) and plunger (5-28).

(h) Screw out the spool eye (8-28).

(i) Remove the 'O' ring (7-28) from the spool eye and the 'O' ring (3-28) from the detent cap.

(j) Dismantle the detent assembly by removing the poppet (3-29) and spring (4-29). Compress the spring (6-29) and remove the circlip (1-29) spring seat (2-29), spring (6-29) and spring seat (5-29). Screw the adjuster from the spring cap (7-29).

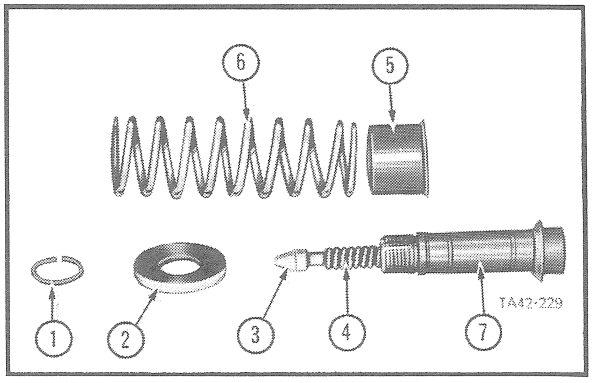


Fig. 29

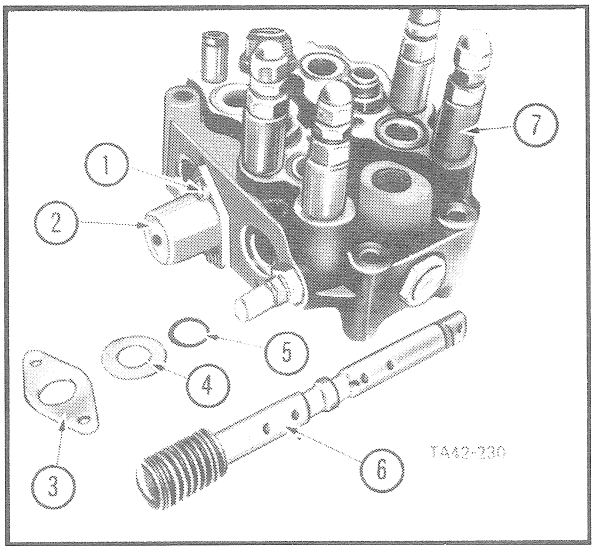


Fig. 30

4. TILT AND AUXILIARY SPOOLS

(a) Remove the bolts (6-24) and withdraw the wiper retainers, wipers, seal retainers and 'O' rings.

(b) Remove the bolts (1-30) and covers (2-30).

(c) Withdraw the spools (6-30) and identify them so that they are returned to their correct locations on assembly.

(d) Remove the retainer (3-30), seal retainer (4-30) and 'O' ring (5-30).

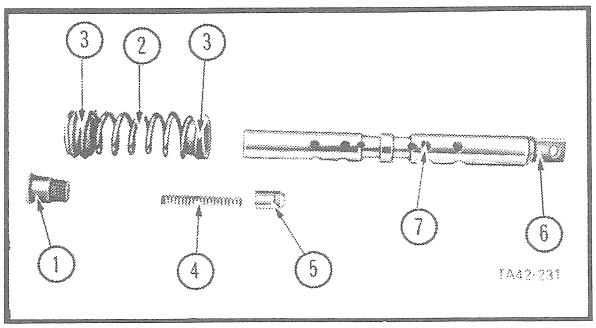


Fig. 31

(e) Grip the spool between wooden blocks in a vice and remove the spring cap (1-31), spring (2-31) and spring retainer (3-31). Withdraw the check valve spring (4-31) and plunger (5-31). Remove the 'O' ring from the spring cap.

(f) Remove the spool eye (6-31) and withdraw the check valve spring and plunger. Remove the 'O' ring from the spool eye.

5. OVERLOAD OR SERVICE LINE RELIEF VALVES

Screw the relief valve assemblies (7-30) from the valve body and remove the 'O' rings. Components of the valve are not serviceable and if faulty the relief valve assembly must be changed.

6c. INSPECTION AND REPAIR

(a) Inspect the valve body for cracks and damaged threads.

(b) Inspect spools and bores for damage. Spools are not interchangeable and must be returned to their original bores.

(c) Check clevis pin holes in the spool eyes and links for wear.

(d) Inspect valve seats for wear and signs of hammering.

(e) The relief valve assembly (4-22) is not serviceable and if found to be faulty must be changed.

(f) Check bushes and pivots in the control lever assembly for excessive wear.

(g) Lightly oil all components prior to assembly.

6d. ASSEMBLY

1. TILT AND AUXILIARY SPOOLS

(a) Grip the spool (7-31) between wooden blocks in a vice.

(b) Position the 'O' ring (5-30), seal retainer (4-30) and wiper retainer (3-30) on the spool.

(c) Insert the check valve plunger (5-31) and spring (4-31) into the spool, position the retainers (3-31) on the spring (2-31) then position the spring assembly on the spool. Fit a new 'O' ring on the spring cap (1-31) then compress the spring and screw in the spring cap.

(d) Insert the check valve plunger and spring into the other end of the spool, fit a new 'O' ring on the spool eye (6-31), then screw the eye into the spool.

(e) Insert a rod through the spool eye then simultaneously tighten the spring cap and eye.

(f) Lubricate the spool then with the cylinder ports uppermost and the inlet port and relief valve nearest, insert the spool into its original bore so that the spool eye is to the right. Ensure that the 'O' ring and its retainer are correctly located before pushing the spool fully home.

(g) Fit the covers (2-30) and secure with the bolts (1-30).

(h) Install the 'O' ring, retainer plate, wiper and wiper retainer to the eye of the spool then install the bolts (6-24) finger tight.

2. LIFT SPOOL

(a) Install the 'O' ring (2-27), seal retainer (3-27) and spacing sleeve on the end of the spool (1-27) with the two holes in the land. Insert the check valve plunger (5-28) and spring (4-28) then install a new 'O' ring (3-28) and screw in the detent cap (1-28).

(b) Install a new 'O' ring (7-28) and screw in the spool eye (8-28). Tighten the spool eye and detent cap simultaneously.

(c) Lubricate the spool and insert it into the bore ensuring that the 'O' ring and retainer are correctly seated before pushing the spool fully home.

(d) Apply a light film of grease to the holes in the detent cap then install two detent balls (2-28) in each hole. Position the detent sleeve (5-26) over the balls.

(e) Insert the spacer (3-26) and 'O' rings (4-26) inside the cover (2-26) then install this assembly onto the spool and secure with the bolts (1-26).

(f) Screw the adjuster into the spring cap (7-29). Position the spring seat (5-29), spring (6-29) and spring seat (2-29) on the spring cap then compress the spring and install the circlip (1-29). Insert the detent spring (4-29) and poppet (3-29) then screw this assembly (4-25) into the spool.

(g) Install the 'O' ring (5-24), seal retainer (4-24), wiper (3-24), and wiper retainer (2-24) at the eye end and secure with the bolts (1-24).

(h) Install the cover plate (3-25), circlip (2-25) and rubber cover (1-25).

(i) Adjust the operating effort referring to para. 6f.

3. MAIN RELIEF VALVE

(a) Install new 'O' rings (2 & 3-22) on the relief valve assembly (4-22). Insert the assembly into the control valve body so that the poppet seat is at the detent side of the control valve.

(b) Install a new 'O' ring (1-22) then screw in the plug cap (1-21) at the spool eye end.

(c) Install a new 'O' ring (9-23) then screw in the pilot valve cap (8-23).

(d) Install the poppet (7-23) and spring (6-23) then screw in the adjuster (5-23).

(e) Install the washer (4-23), locknut (3-23) washer (2-23) and acorn nut (1-23) finger tight.

(f) The relief valve is adjusted after the control valve has been installed on the machine. Refer to para. 6f.

4. OVERLOAD OR SERVICE LINE RELIEF VALVES

(a) Fit new 'O' rings to the relief valve assemblies (7-30).

(b) Screw the relief valves into position in the control valve.

(c) Test the relief valves referring to para. 6f.

5. CONTROL LEVERS

(a) If these were removed, press new bushes into the mounting bracket.

(b) If an auxiliary lever is fitted, position the lever in the bracket then install the washer and circlip (7-19). Screw the eye into the shaft so that the hole centre line is parallel to the shaft centre line then install and tighten the locknut (6-19).

(c) Install the tilt lever plate and secure with the circlip. Screw the bottom ball joint (9-19) into the plate.

(d) If these were removed, press new bushes into the lift and tilt lever pivot then install the pivot in the bracket and secure with the washer and circlip (15-19).

(e) Position the lever assembly on the pivot, install the flag pin and secure with the bolt (4-19). Lift the tilt lever rod into position and screw the top ball joint (5-19) into the lever boss.

(f) Thread the safety lock shaft into the bracket from the underside then install the spring (3-19), and locknut (2-19). Screw on the knob (1-19) then tighten the locknut up to it.

(g) Locate the safety lock bracket on the mounting bracket and secure with the bolts (14-19) noting that the bolt nearer the control valve is the longer of the two.

(h) Secure the links to the spool eyes with the headed pins and split pins noting that the longer links are installed on the auxiliary spool.

(i) Remove the bolts (1-24) from the control valve taking care not to dislodge the wiper retainers, then locate the control bracket assembly on the control valve and secure with the bolts previously removed.

(j) Raise the links on the lift spool into position and secure to the tilt lever plate with the headed pin (13-19) and split pin. The head of the pin must be toward the tilt spool.

(k) Raise the links on the tilt spool into position and secure to the tilt lever plate with the headed pin (10-19) and split pin. The head of the pin must be toward the auxiliary spool.

(l) Position the auxiliary spool links on the eye and secure with the headed pin (8-19) and split pin. It may be necessary to slacken the locknut (6-19) and turn the eye slightly to allow the pin to line up.

(m) Adjust the control levers referring to para. 6f.

6e. INSTALLATION

(a) Locate the control valve on the supports with the control levers to the front then secure with the bolts (1-18).

(b) Connect the pipes and hoses underneath the valve as identified during removal.

(c) Fill the hydraulic reservoir.

(d) Install the cab base referring to GROUP 2.

(e) Run the engine and operate the controls to purge air from the system and check for leaks.

(f) Adjust the valve as necessary referring to para. 6f.

6f. ADJUSTMENTS

1. CONTROL LEVERS

(a) Check that the safety lock pin engages the groove in the lift and tilt lever without side movement of the lever. If movement takes place, adjust the length of the rod (16-19) as necessary. The rod is threaded left and right handed to facilitate this.

(b) Move the main control lever to LIFT. Attach a spring balance directly under the lever knob and check the effort required to return the lever to HOLD. This should be 6.8 to 9.1 kg (15 to 20 lb).

(c) If adjustment is necessary remove the rubber cover (1-25) and turn the adjuster in the centre of the detent spring (7-29) until the required effort is achieved. Install the rubber cover. The effort required to move the lever from the FLOAT position will be approximately 20% higher.

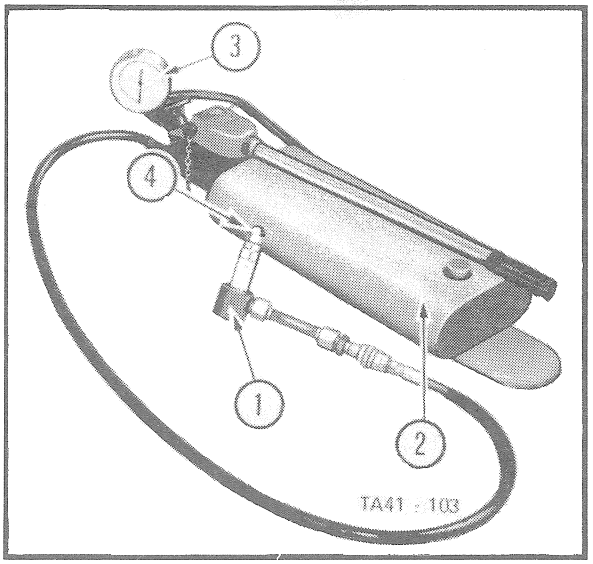


Fig. 32

2. OVERLOAD RELIEF VALVES

(a) Adapt a hand pump similar to that shown in Fig. 32 into one of the tilt spool cylinder ports. The pressure gauge must be capable of reading up to 210 kg/cm^2 (3000 lb/in^2).

(b) Ensure that the tilt spool is in the HOLD position then operate the hand pump and note the pressure at which the valve blows. This should be 193 kg/cm^2 (2750 lb/in^2).

(c) If adjustment is necessary remove the acorn nut (2-21) and sealing washer, slacken the locknut (3-21) then turn the adjuster until the pressure setting is correct. Tighten the locknut and install the sealing washer and acorn nut then recheck the pressure.

(d) Repeat the check for the other tilt spool relief valve and on the auxiliary spool ports for the other two valves if fitted.

3. MAIN RELIEF VALVE

(a) Adapt a pressure gauge into any pressure line in the system. The gauge must be capable of 210 kg/cm^2 (3000 lb/in^2).

(b) Run the engine at high idle speed and operate the control lever for the line into which the gauge is adapted. Note the reading on the gauge at which the relief valve blows. This should be 158 kg/cm^2 (2250 lb/in^2).

(c) If adjustment is required, remove the acorn nut (1-20) and sealing washer, slacken the locknut (2-20) and turn the adjuster as necessary until the gauge reading is correct.

(d) Tighten the locknut (2-20), install the sealing washer and acorn nut (1-20) and recheck the settings before removing the pressure gauge.

7. LIFT CYLINDERS

7a. REMOVAL

(a) Raise the lift arms, then position supports under the bucket or skid shoes so that the lift cylinder is high enough to allow access to the hose clamps underneath. Stop the engine and select the FLOAT position to relieve the pressure in the cylinder than return the control lever to the HOLD position.

(b) Label the hoses (1 & 4-33) so that they can be returned to their correct locations on installation.

(c) Remove the bolts (2-33) and clamps (3-33) to disconnect the hoses.

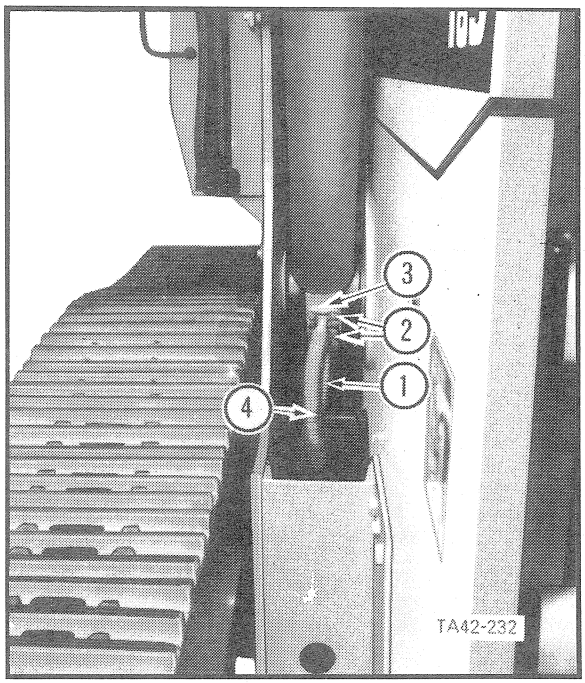


Fig. 33

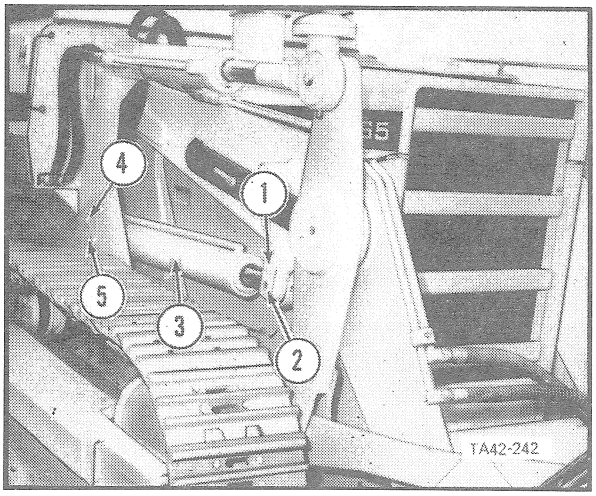


Fig. 34

(d) Remove the bolts (1 & 4-34).

(e) Support the cylinder and remove the front flag pin (2-34) then lower the cylinder onto the loader frame.

(f) Remove the rear flag pin (5-34) and lift out the cylinder (3-34).

7b. DISMANTLING

(a) Fully retract then extend the piston rod to expel any oil in the cylinder.

(b) Release the circlip (1-35) and slide the spacer (2-35) away from the bearing.

(c) Push the piston rod bearing (4-35) into the cylinder until the sections of the cylinder key (3-35) can be removed.

(d) Withdraw the piston rod assembly from the cylinder.

(e) Using a suitable peg spanner in the holes provided, screw the piston (5-35) from the rod then slide off the bearing, spacer and circlip.

(f) Remove the split wear rings (7-35), anti-extrusion rings (8-35) and rubber seal ring (9-35) from the piston.

(g) Remove the 'O' rings (10 & 14-35) and back-up washer (11-35) from the outside of the bearing and the wiper seal (15-35) and gland seal (12-35) from inside the bearing.

(h) Remove the 'O' ring (13-35) from the spacer.

(i) If inspection proves it necessary press the bushes (6 & 16-35) from the cylinder end and rod end.

7c. INSPECTION AND REPAIR

(a) Inspect the cylinder bore for signs of wear or damage. Check welds for signs of leakage.

(b) Check bushes for wear.

(c) Inspect the piston rod for wear, damage and distortion.

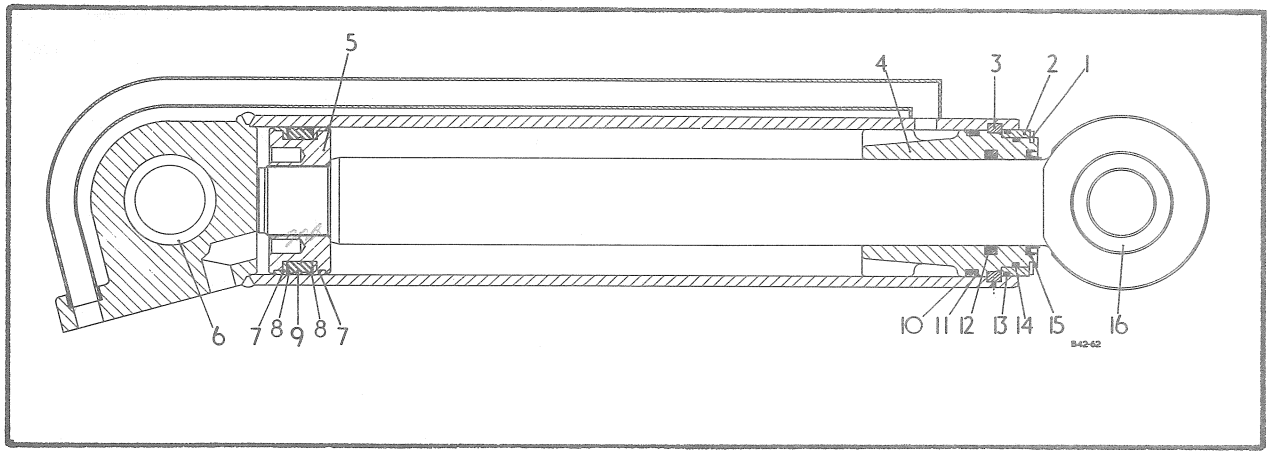


Fig. 35

7d. ASSEMBLY

(a) If these were removed, press new bushes (6 & 16-35) into the cylinder end and rod end.

(b) Install a new 'O' ring (13-35) on the spacer then slide first the circlip (1-35) then the spacer (2-35) onto the piston rod.

(c) Install a new gland seal (12-35) into the inner groove in the bearing, with the nylon (anti-extrusion) ring facing outward.

(d) Press in a new wiper seal (15-35) with the seal lips facing outward.

(e) Install the 'O' ring (14-35).

(f) Install the back-up washer (11-35) then install the 'O' ring (10-35) on the pressure side of the back-up washer.

(g) Lubricate the piston rod and slide on the assembled bearing.

(h) Stretch the rubber seal ring (9-35) over the piston flange and into the groove. Tilt one side of an anti-extrusion ring (8-35) into the base of the groove so that the opposite side can slide over the piston flange. Repeat with the other anti-extrusion ring then locate both rings to conform with corresponding contours on the sealing ring. Expand the split wear rings (7-35) over the piston flanges and into the groove at both ends.

(i) Apply Loctite 241 to the threads of the piston rod then screw on the piston assembly and tighten to 34.5 kgm (250 lbft).

(j) Lubricate the cylinder bore then insert the piston approximately half way into the cylinder.

(k) Push the bearing into the cylinder until clear of the key groove then position the sections of the key (3-35) in the groove and pull the bearing back up to the key. It may be necessary to extend the piston rod to do this.

(l) Lubricate the spacer (2-35) and press this over the head of the bearing and into the cylinder.

(m) Install the circlip (1-35).

7e. INSTALLATION

(a) Position the cylinder within the loader frame and insert the flag pin (5-34).

(b) Lift the cylinder to align the front pin and insert the flag pin (2-34).

(c) Install and tighten the bolts (1 & 4-34).

(d) Install new 'O' rings in the grooves in the ends of the hoses (1 & 4-33), locate the hoses on the cylinder ports then install the clamps (3-33) and bolts (2-33).

(e) Start the engine and operate the lift cylinders through several full cycles to expel air and check for leaks.

8. TILT CYLINDERS.
8a. REMOVAL

(a) Lower the lift arms and position the bucket flat on the ground. Stop the engine then select both tilt positions to release the pressure in the cylinder.

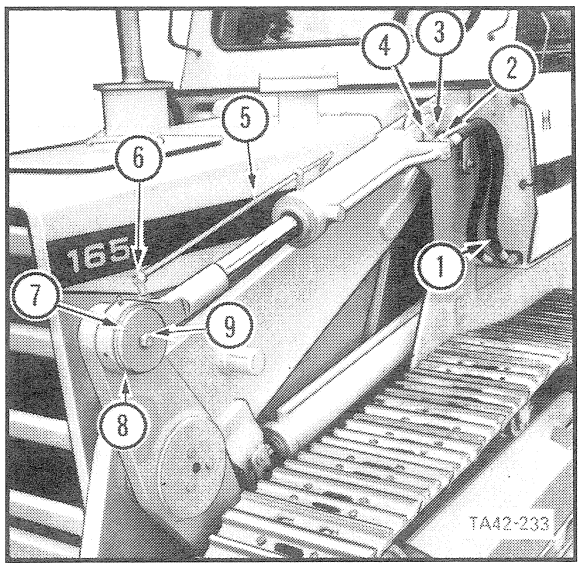


Fig. 36

(b) Disconnect the hoses (1 & 2-36) and loop them to prevent dirt entering the system.

(c) Remove the bolt (9-36), thrust washer (7-36) and 'O' ring (8-36).

(d) Suitably sling the cylinder then remove the bolt (4-36) and withdraw the flag pin (3-36).

(e) Raise the rear of the cylinder then slide the cylinder rod end away from the front pivot.

(f) Remove the inner 'O' ring from the front pivot.

8b. DISMANTLING

(a) On the left cylinder remove the nut (6-36) and withdraw the indicator rod (5-36).

(b) Refer to para. 7b noting that there are no cylinder end bushes.

8c. INSPECTION AND REPAIR

Refer to para. 7c.

8d. ASSEMBLY

(a) Refer to para. 7d noting that there are no cylinder end bushes.

(b) On the left cylinder, position the indicator rod (5-36) and install the nut (6-36).

8e. INSTALLATION

(a) Position the inner 'O' ring on the front pivot boss. A light smear of grease will help retain the 'O' ring in position.

(b) Slide the cylinder rod end onto the front pivot then lower the rear of the cylinder into position. Align the mounting holes then install the flag pin (3-36) and the bolt (4-36).

(c) Position the outer 'O' ring (8-36) and thrust washer (7-36) then screw in the bolt (9-36).

(d) Connect the hoses (1 & 2-36).

(e) Start the engine and operate the tilt lever several times in each direction to expel air and check for leaks.

9. CLAM CYLINDERS

9a. REMOVAL

(a) Disconnect the hoses (3 & 4-37) and loop them to prevent dirt entering the system.

(b) Remove the split pin and clevis pin (1-37) then drive out the pivot pin (2-37).

(c) Remove the bolt (5-37).

(d) Support the cylinder, withdraw the flag pin (6-37) then lift out the cylinder.

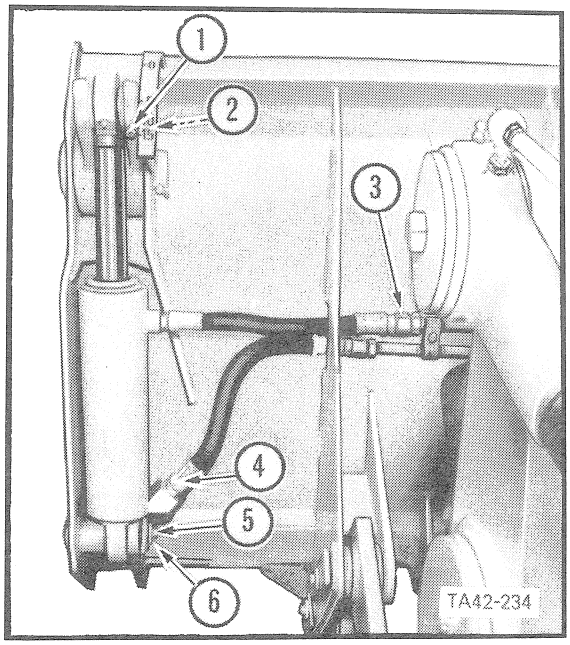


Fig. 37

9b. DISMANTLING

Refer to para. 7b noting that there are no cylinder end bushes.

9c. INSPECTION AND REPAIR

Refer to para. 7c.

9d. ASSEMBLY

Refer to para. 7d noting that there are no cylinder end bushes.

9e. INSTALLATION

(a) Position the cylinder on the bucket and insert the flag pin (6-37). Secure with the bolt (5-37).

(b) Ensure that the rod end lubricator is facing rearward then align the upper pivot and insert the pin (2-37).

(c) Align the holes then insert the clevis pin (1-37) and split pin.

(d) Connect the hoses (3 & 4-37).

(e) Run the engine and operate the auxiliary control lever to expel air from the system and check for leaks.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes

LOADER FRAME
GROUP 15

1. DESCRIPTION

The loader frame consists of a heavy fabricated steel structure which is pin mounted at four points to the rigid crossbars. The rear pins are stepped so that the frame is firmly clamped to the crossbar at these points. Replaceable bushes are fitted in the crossbars and loader frame mounting points.

Individual components on the tractor and on the loader frame can be removed or serviced without removing the loader frame. For a complete overhaul of the transmission, removal of the loader frame as a major assembly will improve access. If, however, the loader frame needs to be removed for repair it may be found easier to remove components from the frame as they become accessible before removing the frame from the machine.

Since many of the hydraulic connections are of the same thread size it is essential that they be identified during removal or dismantling so that they can be returned to their correct locations on assembly or installation.

2. LOADER FRAME

2a. REMOVAL

(a) Remove the bucket and lift arms referring to GROUP 3. If the loader frame is being removed for repair, also remove the lift and tilt cylinders referring to GROUP 14.

(b) Remove the engine hood sheet and side sheets referring to GROUP 4.

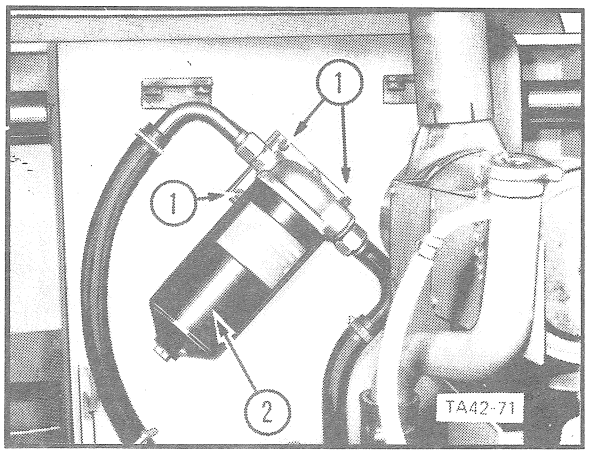


Fig. 1

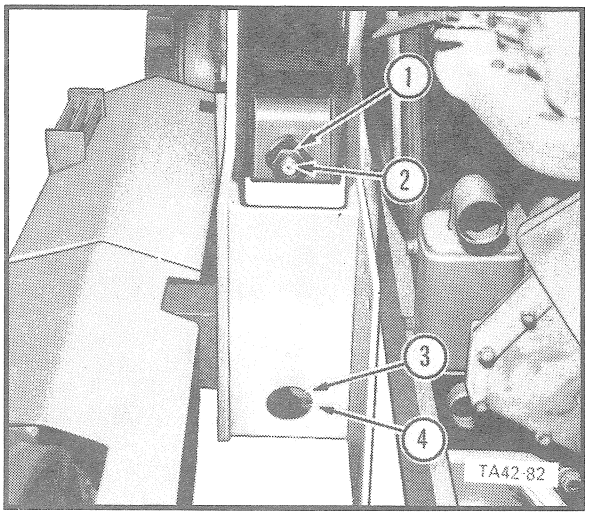


Fig. 2

(c) Remove the mounting bolts (1-1) and lay the transmission pressure filter (2-1) on the engine.

(d) Remove the radiator guard referring to GROUP 7.

(e) On the left side free the wiring harness from the clamps along the inside of the loader frame.

(f) Remove the top idlers referring to GROUP 13.

(g) Remove the cab base referring to GROUP 2.

(h) Remove the batteries and cab heater assembly referring to GROUP 5.

(i) If the loader frame is being removed for repair remove the hydraulic/fuel tank, control valve and unloading valve referring to GROUP 14, and remove the counterweight. Otherwise, drain the hydraulic reservoir and close the fuel shut-off tap. Disconnect the fuel reserve transmitter (2-9 GROUP 14), the spill return (3-9 GROUP 14), suction hose (5-9 GROUP 14), and fuel supply tube (6-9 GROUP 14) at the hydraulic/fuel tank and disconnect the supply hose (5-16 GROUP 14) at the front of the unloading valve.

(j) Remove the nuts (1-2) and spacing washers both sides. Remove the bolts securing the retainer plates (4-2) at both sides.

(k) Securely sling the loader frame. A heavy bar through the lift arm pivots can be used as a front lifting point. Adjust the chain lengths so that the frame is maintained square and level during the lifting operation.

(l) Take the strain then drive out the pins (2 & 3-2) taking care not to damage the threads of the rear pins.

(m) Lift the loader frame assembly straight up at the same time ensuring that hoses, pipes etc. are not fouling.

2b. DISMANTLING

(a) The removal of any remaining pipes and hoses is self evident.

(b) If inspection proves it necessary press out the loader frame mounting bushes (6, 8 & 11 16-3) and the tilt cylinder pivot bushes (3-3).

2c. ASSEMBLY

(a) If these were removed, press in new tilt cylinder pivot bushes (3-3) and mounting bushes (6,8,11 & 16-3).

(b) Position any pipes or hoses that were removed during dismantling.

2d. INSTALLATION

(a) Securely sling the loader frame and lower into position on the cross bars ensuring that pipes, hoses etc. are not fouling or trapped.

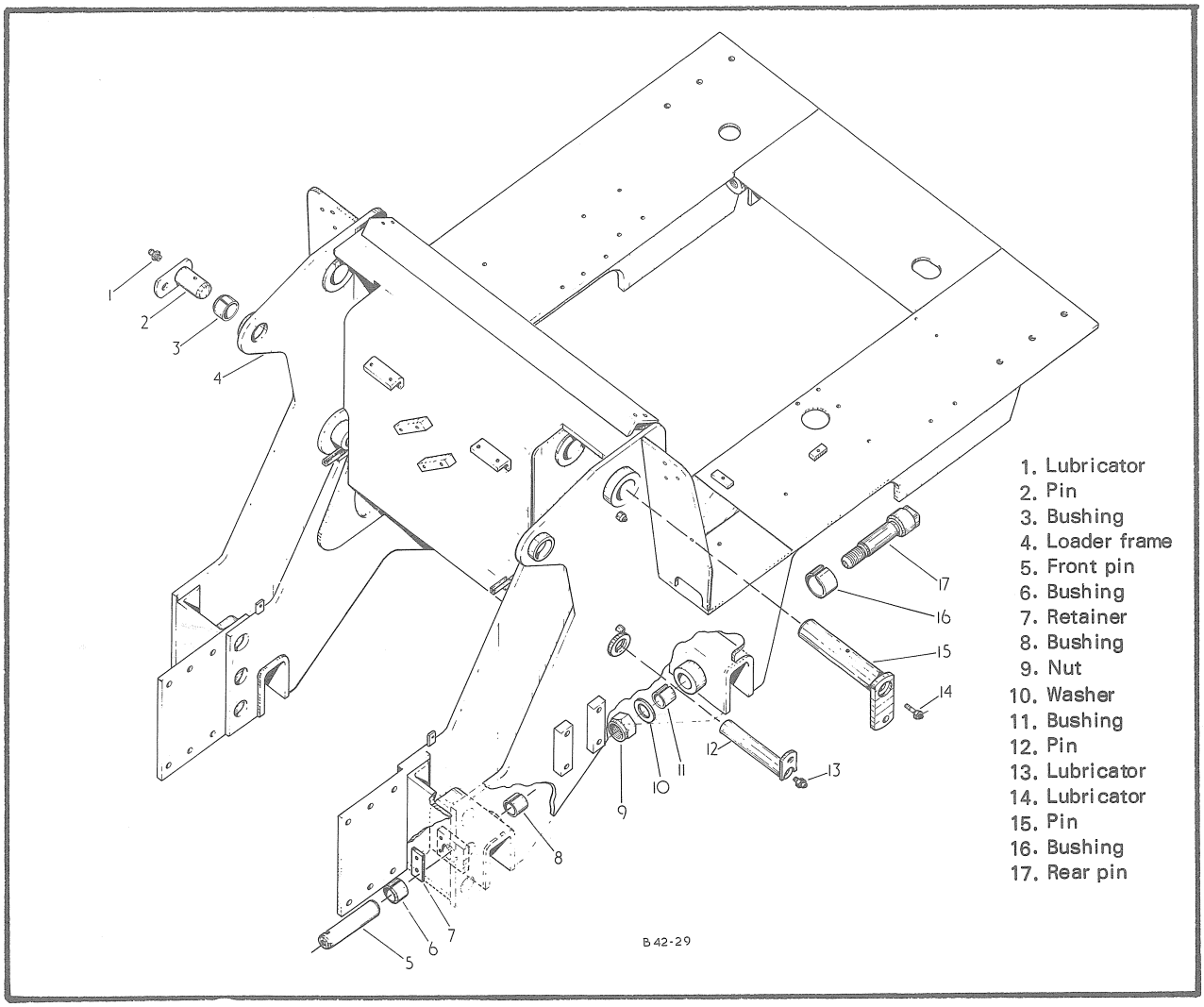


Fig. 3

Align the mounting holes and install the rear pins (2-2). Position the slots in the front pins (3-2) so that they are facing inward and forward then install the pins. Install and secure the retainer plates (4-2). Install the spacing washers (10-3) and nuts (1-2) on the rear pins then tighten the nuts to 131 to 145 kgm (950 to 1050 lbft).

(b) If the loader frame was removed for repair install the hydraulic/fuel tank, control valve and unloading valve referring to GROUP 14 and the counterweight. Otherwise, connect the supply hose (5-16 GROUP 14) at the front of the unloading valve and the fuel supply tube (6-9 GROUP 14) suction hose (5-9 GROUP 14), spill return (3-9 GROUP 14) and fuel reserve transmitter (2-9 GROUP 14) at the front of the hydraulic/fuel tank.

(c) Install the cab heater assembly referring to GROUP 5.

(d) Install the cab base referring to GROUP 2.

(e) Install the top idlers referring to GROUP 13.

(f) On the left side locate the wiring harness in the clamps along the inside of the loader frame.

(g) Position the transmission pressure filter (2-2) on the mounting pads and secure with the bolts (1-1).

(h) Install the radiator guard referring to GROUP 7.

(i) Install the engine side sheets and hood sheet referring to GROUP 4.

(j) If the lift and tilt cylinders were removed install these referring to GROUP 14. Install the lift arms and bucket referring to GROUP 3.

(k) Install the batteries referring to GROUP 5.

(l) Fill the hydraulic reservoir and open the fuel shut-off tap.

(m) Run the engine and operate the hydraulic equipment through several full cycles to purge air from the system and check for leaks.

SERVICE BULLETIN REFERENCE

Number	Date	Subject	Changes