STEERING SYSTEM

TD-15C AND MODEL 175C STEERING SYSTEM SERVICE CHART

STEERING PLANETARY

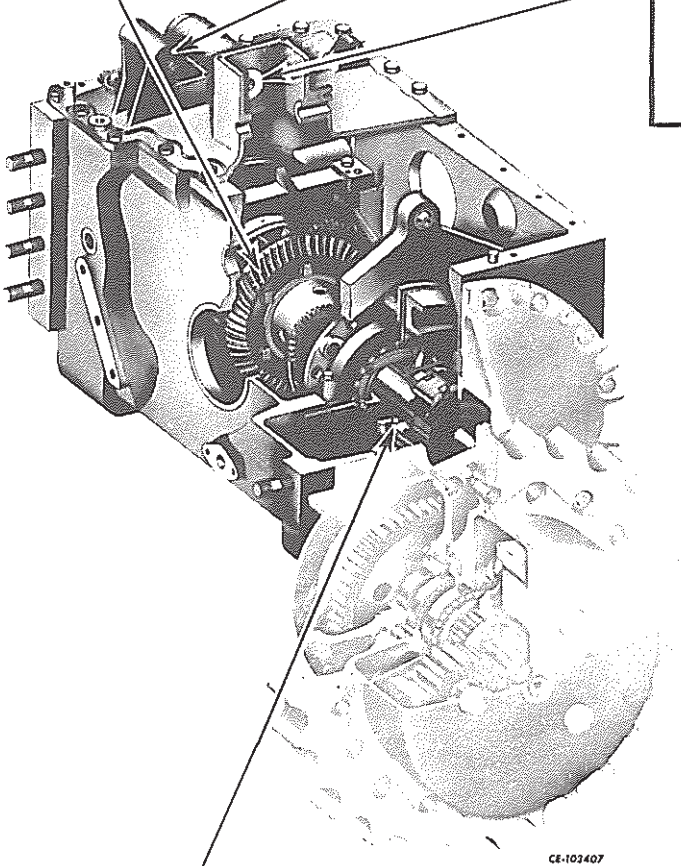
Bevel gear carrier thrust washer thickness	2.311-2.362 mm (.091-.093 in)
Planet gear carrier:	
Bushings ID, (assembled)	122.30-122.25 mm (4.815-4.813 in)
Small sun gear (21 teeth) disc hub OD	122.12-122.04 mm (4.808-4.805 in)
Disc thickness	6.35 mm (.250 in)
Planet gear cluster (small gear, 15 teeth, large gear, 36 teeth):	
Bore diameter	33.36-33.35 mm (1.3135-1.3129 in)
Thrust washer thickness	1.78-1.93 mm (.070-.076 in)
Planet gear cluster shaft diameter	25.4-25.39 mm (1.000-.9996 in)
Backlash, bevel gear with transmission pinion	0.203-0.279 mm (.008-.011 in)

PIVOT BRAKE ACTUATING BELLCRANK

Shaft OD	31.69-31.65 mm (1.248-1.246 in)
Bushing ID (assembled)	31.83-31.71 mm (1.2530-1.2486 in)

BELLCRANK PUSH ROD OUTER LEVER

Shaft OD	25.4-25.38 mm (1.000-.999 in)
Bushing ID (assembled)	25.41-25.46 mm (1.0004-1.0024)



PIVOT BRAKES

Type	Multiple-disc, mechanical
How applied	Steering levers or foot pedal
Mounting	On sprocket drive pinion shaft
Separator plate thickness	3.07-3.17 mm (.121-.125 in)
Friction plate thickness (including lining)	2.79-2.89 mm (.110-.114 in)
Actuator assembly ball diameter	25.4 mm (1 in)
Number of lined plates	7
Number of steel plates	8

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GENERAL

1. DESCRIPTION

The steering system on this tractor combines a planetary gear type drive, steering brakes and pivot brakes for making short turns. These are all located in the rear main frame. The steering is manually operated by hand levers. A brake pedal is used to apply both pivot brakes at the same time for stopping or holding the tractor. Hydraulic boosters are used as an assist for steering.

Steering Planetary

This steering-planetary unit functions as an intermediate crosswise between the transmission and the sprocket final planetary drives. It provides a gear reduction and permits a power disconnect on each side for turning the tractor. Power to the tracks is transmitted through the drive bevel gear, which is bolted to the bevel gear carrier, the planetary gear carriers, located at both ends of the bevel gear carrier, and the sprocket drive pinion shafts out to the sprocket planetary gear drives.

The planet gear carriers are located at the ends of the bevel gear carrier and the hubs are supported by tapered roller bearings mounted in a cage installed in the brake partitions of the main frame. The tapered bearings are preloaded by a circular adjusting nut in a threaded section of the bearing cages. These adjusting nuts are also used to adjust backlash between the bevel gear and pinion. The hub of a 42 tooth sun gear is installed in each end of the bevel gear carrier. A bushing and the hub of a 21 tooth sun gear are installed in the hub of both planet gear carriers. This arrangement provides two adjacent sun gears within each planetary carrier around which the planet gear clusters rotate. Three planet gear clusters, each consisting of a 15 and 36 tooth gear, shaft and roller bearings, mesh with the large (42 tooth) and small (21 tooth) sun gears. The steering brake disc is bolted to the flanged end of the smaller sun gear hub which extends through and beyond the outer edge of the planetary carrier hubs. The sprocket drive pinion shafts extend into the steering planetary and are splined at the

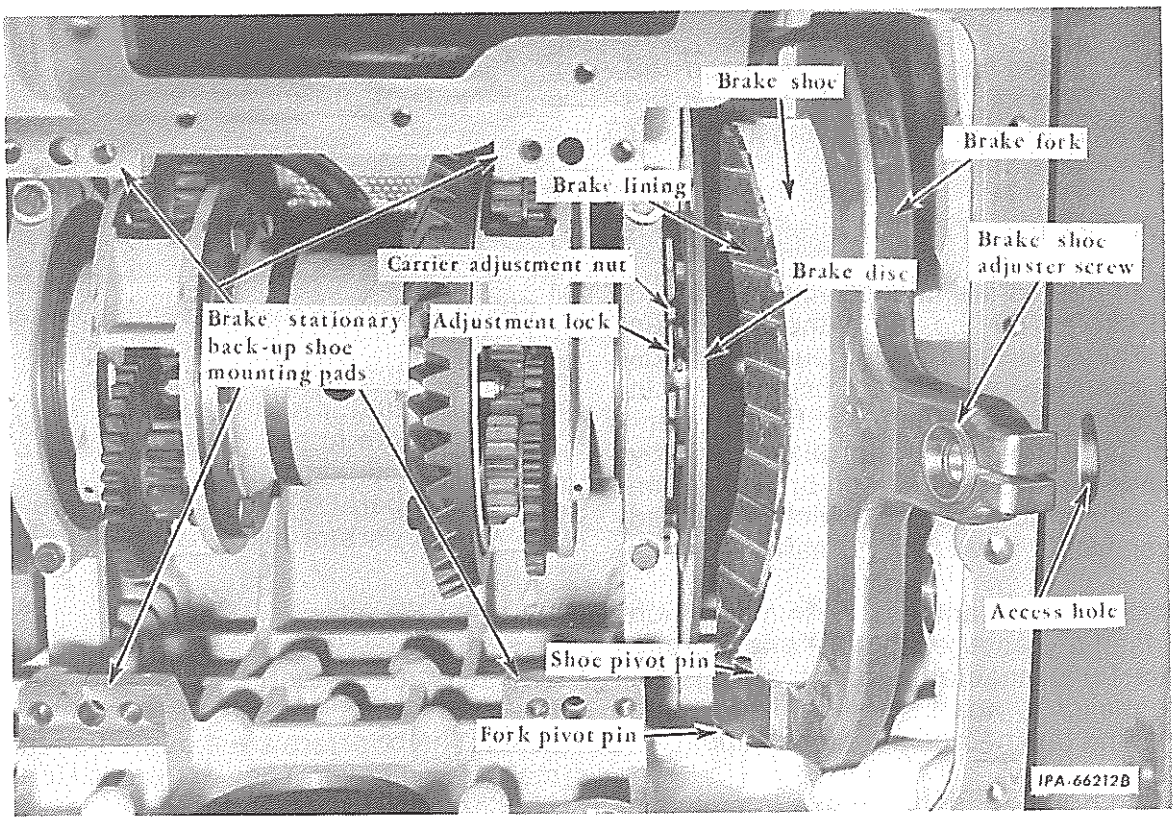

FIG. 1 — Steering Planetary Brakes (Stationary Backup Shoes Removed)

STEERING SYSTEM

GENERAL

1.DESCRIPTION — Continued

Steering Planetary — Continued

inner ends to the large sun gear installed in the bevel gear carrier hub.

Steering Planetary Brakes (Refer to Fig. 1)

There are two sets of mechanical steering planetary brakes installed in the rear main frame, one on each side of the planetary drive unit. Each brake assembly consists of a brake disc, an outer brake shoe installed in a movable fork and an inner stationary backup brake show (not shown). The stationary, or inner brake shoe is secured to the mounting pads shown. Crescent shaped brake linings, bonded to the stationary shoes and to the inner sides of both movable shoes, make contact with the upper section of the brake disc. Springs installed inside the main frame cover apply pressure against the top of each fork, forcing the movable brake shoes against the brake discs. The brake shoes are released with the steering levers which are connected by levers, bellcranks and push rods. When a steering lever is pulled part way, the bellcrank moves the pushrod to force the fork away from the brake disc, causing the outer brake shoe to release the sun gear disc brake disc.

Pivot Brakes (Fig. 2)

The pivot brakes are multiple-disc type and are oil cooled by the oil in the rear main frame. They are separately housed outside of the steering-planetary compartment in each side of the rear frame. Each brake consists of eight steel separator plates held by a retainer (6) and seven lined brake friction plates splined to a hub (3) which is splined to the sprocket drive pinion shaft.

Each brake has an actuator assembly which consists of a pressure plate (1) and a brake actuator (4) connected by three springs (2) and held slightly apart by five balls trapped in matching inclined pockets or ramps.

When the brake actuating cable is pulled, it causes the actuating lever to rotate slightly on its pivot shaft. The actuating lever finger (cast part of the lever) is indexed with a slot in the brake actuator (4) causing the actuator to rotate. As this rotation occurs, the five steel balls located between the plate retainer and actuator roll toward the shallow end of the ramps forcing the actuator against the stationary separator plates and rotating friction plates (5). The same action occurs in either forward or reverse travel. Pick-up blocks, installed at the ends of the brake pull rods, provide delayed brake action which permits the steering levers to be pulled back part way (disengaging sun gear brake disc) without applying the pivot brakes. Further travel of the steering lever applies the pivot brake. (Refer to Fig. 61.)

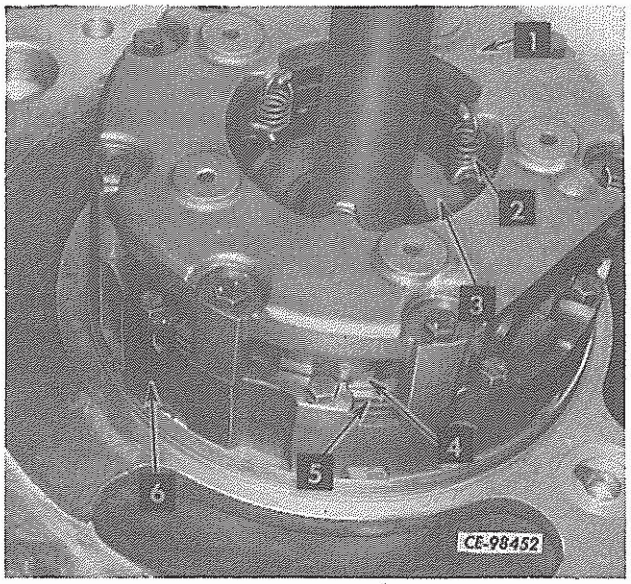

FIG. 2 — Pivot Brake Assembly Installed

1. Actuator pressure plate
2. Actuator return spring
3. Brake hub
4. Brake actuator
5. Separator and friction plates
6. Separator plate retainer

Steering Boosters

The hydraulic steering boosters eliminate the effort to disengage the steering brake discs. The boosters are mounted on the rear main frame cover. They are controlled independently by the steering hand levers and actuated by the oil in the rear main frame.

GENERAL

1. DESCRIPTION — Continued

Operation

With the steering lever in the forward (applied) position, the steering brake holds the sun gear disc with attached sun gear stationary. Rotation of the bevel gear by the transmission pinion carries with it the bevel gear carrier and planetary carriers. This forces the planet gear clusters and their carrier to orbit around the stationary sun gear to which the larger planet gears are meshed. The smaller planet gears, in turn, rotate the sprocket drive pinion shaft sun gear which is splined to the shaft, resulting in a power output.

As the steering lever for one side of the tractor is pulled to the rear (released) position, the steering brake releases the brake disc and small sun gear. Rotation of the bevel gear carrier and planet gear carrier continues. The planet gear carrier induces its rotary motion to the three planet gear clusters which freewheel on their axis and cause the sun gear and disc to rotate in the opposite direction. In a wide gradual turn, the planet gears also freewheel around the larger sun gear, causing the sprocket drive pinion shaft to idle. There is no power output to the pinion shaft. The only reason the sprocket drive pinion shaft turns is that it is being dragged around by the opposite track.

In a pivot turn, however, the steering lever is pulled further to the rear, applying the pivot brake to the sprocket drive pinion shaft. This holds the larger sun gear stationary and allows that end of the planetary drive to freewheel around the sun gears and brake disc. The amount of pressure applied to the pivot brake determines the degree of the turn and the action of the gears in the steering planetary.

One brake pedal, equipped with a pawl and ratchet lock, applies both pivot brakes at the same time without moving the steering levers. Two pulleys (one movable and the other stationary), a cable assembly connected to two brake actuating bellcranks, and a pull rod connected to the brake pedal provide the brake operating linkage. When the foot brake is depressed, the pull rod pivots the movable pulley forward, causing the cable to pull the actuating bellcranks upward to apply the brakes.

2. SPECIFICATIONS

Steering Planetary

Bevel gear carrier thrust washer thickness	2.31-2.36mm (.091-.093 in.)
Planet gear carrier:	
Bushings ID (assembled)	106.34-122.25mm (4.817-4.813 in.)
Small sun gear (21 teeth) disc hub O.D.	122.12-122.04 (4.808-4.805 in.)
Disc thickness	6.35mm (.250 in.)
Planet gear cluster (small gear, 15 teeth; large gear, 36 teeth):	
Bore diameter	33.363-33.348mm (1.3135-1.3129 in.)
Thrust washer thickness	1.78-1.93mm (.070-.076 in.)
Planet gear cluster shaft diameter	25.40-25.389mm (1.000-.9996 in.)
Backlash, bevel gear with transmission pinion	.020-0.28mm (.008-.011 in.)

Steering Planetary Brakes

Number of linings used (each brake)	2
Lining thickness to depth of grooves	3.2mm (1/8 in.)
Bellcrank push rod outer lever:	
Shaft OD	25.40-25.37mm (1.000-.999 in.)
Bushing ID (assembled)	25.410-25.461mm (1.0004-1.0024 in.)

2.SPECIFICATIONS — Continued

Steering Planetary Brakes — Continued

Brake fork push rod bellcrank bushing ID (assembled)	25.540-25.438mm (1.0055-1.0015 in.)
Brake fork push rod bellcrank shaft diameter	25.40-25.438mm (1.000-.998 in.)
Bellcrank push rod length	68.07mm (2.680 in.)
Steering brake pressure spring:	
Free length	140.9mm (5.55 in.)
Test length	96.5mm (3.80 in.)
Test load	3848 N (865 lbf)
Steering brake bellcrank return spring:	
Free length	86.4mm (3.40 in.)
Test length	50.8mm (2 in.)
Test load	155.7 N (35 lbf)
Steering brake hand lever return spring:	
Free length	127.0mm (5.00 in.)
Test length	166.4mm (6.55 in.)
Test load	376.4 N (84.61 lbf)

Pivot Brakes

Type	Multiple-disc, mechanical
How applied	Steering levers or foot pedal
Mounting	On sprocket drive pinion shaft
Separator plate thickness	3.07-3.18mm (.121-.125 in.)
Friction plate thickness (including lining)	2.79-2.89mm (.110-.114 in.)
Actuator assembly ball diameter	25.4mm (1 in.)
Number of lined plates	7
Number of steel plates	8
Brake pedal return spring:	
Free length	244mm (9.61 in.)
Test length	331.8mm (13-1/16 in.)
Test load	177.9 N (40 lbf)
Actuator return springs:*	
Free length	34.9mm (1-3/8 in.)
Test length	41.3mm (1-5/8 in.)
Test load	126.8 N (28-1/2 lbf)
Actuating lever return spring:*	
Free length	69.9mm (2-3/4 in.)
Test length	73.0mm (2-7/8 in.)
Test load	320.3 N (72 lbf)
Pivot brake actuating bellcrank:	
Shaft OD	31.70-31.65mm (1.248-1.246 in.)
Bushing ID (assembled)	31.826-;31.714mm (1.25301.2486 in.)

Hydraulic Steering

Housing inside diameter	57.15-57.23mm (2.250-2.253 in.)
Booster piston:	
Outside diameter	57.07-57.12mm (2.247-2.249 in.)
Inside diameter	25.375-25.400mm (.9990-1.0000 in.)
Rod diameter	25.35-25.40mm (.998-1.000 in.)

GENERAL

2.SPECIFICATIONS — Continued

Hydraulic Steering — Continued

Piston support inside diameter	25.42-25.50mm (1.001-1.004 in.)
Piston valve return spring (12 coils):	
Free length	90.7mm (3.57 in.)
Test length	63.5mm (2.5 in.)
Test load	22.2 N (5.0 lbf)
Booster piston return spring:	
Free length	262.38mm (10.33 in.)
Test length	307.34mm (12.10 in.)
Test load	2.2 N (.50 lbf)
Piston sealing ring gap (assembled in housing)	0.03-0.15mm (.001-.006 in.)

Special Nut and Bolt Torque Data
(Torques given are for bolts and nuts lubricated with SAE-30 engine oil)

Bevel gear dowel bolts	125 N.m (92 lbf ft)
Bevel gear carrier bolts	125 N.m (92 lbf ft)
Planet carrier dowel bolts	125 N.m (92 lbf ft)
Sprocket drive carrier capscrews	393-434 N.m (290-320 lbf ft)
Foot brake idler pulley stud shaft	393-434 N.m (290-320 lbf ft)
Foot brake movable pulley support stud	393-434 N.m (290-320 lbf ft)
Pivot shaft cap-to-sprocket drive carrier bolts	995-1216 N.m (734-897 lbf ft)
Pivot brake actuating lever support bolts	231-257 N.m (170-190 lbf ft)
Pivot brake actuator pressure plate bolts	50-53 N.m (37-39 lbf ft)
Pivot brake separator plate retainer bolts	50-53 N.m (37-39 lbf ft)
Steering planetary brake disc-to-hub bolts	47-50 N.m (35-37 lbf ft)
Swinging drawbar pivot bracket bolt	320 N.m (434 lbf ft)
	267 N.m (195 lbf ft)†
Drawbar bolt:	
Model 175C	710 N.m (520 lbf ft)
TD-15C	1044 N.m (770 lbf ft)
	1110 N.m (815 lbf ft)†
Rear main frame cover bolts (5/8")	267 N.m (195 lbf ft)
Rear main frame cover bolts (3/4")	455 N.m (335 lbf ft)

3. SERVICE DIAGNOSIS (Refer to Section 7A, "TRANSMISSION (Power Shift)")

STEERING PLANETARY

4.REMOVAL

IMPORTANT: *Before removing, review the service diagnosis and perform the tests given in Section 7A, "TRANSMISSION." In this manner, hydraulic and mechanical malfunctions can be pinpointed and corrected at time of teardown.*

NOTE: Disconnected hydraulic lines must be properly capped with the correct size plastic cap. If caps are not available, use tape or rubber stoppers. Openings must never be plugged with rags. This practice could introduce dirt or lint into critical hydraulic components. Remove all dirt accumulation from the main frame cover.