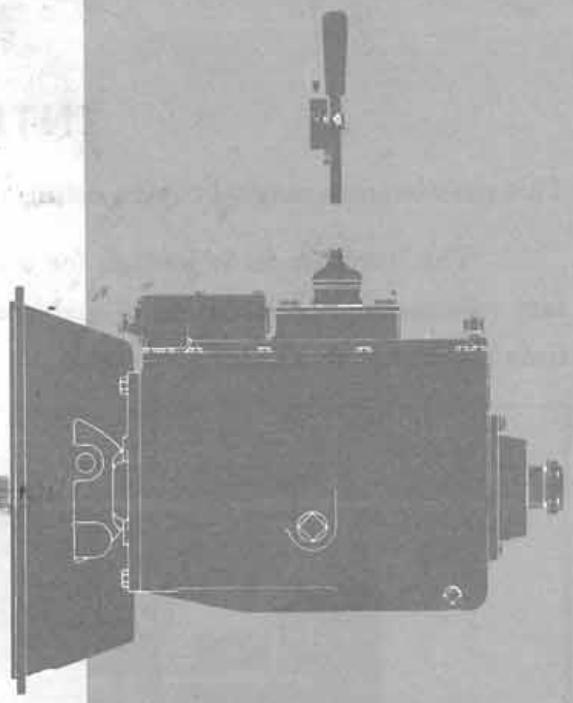


SPICER®

SST

10-SPEED SPLIT-TORQUE TRANSMISSION

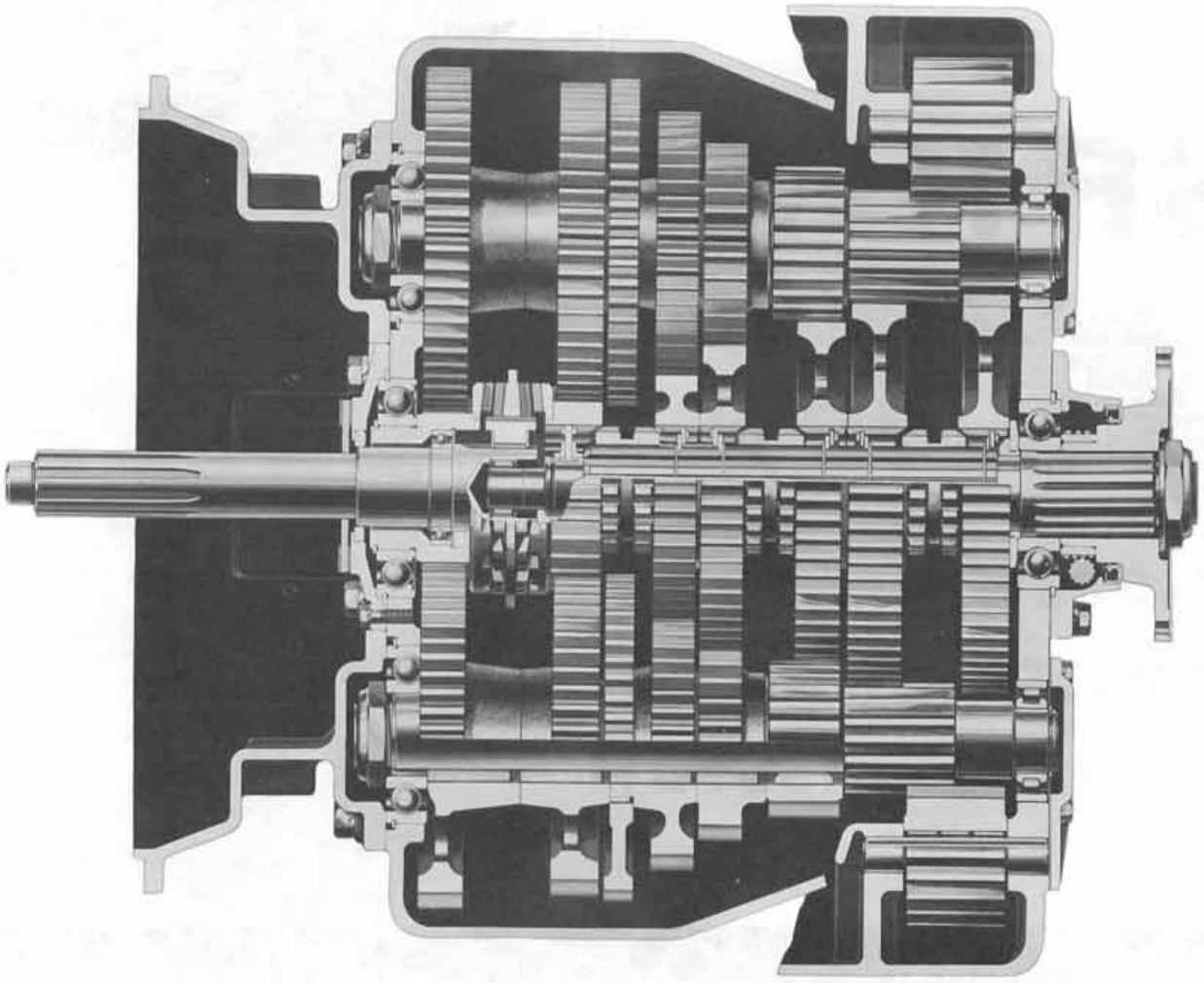
SERVICE MANUAL

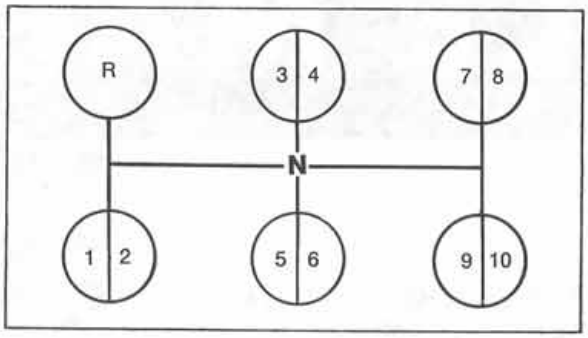
DANA CORPORATION
SPICER TRANSMISSION
DIVISION

INTRODUCTION

This maintenance manual covers details of the SPICER SST 10-Speed Transmission.

The information is written for a skilled mechanic and, therefore, excludes much elementary information. Application of this information will result in longer service life with less downtime and reduced maintenance costs.





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DIRECT AIR CONTROL PIPING FOR SST-1010 WITH COMBINED FILTER-REGULATOR

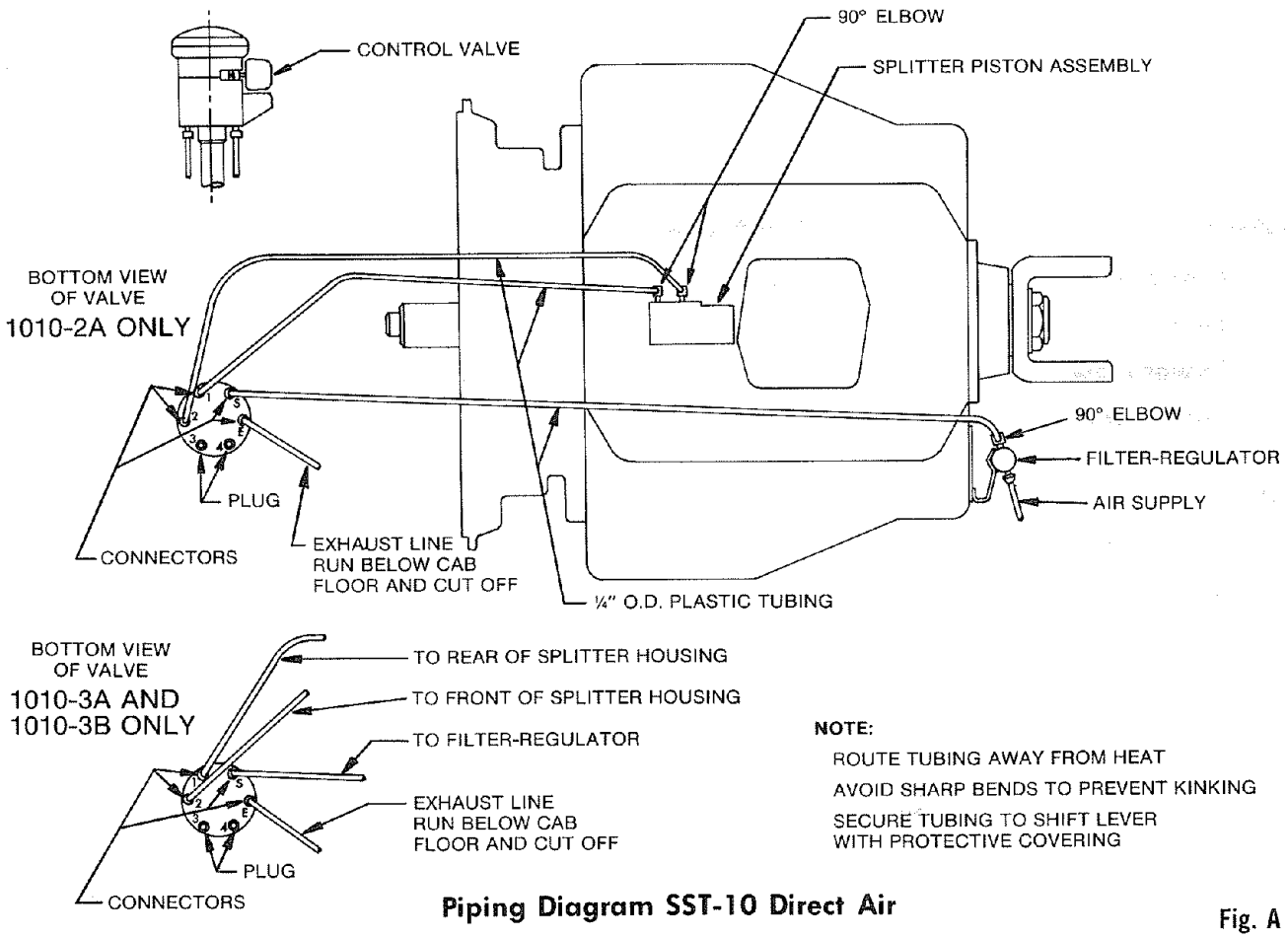
1. Disconnect two air lines from two 90° elbows located on the side of the splitter.

2. The air line on the filter-regulator that connects to the supply on the control valve can be disconnected at the 90° elbow.

Removal and disassembly of the splitter piston assembly is covered on Pages 10 and 11.

NOTE:

Direct air controls do not have side mounted valve body on splitter piston assembly. Omit Paragraphs 1 through 8, on Page 11 when disassembling.



Piping Diagram SST-10 Direct Air Fig. A

CONVERSION OF PILOT AIR TO DIRECT AIR
(Use Kit No. 313212-2X for conversion.)

1. Disconnect all air lines from the splitter piston assembly (per Figure 1).
2. Remove the splitter piston assembly from the transmission.
3. Remove the six screws holding the Humphrey valve body mounted to the side of the splitter piston assembly. This valve body will no longer be used with direct air.
4. Remove the piston and rod from the splitter piston housing cylinder. (Refer to Page 10, Paragraph 1 through 4 for removal.)
5. There are two ¼" diameter through holes into cylinder hole. Drill 7/16" diameter by 11/16" deep maximum; tap ¼"-18 N.P.T.F. threads in each hole.
6. Remove the tapping chips from the cylinders and install two ¼"-18 N.P.T.F. 90° elbows with air connections in the splitter piston housing.
7. Reassemble splitter piston and rod in splitter piston housing. (Refer to Page 11, Paragraph 9 through 13 for assembly.)
8. Mount the piston housing to the transmission.
9. Remove the old flipper control valve with air lines from the shift lever in the cab.
10. Insert four air connectors into the bottom of the new direct air control valve at the ports marked E,S, 1 and 2. Insert two plugs in the bottom of the control valve at the ports marked 3 and 4. Install the control valve to the end of the shift lever.
11. Attach one ¼" N.P.T.F. 90° elbow to the filter-regulator. Use Teflon pipe dope.
12. Attach air lines to control valve, splitter piston assembly and filter-regulator per drawing for direct air (Figure A.).

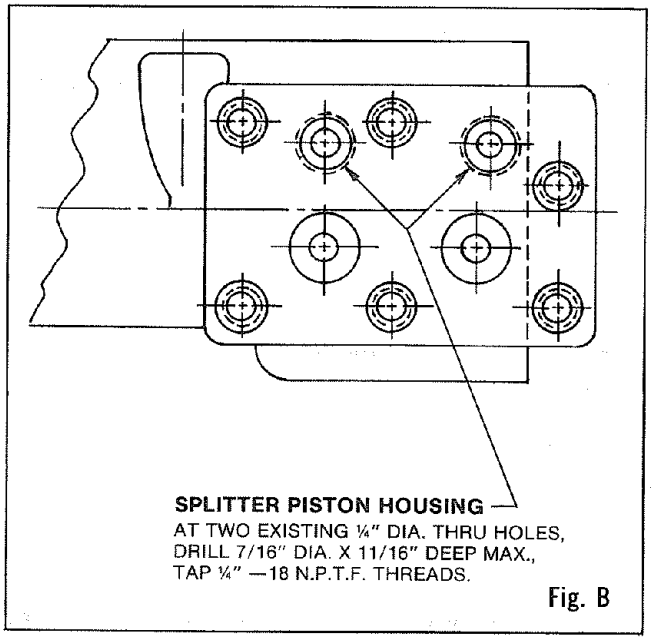


Fig. B

SST-10 LUBRICATION

GENERAL INFORMATION

The SST Series, 10-speed constant mesh transmission is designed to utilize splash lubrication for all bearings, shafts and gears. To insure proper lubrication and operating temperatures in these units, it is most important that the proper lubricants be used and that correct oil levels be maintained.

RECOMMENDED LUBRICANTS:

TEMPERATURE	GRADE	TYPE
ABOVE 0°F BELOW 0°F	SAE 30, 40, or 50 SAE 30	HEAVY DUTY ENGINE OIL MEETING SPEC MIL-L-2104B OR MIL-L-45199 SERIES 3
ABOVE 0°F BELOW 0°F	SAE 90 SAE 80	STRAIGHT MINERAL GEAR OIL

The lubricant should not contain vegetable or animal oils, resin, soaps, graphite, fillers or foreign materials of any kind. **The use of extreme pressure additives, such as found in multi-purpose or rear axle type lubricants, is not recommended in a Spicer transmission.**

Capacity: Approximately 38 pints at 0° installation angle. Fill until oil runs out of fill hole on the transmission.

NOTE: Because the angle of installation will vary, field experience indicates that the oil capacity will become *less* as the angle increases.

OIL CHANGES:

We recommend an initial oil change and flush at the first practical opportunity after the transmission is placed in service. This could take place after a drive-away delivery, only 100 miles or 24 hours of off-highway service, but not more than 2,000 miles of over-the-highway.

There are many factors that influence the oil change period and we have not specified a definite mileage interval. In general, it is suggested that a drain and flush period be scheduled every 20,000 miles for normal over-the-highway operations. Off-the-highway usually requires oil change every 30 days. The oil level in the transmission should be checked every 2,000 miles on-highway, or every 24 hours in off-highway operation.

OVERFILLING:

Do not overfill this transmission with lubricating oil. Overfilling usually results in oil breakdown due to excessive heat and aeration from the churning action of the gears. Early breakdown of the oil will result in heavy varnish and sludge deposits that plug up oil ports and build up on splines and bearings. Overflow of oil usually escapes onto clutch or parking brake causing additional trouble.

CAUTION

Do not tow vehicles with Spicer transmissions without first pulling the axles or disconnecting the drive shaft. Lubrication of the internal gear train is inadequate when the vehicle is towed.

GENERAL INFORMATION

MAINTENANCE INFORMATION:

We recommend that the procedures as outlined in the manual be followed when performing maintenance work on all SST transmissions.

TOOLS:

This transmission can be repaired with ordinary mechanic's hand tools, however this procedure is not only slow but may damage otherwise serviceable and reusable parts. To reduce maintenance costs and vehicle downtime, we recommend that the special tools listed in this manual be procured from a tool manufacturer or be made up in your own shop.

REBUILD FACILITIES:

A suitable holding fixture or overhaul stand is desirable but not necessary to rebuild this unit. The flat bottom of the transmission case provides a suitable working platform when the unit is placed on a sturdy shop table.

For easier working conditions, table height should be 28 - 30 inches. A light chain hoist should be used to handle the mainshaft and countershafts during removal and reassembly procedures.

CLEANLINESS:

Transmissions should be steam cleaned prior to disassembly. Seal all openings before steam cleaning to prevent entry of dirt and water which can damage serviceable parts.

Dirt is abrasive and will cause premature wear of bearings and other parts. We suggest that mechanics have a small wash tank to clean parts just prior to reassembly.

BEARINGS:

When a transmission is removed at relatively low mileage, bearings should be removed with pullers designed for this purpose. Wrap the bearings to keep out dirt. Clean, inspect and lubricate all bearings just prior to reassembly. If accumulated mileage is over 150,000 miles, we suggest that all bearings be replaced.

END YOKES & FLANGES:

Hammering on end yokes and flanges, to remove or install them is not only destructive to the yoke or flange itself, but can also cause serious internal damage. Hammering destroys or mutilates the pilot diameters and warps or bends the flange. Hammering on end yokes will close-in the bearing bores or misalign yoke lugs and result in early failures of journal needle bearings, etc.

Serious damage can be done internally to bearings, thrust faces and washers, pilot bearings, etc., by hammering on external parts.

In most designs when the yoke/flange locknuts are tightened and secure, the internal bearings and gears are in proper location. When the yoke/flange is driven on the shaft, two conditions can exist.

A. If the bearing fit is *tight* on the shaft, then usually the bearings will brinell as they must absorb the pounding forces.

B. If the bearing is *loose*, the shaft will keep moving inward until it is stopped by the internal parts such as pilot bearing thrust washers, etc.

GENERAL INFORMATION

CLUTCHES:

A clutch brake is required for use with this transmission. Attention is called to the fact that Spicer 14" and 15½" two-plate clutch service manuals (Bulletins 1302 and 1303) are available for the asking, and contain complete information on all Spicer heavy duty clutches.

REPLACEMENT PARTS:

The exploded views of sub-assemblies which are incorporated here are for the mechanic's convenience and show the latest material. The parts are arranged in their correct order and may also be used as a reference for assembly or disassembly of this unit.

No special precautions are necessary during removal or installation of the bell housing. The bell housing is piloted on the input drive shaft bearing cap and the large flat case mounting face insures correct alignment of bores, face and pilot with bell housing.

POWER FLOW:

The Spicer split torque transmission is designed for medium and heavy duty, on and off-highway applications.

The two countershaft design allows the engine torque to be equally divided between the two countershafts. This provides a high ratio of torque capacity to transmission weight. This also allows a reduction in the face width of each gear involved in the transmission. All the gears are in constant mesh through spur teeth.

The SST-10 transmission has ten forward speeds and two reverse speeds. All gear selections are made with a mechanical shift lever only.

SPEEDOMETER DRIVE:

The rear mainshaft bearing cap has provision for installation of speedometer driven gear and the attachment cable.

MAGNETIC OIL CLEANER:

The right side drain plug has a long, three-disc, magnetic stem attached to the plug to catch and hold metallic particles deposited in the oil.

P-T.O. SPECIFICATIONS:

Power Take-Off
Bottom: S.A.E. Standard Heavy Duty 8-Bolt
Right side: S.A.E. Standard Regular Duty 6-Bolt
P.T.O. drive gear:
The SST-10 has a (51) tooth (6/8) pitch on the left countershaft and (51) tooth (6/8) pitch gear on the right countershaft.

SPECIFICATIONS

SHIFTING:

This transmission is a combined mechanical and air-shifted unit. All gear selections are made through the mechanical shift lever or by first preselecting the air-controlled splitter unit mounted on the shift lever.

The air control is designated with a (hi) and (lo) position. When the selector is moved to either position, a piston attached to a shift rod and shift fork in the shifter housing moves. The (hi) position shifts the air piston for positions 2, 4, 6, 8 and 10. The (lo) position shifts the same piston for positions 1, 3, 5, 7 and 9.

As in other Spicer transmissions, the gear ratios are progressively spaced with an average of 25% steps between ratios.

Engine torque is transferred from the clutch to the drive gear teeth. The torque is then divided equally into each of the head end gears on the two countershafts.

The head end splitter (air-shifted) is engaged to the drive gear curvic ring side (front)for selection of the odd numbered shift positions (1, 3, 5, 7, 9). The splitter is engaged into the gear curvic ring side (rearward) for selection of the even numbered shift positions (2, 4, 6, 8, 10).

After the selection of the splitter has been made, the shift lever engages the clutch collar for the gear chosen. This locks in the mainshaft gear and takes the torque from both countershaft gears, delivers the torque through the mainshaft to the output yoke or flange of the unit.

OPERATION:

This unit has ten selective ratios with progressive steps, and should not be shifted as a conventional model transmission with an auxiliary transmission, or a two-speed axle. Because each gear selection in this unit is controlled by an air splitter valve, all shifts are made with one lever. The splitter control valve on the lever is used to preselect the desired gear ratio. This transmission consists of five (5) basic speed gears, that are used twice in conjunction with the hi-lo splitter control system. Ten forward speeds are obtained by using the air-controlled splitter at each of the five mechanical shifts.

TORQUE WRENCH GUIDE FOR SST-10 TRANSMISSIONS.

PART NAME	LBS. FT. TORQUE	
Mainshaft flange/yoke locknut	550-600	
Left countershaft — front locknut	550-600	
Right countershaft — front locknut	550-600	
Clutch housing locknuts	½" Dia. 60-80	⅝" Dia. 120-150
Mainshaft front bearing capscrews	25-32	
Mainshaft rear bearing capscrews	60-80	
Countershafts rear bearing capscrews	25-32	
Shifter housing capscrews	25-32	
All set screws (shift forks, brackets and fingers)	40-50	

OVERHEAD CONTROL

DISASSEMBLY OF MISCELLANEOUS PARTS:

NOTE

If overhead or remote controls are intact on the shifter housing, shift the transmission into neutral position before their removal.

1. Disconnect air lines (V-20) from splitter valve (S-1) on shifter housing.

2. Disconnect air line (V-15) from splitter valve (S-1) and from pressure regulator (V-3).

3. If necessary at this time, disconnect pressure regulator and bracket (V-3 and J-56) also filter assembly and bracket (V-10 and J-56) from the rear countershaft bearing caps on the case. Leave air hose (V-8) connecting regulator and filter assemblies intact on these parts unless air hose is damaged or broken and requires replacement.

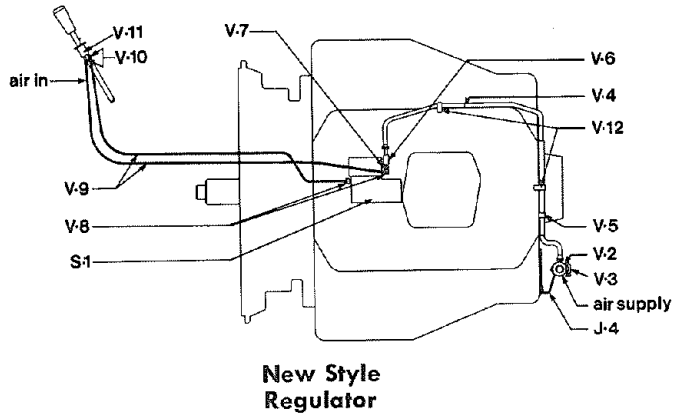
NOTE

If unit is equipped with new style integral filter-regulator (V-2) disconnect air hose (V-4) from (V-2). Also remove filter-regulator with new bracket (J-4).

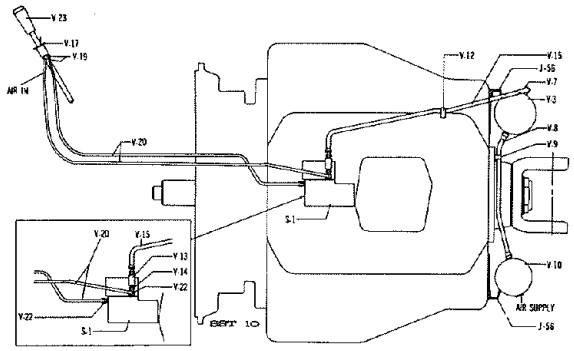
4. Remove the six capscrews (Q-3) and lockwashers (Q-5). Separate the shifter dome (P-12) or remote housing (L-3) from the shifter housing (R-2) and gasket. Lift straight up to remove dome assembly or remote control assembly from shifter housing opening.

NOTE

The disassembly, inspection and reassembly of the overhead control is covered on pages 8 through 9.



New Style Regulator



Old Style Regulator

Fig. 1

REMOVAL:

NOTE

If overhead or remote controls are intact on shifter housing then shift transmission into neutral position before removal.

1. Remove the six retaining cap screws (Q-3) and lock washers (Q-5). Separate the dome (P-12) from the shifter housing and gasket and lift straight up. (See Fig. 3).

DISASSEMBLY:

1. Position shift lever dome (P-12) on edge in vise.

2. Pull up grommet (P-6). Depress collar (P-8) against spring (P-9) and remove lock pin (P-7).

3. Slide compression cup (P-10) up shift lever (P-4) and remove rock shaft snap ring (P-14).

4. Tap rock shaft (P-13) free of dome and remove shift lever (P-4). Remove seal (P-11) and discard.

5. Remove shift lever handle (P-5) and slide grommet (P-6), collar (P-8), spring (P-9) and cup (P-10) off lever.

OVERHEAD CONTROL

INSPECTION:

Wash all parts thoroughly and inspect for excessive wear at cross hole "X" in lever (P-4) and rock shaft (P-13).

Inspect finger end of shift lever for excessive wear. See Figure 2 for original contour.

Check spring tension by comparing to a new part.

REASSEMBLY:

1. Position shift lever dome (P-12) on edge in vise.

2. Hold shift lever (P-4) so that cross hole "X" in lever aligns with the rock shaft cross holes in dome.

3. Insert rock shaft (P-13) through hole in dome and cross hole of shift lever.

4. Assemble rock shaft snap ring (P-14) to groove of dome and lock rock shaft in place.

5. Grease lightly and assemble new seal (P-11) to shift dome. Grease inner wall of cup (P-10) and slide over shift lever into position on dome.

6. Assemble spring (P-9), collar (P-8) and grommet (P-6) over shift lever. Depress collar (P-8) and insert lock pin (P-7) through hole in shift lever.

7. Assemble shift lever handle (P-5).

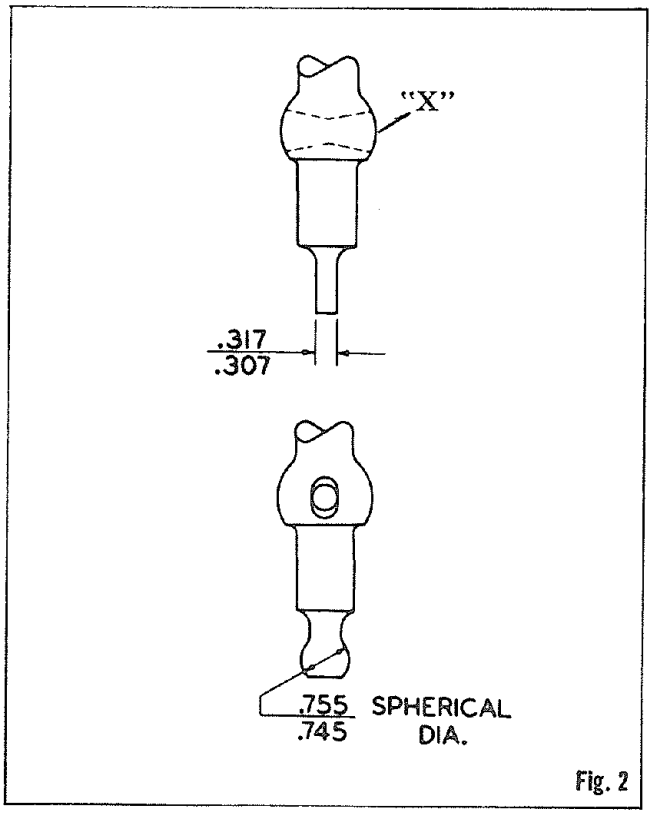


Fig. 2

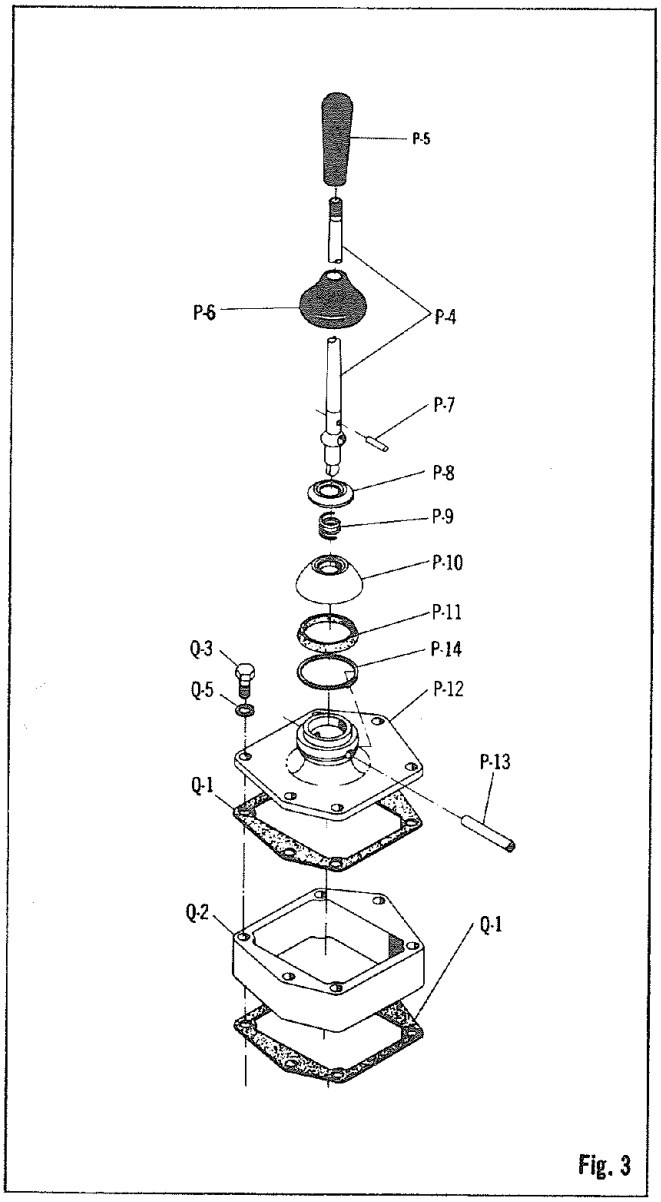


Fig. 3

INSTALLATION:

1. Shift unit into neutral so notches of shift forks and brackets align.

2. Use light coat of gasket cement to assemble new gasket (Q-1) to shifter housing opening.

> **NOTE**
>
> *If filler block (Q-2) is used, a second gasket (Q-1) will have to be applied as shown in Figure 3.*

3. Place shift lever and dome assembly on shifter housing, noting that finger end of shift lever enters the neutral position notches.

4. Secure with six capscrews and lockwashers (Q-5 and Q-3).

SHIFTER HOUSING

REMOVAL OF SHIFTER HOUSING FROM MAIN CASE:

Remove the ten retaining capscrews (K-2) and lockwashers (K-4), also the retaining nuts (K-5) and washers (K-4). Separate shifter housing (R-2) from the main case and gasket by lifting up and tilting housing to the right side, so splitter fork shoes (R-7) can clear clutch collar ring (B-2).

DISASSEMBLY OF SHIFTER HOUSING:

1. Remove four capscrews (S-10) and lockwashers (S-11) from the top of splitter piston housing (S-9) sub-assembly. Remove complete splitter control assembly with gasket (S-26) from shifter housing (R-2).

2. Place splitter control in soft jaws of vise, with splitter piston rod shift bracket (S-22) up.

3. Cut lockwire and remove set screw (S-23) from the shift bracket (S-22).

4. Remove four capscrews (S-14) and lockwashers (S-15) from cap (S-12) to expose piston and rod (S-17, S-16). Pull on rod lock nut (S-18), to take rod away from shift bracket (S-22) and out of housing cylinder (S-9).

NOTE

If necessary, remove O rings (S-20) from piston O.D. groove and (S-19) under I.D. of piston, also ring (S-21) located in housing. If rings are damaged by cuts or have flat spots on air sealing surfaces replace the O ring.

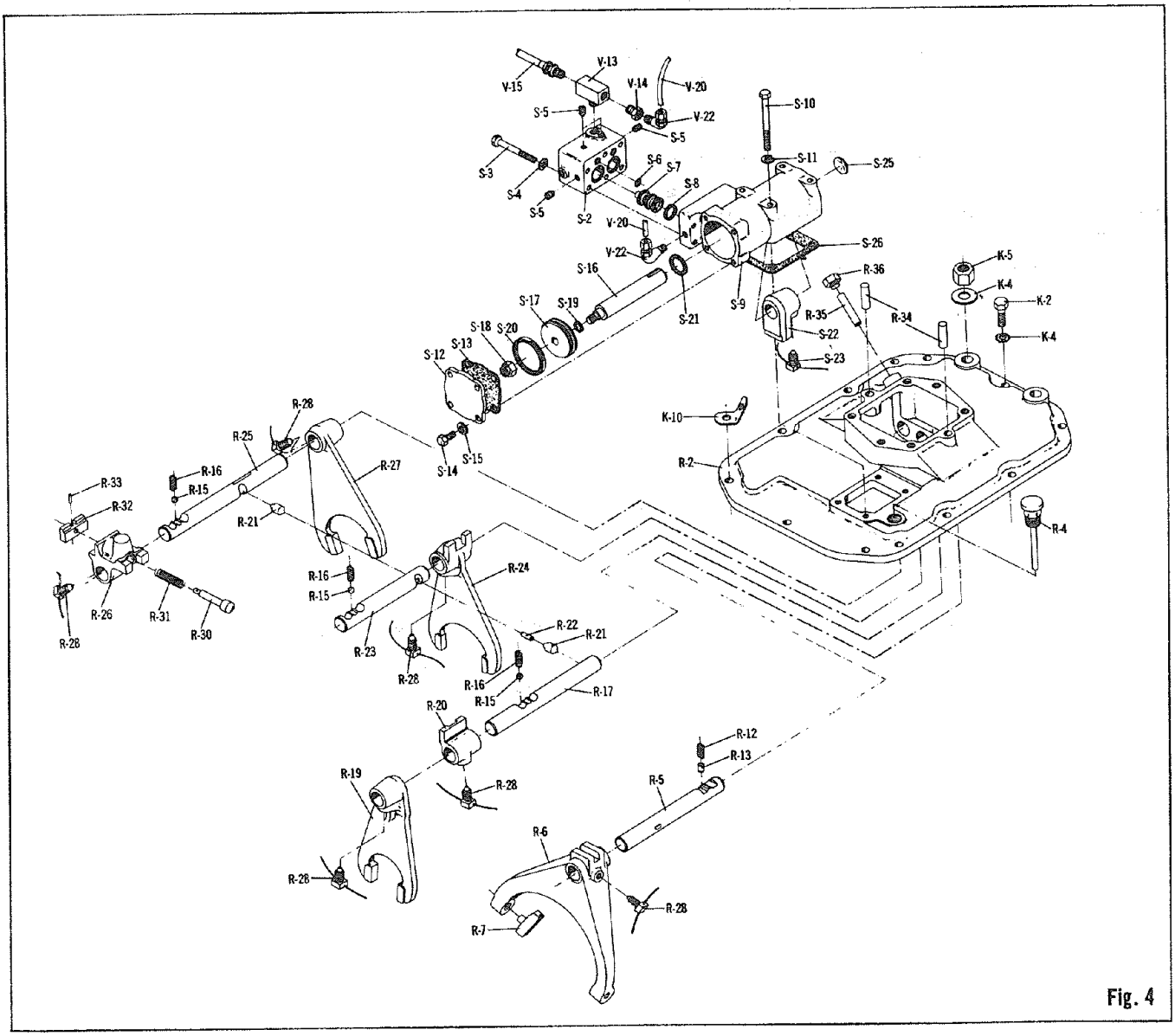


Fig. 4

SHIFTER HOUSING

5. Remove six capscrews (S-3) and lockwashers (S-4) from housing (S-2) of splitter air valve body (S-9). Remove valve housing (S-2) from piston housing (S-9).

6. Remove plungers (S-7) from housing. Inspect "O" rings (S-8) on both plungers for cuts or flat spot wear on sealing surfaces. Replace if necessary.

7. After complete inspection of plunger "O" rings (S-8) and "O" rings (S-6), reassemble new rings, if necessary, on plungers, piston O.D. and I.D. Dow silicon grease is recommended for "O" ring and quad ring lubrication.

8. Reassemble plungers into air valve housing (S-2). Install housing (S-2) on piston body (S-9). Secure valve body on piston housing with capscrews (S-3) and lockwashers (S-4). Torque capscrews to 7-10 lbs. ft.

9. Place piston (S-17) on shift rod (S-16). Secure piston to rod with locknut (S-18). Tighten hand tight at this time.

10. Install piston and rod (long end of rod toward welch plug) into the housing cylinder. As rod end comes through front boss. Install bracket (S-22) on rod, with extended hub of bracket toward welch plug (S-25).

11. Locate bracket (S-22) in its proper position on shift rod. Secure with set screw (S-23). Torque set screw to 40-50 lbs. ft. Secure with lockwire.

12. Tighten rod locknut (S-18). Torque to 40-50 lbs. ft.

13. Install cylinder cap (S-12) and gasket (S-13) on cylinder housing (S-9). Secure with capscrews (S-14) and lockwashers (S-15). Torque capscrews to 13-17 lbs. ft.

14. Set air valve sub-assembly aside for later installation on shifter cover.

15. Remove splitter fork shoes (R-7) from splitter fork (R-6), if they are still on the fork.

16. Place edge of shifter housing in vise with rods and forks exposed to the mechanic and the front of the housing to his left, or lay shifter housing on work bench with forks up and the front of the housing to the left.

17. Cut and remove all lockwires. Loosen and remove all set screws (R-28).

18. Turn splitter shift rod (R-5) 90° in either direction, to preload poppet detent pin (R-13) into recess hole of middle boss of shifter housing (R-2).

19. With soft drift or soft head hammer, tap splitter shift rod (R-5) to the left. As the rod clears the housing middle boss, recover detent pin (R-13) and remove poppet spring (R-12) from housing boss recess hole. As rod clears splitter fork (R-6), remove fork from rod and remove rod from front boss of housing.

20. Tap 7th-8th and 9th-10th shift rod (R-17) to the left. Remove bracket (R-20) as it clears the rod. Recover poppet ball and spring (R-15 & R-16) as the rod clears the front boss. Remove shift fork (R-19) as it clears the rod. Remove rod from the front boss.

21. Tap 3rd-4th and 5th-6th shift rod (R-23) to the left. Recover poppet ball and spring (R-15 & R-16) from housing boss. Recover shift rod interlock pin (R-22) if it should dislodge from rod during rod movement. Remove shift fork (R-24) as it clears the rod. Remove rod from the front boss.

22. Remove interlock pin (R-21) located internally in the rear boss between rod (R-17) and rod (R-23) bores.

23. Tap 1st-2nd and reverse shift rod (R-25) to the left. Remove shift fork (R-27) as it clears the rod. Recover poppet ball and spring (R-15 & R-16) from housing boss. Remove bracket subassembly (R-26) as it clears the rod. Remove rod from the front boss.

24. Remove second interlock pin (R-21) from the housing located between rod (R-23) and rod (R-25) housing bores.

25. To disassemble 1st or reverse shift bracket (R-26), grip trunnion ends in vise with soft jaws. Shear block retainer pin (R-33) using a flat head punch against the small diameter end of plunger (R-30). Strike plunger end with a sharp blow to shear pin (R-33). Lock pin is .084" diameter and is of soft metal. Recover plunger (R-30) and plunger spring (R-31). Check block (R-32) and plunger (R-30) for excessive wear. Check spring (R-31) for broken coils or weak tension.

26. Remove vent (R-4) from top surface of housing.

27. Remove old gaskets and sealing material from machined surfaces of shifter housing and top of main case.

IMPORTANT

Examine shift fork pads for excessive wear. Sharp corners of pads should be chamfered slightly with hand grinder to allow oil entry between pads and shift collar to reduce wear on these surfaces.

28. Clean all parts thoroughly and examine the parts carefully. If they are to be reassembled, check 1st-reverse blocker pin (R-34) that is located on internal side of shifter housing. If the pin shows excessive wear or galling replace with a new pin. To replace pin in shifter housing, drive old pin out with flat head punch. New pin (R-34) must be pressed into housing hole. Press pin flush to top surface of shifter housing. This will allow proper length extention to the internal location of the shifter housing.

ASSEMBLY OF SHIFTER HOUSING:

1. If 1st-reverse bracket (R-26) was previously disassembled, reassemble bracket as follows.

2. Grip trunnion ends of bracket (R-26) in soft jaws of a vise, with shift gate towards the rear of the vise. Assemble plunger spring (R-31) and plunger (R-30) into access hole of bracket. Preload plunger with "C" clamp. Blocker (R-32) has a machined step surface, assemble blocker step toward shift gate.

SHIFTER HOUSING

CAUTION

Assembling the blocker step outward will cause 1st-2nd and reverse gear blockout.

Assemble blocker (R-32) into small diameter of plunger (R-30) align block pin hole with plunger pin hole and assemble lock pin (R-33) until pin enters plunger hole. Use .084" flat head punch on pin (R-33). Tap pin until it is seated. Release "C" clamp from plunger. Exercise plunger backward and forward to be sure parts are functioning properly and that there is no hang-up of parts.

3. Place shifter housing on bench top with the inside of housing facing out and with the front of the housing facing left.

4. Check all four shift rods (R-25, R-23, R-17, R-5) in their proper positions of the housing bosses to make sure they slide freely and that there is no excessive radial movement to the boss bores. Remove rods and apply a light coat of grease to all bores in the shifter housing and to the shift rods as they are assembled to the housing.

5. Coat interlock (R-21) with heavy grease and assemble interlock into access hole of rear boss through 1st-reverse shift rod bore.

6. With poppet tool or equivalent, preload poppet spring (R-16) and ball (R-15) in poppet detent bore of 1st-2nd/reverse rod location.

7. Select 1st-2nd/reverse shift rod (R-25). Start the end of the rod furthest from set screw countersunk holes, through the rear boss of housing. Assemble 1st-2nd/reverse bracket (R-26) on the rod, with bracket top boss down and the shift gate towards tower opening. Tap shift rod sharply to remove poppet loading tool. Slide rod into front boss. Assemble fork (R-27) on rod, with extended hub of fork to the right. Locate fork and bracket in their proper positions and secure with set screws (R-28). Torque setscrews 40-50 lbs. ft. Secure with lockwire. Locate shift rod until poppet ball (R-15) registers in the neutral detent of shift rod (R-25).

8. Use poppet assembly tool or equivalent and preload poppet spring (R-16) and ball (R-15) in the next poppet detent bore.

9. Select 3rd-4th/5th-6th shift rod (R-23). Coat small interlock pin (R-22) with heavy grease and insert pin into hole of shift rod. Enter rod (R-23), with interlock pin to the right, through the rear boss.

10. Assemble 3rd-4th/5th-6th shift fork (R-24) to the rod with extended hub of fork to the left. As the rod enters front boss, tap rod sharply to remove poppet loading tool. Locate shift fork in its proper position and secure with set screw (R-28). Torque set screw 40-50 lbs. ft. Secure with lockwire. Locate rod in neutral detent of shift rod.

11. Coat interlock (R-21) with heavy grease and assemble interlock into access hole of rear boss through 7th-8th/9th-10th speed shift rod bore.

12. Use poppet assembly tool or equivalent and preload poppet spring (R-16) and ball (R-15) in poppet detent bore of 7th-8th/9th-10th location.

13. Select shift rod (R-17) and enter the longest end from the interlock detent, into the rear boss.

14. Assemble shift rod bracket (R-20) on rod with shift gate downward. Tap shift rod sharply to remove poppet loading tool in front boss. Assemble shift fork (R-19) to rod with extended hub to the left. Locate bracket and fork in their proper positions on the rod and secure with set screws (R-28). Torque set screws 40-50 lbs. ft. Secure with lockwire. Locate rod in neutral detent of shift rod.

15. With preload tool or equivalent, preload poppet spring (R-12) and poppet pin (R-13) in poppet detent bore for splitter shift rod (R-5).

16. With shift rod (R-5) poppet detent facing up, assemble poppet detent end of shaft into front boss. Assemble splitter shift fork (R-6) on the shaft, with extended hub to the right and hub shift gate down. Tap shift rod sharply to remove poppet loading tool in housing boss.

17. Turn shift rod (R-5) 180°, so that poppet pin (R-13) locates into shift rod detent. Locate shift fork in its proper position on the rod and secure with set screw (R-28). Torque set screw 40-50 lbs. ft. Secure with lockwire. Locate rod in left side detent of shift rod. This locates splitter fork in (lo) position of splitter to transmission gear.

18. Shift 1st-reverse speed fork into gear position and try to shift the other two rods (R-23 & R-17). If all interlocks are functioning, the rods should be locked in neutral position.

19. Return 1st-reverse fork to neutral position and check movement of each shift rod to make sure they move readily and completely into each gear position.

20. Turn shifter cover assembly over with top up. Use sealer on threads and replace vent (R-4) in tapped hole in top surface of housing. Tighten securely. Use caution not to collapse body of vent by overtightening.

21. Install splitter piston housing gasket (S-26) on opening of splitter housing. Assemble splitter piston housing and splitter valve sub-assembly (S-1) on shifter housing. Locate pad on piston rod shift bracket (S22) into shifter fork (R-6). Secure splitter housing sub-assembly to shifter housing (R-2) with four capscrews (S-10) and lockwashers (S-11).

22. Coat trunnion diameters of splitter fork shoes (R-7) with heavy grease and insert shoes on splitter fork (R-6).

23. Lay complete shifter housing aside for later assembly onto main case.

DISASSEMBLY and REASSEMBLY of FILTER-REGULATOR

NOTE:
The SST-1010 uses filter-regulator pre-set at 50-55 P.S.I. Use only petroleum base solvent to clean parts. Blow air through filter (inside to outside) to dislodge surface contaminants. Do not disassemble regulator section (9), as it is not field repairable.

MAINTENANCE:

1. Clean or replace filter element (7) every six months to one year or whenever slow shifting is encountered. Element should be replaced after three cleanings. If regulator malfunction is indicated, replace entire unit.

2. To service filter section, shut off air pressure. Unscrew bowl (1) and remove O-Ring (2). Unscrew stud (4). Remove louver (5), upper gasket (6), element (7), and lower gasket (8) from stud. Do not disassemble regulator section (9).

3. After cleaning, inspect parts carefully; replace any damaged parts.

4. Reassemble by installing element (7) on stud (4) so that large end of internal taper (thinnest wall section) is toward hex on stud. Torque stud to 5-10 inch pounds.

5. Apply a wipe coat of Dow Corning DC7 Silicone Grease (or equivalent) to O-Ring (2) seating surfaces on regulator (9) and bowl (1). Apply a light, even coat of Molykote "G" (or equivalent) to bowl threads. Torque bowl to 5-10 inch pounds. If drain valve (3) was removed, reinstall and torque to 10-15 inch pounds.

NOTE:
All field rebuilds of 1010-2A equipped with the old type Wabco separate filter-regulator should be replaced with the newer combined filter regulator manufactured by Norgren.

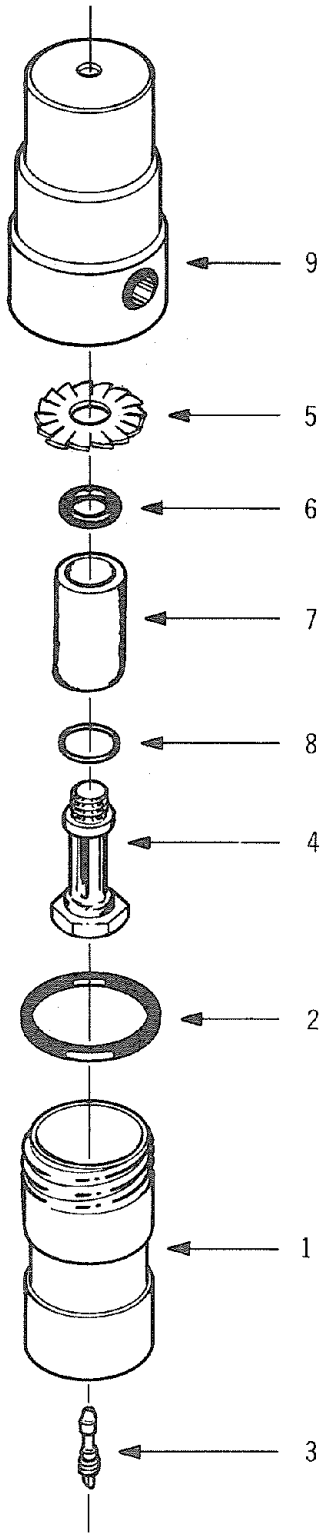


Fig. 5

DISASSEMBLY:

CLUTCH HOUSING AND P.T.O. APERTURE COVERS.

1. It is necessary to remove the clutch housing from the main case to expose the two front countershaft locknuts (C-2) to rebuild internal gears and shafts. It is not necessary to remove P.T.O. covers from the case unless they are damaged or gaskets are leaking.

2. To remove clutch housing (E-1) from the main case (G-1), use 15/16" socket to remove six external capscrews (E-9) and lockwashers (E-10), four capscrews remain inside the clutch housing. Use 3/4" socket to remove four remaining capscrews (E-9) and lockwashers (E-10) from the clutch housing.

3. Using a soft head hammer, tap clutch housing off main case and off front bearing cap (F-1) O.D. pilot. Remove clutch housing gasket (E-8) if torn or mutilated.

4. Rotate main drive gear (A-2) until timing marks on O.D. of the curvic ring on drive gear (A-2) and back face of countershaft drive gears (C-4) match and mate. Lock splitter clutch collar (A-9) into drive gear (A-2) curvic ring. Shift collar (B-19) into 1st-2nd gear (B-18) to lock the transmission in two gears.

NOTE

A standard socket wrench 2-9/16" will have interference to the end yoke ears before it will seat to yoke counterbore and locknut (B-28). Also a standard socket front face will have an interference to the countershaft front bearing cage (C-3) when removing or installing locknut (C-2). Therefore, we recommend that a standard 2-9/16" socket be modified as shown on page 25 Figure 12 to eliminate the interference conditions noted.

5. Use revised 2-9/16" socket to remove both countershaft front locknuts (C-2) and mainshaft locknut (B-28).

6. Use puller tool or equivalent to remove end yoke or flange (B-26). Washer (B-27) will come off with yoke or flange.

7. Use 3/4" socket to remove capscrews (H-5) and lockwashers (H-7) from mainshaft rear bearing cap (H-1). Separate bearing cap from case and gasket (H-4). Remove speedometer drive gear (if used) (H-21) bushing (H-22) and seal (H-3), if it is damaged.

8. Use pry bar between splitter clutch collar (A-9) and 9th-10th gear curvic tooth ring (B-3) to force mainshaft sub-assembly rearward. This will expose the snap ring on mainshaft rear bearing (B-23). Install a puller on the snap ring and pull bearing (B-23) off the shaft.

9. Remove thrust washer (B-22) from shaft. Remove split rings (B-21) from shaft. Remove snap ring (B-14) located in bore of reverse gear (B-20). Use a long, thin-lipped screw driver to work snap ring out of gear bore groove and rearward to remove from gear and shaft.

10. Use the pilot tube, long capscrew and nut, see page 25 Figure 13, for drawing of this tool. Pull out upper idler gear shaft (D-1) from case. Recover idler shaft lock ball (D-2). Leave idler gear (D-3) in place and force it to the side of case. Remove gear after mainshaft sub-assembly has been removed.

11. Engage 1st-reverse shift collar (B-19) under reverse gear (B-20). Slide reverse gear and collar forward butting gear (B-20) against 1st speed gear (B-18). Wire or tie both gears together.

NOTE

The countershaft gears will support the mainshaft gear sub-assembly with the mainshaft rear bearing removed from the case.

12. Use 9/16" socket to remove cap screws (J-3) and lockwashers (J-5) from countershaft rear bearing caps (J-1). Separate caps from case and gasket (J-2). Remove air filter and regulator mounting brackets (J-6).

13. Use 9/16" socket to remove cap screws (F-4) and lockwashers (F-5) from drive gear bearing cap (F-1). Separate cap from case and gasket (F-3).

14. Remove snap ring (A-3) from drive gear (A-1). Pull forward on drive gear spline stem as far as it will go. This is to expose bearing snap ring from case face. Use puller tool on bearing snap ring and pull bearing (A-4) off drive gear (A-1).

IMPORTANT

It was noted in the General Information Section of this manual, page 5, Spicer Transmission Division Engineering Department strongly recommends the procurement and use of the special tools described in this manual.

The tools are necessary for proper disassembly, reassembly and head end gear timing procedures outlined in the manual. Refer to pages 25-27 of this manual for all tool drawings and their related dimensions. Refer to page 21 for sketches of how countershaft front and rear piloting tools can be used to maneuver countershafts for reassembly of mainshaft and gears by spreading both countershafts in an outward direction, to allow easier installation of mainshaft sub-assembly, set up timing marks on head end gears, install countershaft front and rear bearings without pre-brinnelling bearings while driving them on ends of the shaft.

GEARS & CASE

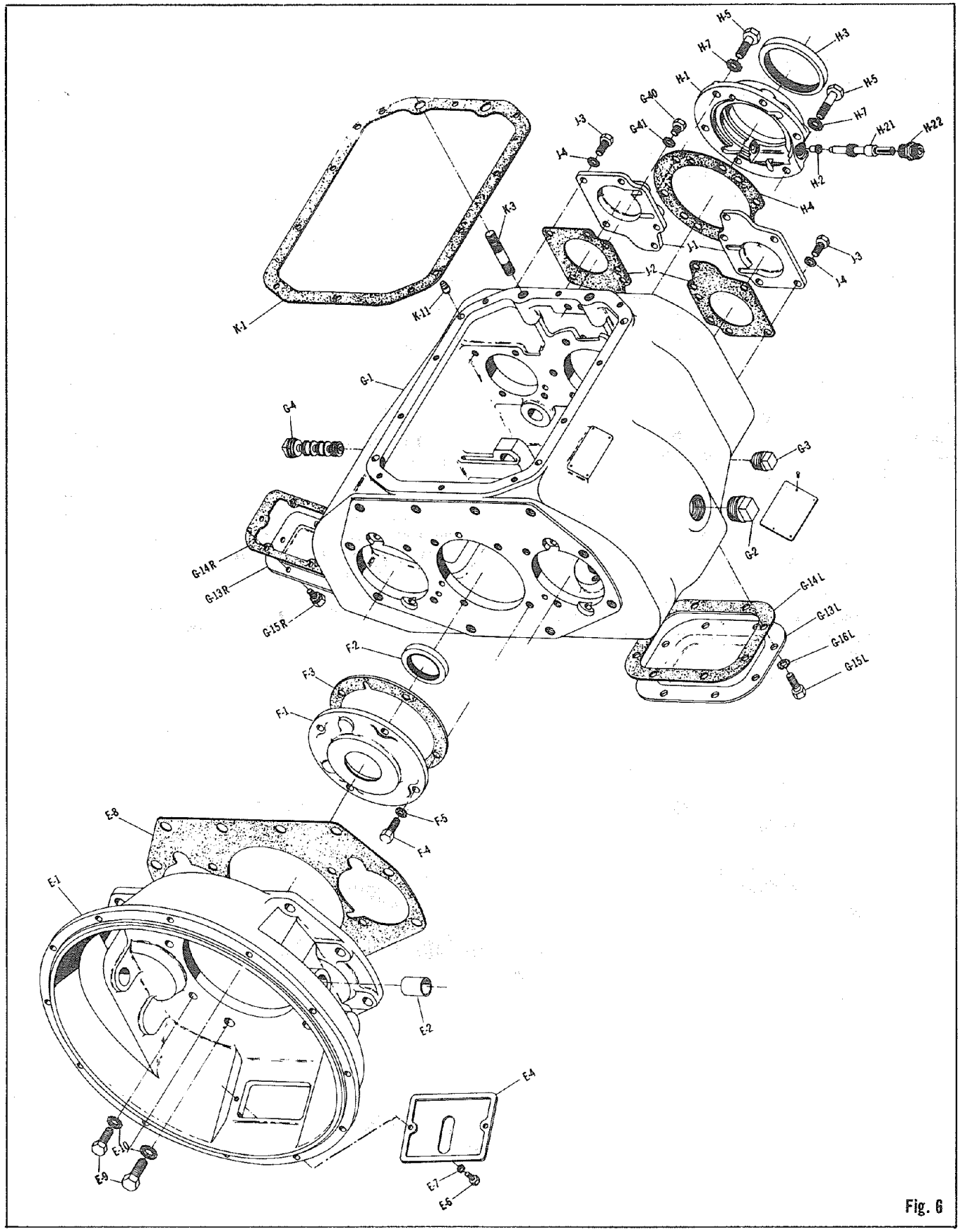


Fig. 6

15. Use a 1-3/4″ diameter (or larger) *soft* metal bar, approximately 6″ long to drive rearward on the front ends of the countershafts (C-1). Force shaft rearward to allow bearings (C-3) to creep forward to expose bearing snap ring. Note recesses in case face. The recesses are to allow clearance to install puller tool arms on the bearing snap ring (C-3). Remove bearings from shafts (C-1).

NOTE

When driving countershafts rearward the drive gear sub-assembly and mainshaft sub-assembly will also move rearward with the countershaft gears. This is because of drive gear curvic ring being pushed by the countershaft head end gears.

16. To remove the countershaft rear bearings (C-15) from the shaft, maneuver countershaft sub-assembly (C-1 through C-16) rearward to expose rear bearings so that a bearing split tool can be installed on the front side of the bearing. Remove snap ring (C-16) from countershaft end. Install puller tool arms on split tool and pull bearing (C-15) off shaft (C-1).

CAUTION

Make certain that split tool pulls on inner race of bearing (C-15). This bearing is a self aligning type. If bearing is not damaged prior to disassembly, damage can be done to the bearing by having pulling force located on the outer race of the bearing.

NOTE

The removal of the countershaft bearings (C-3 and C-15) will allow the shaft sub-assemblies to move sideways in the case. This makes removal of the mainshaft from the case easier.

17. Force countershaft sub-assemblies and the drive gear sub-assembly forward as far as possible. Keep mainshaft sub-assembly in rear position as far back as possible. This must be done to allow passage of the pilot bearing diameter of mainshaft to by-pass drive gear back end for lifting the mainshaft sub-assembly out of the case.

18. Place a sling rope or wire around 3rd-4th/5th-6th clutch collar (B-16) to support mainshaft sub-assembly. Use chain hoist on sling rope, *maneuver* and lift out mainshaft (B-1 through B-20). Place sub-assembly on work bench for later disassembly.

19. Remove upper idler gear sub-assembly (D-3 through D-5).

20. Remove drive gear sub-assembly (A-1 through A-11) from case bore. Remove *right side* (looking from the rear of case) countershaft sub-assembly (C-1 through C-14). Lay both sub-assemblies aside for later disassembly, if it is required.

21. Remove left side countershaft sub-assembly (C-1 through C-14).

22. Use pilot tube, long capscrew and nut (as described in Step 10) to remove lower idler gear shaft (D-1) from case. Remove idler gear sub-assembly (D-3 through D-5).

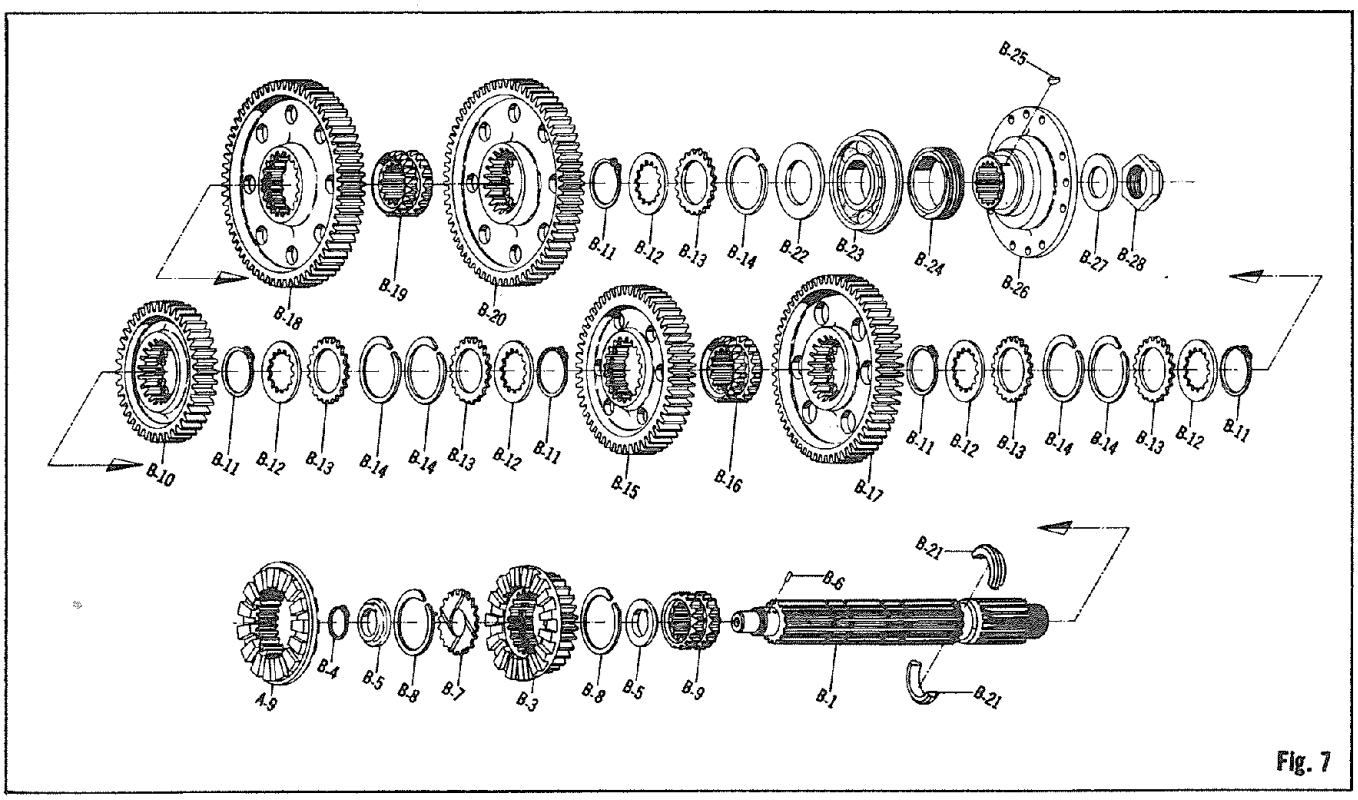


Fig. 7

MAINSHAFT DISASSEMBLY:

1. Remove snap ring (B-4) from front end of mainshaft (B-1). Slide 9th/10th gear sub-assembly (B-3 through B-8) off the shaft drive pins (B-6).
2. Remove 7/8-9/10 clutch collar (B-9) from the shaft.
3. Use *tru arc* pliers and remove snap ring (B-11) from shaft groove. Remove 7th-8th speed gear sub-assembly (B-10 through B-14).
4. Remove 5th-6th speed gear sub-assembly (B-12 through B-15). Remove snap ring (B-11) from shaft groove.
5. Remove 5th-6th/3rd-4th clutch collar (B-16) from the shaft.
6. Remove snap ring (B-11) under 3rd-4th speed gear bore (B-17). Remove 3rd-4th speed gear sub-assembly (B-12 through B-17).
7. Remove holding wire previously used on 1st-2nd and reverse gears (B-18, B-20).
8. Remove 1st-2nd speed gear sub-assembly (B-12 through B-18) from the shaft. Remove snap ring (B-11) from shaft groove.
9. Remove 1st-2nd/Reverse shift collar (B-19) from the shaft.
10. Reverse speed gear sub-assembly (B-13 through B-20) can be removed from the output end (rear) of the shaft.

> **NOTE**
> *Snap ring (B-11) and thrust washer (B-12) can be left on the shaft, unless they are damaged or worn and require replacing.*

COUNTERSHAFT DISASSEMBLY:

> **NOTE**
> *If gears in countershaft require replacement because of tooth damage or ratio change, etc., press all gears off shaft except for 9th-10th gear (C-6) and P.T.O. gear (C-8). See Step 2 below for gear (C-6) removal.*

1. Use an arbor press, support head end drive gear (C-4) with parallel bars as close to the hub as possible. Press countershaft (C-1) out of gear (C-4).

> **NOTE**
> *Keyway in countershaft (C-1) is a straight long continual keyway. As each particular gear is pressed away from the shaft the key may come away with the gear instead of staying in the keyway as is normal.*

2. Since there is very limited space between the 9th-10th speed gear (C-6) and the P.T.O. gear (C-8), it is recommended that a puller tool be used in the lightener holes in web of gear (C-6) to remove the gear from the shaft.
3. Remove the P.T.O. gear (C-8) by lifting it off the splined teeth of the 7th-8th speed gear (C-9).
4. Support the 7th-8th speed gear (C-9) under the gear teeth and press shaft out of gear.
5. In a like manner, support 3rd-4th speed gear (C-13) with parallel bars under, and as close to hub as possible. Press countershaft out of 5th-6th speed gear (C-11) and 3rd-4th speed gear (C-13).

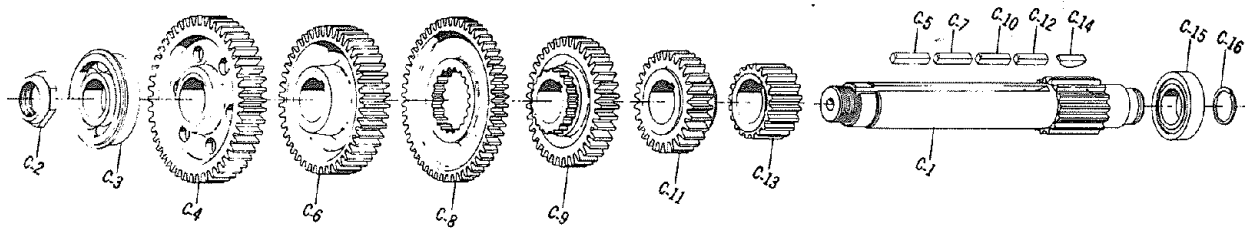


Fig. 8

DISASSEMBLY OF DRIVE GEAR SUB-ASSEMBLY:

1. If bearing (A-8) in pocket of drive gear must be replaced, use small puller tool on the bearing to dislodge it from pocket of gear. Bearing (A-8) is a press O.D. fit into the pocket. The hidden face of the bearing is of softer metal than the numbered face side and can be distorted while being pulled out of gear bore.
2. Remove snap ring (A-11) at pocket end of drive gear. Remove splitter clutch gear (A-10) from drive gear splines (A-1). Remove second snap ring (A-11) that positions clutch gear (A-10).
3. Remove snap ring (A-7) in bore of splitter drive gear (A-2). Force gear (A-2) off, away from drive gear bearing (A-6).
4. Remove snap ring (A-5) from drive gear (A-1). Support bearing (A-6) on press bed and press drive gear out of bearing.

PRESSING GEARS ON COUNTERSHAFT:

NOTE

It is advisable to coat the bores of all the gears with oil when pressing the gears on the countershaft.

We recommend that the keys to each gear be installed in shaft keyway one at a time. Since the countershaft is pressed into the gear bore, if keys become mutilated or burred after assembly to the shaft keyway, use mill file to align sides, remove burrs, etc. This prevents chips and slivers from peeling off and lodging between gear thrust faces.

1. Press key (C-14) into keyway of countershaft (C-1). Support 3rd-4th speed gear (C-13) with either face down. Set countershaft and key into position under arbor. Align key with gear keyway and press shaft and key into gear. Seat gear face firmly against face of 1st-2nd speed gear. If key crept out of position and extends out from 3rd-4th speed gear face, tap key back flush with gear face or slightly under face of gear.
2. In a like manner as in Step 1, press 1-9/16" key (C-12) into countershaft keyway. Support 5th-6th gear (C-11) with long hub up. Set shaft into gear under arbor press. Align key with gear keyway, press shaft and key into gear. Seat gear face firmly against face of 3th-4th speed gear (C-13). If key (C-12) crept out of position, tap key back flush with face of gear or slightly under gear face.
3. Place 2-3/8" key (C-10) in keyway of countershaft. Support 7th-8th speed gear (C-9) with splined teeth on hub down. Set shaft into gear under arbor press. Align keyway with key and press shaft and key into gear. Seat gear face firmly against face of 5th-6th speed gear (C-11) check key so that it is flush or under face of gear (C-9).
4. Install P.T.O. gear (C-8) on splined teeth of 7th-8th speed gear (C-9) with long hub end against gear (C-9).
5. Place 2-7/16" key (C-7) in keyway of countershaft. Support 9th-10th speed gear (C-6) with short end up. Set shaft into gear, holding P.T.O. gear (C-8) in place to its mating gear (C-9). Align keyway with key and press shaft and key into gear. Seat gear face firmly against face of 7th-8th speed gear (C-9). Check key (C-7) face so that it is flush or slightly under face of gear.
6. Place 2-7/16" key (C-5) in keyway of countershaft. Support splitter head end gear (C-4) with long hub up.

NOTICE TOOTH TIMING MARK ON TOOTH WEB OF GEAR. BE SURE IT ALIGNS ITSELF TO CENTER OF GEAR KEYWAY.

Set shaft into gear, align keyway with key and press shaft and key into gear. Seat gear face firmly against face of 9th-10th speed gear (C-6). Check key (C-5) face so that it is flush or slightly under face of gear.

IMPORTANT

Key (C-5) face must be flush or slightly under face of gear (C-4) because countershaft front bearing (C-3) inner face rests against faces of key and gear hub.

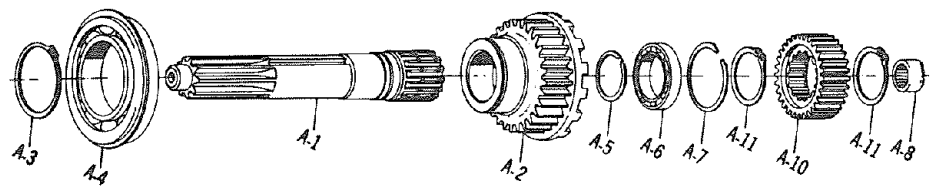


Fig. 9

ASSEMBLY OF MAINSHAFT:

NOTE

Before assembly of all gears on the mainshaft, inspect all thrust washers (B-5, B-7, B-12, B-13) that would have been left in gear bores at the time of disassembly from the shaft. If washers show heavy face galling or tooth wear indentations the washers should be replaced. Lubricate old or new thrust washers with 30 weight engine oil on the thrust faces, as they are assembled.

1. Position mainshaft vertically in vise, with output end splines of shaft resting on bed and soft jaws clamping on splined area.
2. Install thrust washer (B-12) on mainshaft (B-1). Let washer rest on the shoulder, near output splines.

CAUTION

Use care when assembling snap rings on shaft to prevent extending or distorting snap rings.

3. Use *tru arc* pliers to install snap ring (B-11) on shaft. Seat snap ring securely in bottom groove of mainshaft.
4. Assemble 1st-2nd/reverse clutch collar (B-19) on shaft with either end of collar down. Rest clutch collar on snap ring (B-11).

NOTE

Clutch collars (B-19, B-16, B-9) are identical parts and can be used in positions of 1st-2nd/reverse, 3rd/4th, 5th/6th, 7th/8th, 9th/10th gears. Either end of collars can be installed on the shaft at the time of assembly.

5. Install second snap ring (B-11) on shaft. Seat snap ring securely in groove closest to 1st-2nd/reverse clutch collar (B-19).
6. Assemble thrust washer (B-12) on shaft. Rest washer on snap ring (B-11).
7. With thrust washers (B-12, B-13) and snap ring (B-14) assembled into 1st-2nd speed gear (B-18), assemble gear sub-assembly on shaft, with the 35° chamfer in bore of gear down toward clutch collar (B-19).
8. Assemble second set of washers (B-12, B-13) and snap ring (B-14) into 3rd-4th speed gear (B-17). Assemble gear sub-assembly on shaft, with 35° bore chamfer *up*. Rest the gear against the face of 1st-2nd speed gear (B-18). Install the third snap ring (B-11) on shaft. Seat snap ring securely in groove of shaft under the bore of 3rd-4th speed gear (B-17).
9. Assemble 3rd-4th/5th-6th speed clutch collar (B-16), with either end of collar down. Rest clutch collar in bore of 3rd-4th speed gear (B-17).
10. Install fourth snap ring (B-11) on shaft. Seat snap ring securely in groove in shaft closest to 3rd-4th/5th-6th clutch collar (B-16).
11. Install thrust washers (B-12, B-13) on shaft. Rest washers on snap ring (B-11).
12. Assemble third snap ring (B-14) into 5th-6th speed gear (B-15). Assemble gear with snap ring up (or 35° chamfer in bore of gear down) toward clutch collar (B-16). Rest gear on washer (B-13) of shaft.
13. Assemble fourth set of washers (B-12, B-13) and snap ring (B-14) into 7th-8th speed gear (B-10). Assemble gear sub-assembly on shaft with 35° bore chamfer up. Rest gear against the face of 5th-6th speed gear (B-15). Install fifth snap ring (B-11) on shaft. Seat snap ring securely in groove of shaft under bore of 7th-8th speed gear (B-10).
14. Assemble 7th-8th/9th-10th speed clutch collar (B-9) on shaft.
15. If 9th-10th speed gear (B-3 through B-8) was disassembled for inspection of thrust washer (B-7) or snap rings (B-8), reassemble snap ring (B-8) in gear bore groove. Install thrust washer (B-7). Lock parts together with second snap ring (B-8).
16. If drive pins (B-6) on the front of the mainshaft do not have to be replaced, install 9th-10th speed gear sub-assembly (B-3 through B-8) on the mainshaft.
17. Lock up all of 9th-10th gear parts on shaft by installing snap ring (B-4) in groove on shaft. Install curvic shift collar (A-9) on 9th-10th gear curvic ring (B-3).
18. Remove complete assembly from vise, place on work bench.
19. Slide 1st-2nd/reverse clutch collar (B-19) into bore of 1st-2nd gear (B-18) also slide thrust washer (B-12) on end of shaft, against snap ring (B-11).
20. Do not install thrust washer (B-13) or snap ring (B-14) into the bore of reverse gear (B-20) at this time.
21. Assemble reverse gear (B-20) only on rear of the shaft, with 35° chamfer of clutch teeth toward clutch collar (B-19). Match O.D. teeth to 1st speed gear (B-18) teeth. Butt both gears together. Wire or tie the two gears together.

NOTE

The remaining parts relative to the reverse gear (B-20) and to the rear of the mainshaft will be assembled to their respective places after the mainshaft sub-assembly has been placed in the main case.

GEARS & CASE

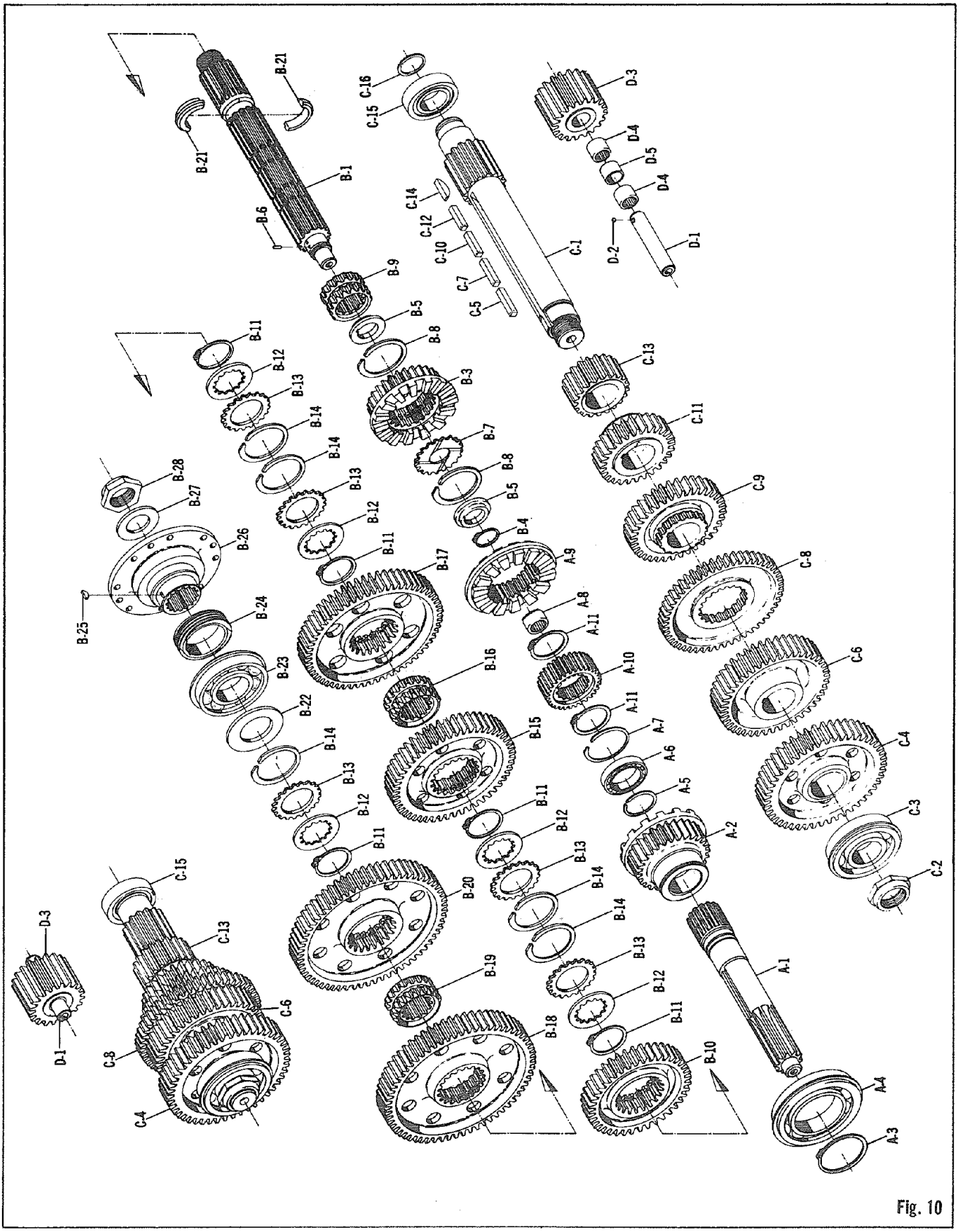


Fig. 10

ASSEMBLY OF DRIVE GEAR:

CAUTION

Use care when assembling snap rings to prevent extending or distorting snap rings.

1. Support bearing (A-6) on arbor press, support inner race of bearing. Press drive shaft (A-1) into bearing. Assemble snap ring (A-5) onto shaft and seat ring securely into shaft groove to bearing face.
2. Assemble drive shaft and bearing (A-1 and A-6) into drive gear and bearing (A-2) bore. Seat drive shaft bearing (A-6) to drive gear bore face. Assemble snap ring (A-7) into drive gear bore groove to bearing face.
3. Install snap ring (A-11) on drive shaft and into snap ring groove near bore of gear (A-2). Assemble splitter clutch gear (A-10) on shaft. Install second snap ring (A-11) on shaft to secure clutch gear to shaft.
4. Support drive gear sub-assembly in arbor press, resting front face of drive gear (A-2) on press bed. Press pocket bearing (A-8) into place, the bearing part number JH 1812 must be visible when pressed in bore. The opposite end of bearing is softer metal. Press bearing so it is recessed .062" or 1/16" under gear face.

IMPORTANT

We recommend that the mechanic paint with yellow, white or other suitable bright paint, the back face of timing teeth of both the countershaft head end gears (C-4) and the drive gear (A-2). Look for "Λ" markings on gear web face. This painting should be done before the installation of gears into the case.

5. Do not install snap ring (A-3) on bearing (A-4) at this time. The complete drive gear assembly must be installed into case bore from the back side (internal side) after countershaft sub-assemblies have been laid into position on the bottom of main case.
6. Set drive gear assembly aside for later assembly into bore after installation of countershaft sub-assemblies into case.

INSTALLATION OF COUNTERSHAFTS AND REVERSE IDLER GEARS INTO CASE:

1. Take either of the countershaft sub-assemblies (C-1 through C-14). Place it inside the main case on the left side (looking from the rear of case) with the head end gear (C-4) to the front bore. Turn head end gear around until the timing mark "Λ" is parallel to the bottom of case. This mark must be mated to the drive gear curvic ring (A-2) timing mark "Λ".
2. Assemble two idler shaft bearings (D-4) with spacer (D-5) between them into bore of reverse idler gears (D-3).

NOTE

Idler gears (D-3) are dimensionally the same.

3. Take either of the reverse idler gear sub-assemblies and place it in the upper boss location. Place it in mesh with rear countershaft gear teeth. *Do not* install reverse idler shaft (D-1) at this time.

IMPORTANT

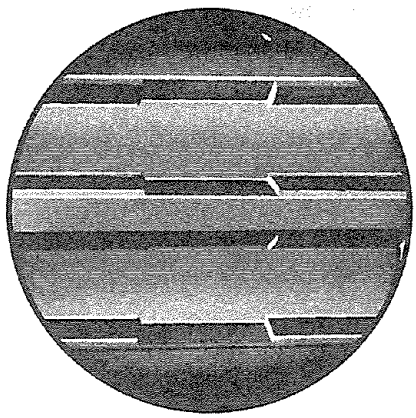
Check inside the main case to see if magnetic drain plug (G-4) on right side of case is in place. If magnetic plug is in case, remove it at this time, so that the sintered magnet metal plugs will not be damaged during the assembly of the lower right side reverse idler gear.

4. Install the remaining countershaft sub-assembly, placing it inside the main case on the right side. Turn the head end gear (C-4) around until the timing mark "Λ" is parallel to the bottom of case. Install reverse idler gear into position of case bosses. Roll idler gear (D-3) on mating tooth of countershaft to find idler gear bearing bore alignment to case hole. After alignment, install reverse idler shaft and ball (D-1 and D-2) into case. Tap shaft flush to case face.
5. *Do not* install front or rear countershaft bearing (C-3 and C-15) at this time. Allow countershafts to lay free in bottom of case until the drive gear sub-assembly is assembled into the case bore and positioned forward as far as possible. This must be done to allow clearance for installation of the mainshaft sub-assembly into the case.

CAUTION

The splines of many Spicer main shafts, etc., are equipped with a machined relief called a "hopping guard". With the clutch collar in the engaged position, the mating collar is free to slip into this notch, preventing the collar from "walking out of gear" under load.

(See enlarged view.) This is not a worn or chipped shaft! Do not grind it down or discard the shaft.



INSTALLATION OF MAINSHAFT SUB-ASSEMBLY INTO CASE:

Use a sling rope or wire around 5th-6th/7th-8th clutch collar (B-16) to support the mainshaft and gears. Use a chain hoist and hook on sling rope and lift from the work bench and lower mainshaft and gears into position and partially mesh with countershaft gears. Position pilot tools to spread position noted in Figure 11 to allow easier assembly of mainshaft and gears into case. Leave hoist and sling in place for support of mainshaft in its position until all bearings and reverse idler shafts have been assembled into case.

2. Install thrust washer (B-13) on output end of mainshaft. Push washer forward and against thrust washer (B-12) that was previously assembled during mainshaft build up. Force both washers (B-12 and B-13) against snap ring (B-11) that is on rear of mainshaft.

3. Cut wire or other tie from 1st-reverse gears. Slide reverse gear backwards into approximate location on reverse gear bore thrust washers (B-12, B-13).

4. Install snap ring (B-14) into location groove of bore on gear (B-20). Use long, thin-lipped screwdriver to work snap ring into gear groove.

5. Coat two split rings (B-21) with heavy grease and install rings into proper recess location on rear of mainshaft with flanges facing the gears.

6. Coat thrust washer (B-22) with heavy grease and install on mainshaft against flange face of split rings (B-21).

7. Install bearing pilot tool for rear mainshaft bore. Refer to Page 25 Figure 14 for this tool. The tool is to help in proper alignment of mainshaft and gears for easier alignment of drive gear sub-assembly that is all ready in front case bore.

TIMING — IMPORTANT

8. Use front bore bearing pilot tools, shown on Page 25 Figure 15 to support the front end of both countershafts. As piloting tools are inserted into the front case bores and on end of shafts, keep timing teeth in correct mesh to each respective gear.

9. With all timing gears painted, bring timing teeth of countershaft head-end gears parallel to bottom of case or pointing to the center of the case. Position drive gear timing marks (two) on curvic ring where they will match and mate to the timing teeth of the countershaft gears.

10. Install snap ring on drive gear bearing (A-4), seat bearing with snap ring against face of main case.

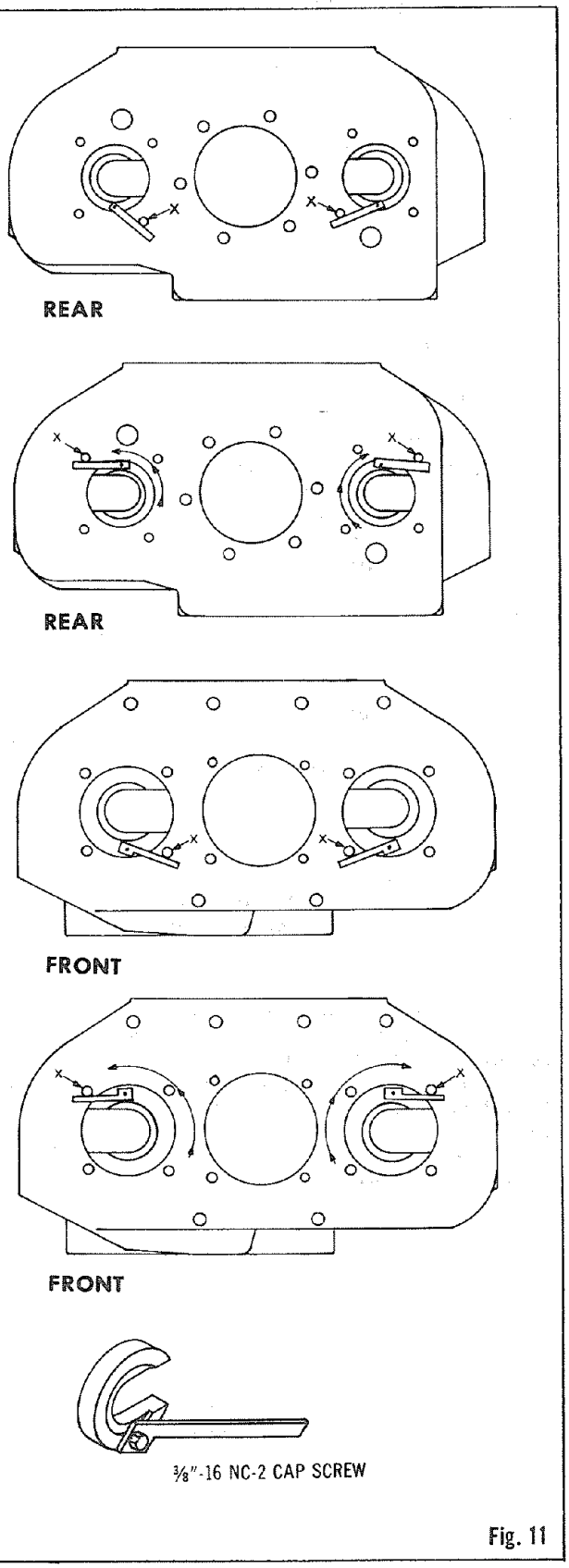


Fig. 11

TIMING (Cont.)

11. Install front drive gear bearing cap (F-1) with gasket (F-3). Align oil port holes of case to oil return holes on bearing cap.
12. Dip cap screws (F-4) in sealer and use washers (F-5) to attach bearing cap to case. Torque cap screws 40-50 lbs. ft.
13. Remove bearing pilot tool from the rear case bore and end of mainshaft. Slide three shift clutch collars (B-19, B-16 B-9) into their neutral positions on the mainshaft.
14. Start mainshaft rear bearing (B-23) inner race bore on mainshaft, using the bearing pilot tool against the bearing faces. Use drive tubing, Figure 13 to drive against pilot tool, Figure 14 to drive bearing on shaft and into bore of case. Seat bearing snap ring against main case face.
15. Relieve hoist tension on sling rope and remove rope from mainshaft.
16. Install reverse idler shaft (D-1) into upper reverse idler gear (D-3) bore. Install idler shaft lock ball (D-2) into shaft ball hole just before ball comes into main case recess. Tap idler shaft end flush to case face.

FINAL ASSEMBLY AND TIE UP OF COUNTERSHAFTS:

1. Use rear bore countershaft bearing piloting tools shown on page 25, Fig. 16, to support the rear ends of both countershafts. As pilot tools are inserted into bores, etc., *keep timing teeth in correct mesh with each other.*
2. Use countershaft support hook tool shown on page 26, Fig. 17. Place rod hooks in web hole of each gear (C-4). Support tool with chain hoist hook. This tool helps centralize both countershafts in relation to the timing teeth mesh, as well as holding the timing marks in place, when each front piloting tool is removed.
3. Remove left front bore pilot tool. Install countershaft bearing (C-3), using face of pilot tool on front end of bearing to drive bearing on shaft and into case bore. Seat snap ring of bearing to face of case.

CAUTION

The piloting tools on the bearing faces (C-3 and C-15) control the driving force (hammering) to the outer and inner race at the same time. Using proper tools prevents damage to bearings.

4. Install countershaft front locknut (C-2) on the shaft. Bring locknut against bearing (C-3) face, hand tight.
5. Remove right front pilot tool. Install countershaft bearing (C-3), per paragraph #3 above by again using face of pilot tool on front end of bearing to drive bearing on shaft, and into bore of case. Seat snap rign of bearing to face of case.
6. Remove countershaft support hook.
7. Install countershaft front locknut (C-2) on shaft hand tight.

CAUTION

Use modified 2-9/16" socket wrench in Fig. 12 to eliminate interference condition on bearing cage (C-3).

8. Lock unit in two gears, moving clutch collar (B-19) into reverse gear (B-20) and collar (A-9) into drive gear (A-1). Tighten both countershaft locknuts (C-2) to 550-600 lbs. ft.
9. Remove left rear pilot tool from the countershaft. Install countershaft rear bearing (C-15).

IMPORTANT

Countershaft rear bearing is a self-aligning type. It has a snap ring holding the rollers on one side only. The bearing MUST *be assembled with the snap ring to the outside.*

DO NOT *assemble the bearing with snap ring toward inside of transmission.*

10. Use pilot tool on face of bearing, with tubing on pilot tool, drive bearing on shaft and into bore of case. Install snap ring (C-16) on shaft.
11. In a like manner to steps 9 and 10, remove right pilot tool from the countershaft and using tools, drive bearing (C-15) on shaft and into bore of case. Install snap ring (C-16) on shaft.
12. Assemble speedometer driven gear into mainshaft rear bearing cap (H-1), if it was removed. Install rear bearing cap with gasket (H-4) on mainshaft rear bearing and case face. Align oil port holes to return holes of bearing cap.
13. Dip cap screws (H-5) in sealer and use washers (H-7) to attach bearing cap to case. Torque cap screws 60-80 lbs. ft.
14. Assemble both countershaft rear bearing caps (J-1) with gaskets (J-2) to case face. Secure caps with cap screws (J-3) and washers (J-4). Torque cap screws 25-32 lbs. ft.
15. Install end yoke or flange (B-26) with washer (B-27) on mainshaft output splines. Install locknut (B-28) on mainshaft. Use tool shown on page 27, Fig. 21 to install this part.
16. With modified 2-9/16" socket wrench, Fig. 15, torque mainshaft locknut (B-28) to 550-600 lbs. ft.
17. Move clutch collar (B-19) out of reverse gear and into its neutral position. Leave collar (A-9) engaged in drive gear.
18. Turn drive gear stem to roll gear train. If teeth timing marks are in their correct positions, the entire gear train will roll freely. If timing teeth have not been set correctly or have escaped their proper position, the gear train will lock up after several turns of the drive gear.

19. If unit locks up, disengage shift collar (A-9) from drive gear. Turn drive gear in *reverse* rotation until the timing marks or paint on teeth come into match, or close mis-match. If mis-match appears, timing was set incorrectly at time of assembly or timing marks escaped positioning during final tie up. If this happened, shafts must be re-timed.

20. If timing is correct, proceed with final installation of clutch housing and its related parts. Place all clutch collars in their neutral positions for later installation of shift housing assembly on main case except splitter clutch collar (A-9). Place collar in mesh with 9th-10th gear (B-3). This will place collar in low position for later assembly with shift fork (R-6).

INSTALLATION OF CLUTCH HOUSING AND MISCELLANEOUS:

1. Place clutch housing gasket (E-8) in place, using drive gear bearing cap (F-1) to pilot on.

2. Set clutch housing (E-1) in place using drive gear bearing cap as guide. Dip capscrews (E-9) in sealer and use lock washers (E-10) to attach clutch housing to case with six external cap screws and eight internal cap screws. Torque cap screws 5/8" diameter 120-150 lbs. ft. and 1/2" diameter to 60-80 lbs. ft.

3. Install clutch release yoke (CR-7) and short shaft (CR-1) to clutch housing. Assemble long shaft (CR-2) to yoke (CR-7). Align keyway with slots in yoke and assemble key (CR-9), lock washers (CR-10) and cap screw (CR-8).

4. Replace P.T.O. aperture covers and gaskets (G-13L and G-14L), lock washers (G-16L) and cap screws (G-15L and G-15R). Torque 6 cap screws 40-50 lbs. ft. Torque 6 cap screws 25-32 lbs. ft.

5. Install magnetic plug (G-4) on right side of unit and oil level plug (G-2.)

6. Install shifter housing gasket (K-1) to transmission case. Check shifter cover assembly for all shift forks in their neutral position. Install shifter housing to main case.

TIE-UP OF AIR LINES FOR AIR CONTROL:

NOTE

If unit is equipped with new style integral filter-regulator (V-2) connect air filter-regulator to bracket (J-4) and assemble to bearing cap. Then connect air hose (V-4) to filter-regulator (V-2) for tie up.

1. Attach air filter and air regulator (V-10 and V-3) to brackets (J-56).

2. Attach filter, bracket sub-assembly, regulator, bracket assembly to countershaft rear bearing caps with the regulator assembly on the right side cap and the filter sub-assembly to the opposite side cap. Secure sub-assembly brackets to caps with existing capscrews and lockwashers on bearing caps.

3. Connect filter to regulator with air hose (V-8) securing hose with clamp (V-9) on mainshaft rear bearing capscrew.

4. Install shift tower assembly with gasket (Q-1) to shifter housing (R-2). Secure with capscrews and lockwashers (Q-3 and Q-5). Torque capscrews 13-17 lbs. ft.

5. Attach air hose (V-15) from regulator elbow (V-7) to splitter valve tee (V-13) on top of splitter valve (S-1). Secure hose with clamp (V-12) on shifter housing with existing capscrew and lockwasher.

6. Attach plastic air line (V-20) from splitter valve elbow (V-22) to shift lever control (V-17) "*IN*" port hole fitting (V-19).

7. Attach plastic air line (V-20) from elbow fitting (V-22) on front of the splitter valve (S-1) to shift lever control (V-17) "*OUT*" port hole fitting (V-19).

8. After the transmission has been installed in the vehicle chassis, install full line pressure air hose from *dry tank* to filer (V-10) "*IN*" port hole.

SPECIAL TOOLS

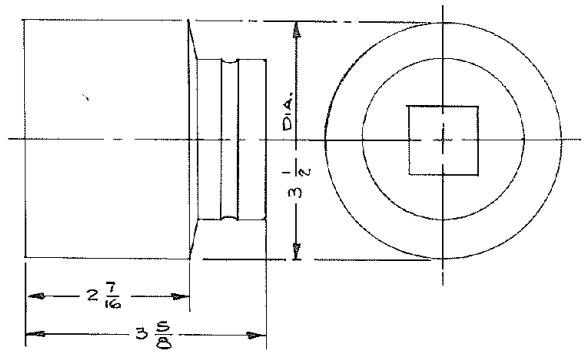


Fig. 12 SOCKET WRENCH

Standard 2 9/16" socket wrench modified to eliminate interference of end yoke ears and bearing cage (C-3) on S.S.T. 10-speed.

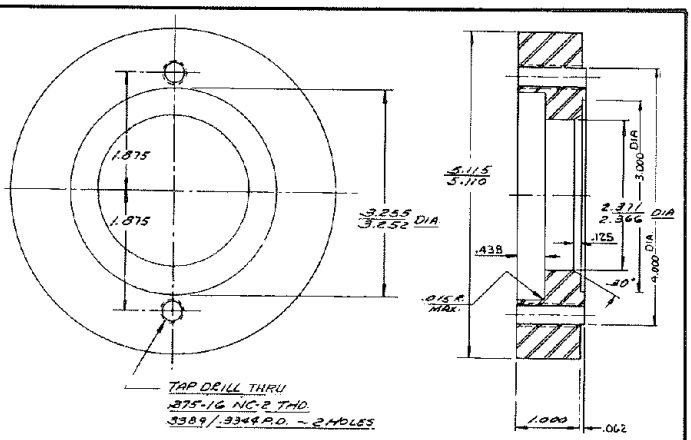


Fig. 14 MAINSHAFT-REAR BUSHING

NOTE:
MATERIAL - S.A.E. 1020 (OR ALUMINUM)

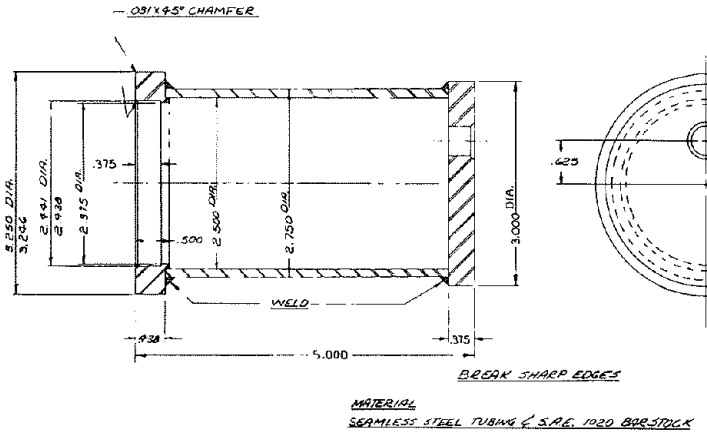
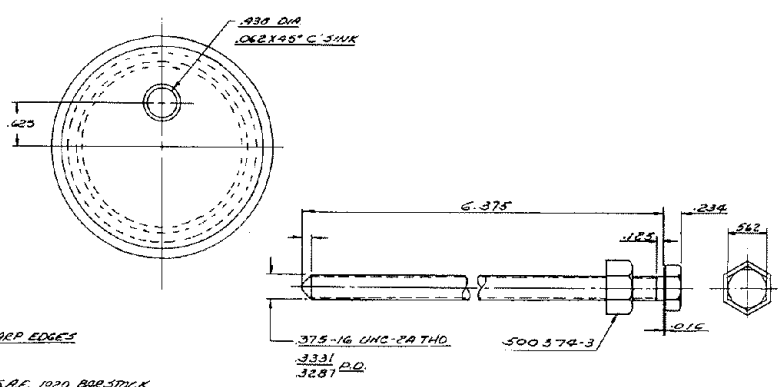


Fig. 13 DRIVER



PULLER CAP SCREW
REVERSE IDLER SHAFT

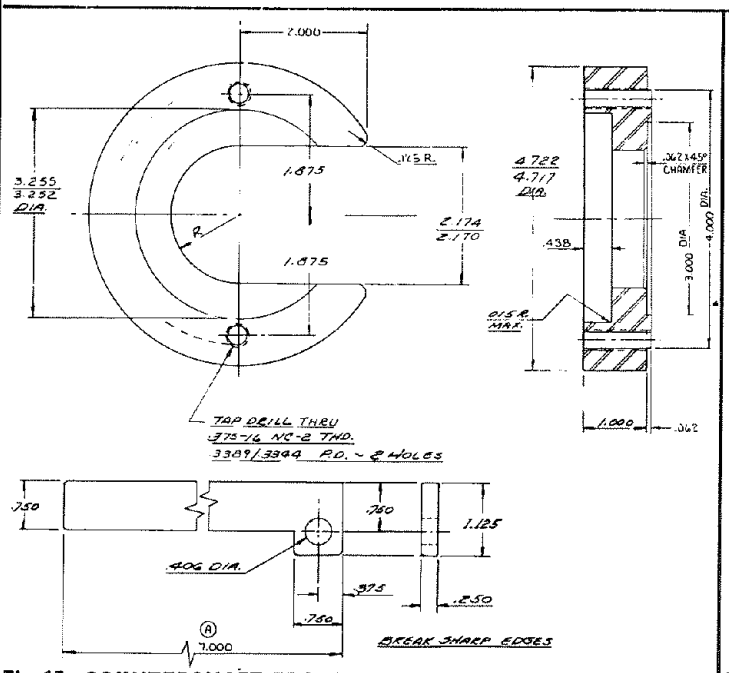


Fig. 15 COUNTERSHAFT-FRONT BUSHING AND RETAINER

NOTE:
MATERIAL - S.A.E. 1020 (OR ALUMINUM)

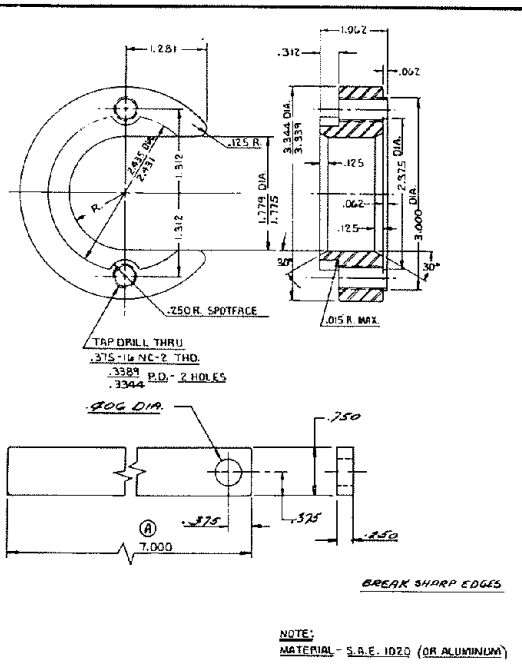


Fig. 16 COUNTERSHAFT-REAR BUSHING AND RETAINER

NOTE:
MATERIAL - S.A.E. 1020 (OR ALUMINUM)

SPECIAL TOOLS

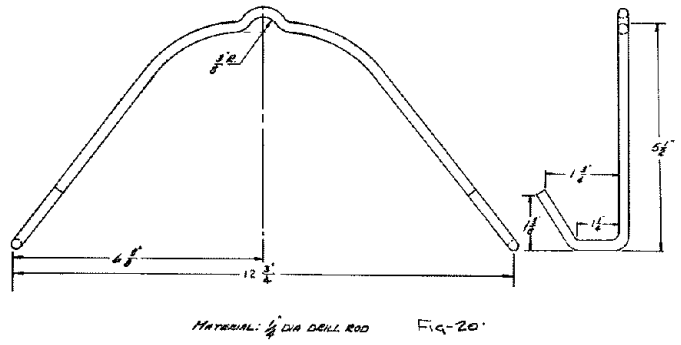


Fig. 17 COUNTERSHAFT SUPPORT HOOK

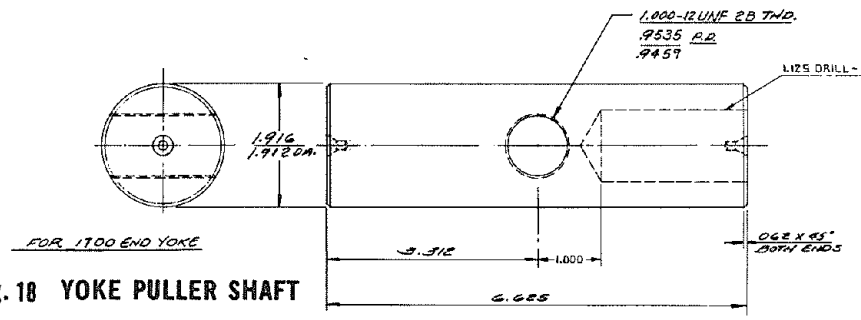
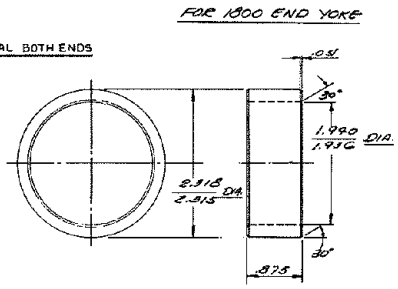
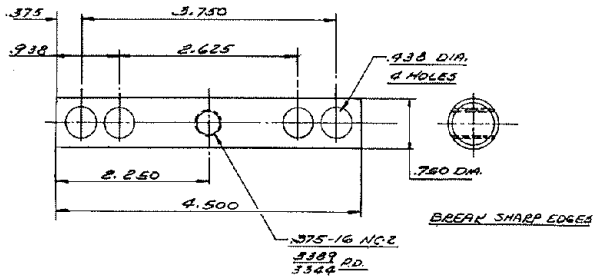


Fig. 18 YOKE PULLER SHAFT

Use standard puller screw from shop jaw puller tool for adaption to this puller tool.



YOKE PULLER SHAFT BUSHING



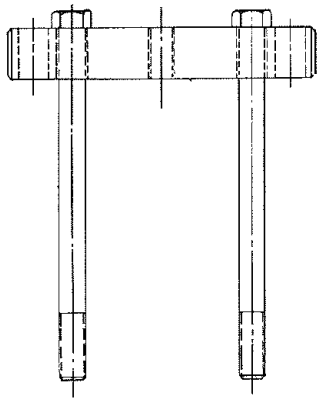
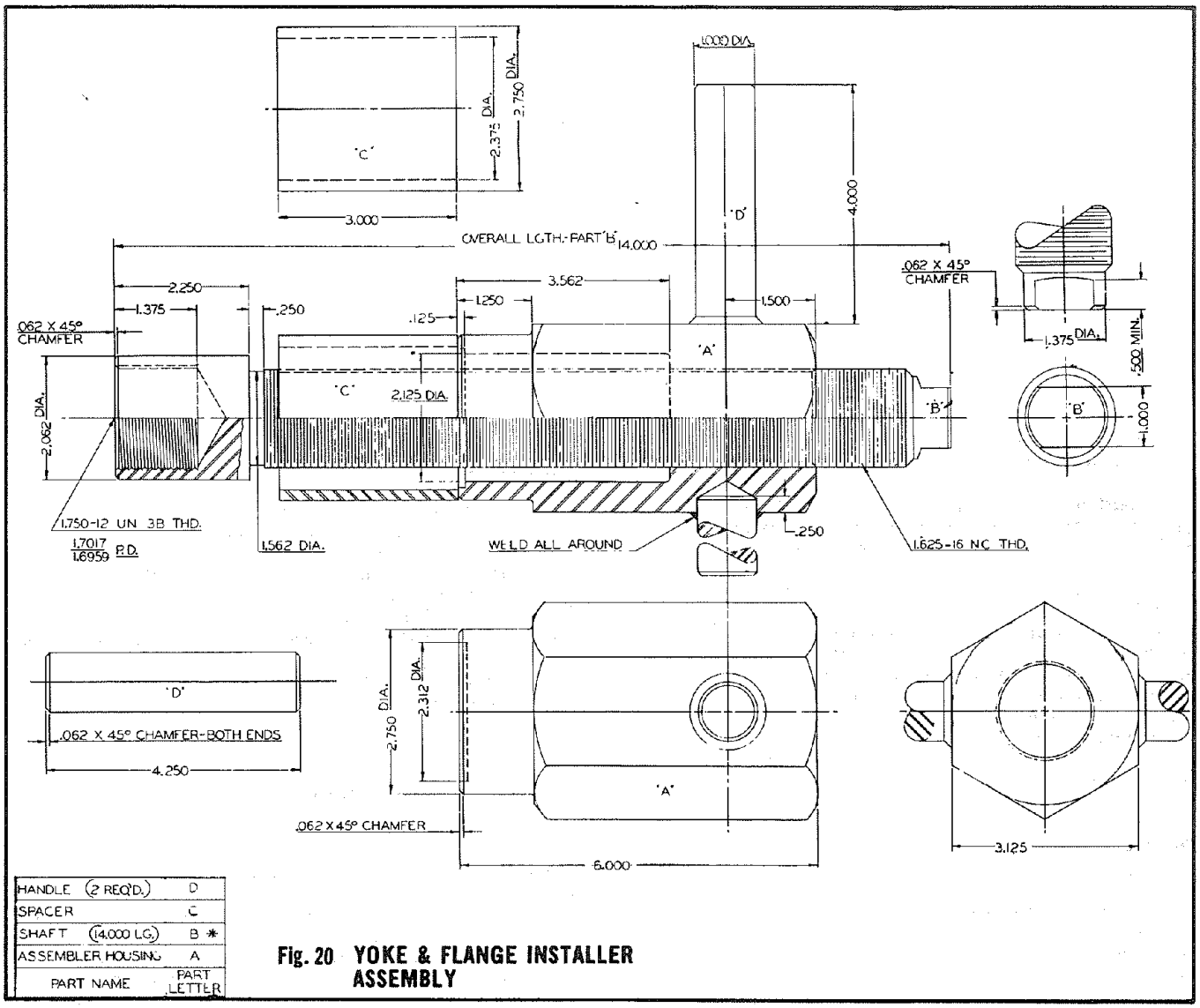


Fig. 19 BUSHING PULLER ASSEMBLY

SPECIAL TOOLS



PART NAME	PART LETTER
HANDLE (2 REQ'D.)	D
SPACER	C
SHAFT (14.000 LG.)	B *
ASSEMBLER HOUSING	A

Fig. 20 YOKE & FLANGE INSTALLER ASSEMBLY

TROUBLE SHOOTING

IMPORTANT PROCEDURE

When locating and correcting unit power or auxiliary transmission troubles, a systematic procedure should be followed.

Road test whenever possible. Mechanics usually get second or third hand reports of trouble experienced with the unit and these reports do not always accurately describe the actual conditions. Sometimes symptoms seem to indicate trouble in the transmission; while, actually the trouble may be caused by the axle, propeller shaft, universal joint, engine or clutch. This is especially true of complaints on noise. Therefore, before removing transmission or related components to locate trouble, always road test to check possibility that trouble may exist in other closely associated units. If the mechanic can drive, road testing will be more effective; however, just riding with the driver can be very informative.

Check Functioning Prior to Disassembly:

If remote controls are used, a careful check of the remote and connecting linkage to transmission must be made. The remote unit must be in good working order if the transmission is expected to shift satisfactorily.

Many times the answer to the trouble is apparent when the unit is inspected prior to disassembly, but this evidence is often lost when the parts are separated. If possible, check the unit prior to disassembly. Bear in mind that a careful inspection of the unit should be made as each disassembly step is performed.

Inspect Thoroughly During Disassembly:

It is poor practice to disassemble a unit or complete transmission as quickly as possible without bothering to examine the parts as they come down. It happens many times that a mechanic has completely disassembled a unit and failed to find the cause of the trouble because he did not bother to examine the parts as they came apart. After the transmission is disassembled, check the lubricant for foreign particles which often reveal sources of trouble that are overlooked during the disassembly.

Repair or Replace Defective Parts:

Many times the parts or critical adjustments that have caused the trouble are not replaced or corrected because the mechanic will only inspect and replace parts that have failed completely. All pieces should be accurately examined because the broken parts are often just the result and not the cause of the trouble. All parts that are broken or worn and no longer meet specifications should be replaced. On large units, like a transmission, it is suggested that a mechanic replace parts that are worn to the extent that they do not have a long service life remaining. This avoids another teardown on the unit in the near future. It is also good practice, at this time, to make the changes or modifications recommended to bring the transmission up to date and increase the service life of the unit.

Noisy Operation:

Noise is usually very elusive and generally not the fault of the transmission; therefore, mechanics should road test to determine if the driver's complaint of noise is actually in the transmission.

In numerous instances, drivers have insisted that the noise was in the transmission, however, investigations revealed the noise to be caused by one of the following conditions:

(a) Fan out of balance or blades were bent.
(b) Defective vibration dampers.
(c) Crankshafts out of balance.
(d) Flywheels out of balance.
(e) Flywheels mounting bolts loose.
(f) Engine rough at idle producing rattle in gear train.
(g) Clutch assembly out of balance.
(h) Engine mounts loose or broken.
(i) Power-take-off engaged.
(j) Universal joints worn out.
(k) Propeller shafts out of balance.
(l) Universal joint angles out of plane or at excessive angle.
(m) Center bearings in drive line dry, not mounted properly, etc.
(n) Wheels out of balance.
(o) Tire treads humming or vibrating at certain speeds.
(p) Air leaks on suction side of induction system — especially with turbo-chargers.

Mechanics should try to locate and eliminate noise by means other than transmission removal, or overhaul. However, if the noise appears to be in the transmission try to break it down into the following classifications. If possible, determine what position the gear shift lever is in when the noise occurs. If the noise is evident in only one gear position, the cause of the noise is generally traceable to the gears in operation.

(a) *Growl and humming* or, more serious, a grinding noise. These noises are caused by worn, chipped, rough or cracked gears. As gears continue to wear, the grinding noise will be noticeable, particularly in the gear position that throws the greatest load on the worn gear.

(b) *Hissing* or, more serious, a thumping or bumping-type noise. Hissing noises can be caused by bad bearings. As bearings wear and retainers start to break up, etc., the noise could change to a thumping or bumping.

(c) *Metallic rattles* within the transmission usually result from a variety of conditions. Engine torsional vibrations are transmitted to the transmission through the clutch. In heavy duty equipment, clutch discs with vibration dampers are not used, so a rattle, particularly in neutral, is common with diesel equipment. In general, engine speeds should be 600 RPM or above to eliminate objectionable rattles and vibration during the idle. A defective or faulty injector would cause a rough or lower idle speed and a rattle in the transmission. Rattle could also be caused by excessive backlash in P.T.O. unit mounting.

(d) *Improper lubricants* or lack of lubricant can produce noises. Transmissions with low oil levels sometimes run hotter than normal, as there is insufficient lubricant to cool and cover the gears.

Improved highways permit sustained high speeds. The fact that engines and entire power trains can now cruise at a higher R.P.M. can introduce vibration frequencies, that were not critical in the past. At slower speeds these items would get by or only pass through critical periods while accelerating or decelerating through the gears.

In the past, drive line vibrations such as bent tubes, joints out of phase or alignment, bad angles due to short couples, clutches out of balance, gears and shafts in transmission out of balance, were fairly obvious. These items will become more critical in vehicles running at sustained high speeds.

Critical vibrations associated with higher speeds are not the old thumping or bumping type but are high frequency vibrations which sting or tingle the soles of your feet, tickle the end of your fingers, etc. This type of vibration will cause gear seizures, broken synchronizer pins, bearing failure due to retainer rivet failures, promote brinelling, fretting corrosion, etc.

(e) *Gear whine* is usually caused by lack of backlash between mating gears — improper shimming of P.T.O. units is the big offender here.

Noise In Neutral:

Possible Causes:

(a) Misalignment of transmission.
(b) Worn flywheel pilot bearing.
(c) Worn, or scored countershaft bearings.
(d) Worn, or rough reverse idler gear.
(e) Sprung, or worn countershaft.
(f) Excessive backlash in gears.
(g) Worn mainshaft pilot bearing.
(h) Scuffed gear tooth contact surface.
(i) Insufficient lubrication.
(j) Use of incorrect grade of lubricant.

Noise In Gear:

Possible Causes:

(a) Worn, or rough mainshaft rear bearing.
(b) Rough, chipped, or tapered sliding gear teeth.
(c) Noisy speedometer gears.
(d) Excessive end play of mainshaft gears.
(e) Refer to conditions listed under *Noise in Neutral.*

TROUBLE SHOOTING

Oil Leaks:

Possible Causes:

(a) Oil level too high.

(b) Wrong lubricant in unit.

(c) Non-shielded bearing used at front or rear bearing cap. (Where applicable.)

(d) Seals (if used) defective or omitted from bearing cap, wrong type seal used, etc.

(e) Transmission breather omitted, plugged internally, etc.

(f) Capscrews loose, omitted or missing from remote control, shifter housing, bearing caps, P.T.O. or covers, etc.

(g) Oil drain-back openings in bearing caps or case plugged with varnish, dirt, covered with gasket material, etc.

(h) Broken gaskets, gaskets shifted or squeezed out of position, pieces still under bearing caps, clutch housing, P.T.O. and covers, etc.

(i) Cracks or holes in castings.

(j) Drain plug loose.

(k) Also possibility that oil leakage could be from engine.

Walking or Jumping Out of Gear:

If the units are walking out of gear it could be caused by:

(a) Interference or resistance in the shift mechanism preventing full engagement of the sliding clutch gear or

(b) If the gear has been shifted completely into position some other malfunction which could move the gear or the shaft itself out of its proper location.

If remote controls are used, the mechanic must satisfy himself that the remote units are satisfactory and that transmission is actually at fault. One other point that should be noted is whether the unit walks out of gear under drive (while pulling a load) or on a coast load. Also, does the gear hop occur on smooth or only on rough roads. A number of items that would prevent full engagement of gears are:

(a) Improperly positioned forward remote control which limits full travel forward and backward from the remote neutral position.

(b) Improper length shift rods or linkage that limits travel of forward remote from neutral position.

(c) Loose bell cranks, sloppy ball and socket joints.

(d) Shift rods, cables, etc., too spongy, flexible, or not secured properly at both ends.

(e) Worn or loose engine mounts if forward unit is mounted to frame.

(f) Forward remote mount too flimsy, loose on frame, etc.

(g) Set screws loose at remote control joints or on shift forks inside remote or even inside transmission unit.

(h) Shift fork pads or groove in sliding gear or collar worn excessively.

(i) Worn taper on gear clutch teeth.

(j) Transmission and engine out of alignment either vertically or horizontally.

A few items which could move the gear or shaft out of proper position, particularly on rough roads are:

(a) Use of heavy shift lever extensions.

(b) Shift rod poppet springs broken.

(c) Shift rod poppet notches worn.

(d) Shift rod bent or sprung out of line.

(e) Shift fork pads not square with shift rod bore.

(f) Excessive end-play in drive gear, mainshaft or countershaft, caused by worn bearings, retainers, etc.

(g) Thrust washers or faces worn excessively, missing, etc.

(h) Worn down corners or mainshaft hopping guards, coast and drive side.

Hard Shifting:

An improperly operating clutch will interfere with the proper shifting of gears in any transmission. It is important that the hydraulic, air or similar release mechanism (if used), also be in proper working order. If the mechanic is sure that a full and complete clutch release is being made, the following could be a few of the possible causes for hard shifting complaints:

(a) No lubricant in remote control units. Forward remote is isolated and is often overlooked. However, many remote controls used on transmissions and auxiliaries require separate lubrication.

(b) No lubricant in (or grease fittings on) U-joints or swivels of remote controls.

(c) Lack of lubricant or wrong lubricant used, causing buildup of sticky varnish and sludge deposits on splines of shaft and gears.

(d) Badly worn or bent shift rods.

(e) Improper adjustment of shifter linkage.

(f) Sliding clutch gears tight on splines of shaft.

(g) Clutch teeth burred over, chipped or badly mutilated due to improper shifting.

(h) Binding or interference of shift lever with other objects or rods inside the cab or near the remote control island.

(i) Driver not familiar with proper shifting procedure for this transmission. Also includes proper shifting if used with 2-speed axle, auxiliary, etc.

(j) Clutch or drive gear pilot bearing seized, rough, or dragging.

(k) Clutch brake engaging too soon when clutch pedal is depressed.

(i) Wrong lubricant especially if E.P. type lubricant are added.

(m) Free running gears, seized or galled on either the thrust face or diameters.

Sticking in Gear:

(a) Clutch not releasing — also check remote units such as hydraulic or air assist, etc. Note: On some units employing a full air control for clutch release, air pressure of approximately 60 lbs. or more must be secured before clutch can be released. *Do not leave these vehicles parked in gear.*

(b) Sliding clutch gears tight on splines.

(c) Chips wedged between or under splines of shaft and gear.

(d) Improper adjustment, excessive wear or lost motion in shifter linkage.

(e) Clutch brake set too high on clutch pedal — locking gears behind hopping guard.

Bearing Failures:

The service life of most transmissions either main or auxiliaries is governed by the life of the bearings. Majority of bearing failures can be attributed to vibration and dirt. Some of the more prominent reasons for unit removal with bearing failures are:

(a) Worn out due to dirt.

(b) Fatigue of raceways or balls.

(c) Wrong type or grade of lubricant.

(d) Lack of lubricant.

(e) Vibrations—breakup of retainer & brinelling of races—fretting corrosion.

(f) Bearings tied-up due to chips in bearings.

(g) Bearings set-up too tight or too loose.

(h) Improper assembly—brinelling bearing.

(i) Improper fit of shafts or bore.

(j) Acid etch of bearings due to water in lube.

(k) Overloading of vehicle. Overload from engine or engine too large for transmissions used.

Dirt:

More than 90% of all ball bearing failures are caused by dirt which is always abrasive.

Dirt may enter the bearings during assembly of the units or be carried into the bearing by the lubricant while in service. Dirt may enter through seals, breather or even dirty containers used for addition or change of lubricant.

Softer material such as dirt, dust, etc., usually forms abrasive paste or lapping compounds within the bearings themselves since the unit pressure between the balls and raceways makes a perfect pulverizer. The rolling motion tends to entrap and hold the abrasives. As the balls and raceways wear, the bearings become noisy. The lapping action tends to increase rapidly as the fine steel from the balls and rollway adds to the lapping material.

Hard coarse material such as chips, etc., may enter the bearings during assembly from hammers, drifts, power chisels, etc., or be manufactured within the unit during service from raking teeth, etc. These chips produce small indentation in balls and races. Jamming of these hard particles between balls and races may cause the inner face to turn on shat, or the outer race to turn in the housing.

Fatique:

All bearings are subject to fatigue and must be replaced eventually. Your own operating experience will dictate mileage replacement of bearings showing only normal wear.

Corrosion:

Water, acid and corrosive materials formed by deterioration of lubricant, will produce reddish-brown coating and small etched holes over outer and exposed surfaces of race. Corrosive oxides also act as lapping agent.

Brinelling caused by improper assembly or removal — usually hammering with off-center blows. Use drivers, preferably under an arbor, or pullers.

Shaft Fits:

Excessive looseness under load is very objectionable because it produces a creeping or slipping of the inner ring on the rotating shaft. This causes the surface metal of shafts to scrub or wear off.

Bearing fits on rotating shafts are usually specified as tight. When play or looseness, even .001", exists between the bearing and shaft, there is a very powerful force tending to rotate the inner race on the shaft; this force is caused by the looseness or lost motion between the parts and disappears when no looseness exists.

Removal of Bearings:

It is far more difficult to remove bearings from a shaft than to put them on. In most cases it is necessary to remove the bearing by pulling on the outer-race which can damage the balls or races. Since such damage is seldom visible, it does not become known until after complete reassembly. It is good P.M. to replace most ball bearings during the overhaul period. If a bearing is not going to be replaced, avoid removal during low mileage rebuild.

AIR TROUBLE SHOOTING

AIR PRESSURE

Air pressures too high or too low will cause improper shifting of splitter controls. Check the following to correct the trouble:

SLOW SHIFTING

Complaints of slow shifting are usually associated with the automatic splitter shifts. Slow shifting could be caused by low air pressure; however, it is advisable to check the air system as outlined on page 13, rather than just raising the air pressure. The truck should be road tested and by a process of elimination isolate the complaint to manual, splitter shifting.

Crash Shifting or Raking of Gears (Splitter)

CAUSE: Crash shifting of splitter is usually caused by high air pressure. Check air control system as outlined on page 13. Also check the following probable troubles:

A. Excessive air leakage across "O" or quad sealing rings on splitter valves.

B. Air system freeze-up in cold weather. Because of water condensation in air lines or dry tank. Air line hook up coming from wet tank instead of dry tank.

C. Poor driver technique or failure to control engine speed drop off during upshift or failure to bring engine speed up to near governor speed when downshifting.

Air Pressure Regulator Assembly

CAUTION

See notes on page 13.

(See Figure 5) Transmissions are shipped with the air pressure regulator (V-3) set at 75-80 P.S.I. This pressure is usually required to shift new units back into lo when the vehicle is stationary and parking brakes are applied.

It is advisable to install a new pressure regulating spring during the rebuild of older transmissions with high mileage. Experience has indicated that regulator springs tend to take a set, evidently due to high frequency vibration.

Air Filter Assembly

(See Figure 1) Clean, dry air is required to insure trouble-free operation of the control valve and air cylinder. An air filter (V-10) has been incorporated to protect the pressure regulator. This filter does not eliminate the requirement for draining moisture, oil and sediment from the main reservoir tanks at regular intervals.

Replacement of the filter element is recommended and is dependent on condition of air compressor and discipline of reservoir drainage. Inspection of the filter element does not usually reveal much dirt or sediment. However, its main feature is the absorption of moisture to prevent freeze-up, condensation and rusting of air cylinders.

High Air Pressure

A. Pressure regulator spring weak. Install new spring.

B. Gauge should hold a steady pressure. If pressure surges or needle fluctuates, check all valves.

For further information, write to

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