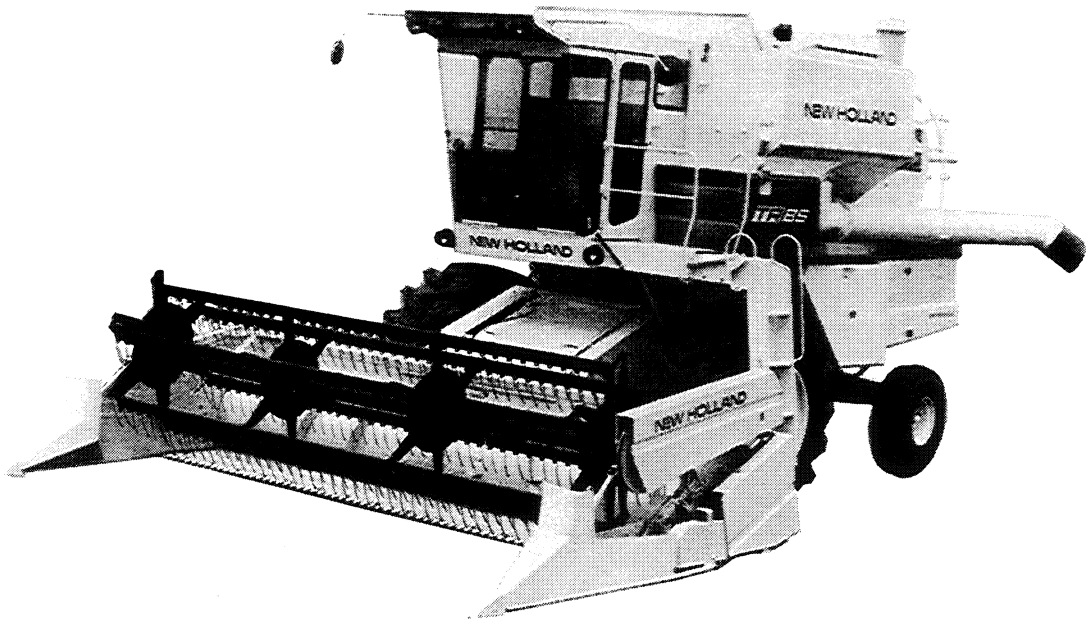
# SERVICE MANUAL

# COMBINE TR™70/75/85/95

## SPECIAL SERVICE TOOLS

SPERRY NEW HOLLAND



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# CONTENTS

# SAFETY PRECAUTIONS

YOUR SAFETY IS OF UTMOST CONCERN TO SPERRY NEW HOLLAND. PLEASE FOLLOW THE SAFETY RULES LISTED, NOT ONLY FOR YOUR OWN GOOD, BUT FOR THE PEOPLE AROUND YOU.

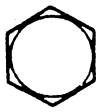
1. DO NOT ALLOW CHILDREN OR BYSTANDERS AROUND THE MACHINE WHILE IT IS BEING ADJUSTED, SERVICED OR OPERATED.
2. ALWAYS USE A SAFETY STAND IN CONJUNCTION WITH HYDRAULIC JACKS OR HOISTS. DO NOT RELY ON THE JACK OR HOIST TO HOLD THE LOAD COMPLETELY BECAUSE THEY COULD FAIL.
3. ALWAYS WEAR SAFETY GLASSES WHEN USING A HAMMER, CHISEL, OR OTHER TOOLS THAT MAY CAUSE CHIPS TO FLY OFF THE WORK.
4. KEEP WORK ORGANIZED AND CLEAN. WIPE UP OIL SPILLS OF ANY KIND TO MINIMIZE THE POSSIBILITY OF A FALL. KEEP TOOLS AND PARTS OFF THE FLOOR TO FURTHER REDUCE THE POSSIBILITY OF SERIOUS INJURY.
5. BE SURE TO REINSTALL SAFETY DEVICES SUCH AS GUARDS OR SHIELDS AFTER ADJUSTING OR SERVICING A MACHINE.
6. WHEN USING A GAS TORCH, ALWAYS WEAR WELDING GOGGLES AND GLOVES. KEEP A FULLY CHARGED FIRE EXTINGUISHER WITHIN REACH. DO NOT HEAT OR WELD NEAR A FUEL TANK OR FUEL LINES, AND UTILIZE PROPER SHIELDING AROUND HYDRAULIC LINES.
7. ELECTRIC STORAGE BATTERIES GIVE OFF HIGHLY FLAMMABLE FUMES WHEN CHARGING, AND CONTINUE TO DO SO FOR SOME TIME AFTER RECEIVING A STEADY CHARGE. DO NOT UNDER ANY CIRCUMSTANCES ALLOW AN ELECTRIC SPARK OR FLAME NEAR THE BATTERY. ALWAYS DISCONNECT THE BATTERY FIRST BEFORE WORKING ON THE ELECTRIC SYSTEM.
8. HYDRAULIC FLUID ESCAPING UNDER PRESSURE CAN HAVE ENOUGH FORCE TO PENETRATE HUMAN SKIN. HYDRAULIC FLUID MAY INFECT A MINOR CUT OR OPENING IN THE SKIN. IF INJURED BY ESCAPING FLUID, SEE A DOCTOR AT ONCE. DO NOT ATTEMPT TO REPAIR OR TIGHTEN HOSES THAT ARE UNDER PRESSURE. CYCLE ALL HYDRAULIC CONTROL VALVES TO RELIEVE ALL PRESSURE BEFORE DISCONNECTING THE LINES OR BEFORE PERFORMING OTHER WORK ON THE HYDRAULIC SYSTEM. MAKE SURE ALL CONNECTORS ARE TIGHT AND HOSES AND LINES ARE IN GOOD CONDITION BEFORE APPLYING PRESSURE TO THE SYSTEM. TO LOCATE A LEAK UNDER PRESSURE, USE A SMALL PIECE OF CARDBOARD. NEVER USE YOUR HANDS!
9. USE PULLERS TO REMOVE BEARINGS, BUSHINGS, CYLINDER SLEEVES, ETC. USE HAMMERS, PUNCHES AND CHISELS ONLY WHEN ABSOLUTELY NECESSARY AND BE SURE TO WEAR SAFETY GLASSES.
10. BE CAREFUL WHEN USING COMPRESSED AIR. USE APPROVED AIR BLOW GUNS, DO NOT EXCEED 35 PSI, WEAR SAFETY GOGGLES, AND USE PROPER SHIELDING TO PROTECT EVERYONE IN THE WORK AREA.
11. DO NOT WEAR RINGS, WRIST WATCHES, OR LOOSE FITTING CLOTHING WHEN WORKING ON MACHINERY BECAUSE THEY COULD CATCH ON MOVING PARTS AND CAUSE SERIOUS INJURY. WEAR STURDY WORK SHOES.
12. PRACTICE SAFETY 365 DAYS A YEAR. KEEP ALL YOUR FARM EQUIPMENT IN SAFE OPERATING CONDITION. KEEP ALL GUARDS AND SAFETY DEVICES IN PLACE. ALWAYS STOP THE MACHINE BEFORE ATTEMPTING TO UNPLUG OR SERVICE IT. REMEMBER: A CAREFUL OPERATOR IS THE BEST INSURANCE AGAINST AN ACCIDENT. EXTREME CARE SHOULD BE TAKEN IN KEEPING HANDS AND CLOTHING AWAY FROM MOVING PARTS.

# STANDARD TIGHTENING TORQUE FOR NORMAL ASSEMBLY APPLICATIONS

| Size | SAE Gr. 2 Min. Torque Ft. Lbs. (N·m) | SAE Gr. 5 Min Torque Ft. Lbs. (N·m) Plain | SAE Gr. 5 Plated | SAE Gr. 8 Min. Torque Ft. Lbs. (N·m) Plain | SAE Gr. 8 Plated | Carr Bolts & B RH SSQ Bolts Min. Torque Ft. Lbs. (N·m) |
|---|---|---|---|---|---|---|
| 1/4" | 5 (7) | 8 (11) | 7 (10) | 12 (16) | 10 (14) | 4 (5) |
| 5/16" | 10 (14) | 18 (24) | 15 (20) | 26 (35) | 21 (29) | 8 (11) |
| 3/8" | 18 (24) | 31 (42) | 25 (34) | 48 (65) | 39 (53) | 15 (20) |
| 7/16" | 31 (42) | 53 (72) | 43 (58) | 75 (102) | 60 (81) | 26 (35) |
| 1/2" | 45 (61) | 82 (111) | 66 (90) | 115 (156) | 92 (125) | 38 (52) |
| 5/8" | 82 (111) | 170 (231) | 140 (190) | 235 (319) | 190 (258) | 70 (95) |
| 3/4" | 155 (210) | 290 (393) | 230 (312) | 415 (563) | 330 (448) | 130 (176) |
| 7/8" | 165 (224) | 430 (583) | 340 (461) | 600 (814) | 480 (651) | 140 (190) |
| 1" | 250 (339) | 640 (868) | 510 (692) | 900 (1220) | 720 (976) | 210 (285) |

SPECIFICATIONS AND DESIGN SUBJECT TO CHANGE WITHOUT NOTICE.

**NOTE: If combining a plated bolt with a plain nut or vice versa, torque to plated bolt torque.**

| Identification Grade Marking | Specification and Grade |
|---|---|
|  NO MARK | SAE—Grade 1 |
| | ASTM—A 307 |
| | SAE—Grade 2 (b) |
|  | SAE—Grade 5 |
| | ASTM—A 449 |
|  | SAE—Grade 8 |
| | ASTM—A 354 Grade BD |

# GENERAL INFORMATION

**Identification of terms used in this manual:**

ANSI - American National Standards Institute (set standards)

ASAE - American Society of Agricultural Engineers (set standards)

SAE - Society of Agricultural Engineers (set standards)

UNF - Unified National Fine (fine bolt thread)

UNC - Unified National Coarse (coarse bolt thread)

All-thread Rod = A rod with continuous threads extending from one end to the other.

O.D. - Outside diameter

I.D. - Inside diameter

## Determining Right and Left of Combine

"Left" and "right" of a machine is determined from a position facing the direction of normal machine travel.

## Other Information

See the Twin Rotor™ combine service manual for specific information on disassembly and assembly of the components covered in this manual.

In many instances, the instructions call for the use of steel pipe of certain dimensions. The outside diameter is usually only critical in the area where the pipe contacts the bearing race to eliminate bearing damage. Thus a larger outside diameter pipe can be used by grinding or machining one end to the correct OD. ID of the pipes used is usually critical only for its fit over the shaft.

# INTRODUCTION

This manual is divided into two major sections: TR™70/75/85 combine special service tools and TR™95 combine special service tools. In each major section, all special service tools which can be fabricated are listed.

Refer to the appropriate combine service manual for more information on use of special service tools.

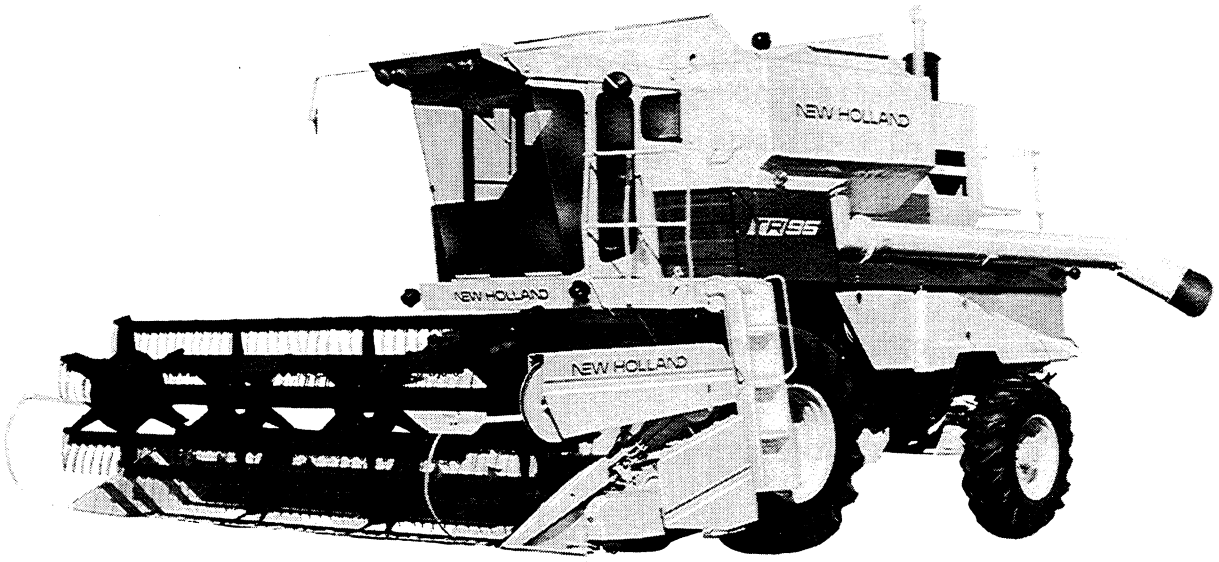
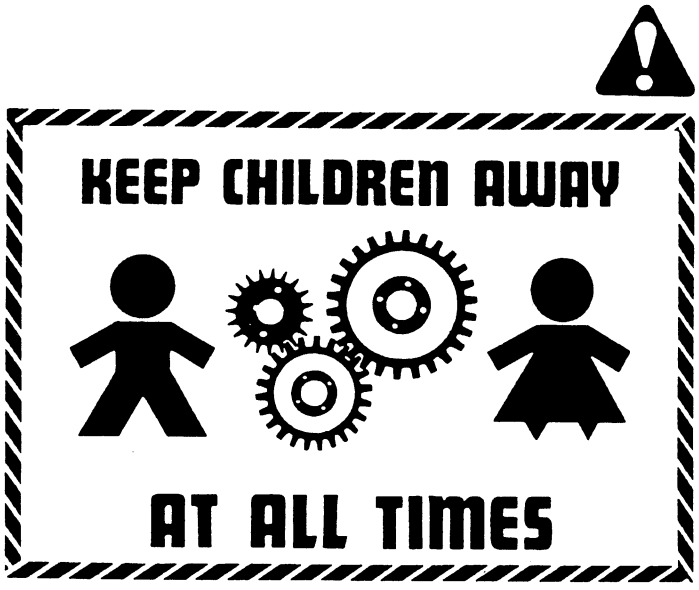



FIGURE 1



# TR™70/75/85 COMBINE SPECIAL SERVICE TOOLS

## SEPARATOR CLUTCH REMOVAL TOOL (Figure 2)

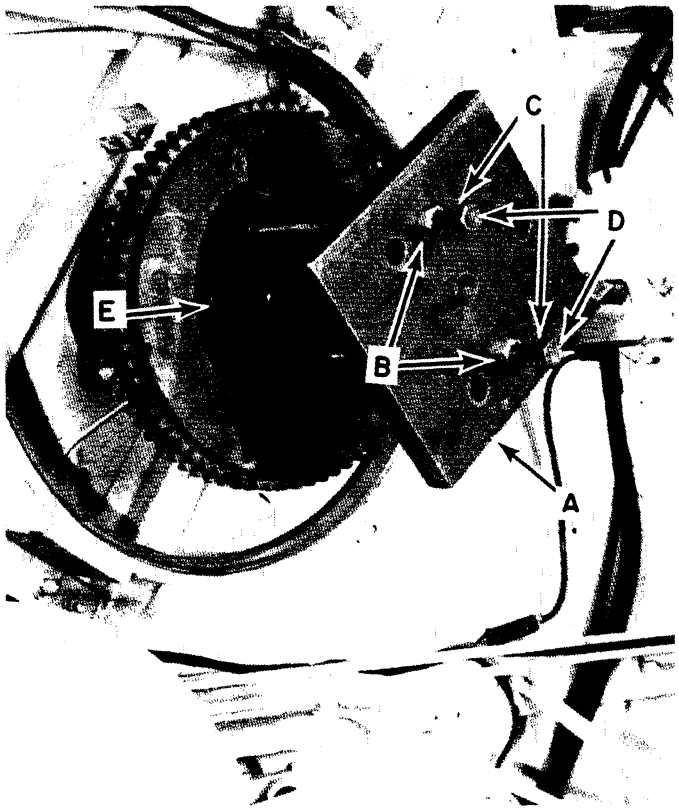



FIGURE 2

### PURPOSE

This tool is used to remove the separator clutch from the left end of the main shaft.

### USE

Used on all model TR™70, 75 and 85 combines with a back-to-back hydrostatic transmission. Place the puller plate, A, Figure 2, against the left end of the main shaft. The center hole of the plate, A, will go over the threaded end of the shaft. Turn the two pieces of all-thread rod, C, Figure 2, into the clutch outer casting, E. Be sure not to turn the all-thread rod in too far and contact the fiber clutch discs. Tighten evenly on nuts, B. Keep the all-thread rod from turning farther into the clutch casting using nuts, D, which are welded to the ends of all-thread rod.

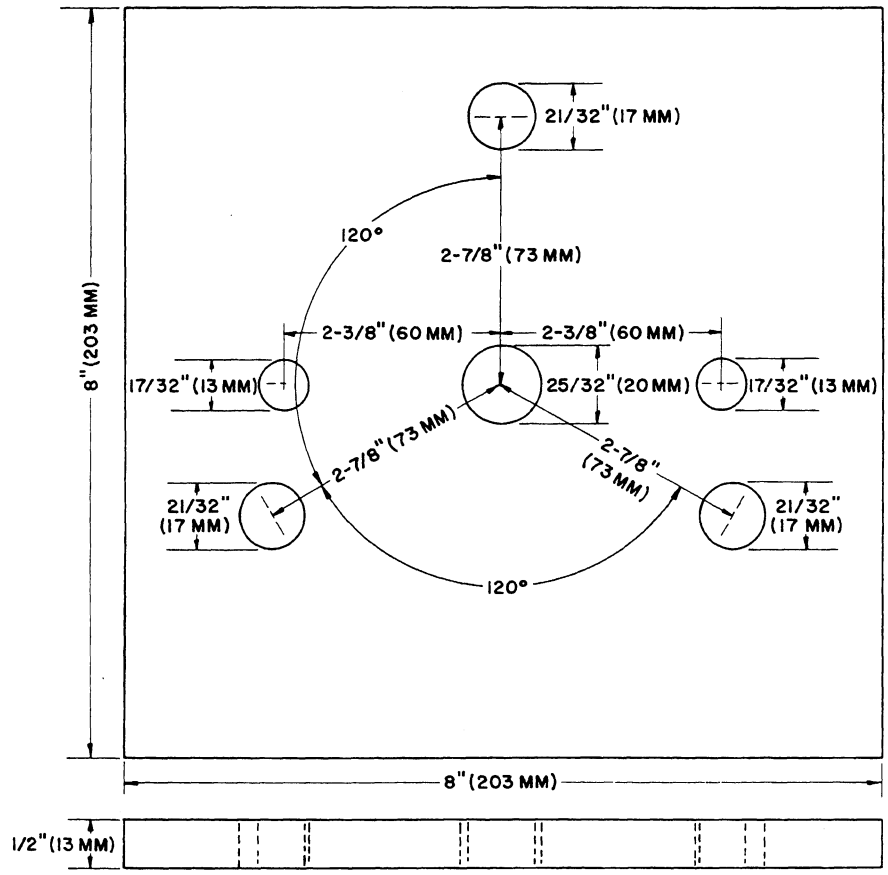



FIGURE 3

## FABRICATION

### Items Needed:

*1 - Metal plate - ½" x 8" x 8" (13 mm x 203 mm x 203 mm) hot rolled

2 - ½" x 12" (13 mm x 305 mm) Grade 5, all-thread rods, UNC

4 - ½" hex nuts

*Fabricate a puller plate as shown in Figure 1.

Center punch a mark for all holes, then drill the holes with the proper size drill bits. The holes used for pulling the separator clutch are two 17/32" (13 mm) holes spaced 180° (3.1 rad) apart and the center hole.

The three 21/32" (17 mm) holes are used for other applications of this same puller plate. Weld one ½" (13 mm) nut to the end of each all-thread rod. Screw two ½" nuts on to the all-thread rods. Insert the all-thread through the two 17/32" (13 mm) holes in the puller plate.

# SEPARATOR CLUTCH INSTALLATION TOOL (Figure 4)

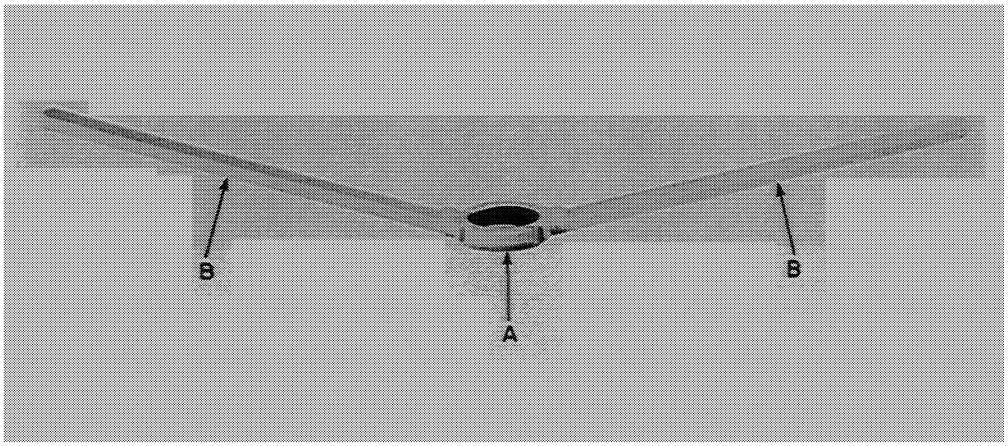



FIGURE 4

## PURPOSE

It is important to use this tool to push the clutch onto the shaft of the TR™70 combines on and before serial number 293162 (style A main shaft - see TR™70 service manual). **Hammering the clutch on could cause main shaft bearing problems.** On TR™70 combines after s/n 293162 (style B main shaft) and TR75 and TR85 combines, the clutch can be tapped on with a heavy soft mallet. This tool could also be used. See the combine service manual for assembly instructions.

## USE

This is used to install clutch on shaft and align the keyway. Thread the tool onto the large threaded portion of the shaft. Continue turning, pushing the clutch to its proper position.

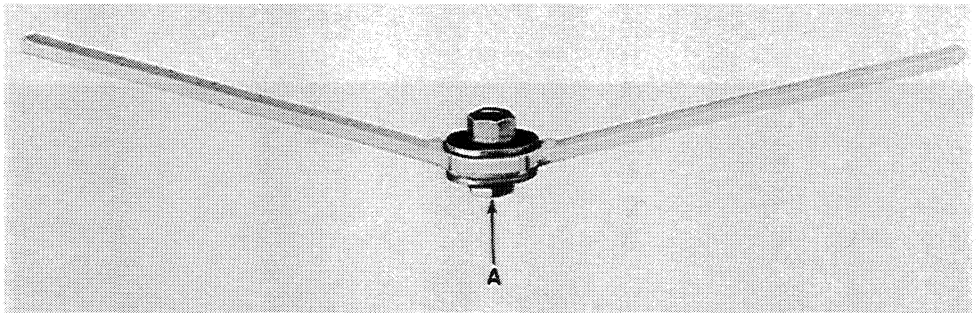



FIGURE 5

## FABRICATION

Obtain a #28683 spanner nut, A, Figure 4, normally used to secure the separator clutch on the main shaft. Weld two pieces of ¼" thick, 1" wide, 9" long (6 mm, 25 mm, 229 mm) flat metal, B, Figure 4, to the spanner nut as shown.

Be sure to get proper weld penetration so the handles will not break off during use. Grind a slight radius in the end of the flat metal to give a better fit to the spanner nut. Use ⅛" E6011 welding rod with the welder set at the proper amperage. Weld on the top and bottom. Use a ⅝" x 1¼" cap screw and nut, along with two ¾" plain washers, A, Figure 5, to protect the threads of the spanner nut when welding as shown.

**CAUTION: ARC WELDING CAN BE DANGEROUS. BE SURE TO WELD IN AN AREA FREE FROM HIGHLY FLAMMABLE MATERIALS. WEAR PROPER PROTECTIVE CLOTHING AND EYE PROTECTION.**

# LEFT MAIN SHAFT BEARING REMOVAL TOOL (Figure 6)

(Style "A" main shaft with style 1, 2 or 3, bearings, see TR™70 combine service manual)

## PURPOSE

This tool is used to pull the left main shaft bearing and housing off the main shaft.

## USE

It is used on TR70 combines on and below serial number 293162.

Install the puller as shown in Figure 6. Thread three all-thread rods, B, Figure 6, into the three threaded holes of bearing housing, A. Thread one ⅝" (16 mm) nut, D, onto each all-thread rod. Tighten nut, D, up against the bearing housing. This will keep the rod from turning farther into the bearing housing when pulling using nuts, C. Install the puller plate, E, and nuts, C. Tighten evenly on nuts, C, to pull the bearing and/or housing.

When using this puller on style "1" bearing (single-row ball bearing), the bearing and housing will normally come off as a unit.

When using this puller on style "2" bearing (single-row ball bearing with brass ball retainer), the inner race will ususally remain on the shaft. The inner race then can be removed using the puller shown in Figure 7.

When using this puller on style "3" bearing (double-row ball bearing), only the bearing housing will be removed. The bearing can be removed with the puller shown in Figure 8.

## FABRICATION

**Items needed:**

| Quantity | Description |
|---|---|
| 3 | ⅝" x 18" (16 mm x 457 mm), UNC, Grade 5, all-thread rod (B, Figure 6) |
| 1 | Puller plate (see Figure 3) |
| 6 | ⅝" (16 mm) UNC hex nuts (C, Figure 6) |

Same puller can be used for right bearing and housing removal.

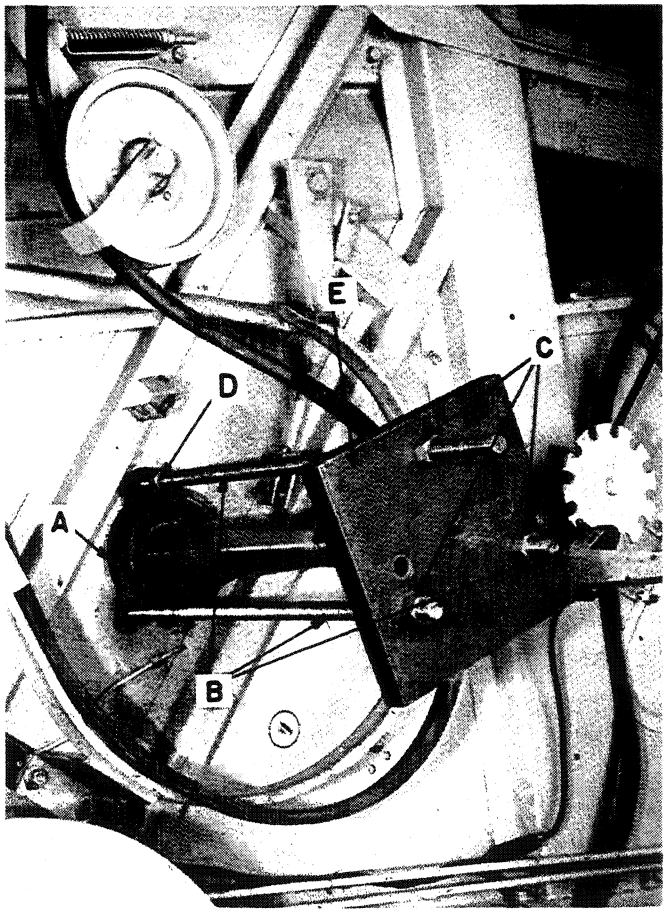



FIGURE 6

# LEFT MAIN SHAFT BEARING REMOVAL TOOL
# (See Figures 7 and 8)

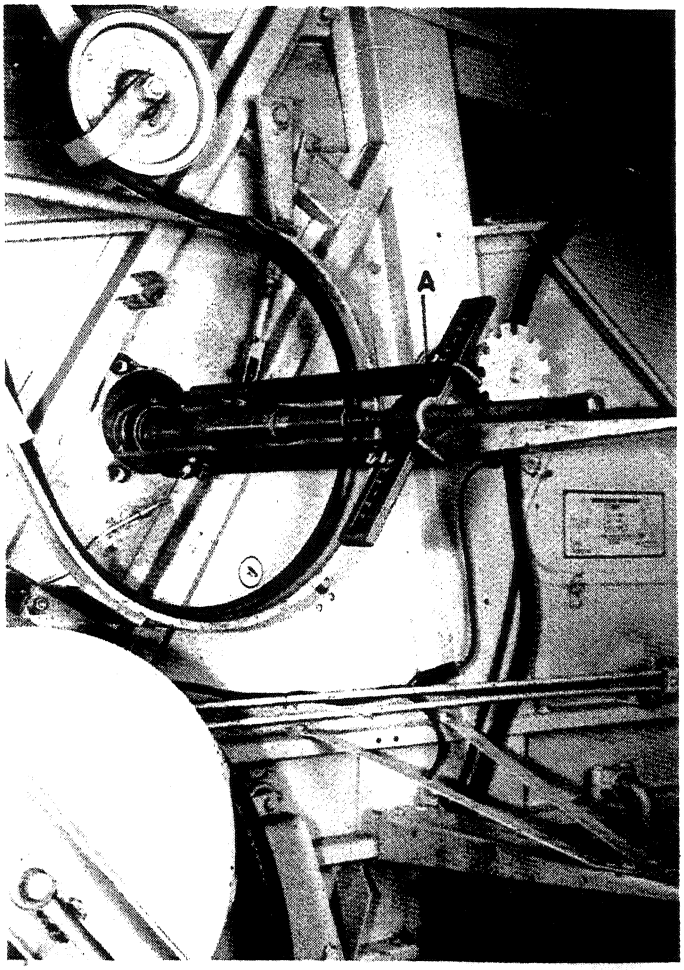



FIGURE 7

(Style "A" main shaft with style "2" and "3" bearings)

## PURPOSE

1. To pull the inner race of style "2" bearing (singe row ball with brass retainer) as shown in Figure 7.
2. To pull style "3" (double row ball bearing) after the housing is removed. See Figure 8.

## USE

It is used on TR70 combines on and below serial number 293162. Install the puller as shown in Figures 7 and 8.

## FABRICATION

The puller, A, Figure 7, is a "Proto" brand puller consisting of:

| | |
|---|---|
| 1 | #4012 forcing screw (C, Figure 8) |
| 1 | #4011 cross arm (B, Figure 8) |
| 2 | #4015 puller jaws (A, Figure 8) |

Plus:

| | |
|---|---|
| 2 | Puller jaw extensions (D, Figure 8) |
| 4 | Cap screws - ⅜" x 1" Grade 5, flat washer and nuts (E, Figure 8) |

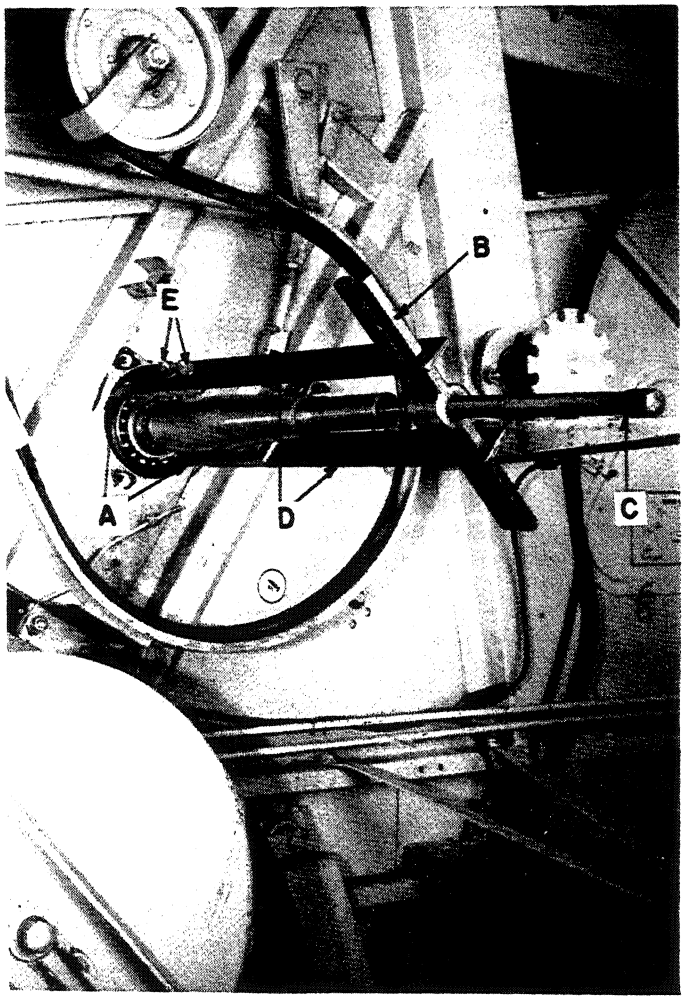



FIGURE 8

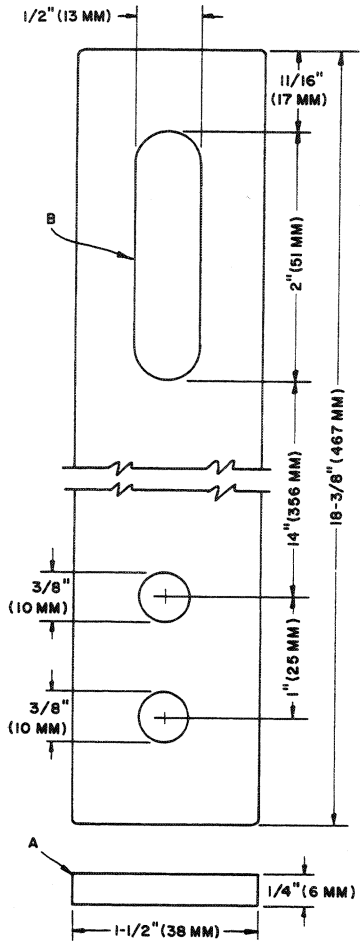



**FIGURE 9**

The puller jaw extensions, D, Figure 8, can be fabricated as shown in Figure 9. Each jaw extension is bolted to the puller jaw with two ⅜" x 1" Grade 5 cap screws, flat washers and nuts at E, Figure 8. A, Figure 9, is an end view of the extension. Cut out slot, B, Figure 9, by drilling a series of holes and/or using a cutting torch and round file.

# LEFT MAIN SHAFT BEARING INSTALLATION TOOL (Figure 10)

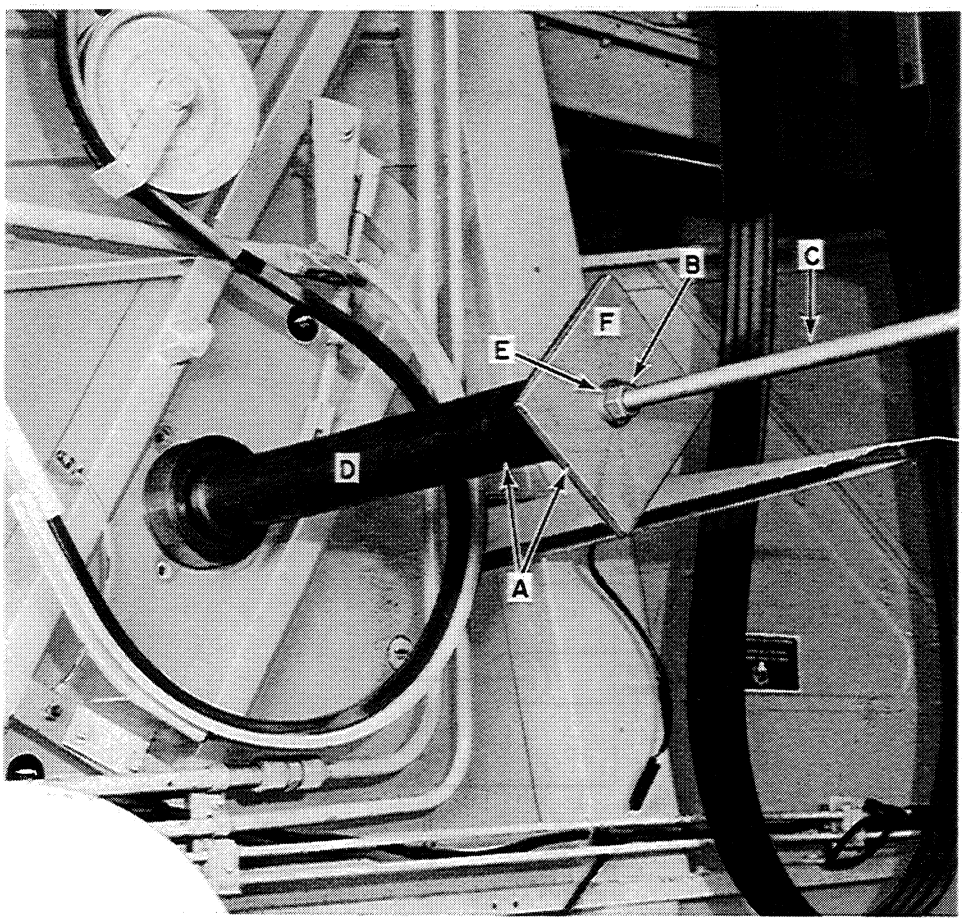



FIGURE 10

(Style "A" main shaft and style "4" bearing - cartridge type, Refer to TR™70 combine service manual)

## PURPOSE

This tool is used to install style "4" left main shaft bearing.

## USE

This tool is used on TR70 combines on and below serial number 293162. Install the bearing pusher assembly, A, Figure 10, as shown.

An adapter is used to secure the ¾" (19 mm) UNC all-thread rod, C, Figure 10, to the ¾" (19 mm) UNF threads on the left end of the main shaft. See nut adapter in Figure 11.

Tighten nut, B, Figure 10, to push the bearing into position on the shaft. Apply oil to the all-thread rod to allow the nut to turn easier and reduce thread wear. See the TR™70 combine service manual for proper bearing installation procedures.

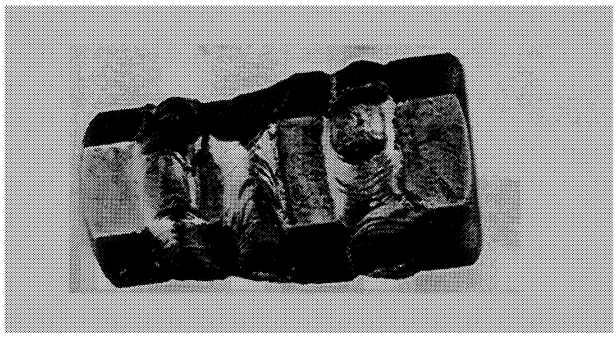


FIGURE 11

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | Pipe - 2¼" ID x 2½" OD x 20" (57 mm x 64 mm x 508 mm) (D, Figure 10) |
| 1 | All-thread rod - ¾" x 18" (19 mm x 457 mm) UNC Grade 5 (C, Figure 10) |
| 1 | Nut adapter* (See Figure 11) - ⅝" UNF x ¾" UNC (Figure 11) |
| 2 | Washer #66850 (¾" ID, 3" OD, ¼" thick) (19 mm x 76 mm x 6 mm) or any flat metal plate with a minimum of 2½" (64 mm) OD with a ¾" (19 mm) hole in the center (F, Figure 10) |
| 1 | Plain flat washer - ¾" (E, Figure 10) |
| 1 | Hex nut - ¾" (B, Figure 10) |

*When welding the nuts together, as shown in Figure 11, install the nuts loosely (not jammed together) on to an appropriate size and thread type bolt. This will eliminate the thread binding when threading the adapter on to the main shaft and/or all-thread rod. Also this will eliminate warping during welding. Use ⅛" E6011 welding rod with the welder set at the proper amperage. Be sure to obtain good penetration of the weld beads.

# DUST CUP, BEARING, AND SHEAVE INSTALLATION TOOL (Figure 12)

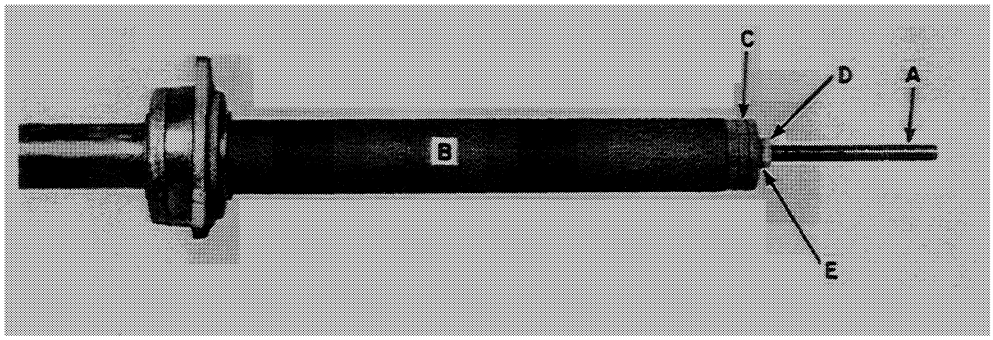



FIGURE 12

(Right end of style "A" main shaft)

(Refer to TR™70 combine service manual for above-mentioned parts removal)

## PURPOSE

This tool is used to install the dust cup, bearing, or sheaves, on the right end of the main shaft, see Figure 12.

## USE

Use the tool on TR70 combines on and below serial number 293162. Install as shown in Figure 12. **NOTE: Main shaft is normally not removed when installing the dust cup, bearing or sheaves on the right end of the main shaft.** Install pipe, B, three heavy flat washers, C, (#66850 or a suitable plate with a ⅝" (16 mm) hole in the center), flat washer, E, and nut, D, Figure 12. Tighten nut, D, Figure 12, to push the dust cup, bearing and sheave into position. Refer to the TR™70 combine service manual for proper installation procedure.

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | *Pipe - 2¼" min. ID, 2½" OD, 15" long (57 mm, 64 mm, 381 mm) (B, Figure 12. |

*The same pipe used to install style "4" bearing on the left end of the main shaft could also be used. The all-thread rod length would have to be 17" (43 cm) to make up for the additional length of the 20" (50.1 cm) pipe.

| | |
|---|---|
| 1 | All-thread rod - ⅝" x 12" (16 mm x 305 mm) UNC Gr. 5 (A, Figure 12) |
| 2 | Hex nuts - ⅝" (D, Figure 12) (one not shown) |
| 3 | Heavy #66850 flat washers or any suitable plate with a ⅝" (16 mm) center hole and 2½" (64 mm) minimum OD (C, Figure 12) |
| 1 | Flat washer - ⅝" (16 mm) (E, Figure 12) |

# MAIN SHAFT SLEEVE REMOVAL TOOL

## PURPOSE

This removal tool is used to remove the sleeve, C, Figure 12A, from the right end of style "B" main shaft.

## USE

It is used on TR70/75/85 combines with style "B" main shaft.

Position plates, A, Figure 12A, as shown. Install ⅜" x 3" cap screws, B, Figure 12A, in sleeve, C, as shown.

Tighten equally on cap screw, B, Figure 12A, to remove the sleeve, C, from the tapered spline fit on the main shaft, D.

## FABRICATION

### Items Needed:

| | |
|---|---|
| 3 | Flat steel ¼" thick x 2" x 2" (6.4 mm, 51 mm, 51 mm) |
| 3 | Cap screws ⅜" x 3", UNC, Grade 5 |

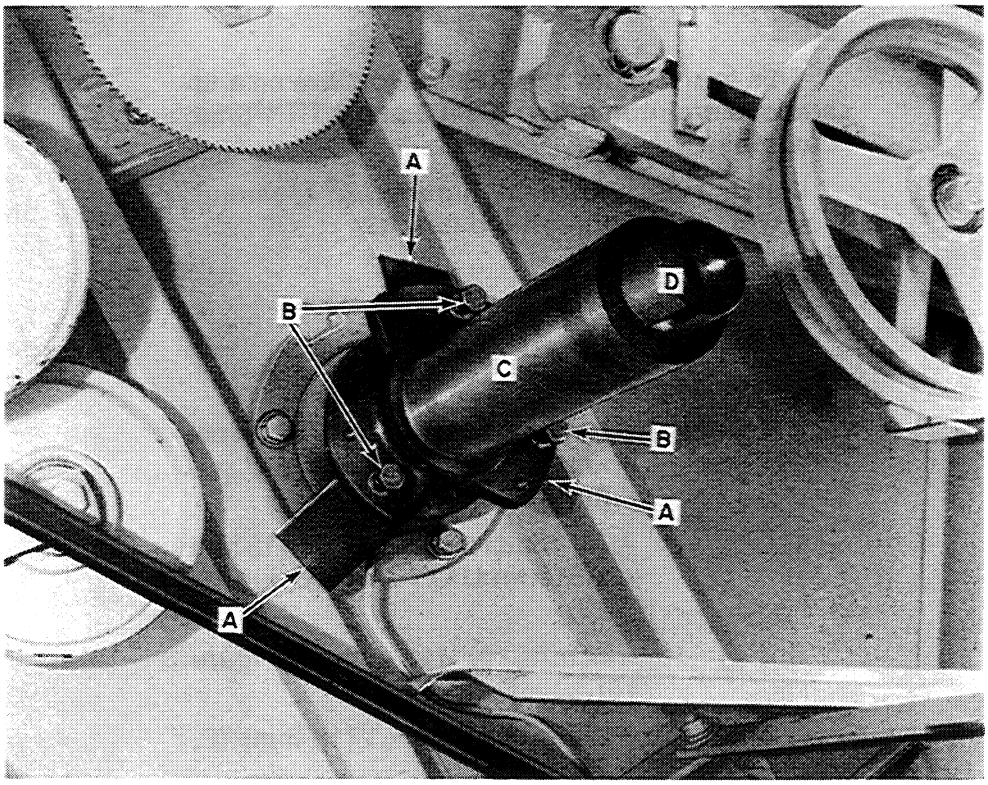



FIGURE 12A

# LEFT MAIN SHAFT BEARING REMOVAL TOOL (Figure 13)

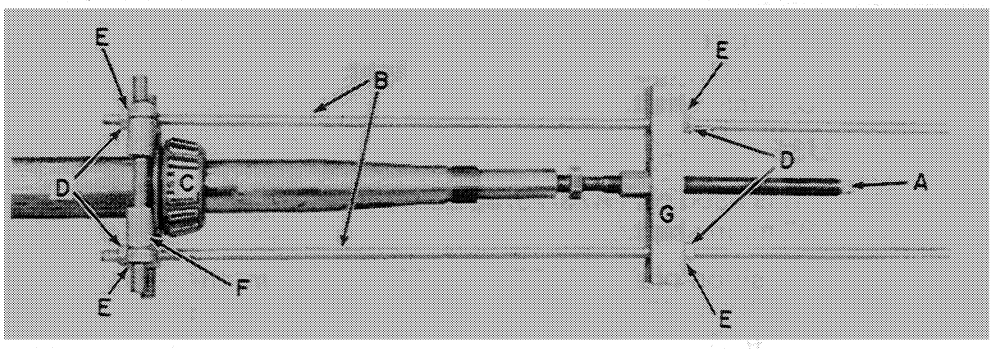



FIGURE 13

(Style "B" Main Shaft. See TR™combine service manual)

## PURPOSE

Use this tool to remove the tapered roller bearing, C, Figure 13, from the left end of the main shaft.

## USE

This tool is used on TR™70 combines on and above serial number 293163 and all TR™75/85 combines.

Install as shown in Figure 13. Tightening screw, A, will pull off the bearing.

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | Suitable bearing separator, screw and cross arm puller (A, F, G, Figure 13) |
| 2 | All-thread rods - ½" x 24" (13 mm x 610 mm) UNC Gr. 5 (B, Figure 13) |
| 4 | Hex nuts - ½" (13 mm) (D, Figure 13) |
| 4 | Plain washers - ½" (13 mm) (E, Figure 13) |

# LEFT MAIN SHAFT BEARING INSTALLATION TOOL (Figure 14)

# (STYLE "B" MAIN SHAFT)

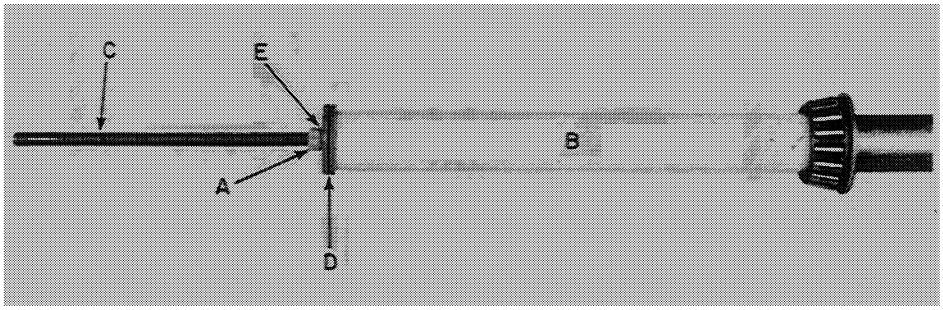



FIGURE 14

## PURPOSE

This tool is used to push left tapered roller bearing on the main shaft.

## USE

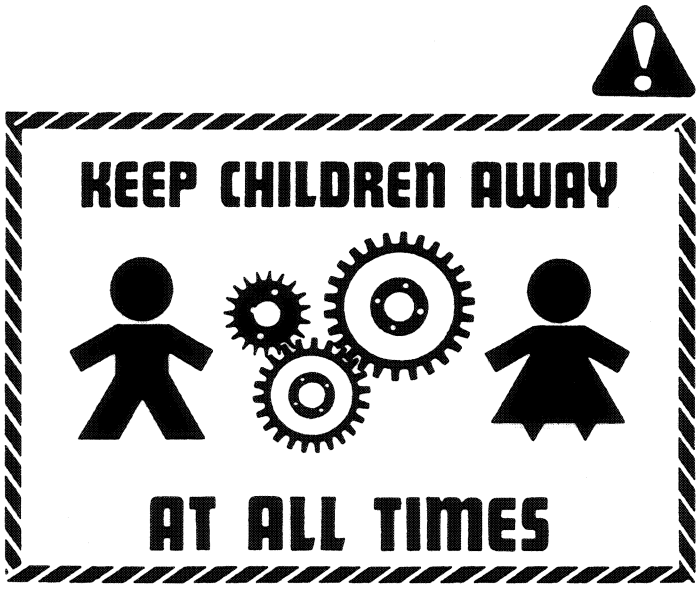
The tool is used on TR™70 combines on and above serial number 293163 and all TR™75/85 combines. Install the bearing pusher tool as shown in Figure 14. Tighten nut, A, to push the bearing into position. Apply oil to the all-thread rod so the nut will turn easier and to reduce thread wear. (See TR™70 combine service manual for proper assembly procedures).

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | Steel pipe - 2¼" ID, 2½" OD, 20" long (57 mm, 64 mm, 508 mm) (OD is only critical where pipe contacts bearing (B, Figure 14) |
| 1 | All-thread rod - ⅝" x 10" (16 mm x 250 mm) UNC Gr. 5 (C, Figure 14) |
| 2 | #66850 heavy flat washers (¾" ID, 3" OD, ¼" thick) (19 mm, 76 mm, 6 mm) or any suitable washer or flat metal plate with a ⅝" (16 mm) hole in the center and a minimum OD of 2½" (D, Figure 14) |
| 1 | Plain washer ⅝" (16 mm) (E, Figure 14) |
| 1 | Nut adapter - ¾" UNF to ⅝" UNC (19 mm - 16 mm) two ¾" (19 mm) UNF nuts welded together and welded to two ⅝" (16 mm) UNC nuts, which are welded together. Figure 14A shows the nut adapter, A, used to secure all-thread, B, to the left end of the shaft (Figure 11) |

*When welding the nuts together, as shown in Figure 11, install the nuts loosely (not jammed together) on to an appropriate size and thread-type bolt. This will eliminate thread binding when threading the adapter on to the main shaft and/or all-thread rod. Also, this will eliminate warping during welding. Use ⅛" E6011 welding rod with the welder set at the proper amperage. Be sure to get good penetration of the weld beads.



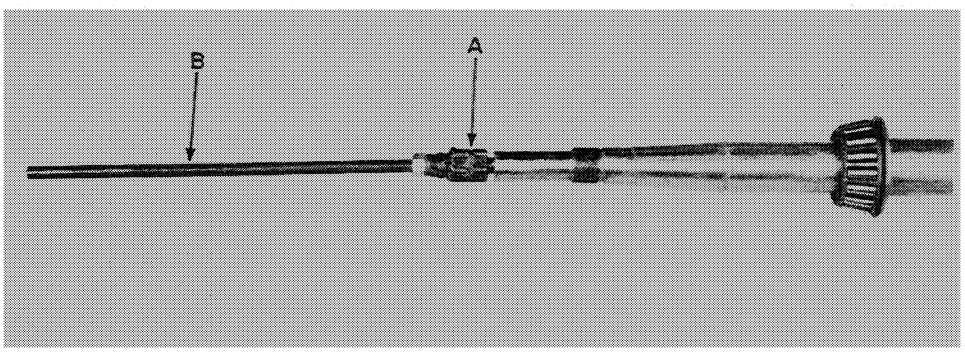




FIGURE 14A

# RIGHT MAIN SHAFT BEARING INSTALLATION TOOL (See Figure 15)

# (STYLE "B" MAIN SHAFT)

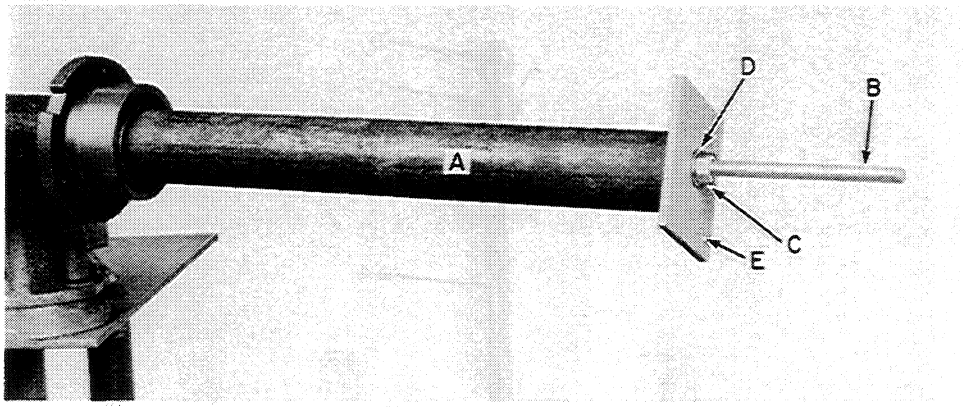



FIGURE 15

## PURPOSE

Use this tool to properly install the tapered roller bearing on the right end of the main shaft.

## USE

Use tool on TR™70 combines on and above serial number 293163 and all TR™75/85 combines.

Screw the 5/8" (16 mm) all-thread rod, B, Figure 15, into the right end of the main shaft. Lock the all-thread to the main shaft by threading a 5/8" (16 mm) nut on the all-thread and jamming it against the end of the main shaft. Install the pipe, A, washers or metal plate, E, flat washer, D, and nut, C.

Tightening nut, C, will push the bearing into position. Refer to TR™70 combine service manual for proper bearing installation procedures.

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | *Steel pipe - 2 3/8" ID, 3" OD, 13" length (60 mm, 76 mm, 330 mm) (A, Figure 15) |
| 1 | All-thread rod - 5/8" x 6" (16 mm x 152 mm) UNC Gr. 5 (B, Figure 15) |
| 2 | Hex nuts - 5/8" (16 mm) (C, Figure 15) |
| 2 | #66850 heavy flat washers or any suitable plate with 11/16" center hole and a minimum OD of 3" (E, Figure 15) |
| 1 | Flat washer - 5/8" (16 mm) (D, Figure 15) |

*OD of pipe is only critical where it contacts the bearing race. ID is critical in that pipe must fit over the shaft.

# TORQUE SENSING DRIVE REMOVAL AND COMPRESSION TOOL (Figure 16)

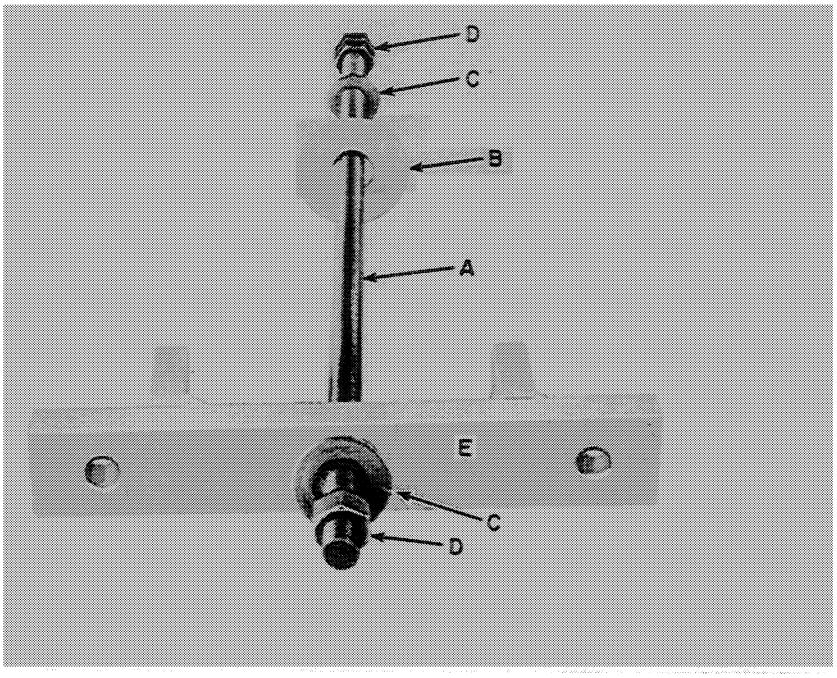



FIGURE 16

## PURPOSE

1. To remove the torque sensing drive assembly from the right rotor gearbox input shaft.
2. To compress the internal spring of the torque sensing drive assembly for safe disassembly.

## USE

This tool is used on TR75/85 combines only. Refer to the service instructions for torque sensing drive in the TR™75/85 combine service manual.

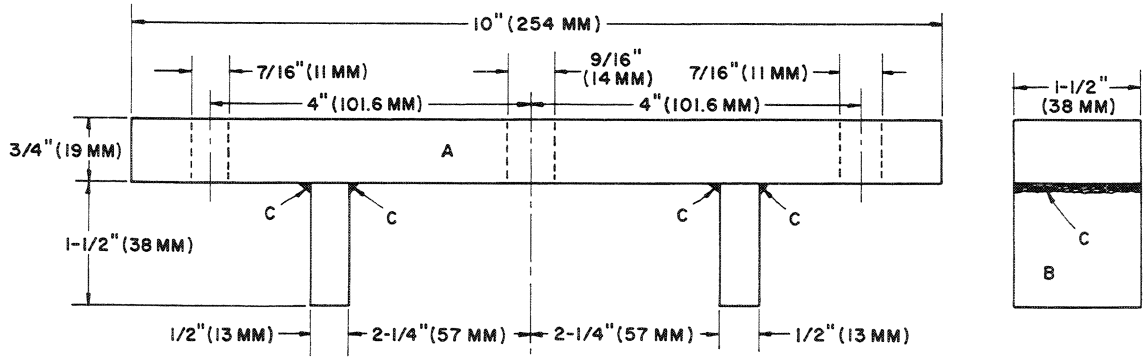



FIGURE 17

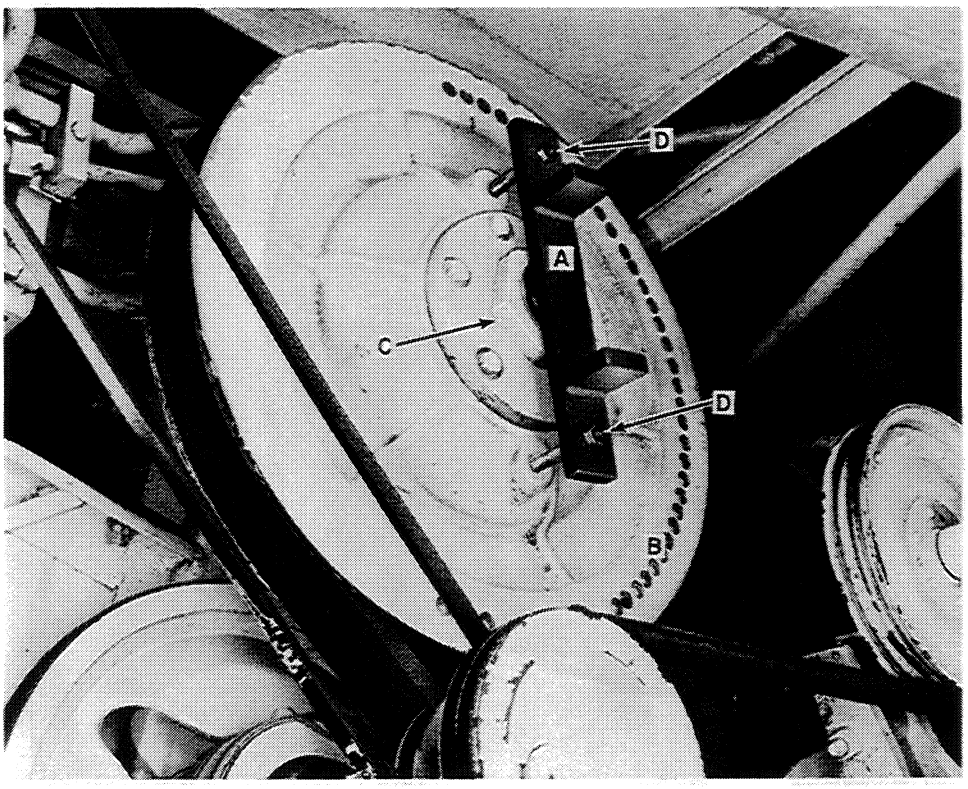



FIGURE 18

Use a crossbar, E, Figure 16, and A, Figure 18, to remove the torque sensing drive assembly, B, Figure 18, as shown.

Loosen the nut or cap screw securing the torque sensing drive to the shaft. Thread either the nut or cap screw out until it extends 3/16" (4.8 mm) beyond the slug wrench nut, C, Figure 18. **NOTE: A longer cap screw may have to be installed to obtain the 3/16" (4.8 mm) dimension.**

Attach the crossbar, A, Figure 18, to the torque sensing sheave using two ⅜" x 3" cap screws, D.

To remove the torque sensing assembly, tighten evenly on cap screws, D, Figure 18. Use a hammer to tap on the center of bar, A.

**CAUTION: DO NOT REMOVE THE NUT OR CAP SCREW COMPLETELY. WHEN PULLING, THE TORQUE SENSING DRIVE ASSEMBLY MAY FALL AND INJURE YOU.**

**CAUTION: USE ASSISTANCE WHEN REMOVING THE TORQUE SENSING DRIVE ASSEMBLY FROM THE COMBINE BECAUSE IT IS EXTREMELY HEAVY FOR ONE MAN TO LIFT.**

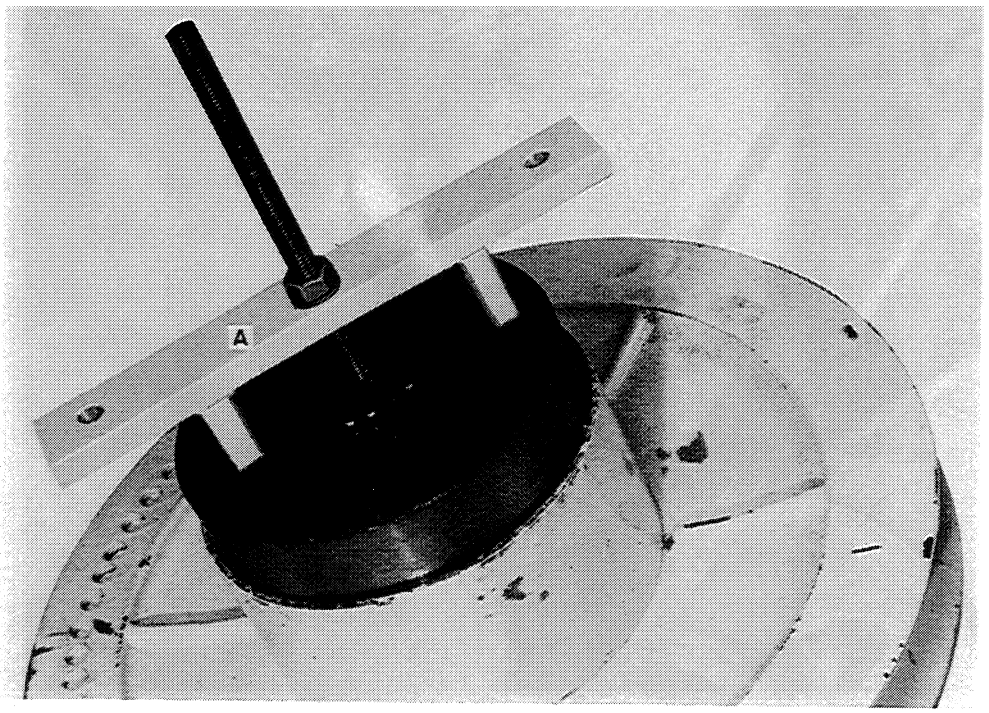



FIGURE 19

The special tool, A, Figure 19, can also be used to compress the internal torque sensing drive spring as shown.

**NOTE: The use of this tool is necessary for safe torque sensing drive disassembly.**

Refer to TR™75/85 combine service manual for use of this tool and proper torque sensing drive disassembly procedures.

## FABRICATION

### Items Needed:

| | |
|---|---|
| 1 | All-thread rod - ½" x 16" (13 mm x 406 mm) UNC Gr. 5 (A, Figure 16) |
| 1 | #615906 special flat washer (¾" ID, 2" OD, 5/32" thick) (19 mm, 51 mm, 4 mm) or any suitable washer with a minimum ID of 9/16" (14 mm) and maximum OD of 2" (51 mm) (B, Figure 16) |
| 2 | Flat washers - ½" (13 mm) (C, Figure 16) |
| 3 | Hex nuts - ½" (13 mm) UNC (D, Figure 16) |
| 1 | Flat steel - (1½" wide, 10" long, ¾" thick) (38 mm, 254 mm, 19 mm) to make into compression tool bar, E, Figure 16. Fabricate as shown in Figure 17. Figure 17 shows a side view, A, and end views, B, of the tool bar. Weld at C, using the proper welding rod and welder amperage settings. |
| 2 | Flat steel - 1½" wide, 1½" long, ½" thick, (38 mm, 38 mm, 13 mm) |
| 2 | ⅜" x 3" cap screws |

# ROTOR SUPPORT TOOL
# (Figure 20)

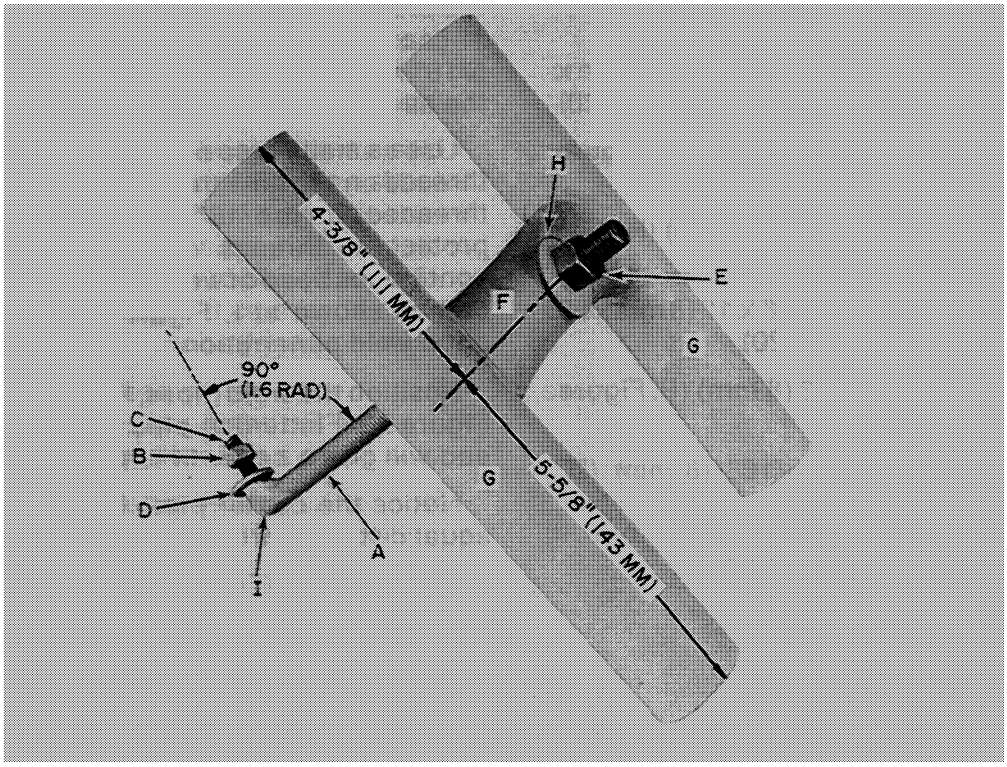



FIGURE 20

## PURPOSE

This is used to hold the rotor up in position so one man can easily remove and reinstall either rotor gearbox.

## USE

It is used on all TR70 and TR75/85 combines.

Set the rotor support tool, see Figure 20, on top of the rear rotor cover (the support tool is indicated by broken lines in Figure 21) with the draw bolt, A, Figure 20, extending down into the rotor chamber. Attach the securing bolt, C, Figure 20, to the rotor at A, Figure 21, using one 5/16" (31 mm) hex nut and flat washer. Tighten nut, E, Figure 20, until the rotor begins to be held by the support tool.

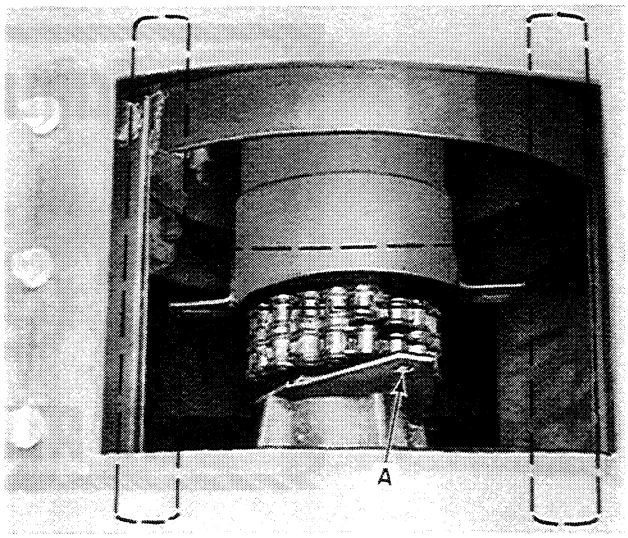



FIGURE 21

## FABRICATION

| | |
|---|---|
| 1 | *Steel pipe - 1½" minimum OD, 6" long, 3/32" wall thickness (38 mm, 152 mm, 2 mm) (F, Figure 20) |
| 2 | *Steel pipe - 1½" minimum OD, 10" long, 3/32" wall thickness (38 mm, 250 mm, 2 mm) (G, Figure 20) |

*Could also be made of square tubing approximately 1½" x 1" (38 mm x 25 mm) or any other suitable material.

| | |
|---|---|
| 1 | All-thread rod - ½" x 9" (13 mm x 229 mm) NC Gr. 5 (A, Figure 20) |
| 1 | Hex nut - ½" (13 mm) (E, Figure 20) |
| 1 | Flat washer - ½" (13 mm) (H, Figure 20) |
| 1 | Cap screw - 5/16" x 1" (8 mm x 25 mm) (C, Figure 20) |
| 1 | Hex nut - 5/16" (8 mm) (B, Figure 20) |
| 1 | Flat washer - 5/16" (8 mm) (D, Figure 20) |

Assemble as shown in Figure 20.

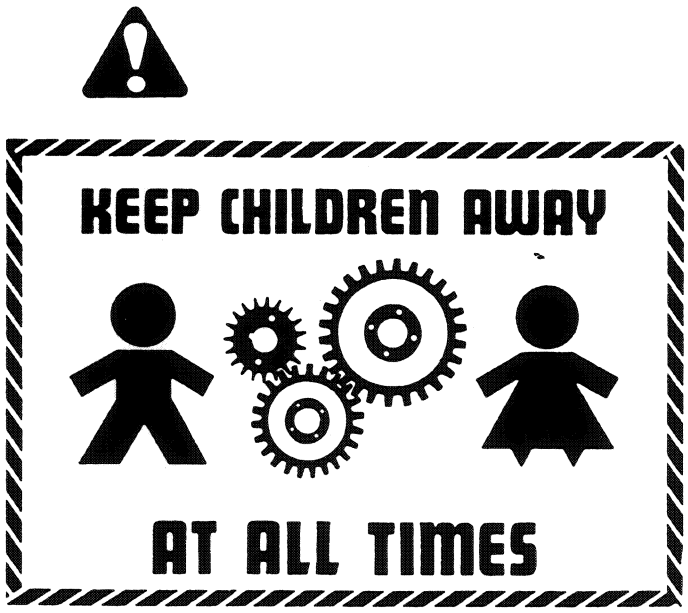
To eliminate thread damage be sure to cover the threads of the ½" (13 mm) all-thread rod and the 5/16" cap screw when welding the 5/16" x 1" cap screw on the all-thread rod. Position the 5/16" x 1" cap screw at a 90° (1.6 rad.) angle to the all-thread rod.

Use a small piece of steel pipe to protect the threads on the all-thread rod. Three 5/16" nuts threaded on the 5/16" cap screw can be used to protect its threads during welding. Weld a continuous bead of weld around the head of the bolt as shown at I, Figure 20. Be sure to get good weld penetration.

Position the weld pipes, F and G, as shown in Figure 20. Flattening pipe, F, slightly on each end will give a better fit to pipes, G.

Notice the center pipe, F, is not positioned equal distances from the ends of pipe, G.

Drill a 9/16" (14 mm) hole through the center of pipe, F, Figure 20, for the all-thread rod.



# STYLE I - LEFT ROTOR GEARBOX SPECIAL SERVICE TOOLS

## (See TR™75/85 Combine Service Manual)

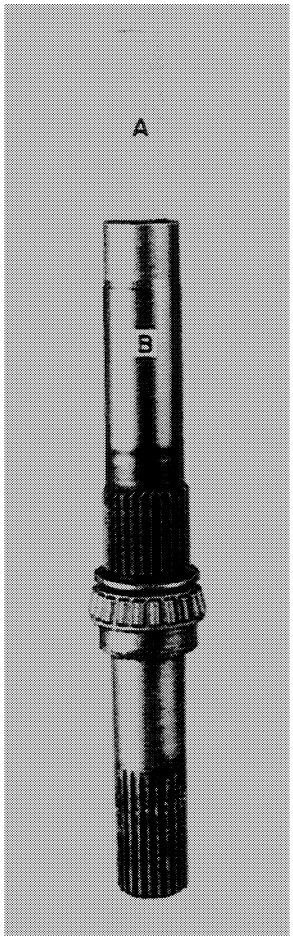



FIGURE 22

### PURPOSE

This tool is used to properly disassemble and reassemble the left rotor gearbox.

### USE

Use this on TR™70, TR75/85 combines with Style I gearboxes. Whenever possible, use a press to do all bearing disassembly and assembly.

See the TR™ combine service manual for proper disassembly and assembly procedures.

### SPECIAL SERVICE TOOLS

1. Pipe, A, Figure 22, is used to push the input shaft out of the left rotor gearbox (push shaft from left to right). Using the pipe will eliminate the possibility of damage to the threaded end of the shaft. Install the pipe, A, Figure 22, on to the input shaft, B, as shown.

   Use a steel pipe with a 9/16" (16 mm) minimum ID (max. of 1⅛" ID) and 3½" (89 mm) long. OD is not critical. Pipe wall thickness should be at least 3/32" (2 mm).

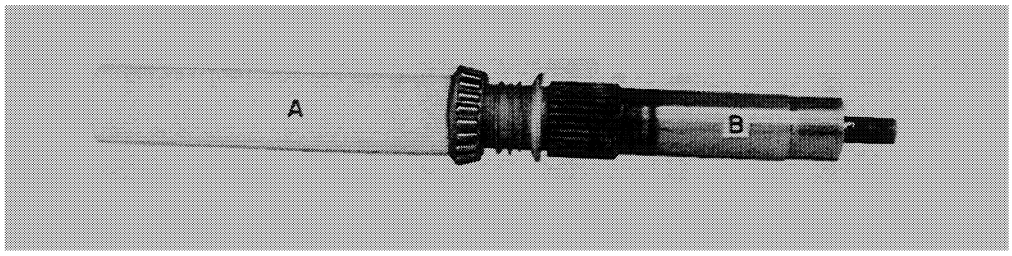



FIGURE 23

2. See A, Figure 23. This pipe is used to push the left and right bearings on the input shaft, B, Figure 23. Install as shown in Figure 2. This pipe can also be used to push the left bearing of the right rotor gearbox on the input shaft (TR™70 Style 2 gearbox) (only if the pipe has a maximum OD of 1⅜").

   Use a steel pipe, A, Figure 23, with a 1-17/32" (39 mm) minimum ID, approximately 2" (51 mm) OD and 7" (178 mm) long.

3. Use the pipe to push against the tapered spacer, A, Figure 24, to preload the snap ring, B.

   Use a steel pipe, C, with a minimum ID of 1¾" (445 mm) and 10" (250 mm) long. OD is not critical.

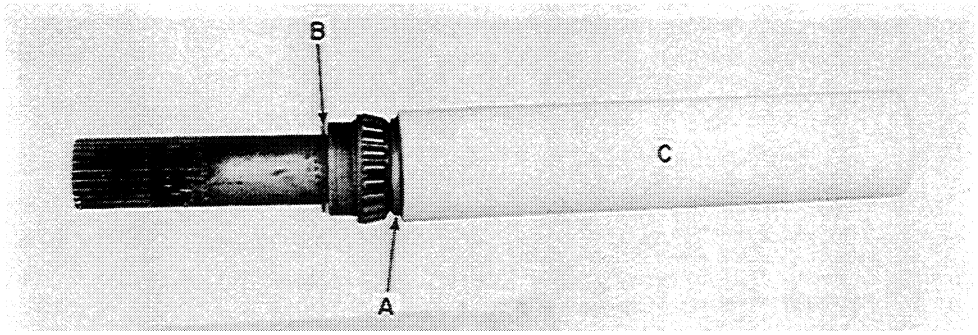



**FIGURE 24**

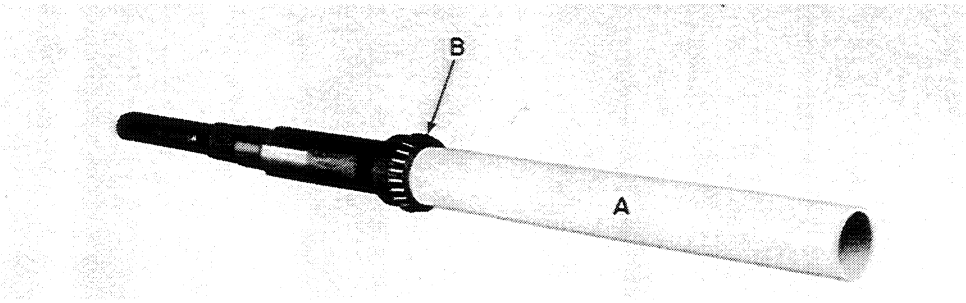



FIGURE 25

## PURPOSE

These are used to properly install both right and left bearing of the input shaft without damaging the bearing cages.

## USE

They are used on all TR™70 right rotor gearboxes and Style I TR™75/85 right rotor gearboxes.

When possible, use a press to do all bearing disassembly and assembly.

See the TR™ combine service manual for proper disassembly and assembly procedures.

## SPECIAL SERVICE TOOLS

1. Pipe is used to press the right tapered roll bearing, B, Figure 25, into position. Use a steel pipe, A, Figure 25, with a minimum ID of 2¼" (57 mm) a maximum OD of 2½" (64 mm) and a minimum length of 14" (356 mm).

**NOTE: The same pipe used to press style 4 (cartridge) bearing onto the left end of style A main shaft could also be used for this application. Its dimensions are 2¼" ID, 2½" OD, 20" long (57 mm, 64 mm, 508 mm).**

2. Pipe is used to push left tapered roller bearing into position. This can be the same pipe used to install the bearings on the left rotor gearbox input shaft. But in this application, the pipe OD is critical (1¾" maximum OD).

## FABRICATION

Use a steel pipe with a minimum ID of 1-17/32" (39 mm) maximum OD of 1¾" (44 mm) and a minimum length of 7" (178 mm).

A larger OD pipe can be used if the edge that contacts the bearing race is machined or ground down to a maximum OD of 1¾" (44 mm) as shown in Figure 26.

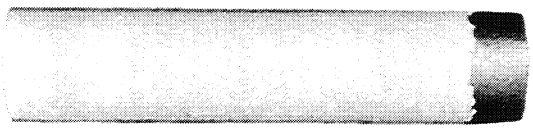


FIGURE 26

# STYLE II LEFT AND RIGHT ROTOR GEARBOX SPECIAL SERVICE TOOLS

## (See TR™75/85 Combine Service Manual for Gearbox Style Identification)

### PURPOSE

This tool is used to properly disassemble and assemble style II left and right rotor gearboxes.

### USE

It is used on TR™75/85 combines with style II rotor gearboxes. When possible, use a press to do all bearing disassembly and assembly.

**NOTE: These same tools can be used to service TR™95 rotor gearboxes.**

See the TR™75/85 combine service manual for proper service procedures.

### SPECIAL SERVICE TOOLS

1. Flat steel pieces, A, Figure 27, are used to support input gear, B, when pressing input shaft, C, out of the gear. Using these steel pieces will keep the input gear from binding on the tapered spline fit of the input shaft.

   Insert the steel pieces as shown in Figure 27. Use a suitable press to push out the shaft.

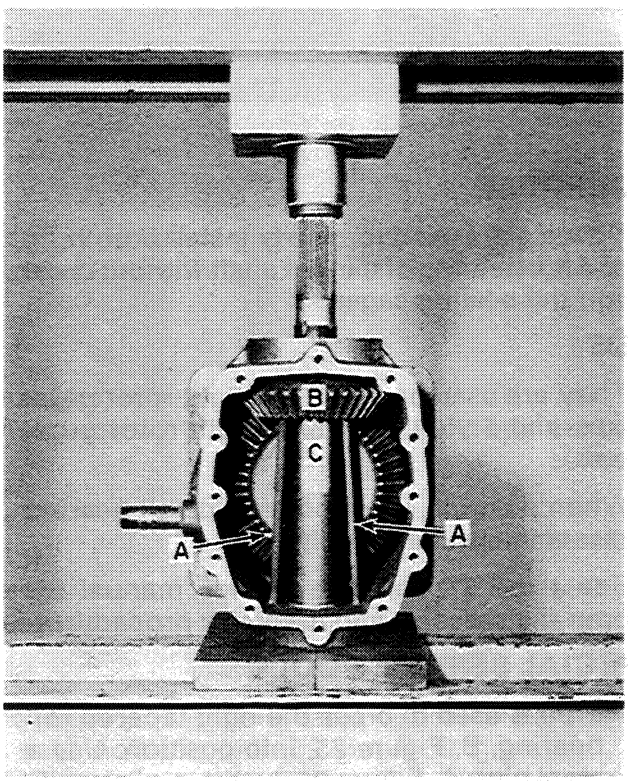



FIGURE 27