Bulletin FM61A

FAIRBANKS-MORSE

SPECIAL SERVICE INFORMATION - TYPE FM-K MAGNETOS

The service instructions of this bulletin apply specifically to the sleeve bearing type FM-K magnetos and cover important differences which must be strictly observed by Service Stations. Reference should also be made to Bulletin FM60, Instructions No. 2822A and Repair Price List No. 9833A.

Service Stations should first determine positively the full type designation, which is stamped in the side of the housing. Designations containing the letter "K" indicate the sleeve bearing design and identical magnetos will be found with the markings FM4BK and FM-K4B, of which the latter has been definitely adopted.

PART ONE - REPLACEMENT OF SLEEVE BEARINGS

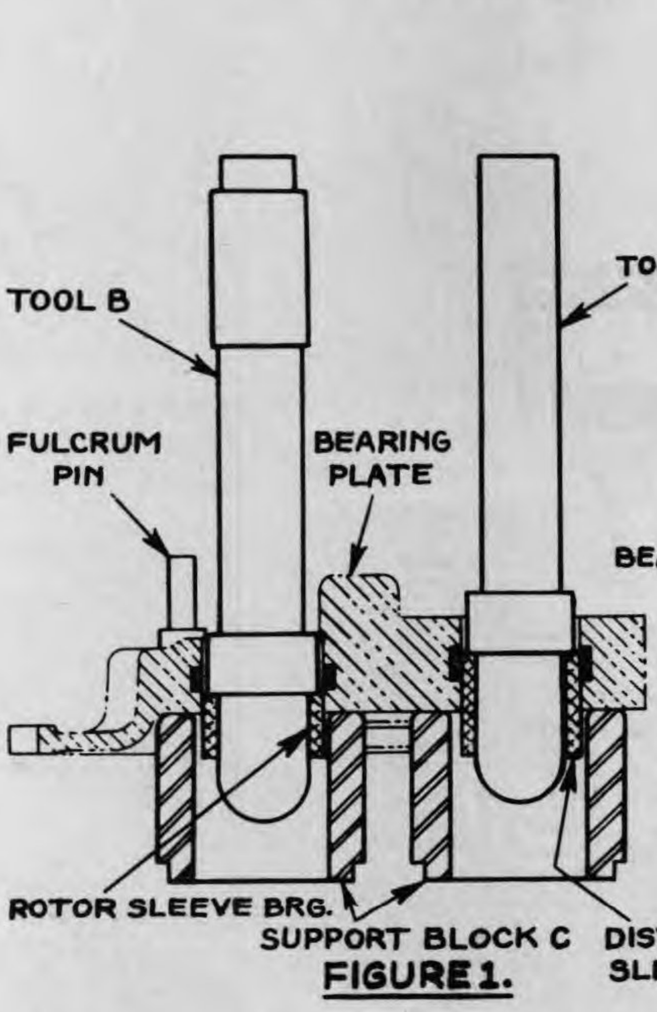


FIGURE 1.

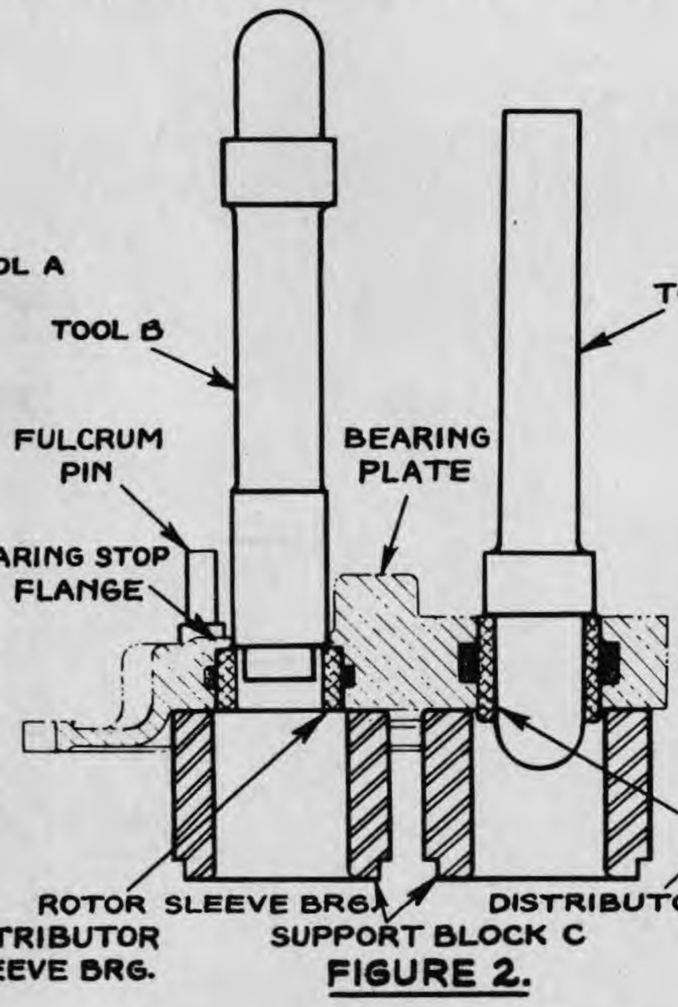


FIGURE 2.

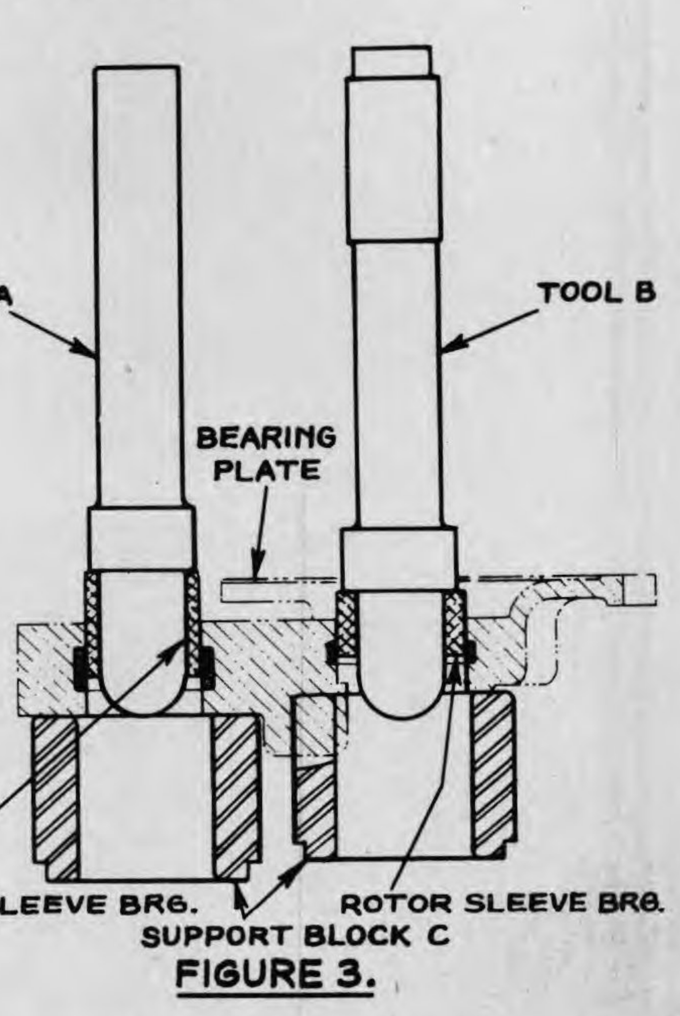


FIGURE 3.

Section A - Removing Sleeve Bearings

1. When to Replace - Sleeve type bearings should be replaced when inspection shows excessive clearance. Replacement of bearings should also be made when there is a noticeable squeal in their operation, such a test being made with end cap removed to eliminate possible confusing noises from distributor brushes.

2. Preliminary Steps - The bearing plate (4631) must be removed from the magneto and the assembly dismantled.

3. Distributor Bearing Figs. 1 & 2 - Place the bearing plate on the round support block C (TD2272A), centering the bearing with the hole in the block. Insert the tool A (TD2252A) as shown in the drawing and push the bearing out, using the screw press. The support block C centers in the large hole of the lower plate of the press; to prevent damage to the end of the tool the brass protective cap (or a block of wood) should always be used between the tool and the drive screw of the press.

4. Rotor Bearing (Fig. 1) - The procedure necessary to remove the rotor sleeve bearing is identical to that given in paragraph #3 for the distributor bearing except that tool B (TD2250A) is used.

5. Rotor Bearing (Fig. 2) - To remove the rotor bearing from a plate having the bearing stop flange, the tool B is reversed in order to use the end which has been machined to just clear the flange and yet have sufficient diameter to push the rotor bearing out of the plate. It is also possible to use the opposite end of the tool as shown in Fig. 1 and shear the flange from the plate.

Section B - Inserting Sleeve Bearings

1. Preliminary Steps - Clean the bearing plate thoroughly and remove all old grease from the annular grooves which serve as lubricant reservoirs. The Special FMC04 Grease should then be used in refilling these grooves to capacity.

2. Distributor and Rotor Bearings (Fig. 3) - The proper sleeve bearing should be pushed as far as possible onto the end of the tool - A, for the distributor bearing; B, for the rotor bearing. The block C should be placed in its position in the lower plate of the press and the bearing plate centered so that the hole in the plate and that in the block are in line. The tool with the bearing should then be pressed into the plate, using the screw press and protecting the upper end of the tool with the brass cap.

3. Correct Position of Bearings - The final position of the distributor bearing is determined by the equal projection of the bearing ends from each side of the plate. The correct final position of the rotor bearing is flush with the bearing plate on the rotor side.

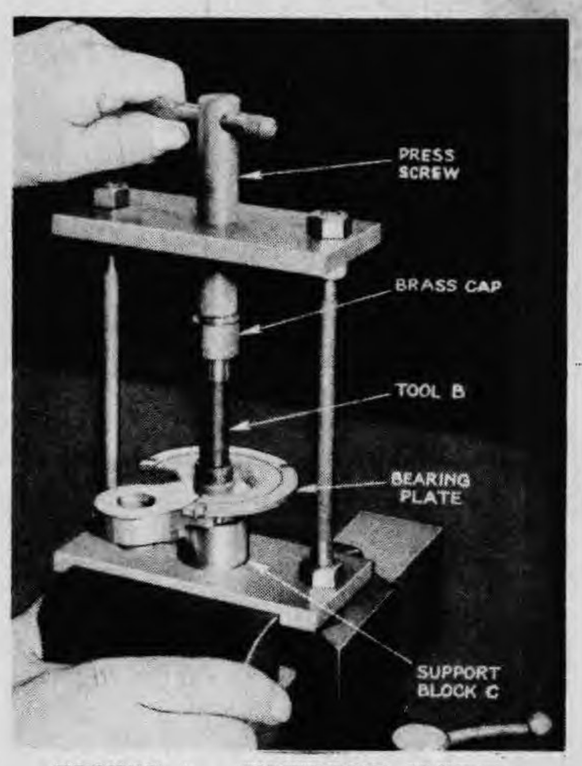


FIGURE 4 - INSERTING SLEEVE BEARING WITH SCREW PRESS

The photograph (Fig. 4) suggests how the press may be held in a bench vise when in use. Notice that support block C has a milled slot to accommodate in the position shown the cam wick mounting boss. Bearing replacements should be made carefully with special attention given to keeping inserting tools perpendicular to the bearing plate.

Bulletin FM61A
November 15, 1946
Printed in U.S.A.

File Section- *TYPES FM,FM-K,FMO*

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PART TWO - REMOVAL OF TYPE FM-K ROTORS

IMPORTANT NOTICE - Magnetic rotors should not be removed from the housing of the Type FM-K magnetos unless such removal is essential to the efficient servicing of the magneto. Due to the increased magnetic retentivity of the Alnico magnets, as well as to the sealed housing and permanently lubricated drive end bearing, less frequent charging and cleaning are required, thus eliminating from most service work the necessity of removing the rotor. After servicing the coil, condenser, brushes and contact points, the magneto should be fully reassembled and tested before arbitrary recommendation of remagnetization of the rotor is made.

Rotor removal in the case of the Type FM-K sleeve bearing magnetos can only be accomplished as described in the following instructions and Service Stations are requested to follow the directions step by step.

1. Drive End Thrust Bearing - In the design of the sleeve bearing variation of the Type FM magneto, it was found desirable to use a lock type thrust ball bearing at the drive end of the rotor shaft. All end play of the rotor is taken up by this bearing, the rotor shaft being a press fit in the bearing where it is locked with a snap ring. No attempt must ever be made to drive out the rotor of the Type FM-K magneto without first releasing this snap ring.

2. Preliminary Steps - The complete impulse coupling as well as the entire bearing plate assembly must be removed from the magneto, leaving it in the state shown in Fig. 5.

3. Releasing Rotor Shaft—The operations necessary to release the rotor shaft from the thrust bearing are listed in the order in which they must be performed:

(a) Remove Outer Retaining Washer (A2492A)
Use a punch or blunt screwdriver and strike the washer a sharp blow near the rotor shaft edge. This will dish the washer and permit easy removal. The washer should be discarded.

(b) Remove Rubber Sealing Washer (G3861)
A knife or sharp screwdriver may be used; if washer is hardened, it should be replaced.

(c) Remove Inner Retaining Washer (C2492)
This washer is a loose fit in the frame recess, but may be difficult to lift out due to the adhesion of the bearing grease.

(d) Remove Rotor Shaft Snap Ring (C1498)
A knife or sharp screwdriver will release this snap ring.

(e) Remove Thrust Bearing Shim (H2723)
This shim goes between the snap ring and the bearing inner race.

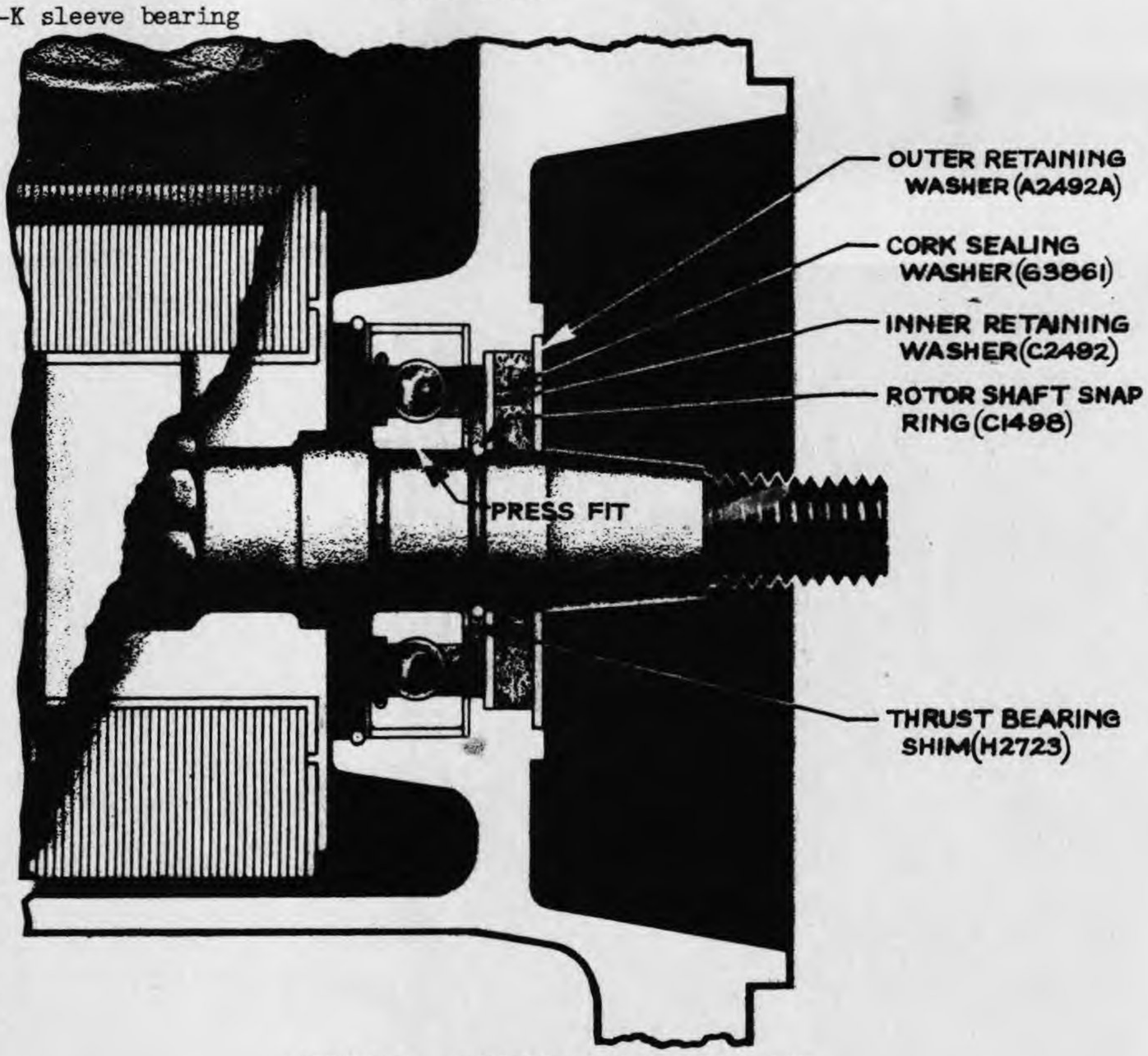


FIGURE 5. CONSTRUCTION OF DRIVE END

4. Pressing the Rotor Out - After the rotor snap ring (C1498) has been released, the assembly is placed in the adjustable press as shown in Fig. 6. The cam end of the rotor shaft should be carefully centered in the large hole of plate L. The brass protective cap must first be placed over the threaded end of the rotor shaft, then by turning the drive screw J slowly an even pressure will be provided to force the rotor shaft out of its press fit in the thrust ball bearing. The rotor may then be removed from the magneto.

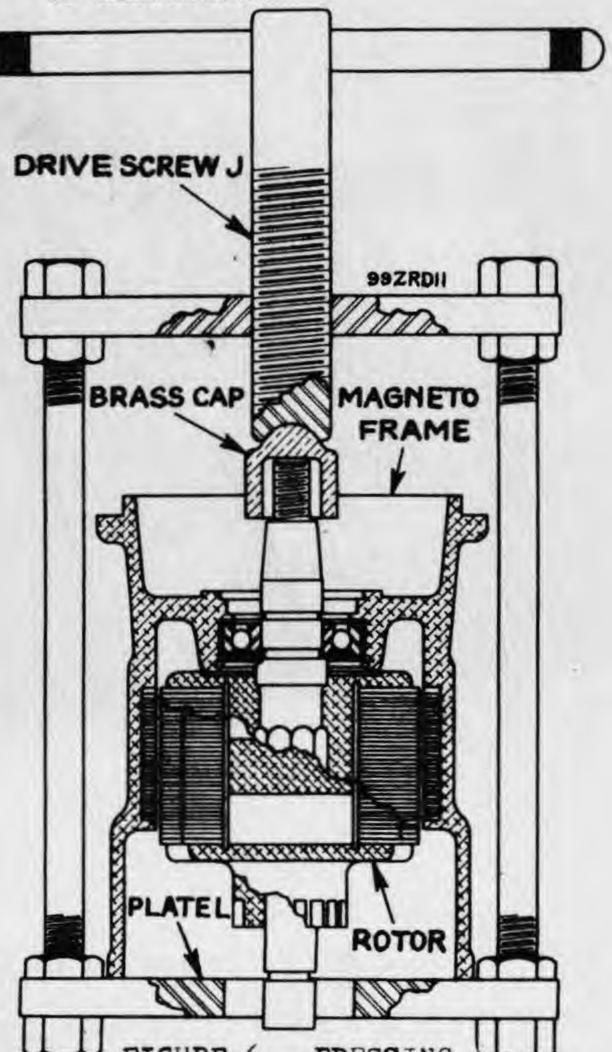


FIGURE 6 - PRESSING ROTOR OUT OF FRAME

5. Inspection of Thrust Bearing - With the rotor removed the thrust ball bearing should be cleaned and refilled with FMC03 Special Ball Bearing Grease. If damaged, the bearing should be replaced as described in Part Three (page three of this bulletin).

6. Pressing the Rotor In - The rotor should be replaced in the magneto housing and pushed by hand partially into place. Then put the assembly into the press, being certain to line up the rotor shaft with the center of the hole in plate L. Put the brass protective cap over the cam end of the rotor shaft and apply even pressure by slowly turning the drive screw J. When the snap ring groove appears on the drive side of the thrust ball bearing the correct final position for the rotor has been reached.

7. Replacing Drive End Seal - After the rotor has been pushed into place, the small steel shim (h2723) should be slipped over the rotor shaft and a new snap ring (C1498) sprung into place. Retaining washer (C2492) is then placed in the recess and the rubber washer (G3861) compressed to seal the bearing. Retaining washer (A2492A) covers the seal and should be fixed in place by upsetting the frame metal at two or three points along its edge.

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PART THREE - REPLACEMENT OF THRUST BALL BEARING

1. After the rotor has been removed from the magneto housing, careful inspection of the thrust bearing should be made and the bearing cleaned and repacked with FMC03 Special Ball Bearing Grease.

2. Replacement of the ball bearing will seldom be necessary; such replacement should be made only when inspection indicated one or more "frozen" or broken balls, or an excessive amount of axial play.

3. The first step in removing the thrust ball bearing is to release the bearing snap ring (A1498B), although for convenience the bearing insulating washer (C2493) may be pulled out, allowing easier access to the snap ring. Use a sharp screwdriver or knife in prying out the snap ring. Figure 7.

4. Put the magneto housing in the screw press as shown in Figure 8 and place the brass cap over the center of the bearing. Then turn the drive screw down and center the assembly so that pressure is applied evenly to the inner race of the bearing. The bearing is easily pushed out of the housing with this arrangement.

5. After the bearing has been taken out, the insulating strip (B2824) and the second insulating washer (C2493) should be removed and the bearing recess cleaned. In reassembly a new insulating strip and washers should always be used; these must be placed carefully in position before inserting a new bearing.

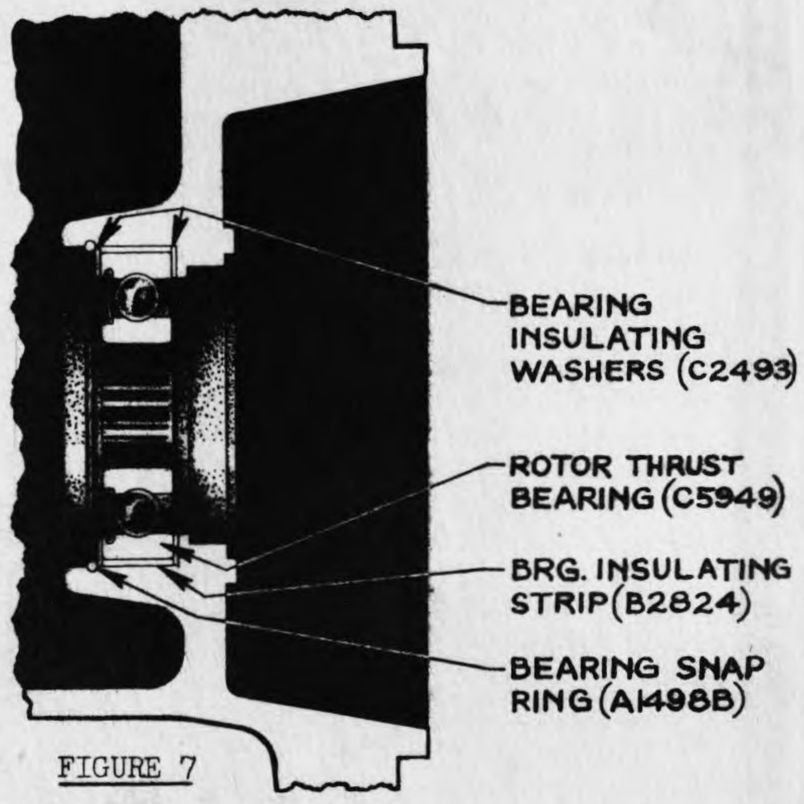


FIGURE 7

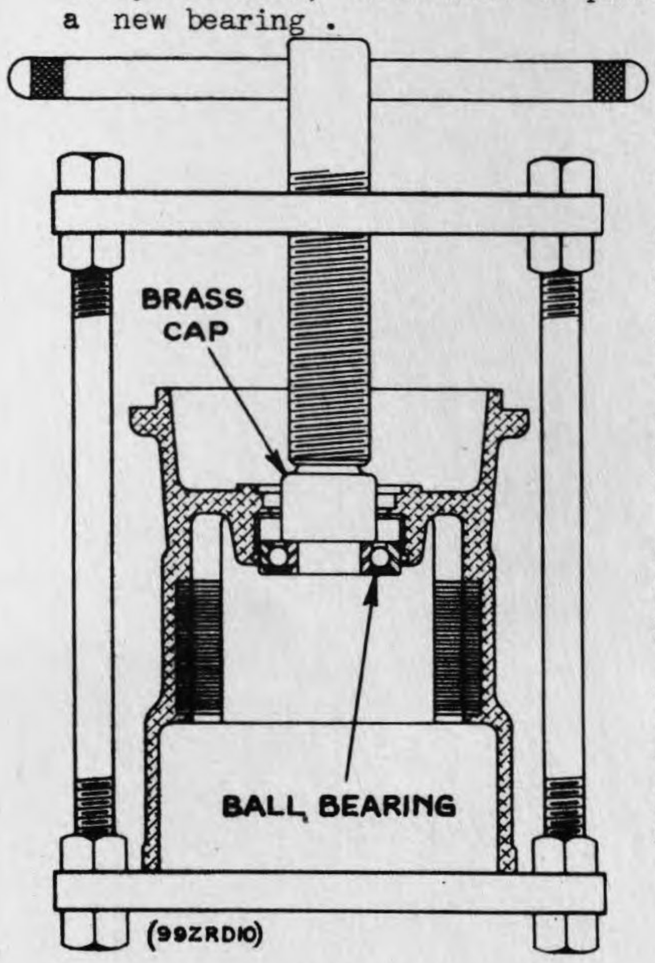


FIGURE 8

6. The new thrust ball bearing should be centered by hand in the housing, being certain that the insulating strip fits evenly around its outside circumference.

7. Place the magneto housing in the screw press as shown in Figure 9. Immediately above the bearing put the block C, carefully centering it with the bearing. Then turn down the drive screw of the press, placing the brass cap between the drive screw and the support block as shown. Be positive the assembly is perpendicular in the press before forcing the bearing into the recess.

8. The bearing insulating washer (C2493) may now be replaced and the snap ring (A1498B) sprung into place.

9. To prevent leakage of electrical current through the ball bearing and resultant damage due to possible fusing, the bearing is electrically insulated from the frame. The condition of the insulation may be determined by a simple circuit tester.

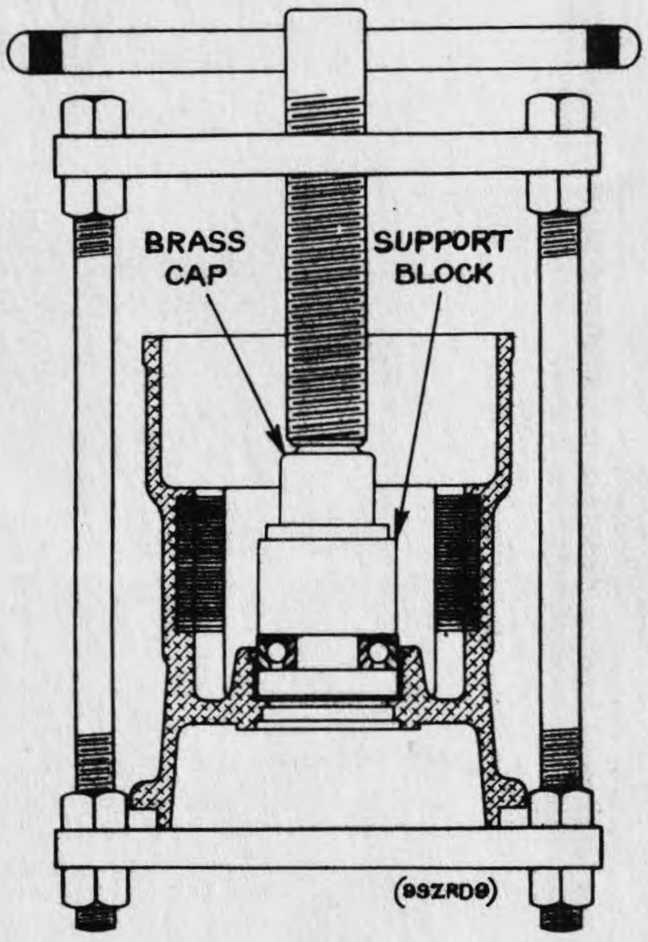


FIGURE 9

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PART FIVE - MESHING ROTOR PINION AND DISTRIBUTOR GEAR TEETH

If, for any reason, it has been necessary to remove the bearing plate (4631) from the magneto, replacement involves meshing the rotor pinion and distributor gear teeth. It is essential to the satisfactory operation of the magneto that these gear teeth be engaged accurately according to the rotation of the particular unit.

Because the magnetic rotor of the Type FM-K sleeve bearing matneto cannot be drawn out of the housing to allow visual matching of the gears, the method recommended for Type FM magnetos cannot be used. Under these circumstances a new, convenient method of meshing the gear teeth has been developed, but which did not become effective on the first shipments of sleeve bearing magnetos because of the changes required in the gear marking. It is therefore necessary to describe two methods of meshing the gear teeth of the Type FM-K sleeve bearing magnetos, and the careful cooperation of the Service Station organization in their selection and use is requested.

Examination of the distributor gear will determine the method to be followed:

(a) Use Method A when distributor gear is marked on back only (side toward coil).
(b) Use Method B when distributor gear is marked on face (side adjacent to bearing plate).

Method A - Gear Marked on Back

1. Turn the magnetic rotor in the housing to the position at which its poles, as distinguished by the machined edges, are vertically above one another, and the red-painted tooth of the rotor pinion points at the center of the coil. The cam will then be as shown in Fig. 11.

2. The distributor gear and disc must first be coupled together through the bearing plate, and the locking cotter pin correctly inserted in the off-center alignment hole of the disc and distributor gear shaft.

3. The assembled bearing plate should then be pushed part way into place, but before the gear teeth begin to mesh, the distributor disc (and gear) should be turned to the position which meets the condition described below, depending upon the rotation.

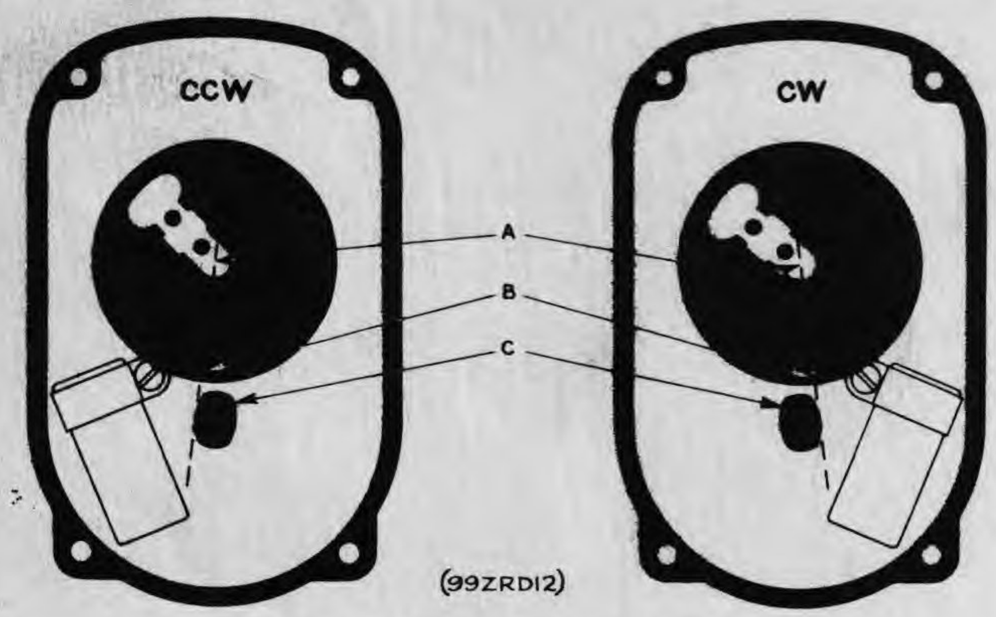


FIGURE 11 - MESHING GEAR TEETH BY TANGENT (METHOD A)

(a) For a CCW magneto, an imaginary line through the center of the distributor disc at A and the white marked recess B on the disc edge should be tangent to the left hand edge of the rotor cam C.
(b) For a CW magneto, an imaginary line through the center of the distributor disc at A and the white marked recess B on the disc edge should be tangent to the right hand edge of the rotor cam C.

4. Holding the distributor disc in this position the bearing plate assembly should be pushed into place and at least one of the assembly screws started. Then by laying a straight edge on the face of the distributor disc the condition (a) or (b) of paragraph #3 should be carefully checked according to the rotation of the magneto.

Method B - Gear Marked on Face

1. Turn the magnetic rotor in the housing to the position at which its poles, as distinguished by the machined edges, are vertically above one another, and the red-painted tooth of the rotor pinion points at the center of the coil. The cam lobes will then be as shown in Fig. 12.

2. The distributor gear and disc must first be coupled together through the bearing plate, and the locking cotter pin correctly inserted in the off-center alignment hole of the disc and distributor gear shaft.

3. The distributor disc and gear should then be turned by hand, watching the distributor gear edge, until the position of the marking meets the condition described below, depending upon the rotation.

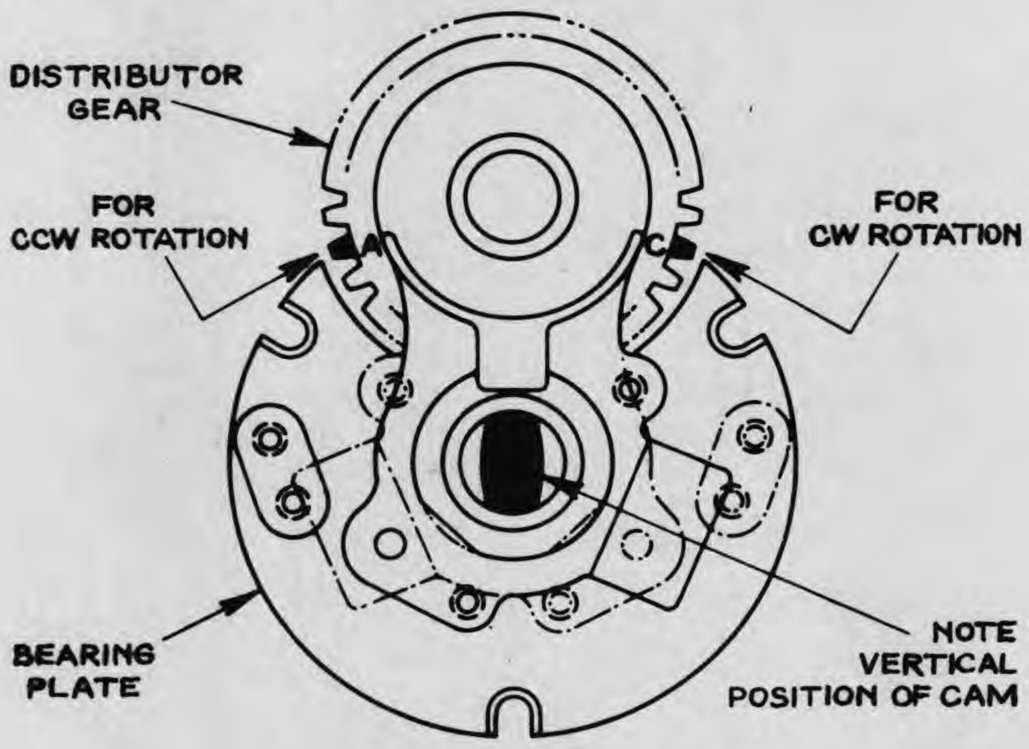


FIGURE 12 - MESHING GEARS BY MARKED TOOTH (METHOD B)

(a) For a CCW magneto, turn the distributor gear until the tooth marked A appears directly in line with the sharp corner on the left hand side of the bearing plate. This position is shown in the drawing above, the sharp corner of the bearing plate being pointed out by an arrow and the marked tooth A being shown in proper position for CCW rotation.
(b) For a CW magneto, turn the distributor gear until the tooth marked C appears directly in line with the sharp corner on the right hand side of the bearing plate. This position is shown in the drawing above, the sharp corner of the bearing plate being pointed out by an arrow and the marked tooth C being shown in proper position for CW rotation.

4. Holding the distributor disc and gear firmly in the position determined in (a) or (b) of paragraph #3, the bearing plate assembly should be pushed into the housing. The rotor pinion and distributor gear teeth will mesh properly, provided care is taken to prevent any deviation from the settings described.

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