# RECORDER-REPRODUCERS
# KS-12055 L4 AND L6
# PIECE-PART DATA AND REPLACEMENT PROCEDURES

## 1. GENERAL

**1.01** This section covers the information for ordering parts to be used in the maintenance of KS-12055 L4 and L6 recorder-reproducers. It also covers approved procedures for replacing these parts.

**1.02** This section is reissued to revise the piece-part data, the List of Materials, and the procedure for replacing the recording band and drum. Detailed reasons for reissue will be found at the end of the section.

**1.03** Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the KS-12055 L4 and L6 recorder-reproducers (hereinafter referred to as the L4 and L6 machines). No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-Part Data.

**1.04** Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

**1.05** ***Make-Busy Information:*** Before performing any work on the machines, operate the MB- key on the test panel associated with the machine under test.

**1.06** ***One drop of KS-16326 L1 oil*** for the purpose of this section is the amount of oil discharged from the nozzle of a 486A oilcan when the sides are depressed until a drop is released.

## 2. PIECE-PART DATA

**2.01** The figures included in this part show the various piece parts in their proper relation to other parts of the machine. The piece-part numbers of the various parts are given, together with the names of the parts as listed by the Western Electric Company Merchandise Department. Where these names differ from those in general use in the field, the latter names in some cases are shown in parentheses.

**2.02** When ordering parts for replacement purposes, give both the piece-part number and the name of the piece-part, for example, "P-297395 Screw." If a part identified by other than a piece-part number is required, order the part by the drawing and detail number and the part name and specify for KS-12055 L4 or L6 recorder-reproducer; for example, "B-178195, Det 3 Pad for KS-12055 L4 Recorder-Reproducer." If the manufacturer's name is given in connection with the ordering information, include this when ordering the part. Do not refer to the BSP number nor to any information shown in parentheses following the piece-part number.

**2.03** Information enclosed by parentheses ( ) is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

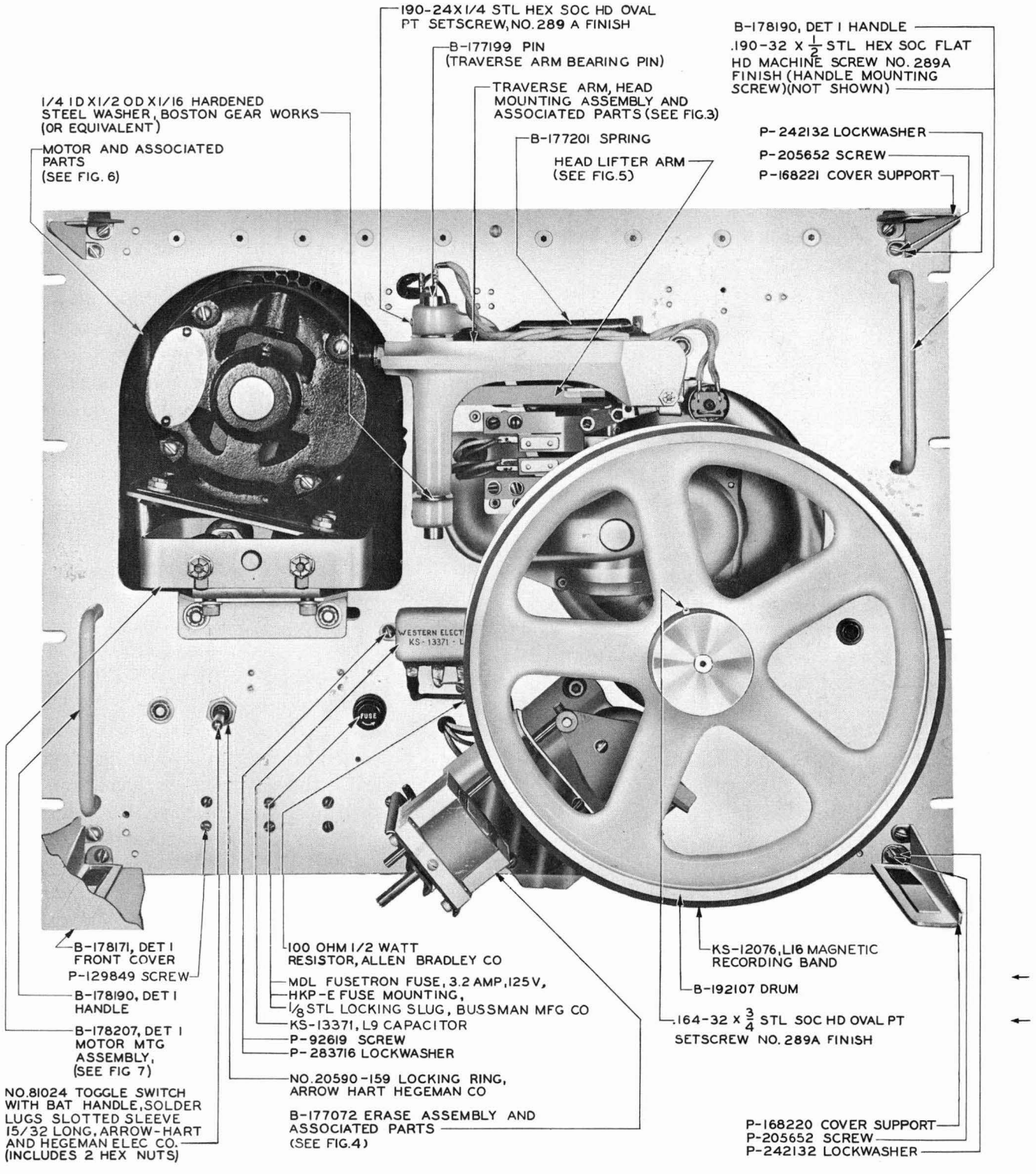


**Fig. 1 – KS-12055 L4 and L6 Recorder-Reproducers — Front View**

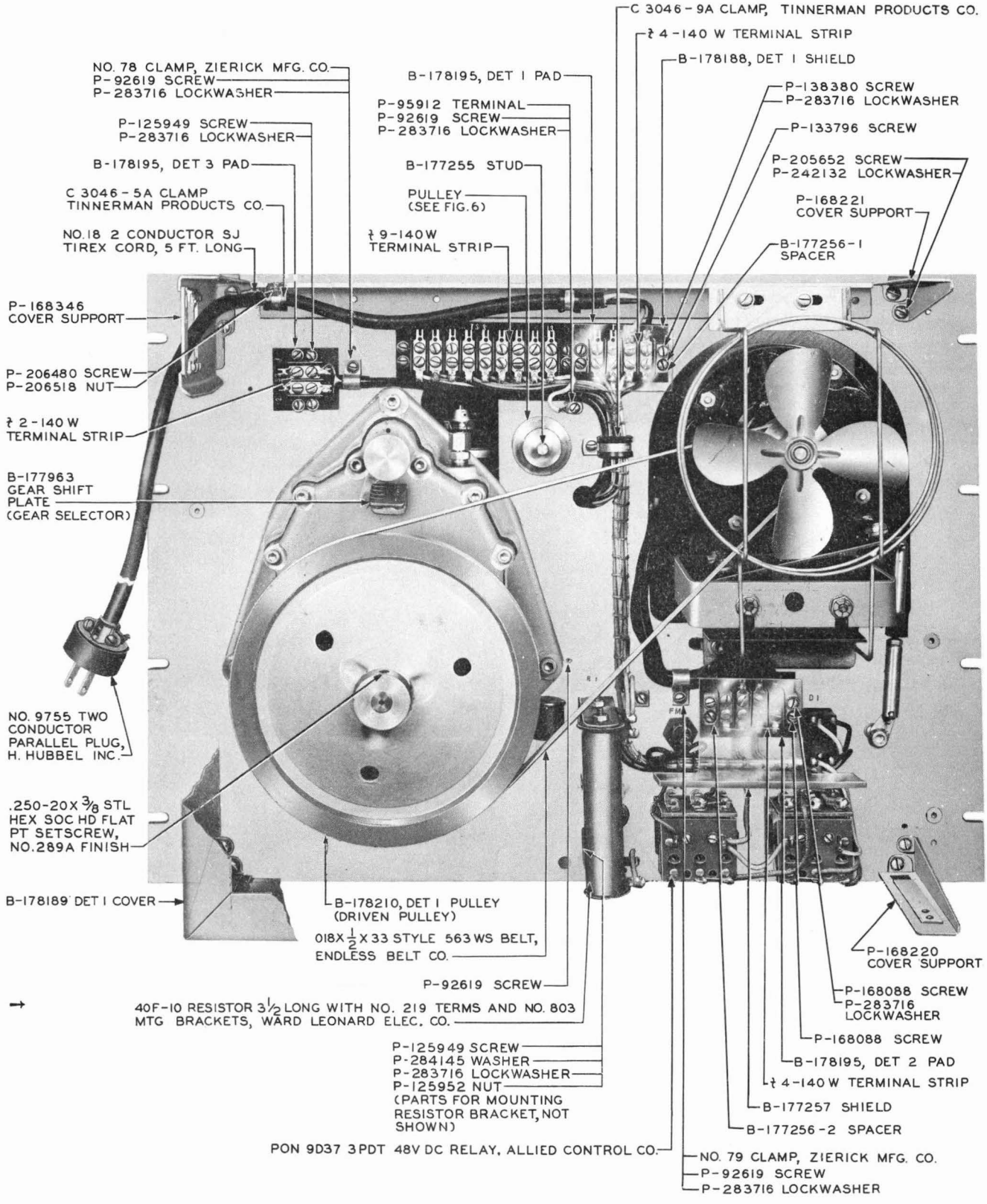


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**Fig. 2 – KS-12055 L4 and L6 Recorder-Reproducers — Rear View**

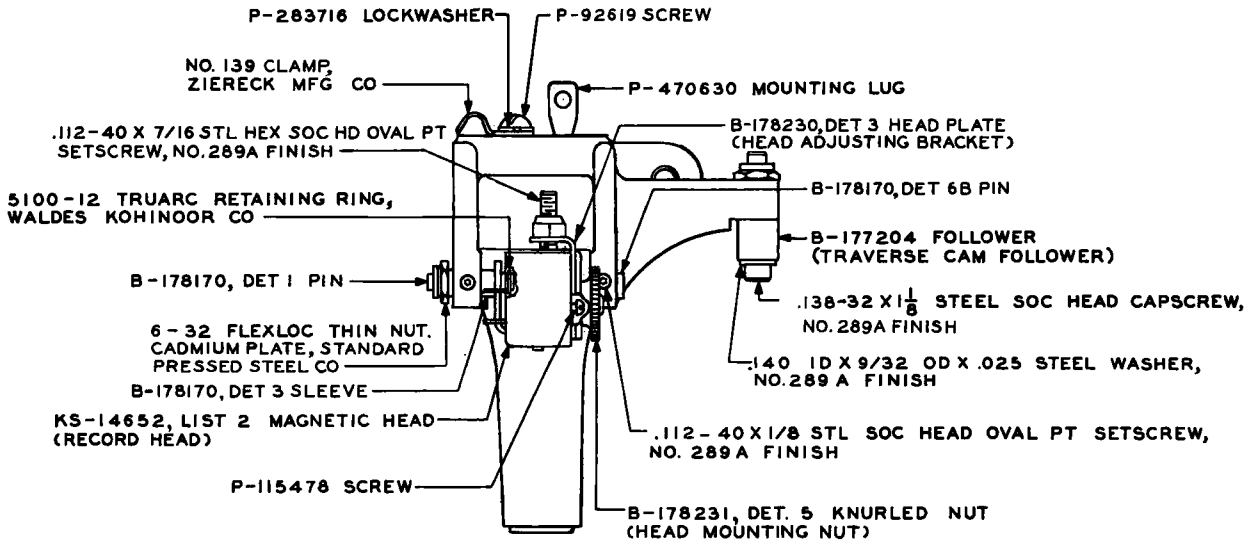


FIG. 3B SIDE VIEW

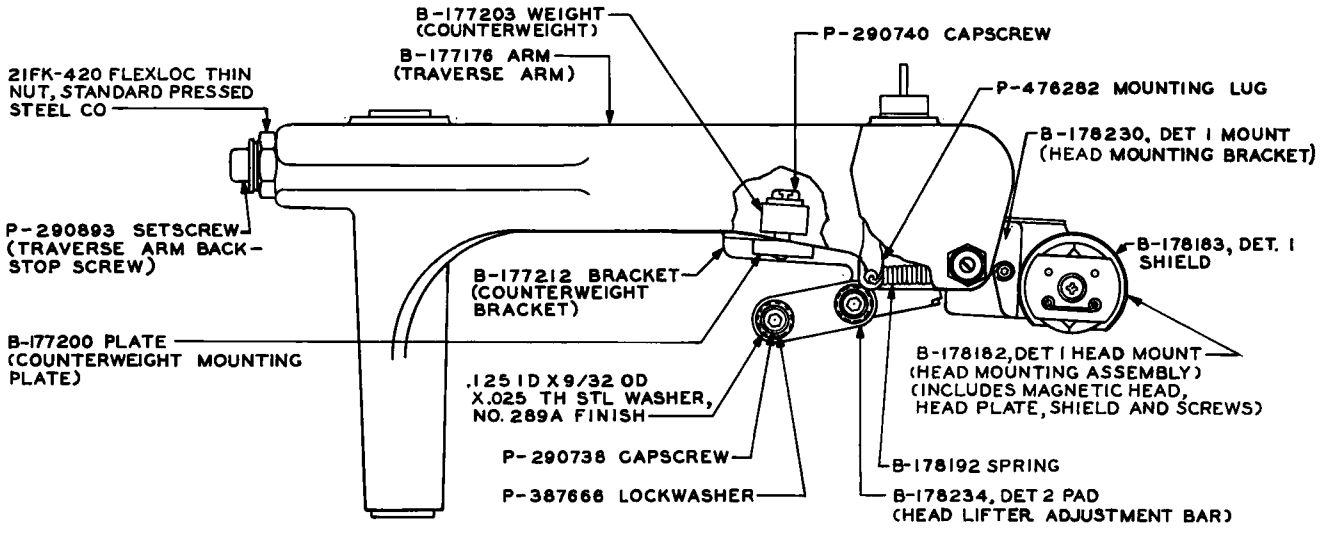


FIG. 3A FRONT VIEW

**Fig. 3 – Traverse Arm, Head Mounting Assembly, and Associated Parts**

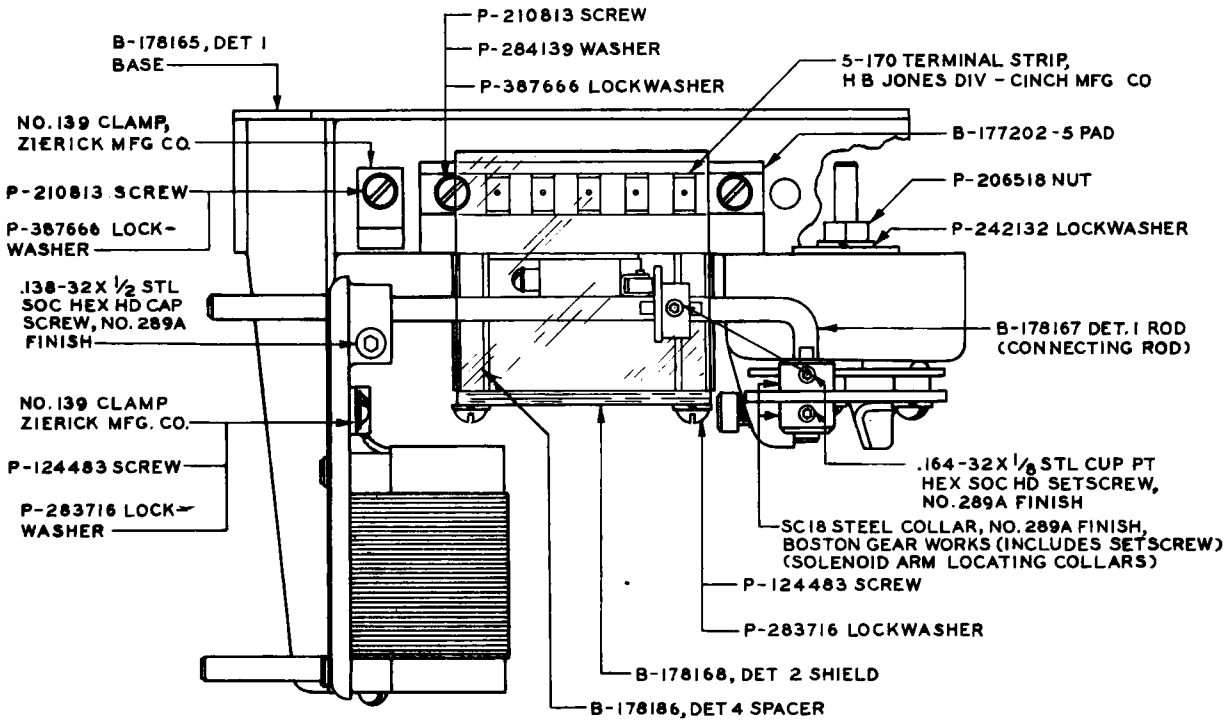


FIG. 4B - TOP VIEW

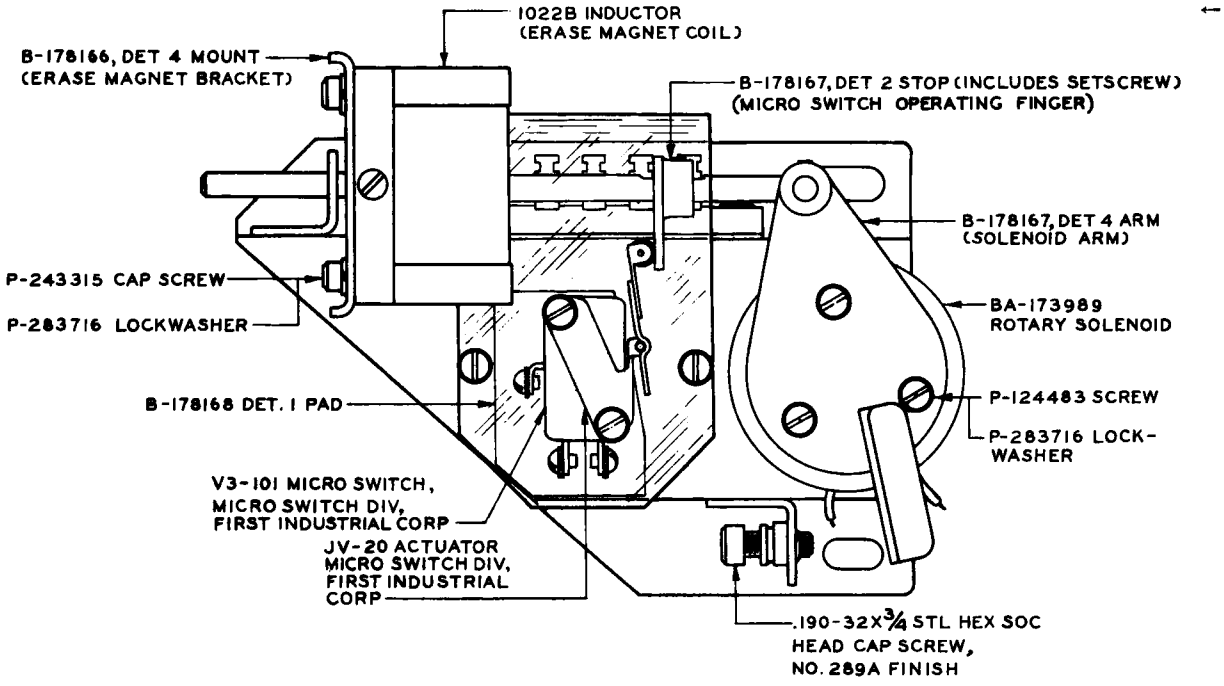


FIG. 4A - FRONT VIEW

**Fig. 4 – Erase Magnet and Associated Parts**

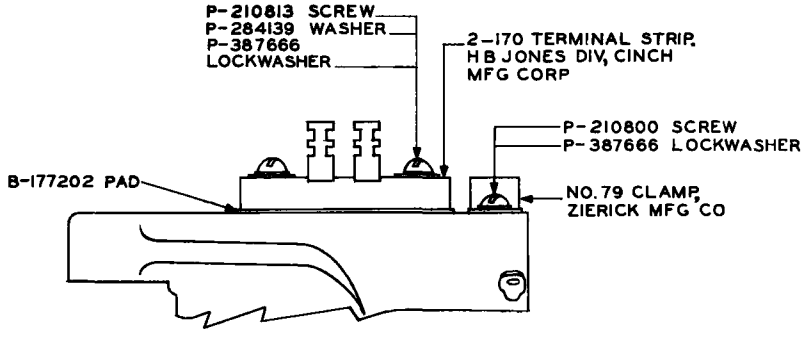


FIG. 5B - END VIEW

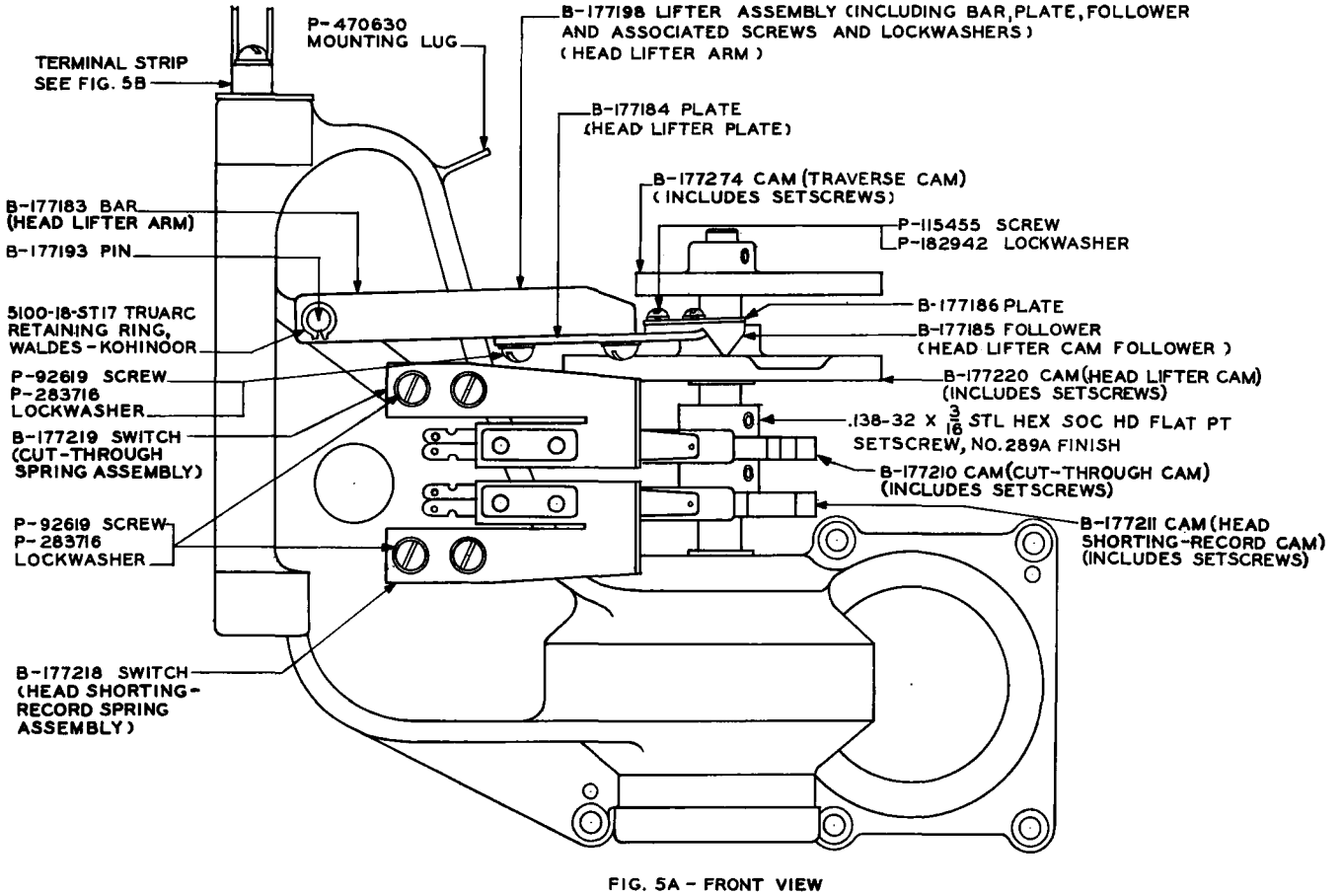


FIG. 5A - FRONT VIEW

**Fig. 5 – Cams, Cut-Through and Head-Shorting Record Spring Assemblies, and Head Lifter Arm**

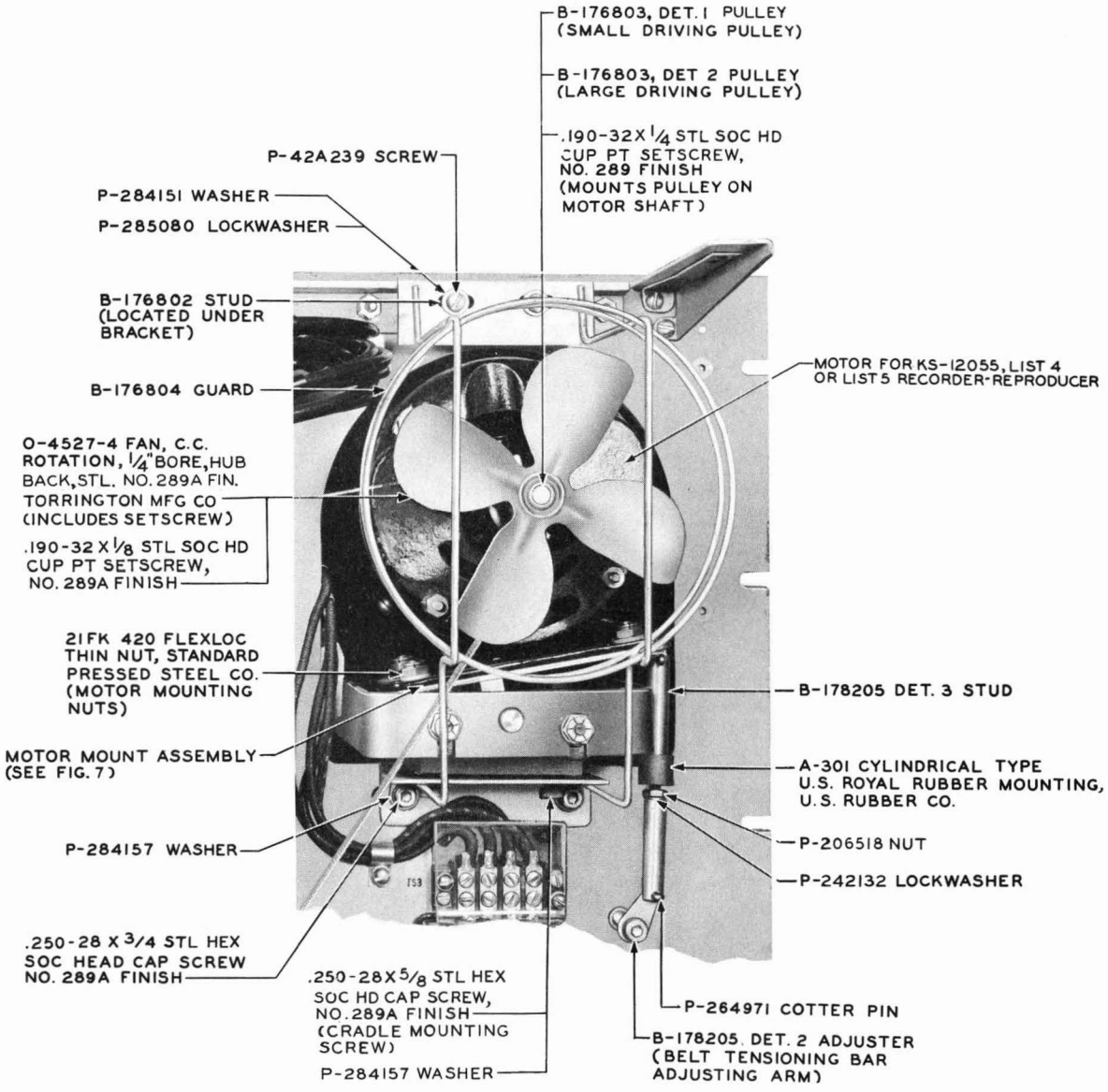


**Fig. 6 – Motor and Associated Parts**

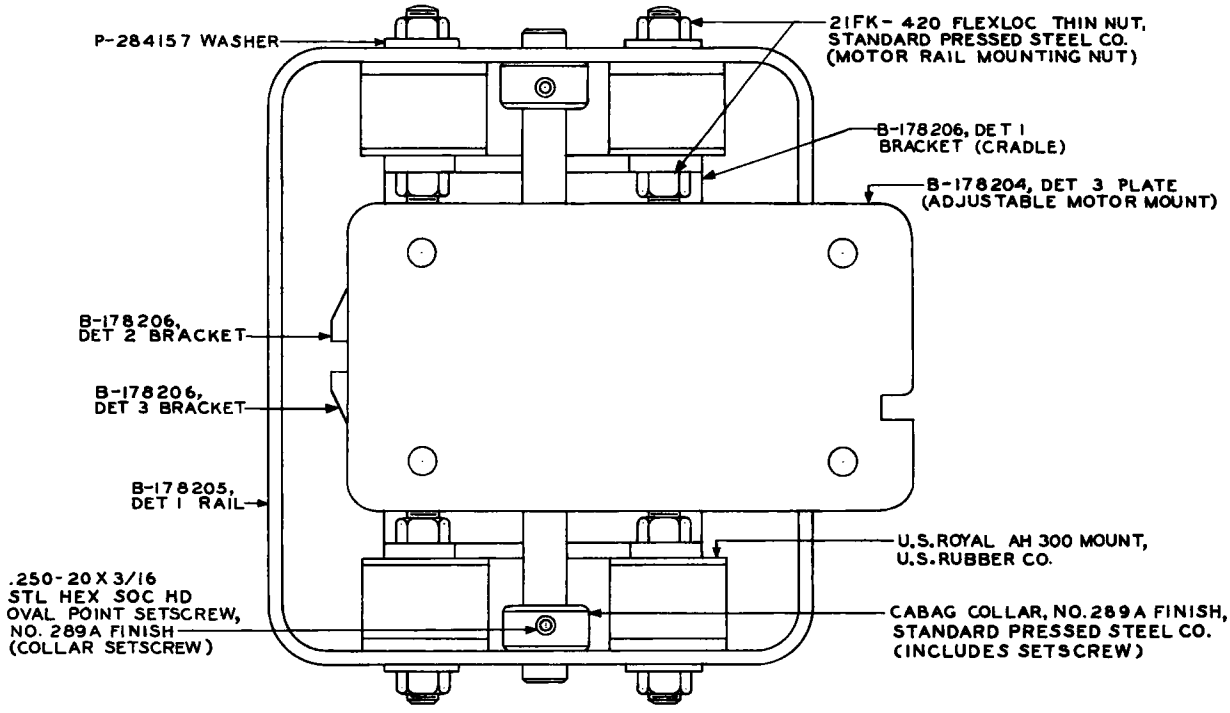


**Fig. 7 – Motor Rail, Adjustable Motor Mount, and Associated Parts**

## 3. REPLACEMENT PROCEDURES

### 3.01 *List of Tools, Materials, and Test Apparatus*

| CODE OR SPEC NO. | DESCRIPTION |
|---|---|
| TOOLS | |
| 245 (2 reqd) | 3/8- and 7/16-Inch Hex. Open Double-End Flat Wrench |
| 485A | Pliers |
| 486A | Oilcan |
| KS-6320 | Orange Stick |
| KS-6854 | 3-Inch Screwdriver |
| KS-8511 | Tweezers |
| R-2670 | 3/32-Inch Allen Socket Screw Wrench |
| R-2671 | 1/8-Inch Allen Socket Screw Wrench |
| R-2812 | 3/16-Inch Allen Socket Screw Wrench |
| R-2958 | 5/64-Inch Allen Socket Screw Wrench |
| R-2959 | 1/16-Inch Allen Socket Screw Wrench |
| R-2961 | 0.050-Inch Allen Socket Screw Wrench |
| R-3415 | 7/64-Inch Allen Socket Screw Wrench |
| R-5850 | 5/8- and 3/4-Inch Hex. Offset Double-End Flat Wrench |
| — | 1/2-Pint Oiler, Gem No. 1706, Gem Div Plews Oiler Co (or equivalent) |
| — | P-Long-Nose Pliers |
| — | No. 555E Jeweler's Screwdriver, L. S. Starrett Company (or equivalent) |
| — | 3-Inch C Screwdriver |
| — | 4-Inch E Screwdriver |
| — | 0012 Tru-arc Pliers for 5100-12 Retaining Ring, Waldes-Kohinoor Company |

| CODE OR SPEC NO. | DESCRIPTION |
|---|---|
| **MATERIALS** | |
| KS-2423 | Cloth |
| KS-7860 | Petroleum Spirits |
| KS-16326 L1 | Oil |
| KS-13148 L1 | Abrasive Paper |
| — | 2- by 6-Inch Cellulose Acetate Sheet, 0.005 to 0.010 Inch Thick (obtain locally) |
| **TEST APPARATUS** | |
| 3P15B | Cord (one P3K cord, 12 feet long, equipped with two 310 plugs) |

**3.02** No replacement procedures are specified for screws or other parts where the replacement consists of a simple operation.

**3.03** Mount the front cover so that the ventilation holes are adjacent to the nameplate. Mount the rear cover so that the ventilation holes are adjacent to the ventilating fan.

**3.04** Before making any replacement of parts, remove power from the machine.

**3.05** After making any replacement of parts of a machine, the part or parts replaced shall meet the readjust requirements involved as specified in Section 034-350-701. Other parts whose adjustments may have been directly disturbed by the replacement operations shall be checked to the readjust requirements and an overall check shall be made of the machine before restoring it to service.

### Recording Band and Drum

**3.06** Raise the record head to its highest position. If necessary to gain access to the setscrews in the hub, swing the motor upward, remove the driving belt from the driven pulley, and manually rotate the drum. Loosen the setscrews in the hub of the drum using the proper size Allen wrench. Remove the drum and place it on a clean surface.

**3.07** Remove the band by gradually working it across the surface of the drum.

**3.08** If the drum is being replaced and the band is in satisfactory condition, mount this band on the new drum as covered in 3.09 and 3.10.

*Note:* The inner surface of the KS-12076 L16 band is coated with a red lining which provides for good adhesion between the band and the recording drum. This red lining is a softer material than the rest of the band and care must be taken when removing or mounting the band to avoid damaging the lining.

**3.09** Before mounting a recording band on the drum, clean the surface of the drum carefully with a cloth slightly moistened with KS-7860 petroleum spirits and wipe with a clean, dry cloth.

***Caution: When cleaning a KS-12055 L20 drum, take care that the petroleum spirits do not contact the hub of the drum.***

**3.10** Mount the band on the drum as follows. Place the drum near the front edge of a clean table or bench with the rim of the drum vertical. Place approximately half the width of the band on the portion of the rim adjacent to the edge of the table or bench. Then, draw the drum to the edge and, using the body as a support, stretch the band around the drum, working simultaneously on both sides of the starting point. During this process, it is advisable to use the arms to hold on the drum that part of the band which has already been mounted on it. After the entire periphery of the band has been partially mounted on the drum, gradually work the band across the surface of the drum.

***Caution: During handling, exercise care to avoid bending the band sharply. Also, while mounting the band take care not to scrape the edge or inner surface of the band against the edge of the drum.***

**3.11** Remount the drum as follows. Make sure that the record head is tilted upward. Guide the drum onto the shaft carefully so that the slot in the drum engages the pin on the shaft, rotating the shaft if necssary. Tighten the setscrews securely. Clean the band as covered in Section 034-350-701. Lower the record head to

the surface of the band. Remount the driving belt on the driven pulley if it was removed.

*Note:* Improved reproduction will be obtained if, after a recording band has been replaced, the message recorded on the machine is erased after 12 hours and the message again recorded.

**Head Tension Spring**

**3.12** Remove the drum as covered in 3.06. Disengage the hook from the stud in the head mounting bracket using the KS-8511 tweezers. Then disengage the other end of the spring from the lug in the traverse arm by applying the tweezers from below the lug. Hook one end of the replacing spring in the lug in the arm. Then grasp the hook at the other end of the spring with the tweezers and place it around the stud in the head mounting bracket. Make sure that the hook engages the groove in the stud. Remount the drum on the shaft as covered in 3.11.

**Record Head and Head Adjusting Bracket**

**3.13** Unsolder the leads to the record head if the head is to be replaced. Swing the head to its highest position. Remove the head mounting nut with the fingers and disengage the head and the head adjusting bracket from the head mounting bracket. Remove the head mounting screws with the KS-6854 screwdriver.

**3.14** Substitute the new part or parts required. Reassemble the parts in the reverse order of removal and securely tighten the head mounting screws. Mount the head and the adjusting bracket on the head mounting bracket so that the head adjusting screw overlaps the stop on the head mounting bracket. Partially tighten the head mounting nut, making sure that the head adjusting screw is in contact with the stop. Reconnect the leads to the head if they were removed. Then position the head as covered in 3.15.

**3.15** ***Positioning of Head*** (Fig. 9)

(a) With the motor running, set the gear selector in position 2. Slightly loosen the head mounting nut by hand. Turn the head adjusting screw in or out as required with the proper size Allen wrench until the magnetic gap between the pole pieces appears to rest directly on the recording band. Tighten the head mounting nut. Then proceed to adjust the head to its final position as covered in (b) through (g).

(b) Connect the −24 db jack to the TI-1 jack using the 3P15B cord. Allow 30 seconds for the associated amplifier to warm up. Then operate the ER1 (erase) key on the test panel and hold it operated for at least one complete revolution of the drum. Restore the ER1 key.

(c) Operate the VOL IND key to position 1. Operate the REC1 key and hold it operated while adjusting the REC gain control of the associated amplifier to obtain a reading of 1.0 on the VOL IND meter. Continue to hold the REC1 key operated for one complete lighted cycle of the REC1 lamp following the adjustment of the REC gain control. Then restore the REC1 key.

*Note:* It should be possible to obtain a reading of 1.0 on the volume indicator with the REC gain control below the halfway point on the scale. If this is not the case, it may indicate that the amplifier is not functioning properly. Refer the matter to the supervisor.

(d) Set the REP gain control at the halfway point on the scale. Loosen the head mounting nut slightly. Turn the head adjusting screw in or out as required with the proper size Allen wrench until a maximum reading is obtained on the meter. If the maximum reading sends the volume indicator pointer off scale, lower the setting of the REP gain control to a point where the VOL IND reading is on the scale. Then securely tighten the head mounting nut.

***Caution: Do not attempt to turn the head adjusting nut, since this is secured to the head adjusting bracket.***

(e) Operate the ER1 key and hold it operated for one complete revolution of the drum. Restore the ER1 key. Operate the REC1 key and hold it operated for one complete lighted cycle of the REC1 lamp. Then restore the REC1 key.

(f) Note the average reading of the volume indicator meter. This reading should be greater than 1.0. If the VOL IND reading is

less than 1.0, this may be due to insufficient head pressure, to accumulations of wax on the band, or to insufficient amplifier gain. If there is insufficient amplifier gain, refer the matter to the supervisor. In case of insufficient head pressure or accumulations of wax on the band, refer to Section 034-350-701.

(g) If the reading is greater than 1.0, adjust the REP gain control until the VOL IND reads exactly 1.0. Then restore the VOL IND key to normal. Operate the ER1 key for one complete revolution of the drum. Then remove the 3P15B cord from the TI-1 jack and from the −24 db jack.

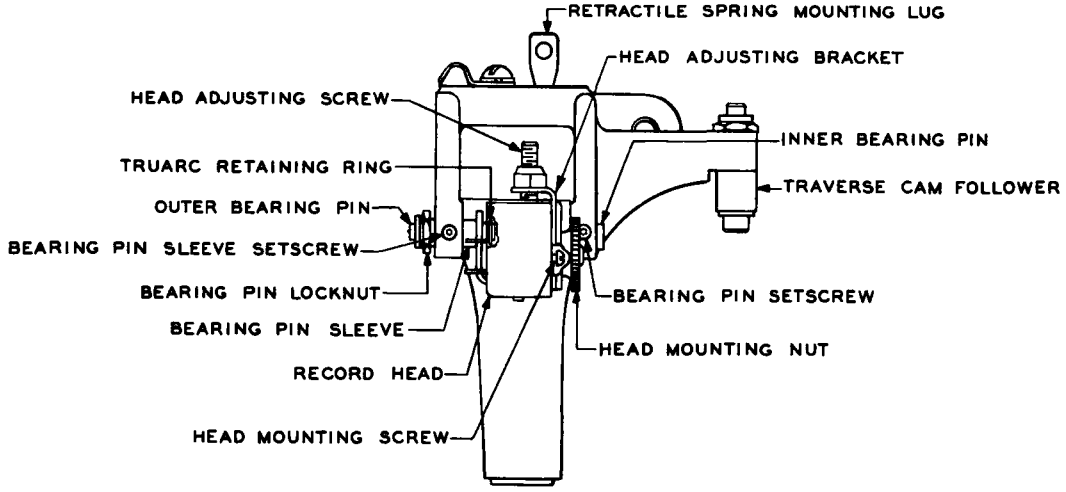


FIG. 8B – SIDE VIEW

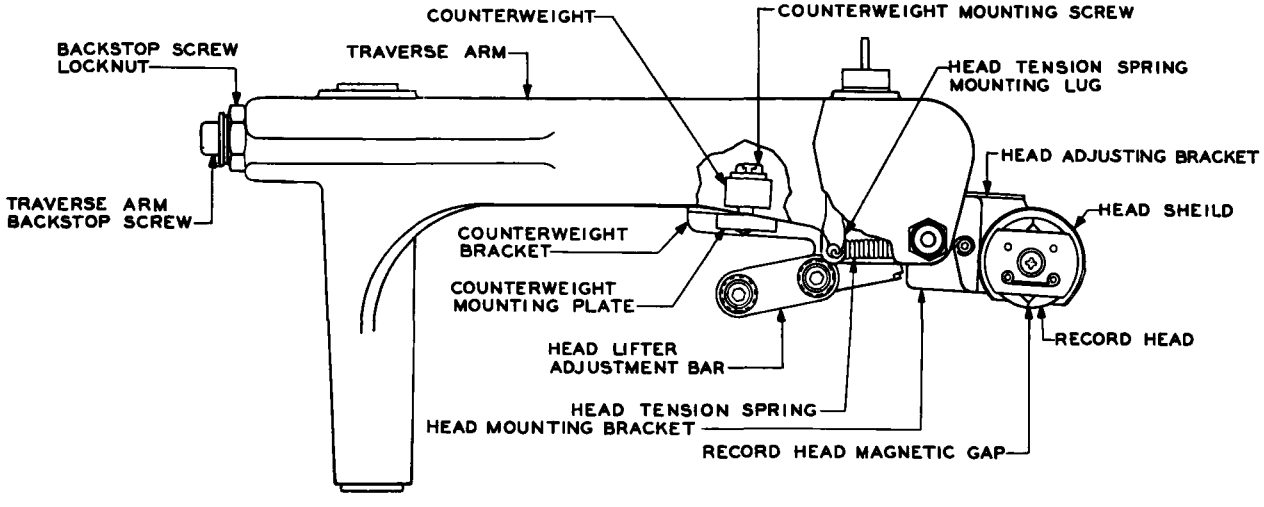


FIG. 8A - FRONT VIEW

**Fig. 8 – Record Head Assembly and Associated Parts**

(h) After positioning the record head, polish the pole pieces as follows. In order to protect the recording band and to provide a smooth base for the polishing operation, place the 2- by 6-inch sheet of cellulose acetate between the head and the recording band. Place the KS-13148 L1 abrasive paper, with the abrasive side up, between the head and the acetate sheet. Press the head lightly against the abrasive paper and withdraw the paper from between the head and acetate sheet, pulling it in the direction of rotation of the drum. Repeat this procedure ten times. Remove the acetate sheet.

**Head Lifter Adjustment Bar**

**3.16** To replace the head lifter adjustment bar, remove the bar mounting screws with the proper size Allen wrench. Mount the new bar in position and tighten the mounting screws securely.

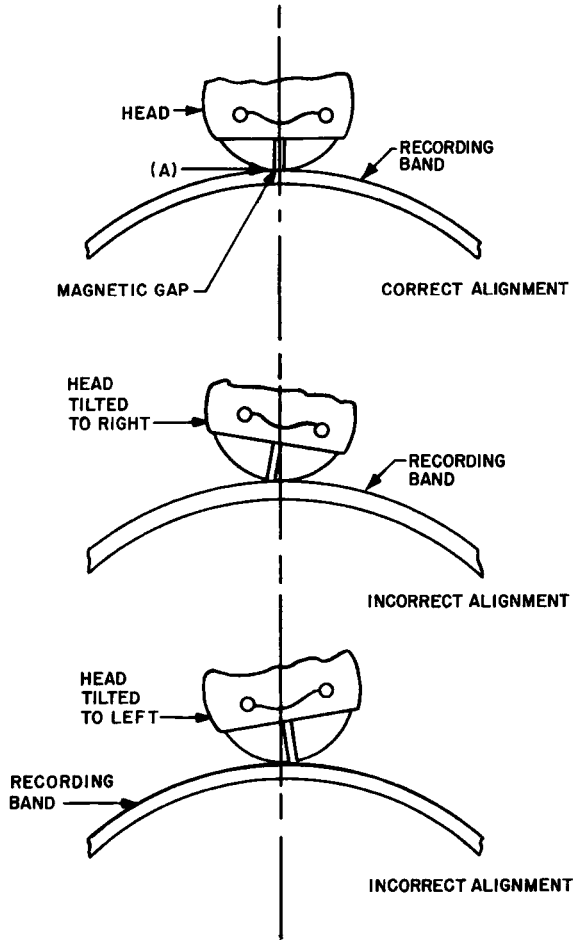


**Fig. 9 – Position of Record Head Magnetic Gap on Recording Band**

**Counterweight and Counterweight Mounting Plate**

**3.17** To replace these parts, remove the counterweight mounting screw with the proper size Allen wrench. Replace the part required. Check that the counterweight is so positioned that the record head rests on the recording band with proper pressure. Tighten the mounting screw securely.

**Head Mounting and Counterweight Brackets and Bearing Pin**

**3.18** Remove the drum as covered in 3.06. Remove the record head and the head adjusting bracket from the head mounting bracket as covered in 3.13. Unscrew the head tension spring mounting lug from the traverse arm, using the 485A pliers. Hold the outer bearing pin with the jeweler's screwdriver, and remove the bearing pin locknut using the 418A wrench. Loosen the bearing pin sleeve setscrew with the proper size Allen wrench and remove the sleeve from the casting. Then push the bearing pin toward the center of the brackets and remove the retaining ring from the bearing pin. Remove the bearing pin from the casting. Then remove the head mounting and counterweight brackets from the inner bearing pin and from the machine.

**3.19** Substitute the new head mounting bracket or counterweight bracket as required. If the counterweight bracket is being replaced, remove the head lifter adjustment bar, the counterweight, and counterweight mounting plate from the old counterweight bracket and mount them on the new bracket. Then place the counterweight bracket inside the head adjusting bracket so that the bearing holes line up. Insert the bearing pin through the bracket bearings from the side opposite the head adjusting stop with the slotted end of the bearing pin on the outside of the brackets. Mount the retaining ring on the bearing pin as covered in 3.20.

**3.20** Insert the tips of the Tru-arc pliers into the eyes of a retaining ring. Spread the ring by closing the pliers, taking care to spread the ring only enough to permit slipping it over the end of the bearing pin. Slip the retaining ring over the bearing pin to a point about 1/8 inch beyond the groove in the pin. Then release the pliers. Slide the bearing pin across the inside of the brackets so that the end with the retaining ring groove enters the inner bearings of both

the head mounting and counterweight brackets. The bearing pin should be placed so that it is flush with both sides of the head mounting bracket. Place the brackets in position in the machine so that the bracket bearings line up with the bearing hole in the casting.

**3.21** When the brackets are in proper position, move the bearing pin into the casting hole. Slowly slide the retaining ring along the bearing pin until it falls into the bearing pin groove, being careful that it does not slip off the end of the pin. Then move the brackets onto the inner bearing pin. Place a clean, dry KS-2423 cloth below the brackets and lubricate each bearing with one drop of KS-16326 L1 oil, applied with a 486A oilcan. Wipe off the excess lubricant with a cloth. Place the bearing pin sleeve over the bearing pin. Hold the sleeve in position to give proper side play to the head mounting bracket and tighten the associated setscrew. Mount the bearing pin locknut on the bearing pin. Hold the bearing pin with the screwdriver and tighten the locknut with the 418A wrench.

**3.22** Remount the head tension spring mounting lug in the casting. Remount the drum as covered in 3.11. Before remounting the head and the head adjusting bracket, clean the pole piece as covered in Section 034-350-701. Remount the head and the head adjusting bracket as covered in 3.14 and position the head on the recording band as covered in 3.15.

### Erase Magnet and Associated Parts

**3.23** ***Shield:*** Remove the drum as covered in 3.06. Remove the shield protecting the terminal strip and the Micro Switch using the 4-inch E screwdriver. Insert the mounting screws in the new shield and tighten them securely. Remount the drum as covered in 3.11.

**3.24** ***Erase Magnet Coil:*** Remove the drum as covered in 3.06. Remove the shield as described in 3.23. Loosen the clamp holding the leads using the 4-inch E screwdriver. Unsolder the coil leads from the terminal strip. Remove the coil mounting screws with the proper size Allen wrench. Mount the new coil loosely in position and solder the leads to the proper terminals. Remount the other parts in the reverse order of removal. Mount the drum on the shaft and center the erase magnet coil with respect to the drum. Tighten all screws securely. Remount the drum as covered in 3.11.

**3.25** ***Solenoid Arm and Solenoid Arm Locating Collars:*** Loosen the setscrews in the front solenoid arm locating collar with the proper size Allen wrench and remove the collar. Loosen the solenoid arm mounting screws with the 4-inch E screwdriver and remove the solenoid arm. Loosen the setscrew in the rear locating collar and replace the collar at this time if necessary, taking care to mount it in the same position as the collar being replaced. Tighten the collar setscrew. Mount the new solenoid arm in position and tighten the mounting screws securely. Mount the front locating collar, check for proper play at the locating collars, and tighten the setscrew. Remount the drum as covered in 3.11.

**3.26** ***Connecting Rod, Erase Magnet Bracket, and Micro Switch Operating Finger***

(a) Remove the drum as covered in 3.06 and the shield as covered in 3.23. Then remove the front solenoid arm locating collar and the solenoid arm as covered in 3.25.

(b) Loosen the clamping screw in the erase magnet bracket collar with the proper size Allen wrench. Loosen the setscrew in the Micro Switch operating finger with the proper size Allen wrench. Remove the connecting rod.

(c) If the Micro Switch operating finger and the erase magnet bracket are to be re-used, remove them from the old connecting rod and mount them on the new one. If the erase magnet bracket is to be replaced, remove the erase magnet coil from the old bracket, using the proper size Allen wrench, and mount it on the new bracket. Remount all parts in the reverse order of removal and temporarily tighten the setscrews. Check that the Micro Switch operating finger properly engages the Micro Switch actuator and that the connecting rod, erase magnet, and solenoid arm move freely. Check that the erase magnet bracket is in its proper position. Also check that the rotary solenoid is fully released before mounting the solenoid arm in place. Tighten all screws securely. Remount the shield and remount the drum as described in 3.11.

**3.27** ***Micro Switch:*** Remove the drum as covered in 3.06. Remove the shield as covered in 3.23. Unsolder the Micro Switch leads from the terminal strip. Remove the Micro Switch mounting screws with the 3-inch C screwdriver and remove the Micro Switch. Mount the new Micro Switch in position, temporarily tighten the mounting screws, and solder the leads to the terminal strip. Check that the Micro Switch actuator is properly engaged by the Micro Switch operating finger and that the Micro Switch requirements are met. Tighten the mounting screws securely. Remount the shield. Remount the drum as covered in 3.11.

**3.28** ***Rotary Solenoid***

(a) Remove the connecting rod as covered in 3.26. Unsolder the solenoid leads from the terminal strip. Remove the erase magnet assembly mounting screws with the proper size Allen wrench. Support the erase magnet assembly, remove the solenoid mounting nut with the 418A wrench, and remove the solenoid.

(b) Mount the new solenoid securely in position. Remount the parts in the reverse order of removal and tighten all mounting screws. Solder the solenoid leads to the terminal strip. Check that the solenoid arm and solenoid move freely, that the solenoid frontstop properly engages the frontstop screw, and that all associated requirements are met.

**3.29** ***Terminal Strip:*** Remove the connecting rod as covered in 3.26. Unsolder and tag the leads to the terminal strip. Remove the erase magnet assembly mounting screws with the proper size Allen wrench. Support the erase magnet assembly and remove the terminal strip mounting screws with the 4-inch E screwdriver. Mount the new terminal strip, tighten the screws securely, and solder the leads to the proper terminals. Remount the other parts in the reverse order of removal.

### Traverse Cam Follower and Traverse Arm Backstop Screw

**3.30** ***Traverse Cam Follower:*** Remove the drum as covered in 3.06. Hold the traverse cam follower mounting screw from below, using the proper size Allen wrench, and remove the follower mounting nut with the 418A wrench. Substitute the new follower. Tighten the mounting nut securely. Remount the drum as covered in 3.11.

**3.31** ***Traverse Arm Backstop Screw:*** Operate the machine until the backstop screw is clear of the motor. Loosen the locknut with the 245 wrench while holding the backstop screw with the proper size Allen wrench. Then remove the backstop screw and replace it. Tighten the locknut securely.

### Traverse Arm and Traverse Arm Bearing Pins

**3.32** Remove the record head and head adjusting bracket as covered in 3.13 and carefully suspend the head and bracket by the leads. Disengage the traverse arm retractile spring from the lug on the traverse arm using the 485A pliers. Remove the cable clamp from the arm using the 4-inch E screwdriver. Loosen the two traverse arm bearing pin setscrews with the proper size Allen wrench. Remove the bearing pins from the casting. Remove the traverse arm.

***Caution: Take care to avoid damaging the record head while the traverse arm is being replaced.***

**3.33** Remove the backstop screw, the retractile spring stud, the head tension spring lug, and the cam follower from the old traverse arm and mount them on the new arm. Remove the head mounting bracket, the counterweight bracket, the bearing pins, and associated parts from the old traverse arm and mount them on the new arm.

**3.34** Place the new traverse arm in position on the machine. Insert the upper bearing pin in position. Hold the traverse arm against the upper bearing pin and insert the thrust bearing washer between the traverse arm and the lower bearing surface. Insert the lower bearing pin. Release the traverse arm and, while holding the lower bearing pin from below so that it just touches the arm, tighten its setscrew. Check that the arm moves freely on its bearings and tighten the upper bearing pin setscrew. Remount the record head and the head adjusting bracket on the head mounting bracket, reconnect the traverse arm retractile spring, and secure the record head leads under the clamp. Position the record head as covered in 3.15. Lubricate the traverse arm bearing pins as covered in Section 034-350-701.

**Head Lifter Arm and Associated Parts**

**3.35** Remove the traverse arm as covered in 3.32. Insert the tips of the 0012 Tru-arc pliers into the eyes of the retaining ring on the head lifter arm bearing pin. Spread the ring by closing the pliers, taking care to spread the ring only enough to permit slipping it over the end of the bearing pin. Pull the head lifter arm from the bearing pin. Loosen the head lifter arm assembly screws using the 4-inch E screwdriver. Mount the new parts in position and tighten the assembly screws. Remount the arm on the bearing pin and remount the retaining ring, taking care not to spread the ring more than the amount required, and slip the ring over the bearing pin. Make sure that the ring is properly seated in the bearing pin groove. Remount the traverse arm as covered in 3.34.

**Cams**

**3.36** ***Traverse Cam***

(a) Operate the machine until the highest point on the operating surface of the traverse cam is accessible. Then hold a straight edge vertically against the edge of the traverse cam at this point and against the edge of the head lifter cam. Place a pencil mark along the edge of the head lifter cam in line with the highest point on the operating surface of the traverse cam. Loosen the traverse cam setscrews with the proper size Allen wrench and remove the cam from the shaft.

(b) Hold the traverse arm in the outermost position and mount the new cam on the shaft. Holding the straight edge vertical, line up the highest point of the operating surface on the traverse cam with the pencil mark on the head lifter cam. Make sure that the traverse cam is properly engaged by its cam follower. Tighten the cam setscrews securely. Check that the head lifter mechanism and the cut-through and head-shorting record spring assemblies meet the requirements covered in Section 034-350-701. If they do not, recheck the alignment of the traverse and head lifter cams as indicated by the pencil mark on the head lifter cam and the highest point on the operating surface of the traverse cam. If the alignment is correct, readjust the spring assemblies as covered in Section 034-350-701. Tighten the cam setscrews securely.

**3.37** ***Head Lifter Cam***

(a) Operate the machine until the highest point on the operating surface of the traverse cam is accessible. Remove the traverse arm as covered in 3.32. Remove the head lifter arm as covered in 3.35.

(b) Then hold a straight edge vertically against the edge of the traverse cam at the highest point on its operating surface and against the edge of the head lifter cam. Place a pencil mark on the edge of the head lifter cam in line with the highest point on the operating surface of the traverse cam. Hold a cut-down filing card or other straight edge vertically against the undersurface of the head lifter cam and against the center of the edge of the highest operating surface on the cut-through and head-shorting record cams. Using the straight edge as a guide, mark a vertical pencil line on the periphery of the head lifter cam and on the operating surface of the cut-through and head-shorting record cams to show the alignment of these cams.

(c) Loosen the traverse cam setscrews with the proper size Allen wrench and remove the traverse cam from the shaft. Place a horizontal pencil mark on the shaft at the top of the hub of the head lifter cam to locate the cam vertically on the shaft. Loosen the cam setscrews and remove the head lifter cam from the shaft.

(d) Place two pencil marks on the new head lifter cam at the points corresponding to those on the replaced cam, using the edge of the cam recess as a reference point.

(e) Mount the new cam on the shaft. Holding the straight edge or card vertically as described above, line up the pencil marks on the cut-through and head-shorting record cams with the left pencil mark on the head lifter cam. Then make sure that the top of the head lifter cam lines up with the pencil mark on the shaft and tighten the setscrews of the head lifter cam.

(f) Mount the traverse cam on the shaft. Using the straight edge, line up the right pencil mark on the head lifter cam with the highest point on the operating surface of the traverse cam. Tighten the traverse cam setscrews securely.

(g) Remount the head lifter arm as covered in 3.35 and the traverse arm as covered in 3.34. Check that the traverse cam follower properly engages the traverse cam. Check that the head lifter mechanism and the cut-through and head-shorting record spring assemblies meet the requirements covered in Section 034-350-701. If they do not, recheck the alignment of the traverse and head lifter cams as indicated by the pencil marks. If the pencil marks are in line, readjust the spring assemblies as covered in Section 034-350-701.

**3.38** ***Cut-Through and Head-Shorting Record Cams***

(a) Operate the machine until the highest point on the operating surface of the traverse cam is accessible. Remove the traverse arm as covered in 3.32. Remove the head lifter arm as covered in 3.35.

(b) Mark the cams as described in 3.37(b). Remove the traverse and head lifter cams as described in 3.37(c). Loosen the setscrews of the cut-through cam if this cam is to be replaced, or the setscrews of both the cut-through and head-shorting record cams if the head-shorting record cam is to be replaced. Remove the cam or cams from the shaft.

(c) Place a pencil mark on the edge of the highest operating surface of the new cam in the same position as it was on the cam being replaced, using the ends of this operating surface as reference points.

(d) If the head-shorting record cam is being replaced, raise the associated operating spring and mount the new cam on the shaft so that the pencil mark is at the front. Tighten the setscrews securely. Then raise the operating spring associated with the cut-through cam, mount the cut-through and head lifter cams, and line up these cams with the head-shorting record cam as covered in 3.37(e). Make sure that the periphery of the cut-through and head-shorting record cam properly engages the studs on the associated operating springs. Then tighten the setscrews of the cut-through cam. Now line up the top of the head lifter cam with the pencil mark on the shaft and tighten the head lifter cam setscrews. Mount the traverse cam on the shaft as covered in 3.37(f). Remount the other parts and check requirements as covered in 3.37(g).

**Cut-Through and Head-Shorting Record Spring Assemblies**

**3.39** Unsolder and tag the leads to the spring assembly to be replaced. Remove the spring assembly mounting screws with the 4-inch E screwdriver and remove the spring assembly. Mount the new assembly in position. Make sure that the stud on the operating spring properly engages the operating surface of its associated cam. Then tighten the mounting screws. Check that the springs meet the requirements covered in Section 034-350-701. If the requirements are not met, remove the spring assembly and adjust the springs as required. If the requirements are met, reconnect the leads to the spring assembly.

**Motor and Associated Parts**

**3.40** ***Fan:*** To replace the fan, loosen the fan setscrew with the 3-inch C screwdriver. Remove the fan from the pulley shaft and through the fan guard. Mount the new fan on the pulley shaft, taking care that the setscrew of the fan engages the flat on the shaft. Securely tighten the setscrew.

**3.41** ***Driving Pulley:*** To replace the driving pulley, remove the fan as covered in 3.40. Remove the belt from the driving pulley. Loosen the driving pulley setscrew with the proper size Allen wrench and remove the pulley from the motor shaft. Mount the new pulley on the shaft, making certain that it clears the motor housing and that the setscrew engages the flat on the motor shaft. Tighten the pulley setscrew securely and remount the belt. Remount the fan securely in place.

**3.42** ***Fan Guard:*** Remove the screws from the upper mounting of the fan guard using the 4-inch E screwdriver. Loosen the cradle mounting screws below the fan guard using the proper size Allen wrench. Remove the guard and substitute a new one. Tighten all mounting screws securely.

**3.43** ***Motor and Adjustable Motor Mount:*** To replace the motor or the adjustable motor mount, proceed as follows.

(a) Remove the fan as described in 3.40 and the fan guard as described in 3.42. Remove the motor terminal strip shield using the 3-inch C screwdriver. Unsolder and tag the motor leads. Remove the clamp holding the leads using the 4-inch E screwdriver. Disconnect the ground wire using the 417A wrench.

(b) Remove the belt from the driving pulley. Remove the cotter pin connecting the belt tension bar to the adjustable motor mount.

(c) Loosen the setscrews on both motor mount collars with the proper size Allen wrench. Shift the motor toward the front of the machine until the motor mount pivot bearing clears the motor rail. Press down on the rail and tilt the motor upward until the pivot bearing is above the rail. Then remove the motor and motor mount from the machine.

(d) Loosen the motor mount nuts with the 245 wrench and remove the motor mount from the motor. If the mount is to be replaced, substitute the new one at this time and mount it securely in place on the motor. Transfer the motor mount collars from the motor mount being replaced to the new mount.

(e) If the motor is to be replaced, loosen the driving pulley setscrew with the proper size Allen wrench and remove the pulley from the shaft of the motor being replaced. Mount the pulley securely on the shaft of the new motor, making sure that it clears the motor housing and that the setscrew engages the flat on the motor shaft. Mount the motor mount on the new motor.

(f) Mount the motor and motor mount in the machine from the rear, at the same time depressing the motor rail to permit the shaft of the adjustable mount to clear the motor rail. With the motor rail held down, shift the motor toward the front so that the shaft of the adjustable mount enters the bearing in the front of the motor rail sufficiently for the rear of the shaft of the mount to clear the inside of the rail at the rear. Then release the rear of the rail and pull the motor toward the rear until the shaft is properly seated in the rail. If the collars have slipped off the shaft of the adjustable mount, place them on the shaft before mounting the adjustable mount in the motor rail.

(g) Insert and secure the cotter pin connecting the belt tension bar to the adjustable motor mount. Mount the driving belt on the driving and driven pulleys. Then mount the fan guard and securely tighten all screws. Connect the motor leads, and mount the terminal strip shield. Place the collars in position so that the driving belt is properly centered on the driving and driven pulleys and tighten the setscrews. Check the motor alignment and readjust it by shifting the motor base on the adjustable motor mount as required. Adjust the belt tension bar as required to give proper belt tension.

**3.44** ***Motor Rail, Cradle, and Rubber Mounts:*** To replace any of these parts, remove the fan and fan guard as covered in 3.40 and 3.42. Remove the motor and adjustable motor mount as described in 3.43(a) through (c), then proceed as follows.

(a) Remove the motor rail mounting nuts and washers on the outside of the motor rail using the 245 wrench. Lift the motor rail from the rubber mounts. If the motor rail is to be replaced, substitute a new one and then proceed as described in (c). If rubber mounts are to be replaced, remove the mounting nuts, using the 245 wrench. Substitute new parts as required and tighten the nuts securely.

(b) If the cradle is to be replaced, remove the rubber mount mounting nuts on the inside of the cradle with the 245 wrench and remove the mounts. Remove the cradle mounting screws with the proper size Allen wrench and remove the cradle. If the cradle support brackets are to be replaced, remove the mounting screws with the proper size Allen wrench.

(c) Remount the parts in the reverse order of removal and tighten all screws securely. Mount the motor as described in 3.43(f) and (g).

**Miscellaneous Parts**

3.45 ***Toggle Switch:*** Remove the shield that protects the toggle switch wiring using the 3-inch C screwdriver. Unsolder the leads to the toggle switch. Loosen the toggle switch mounting ring with the proper size Allen wrench. Remove the switch from the rear of the machine. Mount the new switch securely in position and tighten the mounting ring. Resolder the leads.

**REASONS FOR REISSUE**

1. To revise the piece-part data for the drum, the drum mounting screws, a resistor, the erase magnet coil, and the fan (Fig. 1, 2, 4, and 6).
2. To revise the List of Materials (3.01).
3. To revise the procedure for replacing the recording band (3.08 through 3.11).