RECORDER-REPRODUCER

KS-16534, LIST 1

RECORDER-REPRODUCER MECHANISM

REQUIREMENTS AND ADJUSTING PROCEDURES

1. General

1.01 This section covers the KS-16534, List 1 recorder-reproducer mechanism.

1.02 When working on the recorder-reproducer mechanism, make sure that the power switch is in the OFF position unless otherwise stated in the section.

1.03 ***One drop of KS-16326, List 1 oil,*** for the purpose of this section, is the amount of oil discharged from the nozzle of a No. 486A oil can when the sides are depressed until a drop is released.

1.04 ***One dip of KS-16326, List 1 oil,*** for the purpose of this section, is the amount of oil retained on a KS-14164 brush after being dipped into the oil to a depth of 3/8 inch and then scraped once against the edge of the container as the brush is removed.

1.05 The letter and number shown in parenthesis after the designations of each magnet, solenoid, and switch on the figures indicate the circuit designations of the parts which are shown on the circuit drawings and stamped on the apparatus.

1.06 ***Asterisk (*):*** Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting apparatus, or would affect the adjustment involved, or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

2. REQUIREMENTS

2.01 ***Cleaning***

(a) ***Contacts:*** The contacts shall be cleaned when necessary in accordance with Section 069-306-801.

(b) ***Record-reproduce Head*** — Fig. 1(A): The pole piece of the record-reproduce head shall be free from dirt and foreign material.

Gauge by eye.

To check this requirement, lift the head to its highest position and observe the surface of the pole piece.

(c) ***Recording Band:*** The recording band shall be free from dirt and foreign material and the track shall have a polished appearance.

Gauge by eye.

(d) Other parts shall be cleaned when necessary in accordance with approved procedures.

2.02 ***Lubrication:*** The following parts shall be lubricated with KS-16326, List 1 oil as covered below.

(a) ***Motor Bearings*** — Fig. 2(A): Two drops of oil to each motor bearing.

(b) ***Threads of Lead Screw and Half-nut*** — Fig. 2(B): Two dips of oil distributed over the lead screw threads.

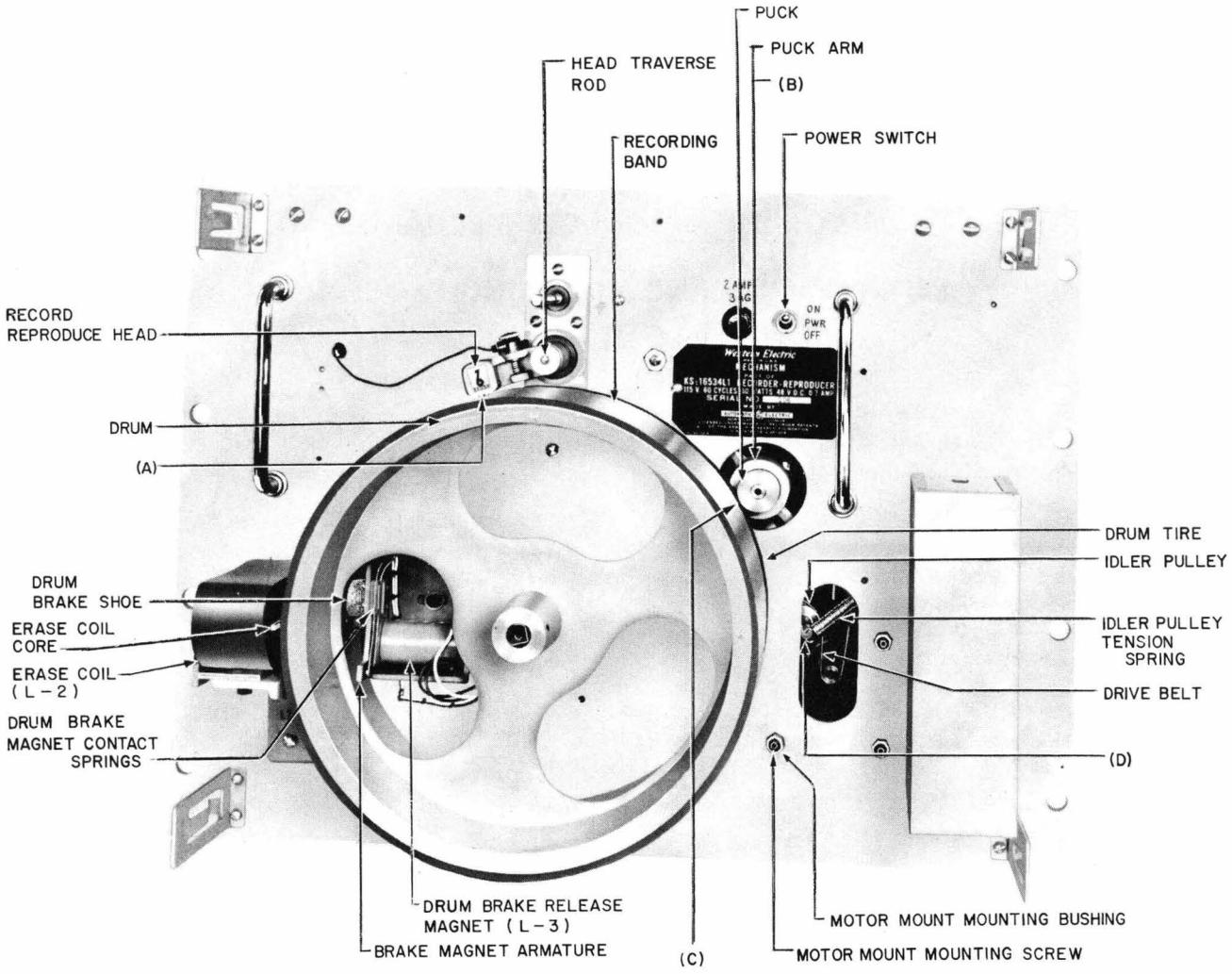

Fig. 1 — Recorder-Reproducer Mechanism — Front View (Cover Removed)

(c) ***Idler Pulley Shaft:*** One drop of oil to idler pulley shaft applied between the pulley and the arm on which it is mounted.

(d) ***Recommended Lubrication Intervals:*** Before being placed in operation, the recorder-reproducer mechanism shall be lubricated as specified. Thereafter, it shall be lubricated at intervals of three months. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that the requirements will be met during the extended interval.

2.03 ***Record of Lubrication:*** During the period of installation, a record shall be kept by date of the lubrication of the recorder-reproducer mechanism, and this record shall be turned over to the telephone company with the equipment.

Puck Drive

2.04 ***Puck Pressure*** — Fig. 1(B): With the puck drive solenoid electrically operated, the puck shall bear against the drum tire with a pressure of

Min. 800 grams

To check this requirement, loop a piece of linen thread around the puck arm adjacent to the puck. Move the power switch to the ON position. Block the J relay non-operated and the H relay operated. These relays are in the control unit.

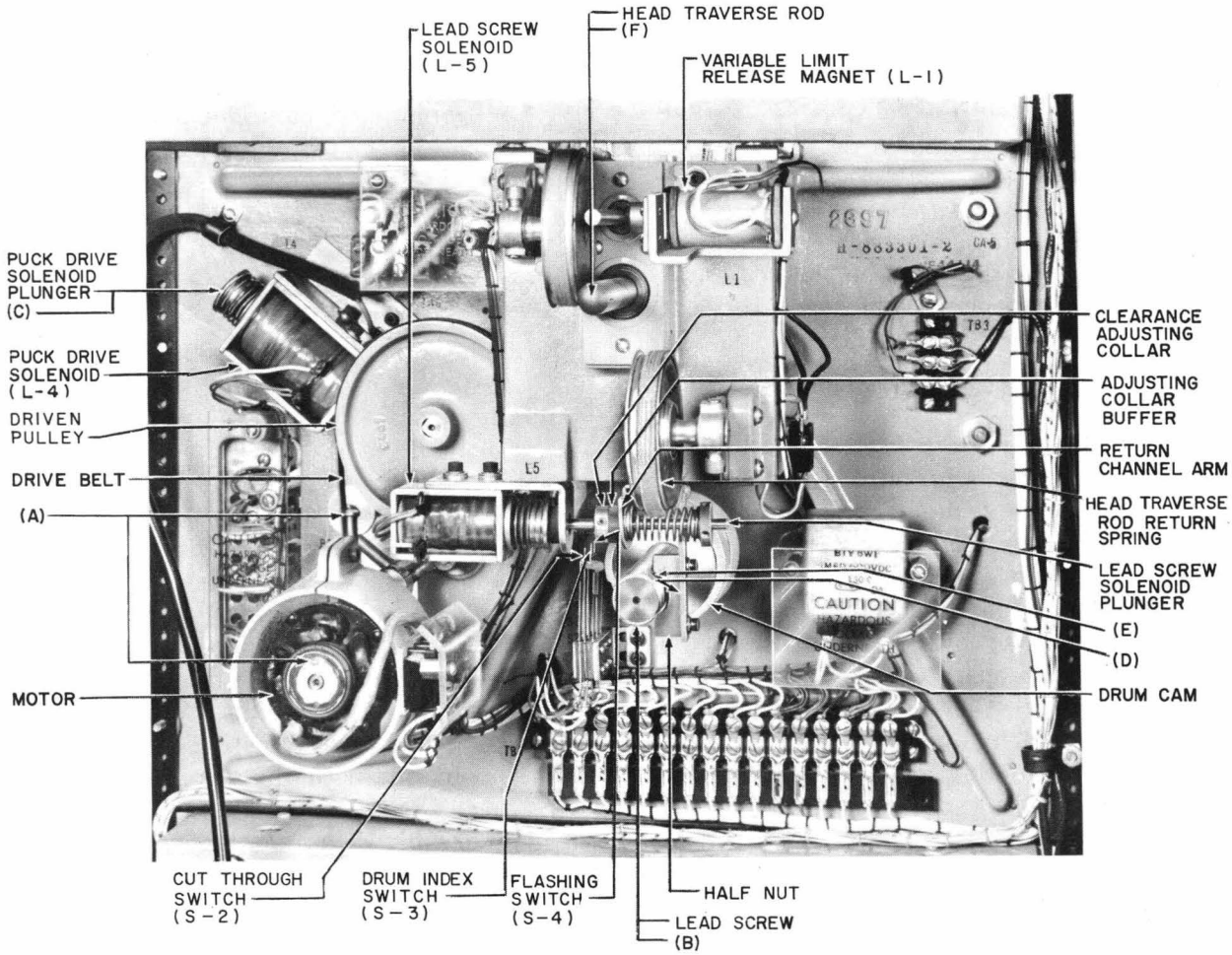

Fig. 2 — Recorder-Reproducer Mechanism — Rear View (Cover Removed)

Engage the loop of thread with the tip of the reed of the No. 158A gauge and move the gauge to lift the puck away from the drum tire. Measure the puck pressure as the puck just begins to slip on the tire. Remove the blocks from the relays.

2.05 ***Puck Clearance*** — Fig. 1(C): With the puck drive solenoid unoperated, there shall be a clearance between the puck and the drum tire of

Min. 0.015 inch

Max. 0.025 inch

This requirement shall be checked at three equidistant points around the periphery of the drum.

Use the KS-6909 gauge.

2.06 ***Puck Drive Solenoid Stroke*** — Fig. 2(C): The stroke of the puck drive solenoid shall be

1/8 inch

Gauge by eye.

To check this requirement make a mark on the mechanism panel in line with the end of the solenoid plunger, using a sharp pencil. Elec-

trically operate the solenoid by blocking the J relay non-operated and the H relay operated. These relays are in the control unit. Again make a mark on the panel in line with the end of the plunger. Check the solenoid stroke as indicated by the distance between the two pencil marks. Remove the blocks from the relays.

*2.07 ***Clearance between Puck Arm and Buffer on Puck Clearance Adjusting Collar:*** With the puck drive solenoid electrically operated, there shall be a clearance between the puck arm and the buffer on the puck clearance adjusting collar.

Gauge by eye.

To check the requirement, it is necessary to remove the driven pulley as follows. Move the idler pulley away from the drive belt and remove the belt from the pulleys. Loosen the setscrews in the driven pulley with the R-2959 wrench and remove the pulley from the shaft. Electrically operate the solenoid by blocking the J relay in the control unit non-operated and the H relay operated. Observe whether there is a clearance between the puck arm and the buffer on the puck clearance adjusting collar. Remove the blocks from the relay and remount the driven pulley and the drive belt.

2.08 ***Freedom of Movement of Puck Drive Solenoid Plunger:*** After being manually operated, the puck drive solenoid plunger shall restore to its normal position without hesitation.

Gauge by eye.

2.09 ***Puck End Play:*** The end play of the puck shall not exceed

Max. 0.010 inch

Gauge by feel.

Drum Brake

2.10 ***Brake Shoe Clearance:*** With the brake release magnet operated, the brake shoe shall not rub on the inner surface of the drum when the drum is rotated manually.

Gauge by feel.

Make sure that the power switch is in the OFF position. Insulate contacts 3 and 4 of the H relay in the control unit and block the relay operated. This will operate the brake release magnet. Rotate the drum manually, noting whether the brake shoe rubs on the inner surface of the drum.

2.11 ***Operation of Brake:*** The drum brake shall stop the drum within a braking distance of

Max 1 inch

Gauge by eye.

Before checking this requirement, make sure that the power switch is in its OFF position. Manually operate the H relay in the control unit. This will hold the brake release magnet operated. Slowly rotate the drum until the brake release magnet releases. With the drum in this position make a mark with a sharp pencil on the edge of the drum in line with the top of the erase coil core. Move the power switch to its ON position and again operate the H relay. This will operate the brake release magnet and start rotation of the drum. When the brake stops the drum, make another pencil mark on the drum in line with the top of the erase coil core. Check the braking distance as indicated by the distance between the two pencil marks on the drum.

2.12 ***Drum Brake Release Magnet Contact Spring Requirements:***

(a) The contacts shall not make with a 0.002-inch gauge between the shoe and drum.

Gauge by eye.

Operate the drum brake release magnet armature and insert the No. 92S gauge between the brake shoe and the drum. Then release the armature and observe whether the contacts are open.

(b) With the drum brake release magnet armature in the unoperated position and the drum in place, the contact spring adjacent to the armature shall have a pressure against the armature of

Min. 20 grams

Use the No. 68B gauge.

(c) With drum brake magnet armature in the unoperated position, there shall be a contact separation of

Min. 0.006 inch

Use the KS-6909 gauge.

(d) The contacts shall have a follow of

Min 0.020 inch

Gauge by eye.

Belt Drive

2.13 ***Belt and Pulley Alignment***

(a) The belt shall ride approximately centrally on the driven pulley.

Gauge by eye.

(b) Lateral movement of the belt on the driven pulley shall not cause either side of the belt to extend beyond the corresponding edge of the pulley.

Gauge by eye.

To check requirement (a) and (b) operate the recorder-reproducer mechanism.

2.14 ***Idler Pulley Pressure*** — Fig. 1(D): The idler pulley shall bear against the belt with a pressure of

Min. 300 grams

Max. 400 grams

Use the No. 62B gauge.

Apply the gauge to the idler pulley arm adjacent to the pulley tension spring. This portion of the arm is accessible from the front of the machine through a hole in the panel. Measure the pressure as the belt starts to follow the pulley.

Head Traverse Mechanism

2.15 ***Engagement of Half-nut with Lead Screw:*** With the cut-through cam follower resting approximately at the center of the cam lobe (Fig. 2), the threads of the half-nut shall fully engage the threads of the lead screw at both the top and bottom of the nut when the lead screw solenoid is operated.

Gauge by eye and feel.

Before checking this requirement, make sure that the power switch is in its OFF position. Manually operate the H relay in the control unit to release the drum brake. Rotate the drum cam manually to position the cut-through switch cam follower approximately at the center of the cam lobe. Manually operate the B relay in the control unit. This will hold the lead screw solenoid operated. Note whether the half-nut fully engages the lead screw thread. To release the B relay, manually operate and release the C relay.

2.16 ***Pressure of Half-nut on Lead Screw*** — Fig. 2(D): With the lead screw solenoid operated, and the half-nut fully engaging the lead screw thread, the half-nut shall bear against the lead screw with a pressure of

Min. 150 grams

Max. 250 grams

Before checking this requirement, make sure that the power switch is in its OFF position. Manually operate the H relay in the control unit to release the drum brake. Rotate the drum cam manually to position the cut-through switch cam follower approximately at the center of the cam lobe. Manually operate the B relay in the control unit. This will hold the lead screw solenoid operated. Measure the pressure of the half-nut against the lead screw by applying the No. 62B gauge to the half-nut arm adjacent to the center of the half-nut. To release the B relay, manually operate and release the C relay.

2.17 ***Clearance between Half-nut and Lead Screw*** — Fig. 2(E): With the lead screw solenoid in the unoperated position, there shall be a clearance between the half-nut and the lead screw for the entire travel of the half-nut of

Min. 0.020 inch

Gauge by eye.

To check the requirement, hold the armature of the variable limit magnet operated and manually move the half-nut through its entire travel by means of the head traverse rod. Observe the clearance between the half-nut and the lead screw.

2.18 ***Clearance between Return Channel Arm and Adjusting Collar Buffer*** — Fig. 2: With the lead screw solenoid operated and the half-nut fully engaging the lead screw thread, there shall be clearance between the return channel arm and the adjacent adjusting collar buffer

Gauge by eye.

Before checking the requirement, make sure that the power switch is in its OFF position. Manually operate the H relay in the control unit to release the drum brake. Rotate the drum cam manually to position the cut-through switch cam follower approximately at the center of the cam lobe. Manually operate the B relay in the control unit which will hold the solenoid operated. Observe whether there is clearance between the return channel arm and the adjacent buffer. To release the B relay and solenoid, manually operate and release the C relay.

2.19 ***Freedom of Movement of Lead Screw Solenoid Plunger:*** The lead screw solenoid plunger shall restore freely after having been manually operated.

Gauge by eye.

2.20 ***Tension of Head Traverse Rod Return Spring*** — Fig. 2(F): The tension of the head traverse rod return spring shall be

Min. 105 grams

Max. 125 grams

Use the No. 70J gauge.

To check this requirement, move the variable limit switch away from its start position, if necessary, by manually operating the armature of the variable limit magnet, moving the limit switch rod, and releasing the armature. Apply the No. 70J gauge to the end of the head traverse rod and check the tension of the spring as the traverse rod starts to leave its start position.

2.21 ***Freedom of Movement of Head Traverse Rod:*** The head traverse rod shall return freely to its start position from any position of its travel.

Gauge by eye.

To check this requirement, move the variable limit switch to the end of its travel by manually operating the armature of the variable limit magnet, moving the limit rod, and releasing the armature. Manually move the head traverse rod and check whether it returns freely to its start position.

2.22 ***Head Traverse Rod Index Switch Contact Spring Requirements*** — Fig. 3.

(a) The follow of the contacts which are closed with the head traverse rod in its start position shall be

Min. 0.020 inch

Gauge by eye.

(b) The follow of the contacts which are closed by movement of the head traverse rod from its start position shall be

Min 0.010 inch

Gauge by eye.

(c) The separation of the contacts which are opened by movement of the head traverse rod from its start position shall be

Min. 0.008 inch

Use the KS-6909 gauge.

(d) As the head traverse rod is moved from its start position by rotation of the lead screw with the half-nut engaged, the closed contacts shall open before the drum cam has completed one revolution.

Gauge by eye.

To check the requirement, move the variable limit switch away from its start position, if necessary, by manually operating the armature of the variable limit magnet, moving the limit rod, and releasing the armature. Operate the H relay in the control unit to release the drum brake. Rotate the drum cam manually to position the cut-through switch cam follower approximately at the center of the cam lobe. Manually operate the lead screw solenoid and check that the half-nut fully engages the lead screw threads. Hold the lead screw solenoid operated and, while observing the closed con-

tacts of the switch, manually turn the drum cam clockwise. Note whether the closed contacts open before the drum cam completes one revolution.

2.23 ***Head Traverse Rod Limit Switch Contact Spring Requirements*** — Fig. 3.

(a) The follow of the normally open contacts shall be

Min. 0.020 inch

Gauge by eye.

(b) The follow of the normally closed contacts shall be

Min. 0.010 inch

Gauge by eye.

(c) The separation between the normally open contacts shall be

Min. 0.008 inch

Use the KS-6909 gauge.

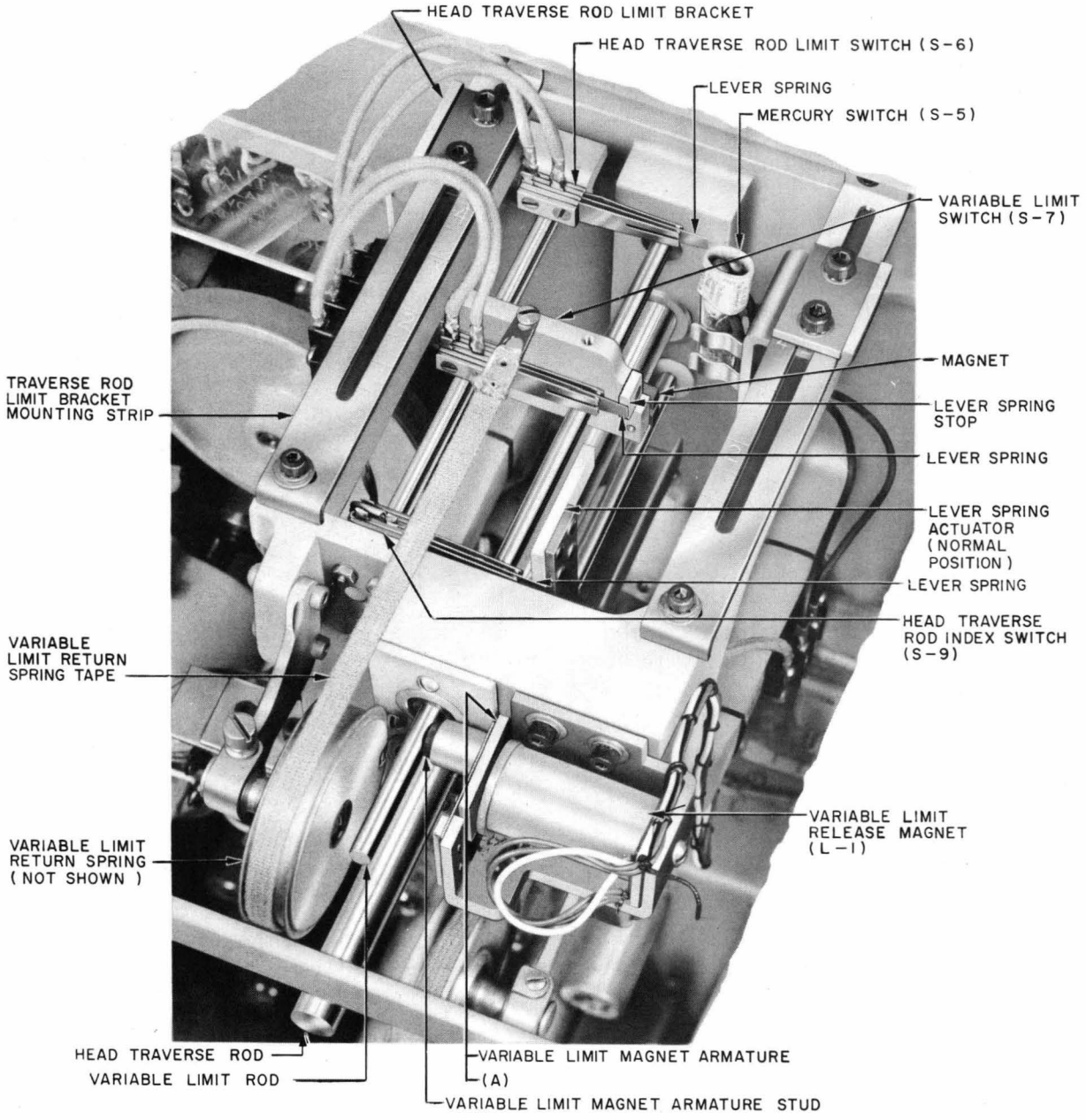

Fig. 3 – Head Traverse and Variable Limit Mechanisms — Top View

Variable Limit Mechanism

2.24 ***Release of Variable Limit Rod:*** With the variable limit rod at any point of its travel, the following requirements shall be met.

(a) The rod shall be released and return freely to its normal position when the variable limit magnet armature is moved manually against a 0.010-inch gauge held across the magnet core.

Gauge by eye, using the KS-6909 gauge to limit the travel of the armature.

(b) The rod shall not be released when the variable limit magnet armature is moved manually against a 0.014-inch gauge held across the magnet core. Gauge by eye, using the KS-6909 gauge to limit the travel of the armature.

2.25 ***Variable Limit Magnet Armature Stud Pressure*** — Fig. 3(A): With the variable limit magnet unoperated, the magnet armature stud shall bear against the variable limit rod with a pressure of

Min. 500 grams

Max. 650 grams

as measured at the end of the armature.

Use the No. 62B gauge.

2.26 ***Variable Limit Return Spring Tension:*** With the end of the variable limit return spring tape opposite the line designated "1" on the traverse rod limit bracket mounting strip, the tension of the return spring shall be

Min. 105 grams

Max. 125 grams

Use the No. 70J gauge.

To check this requirement remove the screw which secures the return spring tape to the limit block taking care not to let go of the tape while checking the requirement. Engage the end of the tape with the reed of the No. 70J gauge and measure the tension with the tape extended to the specified point.

2.27 ***Freedom of Movement of Variable Limit Rod:*** The variable limit rod shall return freely to its start position from any position of its travel when the variable limit magnet is operated.

Gauge by eye.

To check this requirement, manually operate the armature of the variable limit magnet. Manually move the variable limit rod and check whether it returns freely to its start position.

2.28 ***Variable Limit Switch Contact Spring Requirements*** — Fig. 3.

(a) The normally open contacts shall close when the lever spring is operated against a 0.030-inch gauge held against the lever spring stop.

Gauge by eye and check as covered in (e).

(b) The normally open contacts shall not close when the lever spring is operated against a 0.035-inch gauge held against the lever spring stop.

Gauge by eye and check as covered in (e).

(c) The separation between the normally open contacts shall be

Min. 0.008 inch

Use the KS-6909 gauge.

(d) The contact follow of the normally closed contact shall be

Min. 0.010 inch

Gauge by eye.

(e) To check (a) and (b) of the requirement, proceed as follows. Position the variable limit switch so that the lever spring stop is accessible from the right through the opening in the casting which mounts the head traverse mechanism. To do this, manually operate the armature of the variable limit magnet and move the limit switch by means of the limit rod. Hold the No. 92J or 92K gauge, as required, against the face of the stop and, by

means of the traverse rod, move the lever spring actuator until it holds the lever spring of the switch against the gauge.

Mercury Switch

2.29 ***Operation of Mercury Switch:*** The mercury switch shall operate as specified in the following requirements.

(a) The mercury switch shall operate as the magnet on the variable limit switch passes the mercury switch.

Check the requirement as covered in (c).

(b) As the magnet on the variable limit switch is moved past the mercury switch by operation of the mechanism, the mercury switch shall operate for an interval corresponding to the Dictate Lamp Flashing Interval for which the mechanism was adjusted in accordance with Section 034-353-701.

Check the requirement as covered in (c).

(c) Disconnect the mercury switch leads from the terminal strip using the 3-inch cabinet screwdriver, and connect them to the test leads of the KS-14250 flashlight. The flashlight should light. To check requirement (a), manually operate the variable limit magnet and move the variable limit rod so that the variable limit switch passes the mercury switch. The flashlight should be extinguished as the magnet passes the switch. Allow the variable limit switch to return to its start position and release the variable limit magnet. To check requirement (b), proceed as follows. Move the power switch to its ON position. Using the 1W13A cord equipped with two KS-6278 connecting clips, connect ground to terminal 20 of terminal strip TB101 on the rear of the control unit. This will operate the mechanism. Using the KS-3008 stop watch or a watch with a second hand, check the length of time that the flashlight is extinguished as the magnet on the variable limit switch moves past the mercury switch.

Record-reproduce Head Assembly

2.30 ***Freedom of Movement of Head Assembly:*** The record-reproduce head shall pivot freely on the traverse rod.

Gauge by feel.

2.31 ***Record-reproduce Head End Play:*** The record-reproduce head shall have end play with respect to the traverse rod of

Max. 0.003-inch

Gauge by feel.

Cut-through, Drum Index, and Flashing Switches

2.32 ***Contact Spring Requirements***

(a) With the follower on the low portion of the cam, the following requirements shall be met.

(1) There shall be a contact separation of

Min. 0.008 inch

Use the KS-6909 gauge.

(2) The combined pressure of the follower and lever springs against the cam shall be

Min. 15 grams

Max. 25 grams

with more than half of the pressure exerted by the lever spring.

To check the requirement, turn the drum cam manually, if necessary, so that the cam follower is on the low portion of the cam. Loop a piece of linen thread around the springs to be checked, directly below the pointed portion of the follower. Engage the loop with the No. 68B gauge and measure the combined pressure of the lever and follower springs as the follower just leaves the cam. Then, using the KS-6320 orange stick, lift the lever spring away from the follower and measure the pressure of the follower alone.

(b) As the follower moves to the high portion of the cam the following requirement shall be met.

(1) There shall be a contact follow of

Min. 0.020 inch

Gauge by eye.

Erase Coil

2.33 ***Gap Between Erase Coil Core and Recording Band:*** There shall be a gap between the erase coil core and the recording band at both ends of the core of

Min. 0.025 inch

Max. 0.035 inch

Use the KS-6909 and KS-6938 gauges.

Electrical and Operation Requirements

2.34 ***Electrical Requirements:*** The variable limit magnet, drum brake release magnet, puck drive solenoid, and lead screw solenoid shall meet the requirements specified in the circuit requirement table.

2.35 ***Operation Requirement:*** A recorded announcement shall be clearly reproduced at uniform speed and shall be free from extraneous sounds.

Gauge by ear.

To check this requirement, monitor a recording of normal speech using an operator headset plugged into the coupling unit of the announcement system. If a suitable recording is not on the recording band, make a recording for this purpose.

3. ADJUSTING PROCEDURES

3.001 ***List of Tools, Gauges, and Materials***

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
207	90° Offset Screwdriver
319B	Lamp Cap Extractor
415B	Spring Adjuster
416B	Spring Adjuster
417A	1/4-inch and 3/8-inch Hex. Open Double End Flat Wrench
418A	5/16-inch and 7/32-inch Hex. Open Double End Flat Wrench
486A	Oil Can
KS-3008	Stop Watch
KS-6015	Duck-bill Pliers
KS-6320	Orange Stick
KS-14164	No. 4 Artist's Show Card Brush
KS-14250, L1	Flashlight (with two 1W13A cords equipped with KS-6278 connecting clips)
R-1102	Spudger
R-2485	5/32-inch Allen Socket Screw Wrench
R-2670	3/32-inch Allen Socket Screw Wrench
R-2671	1/8-inch Allen Socket Screw Wrench
R-2919	Round Pointed Camel Hair Brush
R-2958	5/64-inch Allen Socket Screw Wrench
R-2959	1/16-inch Allen Socket Screw Wrench
R-2969	6-inch Stiff Bristle Typewriter-type Brush
—	3-inch Cabinet Screwdriver
—	4-inch Regular Screwdriver
	P-Long-nose Pliers
—	1W13A cord equipped with two KS-6278 connecting clips

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
62B	0-700 Gram Gauge
68B	70-0-70 Gram Gauge
70J	0-150 Gram Gauge
92J	0.030-inch Nonmagnetic Offset Thickness Gauge
92K	0.035-inch Nonmagnetic Offset Thickness Gauge
92S	0.002-inch Nonmagnetic Offset Thickness Gauge
92T	0.005-inch Nonmagnetic Offset Thickness Gauge
92W	0.008-inch Nonmagnetic Offset Thickness Gauge
158A	0-1400 Gram Gauge
KS-6909	Feeler Gauge Nest
KS-6938	Feeler Gauge Nest
MATERIALS	
KS-2423	Cloth
KS-6824	Sealing Compound
KS-7860	Petroleum Spirits
KS-8372	Trichloroethylene
KS-16326, List 1	Oil
KS-16328, List 2	Cleaner-Lubricant
—	Abrasive Paper-Flint (Fine)
—	Cotton Swabs
—	Linen Thread

3.01 *Cleaning* (Reqt 2.01)

(1) Clean the contacts in accordance with Section 069-306-801.

Caution: Before using the KS-16328, List 2 cleaner-lubricant as covered below, thoroughly shake its container. Do not permit the cleaner-lubricant to come in contact with any part of the mechanism other than the part being cleaned.

(2) Clean the record head (Fig. 4) as follows.

(a) Lift the head from the recording band and place a clean, dry KS-2423 cloth over the top of the band and drum tire below the head assembly.

(b) Wipe the pole pieces with a KS-2423 cloth slightly moistened with KS-16328, List 2 cleaner-lubricant. Then promptly wipe the pole pieces with a clean, dry KS-2423 cloth. Make sure the pole pieces are thoroughly dry before allowing them to come in contact with the recording band.

(c) After cleaning inspect the head for any spread, pitting, or excessive wear of the laminations. If the laminations show evidence of spreading or pitting or if the length of the worn surface on the laminations exceeds 3/16 inch, replace the head.

(d) Remove the cloth from the band and restore the head to the band.

(3) Clean the recording band as follows:

(a) Lift the record head from the band.

(b) Fold a clean, dry KS-2423 cloth into a pad. Remove loose dirt from the band by holding the pad lightly against it to the right of the record-reproduce head with the drum rotating.

(c) Slightly moisten another clean pad with the KS-16328, List 2 cleaner-lubricant and hold the pad lightly against the rotating band taking particular care not to allow the cleaner-lubricant to come in contact

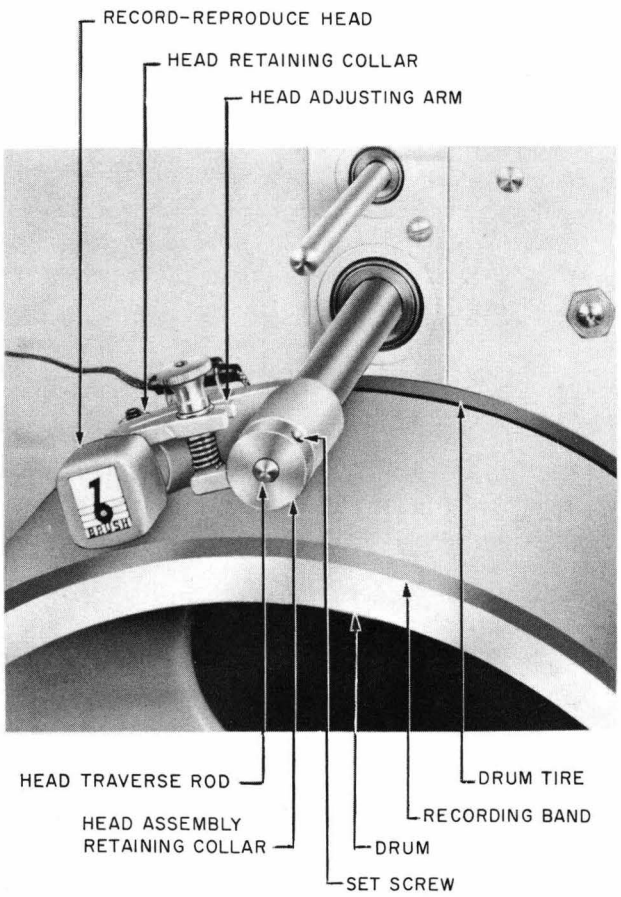

Fig. 4 – Record-Reproduce Head Assembly

with the drum tire. Wipe the band with a clean, dry pad. Repeat the procedure as required.

(4) Clean other parts of the mechanism with a clean, dry KS-2423 cloth.

3.02 ***Lubrication*** (Reqt 2.02)

(1) Apply the specified quantity of oil to the motor bearings and the pulley shaft using the No. 486A oil can.

(2) Before lubricating the lead screw and half-nut threads, remove any oil or dirt from the threads as covered in (a). Then lubricate the screw as covered in (b).

(a) ***Cleaning Lead Screw and Half-nut Threads:*** Hold a KS-2423 cloth directly below the lead screw to prevent petroleum spirits from spattering on the mechanism. Moisten an R-2969 brush with KS-7860 petroleum spirits and brush the lead screw threads with a downward motion on the side of the lead screw opposite the half-nut. Frequently wipe the brush off and moisten it with fresh petroleum spirits. Clean the remaining portion of the screw by turning the screw manually by means of the drum cam. After cleaning the lead screw threads, clean the half-nut threads as follows. Operate the mechanism. Hold the moistened brush against the lead screw threads directly opposite the half-nut while the nut moves approximately 1 inch along the screw. Repeat the procedure, if necessary, to clean the lead screw and half-nut threads. Wipe the lead screw and half-nut threads with a clean, dry KS-2423 cloth.

(b) ***Lubricating Lead Screw and Half-nut Threads:*** Using a clean KS-14164 brush, apply one dip of oil to the surface of the threads on 180° of the side of the lead screw opposite the half-nut. Manually turn the screw 180° by means of the drum cam and apply one dip of oil to the remaining surface of the threads.

3.03 ***Record of Lubrication*** (Reqt 2.03)
(No procedure)

Puck Drive

3.04 ***Puck Pressure*** (Reqt 2.04)

3.05 ***Puck Clearance*** (Reqt 2.05)

3.06 ***Puck Drive Solenoid Stroke*** (Reqt 2.06)

3.07 ***Clearance Between Puck Arm and Buffer on Puck Clearance Adjusting Collar*** (Reqt 2.07)

(1) If any of these requirements is not met, it is necessary to adjust one or more of the collars on the puck drive solenoid plunger. To gain access to these collars proceed as follows. Move the idler pulley away from the drive belt and remove the belt from the pul-

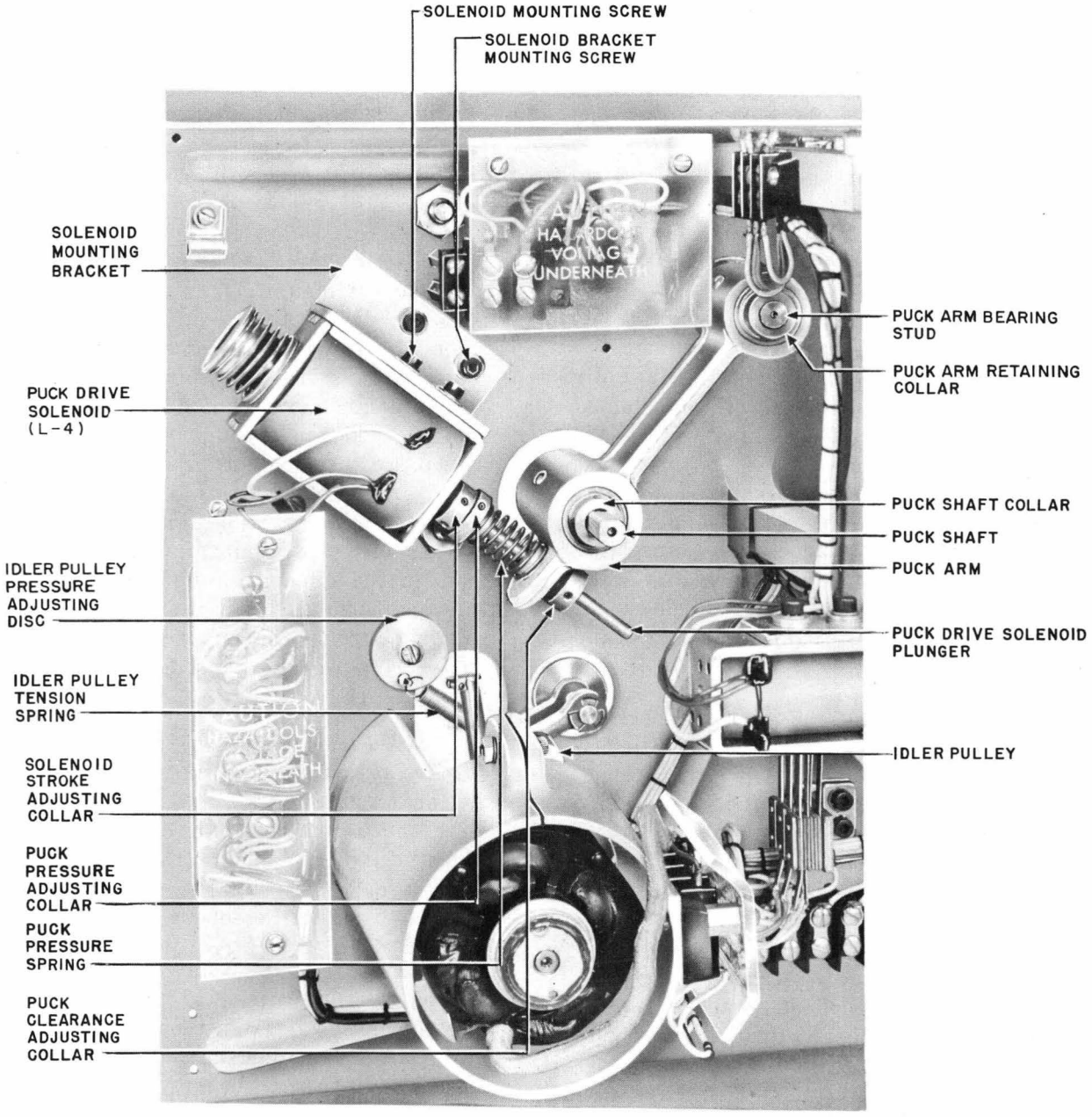

Fig. 5 – Puck Drive (Driven Pulley and Belt Removed)

leys. Loosen the setscrews in the driven pulley with the R-2959 wrench and remove the pulley from the shaft.

(2) To change the puck pressure, loosen one of the pressure adjusting collar setscrews (Fig. 5) with the R-2959 wrench. Then while holding the collar in position, loosen the other setscrew and shift the collar on the plunger to increase or decrease the compression of the spring as required. Increasing the compression of the spring increases the puck pressure. Securely tighten the setscrews. Remount the driven pulley and drive belt and recheck the requirement.

(3) To change the puck clearance, loosen one of the clearance adjusting collar setscrews with the R-2959 wrench. Then while holding the collar in position, loosen the other setscrew and shift the collar slightly toward the solenoid to increase the puck clearance or away from the solenoid to decrease the clearance. Securely tighten the setscrews and recheck the requirement. Remount the driven pulley and drive belt. Check requirements 2.04 and 2.07.

(4) To change the puck drive solenoid stroke, loosen the setscrews in the stroke adjusting collar with the R-2959 wrench. Manually operate the solenoid. Then allow the solenoid plunger to move back 1/8 inch. Hold the plunger in this position and, with the stroke adjusting collar firmly against the solenoid pole-piece, tighten the setscrews in the collar. This procedure will be facilitated by inserting the wrench in one of the setscrews and shifting the collar with the wrench. Recheck the requirement and check requirements 2.05 and 2.04.

(5) If requirement 2.07 is not met, check requirements 2.05 and 2.06 and adjust if necessary. If the requirement is still not met, adjust the puck pressure toward the specified minimum. Recheck the requirement.

3.08 ***Freedom of Movement of Puck Drive Solenoid Plunger*** (Reqt 2.08)

(1) Move the idler pulley away from the drive belt and remove the belt from the pulleys. Loosen the setscrews in the driven pulley with the R-2959 wrench and remove the pulley.

(2) If the bind is caused by misalignment of the solenoid plunger with the hole in the puck arm, reposition the solenoid as follows. Loosen the solenoid bracket mounting screws or the solenoid mounting screws with the R-2671 wrench. Shift the solenoid to eliminate the bind and securely tighten the screws. Recheck the requirement.

(3) If the bind is caused by dirt or gummy deposits on the solenoid plunger or in the solenoid core, clean the solenoid and plunger as follows. Loosen the setscrews in the clearance adjusting collar using the R-2959 wrench and remove the collar from the solenoid plunger. Remove the solenoid bracket mounting screws using the R-2671 wrench and remove the solenoid and bracket. Remove the pressure spring from the solenoid plunger. Loosen the setscrews in the pressure and stroke adjusting collars with the R-2959 wrench and remove the collars. Remove the plunger from the solenoid. Clean the plunger with a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and wipe dry with a clean, dry cloth. Clean the inside of the solenoid core with a cotton swab slightly moistened with petroleum spirits and wipe dry with a clean, dry swab. Also, clean the hole in the puck arm through which the solenoid arm passes using a cotton swab slightly moistened with petroleum spirits and wipe dry with a clean, dry swab. Remount the parts in reverse order of removal. Adjust the alignment of the solenoid plunger with the hole in the puck arm as covered in (2). Adjust the solenoid stroke, the puck clearance, and the puck pressure as covered in 3.04-3.07 (1) through (4).

3.09 ***Puck End Play*** (Reqt 2.09)

(1) To adjust the end play of the puck arm on its bearing stud loosen the setscrews in the puck arm retaining collar on the bearing stud (Fig. 5) using the R-2959 wrench. Shift the collar slightly on the stud and securely tighten the setscrews.

(2) To adjust the end play of the puck on the puck arm proceed as follows. Move the idler pulley away from the drive belt and remove the belt from the pulleys. Loosen the setscrews in the driven pulley with the R-2959 wrench and remove the pulley from the shaft. Loosen the setscrews in the collar on the puck shaft (Fig. 5), shift the collar slightly on the shaft, and securely tighten the setscrews. Recheck the requirement. Remount the driven pulley and the drive belt.

Drum Brake

3.10 ***Brake Shoe Clearance*** (Reqt 2.10)

(1) With the brake release magnet operated as covered in the requirement, loosen the brake release magnet bracket mounting screws

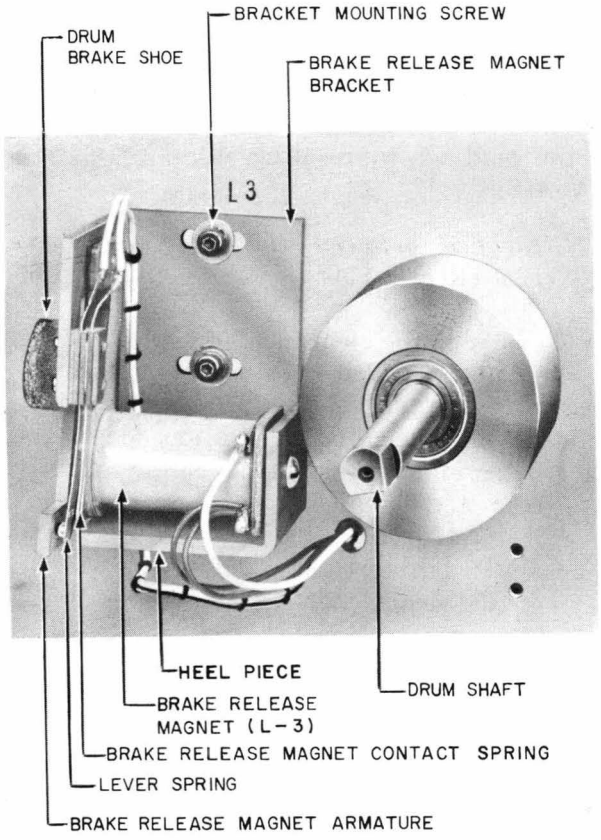

Fig. 6 – Drum Brake Release Magnet (Drum Removed)

using the R-2671 wrench. Slightly shift the bracket to obtain the required clearance. Tighten the setscrews and recheck the requirement and also requirement 2.11.

3.11 ***Operation of Brake*** (Reqt 2.11)

(1) If the requirement is not met, reposition the brake release magnet as covered in 3.10 to reduce the brake shoe clearance. If the requirement is still not met proceed as follows.

(2) Loosen the setscrews in the recording drum hub using the R-2958 wrench. Lift the record-reproduce head away from the surface of the recording band. Remove the drum and place it on a clean surface. Clean the inner drum surface with which the drum brake shoe comes in contact using a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and wipe it dry with a clean, dry cloth.

Caution: Take care that the petroleum spirits do not contact the recording band or drum tire.

(3) Clean the braking surface of the drum brake shoe with a KS-2423 cloth slightly moistened with KS-8372 trichloroethylene. If, after cleaning, the surface has a glazed or polished appearance, rub it lightly with the fine flint abrasive paper.

(4) Check whether, with the drum removed, there is a gap of at least 1/8 inch between the magnet heelpiece and the armature. If necessary, manually adjust the position of the armature to obtain this gap.

(5) Hold the record-reproduce head in a raised position and remount the drum so that the setscrews in the hub will bear against the flats on the drum shaft when tightened. Securely tighten the setscrews. Recheck the requirement. If the requirement is still not met, replace the brake release magnet armature. Check requirement 2.10.

3.12 ***Drum Brake Release Magnet Contact Spring Requirements*** (Reqt 2.12)

(1) Adjust the springs as required using the KS-6015 duck-bill pliers. Apply the pliers as close to the insulators as possible. Avoid excessive bending of the springs.

Belt Drive

3.13 ***Belt and Pulley Alignment*** (Reqt 2.13)

(1) To center the belt on the driven pulley, adjust the alignment of the motor pulley by means of the motor mount mounting screws and bushings (Fig. 1). To do this, slightly loosen one or more of the screws using the R-2671 wrench and turn the associated bushing in or out as required using the No. 417A wrench. Securely tighten the screws.

3.14 ***Idler Pulley Pressure*** (Reqt 2.14)

(1) Hold the idler pulley pressure adjusting disc stationary and loosen the mounting screw (Fig. 5) with the 4-inch regular screw-

driver. Turn the disc to increase or decrease the tension of the spring as required and securely tighten the screw.

Head Traverse Mechanism

3.15 ***Engagement of Half-nut with Lead Screw*** (Reqt 2.15)

(1) If both the top and bottom of the half-nut do not engage the lead screw equally, or if the threads of the nut and screw cross, the nut is improperly positioned on the arm. Reposition the nut as follows. Loosen the half-nut mounting screws using the R-2670 wrench. With the cut-through cam follower approximately at the center of the cam lobe and the half-nut in its start position, manually operate the lead screw solenoid. Adjust the position of the half-nut so that it fully engages the lead screw thread. Hold the half-nut in this position and tighten the mounting screws. Recheck the requirement. Then apply a small amount of KS-6824 sealing compound around the head of each mounting screw and the adjacent surface of the half-nut arm.

(2) If the half-nut is properly positioned on the arm but the nut does not engage the screw because it strikes the top of the lead screw threads, the drum cam is improperly positioned on the lead screw. Reposition the drum cam as follows. With the half-nut in its start position, turn the lead screw until the half-nut fully engages the lead screw threads when the lead screw solenoid is manually operated. Loosen the setscrews in the cam using the R-2958 wrench and rotate the cam until the cut-through cam follower rests at the center of the cam lobe. Again operate the lead screw solenoid manually and check that the half-nut fully engages the lead screw threads without moving from its start position. Tighten the setscrews in the cam. Recheck the requirement and also requirement 2.22.

3.16 ***Pressure of Half-nut on Lead Screw*** (Reqt 2.16)

(1) To change the pressure of the half-nut on the lead screw, loosen one of the pressure adjusting collar setscrews (Fig. 7) with the R-2959 wrench. Then, while holding the collar in position, loosen the other setscrew and shift the collar on the plunger to increase or decrease the compression of the spring as required. Increasing the compression of the spring increases the pressure of the half-nut on the lead screw. Securely tighten the setscrews.

3.17 ***Clearance between Half-nut and Lead Screw*** (Reqt 2.17)

(1) To change the clearance, loosen one of the half-nut clearance adjusting collar setscrews (Fig. 7) with the R-2959 wrench. Then, while holding the collar in position, loosen the other setscrew and shift the collar slightly away from the solenoid to increase the clearance or toward the solenoid to decrease the clearance. Securely tighten the setscrews and recheck the requirement. Check requirement 2.16.

3.18 ***Clearance between Return Channel Arm and Buffer on Adjusting Collar*** (Reqt 2.18)

(1) Adjust the clearance between the half-nut and lead screw toward the specified minimum following procedures covered in 3.17. Recheck the requirement and requirements 2.17 and 2.16. If the requirement is still not met proceed as covered in (2).

(2) Loosen the solenoid mounting screws using the R-2671 wrench. Shift the solenoid away from the return channel arm. Make sure that the solenoid plunger is approximately centered in the hole in the solenoid bracket and securely tighten the mounting screws. Recheck the requirement and requirement 2.16.

3.19 ***Freedom of Movement of Lead Screw Solenoid*** (Reqt 2.19)

(1) If the bind is caused by misalignment of the solenoid with the holes in the solenoid bracket and the return channel arm, reposition the solenoid as follows. Loosen the solenoid mounting screws with the R-2671 wrench. Shift the solenoid to eliminate the bind and securely tighten the screws. Recheck the requirement and requirements 2.16, 2.17, and 2.18.

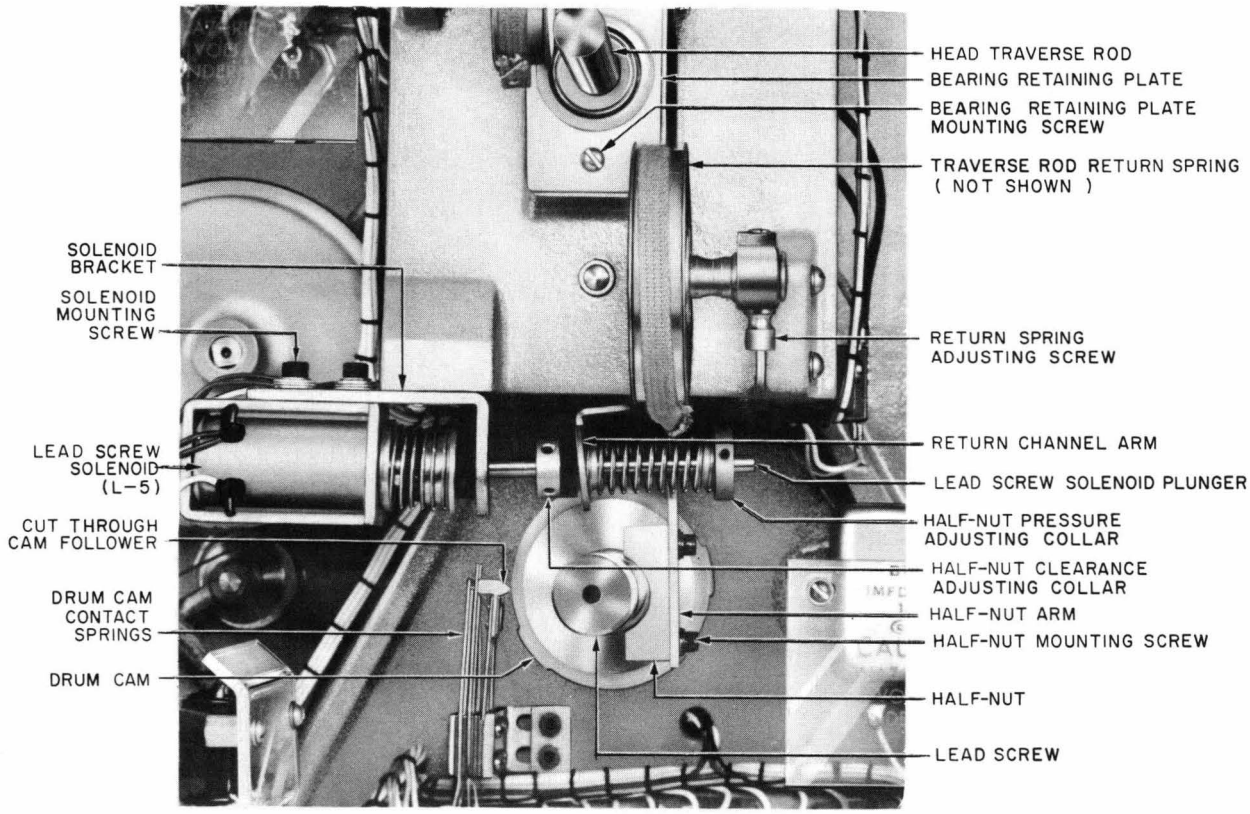

Fig. 7 – Head Traverse Mechanism

(2) If the bind is caused by dirt or gummy deposits on the solenoid plunger or in the solenoid core, clean the parts as follows. Loosen the setscrews in the pressure adjusting collar with the R-2959 wrench and remove the collar and pressure spring. Loosen the setscrews in the clearance adjusting collar using the wrench. Remove the solenoid mounting screws using the R-2671 wrench, and remove the solenoid and clearance adjusting collar. Remove the plunger from the solenoid and the spring and two nonmetallic washers from the plunger. Clean the plunger with a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and wipe dry with a clean, dry cloth. Clean the inside of the solenoid core with a cotton swab slightly moistened with petroleum spirits and dry with a clean, dry swab. Remount the parts in reverse order of removal taking care that the solenoid plunger is approximately centered in the holes in the solenoid bracket and return channel arm. Check requirements 2.16, 2.17, and 2.18.

3.20 ***Tension of Head Traverse Rod Return Spring*** (Reqt 2.20)

(1) Adjust the tension of the return spring by means of the return spring adjusting screw (Fig. 7) using the 4-inch regular screwdriver. Turning the screw clockwise as viewed from below the screw increases the tension and turning it counterclockwise decreases the tension.

3.21 ***Freedom of Movement of Head Traverse Rod*** (Reqt 2.21)

(1) Check requirement 2.17. If this requirement is met, clean the head traverse rod with a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and wipe it dry with a clean, dry cloth. Recheck the requirement.

(2) If the requirement is still not met, adjust the tension of the head traverse rod re-

turn spring toward the specified maximum as covered in 3.20. Recheck the requirement. If the requirement is still not met, clean and lubricate the head traverse rod bearings as covered in (3) through (13).

(3) Referring to Fig. 4, loosen the setscrew in the head assembly retaining collar with the R-2959 wrench and remove the collar. Remove the head assembly from the head traverse rod. Loosen the setscrews in the recording drum hub using the R-2958 wrench and remove the drum.

(4) At the rear of the mechanism, measure the distance the head traverse rod projects beyond the traverse rod bearing retaining plate (Fig. 7), when the traverse rod is in its start position. Make a note of this dimension.

(5) Using the No. 418A wrench, remove the locknut from the screw holding the head traverse rod return spring tape to the half-nut arm. While holding the tape, remove the screw with the 3-inch cabinet screwdriver and then gradually relieve the spring tension.

(6) While holding the variable limit return spring tape, remove the screw securing the tape to the variable limit switch. Gradually relieve the tension of the spring. Using the 4-inch regular screwdriver, remove the variable limit return spring assembly mounting screws (Fig. 8) and remove the assembly.

(7) Remove the traverse rod ground lead from the terminal strip mounting screw by removing the screw with the 3-inch cabinet screwdriver (Fig. 8). Using the R-2670 wrench, loosen the setscrew holding the half-nut arm to the head traverse rod. Move the rod toward the front of the mechanism until the metal insert against which the setscrews were tightened is accessible and remove the insert. Hold the half-nut arm and withdraw the traverse rod from the rear of the mechanism and remove the arm.

(8) Using the 3-inch cabinet screwdriver, remove the screws which mount the variable limit release magnet armature and remove the armature.

(9) Using the 4-inch regular screwdriver, remove the bearing retaining plate mounting screws and remove the plate. Remove the traverse rod bearing. Similarly, remove the other traverse rod bearing from the front of the mechanism. Clean each bearing as covered in (10).

(10) ***Cleaning Bearings***

(a) Pour KS-7860 petroleum spirits into a suitable, clean receptacle to a depth of approximately 1-1/2 inches. During the cleaning operation described below, replace the petroleum spirits whenever it becomes dirty.

(b) Grasp the bearing with the No. 319B lamp cap extractor and move it back and forth in the petroleum spirits to loosen dirt in the rows of balls.

(c) Stand the bearing on end, making sure that it is completely immersed in the petroleum spirits. Clean the head traverse rod with a KS-2423 cloth slightly moistened with petroleum spirits. Insert the large end of the rod into the bearing. Using the lamp cap extractor, move the bearing up and down on the rod several times so that it is alternately lifted from and immersed in the petroleum spirits.

(d) Remove the rod and bearing from the petroleum spirits. Wipe the rod with a dry KS-2423 cloth. Then run the rod back and forth through the bearing several times rotating the bearing on the rod. Wipe the

rod and repeat the procedure several times to remove petroleum spirits from the bearing. If, during this procedure, particles of dirt appear on the rod or if the bearing does not move freely on the rod, repeat the cleaning.

(11) Lubricate the bearings as follows. Using a clean, dry R-2919 brush apply a thin film of KS-16326, List 1 oil to the head traverse rod. Run the rod back and forth several times through the two bearings. Remove the oil from the rod with a clean KS-2423 cloth slightly moistened with petroleum spirits and wipe dry with a clean KS-2423 cloth.

(12) Remount the bearings and bearing retaining plates and tighten the retaining plate mounting screws. Position the half-nut arm with its guide roller in the return channel and the hole in its mounting block in line with the traverse rod bearings, and mount the traverse rod. Position the metal insert in the flat on the traverse rod. Locate the half-nut arm in its start position and position the traverse rod so that it projects beyond the rear bearing retaining plate the same distance noted in (4) and the insert on the rod is directly under the setscrews in the block. Tighten the setscrews.

(13) Remount the other parts that were removed in reverse order of removal. Adjust the tension of the head traverse rod and variable limit return springs to meet requirements 2.20 and 2.26, respectively. Check requirements 2.24, 2.25, 2.30, and 2.31.

3.22 ***Head Traverse Rod Index Switch Contact Spring Requirement*** (Reqt 2.22)

(1) Move the lever spring actuator away from the lever spring by means of the head traverse rod (Fig. 8). Using the KS-6015 duck-bill pliers, adjust the lever spring if necessary so that the spring is approximately straight. Adjust the other springs as required using the pliers. Apply the pliers as close to the insulators as possible. Avoid excessive bending of the springs.

3.23 ***Head Traverse Rod Limit Switch Contact Spring Requirements*** (Reqt 2.23)

(1) Using the KS-6015 duck-bill pliers, adjust the lever spring if necessary so that the spring is approximately straight. Adjust the other springs as required using the pliers. Apply the pliers as close to the insulators as possible. Avoid excessive bending of the springs.

Variable Limit Mechanism

3.24 ***Release of Variable Limit Rod*** (Reqt 2.24)

(1) Loosen the variable limit magnet bracket mounting screws (Fig. 8) with the R-2671 wrench. Adjust the position of the magnet as required to release or hold the rod as covered in the requirement. Securely tighten the screws and recheck the requirement.

3.25 ***Variable Limit Magnet Armature Stud Pressure*** (Reqt 2.25)

(1) Check requirement 2.24. If this requirement is met, remove the armature mounting screws using the 4-inch regular screwdriver and remove the armature and clamp plate. Tension the armature hinge spring in the required direction using the KS-6015 duck-bill pliers. To do this, place the clamp plate in position over the holes in the hinge spring and mark the location of the inner edge of the clamp plate on the spring. Bend the spring at this mark. Remount the armature and recheck the requirement. Check requirement 2.24.

3.26 ***Variable Limit Return Spring Tension*** (Reqt 2.26)

(1) Adjust the tension of the return spring by means of the return spring adjusting screw (Fig. 8) using the 4-inch regular screwdriver. Turning the screw clockwise, as viewed from above the screw, increases the tension and turning it counterclockwise decreases the tension.

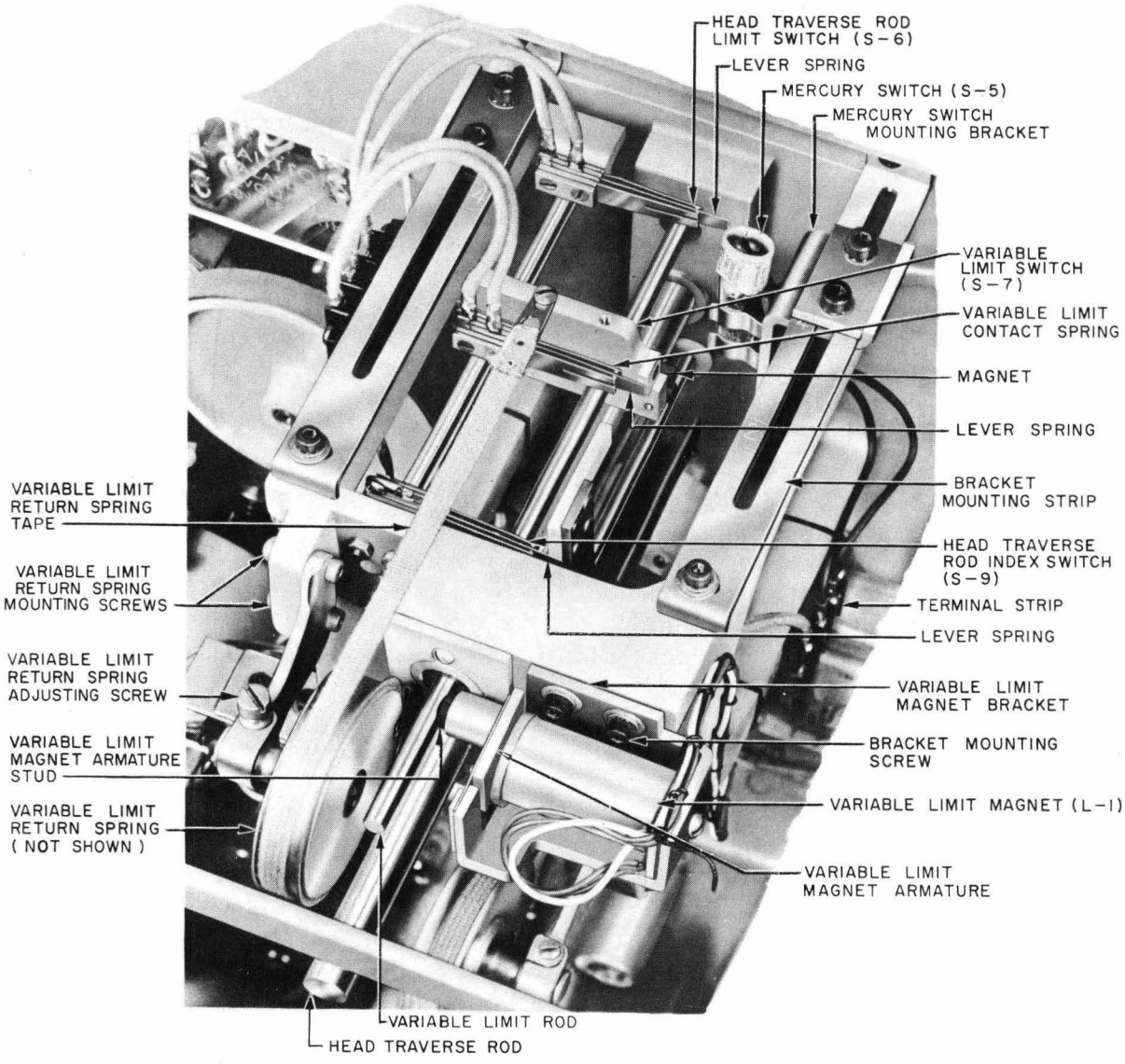

Fig. 8 — Head Traverse and Variable Limit Mechanisms — Top View

3.27 ***Freedom of Movement of Variable Limit Rod*** (Reqt 2.27)

(1) Check requirement 2.24. Also check that the tape of the variable limit return spring does not catch or rub on adjacent parts. If the requirement is still not met, proceed as covered in (2).

(2) Clean the variable limit rod with a KS-2423 cloth slightly moistened with KS-7860 petroleum spirits and wipe it dry with a clean, dry cloth.

(3) If the requirement is still not met, adjust the tension of the variable limit return spring toward the specified maximum as covered in 3.26. Recheck the requirement. If the requirement is still not met, clean and lubricate the variable limit rod bearings as covered in (4) through (10).

(4) Remove the record head assembly and drum as covered in 3.21 (3).

(5) At the rear of the mechanism, measure the distance the variable limit rod projects beyond the bearing retaining plate when

the variable limit switch is in its start position. Make a note of this dimension.

(6) Disconnect the variable limit return spring tape and remove the variable limit release magnet armature as covered in 3.21 (6) and (8).

(7) Using the R-2959 wrench loosen the setscrews holding the variable limit switch to the variable limit rod, and withdraw the rod from the rear of the mechanism. Remove the bearing retaining plates as covered in 3.21 (9) and remove the bearings.

(8) Clean and lubricate the bearings following procedures similar to those covered in 3.21 (10) and (11).

(9) Remount the bearings and bearing retaining plates and tighten the retaining plate mounting screws. Locate the variable limit switch in its start position and position the variable limit rod so that it projects beyond the rear bearing plate the same distance noted in (5). Tighten the variable limit switch setscrews.

(10) Remount the other parts that were removed in reverse order of removal. Adjust the tension of the variable limit return spring to meet requirement 2.26. Check requirements 2.24, 2.25, 2.30, and 2.31.

3.28 ***Variable Limit Switch Contact Spring Requirements*** (Reqt 2.28)

(1) Using the KS-6015 duck-bill pliers adjust the lever spring, if necessary, so that the spring is approximately straight. Adjust the other springs as required using the pliers. Apply the pliers as close to the insulators as possible. Avoid excessive bending of the springs.

Mercury Switch

3.29 ***Operation of Mercury Switch*** (Reqt 2.29)

(1) If the requirement is not met, either the switch is defective or the clearance between the switch and the magnet is too great. Adjust the clearance as covered in (2). If the requirement is still not met, replace the switch.

(2) The clearance between the switch and the magnet may be changed by repositioning the magnet on the variable limit block or the switch bracket on its mounting strip, or by shifting the mounting strip. Use the No. 207 offset screwdriver for the magnet mounting screw and the R-2485 wrench for the bracket and strip mounting screws. After changing the clearance, tighten the screws securely. Recheck the requirement.

Record-Reproduce Head Assembly

3.30 ***Freedom of Movement of Head Assembly*** (Reqt 2.30)

(1) If the requirement is not met, check whether there is play between the head assembly and the head assembly retaining collar. If there is no play at this point, loosen the setscrews in the collar with the R-2959 wrench. Slightly shift the collar, making sure that requirement 2.31 is met. Securely tighten the setscrews. If necessary to meet requirement 2.31, slightly shift the head adjusting arm retaining collar.

(2) If there is play between the head assembly and the head assembly retaining collar, loosen the collar setscrews with the R-2959 wrench and remove the collar and head assembly. Take care not to lose the two nonmetallic washers. Check for bind in the ball bearings of the head assembly. If the ball bearings bind, replace the head assembly. If the bearings are free, clean the parts as covered in (3).

(3) Clean the head assembly, the collar, the washers, and the head traverse rod with a clean KS-2423 cloth slightly moistened with KS-7860 petroleum spirits. Then wipe the parts with a clean, dry cloth.

(4) Remount the parts making sure that a washer is positioned adjacent to each head assembly bearing and that requirement 2.31 is met.

Caution: Exercise care that the KS-7860 petroleum spirits does not contact the recording band or the drum tire.

3.31 ***Record Head End Play*** (Reqt 2.31)

(1) If the record head end play exceeds the specified maximum, loosen the setscrews in the head assembly retaining collar with the R-2959 wrench, shift the collar slightly and securely tighten the setscrews. Also, if necessary, adjust the position of the head adjusting arm retaining collar using a similar procedure.

Cut-Through, Drum Index, and Flashing Switches

3.32 ***Contact Spring Requirements*** (Reqt 2.32)

(1) ***Cut-Through Cam Contact Springs:*** Adjust the springs as required using the KS-6015 duck-bill pliers. Apply the pliers as close to the insulators as possible. Avoid excessive bending of the springs.

(2) ***Drum Index and Flashing Cam Contact Springs:*** First make sure that the cut-through cam contact springs meet the requirements. Then remove the spring assembly bracket mounting screws using the R-2671 wrench and remove the bracket from the panel taking care not to damage the leads. Using the No. 415B spring adjustor for the thin springs and the No. 416B adjustor for the heavy springs, adjust the drum index and flashing cam springs to be in line with the corresponding cut-through cam springs. Remount the spring assembly bracket and mounting screws. Adjust the position of the bracket so that the cut-through cam springs meet the requirements and securely tighten the screws. Recheck the requirements.

Erase Coil

3.33 ***Gap Between Erase Coil Core and Recording Band*** (Reqt 2.33)

(1) To adjust the gap between the erase coil core and the recording band, loosen the erase coil mounting screws using the R-2671 wrench, reposition the coil as required, and securely tighten the screws.

Electrical and Operation Requirements

3.34 ***Electrical Requirements*** (Reqt 2.34)

(1) ***Variable Limit Magnet:*** If the variable limit magnet fails to meet its operate requirement, check requirements 2.24, 2.25, and 2.27. If the requirement is still not met, replace the magnet.

(2) ***Drum Brake Release Magnet:*** If the drum brake release magnet fails to meet its operate requirement, check requirement 2.12. If the requirement is still not met, replace the magnet.

(3) ***Puck Drive Solenoid:*** If the puck drive solenoid fails to meet its operate requirement check requirements 2.04 through 2.08. If the requirement is still not met, replace the solenoid.

(4) ***Lead Screw Solenoid:*** If the lead screw solenoid fails to meet its operate requirement, check requirements 2.15 through 2.19 If the requirement is still not met, replace the solenoid.

3.35 ***Operation Requirement*** (Reqt 2.35)

(1) ***General:*** If the requirement is not met, it may be due to one of the following conditions which can be corrected as indicated.

Caution: When checking for faulty connections in the record head circuit, never use testing equipment which might subject the head coil to a current in excess of 0.5 milliampere. It is preferable to check these connections manually and visually.

(2) ***No Output from Record-reproduce Head:*** This may be due to the following.

(a) The circuit from the head may be defective. Check for broken leads and loose connections.

(b) The head may not be touching the recording band. Check requirement 2.30.

(c) The head may not rest on the recording band at the magnetic gap between the pole pieces. Reposition the head as covered in Section 034-353-701.

(d) If the above procedures do not correct the trouble and the associated amplifier is functioning properly, replace the head.

(3) ***Output Level Low:*** This may be due to the following.

(a) There may be dirt or foreign material on the laminations of the head, preventing good contact between the pole piece and the recording band. To correct this clean the pole piece as covered in 3.01.

(b) The head may not rest on the recording band at the magnetic gap between the pole pieces. Reposition the head as covered in Section 034-353-701.

(c) The head assembly may be binding on the head traverse rod. Check requirement 2.30.

(d) If the above procedures do not correct the trouble and the associated amplifier is functioning properly, replace the head.

(4) ***Output Level Varies:*** This may be due to the following.

(a) The record-reproduce head may chatter due to dirt or foreign material on the surface of the recording band, or due to surface irregularities on the band. Clean the band as covered in 3.01. If this does not clear the trouble, it may be necessary to replace the band.

(b) The head assembly may be binding on the head traverse rod. Check requirement 2.30.

(c) The head may have excessive end play. Check requirement 2.31.

(d) The circuit from the head may be defective. Check for loose or poor connections.

(5) ***Output Shows Traces of Previous Recording or is Noisy.***

(a) The recording band or the record-reproduce head may be dirty. Clean the band and head as covered in 3.01.

(b) The erase coil may be improperly positioned. Check requirement 2.33. If this requirement is met but the recording shows traces of the previous recording, reduce the gap between the erase coil pole piece and the recording band toward the specified minimum. If the recording contains a noisy interval occurring once per drum revolution, increase the gap toward the specified maximum.

(6) ***Output Shows Magnetic Noise:*** (A relatively strong background hiss.) This may be due to the following.

(a) There may be residual magnetism in the head. Loosen the setscrews in the head assembly retaining collar and remove the collar. Remove the head assembly from the head traverse rod and hold it on top of the erase coil so that the head is in contact with the coil. Move the power switch to its ON position. Manually operate the G relay in the control unit and hold it operated until the F relay operates. This will energize the erase coil and start rotation of the drum. Hold the head against the coil while the drum makes approximately three quarters of a revolution. Then move it away from the coil at a uniform rate so that it is at least 6 inches from the coil when the drum completes one revolution. When the drum stops, move the power switch to its OFF position. Remount the head assembly making sure that requirement 2.31 is met.

(7) ***Output Shows Excessive Hum:*** This may be due to the following.

(a) The equipment may be improperly grounded. Check the ground connections.

(b) There may be strong ac fields in the vicinity of the recorder-reproducer. Turn off the adjacent equipment and note whether the hum disappears. Take whatever steps are necessary to remove the trouble.

(c) The circuit from the head may be defective. Check for loose connections.

(d) If the above procedures do not correct the trouble and the associated amplifier is functioning properly, replace the head.

(8) ***Output Shows Variation in Speed of Reproduction:*** This may be due to the following.

(a) The drive belt may be slipping. Check requirements 2.13 and 2.14 and clean the surfaces of the pulleys. If this does not correct the trouble, replace the drive belt.

(b) The puck may be slipping on the drum tire. Check requirement 2.04. Clean the puck and drum tire. If this does not correct the trouble, replace the drum tire.

(c) The motor may be defective. In this case, replace the motor.