

# **SERVICE INSTRUCTIONS**

**Sears** **SOUNDSTAGE**  
**8-MM SOUND PROJECTOR**  
**DESIGN 9254**  
**MODEL 584.92540**

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# Introduction

## GENERAL.

This instruction book has been prepared to aid in servicing the Design 9254 Tower 8-mm Magnetic Sound Motion Picture Projector. The projector is automatic threading and is equipped with a two-position switch for silent and sound operation. The amplifier is mounted in the base, and the four by six-inch oval speaker is mounted in the back cover. The projector operates on 120 volt, 60 cycle alternating current.

An illustrated parts list is included at the rear of the instruction book to identify replacement parts and assemblies. The illustrations are indexed in a suggested sequence of parts removal, with attaching parts immediately preceding those items which they attach. Where disassembly and reassembly of parts is purely mechanical, no attempt has been made to provide detailed instructions. When making specific replacements or repairs, the serviceman must use his own judgement in eliminating unnecessary steps of procedure.

## PRINCIPLES OF AUTO-LOAD THREADING.

a. Note, in Figure B, that the threading system lock lever (19) must be moved to the left to place the automatic system in threading position. Do not press down on the upper loop former as is common in earlier automatic film threading models. A spring-loaded latch will lock the upper loop former in position A and move idler roller (14) to its closed position.

b. For silent film operation, the film path knob is set at the SILENT position, thereby pivoting the film deflector (10) counterclockwise and guiding the film directly to the take-up sprocket (12). The film then passes out through the opening (13) and is guided down around idler roller (14) to the take-up reel.

c. For sound film operation, the film path knob is set at the SOUND position, thereby pivoting the film deflector guide clockwise. In this position, the film is directed downward in the formed plastic guide path; then up between the magnetic head (15) and its mounting block, between the capstan (16) and pressure roller (17) and up around idler roller (18). A formed plastic guide directs the film to the take-up sprocket (12) and the film passes out through the opening (13) and is guided down around the idler roller (14) to the take-up reel.

d. In actual threading, the system is placed in automatic threading position (step a) and the film path knob is set at the desired (SILENT or SOUND) position. The end of the film is trimmed with the film cutter on the projector base. Place the power switch in MOTOR position and the direction control lever in FORWARD position; then insert the cut end of the film into the loading slot (1). When 20 to 24 inches of film have passed through the film path, stop the projector and engage the cut end with the film reel. Press idler roller (14) to position B to place upper loop former in operating position.

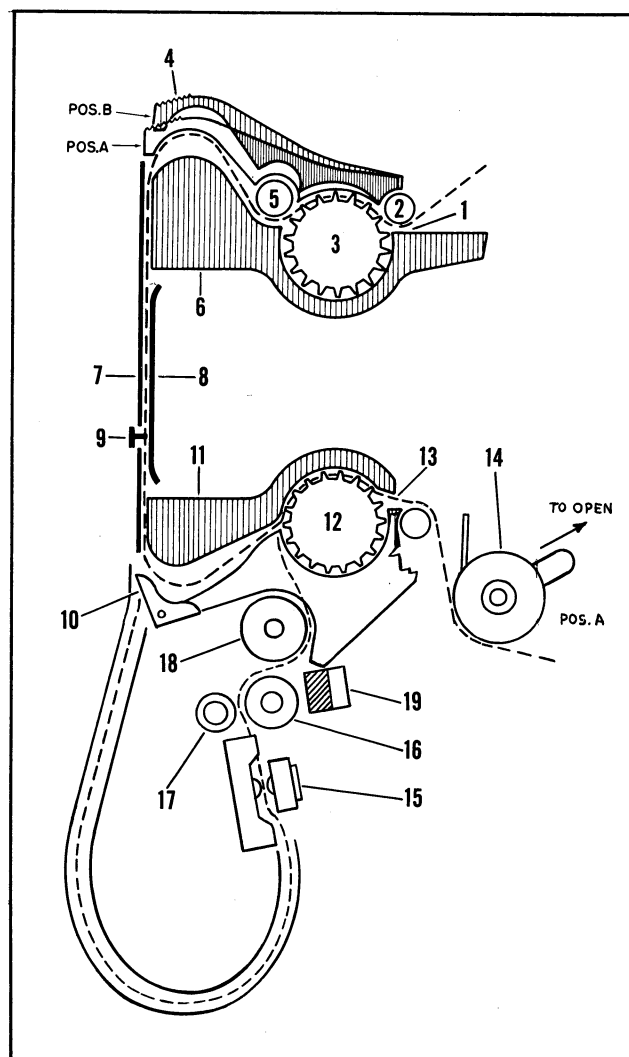


Figure B. Film Path — Self-Threading Procedure

**SPECIAL MAINTENANCE PRECAUTIONS.**

For the most part, disassembly and reassembly of the projector is comparatively simple. However, be sure to note the special precautions and adjustment procedures listed in the instructions.

When lubricating projector parts during reassembly, it is recommended that only Bell & Howell grease

(Spec. 1956) and oil (Spec. 310) be used.

If Bell & Howell lubricants are not immediately available, use only the best grades of ball bearing grease and projector oil which are commercially available.

Special tools and fixtures required for the proper repair and adjustment of the projector are illustrated in Figure C.

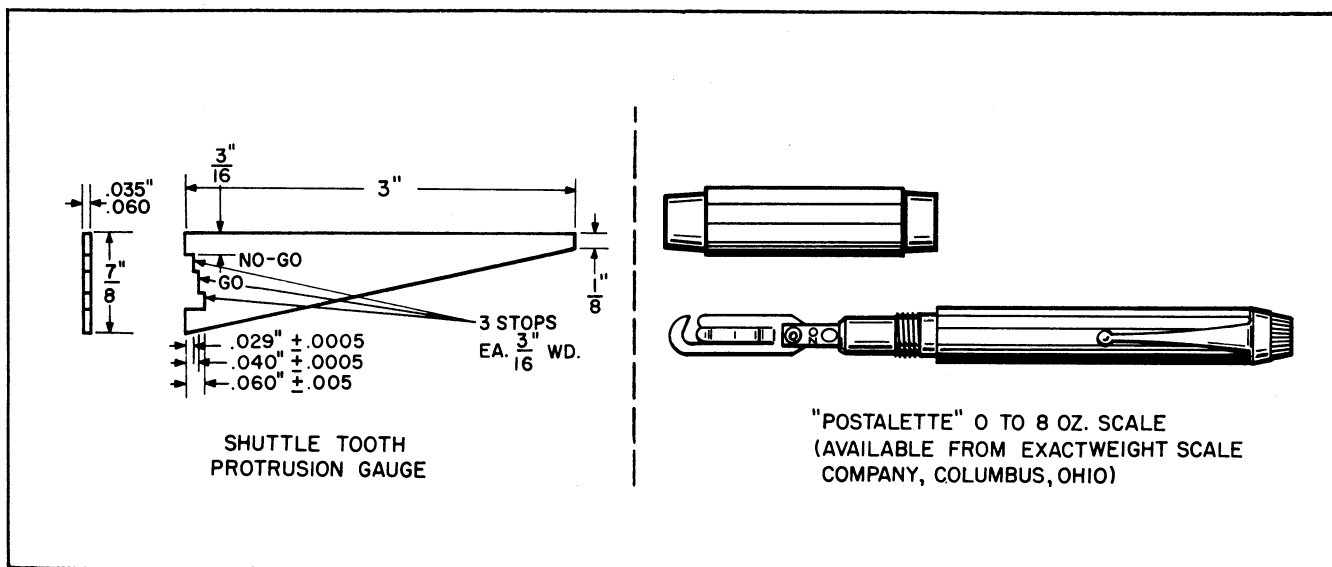


Figure C. Special Tools

# Disassembly

## 1. GENERAL INSTRUCTIONS.

a. When optical parts, such as the projection lamp and lens, are removed from the projector, wrap them in tissue paper to protect them from possible damage.

b. When removing riveted parts for replacement, the old rivet must be drilled out of the casting. Use a drill equal to or slightly smaller than, the diameter of the rivet to be installed.

c. When repairing projectors, remember that cleanliness of surroundings and orderliness of disassembled parts is very important. When attaching parts (screws, nuts, washers) are removed, reattach them, loosely, to the removed part of the casting to prevent loss.

## 2. REMOVAL OF PARTS IN FIGURE 1. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. To remove the front cover (1), press down on the catch button (1C) to release the cover catch (1B) from the slot in the front mechanism plate.

b. To remove the lamphouse cover (3), loosen the cover screw (3B). Remove the projection lamp (4) by pulling straight upward. Do not rock the lamp in its socket.

c. To remove the rear cover and speaker assembly (7), unscrew all eight hex head screws (5); then lay projector gently on its side and take out the two screws (6) which tap into the cover through the base. Pull cover away carefully to the limit of speaker and transformer leadwires. Tag all leadwires as they are disconnected from the terminal strip at the rear of the amplifier. If speaker (7H) requires replacement, four rivets (7A) must be removed to expose the speaker mounting rivets (7F) for removal.

d. Remove the film guide cover (15) by pulling firmly on the cover knob. Remove two screws (16 and 17) and lift off the film guide (18).

e. Loosen three setscrews (19) and remove knobs (20, 21 and 22). Tilt projector carefully on its side and remove the two bottom control housing screws (25). Then set projector on its base and remove two control housing-to-main plate screws (26 and 27). Work the control housing carefully from the projector base and main plate, separating the riveted female connection of the power cord (45) from the male connection on the main plate. The control housing parts (29 through 45) now can be removed for replacement if necessary.

f. Removal of the control housing exposes amplifier parts for inspection and replacement of tubes. If complete amplifier removal is required, the leadwires from the magnetic head first must be unsoldered from the amplifier terminal board; then remove four screws (46) and lift the amplifier out through the front of the base.

## 3. REMOVAL OF PARTS IN FIGURE 2. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Removal of screw (1) will permit the withdrawal of the feed reel arm assembly (3) and the assembled spindle parts (6 through 10) which are secured by screw (2). The spur gear (4) can be lifted from the gear stud of the feed reel arm support assembly (29). Note the manner in which spring (5) is installed.

b. Removal of the two screws (14) will permit the withdrawal of the take-up reel arm assembly (16) and the assembled spindle parts (19 through 23) which are secured by screw (15). The three spur gears (17 and 18) can be lifted from the gear studs of the take-up reel arm support assembly (30).

c. The reel spindle assemblies (10 and 23) can be disassembled by removing the plugs (10C and 23C) and withdrawing the springs and keys. Note the manner in which the springs (10A and 23A) are installed.

d. At the back of the main plate, remove two retaining rings (31) and large spur gears (32). Remove retaining ring (33) and disassemble the washer (34), ratchet (35), spacer washer (36), two bevel gears (37) and the drive gear plate assembly (38) from the mounting stud of the gear mounting plate (44). Remove retaining rings (39) and spur gears (40). Remove screw (41) and eccentric (42).

e. Removal of two retaining rings (27) will permit the disassembly of the bearings (28) and reel arm supports (29 and 30). The tension springs (45), cam washers (46) and steel balls (47) will fall from position as the bearings are withdrawn from the main frame.

## 4. REMOVAL OF PARTS IN FIGURE 3. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Be careful not to lose motor discharge spring (25) when removing motor mounting bracket (24).

b. Engage screwdriver blade with slotted front end of flywheel shaft and hold shaft firmly while removing flywheel nut (30). Be careful not to drop flywheel (32).

5. REMOVAL OF PARTS IN FIGURE 4. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Note the manner in which the torsion springs (1) are engaged in the slots of the sprocket shafts.

b. Knob (16) is held in place by the tension of the preformed spring (17). If knob is loose, replace the spring.

c. The spring (39), retainer plate (40) and the pressure plate (41) can be removed from the lens carrier (38) without removing the carrier from the main plate. Swing open the lens carrier and grasp the top and bottom edges of the pressure plate between thumb and forefinger. Press the upper end of the retainer plate away from the lens carrier to disengage the plate and spring (39) from the pins in the casting.

d. Inspect the aperture plate (34) and guide rail (32) for rough scratches or nicks on surfaces which contact the film. Fine scratches often can be removed by polishing the affected part carefully with fine crocus cloth.

6. REMOVAL OF PARTS IN FIGURE 5. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Before removing tension springs (3, 5 and 9), make note of the manner in which these springs are installed.

b. The magnetic head and linkage are carefully adjusted in assembly and should not be disassembled unless replacements are necessary. Note that the lock lever arm assembly (12) must be removed in order to expose the head assembly mounting screws (14). The

head must be carefully disengaged from the socket (17) during removal.

c. Inspect pressure roller (19) for flat spots and replace if necessary.

d. The lower hole in the actuator (22) is slotted to permit adjustment of the pressure plate in regard to the magnetic head. Do not disassemble the actuator from the lever assembly (24) unless replacement of one or the other of these parts is necessary.

e. The capstan assembly (31) is machined after assembly and must not be disassembled for repairs. Replace capstan assembly complete.

7. REMOVAL OF PARTS IN FIGURE 6. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. The upper driver roller (7) is exposed and can be serviced without difficulty. To gain access to the inner roller, remove retaining ring (4) and lift the assembled bracket assembly (9) and roller parts (5 through 8) from the projector.

b. To free the safety shutter and bracket assembly (15), remove pivot screw (10), pivot spring (11), screw (12), knob (13) and screw (14). Note the manner in which the legs of pivot spring (11) are engaged before removing these parts.

8. AMPLIFIER REPAIRS. Refer to Figure 7 for amplifier mechanical parts replacement and to the schematic diagram, Figure 8, for electronic parts replacement and amplifier circuitry. Use normal circuit tracing techniques for locating and remedying amplifier troubles.

## *Reassembly and Adjustment*

9. GENERAL INSTRUCTIONS.

a. When the reassembly procedure includes the staking of rivets or other parts, all riveting and staking should be done first to avoid the possibility of damage to other parts. Be sure to support the casting solidly before riveting or staking.

b. Parts which must be lubricated during reassembly are listed in the following lubrication table. Lubricate sparingly, and wipe away excess lubricant with a lint-free cloth. Use only Bell & Howell grease (Spec. 1956 as noted) and oil (Spec. 310) or the best available commercial grades of ball bearing grease or projector oil.

c. Amplifier replacement parts are identified in Figures 7 and 8 at the rear of the parts catalog section. When replacing electrical parts, all necessary soldering of connections must be carefully done, using approved techniques followed in electronics repair shops.

d. In the following reassembly procedures, no specific instructions are included for making leadwire connections. Refer to the wiring diagrams, Figures 8 and 9, for making such connections during reassembly. Make certain that all leadwires are "dressed" so as not to interfere with moving mechanical parts.

Table I. Lubrication

ITEM	LUBRICATION
Roller (51, Figure 1)	Apply grease (1956) to roller shaft with brush
Spur gear (4, Figure 2)	Apply grease (1956) to face of gear
Spur gears (7 and 20, Figure 2)	Apply grease (1956) to both sides
Gear and shaft assemblies (13 and 26, Figure 2)	Apply grease (1956) between faces of bearings (30, Figure 2) and faces of gears
Reel arm supports (29 and 30, Figure 2)	Apply grease (1956) between supports and mechanism plate
Bearing balls (47, Figure 2)	Speck of grease on each ball
Motor pulley (18, Figure 3)	Apply oil (310) between pulley and motor shaft
All oilless bearings	Light film of oil (310)
Projector gear train, complete	After gears are assembled, apply grease (1956) with brush to entire gear train for one revolution of the gears

10. REASSEMBLY OF PARTS IN FIGURE 6. Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. Assemble pulley (15B) with large diameter against fire shutter plate.

b. Install washer (36) on shaft (32). Hold drive pinion (35) in position between the two cast ears of the mechanism plate while installing the main shaft (32). Hub of pinion must face to the right, and shaft must be inserted until it clears cut-out for knob in main plate. Hold knob in cut-out and slide main shaft to the left and into the knob. Assemble retaining ring (37) to shaft, and tap knob end of shaft with rubber mallet to seat the retaining ring flush against knob side of recess wall.

c. Install washer (30) and pulldown cam (29) on main shaft (spot on face of cam must face knob end of shaft). Secure cam with setscrews (28), leaving no end play in shaft. Visually center the knob (34) in the rectangular opening in the main plate; then tighten setscrew (33). If shaft appears to bind when knob is turned, tap lightly to free shaft. Insert a 0.002-in. shim between left face of pinion (35) and front main shaft bearing. Hold pinion against shim while tightening setscrew (31).

d. Assemble retaining ring (24) to framer shaft (23). Grease threads of shaft and turn shaft into the framer bushing about six or seven full turns.

e. Assembly (20, (21), (22), (26) and (27). Bow of washer (21) to go against shoulder of pivot (20). Assemble this group to long cast arm of main plate, engaging shuttle with end of framer shaft. Fit shuttle around the pulldown cam (29) and insert screw end of

pivot through hole in cast arm. Secure the pivot loosely with nut (1).

f. Insert cam shoes (25) on either side of pulldown cam, between cam surface and shuttle. Use any combination of white and/or black cam shoes to obtain proper fit on cam. Turn main shaft knob in each direction and check for snug but free rotation. Replace shoes, as necessary, to obtain the best possible fit.

g. Install in-out cam (19) with high section of rim toward shuttle. Install shutter (18) with open side facing to the right, and assemble washer (17) and screws (16). Make sure that small hole in washer, shutter and in-out cam are lined up with large hole in pulldown cam. Before securing these parts, rotate shutter clockwise against screws (16).

h. Assemble safety shutter assembly (15) to projector with lever projecting through slot in main plate. Assemble the pivot spring (11) to shoulder of screw (10) and thread screw into pivot (20). Cross the ends of the spring and lock them into slotted ears of safety shutter bracket. Spring must pivot freely. Install screw (14). Move safety shutter lever through all three positions and check for freeness and locking action. With lever in center position, check perforated safety shutter to make certain that it is centered with aperture opening. Bend ends of spring (11) and move mounting plate up or down as necessary to insure centering and minimum play. Secure knob (13) to safety shutter lever with screw (12).

i. Assemble drive rollers (7) and spring loading bracket assembly (3) to pulley mounting bracket (9), and secure the pulley bracket to the safety shutter bracket with retaining ring (4). With safety shutter lever in center (still) position and screws (2) loose,

insert a 0.062-inch ( $\pm 0.015$ -inch) shim between the upper driver roller rim (7A) and outer rim of shutter (18). Press lightly against roller to hold shim in place and tighten the two screws (2) securely. Withdraw the shim. Final adjustment and test will be performed after completed projector assembly (para. 24).

**11. REASSEMBLY OF PARTS IN FIGURE 5.** Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. Install capstan assembly (31) with screws (28), pushing capstan up toward mechanism plate while tightening the screws.

b. Assemble spring (33) to top sprocket shifting lever and hole in main plate. Assemble spring (32) to lower end of lock lever (37) and hole in main plate.

c. Install lever and stud assembly (8) to tapped boss on main plate with screw (6) and washer (7).

d. Assemble washer (20), roller (19) and a second washer (20) to stud of pressure roller lever assembly (24) and secure parts with retaining ring (18). Assemble actuator (22) to lever assembly with screws (21), but tighten screws only enough to hold. Fasten this assembled group and the washer (25) in place with screw (23). Hook spring (3) to hole in end of pressure roller lever arm, install the stop (4) over the spring and hook free end of spring to inner hole in safety shutter bracket. Hook short spring (5) to lever assembly (8) and outer hole in fire shutter bracket.

e. Fasten retaining clamp (30) to main plate with screw (29). Insert head socket (17) and hum buck coil through opening in main plate and secure coil holder to capstan housing with screw (14). Engage socket with pins extending from rear of magnetic head. Secure head and mounting block assembly (16) to capstan housing with screws (14). Head mounting block must rest on milled mounting pads. Secure coil and head socket wires with clamp (30). Make adjustments (para. 21).

f. Assemble idler roller (2) to stud of lock lever arm assembly (12) with retaining ring (1). Assemble washer (13), arm assembly (12) and spring washer (11) to capstan housing with screw (10). Hook spring (9) between lower end of arm assembly (12) and hole in capstan housing.

g. Assemble link adjusting plate assembly (27) to the actuating lever extending from the mechanism plate, engaging the pin of the adjusting plate with the slot in the lock lever arm assembly (12). Install but do not tighten screws (26) until reel arms are installed. Refer to paragraph 17 for loop former-linkage adjustment.

**12. REASSEMBLY OF PARTS IN FIGURE 4.** Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. If the lens mount catch (43) was removed for replacement, tap the rivet holes with a No. 4-40NC

thread tap and install new catch with two screws, part number 30243.

b. Assemble side tension arm (36) and tension spring (35) to aperture plate (34). Prongs of tension arm must enter slots in aperture plate. Loop of spring must encircle aperture plate stud and spring legs must enter holes in top and bottom ears of tension arm. Install aperture plate with two screws (33), but do not tighten screws. Check centering of shuttle teeth in aperture plate slot and alignment of aperture opening with cut-out in mechanism plate; then tighten screws (33) securely. Aperture plate must be flush against back edge of casting. Assemble guide rail (32) to aperture plate. Hold rail straight and loosely install screws (31). Push guide rail forward so that both ears are against sides of aperture plate slots and tighten screws securely.

c. Assemble the pressure plate spring (39), retainer plate (40) and pressure plate (41). Compress these parts and lock them in place over the boss at each end of the lens carrier (38). Release the pressure on the parts, guiding the retainer plate and spring as necessary to engage the pins protruding from the lens carrier casting. Hold the lens carrier between the ears of the casting and install the carrier hinge pins (37).

d. Assemble upper sprocket (28) into cavity of bracket (15). Assemble roller (13) flush with end of pin on bracket. Assemble washer (12) to spring-loaded pin against ear of bracket. Assemble upper loop former to assembled bracket and upper sprocket. Insert roller (11) between ears of loop former and install screw (9) through loop former, roller, washer and bracket. Loosely assemble these parts to the mechanism plate with the screws (9 and 14).

e. Assemble film guide (22) into lower loop former (19) with detent pin (24). Assemble lower sprocket (29) into cavity of loop former. Assemble guide roller (20) to loop former with tapered end toward inner face of loop former and install screw (18). Add spacer washer to threaded end of screw. Assemble lower bracket (26) to screw, trapping the sprocket. Install washer (30) on sprocket shaft. Loosely assemble these parts to the mechanism plate with screws (18 and 25). Install knob (16) on detent pin, pressing firmly in place. Tighten all screws securely and install retaining ring (23) on end of detent pin (24).

f. Assemble inner gear (5) to upper sprocket shaft with the three projections around the gear center hole facing out. Assemble outer gear (5) so that its three projections lock with those of inner gear. Install washer (8) and lower gear assembly (7), pin facing away from casting, on lower sprocket shaft. Install lower drive gear (6) with its three projections facing in and slot of gear engaging pin of gear assembly (7). Assemble spacer washers (4) to both sprocket shafts. Install the ratchet springs (3) with ribs at either end of springs engaging ratchet teeth on gears. Assemble flat washers (2) and springs (1) to sprocket shafts. The short end of the spring must enter slot in shaft. Compress spring and rotate clockwise enough to push spring onto shaft recess. Check sprocket torque with



a torque gage. Upper sprocket must not turn at 16.5 inch-ounces of torque. Lower sprocket must not turn at 13.3 inch-ounces of torque. Both sprockets must turn at 33 inch-ounces of torque. Ratchet spring (3) can be bent to adjust torque. Refer to paragraph 16 for upper loop former adjustment before continuing reassembly.

13. REASSEMBLY OF PARTS IN FIGURE 3. Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. Assemble the motor (16), insulator (21) and brackets (24 and 27), and install screws (14) and hex nuts (15). Insert cotter pin (20) through holes in bracket with one leg on each side of insulator (21) and bend legs over with a pliers. Assemble grommets (29) into mounting holes of motor brackets. Install assembled motor and brackets over mounting studs on main plate and add four washers (23) to the studs. Place discharge spring (25) over upper stud of right-hand bracket with end of spring touching bracket, and install the four nuts (22).

b. Insert straight end of belt shifter shaft (28) through tabs below motor bracket and through the main plate until retaining ring groove is visible. Install one retaining ring (26) and push shaft back until ring is against inner tab; then install remaining ring (26) to groove in front of outer tab.

c. Install pulley (18) on motor shaft and tighten setscrew (17) against flat of motor shaft just enough to hold the pulley. Assemble both belts (13 and 19) loosely to the pulley, and engage belt (19) with the idler roller (7, Figure 6) and the nylon pulley (15B, Figure 6).

d. Assemble sleeves (7) to pins of belt shifter plate assembly (4) with retaining rings (6). Install washer (5) and plate assembly (4) to stud protruding from motor bracket, with elongated hole in plate over crank end of shaft (28). One sleeve (7) must be on each side of belt (19). Install spring washer (3), bowed side out, and retaining ring (2). Assemble centering spring (1) with small end hooked over shifter shaft and large end hooked over plate mounting stud.

e. Engage belt (13) with fan pulley. Install washer (12), fan and pulley assembly (11) and washer (10) on fan shaft. Install collar (9) and tighten setscrew (8) so that fan has a minimum of end play.

f. Install flywheel (32) and washer (31) onto rear end of capstan shaft. Hold front end of shaft with a screwdriver and install and tighten flywheel nut (30). Flywheel must be lightly snug when turning and holding shaft.

14. REASSEMBLY OF PARTS IN FIGURE 2. Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. Assemble key (10B) through slot in spindle shaft (10D), long ear first. Slide in and up until tab enters. Assemble spring (10A), loop up and small tab toward key, into hole in spindle shaft. Push down until small

tab engages in slot of key. Install plug (10C) to end of spindle shaft. Assemble spindle assembly (23) in the same manner.

b. Assemble reel arms (1 through 26) in reverse order of disassembly. The spindles (10 and 23) must have some end play and must turn freely. Torque spring (5) is assembled into feed reel arm cover (3) with bulge up and spring ends locked against two bosses in the cover.

c. Assemble bearings (28) to reel arm supports (29 and 30). Insert bearings through main plate. Apply a thin coat of grease around bearings and position a steel ball (47) on each side of each bearing. Install cam washers (46) with prongs toward outside of main frame. Install springs (45) and gear plate (44), compressing springs until retaining rings (27) can be installed. Secure gear plate to main plate with screw (43).

d. Assemble spur gear (12) to feed arm shaft assembly (13). Insert 0.003-inch shim between hub of gear and face of bearing and hold gear against shim while tightening the setscrew (11). Assemble spur gear (25) to take-up arm shaft assembly (26), maintaining 0.003-inch clearance in the same manner as outlined above.

e. Assemble gearing to gear plates (items 31 through 40). Gears (40) are installed with hubs down. When assembling gears (37), the first gear is installed with its lugs facing up; the second gear with lugs facing down. Dimples in ends of ratchet spring (35) must engage ratchet teeth of upper gear (37). Attach eccentric (42) to upper end of gear plate (44) with screw (41). Adjust eccentric to provide backlash between uppermost idler gear and the spur gear (12) on the feed shaft; then tighten eccentric screw securely.

15. REASSEMBLY OF PARTS IN FIGURE 1. Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. New nameplates and knob inserts are supplied with a protective backing. Remove backing, moisten adhesive with activating solvent and allow adhesive to become tacky before applying nameplate.

b. Assemble tilt locking shaft (52) to base and secure tilt shaft assembly in the "up" position.

c. Assemble roller (51) to film guide (50) so that the guide ear is between the roller flanges. Assemble both parts to roller stud and, with upper tip of guide ear even with or no more than 1/32 inch away from end of lower loop former, tighten setscrew (49) securely.

d. When installing framer knob (40), bowed face of spring washer must be toward control housing boss.

e. Switch (34) must be installed with single lug end up (as viewed from rear of switch). Connect push-on lugs of leadwires as follows: green motor lead to lug in lower left-hand corner of switch; red interlock lead to lug in center of switch; yellow lamp lead to lug in lower right-hand corner of switch.

f. Assemble control housing to projector, with shifter shaft entering pointer (36), framer shaft engaging slot of framer knob (40), and power cord connector engaging pins of interlock. Secure housing with screws (25, 26 and 27).

g. Assemble speed knob (22) over pointer (36) and onto shifter shaft. Position the pointer so that it indicates NORMAL with the knob centered, and tighten setscrew (19). Install VOLUME knob (21) and tighten setscrew (19) down on flat of volume control shaft. Install tilt knob to its shaft, tightening setscrew (19) down on flat of shaft.

#### NOTE

Turn the projector so that you are facing the rear (motor side) of the main plate. Loosen the setscrew in the motor pulley and, while holding the speed knob in the NORMAL position, move the motor pulley until the right-hand plastic sleeve of the belt shifter bracket is contacting the blower belt. Tighten motor pulley setscrew securely.

h. Attach film guide (18) to projector with screws (16 and 17). Install cover assembly (15) by pressing in on the cover locking button.

i. Apply a thin film of cement (Spec. 387) around lip of vent grille (7J) before assembling grille to rear cover. Note location of notch on grille sleeve.

j. Assemble lamp (4) into socket by pressing down on very top of lamp. Avoid leaving fingerprints on lamp, and do not rock lamp to seat it in socket.

#### 16. UPPER LOOP FORMER ADJUSTMENT.

a. Close the upper loop former tight against the aperture plate by pushing and holding the lever of the actuating lever assembly (8, Figure 5) until the lip of the loop former rests on the top edge of the aperture plate.

b. When viewing rear of main plate, note the lever which encircles the lower sprocket shaft bearing. Loosen the two lever screws just enough to permit the lever to be rotated. While holding loop former in closed position, rotate this lever until its ear engages and is flush with tongue of the actuator lock lever (37, Figure 5); then retighten lever screws securely and release the loop former. The lip of the loop former must not spring more than 0.035-inch away from top edge of aperture plate.

#### 17. LOOP FORMER LINKAGE ADJUSTMENT.

a. Swing the lower reel arm outward to the operating position. Note that there is considerable play at the spindle end of the reel arm. Gently press reel arm back toward closed position until resistance is encountered.

b. Insert a 0.020-inch shim between the idler roller (2, Figure 5) and the edge of the plastic threading guide to the right of the roller. Shim will be held in

place by the tension of the spring (9, Figure 5) at the lower end of the lock lever arm assembly (12, Figure 5).

c. Loosen screws (26, Figure 5) so that the link adjusting plate (27) can be shifted without difficulty. Insert a 0.040-inch spacing shim between the lower tip of the link adjusting plate and the reel arm cover. Gently hold these parts in contact and slowly slide the link adjusting plate upward until the roller (2) moves away from the plastic film guide and permits the 0.020-inch shim to drop free. Tighten screws (26) securely without disturbing the position of the link adjusting plate.

#### 18. ADJUSTING TAKE-UP AND REWIND TORQUE.

The take-up torque of the lower (take-up) spindle should measure 2-1/2 to 5 inch-ounces; the rewind torque of the upper (feed) spindle should measure 3 to 6 inch-ounces. Torque can be measured with a 0 to 8 ounce Postalette scale and a modified 8-mm film reel as shown in Figure D. The method of checking take-up torque is illustrated in Figure D; to measure rewind

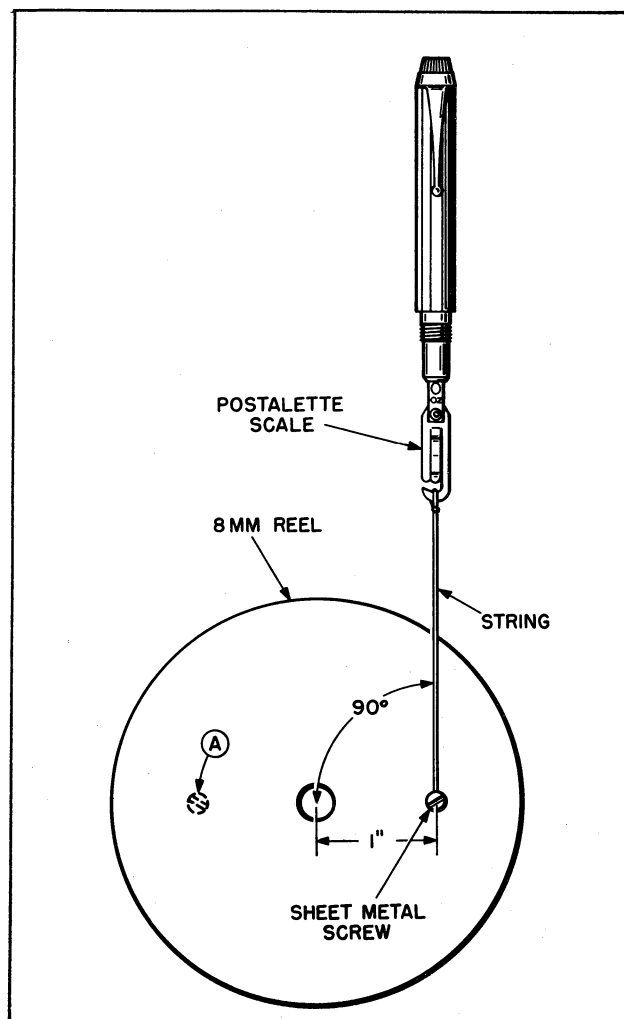


Figure D. Checking Reel Arm Torque

torque, the film reel must be rotated so that the sheet metal screw is at position A, with the scale held directly above the screw. Torque can be increased or decreased by either tightening or loosening the respective screw (2 or 15, Figure 2).

**19. ADJUSTING SHUTTLE TOOTH PROTRUSION.** Excessive or inadequate protrusion of the shuttle tooth will result in improper film transport during operation. Proper shuttle tooth protrusion is checked with the shuttle tooth protrusion gage shown in Figure C. Proceed as follows:

- a. Set the framer knob in the approximate center of its travel range, and swing open the lens carrier.
- b. Rotate the main shaft knob (34, Figure 6) until the shuttle teeth reach the approximate center of the downstroke.
- c. Place the base (notched edge) of the gage against the aperture plate with the deepest notch positioned directly over the shuttle teeth.
- d. Holding the base of the gage firmly against the aperture plate, slowly slide the gage downward. If the shuttle teeth catch against the "go" step of the gage, the teeth are protruding too far beyond the surface of the aperture plate. If the teeth pass the "go" step of the gage but fail to catch against the "no go" step, the teeth are not protruding far enough.

e. Shuttle tooth protrusion is adjusted by bending the shuttle arm carefully to obtain the desired protrusion (0.034 inch). A bending tool S-35975 F-1-D may be used.

f. When the shuttle tooth protrusion has been properly adjusted, check the position of the shuttle teeth in relation to the sides of the slot in the aperture plate. By means of the eccentric washer (item 26, Figure 6), the shuttle teeth can be shifted toward one side or the other of the slot. The teeth must be adjusted so that they enter the center of the film perforations.

**20. ADJUSTING PICTURE FRAMING.** The framing mechanism must be adjusted to permit maximum picture framing in either direction. Proceed as follows:

a. Turn the framing knob carefully from extreme clockwise to extreme counterclockwise position, counting the number of revolutions of the knob. Then turn the knob back to mid-position.

b. Thread the projector with film known to be in correct frame. Start projector and focus picture on screen.

c. Note the binding head screw in the elongated hole at the bend or "knee" of the framing lever (22, Figure 6). Loosen this screw and shift the shuttle bracket arm

up or down, as necessary, to center the frame in the aperture. Then tighten binding head screw securely without disturbing the position of the bracket arm.

#### CAUTION

Keep hands and tools away from the motor fan while adjusting the framing lever.

**21. RETRACTOR LEVER ADJUSTMENT.** The bent ear on the retractor lever (22, Figure 5) protrudes up through the pressure plate yoke on the magnetic head. With the projector in the STILL position, there must be a noticeable gap between this ear and the rear edge of the yoke. In FORWARD position, the ear must move forward, but not far enough to bear against the front edge of the yoke. In REVERSE position, the ear must contact the rear edge of the yoke and move the pressure plate rearward until the plate and magnetic head are no longer in contact with one another and the film passes freely between the two. The lower end of the retractor lever has a slotted mounting hole to permit adjustment as outlined above. This adjustment should be made before the hum buck coil and pressure plate adjustment (paragraph 22, following) and should be rechecked after that adjustment has been made.

**22. HUM BUCK COIL AND PRESSURE PLATE ADJUSTMENT.** If the hum buck coil or magnetic head assembly have been replaced, the following adjustments must be performed to insure satisfactory operation.

- a. With the motor and amplifier ON and the VOLUME control fully clockwise, position the hum buck coil for minimum audible hum.

#### NOTE

Check to make certain that the coil does not interfere with any mechanical moving parts.

b. Set up the projector for sound operation in forward-normal speed. Connect a VTVM, oscilloscope, and an 8-ohm, 5-watt resistor across a 0.210-inch (sleeve diameter) phono plug and insert plug into the EXT SPKR jack. With amplifier in PLAY mode of operation, run a 3000-cycle prerecorded test film through projector and adjust the eccentric nut on the head mounting block for maximum output. Seal the eccentric nut screw with Loctite.

# Final Test

## 23. GENERAL INSTRUCTIONS.

This section contains specific tests to be performed to ensure that the projector is in proper working order. Tests will also serve to indicate the possible trouble or malfunction in the projector so that time can be saved in trouble shooting and servicing. Note that the projector is to be operated only from a 115-volt ac, 60-cycle power source.

**24. SAFETY SHUTTER OPERATION TEST.** It is important that the drive rollers, which drive the shutter pulley, make contact and begin driving the mechanism (either in forward or reverse) before the fire shutter clears the aperture opening. With the back cover removed and the projector connected to the power source, switch on the projector. This test is to be made without film.

a. Operate the projector, first in the forward direction and then in the reverse direction. Watch carefully as the knob is turned from the "still" position to either of the operating positions.

b. Proper operation of the fire shutter is controlled by the clearance between upper drive roller (7, Figure 6) and rim of shutter (18). Nominal clearance is 0.062 inch ( $\pm 0.015$  inch). If the fire shutter tends to clear the aperture opening before shutter (18) begins to revolve, when operating in reverse, this clearance should be increased toward the high (0.077 inch) tolerance limit. If the same thing happens when operating in "forward," reduce clearance toward the lower (0.047 inch) limit. To adjust, place lever in "still" position and loosen bracket screws (2, Figure 6). Insert shim stock (thickness to suit above requirements) between upper roller and shutter. Maintain light pressure on roller while tightening screws (2). Check operation.

**25. OPTICAL ALIGNMENT TEST.** The alignment of the optical axis of the projection lens in the vertical plane is held to very close tolerances in the machining of the lens mount pivot. However, alignment in a horizontal plane is subject to possible variation, and provision has been made for adjusting the lens carrier accordingly. Check alignment as follows:

a. Thread the projector with resolution test film, roll title film, or other film known to have good resolution at the edges of the frame.

b. Project and focus the picture on a matte-surface screen. If the picture is "soft" along either edge, remove the back cover to gain access to the adjusting setscrew (44, Figure 4). This setscrew bears against the machined surface of the lens carrier and

determines the angular relationship between the optical axis and the aperture plate.

c. Turn adjusting setscrew in or out to obtain equal sharpness of the image along both sides of the picture. If the lens carrier is far out of alignment, it may be necessary to refocus the picture during the alignment procedure.

**26. PROJECTOR SPEED TEST.** Before making the following speed test, run the projector for approximately five minutes with the projection lamp on.

a. Use a variac set at 120 volts to obtain a constant voltage. Projector speed is checked at the manual shaft knob (34, Figure 6) with a tachometer.

b. Check speeds both in forward and reverse operation and with the speed knob in FAST and NORMAL positions. Proper speed limits are as follows:

Forward - Normal position, 1020 to 1140 rpm.

Forward - Fast position, 1380 to 1500 rpm.

Reverse - Normal position, 1000 to 1150 rpm.

Reverse - Fast position, 1300 to 1520 rpm.

c. If the projector is running consistently slow in all positions, replace the motor to drive pulley belt and recheck speeds. Also check to make certain that the cam shoes are not too snug-fitting (see NOTE at bottom of Figure 6 parts list) and that gearing is not binding. If projector runs too slow in reverse only, check to see if the eccentric (42, Figure 2) has been adjusted to allow sufficient backlash between upper sprocket gear (12, Figure 2) and its mating gear (32, Figure 2).

**27. OPERATIONAL TEST.** Thread the projector with film, using a full reel, and run the projector to check for proper operation. Check the following items during the test.

a. Listen for unusual noises that may indicate insufficient lubrication.

b. If film should spill from the feed reel during operation, it may be necessary to tighten screw (2, Figure 2) slightly to apply additional tension.

c. If the film fails to maintain its loop above or below the aperture, check the shuttle tooth protrusion as described in paragraph 19, and readjust if necessary.

d. If the projected image appears soft at the edges, check the alignment of the optical axis as instructed in paragraph 25, and adjust if necessary.

e. If sound troubles have been indicated, make the sound system tests outlined in paragraphs 28 through 30.

## 28. RECORDING TEST FILM.

a. Set up the projector for sound operation in the forward-normal speed position. With the amplifier in the "record" mode of operation, make a test recording for approximately 30 seconds by inserting a 0.01 volt, 3000 cycle signal at the MIC jack. The volume control should be set so that the record level indicator bars just meet.

b. Remove the generator plug. Place the record lever to "play back" position and reverse the projector for approximately 10 seconds. Stop the projector, set the volume control to the maximum counterclockwise position and set the record lever to the "record" position. Run the projector in the forward direction for approximately 10 seconds to erase the previous recording.

c. Insert a phonograph plug into the "PHONO" jack and make a music recording for approximately 30 seconds with the volume control adjusted so that the record level indicating bars just meet.

d. Switch the speed control to FAST and make a second music recording as instructed in paragraph "c" above.

## 29. PERFORMANCE TEST.

a. General. Connect a VTVM, an oscilloscope, and an 8-ohm, 5-watt resistor across a Bell & Howell no. 28088 phono plug (0.210-inch sleeve diameter) and insert the plug in the EXT SPKR phone jack.

b. Power Output Test. With the amplifier in the "play" mode of operation and the projector in forward-normal position, play back the 3000 cycle portion of the test film, prerecorded in accordance with paragraph 28. Adjust the volume control and observe the output voltage and waveform. The output voltage should be at least 4.0 volts (at 5% maximum harmonic distortion level).

### NOTE

The volume control must be maintained in this position during the erase test, step c following.

c. Erase Test. When the erased portion of the test film reaches the magnetic head, remove the phono plug from the EXT SPKR jack. The 3000 cycle tone must not be audible.

d. Overall Sound Performance. Play back the first portion of the music section of the prerecorded test film at "normal" speed and the second section at "fast" speed. The reproduced music at both speeds should be free of audible distortion and rattles or noise reproduced due to the internal speaker.

## 30. MEASURING ERASE AND RECORD CURRENTS.

a. Record current. The record current is approximately 1.2 ma. for operating level at 1000 cycles. Use a 10-ohm, non-inductive resistor in series with the record head and measure the voltage across the resistor (0.012 volts).

b. Erase current. The erase current will be 60 to 100 ma. Use a 10 ohm non-inductive resistor in series with the erase head and measure the voltage across the resistor (0.6 to 1.0 volt).

# Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
Projector inoperative with switch in the MOTOR or LAMP position	<ol style="list-style-type: none"> <li>1. No electrical power</li> <li>2. Loose drive pulley</li> <li>3. Broken drive belt</li> <li>4. Defective switch or wiring</li> </ol>	<ol style="list-style-type: none"> <li>1. Check power source.</li> <li>2. Tighten pulley setscrew.</li> <li>3. Replace belt.</li> <li>4. Check circuit.</li> </ol>
Film scratches	<ol style="list-style-type: none"> <li>1. Excessively dirty film channel parts (sprockets, guides, etc.)</li> <li>2. Worn pressure and aperture plates (34 and 41, Figure 4)</li> <li>3. Worn or damaged film guide (32, Figure 4)</li> <li>4. Worn lower loop former</li> <li>5. Scratched idler roller</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean projector thoroughly.</li> <li>2. Replace if worn or marred.</li> <li>3. Replace film guide.</li> <li>4. Replace (19, Figure 4).</li> <li>5. Replace (2, Figure 5).</li> </ol>
Jumpy picture	<ol style="list-style-type: none"> <li>1. Loss of film loop due to damaged film</li> <li>2. Green film</li> <li>3. Shuttle tooth worn</li> <li>4. Misaligned shuttle tooth</li> <li>5. Grooves worn in film guide (32, Figure 4)</li> <li>6. Loose shuttle shoes</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect and splice as required.</li> <li>2. Run film through projector two or three times to age the film.</li> <li>3. Replace shuttle assembly (22, Figure 6).</li> <li>4. Adjust and align shuttle as instructed in paragraph 19.</li> <li>5. Replace film guide.</li> <li>6. Replace shuttle shoes.</li> </ol>
Soft focus	<ol style="list-style-type: none"> <li>1. Dirty projection lens</li> <li>2. Lens mount out of alignment</li> <li>3. Loose lens mount catch (43, Figure 4)</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean projector lens.</li> <li>2. Readjust as instructed in paragraph 25.</li> <li>3. Reset tension by bending catch carefully.</li> </ol>
Auto-threading not operating properly	<ol style="list-style-type: none"> <li>1. Loop former linkage improperly adjusted or binding</li> <li>2. Loop formers not releasing</li> </ol>	<ol style="list-style-type: none"> <li>1. Realign loop formers and reset linkage (paragraph 16).</li> <li>2. Linkage binding or springs stretched or broken on linkage. Adjust linkage (paragraph 17).</li> </ol>

TROUBLE	PROBABLE CAUSE	REMEDY
Auto-threading not operating properly (cont)	3. Improper setting of film path selector 4. Improper clearance, idler roller to loop former	3. Set selector for silent or sound operation. 4. Adjust clearance as directed in paragraph 17.
Film spills	1. Insufficient tension on feed spindle	1. Adjust, paragraph 27, step b.
Fails to take-up or rewind	1. Defective drive belt 2. Worn rim on drive roller 3. Drive rollers not adjusted properly	1. Replace belt. 2. Replace rim (7A, Figure 6). 3. Readjust as instructed in paragraph 24.
Noisy	1. Loose attaching parts 2. Gearing dry	1. Tighten as necessary. 2. Lubricate as necessary.
SOUND TROUBLES		
No sound	1. Wires improperly connected to terminal strip 2. Defective tube or transistor 3. Head socket not connected 4. No sound on film 5. Defective amplifier circuit 6. Defective head or pressure plate 7. Poor electrical contact at "record-play" switch contacts	1. Check wiring diagram. 2. Try substitution method (tubes first), and replace faulty part. 3. Check for proper seating of head in socket. 4. Use recorded film. 5. Signal trace amplifier. 6. Replace head and mounting block assembly. 7. Clean contacts or replace switch.
Low volume (output)	1. Dirty head 2. Defective head or pressure plate 3. Weak tube or transistor 4. Film recording made at too low level	1. Clean head. 2. Replace head and mounting base assembly. 3. Try substitution method (tubes first) and replace faulty part. 4. Make recording per instructions.
Unsatisfactory sound qualities	1. Threading lever in threading position 2. Worn head or pressure plate 3. Pressure plate misadjusted 4. Dirty head	1. Close lever. 2. Replace head and mounting block assembly 3. Readjust pressure plate (paragraph 21). 4. Clean head.

TROUBLE	PROBABLE CAUSE	REMEDY
Unsatisfactory sound qualities (cont)	5. Defective film recording 6. Excessive hum 7. Slow film speed	5. Use good film recording. 6. Replace or readjust hum buck coil (paragraph 22). 7. Check that speed control is set at same speed used for recording.
Improper recording	1. Open oscillator coil 2. Defective 6BMB record level indicator tube 3. Improper input signal level 4. Dirty or defective head 5. Improper film pressure at head 6. Defective recording level indicator 7. Record-play switch inoperative 8. Improper speed 9. Improper bias (current)	1. Test and replace if necessary. 2. Test and replace if necessary. 3. Refer to the recording procedure in operator's book. 4. Clean head or replace complete head assembly. 5. Check pressure plate adjustment (paragraph 21). 6. Test and replace 6FG6 tubes if necessary. 7. Test and replace if necessary. 8. Check speed (rpm) and replace associated parts if necessary (paragraph 26). 9. Check per paragraph 30.
Improper erase	1. Dirty or defective head 2. Volume control not full CCW or other improper control settings 3. Defective oscillator coil or circuit 4. Improper erase currents 5. Not enough head pressure	1. Clean or replace. 2. Refer to erase procedures in operator's book. 3. Check and replace parts if necessary. 4. Check per paragraph 30. 5. Check pressure plate adjustment procedure (paragraph 21).



## *Replacement Parts*

The following pages illustrate and list, by part number and description, all replacement parts of the Design 9254 Tower Automatic Threading 8-mm Sound Projector. Illustrations are indexed in a suggested order of disassembly and will serve as an aid to the serviceman during projector repair. Check parts list notes for special replacement instructions.

### ACCESSORIES

400 ft. Film Reel . . . . .	p/n 010497
Projector Lens (1 in. f/1.6) . . . . .	p/n 020448
Ceramic Microphone . . . . .	p/n 38420

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
1	2	3 4 5 6 7		
PROJECTOR MAIN ASSEMBLY				
1-1	06211	COVER ASSY, Front . . . . .	1	
-1A	30226	. RIVET, Front cover catch . . . . .	1	
-1B	26321	. CATCH, Front cover . . . . .	1	
-1C	32361	. BUTTON, Catch . . . . .	1	
-1D	37783	. NAMEPLATE, "SEARS" . . . . .	1	
-1E	37889	. NAMEPLATE, Triangle . . . . .	1	
-1F	37937	RIVET . . . . .	2	
-1G	31020	WASHER . . . . .	2	
-1H	012286	STRAP ASSY, Microphone . . . . .	1	
-2	010716	SUPPORT ASSY, Film reel. . . . .	1	
-3	06237	COVER ASSY, Lamphouse . . . . .	1	
-3A	37890	. NAMEPLATE, Forward-Still-Reverse . . . . .	1	
-3B	010283	. SCREW ASSY, Lamphouse cover . . . . .	1	
-3C	37911	. COVER, Lamphouse . . . . .	1	
-4	37919	LAMP, Projection . . . . .	1	
-5	29065	SCREW, Rear cover . . . . .	8	
-6	33194	SCREW, Rear cover . . . . .	2	
-7	06233	COVER AND SPEAKER ASSY, Rear . . . . .	1	
-7A	37939	. RIVET, Tubular . . . . .	4	
-7B	31020	. WASHER, Flat. . . . .	3	
-7C	31585	. CLAMP, Leadwire (lower R. H. corner) . . . . .	1	
-7D	37804	. GASKET, Speaker . . . . .	1	
-7E	37793	. GRILLE, Speaker . . . . .	1	
-7F	37940	. RIVET . . . . .	4	
-7G	37794	. BAFFLE, Speaker . . . . .	1	
-7H	37808	. SPEAKER, 4 by 6 oval . . . . .	1	
-7J	012267	. GRILLE ASSY, Vent . . . . .	1	
-7K	37959	. RIVET . . . . .	1	
-7L	37957	. STOP . . . . .	1	
-8	37960	SCREW, Transformer . . . . .	2	
-9	19037	NUT, Hex . . . . .	2	
-10	37841	TRANSFORMER . . . . .	1	
-11	37897	SPACER, Transformer . . . . .	2	
-12	31685	JACK, Speaker (w/mtg nut). . . . .	1	
-13	604132	WASHER, Flat . . . . .	2	
-14	37916	NAMEPLATE, Speaker jack . . . . .	1	
-15	06329	COVER ASSY, Film guide . . . . .	1	
-16	36842	SCREW, Film guide L. H. . . . .	1	
-17	36845	SCREW, Film guide, R. H. . . . .	1	
-18	37755	GUIDE, Film . . . . .	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN ASSEMBLY (CONT)				
1-19	12636	SETSCREW, Knob . . . . .	3	
-20	35310	KNOB, Tilt . . . . .	1	
-21	37903	KNOB, Volume . . . . .	1	
-22	37904	KNOB, Speed . . . . .	1	
-23	37901	INSERT, Volume knob . . . . .	1	
-24	37902	INSERT, Tilt and speed knobs . . . . .	2	
-25	36841	SCREW, Control housing bottom . . . . .	2	
-26	36842	SCREW, Control housing L. H. . . . .	1	
-27	700042	SCREW, Control housing R. H. . . . .	1	
-28	37777	HOUSING, Control . . . . .	1	
-29	37786	NAMEPLATE, Amplifier control . . . . .	1	
-30	37784	NAMEPLATE, Serial Number . . . . .	1	
-31	37785	NAMEPLATE, Motor-speed . . . . .	1	
-32	38423	INSULATOR, Switch . . . . .	1	
-33	700222	SCREW, Switch . . . . .	2	
-34	35331	SWITCH, Off-Motor-Lamp rocker . . . . .	1	
-35	37921	RING, Retaining . . . . .	1	
-36	37899	POINTER, Speed knob . . . . .	1	
-37	34539	RING, Retaining . . . . .	1	
-38	33931	WASHER, Flat . . . . .	1	
-39	35349	WASHER, Spring tension . . . . .	1	
-40	35311	KNOB, Framer . . . . .	1	
-41	35348	WASHER, Flat . . . . .	1	
-42	37902	INSERT, Framer knob . . . . .	1	
-43	37935	RIVET, Power cord . . . . .	2	
-44	37949	WASHER, Flat . . . . .	2	
-45	38421	CORD, Power . . . . .	1	
-46	36801	SCREW, Amplifier . . . . .	4	
-47	012273	AMPLIFIER ASSY (See Figures 7 and 8 for parts list) . . . . .	1	
-48	37922	SLEEVE, Record-Play lever . . . . .	1	
-49	33072	SETSCREW . . . . .	1	
-50	33117	GUIDE, Film . . . . .	1	
-51	30662	ROLLER, Guide . . . . .	1	
-52	37846	SHAFT, Tilt locking . . . . .	1	
-53	22113	RING, Retaining . . . . .	1	
-54	010188	SHAFT ASSY, Tilt . . . . .	1	
-55	28145	SPRING, Tilt shaft . . . . .	1	
-56	29144	RIVET, Lamp socket . . . . .	2	
-57	06358	SOCKET AND BRACKET ASSY, Lamp . . . . .	1	
	30226	. RIVET . . . . .	2	
	30707	. SOCKET, Lamp . . . . .	1	
-58	19025	RIVET, Lamp baffle . . . . .	2	
-59	32478	BAFFLE, Lamp . . . . .	1	
-60	37933	RIVET, Carrying handle . . . . .	2	
-61	37934	WASHER, Flat . . . . .	2	
-62	37822	HANDLE, Carrying . . . . .	1	
-63	37948	NAMEPLATE, Lamp designation . . . . .	1	

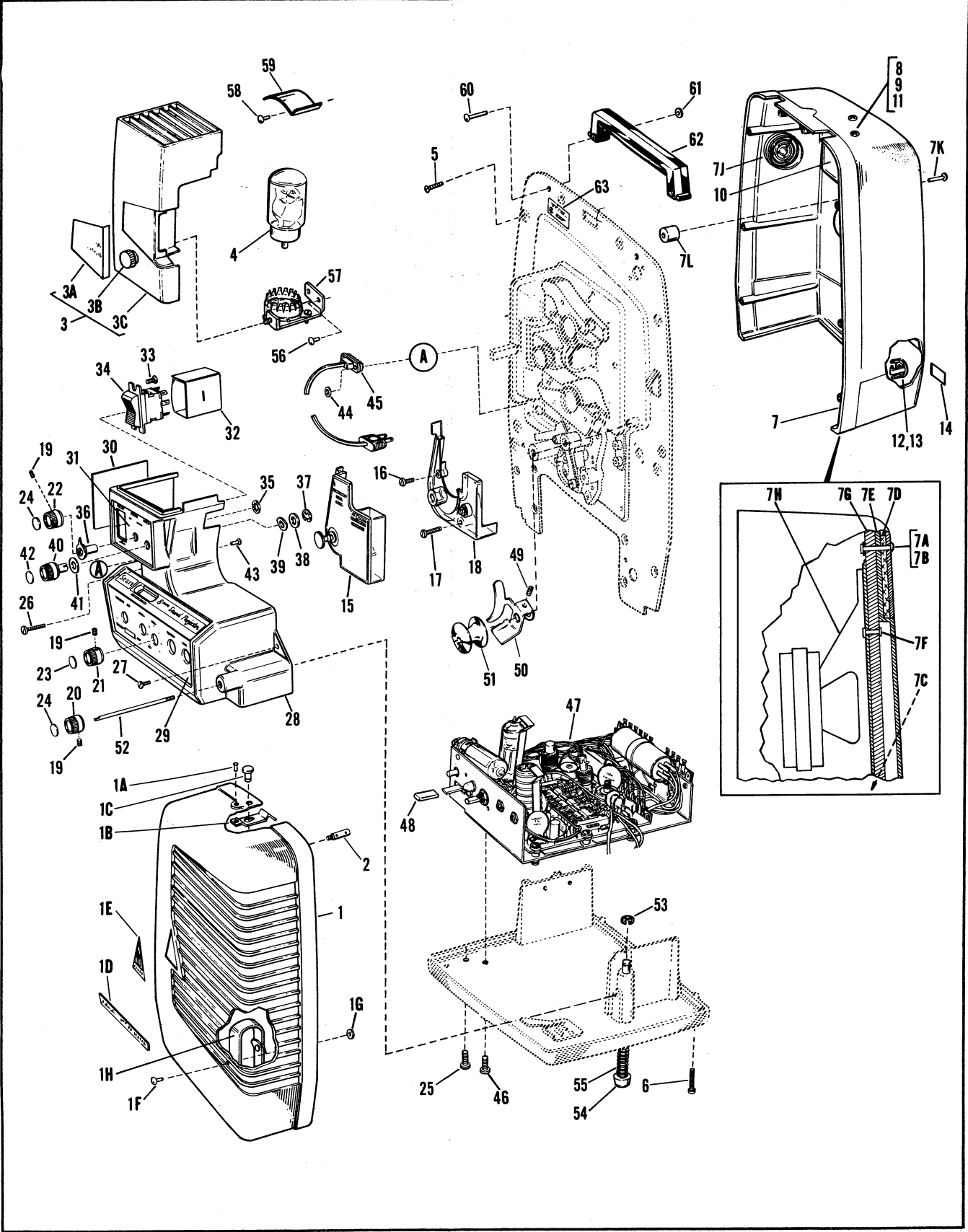


Figure 1. Projector Main Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
REEL ARMS AND GEARS				
2-1	23822	SCREW, Binding head . . . . .	1	
-2	32861	SCREW, Tension adjusting . . . . .	1	
-3	012295	ARM ASSY, Feed reel . . . . .	1	
-4	29706	GEAR, Spur . . . . .	1	
-5	32979	SPRING, Torque . . . . .	1	
-6	29726	SPACER, Tension adjusting . . . . .	1	
-7	35579	GEAR, Spur . . . . .	1	
-8	35580	DISC, Friction . . . . .	2	
-9	29724	WASHER, Spring . . . . .	1	
-10	010935	SPINDLE ASSY, Feed reel . . . . .	1	
-10A	7477	. SPRING . . . . .	1	
-10B	9350	. KEY . . . . .	1	
-10C	12143	. PLUG . . . . .	1	
-10D	33664	. SPINDLE . . . . .	1	
-11	29192	SETSCREW . . . . .	1	
-12	37781	GEAR, Spur . . . . .	1	
-13	06321	SHAFT ASSY, Feed arm . . . . .	1	
-14	23822	SCREW, Binding head . . . . .	2	
-15	32861	SCREW, Tension adjusting . . . . .	1	
-16	012296	ARM ASSY, Take-up reel arm . . . . .	1	
-17	29707	GEAR, Spur . . . . .	2	
-18	29706	GEAR, Spur . . . . .	1	
-19	29726	SPACER, Tension adjusting . . . . .	1	
-20	35579	GEAR, Spur . . . . .	1	
-21	35580	DISC, Friction . . . . .	2	
-22	29724	WASHER, Spring . . . . .	1	
-23	010935	SPINDLE ASSY, Take-up reel . . . . .	1	
-23A	7477	. SPRING . . . . .	1	
-23B	9350	. KEY . . . . .	1	
-23C	12143	. PLUG . . . . .	1	
-23D	33664	. SPINDLE . . . . .	1	
-24	29192	SETSCREW . . . . .	1	
-25	30203	GEAR, Spur . . . . .	1	
-26	06313	SHAFT ASSY, Take-up arm . . . . .	1	
-27	29744	RING, Retaining . . . . .	2	
-28	34705	BEARING . . . . .	2	
-29	012401	SUPPORT ASSY, Feed reel arm . . . . .	1	
-30	012402	SUPPORT ASSY, Take-up reel arm . . . . .	1	
-31	21736	RING, Retaining . . . . .	2	
-32	37761	GEAR, Spur . . . . .	2	
-33	33966	RING, Retaining . . . . .	1	
-34	30667	WASHER, Flat . . . . .	2	
-35	37850	SPRING, Ratchet . . . . .	1	
-36	35186	WASHER, Spacer . . . . .	1	
-37	35177	GEAR, Bevel . . . . .	2	
-38	06295	PLATE ASSY, Drive gear . . . . .	1	
-39	20808	RING, Retaining . . . . .	2	
-40	37762	GEAR, Spur . . . . .	2	
-41	37932	SCREW, Hex head . . . . .	1	
-42	37865	ECCENTRIC . . . . .	1	
-43	30165	SCREW, Gear mounting plate. . . . .	1	
-44	06293	PLATE ASSY, Gear mounting . . . . .	1	
-45	30238	SPRING, Reel arm tension . . . . .	2	
-46	29736	WASHER, Cam . . . . .	2	
-47	145	BALL, Steel . . . . .	4	

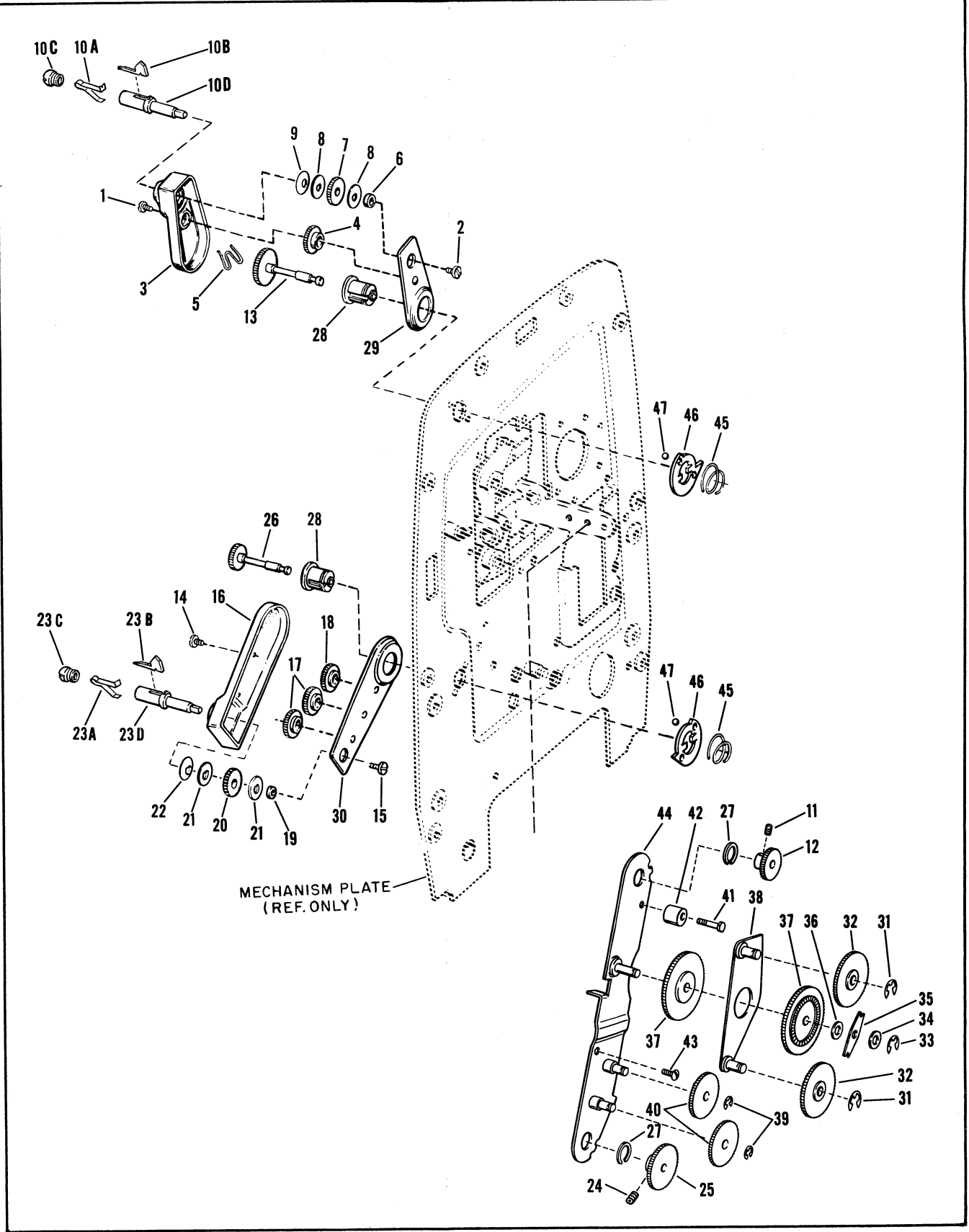


Figure 2. Reel Arms and Gears

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		MOTOR AND BLOWER		
3-1	37887	SPRING, Belt tension. . . . .	1	
-2	21736	RING, Retaining . . . . .	1	
-3	621067	WASHER, Spring . . . . .	1	
-4	06264	PLATE ASSY, Belt shifter . . . . .	1	
-5	31015	WASHER . . . . .	1	
-6	17639	RING, Retaining . . . . .	2	
-7	37870	SLEEVE, Plastic . . . . .	2	
-8	32653	SETSCREW . . . . .	1	
-9	37874	COLLAR . . . . .	1	
-10	37875	WASHER . . . . .	1	
-11	06292	FAN AND PULLEY ASSY, Blower . . . . .	1	
-12	37875	WASHER . . . . .	1	
-13	37885	BELT, Blower to motor . . . . .	1	
-14	26923	SCREW, Motor mounting . . . . .	4	
-15	26906	NUT, Hex . . . . .	4	
-16	012285	MOTOR ASSY . . . . .	1	
-17	80591	SETSCREW, Motor pulley . . . . .	1	
-18	37927	PULLEY, Motor . . . . .	1	
-19	37926	BELT, Motor to drive roller. . . . .	1	
-20	37944	PIN, Cotter . . . . .	1	
-21	37941	INSULATOR, Motor . . . . .	1	
-22	19037	NUT, Hex . . . . .	4	
-23	23382	WASHER, Flat . . . . .	4	
-24	37790	BRACKET, Motor mounting, R. H. . . . .	1	
-25	34900	SPRING, Motor discharge . . . . .	1	
-26	20808	RING, Retaining . . . . .	2	
-27	06311	BRACKET ASSY, Motor and blower, L. H. . . . .	1	
-28	37802	SHAFT, Belt shifter . . . . .	1	
-29	37896	GROMMET, Rubber . . . . .	4	
-30	19192	NUT, Flywheel . . . . .	1	
-31	30667	WASHER, Flat . . . . .	1	
-32	37779	FLYWHEEL . . . . .	1	
-33	700816	RIVET, Tubular . . . . .	2	
-34	31020	WASHER, Flat . . . . .	2	
-35	37910	PLUG, Power cord interlock. . . . .	1	

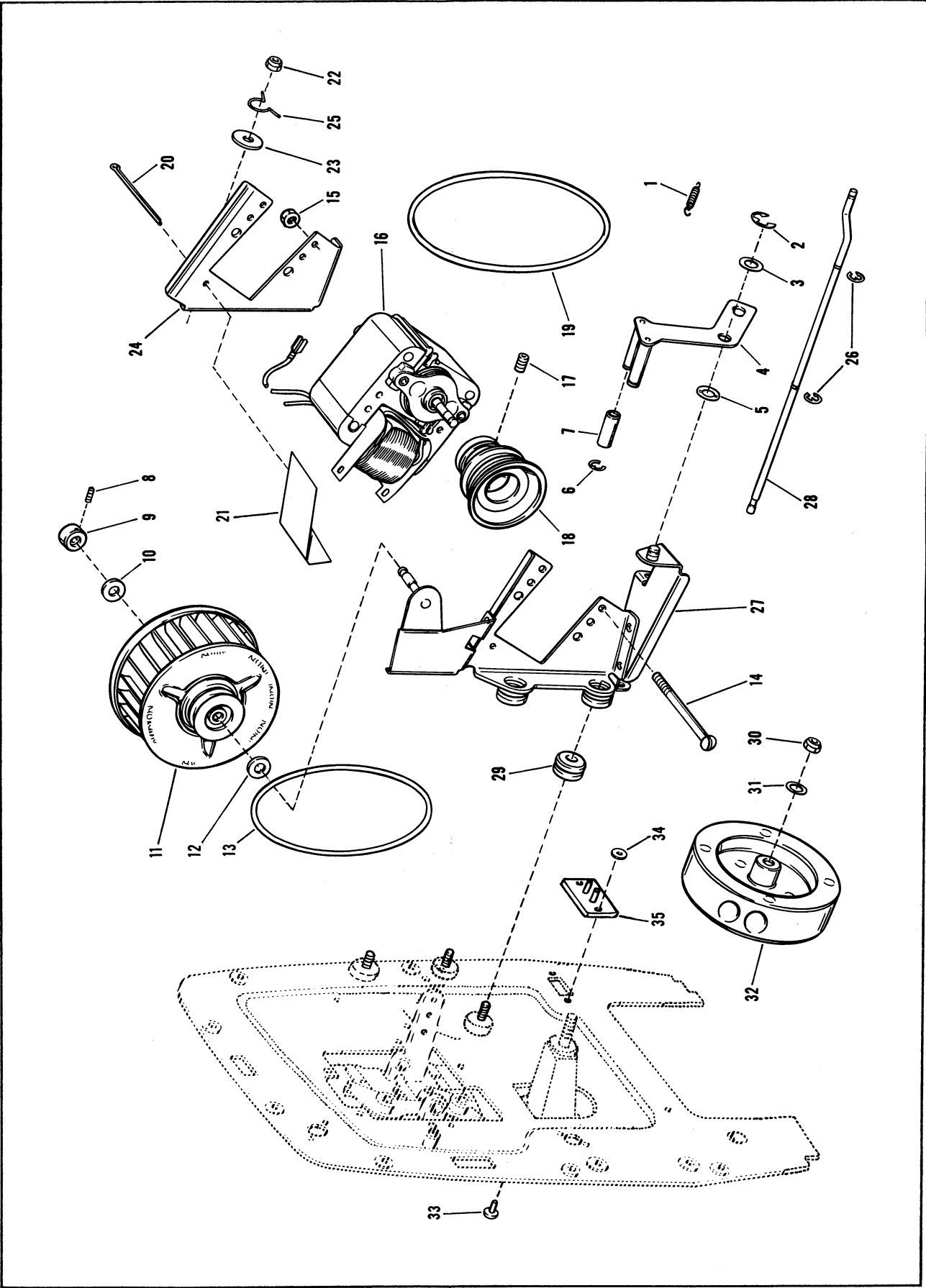


Figure 3. Motor and Blower Parts

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
LOOP FORMERS AND SPROCKETS				
4-1	35181	SPRING, Torsion . . . . .	2	
-2	30667	WASHER, Flat . . . . .	2	
-3	35184	SPRING, Ratchet . . . . .	2	
-4	35186	WASHER, Spacer . . . . .	2	
-5	35177	GEAR, Upper drive . . . . .	2	
-6	37828	GEAR, Lower drive . . . . .	1	
-7	06297	GEAR ASSY, Lower drive . . . . .	1	
-8	30667	WASHER, Flat . . . . .	1	
-9	30612	SCREW, Upper loop former . . . . .	1	
-10	37429	LOOP FORMER, Upper . . . . .	1	
-11	30611	ROLLER, Film guide . . . . .	1	
-12	30613	WASHER, Spacer . . . . .	1	
-13	30625	ROLLER, Film guide . . . . .	1	
-14	34580	SCREW, Loop former bracket . . . . .	1	
-15	011319	BRACKET ASSY, Upper loop former . . . . .	1	
-16	37771	KNOB, Silent-Sound . . . . .	1	
-17	37881	SPRING, Knob retaining . . . . .	1	
-18	37866	SCREW, Lower loop former . . . . .	1	
-19	37767	LOOP FORMER, Lower . . . . .	1	
-20	37266	ROLLER, Film guide, tapered . . . . .	1	
-21	30613	WASHER, Spacer . . . . .	1	
-22	37768	GUIDE, Film deflector . . . . .	1	
-23	17676	RING, Retaining . . . . .	1	
-24	06333	SPRING AND PIN ASSY, Detent . . . . .	1	
-25	34580	SCREW, Loop former bracket . . . . .	1	
-26	37780	BRACKET, Lower loop former . . . . .	1	
-27	37945	STUD, Detent . . . . .	1	
-28	012269	SPROCKET ASSY, Upper . . . . .	1	
-29	012268	SPROCKET ASSY, Lower . . . . .	1	
-30	27198	WASHER, Spacer (lower sprocket) . . . . .	1	
-31	30621	SCREW, Film guide rail . . . . .	2	
-32	37426	RAIL, Film guide . . . . .	1	
-33	30620	SCREW, Aperture plate . . . . .	2	
-34	011114	PLATE ASSY, Aperture . . . . .	1	
-35	28067	SPRING, Side tension . . . . .	1	
-36	30639	ARM, Side tension . . . . .	1	
-37	26030	PIN, Hinge (lens carrier) . . . . .	2	
-38	06322	CARRIER ASSY, Lens . . . . .	1	
-39	34960	SPRING, Pressure plate . . . . .	1	
-40	33937	PLATE, Retainer . . . . .	1	
-41	33680	PLATE, Pressure . . . . .	1	
-42	26642	RIVET, Lens mount catch . . . . .	2	
-43	30615	CATCH, Lens mount . . . . .	1	
-44	30634	SETSCREW, Lens mount adjusting . . . . .	1	

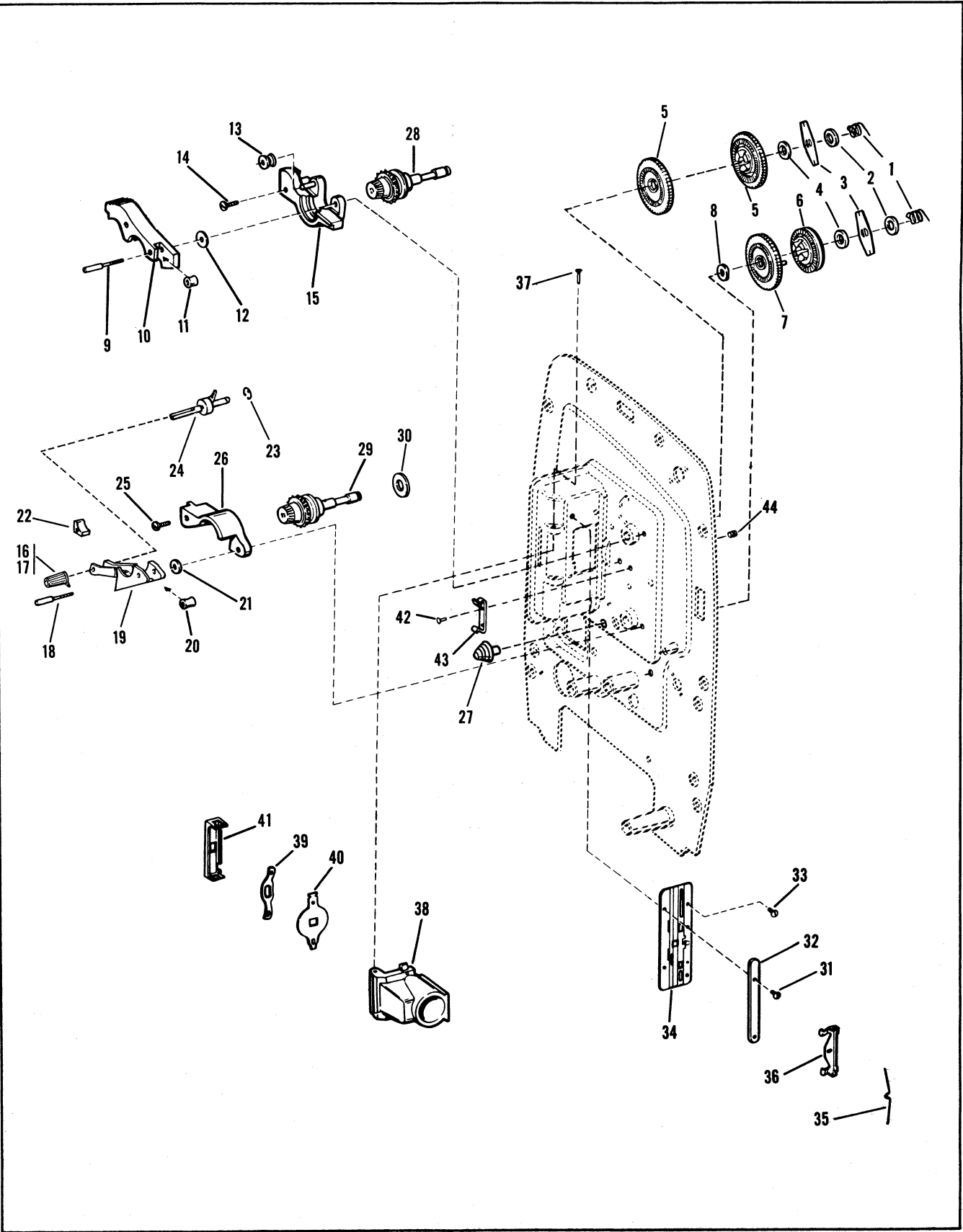


Figure 4. Loopformers and Sprockets

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
HEAD, CAPSTAN AND LINKAGE				
5-1	20808	RING, Retaining . . . . .	1	
-2	012297	ROLLER ASSY, Idler . . . . .	1	
-3	37883	SPRING, Tension (long) . . . . .	1	
-4	37963	STOP, Plastic . . . . .	1	
-5	37884	SPRING, Tension (short) . . . . .	1	
-6	30165	SCREW, Lever . . . . .	1	
-7	24153	WASHER, Shim . . . . .	1	
-8	06361	LEVER AND STUD ASSY, Actuating . . . . .	1	
-9	37917	SPRING, Lock lever arm . . . . .	1	
-10	37924	SCREW, Lock lever arm . . . . .	1	
-11	37920	WASHER, Spring tension . . . . .	1	
-12	06331	ARM ASSY, Lock lever . . . . .	1	
-13	29179	WASHER, Shim . . . . .	1	
-14	36838	SCREW, Head and coil . . . . .	3	
-15	012257	COIL ASSY, Hum buck . . . . .	1	
-16	06360	HEAD AND MOUNTING BLOCK ASSY . . . . .	1	
-17	012283	SOCKET, Magnetic head . . . . .	1	
-18	17639	RING, Retaining . . . . .	1	
-19	37765	ROLLER, Pressure . . . . .	1	
-20	37882	WASHER, Flat . . . . .	2	
-21	37931	SCREW, Actuator . . . . .	2	
-22	37923	ACTUATOR . . . . .	1	
-23	37861	SCREW, Pressure roller arm . . . . .	1	
-24	06330	LEVER ASSY, Pressure roller . . . . .	1	
-25	29179	WASHER, Shim . . . . .	1	
-26	37860	SCREW, Special . . . . .	2	
-27	06332	PLATE ASSY, Link adjusting . . . . .	1	
-28	36841	SCREW, Capstan (slotted) . . . . .	3	
-29	37947	SCREW, Hex head . . . . .	1	
-30	31585	CLAMP, Wire retaining . . . . .	1	
-31	012287	CAPSTAN ASSY, Complete . . . . .	1	
-32	30650	SPRING, Trip roller lever . . . . .	1	
-33	37961	SPRING, Loop former lever . . . . .	1	
-34	30165	SCREW . . . . .	2	
-35	24153	WASHER, Shim . . . . .	2	
-36	011297	LEVER ASSY, Trip . . . . .	1	
-37	06357	LEVER ASSY, Actuator lock . . . . .	1	

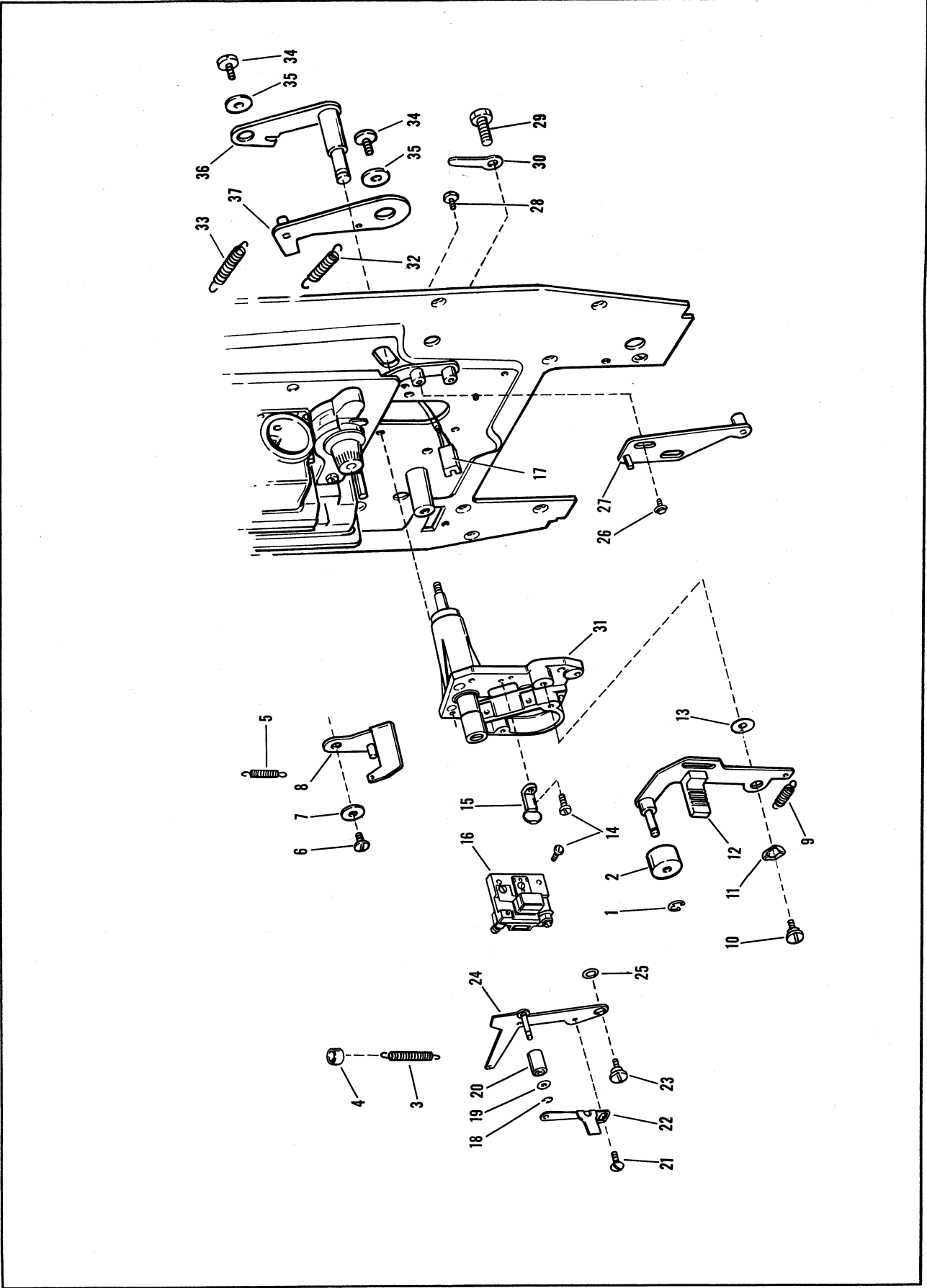


Figure 5. Head, Capstan and Linkage

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
SHUTTER AND SHUTTLE				
6-1	26906	NUT AND LOCK WASHER . . . . .	1	
-2	27641	SCREW, Fillister head . . . . .	2	
-3	010181	BRACKET ASSY, Spring loading . . . . .	1	
-4	25715	RING, Retaining . . . . .	1	
-5	27322	RING, Retaining . . . . .	2	
-6	32172	WASHER . . . . .	2	
-7	012271	ROLLER ASSY, Mounting . . . . .	2	
-7A	27313	. RIM, Drive roller . . . . .	1	
-8	32172	WASHER . . . . .	2	
-9	010278	BRACKET ASSY, Mounting . . . . .	1	
-10	29472	SCREW, Pivot . . . . .	1	
-11	32169	SPRING, Pivot . . . . .	1	
-12	30714	SCREW, Fillister head . . . . .	1	
-13	33057	KNOB, Forward-Still-Reverse . . . . .	1	
-14	34656	SCREW, Round head . . . . .	1	
-15	06359	SAFETY SHUTTER AND BRACKET ASSY . . . . .	1	
-15A	20808	RING, Retaining . . . . .	1	
-15B	37816	PULLEY, Nylon . . . . .	1	
-16	30551	SCREW, Fillister head machine . . . . .	2	
-17	29175	WASHER, Shutter . . . . .	1	
-18	37797	SHUTTER . . . . .	1	
-19	29040	CAM, In-out . . . . .	1	
-20	32117	PIVOT . . . . .	1	
-21	30800	WASHER, Spring . . . . .	1	
-22	06323	SHUTTLE AND FRAMING LEVER ASSY . . . . .	1	
-23	37905	SHAFT, Frammer . . . . .	1	
-24	21736	RING, Retaining . . . . .	1	
-25	(See Note A)	SHOE, Cam . . . . .	2	
-26	35319	WASHER, Eccentric . . . . .	1	
-27	30745	SPACER, Shuttle . . . . .	1	
-28	80591	SETSCREW, Bristol head . . . . .	2	
-29	37823	CAM, Pulldown . . . . .	1	
-30	26085	WASHER, Thrust . . . . .	1	
-31	12498	SETSCREW . . . . .	1	
-32	33039	SHAFT ASSY, Main . . . . .	1	
-33	80591	SCREW, Cup point . . . . .	1	
-34	33040	KNOB, Main shaft . . . . .	1	
-35	33196	PINION, Drive . . . . .	1	
-36	30667	WASHER, Friction . . . . .	1	
-37	26131	RING, Retaining . . . . .	1	
-38	29065	SCREW, Hex head machine . . . . .	4	
-39	37758	BASE, Projector . . . . .	1	
-40	33106	SCREW, Rubber foot . . . . .	1	
-41	33105	RIVET, Rubber foot . . . . .	1	
-42	26135	FOOT, Rubber . . . . .	2	
-43	30648	RIVET, Film cutter . . . . .	2	
-44	30628	CUTTER, Film . . . . .	1	
-45	010177	BRACKET ASSY, Film cutter . . . . .	1	
-46	No Number	MAIN PLATE ASSY. . . . .	NP	

Note A: Select any combination of cam shoes #32947 and/or #33712 to obtain proper fit on cam.

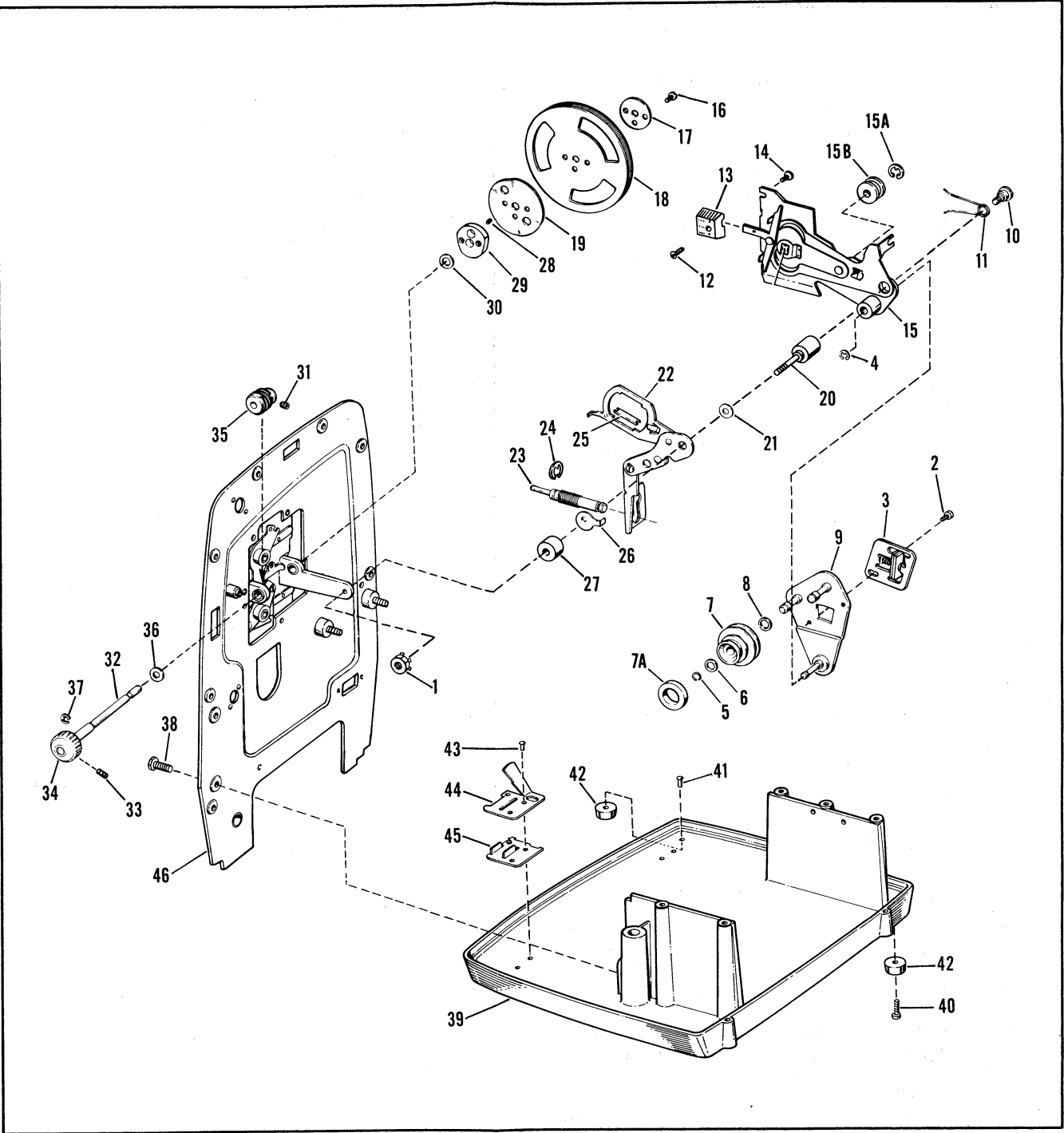


Figure 6. Shutter, Shuttle and Base



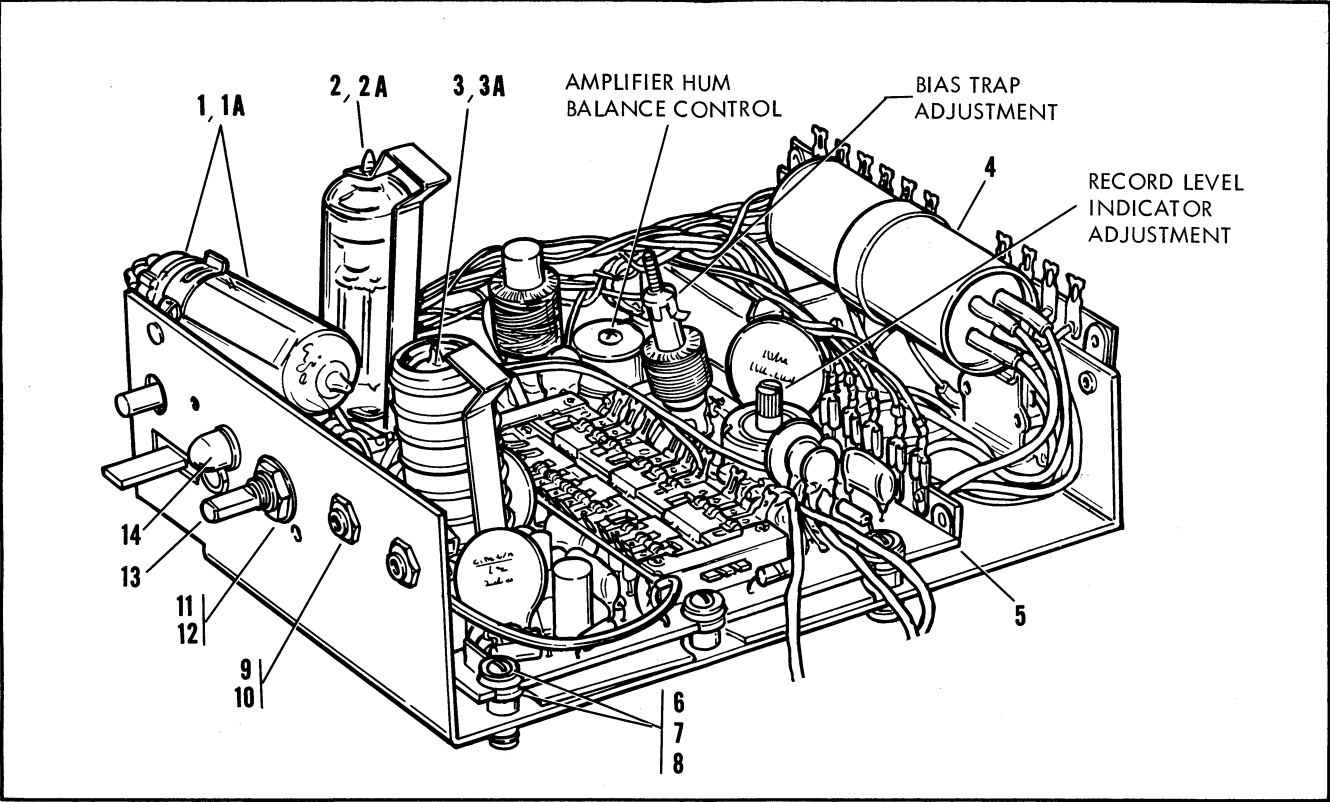
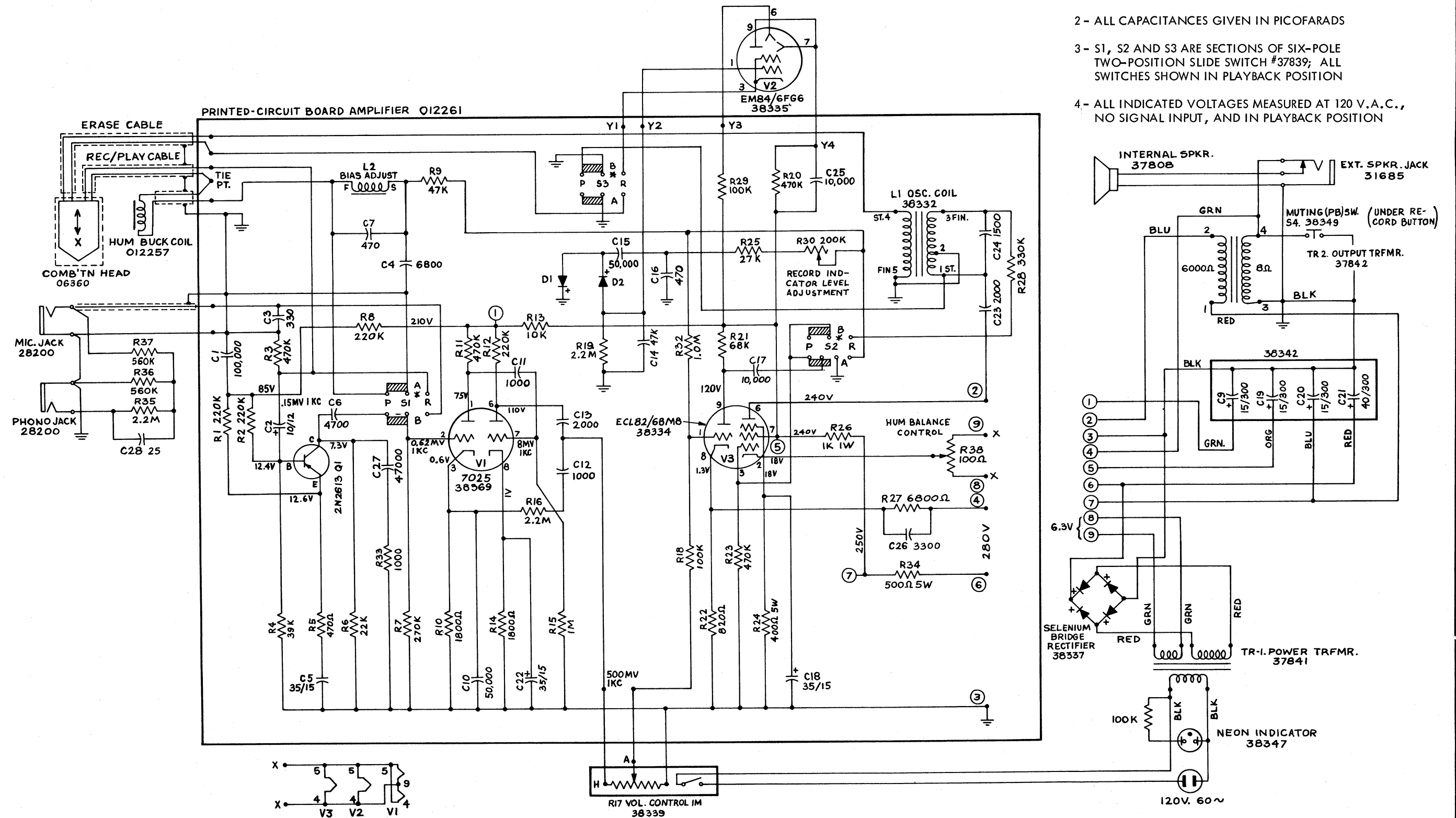


Figure 7. Amplifier Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
AMPLIFIER COMPONENTS (Also see Figure 8)				
7-1	38335	TUBE, Electron (V2)	1	
-1A	38368	SOCKET, Tube (for V2)	1	
-2	38334	TUBE, Electron (V3)	1	
-2A	37953	SOCKET, Tube (for V3)	1	
-3	38369	TUBE, Electron (V1)	1	
-3A	37952	SOCKET, Tube (for V1)	1	
-4	38342	CAPACITOR (C9, C19, C20, C21)	1	
-5	012261	PRINTED CIRCUIT BOARD, Complete	1	
-6	700008	SCREW, Circuit board	6	
-7	21238	WASHER	6	
-8	38367	GROMMET, Rubber	6	
-9	28200	RECEPTACLE, MIC and PHONO	2	
-10	26734	WASHER, Receptacle	2	
-11	19010	NUT, Volume control	1	
-12	19154	WASHER	1	
-13	38339	CONTROL, Volume	1	
-14	38347	NEON INDICATOR	1	

AMPLIFIER ELECTRICAL PARTS (FIGURE 8)

REFERENCE DESIGNATOR	PART NO.	NOTES	REFERENCE DESIGNATOR	PART NO.	NOTES
C1	38365		R7	33290	
C2	31731		R8	34840	
C3	38358		R9	31745	
C4	38361		R10	31747	
C5	31718		R11	31740	
C6	38362		R12	34840	
C7	38359		R13	31742	
C9	-----	(p/o 38342)	R14	31747	
C10	38363		R15	38354	
C11, C12	38360		R16	38355	
C13	36341		R17	38339	
C14	38364		R18	31739	
C15	38363		R19	38355	
C16	38359		R20	31740	
C17	31727		R21	31746	
C18	31718		R22	38351	
C19	-----	(p/o 38342)	R23	31740	
C20	-----	(p/o 38342)	R24	38356	
C21	-----	(p/o 38342)	R25	36305	
C22	31718		R26	31720	
C23	36341		R27	38352	
C24	36349		R28	31748	
C25	31727		R29	31739	
C26	38366		R30	38340	
C27	38364		R31	-----	(removed)
C28	37965		R32	38354	
D1, D2	38338		R33	36311	
L1	38332		R34	38357	
L2	38333		R35	36510	
Q1	38336		R36	29655	
R1, R2	34840		R37	29655	
R3	31740		R38	38341	
R4	36306		V1	38369	(7025)
R5	38350		V2	38335	(EM84/6FG6)
R6	31744		V3	38334	(ECL82/6BM8)



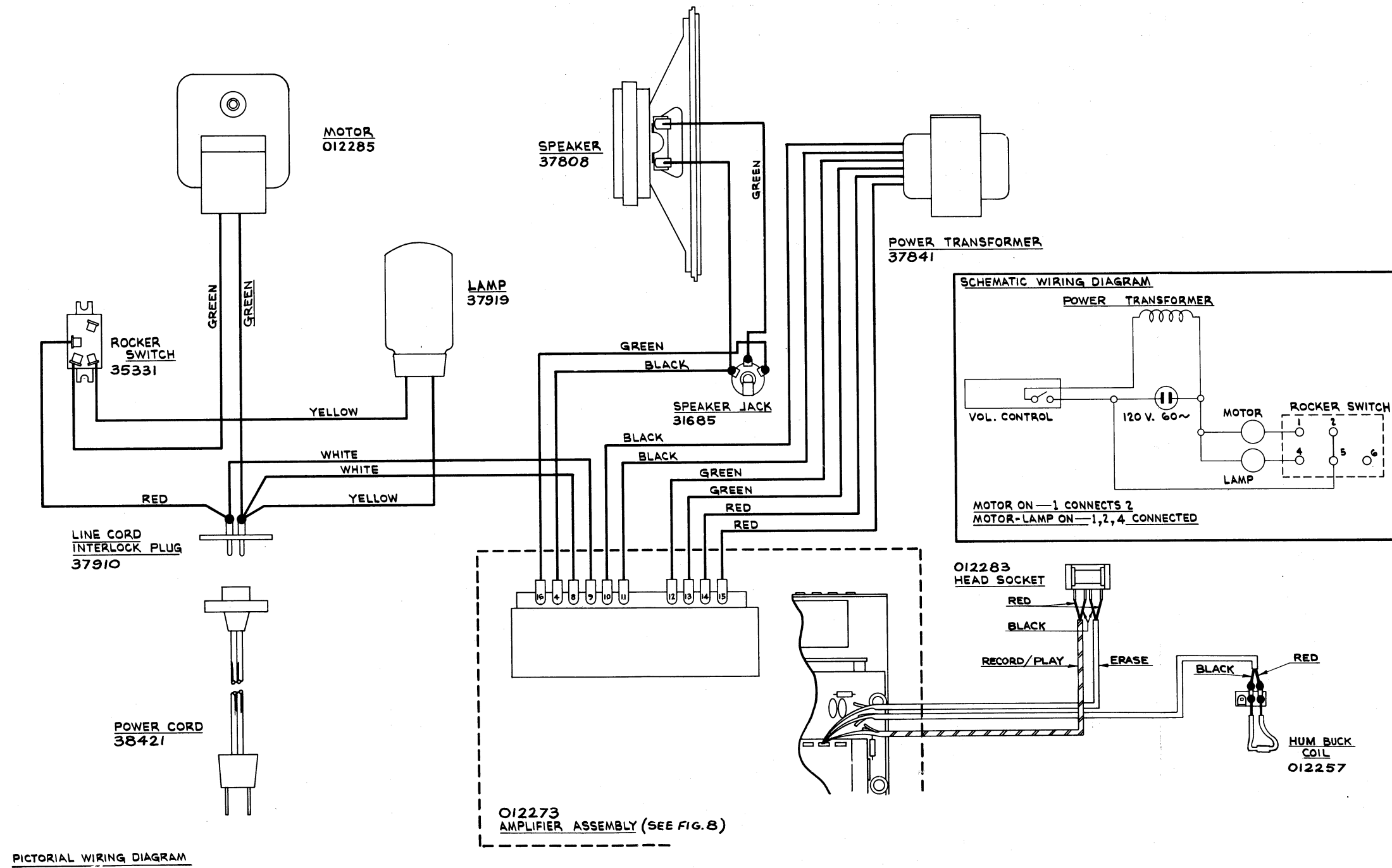


Figure 9. Projector Wiring Diagram

NUMERICAL INDEX OF PARTS

PART NO.	FIG. & INDEX NO.	PART NO.	FIG. & INDEX NO.	PART NO.	FIG. & INDEX NO.	PART NO.	FIG. & INDEX NO.	PART NO.	FIG. & INDEX NO.	PART NO.	FIG. & INDEX NO.
145	2-47	19154	7-12	30650	5-32	34900	3-25	37866	4-18	38340	8-R30
7477	2-10A, 2-23A	19192	3-30	30662	1-51	34960	4-39	37870	3-7	38341	8-R38
9350	2-10B, 2-23B	20808	2-39, 3-26,	30667	2-34, 3-31,	35177	2-37, 4-5	37874	3-9	38342	7-4, 8-C9
06211	1-1		5-1, 6-15A		4-2, 4-8,	35181	4-1	37875	3-10, 3-12	38347	7-14
06233	1-7	21238	7-7		6-36	35184	4-3	37881	4-17	38350	8-R5
06237	1-3	21736	2-31, 3-2,	30707	(see 1-57)	35186	2-36, 4-4	37882	5-20	38351	8-R22
06264	3-4		6-25	30714	6-12	35310	1-20	37883	5-3	38352	8-R27
06292	3-11	22113	1-53	30745	6-27	35311	1-40	37884	5-5	38354	8-R15, 8-R32
06293	2-44	23382	3-23	30800	6-21	35319	6-26	37885	3-13	38355	8-R16, 8-R19
06295	2-38	23822	2-1, 2-14	31015	3-5	35331	1-34	37887	3-1	38356	8-R24
06297	4-7	24153	5-7, 5-35	31020	1-1G, 1-7B,	35348	1-41	37889	1-1E	38357	8-R34
06311	3-27	25715	6-4		3-34	35349	1-39	37890	1-3A	38358	8-C3
06313	2-26	26030	4-37	31585	1-7C, 5-30	35579	2-7, 2-20	37896	3-29	38359	8-C7,
06321	2-13	26085	6-30	31685	1-12	35580	2-8, 2-21	37897	1-11		8-C16
06322	4-38	26131	6-37	31718	8-C5, 8-C18,	36305	8-R25	37899	1-36	38360	8-C11, 8-C12
06323	6-22	26135	6-42		8-C22	36306	8-R4	37901	1-23	38361	8-C4
06329	1-15	26321	1-1B	31720	8-R26	36341	8-C13, 8-C23	37902	1-24, 1-42	38362	8-C6
06330	5-24	26642	4-42	31727	8-C17, 8-C25	36349	8-C24	37903	1-21	38363	8-C10, 8-C15
06331	5-12	26734	7-10	31731	8-C2	36510	8-R35	37904	1-22	38364	8-C14, 8-C27,
06332	5-27	26906	3-15, 6-1	31739	8-R18, 8-R29	36801	1-46	37905	6-23		8-C27
06333	4-24	26923	3-14	31740	8-R3, 8-R11,	36838	5-14	37910	3-35	38365	8-C1
06357	5-37	27198	4-30		8-R20, 8-R23	36841	1-25, 5-28	37911	1-3C	38366	8-C26
06358	1-57	27313	6-7A	31742	8-R13	36842	1-16, 1-26	37916	1-14	38367	7-8
06359	6-15	27322	6-5	31744	8-R6	36845	1-17	37917	5-9	38368	7-1A
06360	5-16	27641	6-2	31745	8-R9	37266	4-20	37919	1-4	38369	7-3, 8-V1
06361	5-8	28067	4-35	31746	8-R21	37426	4-32	37920	5-11	38421	1-45
010177	6-45	28145	1-55	31747	8-R10, 8-R14,	37429	4-10	37921	1-35	38422	8-R37
010181	6-3	28200	7-9		8-R28,	37755	1-18	37922	1-48	38423	1-32
010188	1-54	29040	6-19		8-R33	37758	6-39	37923	5-22	80591	3-17, 6-28,
010278	6-9	29065	1-5, 6-38	32117	6-20	37761	2-32	37924	5-10		6-33
010283	1-3B	29144	1-56	32169	6-11	37762	2-40	37926	3-19	604132	1-13
010716	1-2	29175	6-17	32172	6-6, 6-8	37765	5-19	37927	3-18	621067	3-3
010935	2-10, 2-23	29179	5-13, 5-25	32361	1-1C	37767	4-19	37931	5-21	700008	7-6
011114	4-34	29192	2-11, 2-24	32478	1-59	37768	4-22	37932	2-41	700042	1-27
011297	5-36	29472	6-10	32653	3-8	37771	4-16	37933	1-60	700222	1-33
011319	4-15	29645	8-C28	32861	2-2, 2-15	37777	1-28	37934	1-61	700816	3-33
012257	5-15	29655	8-R36 8-R37	32947	6-25	37779	3-32	37935	1-43		
012261	7-5	29706	2-4, 2-18	32979	2-5	37780	4-26	37937	1-1F		
012267	1-7J	29707	2-17	33039	6-32	37781	2-12	37939	1-7A		
012268	4-29	29724	2-9, 2-22	33040	6-34	37783	1-1D	37940	1-7F		
012269	4-28	29726	2-6, 2-19	33057	6-13	37784	1-30	37941	3-21		
012271	6-7	29736	2-46	33072	1-49	37785	1-31	37944	3-20		
012273	1-47	29744	2-27	33105	6-41	37786	1-29	37945	4-27		
012283	5-17	30165	2-43, 5-6,	33106	6-40	37790	3-24	37947	5-29		
012285	3-16		5-34	33117	1-50	37793	1-7E	37948	1-63		
012286	1-1H	30203	2-25	33194	1-6	37794	1-7G	37949	1-44		
012287	5-31	30226	1-1A, 1-57	33196	6-35	37797	6-18	37952	7-3A		
012295	2-3	30238	2-45	33290	8-R7	37802	3-28	37953	7-2A		
012296	2-16	30551	6-16	33664	2-10D, 2-23D	37804	1-7D	37957	1-7L		
012297	5-2	30611	4-11	33680	4-41	37808	1-7H	37959	1-7K		
012401	2-29	30612	4-9	33712	6-25	37816	6-15B	37960	1-8		
012402	2-30	30613	4-12, 4-21	33931	1-38	37822	1-62	37961	5-33		
12143	2-10C, 2-23C	30615	4-43	33937	4-40	37823	6-29	37963	5-4		
12498	6-31	30620	4-33	33966	2-33	37828	4-6	38332	8-L1		
12636	1-19	30621	4-31	34539	1-37	37841	1-10	38333	8-L2		
17639	3-6, 5-18	30625	4-13	34580	4-14, 4-25	37846	1-52	38334	7-2, 8-V3		
17676	4-23	30628	6-44	34656	6-14	37850	2-35	38335	7-1, 8-V2		
19010	7-11	30634	4-44	34705	2-28	37860	5-26	38336	8-Q1		
19025	1-58	30639	4-36	34840	8-R1, 8-R2,	37861	5-23	38338	8-D1, 8-D2		
19037	1-9, 3-22	30648	6-43		8-R8, 8-R12	37865	2-42	38339	7-13, 8-R17		