SERVICE INSTRUCTIONS

COMPATIBLE SUPER 8 AND STANDARD 8 AUTOLOAD® PROJECTOR

DESIGN 467

PHOTO PRODUCTS GROUP

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

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PRODUCT ONLY

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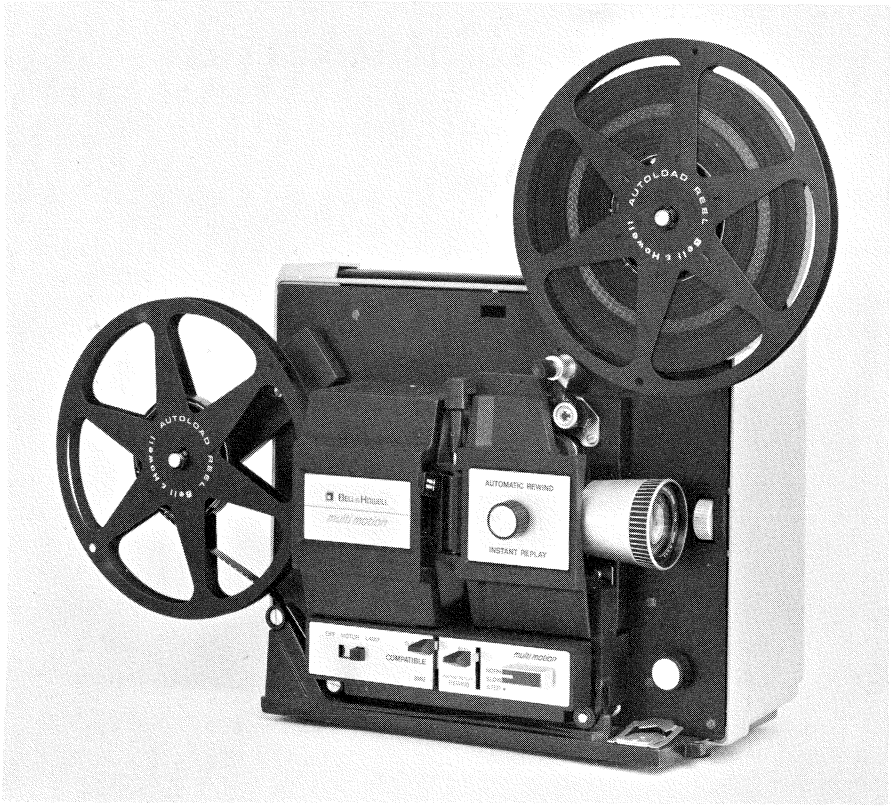

Design 467 Compatible Autoload Projector

FEATURE DESCRIPTION LIST

Color	pewter and black
Type of film	standard 8-mm and super 8-mm
Projector operation	forward-still-reverse
Still projection filter	perforated metal screen
Type of framer	screw knob
Projection lamp	Type DFZ, 30 volts, 80 watts
Loopformer system	hold-down
Operating voltage	120 volts, 60 cycles, a-c
Tilt device	gravity foot, knob-locked
Weight	16-1/2 pounds
Special features	film trimmer mounted on base speed control knob automatic rewind

Introduction

GENERAL.

This manual has been prepared to aid in the servicing and repair of the Bell & Howell Compatible 8-mm and Super 8-mm Autoload Projector with automatic rewind, Design 467. An Illustrated Parts Catalog is included at the rear of the manual to identify replacement parts and to aid the serviceman in the disassembly and reassembly of the projector.

All parts in the Parts Catalog exploded view illustrations are indexed in a suggested order of disassembly, with attaching parts immediately preceding those parts which they attach. Where disassembly and reassembly of parts is purely mechanical and no critical adjustments are involved, no attempt has been made to elaborate on the removal or installation of such items. When making specific projector repairs, the serviceman must use his own judgment in eliminating unnecessary steps of procedure. Illustrations referred to by letter (Figure A, Figure B) will be found in the Service Instructions portion of this manual, while those identified by number will be found in the Parts Catalog section.

DESCRIPTION.

The Design 467 Projector uses either standard or super 8-mm film and is equipped with self-latching loopformers for fully automatic film threading a fully automatic through-the-system rewind capability, and three film speeds in forward and reverse. Special design features are listed in the Feature Description List. Note that the projector uses the Type DFZ (30 volts, 80 watts) projection lamp.

AUTOLOAD THREADING (Figure A).

a. Before attempting to thread the film, place the format selector lever into either the Super 8 or 8 mm position, depending on the film which is to be shown. The Format Selector Lever can only be operated when the control switch is "OFF." Place the RUN-REWIND lever in the RUN position.

b. To thread the film, the end is trimmed with the film cutter mounted on the projector base. Place the control switch in the MOTOR position and the direction lever in the FORWARD position. Depress the film threading lever (1) down and feed the cut end of the film leader between the two metal guide rollers (2) until the projector pulls film from the front reel. Allow about six inches of the film leader to enter the projector, or until the clicking of the shuttle can be heard. Release the film threading lever gently to its original position.

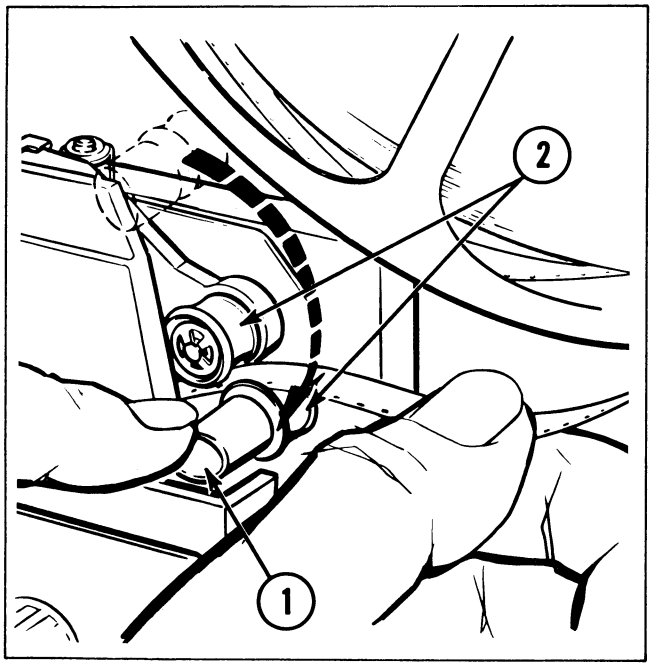

Figure A. Autoload Threading

NOTE: Failure to release the film threading lever as soon as the clicking is heard may cause a threading malfunction.

The film will now thread itself through the projector automatically, and attach itself to the take-up reel. Once the leader begins to take up on the hub of the reel, the MOTOR-LAMP switch is pressed to the LAMP position to initiate film projection.

AUTOMATIC REWIND.

Automatic rewind through the system is triggered by a clip that attaches the film to the reel. The clip taughtens the film which exerts pressure on the upper loopformer assembly, displacing it momentarily. This displacement triggers the reversing gear mechanism. The film pressure plate is raised, the forward-reverse lever is unlatched from the forward position and moves to the center or still position, and the film side tension arm is retracted so that the film will have a smooth, clear path during the automatic rewinding. The automatic rewind can also be triggered at any point in the film by pressing down on the run-rewind lever.

SPEED CHANGE OPERATION.

The Model 467 projector is designed to provide three operating speeds: 18 fps (standard speed),

6 fps and 2 fps. The lower speeds are effected by one or the other of two cam-and-follower arrangements working in conjunction with the standard (18 fps) pull-down cam. The position of the speed change knob determines which of the two cam-and-follower arrangements will be in effective operation.

SPECIAL MAINTENANCE PRECAUTIONS.

The removal and installation of projector parts is comparatively simple and, for the most part, requires tools normally available in most repair shops (retaining ring pliers, Bristol setscrew wrenches, assorted screwdrivers and socket hex wrenches, etc.). Where required, special tools and gages are clearly noted in the instructions and illustrated in Figure B.

When repairing equipment, be sure that the work table surface is clean. As parts are removed, group them in an orderly fashion to avoid confusion during reassembly. Clean dirt and old lubricant from parts (except electrical components) by washing them in a pan of solvent. Hardened film emulsion can be removed from film path parts by using alcohol and a wooden implement (tooth pick or orange stick). Do not use a knife or other metal tool to scrape film emulsion from film path components.

After the projector has been repaired, reassembled and adjusted, perform the inspections and test procedures outlined in the Final Test section to insure satisfactory projector operation.

During reassembly, be sure to lubricate parts as noted in the service instructions. If possible, use only recommended Bell & Howell lubricants as listed in the lubrication chart at the end of the Reassembly and Adjustment section. If Bell & Howell lubricants are not immediately available, use only the best grades of ball bearing grease and projector oil obtainable from local commercial outlets.

Grease (Bell & Howell Specs. 1516, 1956 and 1980)
Oil (Bell & Howell Spec. 1543 and 1987)

BRISTOL SETSCREW WRENCHES REQUIRED FOR MAINTENANCE

Setscrew Size	No. of Flutes	B&H Part Number	
		Handle	Wrench
No. 4-40NC	6	G1271-F1	G1271-X2
No. 6-32NC	6	STK3852-B	STK3863-B
No. 8-32NC	6	G165-F1	G165-X2
NOTE: Wrench G165-F3 is required to tighten setscrew in tool handles.			

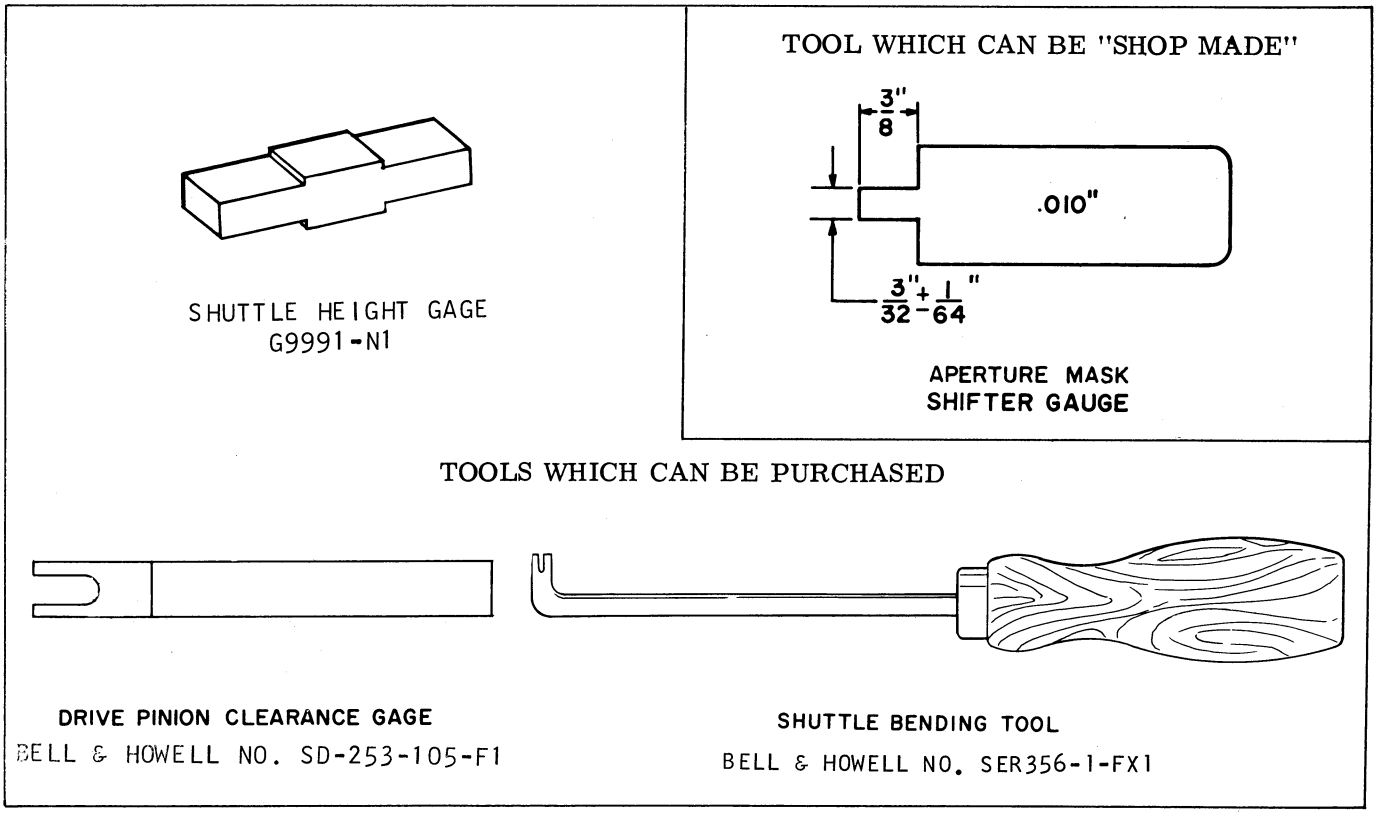

Figure B. Special Tools

Disassembly Procedure

1. GENERAL DISASSEMBLY INSTRUCTIONS.

a. Before beginning the disassembly procedure, be sure to disconnect the projector from the power source and remove the projection lamp and lens. Wrap the lamp and lens in tissue paper and place them on a shelf to protect them from possible damage.

b. If repairs require the replacement of electrical items (lamp socket, motor, or switch), refer to the wiring diagram Figure 9, at the end of the Parts Catalog as an aid to wire identification and unsolder or disconnect wires as necessary.

c. 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 removed.

d. When attaching parts (screws, nuts, etc.) are removed, reassemble them loosely to the removed part or to the tapped casting to prevent loss.

e. The majority of the parts used to mechanize the automatic rewind and multimotion functions are included in Figure 7. Some of the parts interlock or interconnect with parts removed in prior figures. Care should be exercised in disassembly to avoid damage to these parts.

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

a. The back cover (21) is secured by six screws. Four of these screws (9) are inserted through the mechanism plate and into tapped bosses in the cover; the remaining two screws (10) are inserted up through the base and into tapped bosses in the cover. To remove the back cover completely, disconnect the power cord leads from the crimp connectors.

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

a. Note that the air deflector (5) is secured to the base casting with one screw (4) while the remaining two screws (3) attach it to the lamp socket assembly (11). If the lamp socket is to be removed, take out the single screw (4) and the two lamp socket screws and remove the socket with deflector attached. If the lamp socket need not be removed, remove only the single screw (4) so that the deflector can be raised to expose the motor and blower fan for inspection.

b. The control lever knobs (12) and speed control bar knob (18) must be removed and nameplates (19) and (20) must be pried off to permit removal of screws (21) for the replacement of switch (24). The control housing is secured to the mechanism plate from the motor side by two screws (13) which are inserted into tapped holes in the control housing.

c. A retaining ring (25) retains the guide roller (26) on the roller shaft. Removal of a second retaining ring (25) will permit the withdrawal of the film guide (27) and torsion spring (28). Note the manner in which the bent ends of the spring (28) engage holes in the mechanism plate and film guide.

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

a. Removal of four screws (1) and two screws (2) will permit withdrawal of both the reel arms (3) and the assembled spindles (5). Do not disassemble the reel spindle assemblies.

b. Spur gears (6) and (7) can be lifted from the studs of the stud and support assembly (26) or (27). To free spur gear and shaft assembly (15), loosen setscrew (13) in the spur gear (14) and disassemble these parts from the support assembly (26). To free spur gear and shaft assembly (12) loosen setscrew (10) in spur gear (11) and disassemble these parts from the support assembly (27).

c. Two small spur gears (20) and (21) and two large spur gears (22) are retained on the studs of gear mounting plate by retaining rings (19).

d. The removal of a single screw (23) and two retaining rings (24) will permit the gear mounting plate assembly (28) and all remaining reel arm parts to be disassembled from the mechanism plate. Be careful not to mix the front and rear cam washers (30) and (31).

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

a. Before disassembling the film drive roller and shaft assembly and loopformer parts, note carefully the manner in which the gear retaining spring (3) and spring ratchet (4) are installed so that they can be reassembled in the same manner. Carefully remove the spring (3) and disassemble parts (4 through 8) from the rear of the film drive roller and shaft assembly.

b. To remove lens carrier assembly (71), swing open lens carrier assembly, loosen three setscrews (11) in collars (14) and (15) and unscrew framer knob assembly (12) from mechanism casting.

c. When removing lower loopformer (19) and upper loopformer (38) from mechanism casting, note the manner in which the parts were disassembled to insure proper reassembly. The lower loopformer parts (18 through 35) can be removed as an assembled group by taking out three screws (16) and (17). When removing the upper loopformer parts (also as an assembled group), note that three screws (16) and (17) secure the upper mounting plate (57) and an additional screw (36) threads into the upper film guide (37).

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

a. To remove the lens carrier from the mechanism casting refer to paragraph 5.

b. Remove the setscrew (1) from the focus knob (3) and pry the knob from its shaft. Pry off the trim plate (4) and remove parts (7 through 10), and remove two screws (5). Inspect washer (9) for dryness, hardness or damage and replace if necessary.

c. The pressure plate and stud assembly (17) can be removed from the lens mount (12) without disassembling the mount from the mechanism casting. Swing open the lens carrier cover and remove the retaining E-rings (15). Remove the pressure plate parts.

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

a. Disengage the drive belt from the drive rollers (8). Outer drive roller (8) is accessible for replacement and can be disassembled from its mounting stud by removing the retaining ring (6). Note the flat washers (7) on either side of the roller. To replace inner drive roller (8), it will be necessary to remove retaining ring (3) and withdraw pulley mounting bracket assembly (4) and pivot spring (5) from the projector. Remove screws (1) and spring loading bracket (2).

b. Make certain that the forward-still-reverse knob has been removed from the safety shutter on the operating side of the projector main plate. Remove the pivot screw (9); then loosen the screw (10) which retains the front end of the safety shutter (11) to the mechanism casting just behind the aperture opening and lift out the safety shutter.

c. Remove two screws (12), the shutter washer (13), the shutter (14), and the pull-down cam (15).

d. Remove the Sems nut (17) and washer (18) and disassemble the pivot screw (19), washer (20), spring tension washer (21), shuttle and bracket assembly (22) and spacer (23) from the cast arm of the mechanism. Loosen the setscrews (33) and withdraw the in-out cam from the main shaft. Check the felt wiper on the shuttle for looseness or damage.

e. Remove the Sems nut (16) from the pivot stud (26). Then disassemble the pivot stud (26).

f. Remove the two screws (27) and withdraw the assembled format shifter parts (28 through 31) from the main plate. Remove retaining ring (30) and disassemble the format shifting lever assembly (32) from the support bracket and stud assembly (31). The eccentric studs (29) and nuts (28) need not be removed unless the support bracket and stud assembly is in need of replacement.

g. Loosen setscrews (36) and (38) so that the drive pinion (41) and manual knob (39) are loose on the main shaft. Pry retaining ring (37) from its groove in the main shaft and press the shaft toward the rear of the projector until the manual knob can be slipped from the shaft; then withdraw the shaft toward the front of the projector, removing the drive pinion (41) and friction washer (42) in the process.

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

a. Unhook extension spring (1) from rewind arm. Remove screw (2) to free rewind arm and actuating lever assembly (3). Retaining rings (4) secure spring and sleeve assembly (5) to a stud on the support bracket (31, Figure 6) and to the stud on the rewind actuating lever assembly (7). Flat washer (6) and spacer (8) are fall-off items when pivot stud (26, Figure 6) is removed.

b. Gear cam and mounting plate assembly (9) is removed at the same time as shuttle spacer (23, Figure 6). Avoid disassembling the retaining ring (10) and second stage gear (11). They are set for timing with other gears and cams of the system.

c. Retaining ring (13) secures slow motion gear cam (14) to the large tang of the mechanism plate. By removing retaining ring (15), lock and bushing assembly (16) can be unhooked from the formed end of actuating rod assembly (17) and slipped off its mounting stud. The actuating rod assembly (17) can now be pushed down through the mechanism casting. Pry push nut (18) from the casting to free rewind link (19) and connecting rod (20).

d. Film guard spring (21) is removed to free the retractor plate stud (22). Retractor plate (23) and keeper plate (24) are removed at Figure 4 when the lower loopformer mounting plate is removed.

e. The speed control shaft and ball detent bracket group (25 through 36) are removed in index number order as necessary. With a tweezers, unhook extension spring (37) from the shuttle retractor (38) and the speed shift bracket assembly. Shuttle retractor

(38) and ball (39) can be slipped from the mechanism tang. The remaining items of Figure 7, speed shift bracket assembly (40), torsion spring (41), and animation shaft (42) are removed when the main plate is separated from the base in Figure 8.

9. REMOVAL OF PARTS IN FIGURE 8. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the drive belt (1). Remove the three screws (2) which thread into the mounting inserts (12) and carefully lift out the motor assembly (3) with fans and mounting brackets installed. Loosen setscrew (4) and withdraw the multi-bladed fan (5). Loosen setscrew (4) and withdraw the blower fan and pulley assembly (6) from the motor shaft.

b. Before removing the film cutter parts (25 through 28), note the manner in which these parts are installed. If the base casting is in need of replacement, replace the complete base assembly (22) with all parts riveted in place.

Reassembly and Adjustment

10. GENERAL.

a. When the reassembly procedure includes the staking of rivets or other parts, all such riveting and staking should be accomplished before any other reassembly procedures are attempted. Be sure to support the casting or plate solidly while performing the riveting or staking operation.

b. Be sure to follow the lubrication procedures indicated in the reassembly instructions, using the Bell & Howell lubricants. Lubricate sparingly and wipe away excess lubricant with a lint-free cloth.

c. When installing adhesive-backed nameplates, clean the contact surface of the projector. Remove paper backing from nameplate and moisten adhesive with trichlorethylene. When tacky, install nameplate and smooth down with a clean cloth.

d. When installing electrical parts (motor, switch or lamp socket), refer to the wiring diagram at the end of the Parts Catalog for proper wiring connections.

11. REASSEMBLY OF PARTS IN FIGURE 8. Reassemble parts in reverse order of disassembly, noting the following special precautions.

a. To completely assemble the film cutter to the base, first place the spacer (28) onto the base with the pointer end toward the post of the base. Next place the film cutter (27) over the spacer with the formed end toward the post of the base, and add the film cutter guide (26) with lettering up and pointed end toward the post of the base. Secure to the base with two rivets (25).

b. When assembling rubber foot (24) to base, note that counterbore of foot must be away from the base. The speed shift bracket assembly, torsion spring, and animation shaft (40, 41 and 42, Figure 7) must be assembled in place before the main plate (21) is attached to the base with three screws (20).

c. Leadwire clamp (19) need not be installed until the projector is assembled and ready for final wiring. Assemble the tilt shaft assembly (16) and retaining ring (15) to the base.

d. Motor parts should be preassembled as follows: Assemble the grommets (14) into the motor mounting brackets (10) and (11) and the inserts (12), with washers (13), into the grommets. Insert screws (7) through holes in the short bracket (11); then through the motor (3) and finally through the holes in the long bracket (10). Install and tighten the two nuts (8) and washers (9). Assemble the pulley and fan assembly (6) onto the long end of the motor shaft with pulley away from the motor. Install and tighten the setscrew (4) just enough to hold. Install the multiblade fan (5), hub toward the motor and tighten the setscrew (4). Position the motor on the base and align the holes in the base with the holes in the mounting inserts (12), being careful not to damage the blades of the blower fan against the cast wall of the blower housing. Install and tighten the three motor bracket screws (2). Loosen the blower fan setscrew (4), visually center the blower fan between the walls of the blower housing, and retighten setscrew. Temporarily loop the drive belt (1) over the pulley of the blower fan.

12. REASSEMBLY OF PARTS IN FIGURE 7. Reassemble parts in reverse order of disassembly, noting the following precautions.

a. Lightly grease contact points of the animation shaft (42) and speed shift bracket assembly (40). With torsion spring (41) in place on the bracket stud and the animation shaft in the grooves provided, mount the speed shift bracket on the pin in the base upright and under the bearing stud before attaching the main

plate to the base. Be sure small stud of actuator bracket is in the slot of the animation shaft.

b. Grease hole in the end of the shuttle retractor (38) shaft and insert ball (39). Apply two drops of oil to shuttle retractor shaft and assemble into hole in mechanism plate, rotating the shaft in the hole to distribute the oil. Hook extension spring (37) to speed shift bracket arm and to hook of shuttle retractor, using a tweezers. Assemble bracket assembly to main plate using washer (33) and screw (32). Grease ball (35) and insert in lower hole of ball detent bracket assembly (34).

c. Assemble speed control shaft (31) into speed control hub (30) so that end of the shaft is flush with hub. Secure in place with setscrew (29). Lightly grease shoulder of hub. Insert shaft through main plate and secure by assembling bushing (26) over end of shaft and locking with setscrew (25). Assemble eccentric stud (28) to speed control hub. Rotate hub until eccentric seats against face of hub. Lightly secure eccentric with screw (27).

d. Keeper plate (24) and retractor plate (23) are assembled at the time the lower loopformer mounting plate is mounted. Apply a light brushing of grease to the back and to the area around the slot of the retractor plate. Stud (22) assembled through front of plate and through slot in retractor plate, is held in place by film guard spring (21).

e. Thread end of connecting rod (20) through hole in rewind link (19) from the side opposite the formed tabs. Assemble rewind link over greased boss of mechanism plate. Secure link to mechanism plate with push nut (18) so that the link moves freely. Thread formed end of actuating rod assembly (17) up through the bottom of the casting and between the animation shaft and speed shift bracket assembly. Press into place in casting with the formed end facing to the right and the actuating feet to the left, when viewed from the rear of the projector. Engage formed end of actuating rod assembly (17) into slot of lock and bushing assembly (16). Assemble lock over greased stud and secure with retaining ring (15). Grease stud in mechanism plate tang and assemble slow motion cam gear (14) over stud with cam side out. Secure with retaining ring (13).

f. Refer to Figure C and assemble gear cam and mounting plate assembly (9). Line up the 0.093-inch diameter hole in the large cam gear with the timing slot in the plate. Assemble the second stage gear (11) with the small diameter gear towards the plate and the timing slot in the larger diameter gear vertical when the assembly is mounted. This assembly will be installed after the items in Figure 6 are assembled to the projector.

g. Assemble items 1 through 5 and 7. This subassembly group will be fitted into place as Figure 6 items are installed.

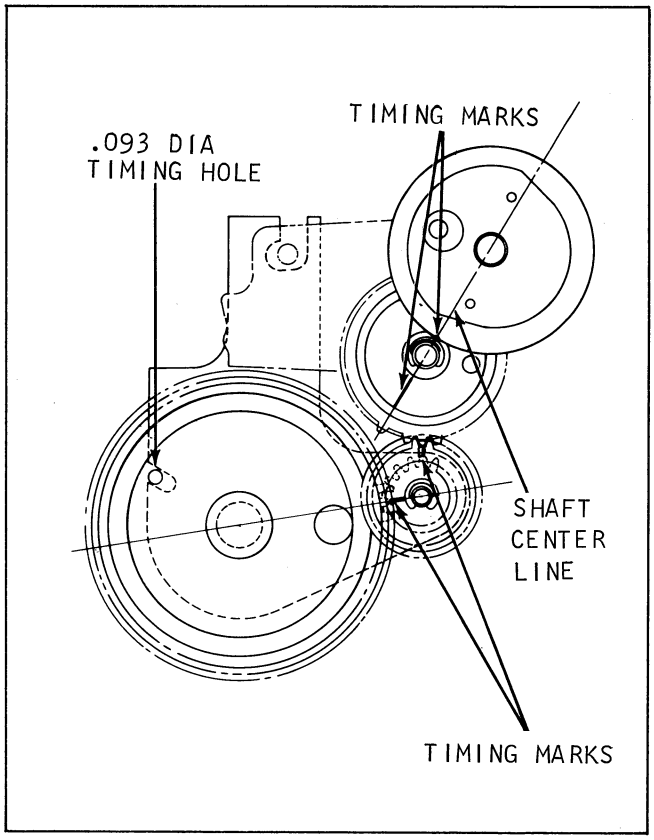

Figure C. Cam-Gear Alignment

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

a. Assemble the friction washer (42) to the main shaft (40) and lightly oil the rear end of the shaft. Insert end of shaft through the bearing in the short cast arm of the mechanism plate, assemble the drive pinion (41), hub to the right, to the shaft. At this point in the reassembly fit the subassembly described in paragraph 12, step g, into position with the lever through the slot in the main plate and the cut out positioned so that the shaft will clear. Insert the shaft through the bearing in the long cast arm. Press the shaft toward the rear of the mechanism plate until the front end of the shaft clears the cut-out of the front edge on the mechanism plate. Hold the manual knob (39) in this cut-out and slide the main shaft forward until it engages the knob. Tighten the knob setscrew (38) just enough to hold, and assemble the retaining ring (37) to main shaft groove so that the friction washer (42) is captured against the bearing in the short cast arm. Temporarily tighten the drive pinion setscrew (36) just enough to hold.

b. Tap the knob end of the main shaft with a mallet to seat the retaining ring (37) flush against the knob side of the recess wall. Assemble the thrust washer (35) onto the main shaft. Lightly grease cam surface and assemble in-out cam (34) over washer (35) on shaft with gear portion of cam toward knob end of shaft. Refer to Figure C for timing alignment of

in-out cam gear with slow motion cam (14, Figure 7). With no end play in main shaft, dip setscrew (33) in shellac and secure cam. Wipe excess shellac from cam surface.

c. Loosen setscrew (38) in the manual knob (39) and visually center the knob in the main plate cut-out. There must be sufficient clearance on either side of the knob to eliminate any binding of the knob against the main plate. Tighten the setscrew (38) securely and turn the main shaft. The shaft must turn freely with no binding or high spots. If binding does occur, tap the knob end of the shaft lightly to free it.

d. Assemble the eccentric studs (29) to the support bracket and stud assembly (31) and tighten the Sems nuts (28) finger-tight. Install the format shifting lever assembly (32) on the support bracket stud and secure in place with the retaining ring (30). Guide the format shifting lever through its slot in the main plate and fasten bracket securely to the main plate with two screws (27). Hook spring ends of spring and sleeve assembly (5, Figure 7) over stud on bracket. Refer to paragraph 24 for final adjustment.

e. Screw spacer (23) into threaded hole in mounting bracket. Loosely secure with Sems nut (17) and washer (18). Rotate the main shaft until the timing marks on the in-out cam and the slow motion cam are as shown in Figure C. Mount gear cam and mounting plate assembly (described in paragraph 12, step f) between washer (18) and tang of casting. When all gears are properly meshed and timing marks correctly located, tighten Sems nut (17). Assemble flat washer (20) to pivot screw (19). Grease both sides of washer (21) and assemble to pivot screw with bowed face against the flat washer. Assemble the shuttle and bracket assembly to the spacer (23) with pivot screw and washers engaging the stud of bracket (22) with notch of format shifting bracket.

f. Assemble cam shoe (25) to left side of shuttle cam opening with stepped follower surface against in-out cam. Assemble cam shoe (24) to right side of shuttle cam opening. Assemble pull-down cam (15) into shuttle opening between shoes with identification mark down and holes lined up with holes in the in-out cam. Lightly grease cam surfaces and add shutter (14) with open side away from cams. Place washer (13) on main shaft. Align all holes and secure shutter and cam with screws (12). Turn hand knob to check fit of shoes on cam. Adjust screw on shuttle to obtain slightly snug fit. Insert drive pinion clearance gage (Figure B) between drive pinion and bearing in short cast arm. Hold drive pinion against gage, dip end of setscrew in shellac and secure pinion to shaft. Remove clearance gage.

g. Install washer (7) on each stud of mounting bracket assembly (4). Apply several drops of oil to large recess and diameter just above recess of studs and assemble drive rollers (8) and remaining washers (7) to the studs, securing these parts with retaining ring (6).

h. Assemble the safety shutter assembly (11) to the projector. The safety shutter must locate on shoulder of pivot stud (26) with the front end of the assembly inserted through the mechanism plate, spacer (8, Figure 7), washer (6, Figure 7), and secure with Sems nut (16) after positioning subassembly as described in paragraph 12, step g, over the pivot stud. Install screw (9) into pivot hole of mounting plate of fire shutter assembly. Hold fire shutter assembly flat to keep screw from falling out. Turn the screw tightly into the tapped hole of the pivot stud. Cross the legs of the spring and engage them in the slotted ears of the safety shutter bracket. Secure the front end of the safety shutter by installing and tightening screw (10). Move the forward-reverse lever through all three positions to make certain that the lever moves freely and locks in each position. Place the lever in the "still" (center) position and visually check the centering of the perforated heat filter with the aperture opening. Adjust for centering and minimum amount of play by bending the legs of the pivot spring and moving safety shutter mounting plate up or down as necessary. Be sure to tighten screw (10) securely after adjusting.

i. Oil the studs of the pulley mounting bracket (4) and install a washer (7) on each stud. Install the driver rollers (8) and remaining washers (7) to the studs, securing these parts with the retaining rings (6). Check to make sure that the rollers spin freely and smoothly. Assemble the spring loading bracket assembly (2) to the pulley mounting bracket assembly with the two screws (1). Line up the edges of both brackets and tighten the screws enough to hold. Lightly oil the end of the pulley mounting bracket shaft and position spring (5) over shoulder of pivot stud. Insert the shaft through the bearing hole in the safety shutter assembly, with the ear of the actuating plate between shoes of the drive pulley assembly. One drive roller must be on each side of the shutter pulley. Install a retaining ring (3) to secure pulley mounting bracket and engage the drive belt with the motor pulley and the two drive rollers.

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

a. Assemble lens carrier parts as follows. Grease recess of shaft (10) and assemble washer (9) over end of shaft. Assemble focus shaft and pin assembly (10) into hole of lens carrier (12), and place spring (8) over focus shaft. Secure focus shaft to lens mount with retaining ring (7). Lightly grease both studs and assemble springs (16) over studs on pressure plate and stud assembly (17). Assemble pressure plate and springs to lens carrier with longest rail toward mounting ears of lens carrier. Place pressure plate lifter (18) over ends of studs protruding through lens carrier with tab of lifter towards pressure plate. Secure pressure plate and lifter to lens carrier with retaining rings (15). Retaining rings must be assembled straight in from end of casting to avoid interference.

CAUTION: Do not distort pressure plate when assembling. When holding in, press only in the area at the staked ends of the studs.

Assemble cover plate (14) to lens carrier and loosely secure with two screws (13). Assemble lens carrier cover (6) to lens carrier using shim washers (11) between cover and lens carrier. Shims are to be used in pairs, as required, to maintain a minimum clearance of 0.005 between lens carrier cover and loopformers, without binding. Tighten previously assembled screws (13).

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

a. Assemble the fire shutter tension spring (65) to recess of fire shutter pivot stud. Short end of the spring is to be engaged with fire shutter actuating ear and long end is to be hooked over side tension arm (68). Actuate ear of the fire shutter and release slowly several times to check proper operation of shutter. Shutter must return to stop on framing bracket without binding.

b. Place aperture plate (70) on the work bench with the stud up and away from you. Assemble the side tension arm (68) over the stud with the tension arm prongs down and into the aperture plate slots. Assemble the spring (67) with the center loop toward you and the ends of the spring entering the holes in the side tension arm. Place the loop opening of the spring into the stud groove and press the spring in until it seats. Side tension arm should exert a tension of 160 grams minimum to 180 grams maximum. It may be necessary to adjust the side tension spring (67) as shown in Figure D until the proper tension is obtained. Then assemble the aperture plate loosely to the mechanism plate with the two screws (62, 63). Line up the aperture opening and tighten the two screws securely. Assemble the film guide (69) to the aperture plate. Position the film guide over the threaded studs, and while holding the film guide in, with tangs against the inside edge of the slots in the aperture rail and aperture plate, secure the film guide with two screws (66). After the aperture plate screws are tightened, unhook fire shutter tension spring (65) from ear of the side tension arm (68). Place free end of spring (65) between rear of side tension arm and mechanism plate.

c. Pick up shaft (53) and assemble one shaft retaining ring (51) to groove at either end of the shaft; then from the other end of the shaft assemble spring washer (52) with bow up. Assemble spring (54) over shaft and place two upper spring stop plate and sleeve assemblies (55) over the spring and shaft. Assemble spring (56) over shaft and complete assembly by inserting a second retaining ring (51) to groove of shaft.

d. Assemble spring (49) over snubber pivot bushing with straight end of spring into the shear formed notch of upper loopformer mounting plate. Liberally

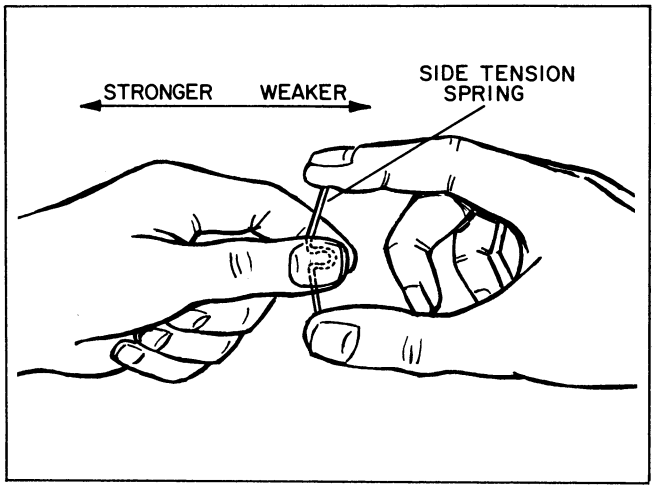

Figure D. Adjusting Tension of Aperture Plate Spring

apply oil to the pivot shaft (48), assemble into bushing of mounting plate and secure at rear side with retaining ring (47). Snubber must pivot freely without binding and the spring must return snubber arm to the running position. Apply light coating of grease to the actuating shaft of snubber arm. Assemble roller (46) over the shaft. Secure the assembly to the shaft with one retaining ring (45). Assemble the threading knob assembly (44) to the snubber arm shaft with the flat of the knob over the flat of the shaft. Press knob firmly onto the shaft to seat.

e. Apply a light coating of grease to two roller shafts of upper loopformer. Place guide roller (42) over the right shaft of the loopformer and roller (41) over the left shaft of the loopformer, both with recess up. Assemble two washers (40), one over each shaft, to the loopformer. Secure rollers with two retaining rings (39). Rollers must not have excessive end play and must be free of binding. Position upper film guide (37) against the mounting plate and loosely secure with one screw (36). Film guide will be final tightened after assembly to the mechanism plate. Assemble one washer (27) to shaft of upper loopformer assembly, and liberally apply oil to the shaft. Insert the loopformer shaft into the bushing of the mounting plate, engaging tabs of loopformer between the spring loaded shoes of the mounting plate. Place a 0.002 inch shim between loopformer and bearing washer. Place trigger (26) over the rear of the shaft. Secure the trigger with setscrew (24).

CAUTION: Place RUN-REWIND lever in RUN position (raised) to avoid damaging lock and bushing assembly (21, Figure 7).

Secure the upper loopformer assembly to the mechanism plate with two screws (16) and (17). Do not fully tighten these screws. Tighten one screw (36) from inside of mechanism plate. Tighten two previously assembled screws (16) and (17) to complete assembly of upper loopformer assembly. Actuate loopformer up and down to assure free operation. Assembly must be free from binding in either direction.

f. Place bumper (34) onto the inner side of the lower tab of the plate (35); holes in bumper and plate must line up. Assemble one retaining ring (29) to the groove at one end of shaft (31); then from other end of shaft assemble spring washer (30) with bow up. Assemble spring (32) and plate (33) over the shaft. Assemble remaining retaining ring (29) to other end of shaft to complete the assembly.

g. Apply a light coat of grease to the roller shafts of the lower loopformer. Assemble two rollers (22) to the lower loopformer (23) with recess up and add two washers (21), one over each shaft, into the roller recess. Secure rollers to shafts with two retaining rings (20). Secure lower film guide (18) to edge of mounting plate with one screw (16). Oil the shaft of the loopformer and roller assembly and add one washer (27) to the shaft. Insert the lower loopformer shaft into the bushing of mounting plate (35), engaging the tabs of loopformer between lower stop plate and bumper. Place a 0.002-inch shim between loopformer and bearing washer. Assemble bushing (25) to the shaft and secure with two setscrews (24). Secure lower loopformer assembly to the mechanism plate with two screws (16) and (17) while holding the loopformer assembly against aperture plate. Actuate loopformer to assure free operation. Assembly must be free from any binding.

h. Assemble framer shaft (12) through collars (14 and 15) into lens carrier (71). Adjust collars (14 and 15) on shaft as instructed in paragraph 23. Secure collars with three setscrews (11).

i. Assemble washer (10) over the end of drive roller and shaft assembly (9) and oil the end of the shaft. Lightly oil gears (8) and (6) on side with projections. Assemble spacer (5) to the shaft. Assemble gear (8) to the drive roller shaft and place drive gear lever and stud assembly (7) over this gear. Assemble gear (6) and add ratchet spring (4) to the shaft with depressions engaged with gear teeth. Assemble spring (3) to shaft with the short end of the spring engaged in the slot on the shaft. Apply light film of grease to the remaining stud on the gear plate and assemble gear (2) securing it with retaining ring (1).

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

a. Insert bearing (25) through hole in take-up arm (27) from the unpainted sides of the arm. Apply grease to arm around bearing. Add a steel ball (32) on either side of each bearing. Add cam (31) over the bearing of the take-up arm with prongs toward top of main frame. Install tension spring (29) over the bearing, small diameter down and end of small diameter toward top of mechanism plate. The feed reel arm is similarly assembled except for the addition of two cams (17) and (18) and spring (9). The cams fit through sleeve type reel arm bearing (16). Move actuating plate, on supply reel arm, aside. Assemble cam (17) into bearing (16). Reposition actuating plate over cam with button at top of plate cutout. Cam (18) is fitted into bearing (16) so that the projections match with cam (17). Connecting rod (7, Figure 7) is connected to cam (17) at this time. Assemble the gear mounting plate (28) and install the two large retaining rings (24). Secure the gear mounting plate to the main plate with the single screw (23).

b. Lightly oil the end of the spur gear and shaft assemblies (12) and (15) and assemble one shaft into the supply arm bearing and one shaft into the take-up arm bearing from the arm side. Assemble spur gear (11) over end of gear shaft. Insert a 0.003-inch shim between gear face and bearing face, press down lightly on the spur gear, and tighten its setscrew (10) securely. Check to make certain that the assembled spur gear and gear and shaft assembly have 0.002 to 0.003 inch end play. Repeat the above procedure with the feed gear shaft assembly (15) and its spur gear (14) and setscrew (13).

c. Lightly grease each gear stud of the gear mounting plate (28). Install spur gear (21) onto its gear stud so that it meshes with the supply arm spur gear (14). Install spur gear (20) onto its gear stud so that it meshes with the take-up spur gear (11). Secure both gears with the retaining rings (19). Assemble large spur gears (22) on their studs.

d. Lightly grease all gear studs of the reel arm supports (26) and (27). Assemble rewind release spring (9) onto stud of support arm and formed ear of actuating plate. Assemble one gear (7), hub down, onto its stud on the supply arm with washer (8) underneath; and the other gear (7) onto its stud on the take-up arm, also with hub down. Add four gears (6), with hubs down, on the two remaining studs of both arms. Lightly grease all gear teeth and carefully assemble the reel arms to the supports, installing and tightening the screws (1). Assemble reel spindle assembly (5), with gear (4) in place on spindle shaft, to feed reel arm with flat of shaft engaged with flat of reel support arm. Secure with screw (2).

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

a. Assemble forward-reverse knob (37) to reversing lever with lettering positioned so as to be readable, and secure with screw (36).

b. Assemble screws (29) to rollers (31) and (32), with head of screw in recess of roller, and install to the upright of the base. Assemble the film deflector (33) over the threaded end of the upper screw so that it fits into the formed recess and secure in place with hex nut (30).

c. Install the torsion spring (28), short tang first, over the idler stud protruding from the mechanism plate. Engage the short tang of the spring with the hole in the mechanism plate. Install film guide (27) over the stud and the long tang of the spring and secure these parts with retaining ring (25). Assemble roller (26) to stud and secure with the second retaining ring (25).

d. Apply grease to all surfaces of the interlock lever (23) which will contact the control housing (14). Assemble end of lever with elongated slot through notch in center wall, with angled edge toward top of control housing. Place two bushings (22) on the assembly. Assemble switch (24) onto the control housing with notch side of switch toward top of control housing. Secure switch to housing with two screws (21). Actuate the switch to assure switch and interlock lever are working properly. Assemble tubing (15) over the three switch leads and slide down as close as possible to rear of switch assembly. Apply nameplate (38) to shelf of control housing approximately 1/8-inch in from the front edge and centered. Smooth down to assure good adhesion using clean dry rag. Place the control housing (14) onto the main plate with format shifting and rewind levers of main plate through long rectangular openings of control housing. Secure the assembly to main plate with two screws (13). Press control lever knob (12) onto shafts protruding through control housing. Assemble bar knob (18) on shaft protruding through control housing. Install setscrew (17) and tighten to flat of shaft.

e. Pull leadwires of lamp socket and bracket assembly through clamp (10), and assemble clamp to main plate with screw (8) and washer (9). Secure lamp socket assembly (11) to main plate with two screws (6) and washers (7). Attach leadwires to lamp socket assembly as shown in the wiring diagram, Figure 9. After the projector is assembled, the lamp socket must be aligned as instructed in paragraph 21. Secure the air deflector (5) to the lamp socket bracket with two screws (3). Bend the end of the air deflector down around the fan and secure it to the blower well with screw (4). Dress the leads and pull them up snugly so they do not touch the motor.

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

a. Assemble the lamphouse baffle (24), spacer (25) and catch (26) to the lamphouse (28) with one rivet (23). Do not install the assembled lamphouse assembly (22) until the lamp socket is aligned (paragraph 21).

b. Insert cover release button (4) into top hole of front cover (8). Add catch (3) onto button with bulge up and rivet together with rivet (2).

19. FINAL INSPECTIONS.

a. Open the film gate and rotate the manual knob while watching the movement of the shuttle. The shuttle tooth should travel in the center of the shuttle slot. Refer to paragraph 22 for shuttle tooth adjustments.

b. With the projector grounded, plug the line cord into the 110 to 120 volts outlet. With the Off-Run Lamp switch in the RUN position, run the projector in "Forward" while applying grease to the gear train with a brush. Be very careful not to get grease on the drive belt or the motor pulley. After greasing and with the projector still running, apply naphtha to the drive belt and pulley with a brush to remove any grease or oil from these parts; then blow dry with a low pressure jet of compressed air.

c. With the lens removed, film gate open and projector running in "Forward," move the forward-reverse lever to "still" (center) position. The safety shutter must drop in front of the aperture opening at the very moment that the motor stops running. Repeat this procedure by moving the forward-reverse lever to "Reverse" position and then to the "Still" position. At the same time, check to make certain that the mechanism (drive rollers and sprockets) begins to drive just before the safety shutter clears the aperture opening. Turn off projector and, if necessary, adjust safety shutter operation as instructed in paragraph 24.

d. With the film gate closed, check to make certain that there is no play in the lens carrier. If necessary, bend the lens carrier spring catch with a pliers to eliminate play.

e. Check all attaching screws and nuts to make certain that they are tightened securely and visually check the projector for missing parts. Pick up the unit, turn it over and shake it to make sure no loose parts are lying in the mechanism.

f. Check to make certain that all leadwire connections are secure by tugging gently on the leadwire near the terminal connection, and see that all leadwires are properly dressed out of the way of moving parts.

g. Make final projector adjustments as outlined in paragraphs 20 through 25. Then make a final test of projector operation as outlined in the Final Test section.

20. CHECKING SPINDLE TORQUE.

a. The spindle assembly on the front (rewind) arm must be replaced if (1) film spills from the reel which indicates that the spindle is too loose, or (2) projector pulls film from the reel or perforations on the film are damaged which indicates that the spindle is too tight.

b. The spindle assembly on the rear (take-up) arm must be replaced if (1) the reel will not take up film which is an indication that spindle is too loose, or (2) it pulls bottom loop out or damages film perforations or causes picture unsteadiness.

21. LAMP SOCKET ALIGNMENT. As illustrated in Figure E, the lamp socket is secured with two screws. The screw to the rear of the lamp socket is inserted through an oversized hole in the main plate; thus when both screws are loosened slightly, the socket can be rotated to obtain full and even light through the aperture opening.

a. Rotate the manual knob until the shutter clears the aperture opening. Install the projection lamp, aligning the key on the lamp base with the key slot in the socket and pressing down firmly on top of lamp until it is seated.

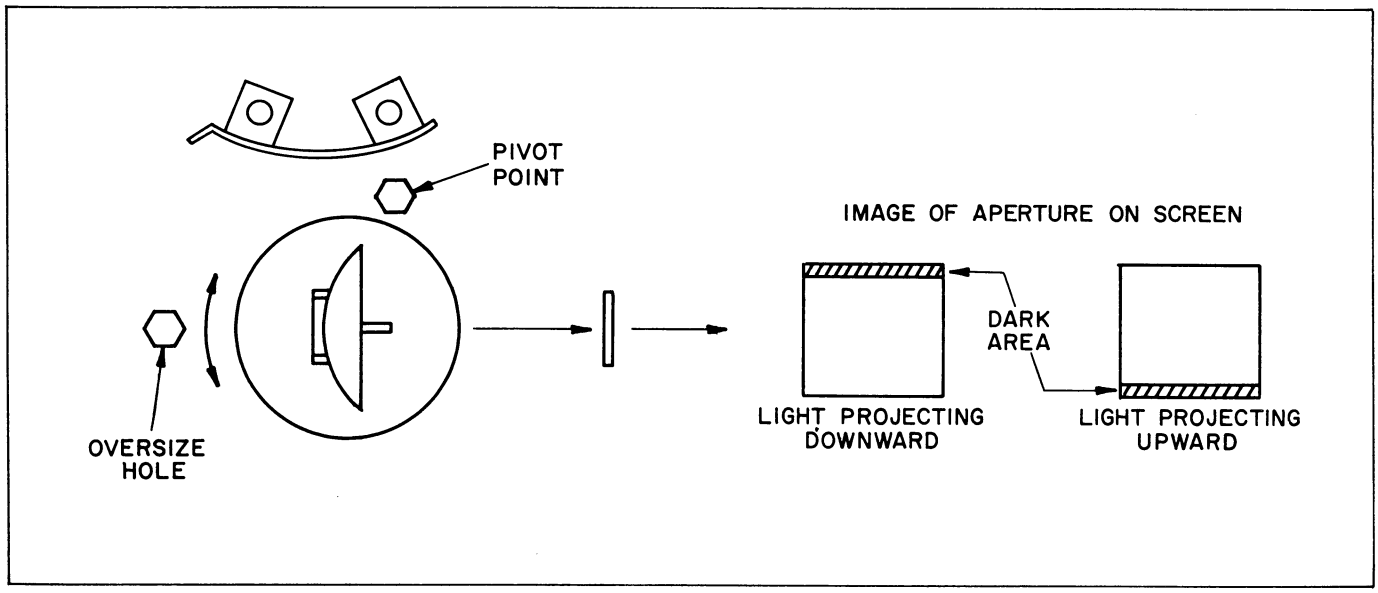

Figure E. Lamp Socket Alignment

b. Install the projection lens and switch on the projector. Focus the lens until the image of the aperture is sharp on the screen and note whether a dark area is evident at the top or bottom of the image.

c. If dark area was noted, switch off the projector and loosen the lamp socket screws just enough to permit the lamp socket to be rotated. A dark area at the top of the aperture image indicates that light is projecting at a slightly downward angle. With the blade end of a screwdriver, apply a slight amount of pressure against the top edge of the rear socket screw, thereby rotating the lamp socket slightly counterclockwise.

d. If the dark area appeared at the bottom of the aperture image, it indicates that the light is projecting at a slightly upward angle. In that case, apply pressure to the bottom edge of the rear socket screw, rotating the lamp socket clockwise.

e. It may be necessary to repeat the adjustment several times, switching on the lamp between adjustments to check the image. When the aperture image appears fully and evenly lighted, tighten both lamp socket screws securely, watching the image to make certain that the socket does not move out of alignment. Then switch off the projector and install the lamphouse.

22. SHUTTLE TOOTH ADJUSTMENT. Excessive or inadequate protrusion of the shuttle teeth will result in improper film transport during operation. Proper shuttle tooth protrusion is checked with shuttle tooth Go-No-Go gage shown in Figure B. Proceed as follows.

a. Make the following adjustments to the projector controls.

(1) Set the framer knob at the approximate center of its travel range.

(2) Set the format lever at 8-MM.

(3) Set the RUN-REWIND lever at RUN.

(4) Set the MOTION lever to NORM.

(5) Set forward and reverse lever to either forward or reverse.

(6) Swing open the lens carrier.

b. Rotate the manual knob until the shuttle teeth reach approximate mid-stroke.

c. Place the shuttle protrusion gage against the aperture plate with the deepest notch positioned directly over the shuttle teeth.

d. While holding the gage lightly but firmly against the aperture plate, slide the gage slowly 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. Also, note if shuttle teeth are protruding an equal amount.

e. To adjust shuttle tooth protrusion loosen locking nut with a socket wrench. Insert a screwdriver in slotted end of pivot spacer. To increase the height of the shuttle teeth, turn the spacer clockwise. To decrease the height of the teeth, turn the spacer counterclockwise. First check protrusion of shuttle teeth at NORM speed setting. Then when shifting to

SLOW and STEP, teeth must not move. If teeth moved when shifted to STEP setting, adjust cam gear follower on speed shift bracket assembly (40, Figure 7). To get more play between follower and cam, use a No. 4 Bristol wrench and a wrench to hold self-locking nut. Readjust tooth protrusion at NORM setting if necessary.

f. When teeth are within the minimum and maximum setting, carefully tighten the locking nut with a socket wrench. Recheck teeth for proper height after securing locking nut. If teeth have gone out of adjustment, repeat above adjusting sequences. Do not allow gear cam and plate assembly that is mounted under the locking nut and washer to become unmeshed from the slow motion gear. If it is necessary to set cam timing refer to paragraphs 12 and 13 and Figure C.

g. To adjust shuttle teeth for uneven protrusion (one tooth protruding more than the other), remove lamphouse assembly and lamp. Rotate the manual knob until the shuttle is visible through the casting just forward of the lamp socket and the shutter opening. Insert the shuttle bending tool and engage the slot of the tool with the shuttle tooth arm. The bending tool can be raised or lowered, thereby twisting the shuttle tooth arm slightly.

CAUTION: The shuttle tooth arm must be bent carefully, and in small amounts, checking between each bending operation until evenness of shuttle teeth is properly established. Use extreme care when bending so as not to distort aperture plate components or damage the shuttle teeth.

h. Carefully rest the projector on its back surface (lens pointing up) with the format shifter locked in Super 8-mm position. Open the lens carrier and set the framer knob at the approximate center of its travel range. Place a strip of film onto the aperture plate and turn the manual knob until the shuttle teeth are at the extreme top and extending through the film. With a magnifying glass, check to make certain that the teeth are approximately in the center of the perforations. Adjust centering as necessary by loosening screw in adjusting slot and moving bracket in either direction (see Figure H, item 7). Tighten the screw securely after adjustment has been made.

i. If pivot spring tension is insufficient to maintain shuttle pressure of upper cam shoe against in-out cam, adjust shuttle leaf spring adjusting screw clockwise. Reseal screw threads with shellac and center leaf spring over end of adjusting screw.

23. FRAMER ADJUSTMENT. The framing mechanism must be adjusted to permit maximum picture framing in either direction. Proceed in the following manner. Refer to Figure F.

a. Apply a light brushing of grease to the threads of framer shaft assembly. Assemble threaded end of framer knob and shaft assembly through the upper ear of mechanism plate. Position lens carrier assembly between the ears of the mechanism plate while pushing framer shaft through upper ear of carrier. Assemble the upper and lower collars with threaded hole toward upper ear, and framer collar onto framer shaft. Then push framer shaft through lower ear of lens carrier and thread into lower ear of mechanism plate. Thread shaft until end is just coming through the ear, and flat side is facing you.

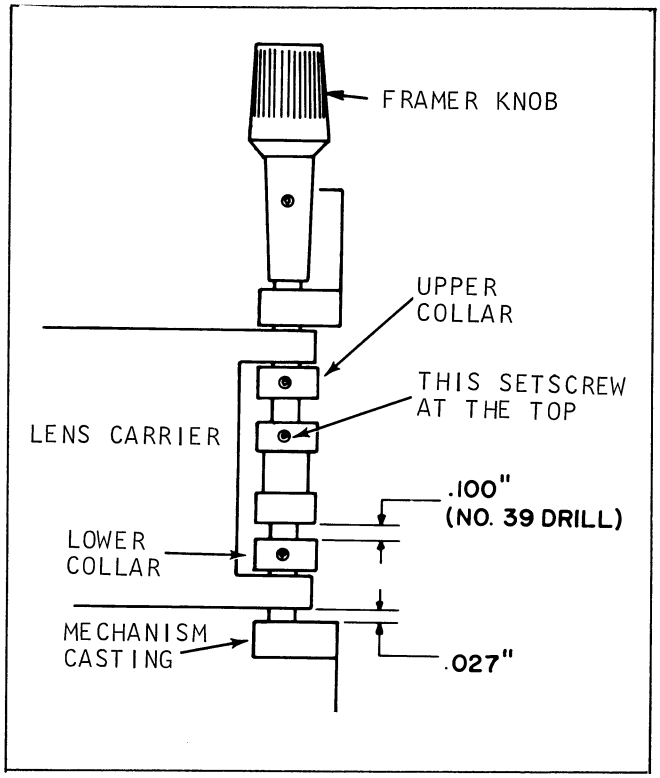

Figure F. Framer Adjustments

b. Place a 0.027 shim between the lower ear of the mechanism casting and the lens mount.

c. Press the lens mount down against the shim. Hold the upper and lower collars against both the lens mount ears and tighten the collar setscrews securely against the flat of the framer shaft.

d. Place a 0.1-inch shim between the lower collar and the framer collar and tighten the framer collar setscrew securely against the flat of the framer shaft.

e. The framer knob must turn freely, without binding. If it does not turn freely, adjust the upper collar to free it.

f. Using the test film strips indicated in Figure G, check the framing both in the Standard and Super 8-mm modes of operation. Framing results should be as noted in Figure G.

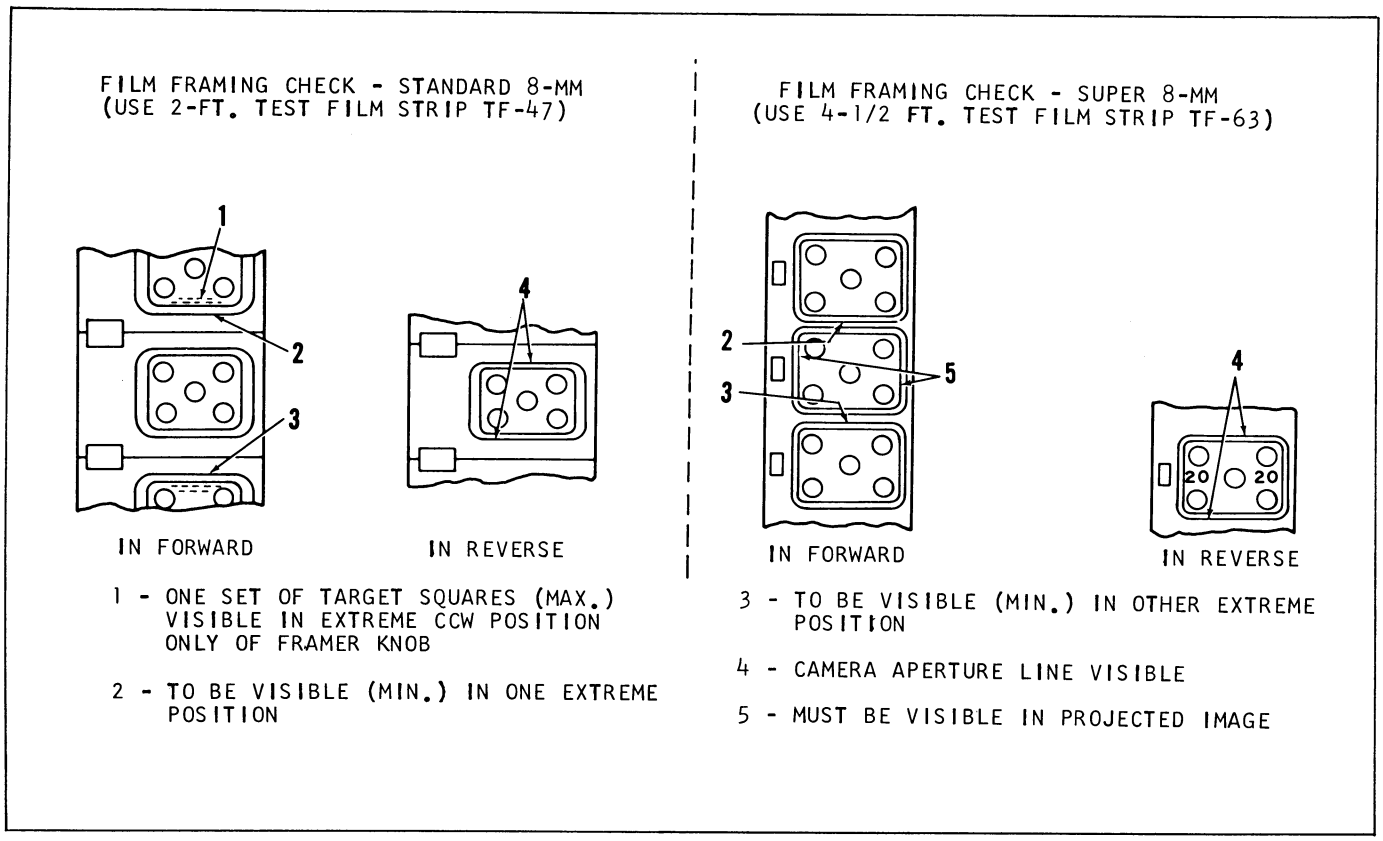

Figure G. Film Framing Check

24. APERTURE MASK ADJUSTMENT (Figure H).

a. Remove the knob from the end of the format shifting lever. Place the projector slide switch in the OFF position and the format shifting lever in Super 8 position; then move the slide switch to the LAMP position so that the format shifting lever is locked in Super 8.

b. Insert the narrow tip of the shifter gage (Figure B) through the shifting lever slot in front of the control housing so that it is located between the shifting lever and the top edge of the switch interlock lever. Note that the threaded ends of the eccentrics are slotted. Loosen the lock nut (2, Figure H) on eccentric (1) and rotate the eccentric until it just makes contact with the rear edge of the shifting lever arm; then tighten the lock nut securely.

c. Return the slide switch to the OFF position and place the shifting lever in the Standard-8 position; then move the slide switch back to the LAMP position. Again insert the shifter gage, this time between the shifter lever and the bottom edge of the switch interlock lever. Loosen the lock nut (4) on eccentric (3) and rotate the eccentric until it just makes contact with the forward edge of the shifting lever arm; then tighten the lock nut securely.

d. Swing open the lens carrier and visually check the centering of the aperture mask both in Standard-8 and Super 8. The mask must shift completely from one format to the other in either extreme of the framing knob. Also, the mask actuating lever (5) must not touch the actuating ears of the mask after shifting to either format and in the extremes of framing range. If the mask does not shift completely, or if actuating lever touches the ears of the mask, adjust by loosening the screw (6) and moving the lever in the proper direction.

25. SAFETY SHUTTER ADJUSTMENT. The rubber drive rollers which drive the shutter pulley must make contact and begin driving the mechanism (in forward and in reverse) before the safety shutter clears the aperture opening. With the back cover removed and the projector line cord 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 the safety shutter carefully as the lever is moved from the "still" position to either of the operating positions.

b. Proper operation of the safety shutter is controlled by the clearance between the outer drive roller and the rim of the shutter (Figure H). The nominal clearance is 0.062 ± 0.015 inch. If, when operating in

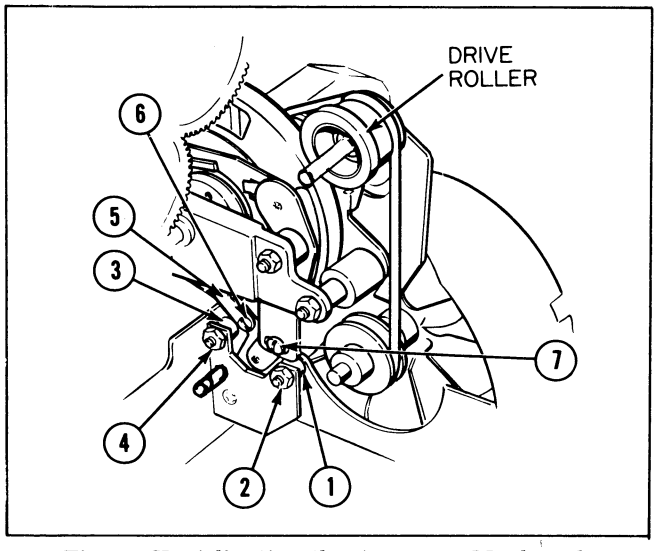

Figure H. Adjusting the Aperture Mask and Shifting Lever

reverse, the safety shutter tends to clear the aperture opening before the shutter begins to revolve, this clearance should be increased toward the high (0.077 inch) tolerance limit. If, when operating in forward, the safety shutter clears the aperture opening too soon, the clearance should be reduced toward the lower (0.047 inch) tolerance limit.

c. To adjust, place the lever in the "still" (center) position and loosen the two screws which attach the spring loading bracket to the pulley mounting bracket. Insert shim stock of the desired thickness (to increase or decrease nominal clearance of 0.062 inch) between upper drive roller and rim of shutter. While maintaining a light pressure on the roller, tighten the two loading bracket screws securely.

d. Retest safety shutter operation and readjust, if necessary, by changing the thickness of the shim stock inserted between roller and shutter rim.

e. To adjust the rewind actuating lever assembly (3, Figure 7) loosen screw (2) and move the lever assembly until it is approximately 3/16-inch from the outer drive roller shaft. Tighten screw (2). Operate the projector in the forward direction. When the rewind lever is pressed down to rewind position the pressure of the lever on the outer drive roller shaft should be sufficient to reverse the film drive gears. Reset the projector to run. The gears must start to drive in forward immediately. Vary the distance between lever and shaft until a positive reverse and forward shift is effected.

Final Test

26. GENERAL INSTRUCTIONS.

This section contains specific tests to be performed to insure 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 to 120 volts a-c, 60-cycle power source.

27. INSPECTION PROCEDURE.

a. Visually inspect the projector for missing parts. Pick up the projector, turn it over, and shake it to make sure that no loose parts are inside.

b. Check attaching screws and nuts for tightness, and tighten if necessary.

c. Check to see that all leadwires are properly dressed out of the way and that all solderless connectors are securely pressed onto their lugs.

d. Press on the ends of the sprocket shafts to check for end play. Sprockets must be under spring tension and springs must not be loose.

e. Open and close the lens carrier to make certain that it latches securely in place. If necessary, bend the fingers of lens carrier catch (60, Figure 4) to increase the tension.

f. Check the manual knob shaft for a slight amount of end play. Rotate manual knob to check the fit of the cam shoes. Cam shoes should fit snugly but without binding, and proper fit is obtained by adjusting the long screw on the shuttle.

g. With MOTOR-LAMP switch in MOTOR position, and RUN-REWIND lever in RUN position, move direction lever back and forth several times between "still" and "reverse." Shutter must not rotate when lever is in "still" position. Switch lever to "forward" operation. Shutter now must rotate. Refer to paragraph 25 for adjustment.

28. 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. Operate the projector, first in the foward direction and then in reverse. Watch the action of the safety shutter and the drive rollers against the shutter rim as the lever is moved from the "still" position to either of the operating positions. If necessary, adjust drive rollers as instructed in paragraph 25.

29. REWIND OPERATION TEST. With the projector operating in forward direction, shift the RUN-REWIND lever to REWIND. The projector must reverse at once. Reset RUN-REWIND lever to RUN and REWIND alternately several times. Refer to paragraph 25 for adjustment. With projector operating in "still" with lamp off, slowly bring down the RUN-REWIND lever until drive roller just starts driving shutter. Hold feed reel spindle while holding rewind lever in above mentioned position. Feed spindle should not fully engage into rewind but must be touching the spindle drive gear causing a ratcheting sound. If it does not ratchet, bend down the connecting rod (20, Figure 7) to take up excess play in upper direction. Repeat above check and adjustment until ratcheting sound is obtained.

30. OPTICAL ALIGNMENT TEST. The alignment of the optical axis of the projection lens in the vertical plane is held to very close tolerance 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, swing open the lens carrier and turn the adjusting screw (59, Figure 4) in or out, as necessary to obtain equal sharpness of the image along both sides of the projected picture. The head of this screw bears against the machined surface of the lens carrier and determines the angular relationship between the optical axis and the aperture plate.

c. The adjustment should be made a bit at a time, and it may be necessary to refocus the lens during the alignment procedure.

31. OPERATIONAL TEST. Thread the projector with silent 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 is necessary to replace the reel spindle.

c. If the film fails to maintain its loop above or below the aperture, check shuttle tooth height as described in paragraph 22 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 30 and adjust if necessary.

e. If the projected picture is out-of-frame in either format (Standard 8 or Super 8), adjust framing as outlined in paragraph 23.

Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
Projector inoperative with switch in the MOTOR or LAMP position	1. No electrical power.	1. Check power source.
	2. Loose blower fan.	2. Tighten fan setscrew (8-4).
	3. Broken drive belt.	3. Replace belt.
	4. Defective switch or wiring.	4. Check switch and circuitry.
Picture flicker	1. Drive roller assemblies not adjusted properly.	1. Readjust as instructed in paragraph 25.
	2. Defective drive belt pulley.	2. Replace drive belt pulley.
	3. Dirt, wear or binding in gearing.	3. Clean and repair or adjust gearing as instructed in reassembly instructions.
Film scratches	1. Excessively dirty film channel parts (rollers, guides, etc.).	1. Clean projector thoroughly.
	2. Worn aperture plate (4-70) or pressure plate (5-17).	2. Replace if worn or marred.
	3. Worn or damaged aperture plate film guide rail.	3. Replace aperture plate (4-69).
Jumpy picture	1. Loss of film loop due to damaged film.	1. Inspect and splice as required.
	2. Green film.	2. Run film through projector two or three times to age the film.
	3. Shuttle tooth worn.	3. Replace shuttle assembly (6-22).
	4. Misaligned shuttle tooth.	4. Adjust and align shuttle as instructed in paragraph 22.

TROUBLE	PROBABLE CAUSE	REMEDY
	5. Grooves worn in aperture plate film guide rail.	5. Replace aperture plate (4-69).
	6. Upper and/or lower loopformer binding.	6. Free up binding loopformer.
Soft focus	1. Dirty projection lens.	1. Clean projection lens.
	2. Lens mount out of alignment.	2. Readjust focus screw as necessary (paragraph 29).
	3. Loose lens mount catch (4-60).	3. Reset tension by bending catch carefully.
Autothreading not operating properly	1. Loopformers binding.	1. Free-up loopformers.
	2. Safety shutter binding.	2. Free-up safety shutter.
Film spills	1. Insufficient tension on feed or take-up spindle.	1. Replace spindle.
Fails to take-up or rewind	1. Defective drive belt.	1. Replace belt.
	2. Worn rim on drive roller.	2. Replace worn roller (6-8).
	3. Drive rollers not adjusted properly.	3. Readjust as instructed in paragraph 25.
	4. Defective reel spindles.	4. Replace spindles.
Noisy	1. Loose attaching parts.	1. Tighten as necessary.
	2. Gearing dry.	2. Lubricate as necessary.
Dim projected pictures	1. Projector lamp dirty.	1. Clean projector lamp.
	2. Wrong lamp used.	2. Use Type DFZ 30V, 80W lamp only.
	3. Lamp socket out of alignment.	3. Align lamp socket as instructed in paragraph 21.
Pictures not framing properly	1. Framing spacers out-of-adjustment.	1. Adjust framing (paragraph 23).
	2. Format shifting lever out-of-adjustment.	2. Adjust aperture mask and shifting lever (paragraph 24).
Rewind failure	1. Loose staking of gear and shaft assembly (3-15).	1. Restake or replace gear and shaft assembly.
	2. Excessive end play in gear and shaft assembly.	2. Adjust end play (paragraph 12).
	3. Defective spindles (3-5).	3. Replace spindles.
	4. Rewind connecting rod (7-20) adjusted incorrectly, or not in hole of rewind link (7-19) closest to pivot.	4. Adjust connecting rod (paragraph 12).

TROUBLE	PROBABLE CAUSE	REMEDY
Rewind failure (cont'd)	5. Spring assembly (7-5) not on studs or tubing not centered	5. Center tubing and mount assembly on studs.
	6. Rewind arm (7-3) twisted or out of adjustment.	6. Straighten or replace arm and adjust (paragraph 25).
	7. Rewind knob (2-12) on too far.	7. Reset or replace knob.
	8. Dry pull-down cam.	8. Lightly grease cam (6-15).
	9. Tight cam shoes (6-24) and (6-25).	9. Correct fit by turning long adjusting screw on shuttle counterclockwise.
	10. Tight animation shaft.	10. Lubricate or replace shaft (7-42).
	11. Pressure plate does not retract.	11. Replace defective pressure plate (5-17), retractor plate (7-23), or lifter (5-18).
	12. Excessive tooth penetration.	12. Adjust shuttle tooth protrusion (paragraph 22).
	13. Loose or missing film clip.	13. Replace film clip.
Trigger problems	1. Upper loopformer binds.	1. Free binding loopformer.
	2. Lock (7-16) binds.	2. Lubricate lock mounting stud.
	3. Actuating rod assembly (7-17) improperly mounted or damaged.	3. Assemble correctly or replace (paragraph 12).
Film transport problems	1. Incorrect shuttle tooth penetration or centering.	1. Adjust as instructed in paragraph 22.
	2. Cam shoes too tight or too loose.	2. Correct shoe fit by adjusting long screw on shuttle.
	3. Cam holes not lined up.	3. Align holes as directed in paragraph 13.
	4. Shuttle pivot leaf spring too loose.	4. Adjust leaf spring adjusting screw clockwise. Recenter spring over end of screw.
	5. Bent shuttle (6-22) or shuttle not parallel to tang.	5. Tighten mounting screw (6-9). Straighten or replace bent shuttle.
	6. Defective or wrong upper cam shoe (6-25).	6. Replace cam shoe.

TROUBLE	PROBABLE CAUSE	REMEDY
Film transport problems (cont'd)	7. Upper cam shoe (6-25) assembled backwards.	7. Assemble cam shoes as instructed in paragraph 13.
Speed change failure	1. Spring (7-37) missing or not attached at both ends.	1. Replace spring or attach as directed in paragraph 12.
	2. Cam follower out of adjustment (part of 40, Figure 7).	2. Adjust follower (paragraph 22).
	3. Gear, cam and mounting plate assembly (7-9) not engaged.	3. Align gear cams (paragraph 12, Figure C) and tighten nut (6-17).

PARTS CATALOG

COMPATIBLE SUPER 8 AND STANDARD 8 AUTOLOAD® PROJECTOR

DESIGN 467

PHOTO PRODUCTS GROUP

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 72729-1 PRINTED IN U.S.A. APRIL 1970

Replacement Parts

The following pages illustrate and list by part name and number all replacement parts of the Design 467 Autoload Super and Standard 8 Projectors. Since the illustrations are arranged in the suggested order of disassembly, they will serve as an aid to the repairman during disassembly and reassembly of the projector.

NOTE: Refer to the Bristol Wrench Chart for proper wrenches required for removal of the fluted socket setscrews illustrated in these parts lists.

ACCESSORIES

400 Ft. Super 8-mm Reel . . . . . p/n 012610

400 Ft. Super 8-mm Reel with Safety Clutch . . . . . p/n 012813

400 Ft. 8-mm Reel . . . . . p/n 08538

Standard 1-Inch f/1.5 Projection Lens . . . . . p/n 020749

18 to 30-mm f/1.6 Zoom Lens . . . . . p/n 202922

Spindle Adapters and Spring Clips . . . . . p/n 013460

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR COVERS AND LAMP		
1-1	014050	COVER ASSEMBLY, Front	1	
-2	30226	. RIVET, Tubular, 0.123 inch diameter	1	
-3	39252	. CATCH, Cover	1	
-4	32361	. BUTTON, Cover release	1	
-5	40553	. CLIP, Film reel retaining	1	
-6	43074	. NAMEPLATE, Front cover	1	
-7	43825	. TRIMPLATE, Front cover	1	
-8	No Number	. COVER, Front (order complete cover assembly)	NP	
-9	43199	SCREW, Hex head tapping, 4-40 by 1/2 inch	4	
-10	37932	SCREW, Hex head, 6-32 by 5/8 inch	2	
-11	43126	PLATE, Data	1	
-12	39181	CORD, Power	1	
-13	22464	BUSHING, Strain relief	1	
-14	39200	SCREW, Hex head Sems tapping, 8-18 by 1/2 inch	2	
-15	39124	HOOK, Power cord storage	2	
-16	39204	SCREW, Hex head Sems tapping, 10-32 by 0.437 inch	2	
-17	35186	WASHER, Flat	2	
-18	43197	END CAP, Handle	2	
-19	39074	HANDLE, Carrying	1	
-20	39073	INSERT, Carrying handle	1	
-21	43193	COVER, Back	1	
-22	014059	LAMPHOUSE ASSEMBLY, Complete	1	
-23	39190	. RIVET, Tubular, 0.123 inch diameter	1	
-24	39231	. BAFFLE, Heat	1	
-25	39189	. SPACER, Sleeve	1	
-26	35360	. CATCH, Lamphouse	1	
-27	43070	. NAMEPLATE, Lamphouse	1	
-28	No Number	. LAMPHOUSE (Order complete lamphouse assembly)	NP	
-29	43057	LAMP, Projection, Type DFZ	1	

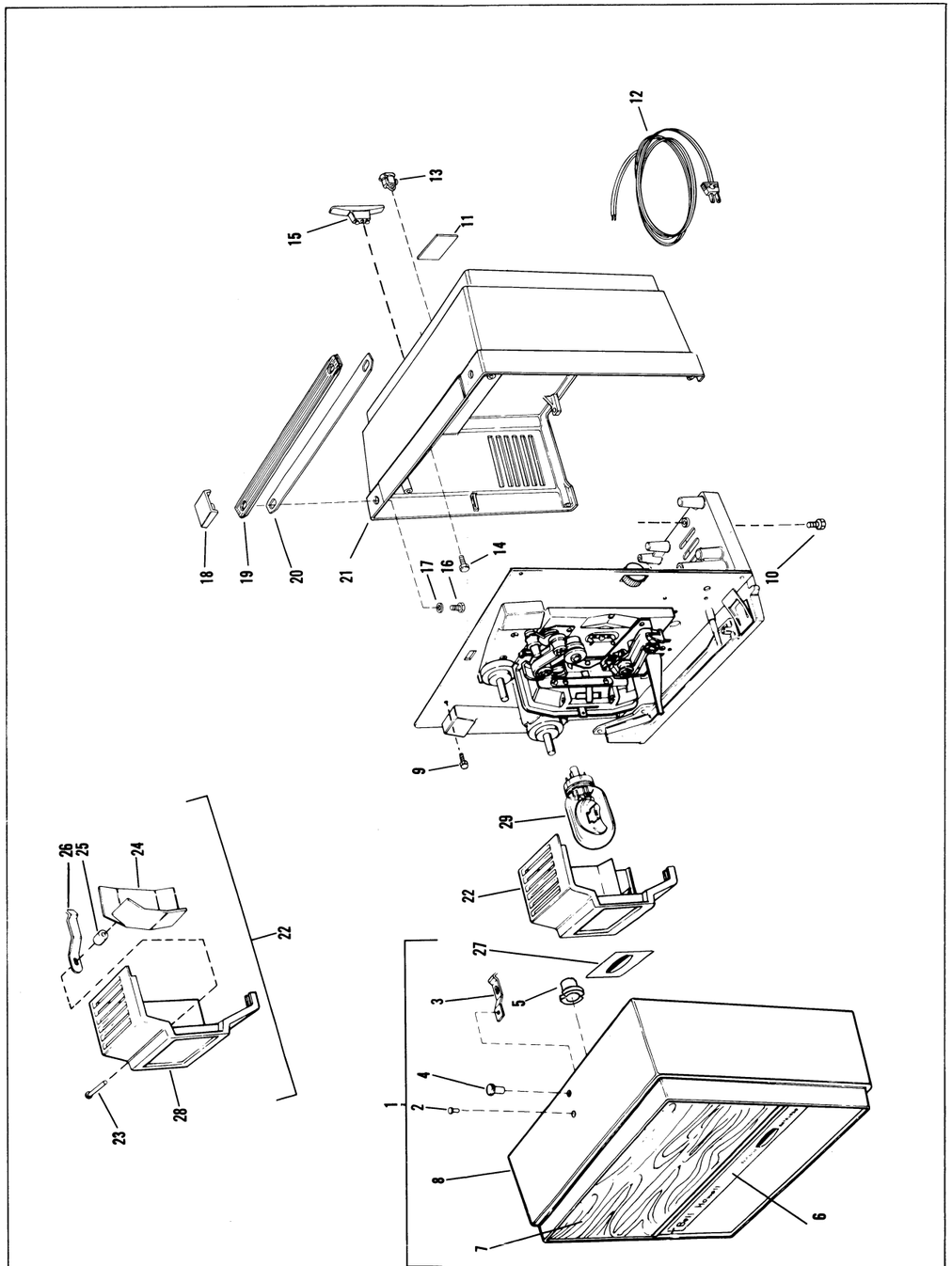

Figure 1. Projector Covers and Lamp

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		CONTROL HOUSING AND ROLLERS		
2-1	19025	RIVET, Tubular, 0.123 inch diameter	2	
-2	32478	BAFFLE, Lamp	1	
-3	37947	SCREW, Hex head tapping, 4-40 by 1/4 inch	2	
-4	30237	SCREW, Hex head tapping, 4-40 by 1/4 inch	1	
-5	39301	DEFLECTOR, Air	1	
-6	706679	SCREW, Hex head tapping, 6-32 by 3/8 inch	2	
-7	17632	WASHER, Flat	2	
-8	36882	SCREW, Hex head tapping, 6-32 by 3/8 inch	1	
-9	17632	WASHER, Flat	1	
-10	83286	CLAMP, Leadwire	1	
-11	010271	SOCKET AND BRACKET ASSEMBLY, Lamp	1	
-12	43861	KNOB, Control lever	2	
-13	706679	SCREW, Hex head tapping, 6-32 by 3/8 inch	2	
-14	43127	HOUSING, Control	1	
-15	39182	TUBING, Insulating	1	
-16	43832	NAMEPLATE, Bar knob	1	
-17	36769	SETSCREW, Fluted socket, cup pt, 8-32 by 1/4 inch	1	
-18	43059	KNOB, Bar	1	
-19	43071	NAMEPLATE, Control box, I	1	
-20	43867	NAMEPLATE, Control box, II	1	
-21	34590	SCREW, Flat head, 6-32 by 3/8 inch	2	
-22	40495	BUSHING, Interlock lever	2	
-23	40454	LEVER, Interlock	1	
-24	012860	SWITCH, Slide	1	
-25	20808	RING, Retaining, 0.145 ID (IRRC No. 1000-18)	2	
-26	39087	ROLLER, Guide	1	
-27	40419	GUIDE, Film	1	
-28	39098	SPRING, Torsion	1	
-29	39089	SCREW, Guide roller, 4-40NC	2	
-30	39223	NUT, Plain hex, 4-40NC	1	
-31	39248	ROLLER, Guide	1	
-32	40518	ROLLER	1	
-33	39143	DEFLECTOR, Film	1	
-34	43454	DISC, Decorative	1	
-35	013642	KNOB, Tilt	1	
-36	32926	SCREW, Fillister head, 2-56 by 1/4 inch	1	
-37	40420	KNOB, Forward-Reverse	1	
-38	43065	NAMEPLATE, Lamp designation	1	

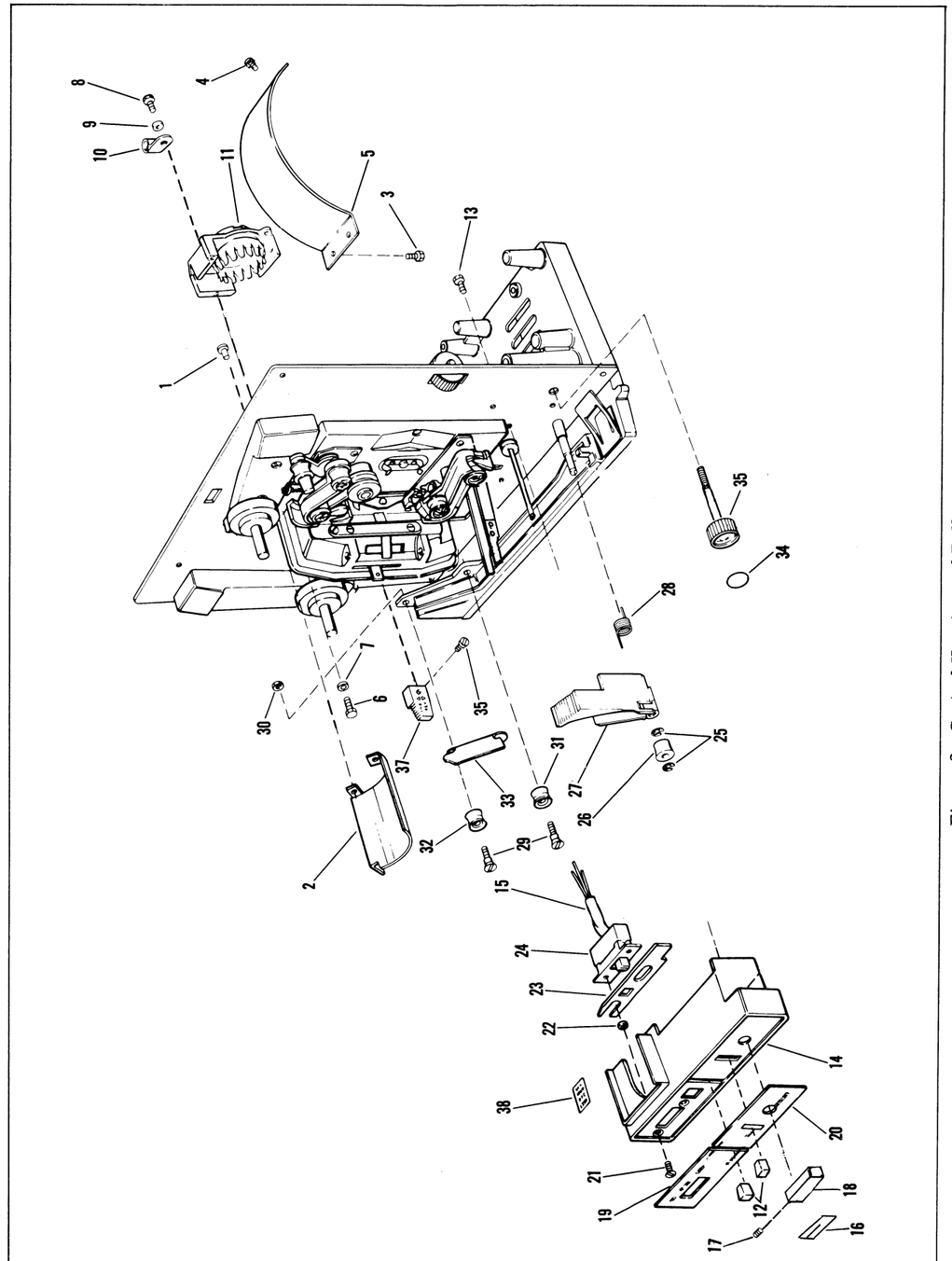

Figure 2. Control Housing and Rollers

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		REEL ARMS AND GEARS		
3-1	23822	SCREW, Binding head, 5-40 by 0.203 inch	4	
-2	36837	SCREW, Pan head, 4-40 by 1/4-inch	2	
-3	43194	ARM, Reel	2	
-4	43189	GEAR, Spur	2	
-5	09578	SPINDLE ASSEMBLY, Film reel	2	
-6	29707	GEAR, Spur	4	
-7	39049	GEAR, Spur	2	
-8	43176	WASHER	1	
-9	43011	SPRING, Rewind release	1	
-10	29192	SETSCREW, Fluted socket cup pt, 4-40 by 1/8 inch	1	
-11	39056	GEAR, Spur	1	
-12	010189	SPUR GEAR AND SHAFT ASSEMBLY	1	
-13	80591	SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-14	43118	GEAR, Spur	1	
-15	014032	SPUR GEAR AND SHAFT ASSEMBLY	1	
-16	43028	BEARING, Reel arm	1	
-17	43110	CAM, Rewind actuating	1	
-18	43029	CAM, Motion change lever	1	
-19	21736	RING, Retaining, 0.207 inch ID (IRRC No. 1000-25)	4	
-20	29706	GEAR, Spur, small	1	
-21	43159	GEAR, Spur, small	1	
-22	34718	GEAR, Spur, large	2	
-23	80147	SCREW, Binding head, 5-40 by 3/16 inch	1	
-24	29744	RING, Retaining, external 0.562 inch ID	2	
-25	34705	BEARING, Reel arm	1	
-26	014037	SUPPORT AND REWIND LEVER ASSEMBLY	1	
-27	012863	STUD AND SUPPORT ASSEMBLY	1	
-28	014028	PLATE ASSEMBLY, Gear mounting	1	
-29	39099	SPRING, Reel arm tension	2	
-30	29736	WASHER, Cam, feed arm	1	
-31	39228	WASHER, Cam, take-up arm	1	
-32	1261	BALL, Steel	4	

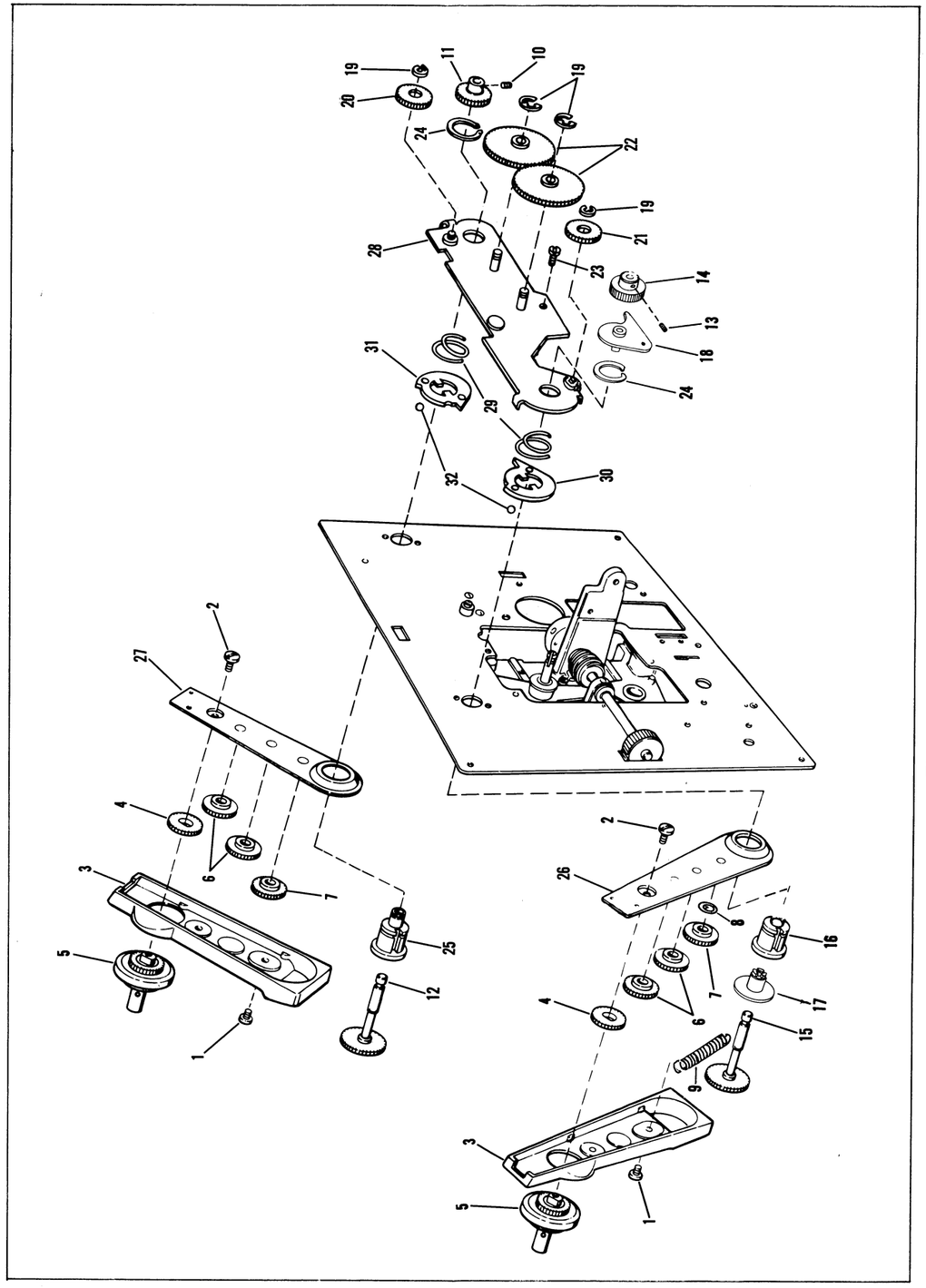

Figure 3. Reel Arms and Gears.

FIG. & INDEX NO.	PART NO.	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		LOOPFORMERS, SPROCKETS AND GEARS		
4-1	21736	RING, Retaining, 0.207 inch ID (IRRC No. 1000-25)	1	
-2	34718	GEAR, Spur	1	
-3	35181	SPRING, Gear retaining	1	
-4	35184	RATCHET, Spring	1	
-5	35186	WASHER, Spacer	1	
-6	35177	GEAR ASSEMBLY, Outer	1	
-7	014031	DRIVE GEAR LEVER AND STUD ASSEMBLY	1	
-8	43868	GEAR, Inner	1	
-9	09624	FILM DRIVE ROLLER AND SHAFT ASSEMBLY	1	
-10	26085	WASHER, Friction	2	
-11	41973	SETSCREW, Fluted socket cup pt, 4-40 by 0.093 inch	3	
-12	014033	FRAMER KNOB AND SHAFT ASSEMBLY	1	
-13	40491	. DISC, Decorative	1	
-14	40479	COLLAR	2	
-15	40462	COLLAR, Framer	1	
-16	36836	SCREW, Pan head, 4-40 by 3/16 inch	5	
-17	36839	SCREW, Slotted pan head, 4-40 by 1/2 inch	1	
-18	40412	GUIDE, Film, lower	1	
-19	09627	LOWER LOOPFORMER ASSEMBLY	1	
-20	40567	. RING, Self-locking, retaining external	2	
-21	40492	. WASHER	2	
-22	40536	. ROLLER	2	
-23	40413	. LOOPFORMER, Lower	1	
-24	29192	SETSCREW, Fluted socket cup pt, 4-40 by 1/8 inch	3	
-25	40468	BUSHING	1	
-26	43007	TRIGGER	1	
-27	705972	WASHER, Thrust	2	
-28	09629	LOWER LOOPFORMER MOUNTING PLATE ASSEMBLY	1	
-29	17639	. RING, Retaining, external, 0.125 inch ID (Type E)	2	
-30	17188	. WASHER, Spring	1	
-31	40473	. SHAFT, Spring, lower	1	
-32	40541	. SPRING, Snubber	1	
-33	40446	. PLATE, Spring stop, lower	1	
-34	40546	. SLEEVE	2	
-35	No Number	. PLATE, Lower (order complete lower loopformer mounting plate assembly)	NP	
-36	36838	SCREW, Pan head, 4-40 by 3/8 inch	1	
-37	40410	GUIDE, Film, upper	1	
-38	09626	UPPER LOOPFORMER ASSEMBLY	1	
-39	40567	. RING, Self-locking, retaining, external	2	
-40	40492	. WASHER	2	
-41	40536	. ROLLER	1	
-42	40535	. ROLLER, Guide	1	
-43	09164	. LOOPFORMER AND SLEEVE ASSEMBLY, Upper	1	
-44	09622	THREADING KNOB ASSEMBLY	1	
-45	20808	RING, Retaining, 0.145 inch ID (IRRC No. 1000-18)	1	
-46	40585	ROLLER	1	
-47	86799	RING, Retaining, external crescent, 0.156 inch ID	1	
-48	014030	SNUBBING ARM AND PIVOT SHAFT ASSEMBLY	1	
-49	40530	SPRING, Upper snubber	1	
-50	09628	UPPER LOOPFORMER MOUNTING PLATE ASSEMBLY	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LOOPFORMERS, SPROCKETS AND GEARS (CONT)		
4-51	17639	. RING, Retaining, external, 0.125 inch ID (Type E)	2	
-52	17188	. WASHER, Spring	1	
-53	40577	. SHAFT, Spring, upper	1	
-54	40543	. SPRING, Top, snubber	2	
-55	40447	. UPPER SPRING STOP PLATE	2	
-56	40541	. SPRING, Snubber	1	
-57	No Number	. PLATE, Upper (order complete upper loopformer mounting plate assembly)	NP	
-58	40467	RIVET, Lens mount catch	2	
-59	40533	SCREW, Hex head, 4-40 by 1/4 inch	1	
-60	09630	LENS MOUNT CATCH ASSEMBLY	1	
-61	40621	SHIM	2	
-62	30621	SCREW, Truss head, 3-48 by 3/16 inch	1	
-63	40551	SCREW, Truss head, 3-48 by 1/4 inch	1	
-64	014074	APERTURE PLATE ASSEMBLY	1	
-65	40494	. SPRING, Fire shutter tension	1	
-66	30620	. SCREW, Truss head, 3-48 by 1/8 inch	2	
-67	40531	. SPRING, Side tension	1	
-68	30639	. ARM, Side tension	1	
-69	40440	. GUIDE, Film	1	
-70	No Number	. APERTURE PLATE (Order complete aperture plate assembly)	1	
-71	014041	LENS CARRIER ASSEMBLY (See Figure 5 for detail parts)	1	

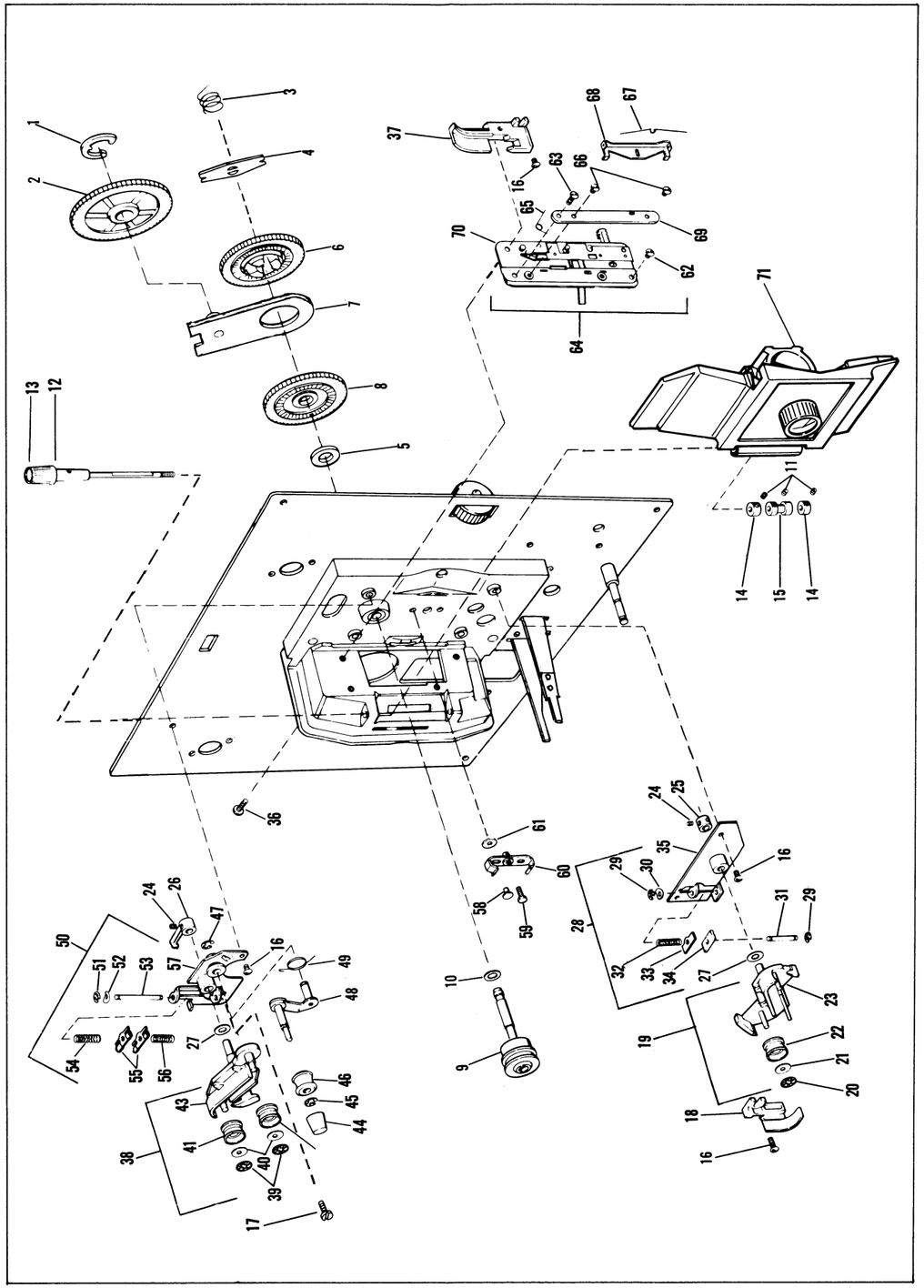

Figure 4. Loopformers, Sprockets and Gears

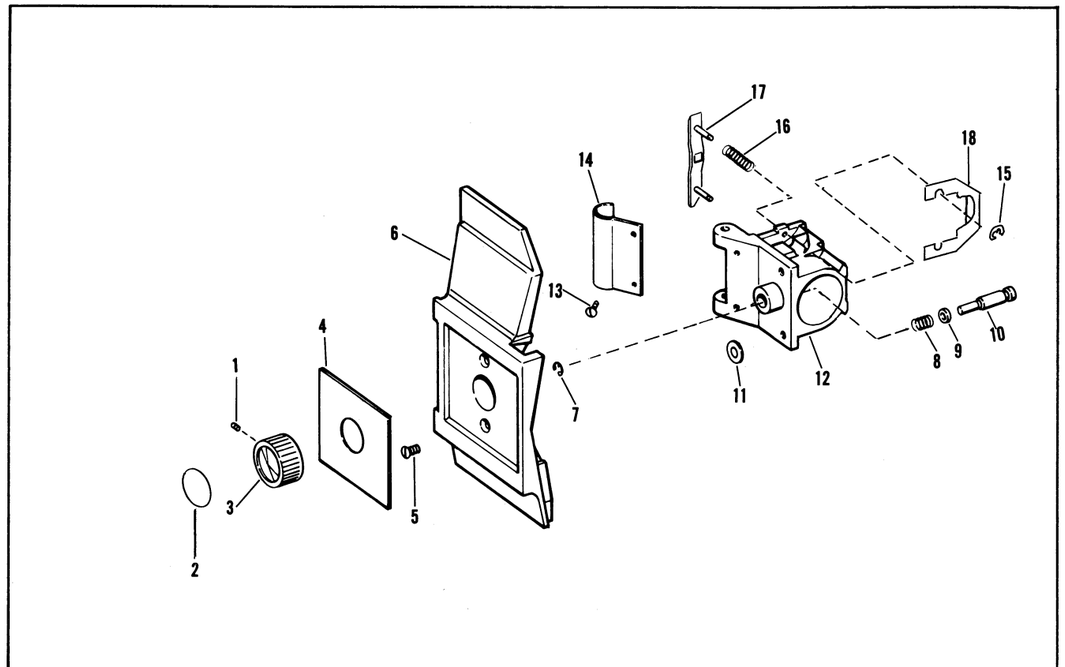

Figure 5. Lens Carrier Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LENS CARRIER ASSEMBLY		
5-	014041	LENS CARRIER ASSEMBLY	1	
-1	36770	. SETSCREW, Fluted socket, cup pt, 8-32 by 1/4 inch	1	
-2	43454	. CAP, Decorative	1	
-3	013643	. KNOB, Focus	1	
-4	43574	. PLATE, Trim	1	
-5	25618	. SCREW, Pan head, 6-32 by 9/16 inch	2	
-6	43195	. COVER, Lens carrier	1	
-7	20808	. RING, Retaining, 0.145 inch ID (IRRC No. 1000-18)	1	
-8	39097	. SPRING, Focus	1	
-9	39230	. WASHER	1	
-10	09621	. FOCUS SHAFT AND PIN ASSEMBLY	1	
-11	705972	. WASHER, Shim	2	
-12	014029	. LENS MOUNT AND BUSHING ASSEMBLY	1	
-13	36836	. SCREW, Pan head, 4-40 by 3/16 inch	2	
-14	43196	. PLATE, Cover	1	
-15	40564	. RING, Retaining, external, Type E	2	
-16	40542	SPRING, Pressure plate	2	
-17	013457	PRESSURE PLATE AND STUD ASSEMBLY	1	
-18	43121	LIFTER, Pressure plate	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		SHUTTER, SHUTTLE AND DRIVE MECHANISM		
6-1	35956	SCREW, Pan head, Sems, 3-48 by 3/16 inch	2	
-2	09167	BRACKET ASSEMBLY, Spring loading	1	
-3	25715	RING, Retaining, external bowed E, 0.145 inch ID	1	
-4	013458	BRACKET ASSEMBLY, Pulley mounting	1	
-5	39245	SPRING, Torsion	1	
-6	27322	RING, Retaining, special	2	
-7	32172	WASHER, Flat	4	
-8	010667	DRIVER ROLLER ASSEMBLY	2	
-9	39264	SCREW, Pivot	1	
-10	34656	SCREW, Round head Sems, 6-32 by 1/4 inch	1	
-11	010348	SHUTTER ASSEMBLY, Safety	1	
-12	28308	SCREW, Slotted binding head, 3-48 by 7/16 inch	2	
-13	29175	WASHER, Shutter	1	
-14	40431	SHUTTER ASSEMBLY	1	
-15	43166	CAM, Pull-down	1	
-16	26906	NUT AND WASHER, Sems, 6-32NC	1	
-17	35164	NUT AND WASHER, Sems, 8-32NC	1	
-18	611439	WASHER, Flat	1	
-19	706964	SCREW, Pivot	1	
-20	43857	WASHER, Flat	1	
-21	39027	WASHER, Spring tension	1	
-22	014034	SHUTTLE AND BRACKET ASSEMBLY	1	
-23	43862	SPACER, Shuttle	1	
-24	32947	SHOE, Cam, lower	1	
-25	43169	SHOE, Cam, upper	1	
-26	43119	STUD, Pivot	1	
-27	32350	SCREW, Round head, 8-32 by 5/16 inch	2	
-28	26906	NUT AND WASHER, Sems, 6-32NC	2	
-29	40474	STUD, Eccentric	2	
-30	33968	RING, Retaining, special	1	
-31	014054	SUPPORT BRACKET AND STUD ASSEMBLY	1	
-32	014055	FORMAT SHIFTING LEVER ASSEMBLY	1	
-33	12498	SETSCREW, Fluted socket cup pt, 6-32 by 1/8-inch	2	
-34	43167	CAM, In-out	1	
-35	26085	WASHER, Thrust	1	
-36	12498	SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-37	26131	RING, Retaining, crescent external, 0.219 inch ID	1	
-38	80591	SETSCREW, Fluted socket cup pt, 6-32 by 3/16 inch	1	
-39	39140	KNOB, Manual, main shaft	1	
-40	43183	SHAFT, Main	1	
-41	39004	PINION, Drive	1	
-42	30667	WASHER, Friction	1	

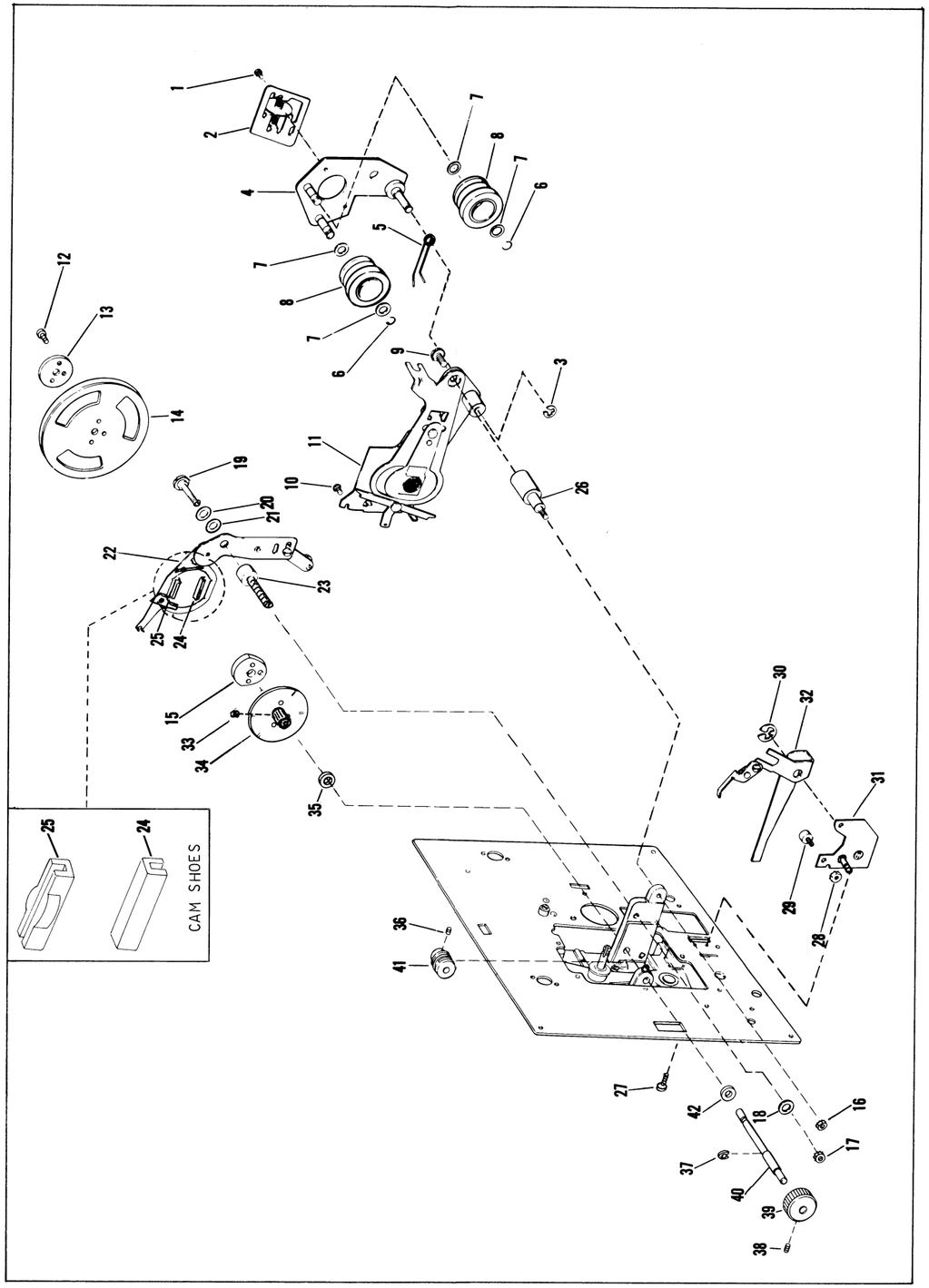

Figure 6. Shuttle, Shutter and Drive Mechanism

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		AUTOMATIC REWIND MECHANISM		
7-1	43863	SPRING, Extension	1	
-2	706679	SCREW, Hex head tapping, 6-32 by 3/8 inch	1	
-3	014053	REWIND ARM AND ACTUATING LEVER ASSEMBLY	1	
-4	27067	RING, Retaining, external type E, 0.094 inch ID	2	
-5	014057	SPRING AND SLEEVE ASSEMBLY	1	
-6	41733	WASHER, Flat	1	
-7	014058	REWIND ACTUATING LEVER ASSEMBLY	1	
-8	43002	SPACER	1	
-9	014073	GEAR, CAM AND MOUNTING PLATE ASSEMBLY	1	
-10	20808	. RING, Retaining, 0.145 inch ID (IRRC 1000-18)	1	
-11	43838	. GEAR, Second stage	1	
-12	No Number	. CAM AND PLATE ASSEMBLY	NP	
-13	20808	RING, Retaining, 0.145 inch ID (IRRC 1000-18)	1	
-14	43174	CAM, Gear, slow motion	1	
-15	20808	RING, Retaining, 0.145 inch ID (IRRC 1000-18)	1	
-16	014039	LOCK AND BUSHING ASSEMBLY	1	
-17	014035	ACTUATING ROD ASSEMBLY	1	
-18	43136	PUSH NUT	1	
-19	43113	LINK, Rewind	1	
-20	43114	ROD, Connecting	1	
-21	43184	SPRING, Film guard	1	
-22	43143	STUD, Retractor plate	1	
-23	43144	PLATE, Retractor	1	
-24	43586	PLATE, Keeper	1	
-25	80591	SETSCREW, Fluted socket, cup pt, 6-32 by 1/4 inch	1	
-26	43829	BUSHING	1	
-27	36837	SCREW, Pan head, 4-40 by 1/4 inch	1	
-28	43864	STUD, Eccentric	1	
-29	706811	SETSCREW, Fluted socket, cup pt, 8-32 by 3/16 inch	1	
-30	43869	HUB, Speed control	1	
-31	43855	SHAFT, Speed control	1	
-32	30815	SCREW, Swage type, 8-32 by 3/8 inch phillips head	1	
-33	706574	WASHER, Flat	1	
-34	014052	BALL DETENT BRACKET ASSEMBLY	1	
-35	1261	. BALL, Steel	1	
-36	No Number	. BRACKET ASSEMBLY (Order complete assembly)	NP	
-37	43849	SPRING, Extension	1	
-38	43851	RETRACTOR, Shuttle	1	
-39	6715	BALL, Bearing	1	
-40	014056	SPEED SHIFT BRACKET ASSEMBLY	1	
-41	43036	SPRING, Torsion	1	
-42	43856	SHAFT, Animation	1	

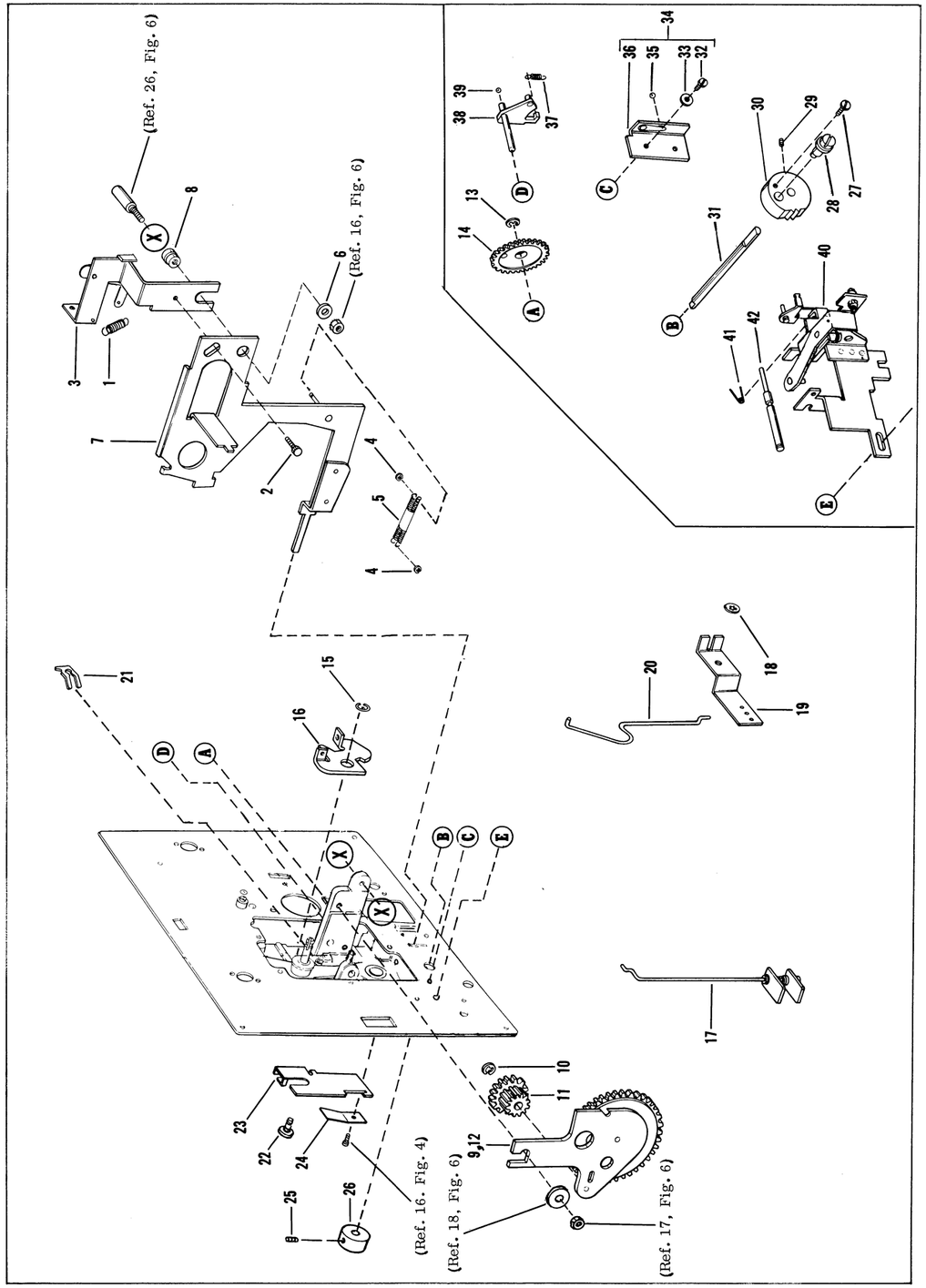

Figure 7. Automatic Rewind Mechanism

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR BASE AND MOTOR		
8-1	37885	BELT, Drive	1	
-2	700454	SCREW, Pan head Sems, 6-32 by 3/8 inch	3	
-3	013462	MOTOR ASSEMBLY	1	
-4	32974	SETSCREW, Fluted socket cup pt, 8-32 by 1/8 inch	2	
-5	39126	FAN, Multi-bladed	1	
-6	013455	PULLEY AND FAN ASSEMBLY	1	
-7	39256	SCREW, Round head, 6-32 by 5/8 inch	2	
-8	26906	NUT AND WASHER, Sems 6-32 NC	2	
-9	17632	WASHER, Flat	2	
-10	40612	BRACKET, Motor mounting, long	1	
-11	39058	BRACKET, Motor mounting, short	1	
-12	39065	INSERT, Mounting	3	
-13	28718	WASHER, Flat (used on short bracket only)	1	
-14	39177	GROMMET, Motor mounting	3	
-15	21736	RING, Retaining, Type E (IRRC No. 1000-25)	1	
-16	010373	SHAFT AND FOOT ASSEMBLY, Tilt	1	
-17	43324	SCREW, Hex head tapping, 8-32 by 3/8 inch	1	
-18	22659	WASHER, Flat	1	
-19	39185	CLAMP, Leadwire	1	
-20	43199	SCREW, Hex head tapping, 4-40 by 1/2 inch	3	
-21	No Number	MECHANISM PLATE AND MAIN PLATE ASSEMBLY	NP	
-22	014051	BASE ASSEMBLY, Projector	1	
-23	32652	. RIVET, Tubular, 0.123 inch diameter	2	
-24	26135	. FOOT, Rubber	2	
-25	40572	. RIVET	2	
-26	40498	. GUIDE, Film cutter	1	
-27	40497	. CUTTER, Film	1	
-28	40501	. SPACER, Film cutter	1	
-29	No Number	. BASE (Order complete base assembly)	NP	

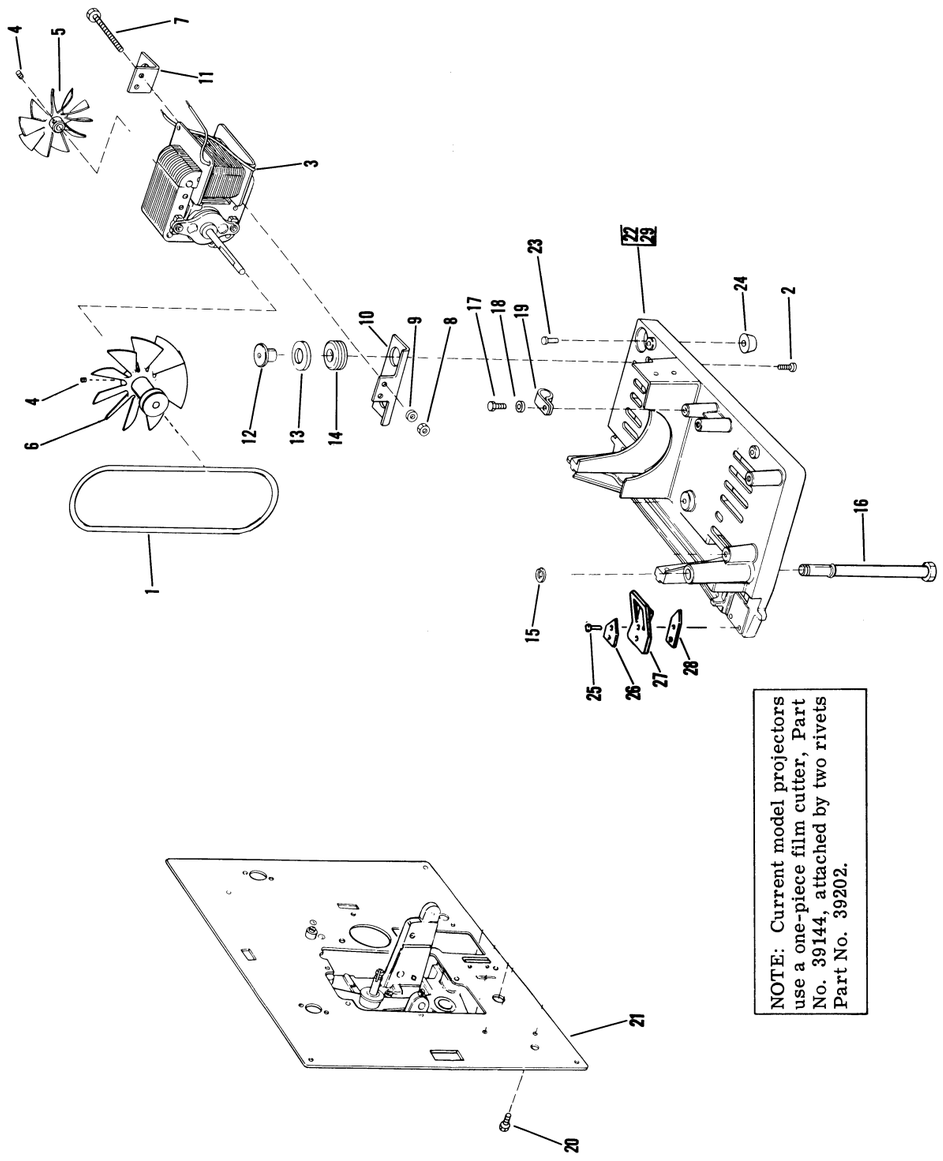

Figure 8. Projector Base and Motor

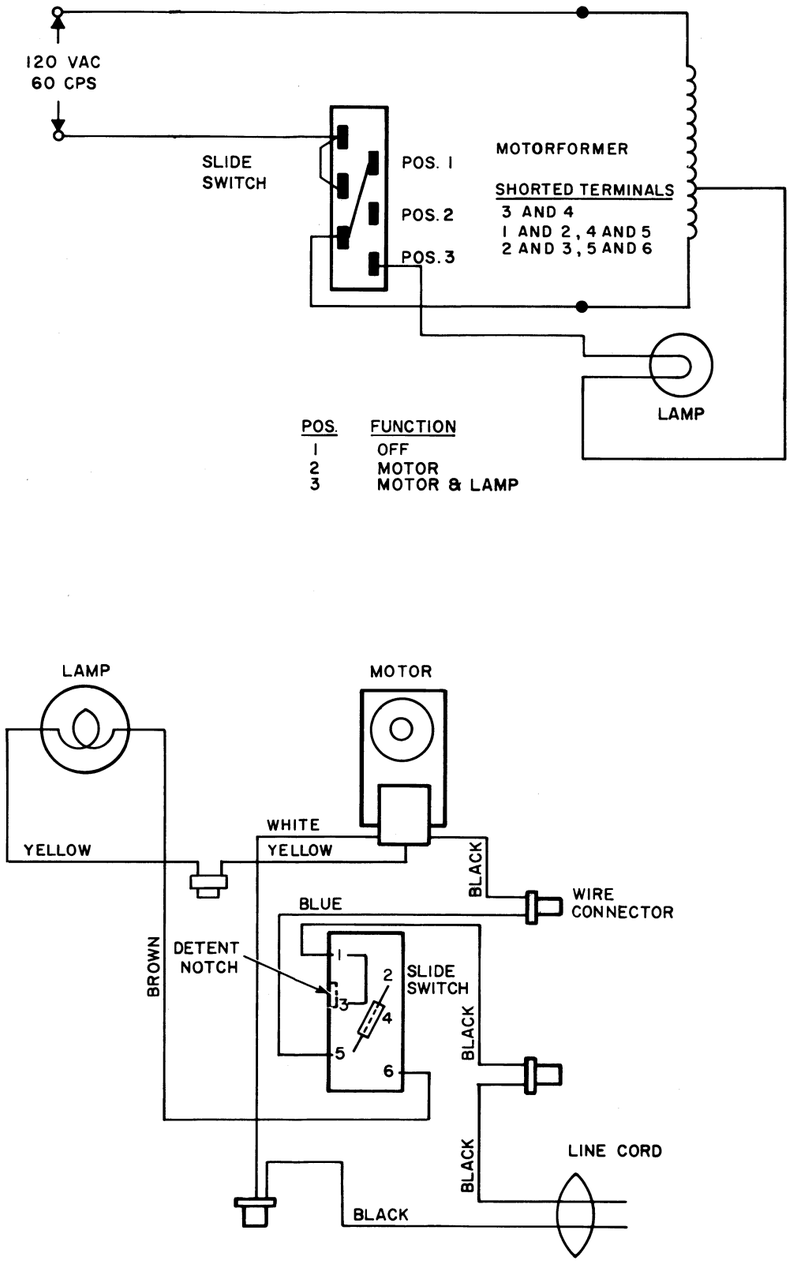

Figure 9. Projector Wiring Diagrams

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09628	4-50
09629	4-28
09630	4-60
010189	3-12
010271	2-11
010348	6-11
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010667	6-8
012860	2-24
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23822	3-1
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26085	4-10, 6-35
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39182	2-15
39185	8-19
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43118	3-14
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43144	7-23
43159	3-21
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43849	7-37
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