

SERVICE INSTRUCTIONS

TOWER REMOTE CONTROL SUPER AUTOMATIC 8-MM PROJECTOR

NO. 9299AY

MODEL 584.92990

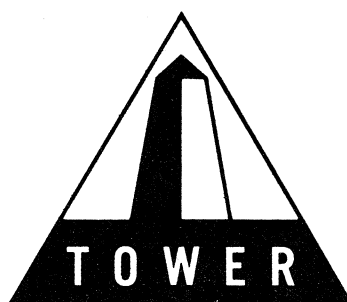




Figure A. Tower Remote Control Automatic 8-mm Projector Model 584.92990

Introduction

GENERAL.

This manual has been prepared to aid in servicing the Tower Remote Control Automatic 8-mm Movie Projector, Design 9299AY. An Illustrated Parts Catalog is included at the rear of the manual to identify replacement parts and to aid the serviceman in the disassembly, reassembly, and adjustment of the projector.

All parts in the exploded view illustrations in the Parts Catalog section are indexed in their suggested order of removal. Where disassembly and reassembly of parts is quite obvious, no attempt has been made to elaborate on the removal and installation of such parts. When making specific projector repairs, the serviceman must use his own judgment in eliminating unnecessary steps of procedure.

In the disassembly and reassembly instructions, illustrations referred to by number (Figure 1, Figure 2, etc.) are those located in the Parts Catalog section. Those referred to by letter (Figure A, Figure B, etc.) will be found in the instruction portion of the book.

PRINCIPLES OF AUTO-LOAD THREADING. (Figure B.)

a. The operator depresses the upper loop former (4), which pivots to position A. This actuates a linkage system which automatically pivots the lower loop former (10) to position A. A spring-loaded latch, to which the take-up idler (14) is attached, locks the loop formers in position A and, at the same time, shifts the take-up idler (14) to position A.

b. The end of the film leader is trimmed with the cutter mounted on the projector base. The projector is started and the cut end of the leader is inserted into opening (1). The film must be pushed past the roller (2) and against the sprocket (3) where a sprocket tooth can engage a perforation. This starts the self-threading cycle.

c. Since the loop former (4) keeps the film on the sprocket (3), the sprocket advances the film past the roller (5) and through the passage between the loop former and upper bracket (6). The upper loop former guides the film downward between the aperture plate (7) and pressure shoe (8). When the film reaches the shuttle (9), the shuttle tooth engages a perforation and assists in transporting the film.

d. When the film reaches the lower loop former (10), it turns upward and passes through the passage between the loop former and lower bracket (11), where it is guided to the take-up sprocket (12). The film then passes out through the opening (13).

e. After 20 to 24 inches of film have passed through the projector film path, the operator stops the projector, threads the film under the guide rollers, and inserts the loose end of the film in the take-up reel. When idler roller (14) is pressed back to position B, the spring-loaded latch is released and loop formers (4 and 10) automatically return to open position B.

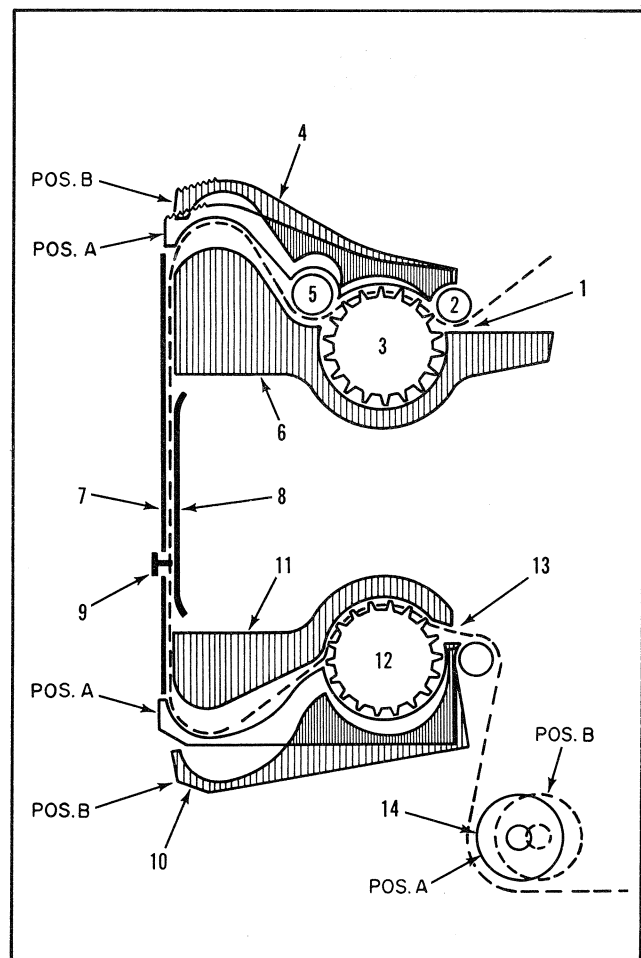


Figure B. Film Path — Self-Threading Procedure

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.

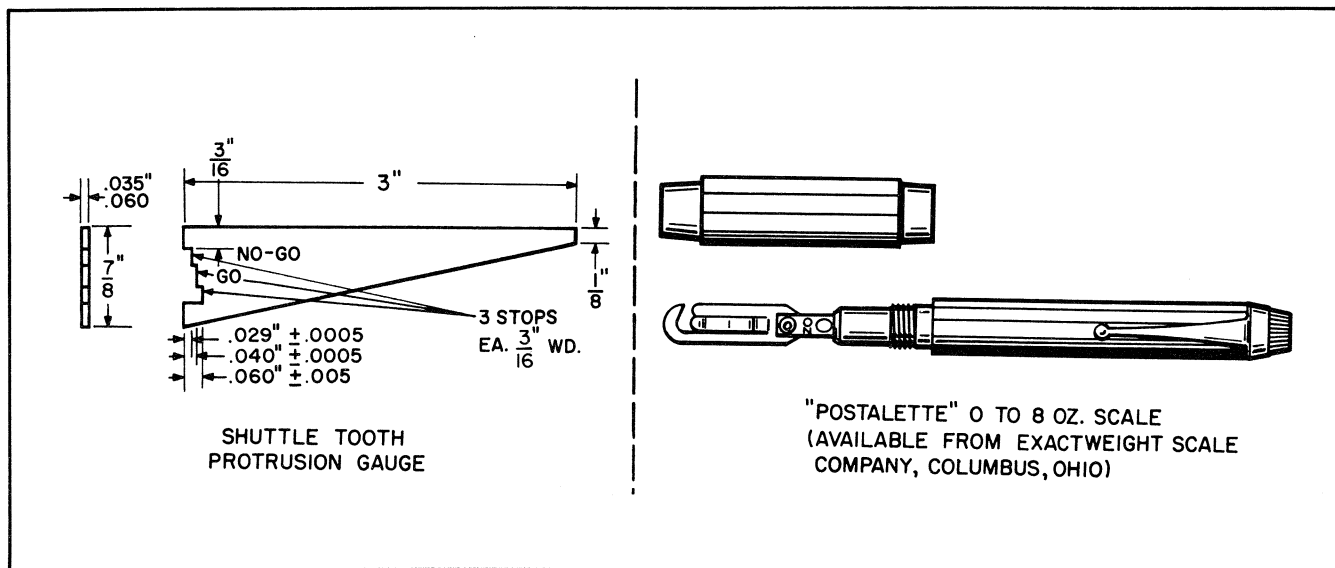


Figure C. Special Tools

Disassembly Procedure

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 assembly (1), the catch button (1C) must be pressed downward to release the cover catch (1B) from the slot in the mechanism plate.

b. Note the difference in the knobs (9 through 11) so that they can be replaced in their proper position.

c. The removal of the framer knob (19) is not necessary when removal of the control housing is required, nor is it possible because of the design. Any attempt to remove this knob first will result in damage to the knob.

d. The take-up drive roller (36) cannot be removed without first loosening the setscrew (35) and sliding off both the roller and the film guide (37).

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

a. The upper end of the support bracket (21) is fastened to the riveted angle bracket of the gear mounting plate (item 34, Figure 3) with two screws (3). The lower end of the support bracket is attached to a support plate (6) which is mounted on the pivot (item 18, Figure 6) between the eccentric washer and the cast bearing arm of the mechanism plate. In addition, two screws (3) serve to attach the extension arm of the safety shutter to the pivot arm assembly (5). Removal of these six attaching screws will permit the entire solenoid group to be withdrawn to the limit of the leadwires.

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 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 (31). 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 (32).

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. Removal of the two retaining rings (29) will permit the disassembly of the bearings (30) and the reel arm supports (31 and 32). The tension springs (35), cam washers (36) and the steel balls (37) will fall from position when the bearings (30) are withdrawn from the casting.

5. REMOVAL OF PARTS IN FIGURE 4. Remove parts, as necessary, in their indexed order of disassembly. Note the manner in which the cam follower (29) on actuating spring (28) bears against the thrust bearing (19).

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

a. Note the manner in which springs (10 and 11) are hooked into place so that they can be properly re-installed. The return linkage staked to the rear of the mechanism plate must not be removed.

b. The pin screws (16) which attach the upper and lower loop former assemblies (17 and 18) also serve as shafts for the film rollers (19).

c. When the removal of the focus knob (33) or the sleeve and stud assembly (34) is required it is necessary to pry out the disc (28) to gain access to the screw (29). If the knob or disc are damaged during this operation, it is recommended that they be replaced.

d. The spring (35), retainer plate (36) and the pressure plate (37) can be removed from the lens carrier assembly (38) without removing the carrier from the mechanism plate. Swing open the lens carrier, grasp

the top and bottom of the pressure plate (37) between the thumb and forefinger of the right hand. Press the upper end of the retainer plate (36) away from the lens carrier casting to disengage the retainer plate and spring (35) from the pins of the casting. To remove the lens carrier assembly (38), the hinge pins (27) must be pried out.

e. The framer knob shaft (50) can be removed by unhooking the framer lever (item 20, Figure 6) from the end of the shaft and unthreading the shaft from the mechanism plate.

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

a. One of the drive roller assemblies (7) is exposed and can be serviced quite easily. To gain access to the inner roller, remove retaining ring (4), and lift the assembled pulley mounting bracket assembly (9), and roller parts (5 through 8) from the projector.

b. To free the safety shutter and bracket assembly (13), remove the pivot screw (10), pivot spring (11), link spring (item 42, Figure 1), direction control link (item 47, Figure 1) and the screw (12). Note the manner in which the legs of the pivot spring (11) are engaged.

c. Note carefully the engagement of cam shoes (21) with the surface of the pulldown cam (25) before disassembling the shutter (16), shuttle and framing lever assembly (20) or pulldown cam (25).

Reassembly Procedure

8. 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 (Specification No. 1956 as noted) and oil (Spec. 310) or the best available commercial grades of ball bearing

grease or projector oil.

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

a. Hold the drive pinion (33) in position between the two cast ears of the mechanism plate while installing the main shaft assembly (31). Note that the hub of pinion (33) must face in the direction shown in Figure 6. Tighten setscrew (27) just enough to hold.

b. Assemble shutter washer (15), shutter (16), in-out cam (17), and pulldown cam (25) with screws

Table I. Lubrication

ITEM	LUBRICATION
Roller (item 36, Figure 1)	Apply grease (1956) to roller shaft with brush
Spur gear (item 4, Figure 3)	Apply grease (1956) to face of gear
Spur gears (items 7 and 20, Figure 3)	Apply grease (1956) to both sides
Gear and shaft assemblies (items 13 and 26, Figure 3)	Apply grease (1956) between faces of bearings (item 30, Figure 3) and faces of gears
Reel arm supports (items 31 and 32, Figure 3)	Apply grease (1956) between supports and mechanism plate
Bearing balls (item 37, Figure 3)	Speck of grease on each ball
Motor pulley (items 16 and 18, Figure 4)	Apply oil (310) between pulley and motor shaft
Lens carrier (item 38, Figure 5)	Apply grease (1956) to the fine focus cam
Projector gear train, complete	After gears are assembled, apply grease (1956) with brush to entire gear train for one revolution of the gears.

(14). Select any combination of white and/or black cam shoes (21) for proper fit on cam (25). The white shoe is thicker than the black. Use two white shoes for minimum cam spacing, two black shoes for maximum cam spacing and one of each for median spacing. Hold cam shoes (21) in place while assembling shuttle and framing lever assembly (20) to pulldown cam (25). Install thrust washer (26) over end of framer shaft; then hold the assembled shutter and shuttle in position while pressing the framer shaft into place. Insert a 0.002-inch feeler gauge between the washer (32) and the bearing which is pressed into the cast arm of the mechanism plate. Press the shutter and framer shaft knob toward one another until the feeler gauge is held in place; then tighten the pulldown cam setscrews (24) securely, and remove feeler gauge.

c. Assemble the pivot (18) and spring washer (19) to the shuttle and framing lever assembly (20), sliding the eccentric washer (22), support plate (6, Figure 2) and shuttle spacer (23) onto the pivot before inserting the threaded end of the pivot shaft through cast arm of mechanism plate.

d. Engage the crossed legs of the pivot spring (11) with the groove in a spring stud protruding from the safety shutter and bracket assembly (13), and install pivot screw (10) so that loop of spring slips around the shoulder of the screw.

e. Assemble drive rollers (7) and spring-loading bracket assembly (3) to the pulley mounting bracket assembly (9), and secure the pulley bracket to the safety shutter and bracket assembly with retaining ring (4). Place the safety shutter and bracket assembly in the center ("still") position. With the spring-loading bracket screws (2) loose, insert a 0.062-inch (± 0.015 inch) shim between the upper drive roller rim (7A) and the outer rim of the shutter (16). While maintaining a light pressure on the roller against the shim, tighten the two spring loading bracket screws (2) securely. Withdraw the shim. Test the operation of the assembled parts as instructed in paragraph 19.

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

a. If the lens mount catch (48) was removed for replacement, the 0.095-inch-diameter rivet holes should be tapped with a No. 4-40NC thread tap. Reinstall the catch with two No. 4-40 binder head screws part number 30243.

b. Assemble the side tension arm (43) and spring (42) to the aperture plate assembly (44). Note that the loop of the spring encircles the aperture plate stud and the spring legs enter the holes at the top and bottom of the side tension arm. Hold the aperture plate in position against the casting so that the shuttle tooth is approximately in the center of the slot, and install the four screws (39 and 41) and film guide (40).

c. Assemble the spring (35), retainer plate (36), and pressure plate (37). Compress these parts, and

engage the upper and lower slots of the pressure plate with the cast ears at top and bottom of lens carrier subassembly (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. Be sure retainer plate is under the pin protruding from the left side of the lens carrier.

d. Assemble the sprockets and loop formers (16 through 26) to the mechanism plate. The short spring (11) is located just behind the upper sprocket gear and the long spring (10) just behind the motor.

e. Loosen the two linkage screws (46) located just to the right of the trip lever (14), and move the protruding shaft of the trip lever toward the rear of the mechanism plate until the loop formers open. Hold the loop formers in a closed position with one hand and adjust the linkage so that the upper end of the trip lever engages an ear of the linkage, locking the linkage in place. Tighten the screws (46) securely and recheck trip lever operation several times.

f. Install gears (5 and 6) on their sprocket shafts. Note that the upper sprocket gear engages the drive pinion (item 33, Figure 6) located on the framer shaft. Position this pinion so that the pinion teeth are centered at the bottom of the sprocket gear and tighten the drive pinion setscrew securely.

g. Thread the end of a 6-inch length of 8 mm film one inch beyond upper sprocket and hook a 0 to 10 lb. spring scale to end of film strip. Pull film steadily straight toward front of projector while watching spring scale. Sprocket must turn or ratchet at 2 to 5 pounds on scale. Lower sprocket must ratchet at 1-1/2 to 5 pounds. Bend the flat spring (3, Figure 5) to increase or decrease tension.

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

a. If the dowel pin (17) was removed for replacement, a new pin must be pressed in flush to 0.005 inch below the outer face of the left half pulley (18).

b. With the pulley halves (16 and 18) installed on the motor shaft, engage the drive belt around the drive pulley and the two drive rollers before securing the motor in place with the screws (11). The blower fan (7) should also be in position with the setscrew (6) loose.

c. The face of the blower fan (7) should be centered in the blower fan housing when the setscrew (6) is tightened. Install blower housing cover (5), seal (4) and terminal board (3).

d. Turn the speed shaft (26) to the slowest speed position (full clockwise). The end of the pulley should be touching the retaining ring (20). If it is not, the setscrew (15) should be loosened and the pulley repositioned.

e. Refer to Figure D for wiring connections.

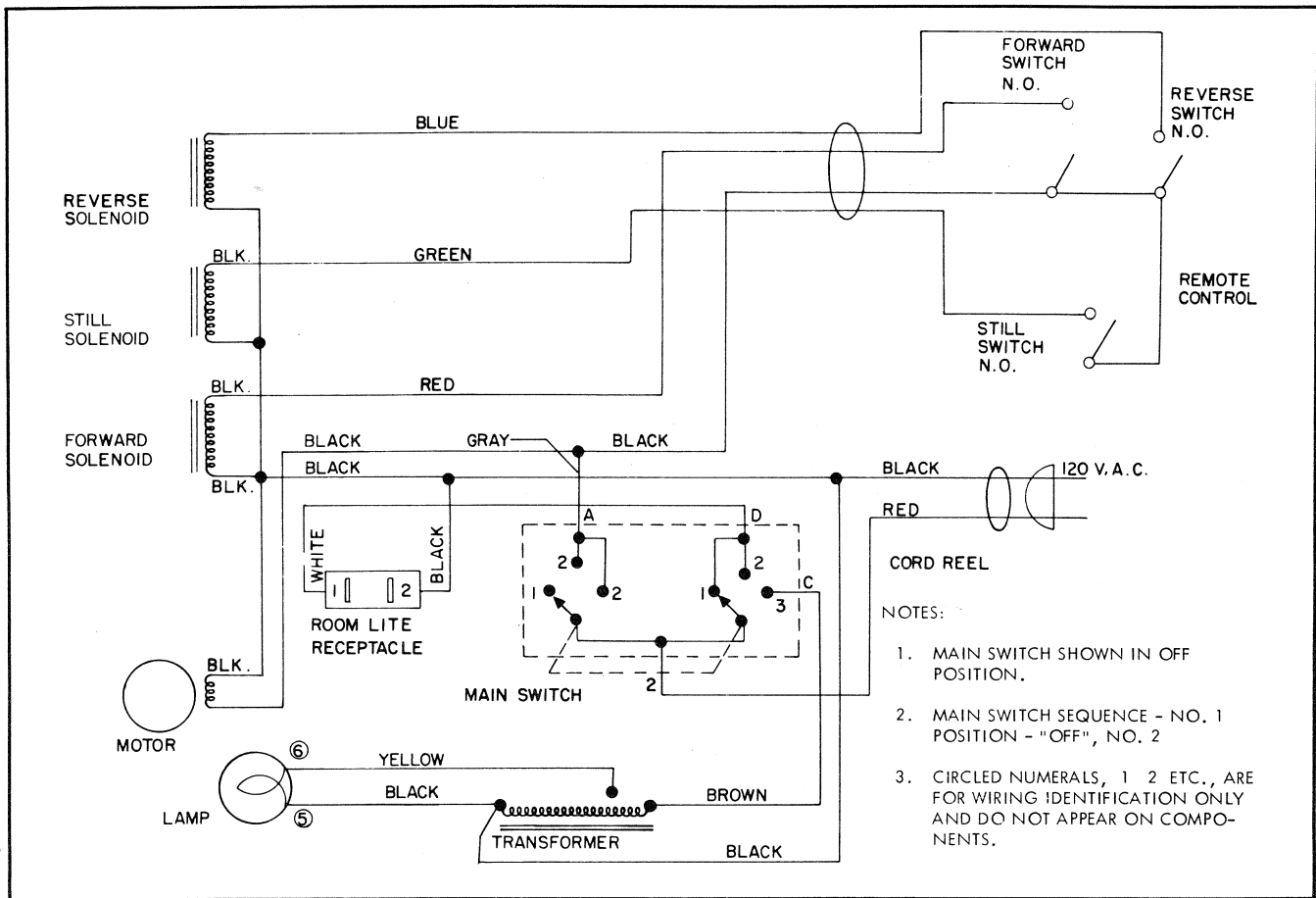


Figure D. Projector Wiring Diagram

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

a. Assemble the reel arm supports (31 and 32), bearings (30), cam washers (36), tension springs (35), and gear mounting plate (34) to the mechanism plate with the screw (33) tightened just enough to hold all parts together. Insert a steel ball (37) between each cam washer and the detent hole in the mechanism plate, and hold all parts firmly together while tightening screw (33) securely. Install the two retaining rings (29) in the grooves of the bearings (30).

b. Install gears (17, 18, and 26) into take-up reel arm support assembly (32), and lubricate gears as instructed in Table I. Install gears (4 and 13) into feed reel arm support assembly (31), and lubricate gears as instructed in Table I.

c. Assemble take-up spindle parts (19 through 23), using new spring washer (22), into take-up reel arm (16), and install screw (15). Install assembled reel arm to reel arm support (32), rotating the shaft of the take-up gear (26) until the teeth of the spur gear (20) mesh with those of its mating gear. Install and tighten the screws (14).

d. Assemble feed spindle parts (6 through 10), using new spring washer (9), into feed reel arm (3), and install screw (2). Insert the torque spring (5) into place within reel arm so that it will apply tension to gear and shaft (13). Install assembled reel arm to reel arm support (31), rotating the shaft of feed gear (13) until the teeth of the spur gear (7) mesh with those of its mating gear. Install and tighten screw (1).

e. Install spur gears (12 and 25) onto their shafts. Use a feeler gauge to maintain 0.003 inch end play between the bearings (30) and the gears. Tighten setscrews (11 and 24).

f. Lubricate the entire gear train as instructed in Table I.

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

a. Insert plunger (20) up into plunger bracket (8) and engage inner end of pivot crank (9) over the small plunger pin. Assemble solenoid cores (18) and solenoids (13 and 15) over ends of plunger and hold these parts together while inserting them be-

tween the arms of the support bracket (21). Install two Sems screws (3) through bracket (21) and into tapped holes of bracket (8); tighten screws.

b. Raise the plunger (20) until its upper end bears against the inner surface of the upper solenoid core. Turn upper setscrew (7) in until it touches the plunger; then release the plunger and turn the setscrew in an additional 1/4 to 1/2 turn and lock setscrew with nut (1). Repeat adjustment at lower end of plunger.

c. Assemble solenoid (14), spring (16) and plunger (17) to support plate and bushing assembly (12). Insert this assembled group into the bracket (8), spreading the bracket slightly until the ears on the support plate enter the slots in the bracket. Install screw (11), washer (4) and nut (10).

d. Assemble pivot arm (5) to support bracket (21), and secure the pivot crank (9) to the pivot arm stud with screw (3) and washer (4). Lift the assembled solenoid group up into position and install the four Sems screws (3) that secure the support bracket (21) to the support plate (6) and the L-bracket of the gear mounting plate and the two Sems screws (3) that attach the safety shutter pivot arm to the arm assembly (5). Note that the screw holes in the safety shutter pivot arm are elongated. With the plunger (20) in the center (still) position, the safety shutter glass must cover the aperture opening. With the plunger in extreme upper or lower position, the safety shutter glass must be clear of the aperture opening. Position the plunger manually and adjust pivot arm to obtain desired results; then tighten screws (3) securely.

e. Connect wiring as shown in Figure D.

14. REASSEMBLY OF PARTS IN FIGURE 1. Reassemble parts in reverse order of disassembly, but do not install the back cover (7) until all final projector adjustments have been made.

15. ADJUSTING TAKE-UP AND REWIND TORQUE. The take-up torque of the rear (take-up) spindle should measure 1 to 3-1/2 inch-ounces; the rewind torque of the front (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 E. The method of checking take-up torque is illustrated in Figure E; to measure rewind 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 3).

16. 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 gauge shown in Figure C. Proceed as follows:

a. Set the framer knob in the approximate center of

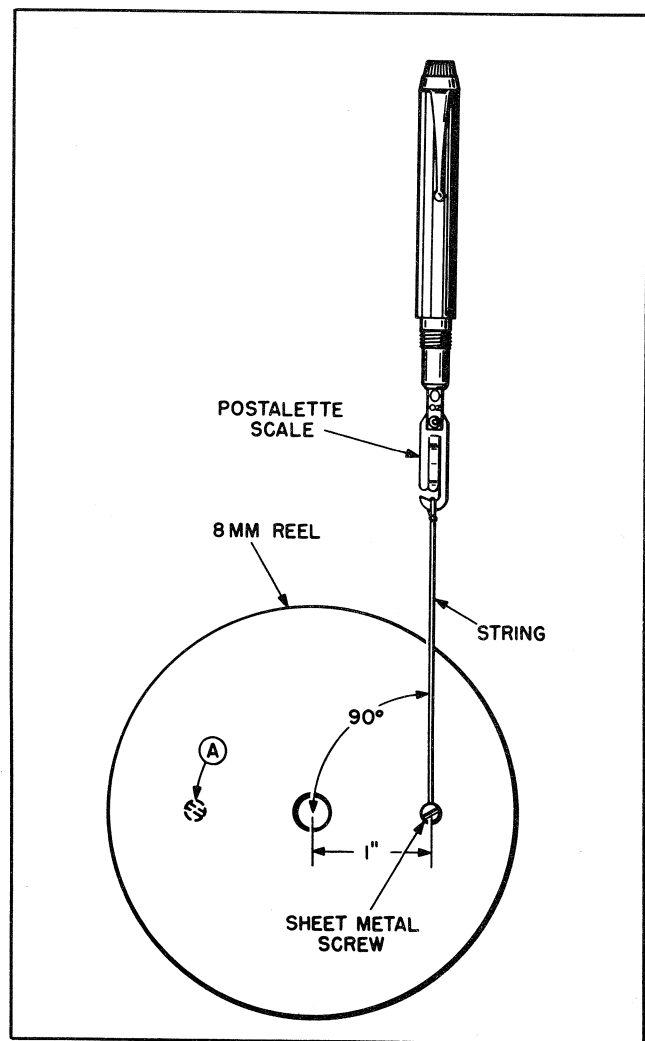


Figure E. Checking Reel Arm Torque

its travel range, and swing open the lens carrier.

b. Rotate the main shaft knob (29, Figure 6) until the shuttle teeth reach the approximate center of the downstroke.

c. Place the base (notched edge) of the gauge against the aperture plate with the deepest notch positioned directly over the shuttle teeth.

d. Holding the base of the gauge firmly against the aperture plate, slowly slide the gauge downward. If the shuttle teeth catch against the "go" step of the gauge, the teeth are protruding too far beyond the surface of the aperture plate. If the teeth pass the "go" step of the gauge 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 proper-

ly 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 22, 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.

17. 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 midposition.

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 (20, Figure 6). Loosen this screw and shift the shuttle bracket arm (Figure 6) 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.

Final Test

18. 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 troubleshooting and servicing. Note that the projector is to be operated only from a 115-volt ac, 60-cycle power source.

19. 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 (16). Nominal clearance is 0.062 inch (± 0.015 inch). If the fire shutter tends to clear the aperture opening before shutter (16) 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.

20. 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 (item 45, Figure 5). 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.

21. 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 3) 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 16, 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 20, and adjust if necessary.

Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
Projector inoperative with switch in the MOTOR or LAMP position	<ol style="list-style-type: none"> 1. No electrical power 2. Loose drive pulley 3. Broken drive belt 4. Defective switch or wiring 	<ol style="list-style-type: none"> 1. Check power source. 2. Tighten pulley setscrew. 3. Replace belt. 4. Check circuit.
Picture flicker	<ol style="list-style-type: none"> 1. Drive roller assemblies not adjusted properly 2. Defective drive belt pulley 3. Dirt, wear or binding 	<ol style="list-style-type: none"> 1. Readjust as instructed in paragraph 19. 2. Replace drive belt pulley. 3. Clean and repair or adjust gearing as instructed in paragraph 12.
Film scratches	<ol style="list-style-type: none"> 1. Excessively dirty film channel parts (sprockets, guides, etc.) 2. Worn pressure and aperture plates (37 and 44, Figure 5) 3. Worn or damaged film guide (40, Figure 5) 	<ol style="list-style-type: none"> 1. Clean projector thoroughly. 2. Replace if worn or marred. 3. Replace film guide.
Jumpy picture	<ol style="list-style-type: none"> 1. Loss of film loop due to damaged film 2. Green film 3. Shuttle tooth worn 4. Misaligned shuttle tooth 5. Grooves worn in film guide (40, Figure 5) 	<ol style="list-style-type: none"> 1. Inspect and splice as required. 2. Run film through projector two or three times to age film. 3. Replace shuttle assembly (20, Figure 6). 4. Adjust and align shuttle as instructed in paragraph 16. 5. Replace film guide.
Soft focus	<ol style="list-style-type: none"> 1. Dirty projection lens 2. Lens mount out of alignment 3. Loose lens mount catch (48, Figure 5) 	<ol style="list-style-type: none"> 1. Clean projector lens. 2. Readjust as instructed in paragraph 20. 3. Reset tension by bending catch carefully.

SERVICE INSTRUCTIONS

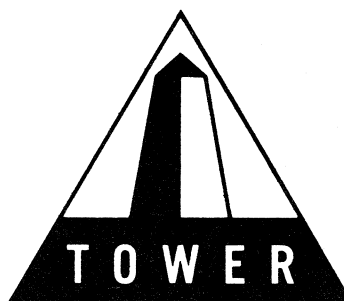
TROUBLE	PROBABLE CAUSE	REMEDY
Auto-threading not operating properly	<ol style="list-style-type: none"> 1. Loop former linkage improperly adjusted or binding 2. Loop formers not releasing 	<ol style="list-style-type: none"> 1. Realign loop formers and reset linkage (paragraph 10, step e). 2. Linkage binding or springs stretched or broken on linkage.
Film spills	<ol style="list-style-type: none"> 1. Insufficient tension on feed spindle 	<ol style="list-style-type: none"> 1. Adjust, paragraph 21, step b.
Fails to take up or rewind	<ol style="list-style-type: none"> 1. Defective drive belt 2. Worn rim on drive roller 3. Drive rollers not adjusted properly 	<ol style="list-style-type: none"> 1. Replace belt. 2. Replace rim (7A, Figure 6). 3. Readjust as instructed in paragraph 19.
Noisy	<ol style="list-style-type: none"> 1. Loose attaching parts 2. Gearing dry 	<ol style="list-style-type: none"> 1. Tighten as necessary. 2. Lubricate as necessary.

PARTS CATALOG

TOWER REMOTE CONTROL SUPER AUTOMATIC 8-MM PROJECTOR

NO. 9299AY

MODEL 584.92990



Replacement Parts

The following pages illustrate and list by part number and part name all replacement parts of the Design 9299AY 8-mm projector. 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. Be sure to check footnotes which appear on some pages for special instructions regarding replacement procedures.

ACCESSORIES

400-Ft. Tower Auto-Thread Reel, Part No. 010497
Quick-Splice Film Splicer, Part No. 32371
Filmovara Lens, Part No. 020242
Remote Control, Complete, Part No. 011449

FIG. & INDEX NO.	PART NO.	1	2	3	4	5	6	7	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
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FRONT COVER ASSEMBLY

1-1	05630	COVER ASSY, Front								1	
-1A	29144	. RIVET, Tubular (front cover catch)								1	
-1B	26321	. CATCH, Front cover								1	
-1C	32361	. BUTTON, Catch (front cover)								1	
-1D	33120	. NAMEPLATE, Cover, "Tower"								1	
-1E	33187	. NAMEPLATE, Cover, "Remote Control 8mm Projector"								1	
-1F	19025	. RIVET, Splicer clip								2	
-1G	33093	. CLIP, Splicer retaining								1	
-1H	34627	. INSTRUCTION PLATE (cemented inside front cover)								1	
-2	010716	SUPPORT ASSY, Film reel								1	
-3	05629	COVER ASSY, Lamphouse								1	
-3A	33186	. NAMEPLATE, Lamphouse.								1	
-3B	010283	. SCREW AND KNOB ASSY, Lamphouse								1	
-4	34399	LAMP, Tru-flector, T-14, Lo-volt, DLG								1	
-5	29065	SCREW, Hex head.								8	
-6	33194	SCREW, Self-threading								2	
-7	010721	COVER ASSY, Back								1	
-7A	29144	. RIVET, Tubular (back cover)								1	
-7B	33073	. SPRING, Handle								1	
-8	33051	HANDLE, Carrying								1	
-9	33104	KNOB, Speed								1	
-10	33103	KNOB, Motor-Lamp Switch								1	
-11	33102	KNOB, Clutch								1	
-12	33197	SCREW, Phillips head.								6	
-13	33081	PLATE, Switch mounting								1	
-14	33099	SWITCH, Rotary (includes mounting nut and lockwasher)								1	
-15	33101	RECEPTACLE, Room lamp (includes screw and bracket)								1	
-16	34539	RING, Retaining								1	
-17	33931	WASHER.								1	
-18	33166	WASHER, Felt.								1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
FRONT COVER ASSEMBLY (CONT)				
1-19	33165	KNOB, Framer	1	
-20	33174	NAMEPLATE, Side (control housing).	1	
-21	33163	NAMEPLATE, Front (control housing).	1	
-22	33171	PIN	1	
-23	33162	HOUSING, Control	1	
-24	32350	SCREW, Rd hedd	2	
-25	33116	REEL, Cord	1	
-26	32136	SCREW, Rd head	3	
-27	010608	SOCKET AND BRACKET ASSY, Lamp	1	
-28	26329	SCREW, Hex head	2	
-29	34784	WASHER, Flat.	2	
-30	32478	BAFFLE, Lamp	1	
-31	26906	NUT AND LOCKWASHER	3	
-32	609051	WASHER.	1	
-33	010682	BRACKET ASSY, Lamphouse cover	1	
-34	32928	TRANSFORMER.	1	
-35	33072	SETSCREW, Film guide	1	
-36	30662	ROLLE R, Take-up drive	1	
-37	33117	GUIDE, Film	1	
-38	33106	SCREW, Fillister head	1	
-39	26135	FOOT, Rubber.	1	
-40	33104	KNOB, Tilt	1	
-41	33038	SHAFT, Locking screw	1	
-42	33089	SPRING, Link	1	
-43	80591	SETSCREW	1	
-44	20808	RING, Retaining.	1	
-45	25715	RING, Retaining.	1	
-46	33079	SHAFT, Direction control	1	
-47	33092	LINK, Direction control.	1	
-48	27207	PIN, Dowel	1	
-49	33085	ACTUATOR, Direction control	1	
-50	33082	ECCENTRIC, Direction control	1	
-51	34371	DECAL, Reel warning.	1	
-52	706011	BUSHING, Strain relief	1	

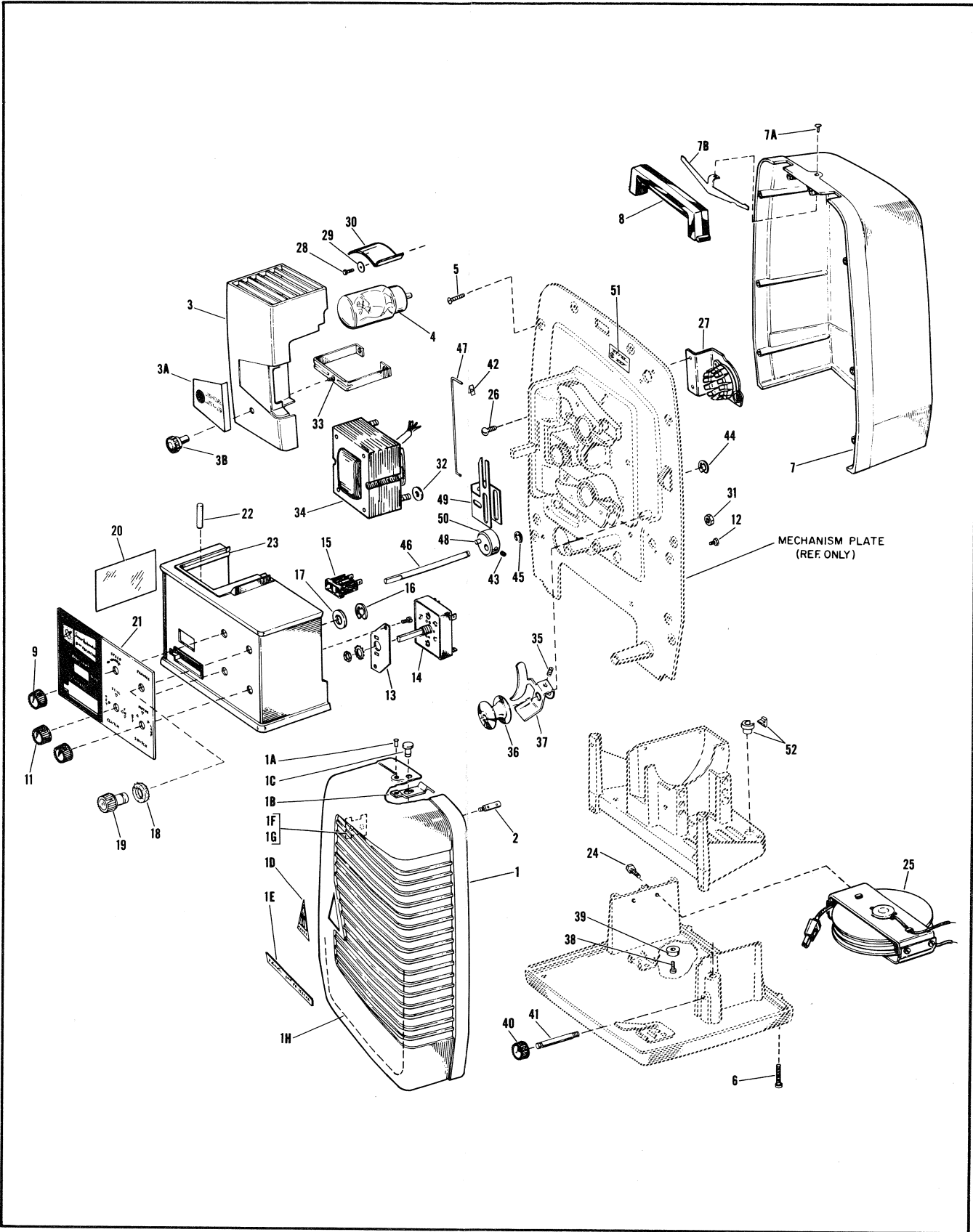


Figure 1. Covers and Lamp

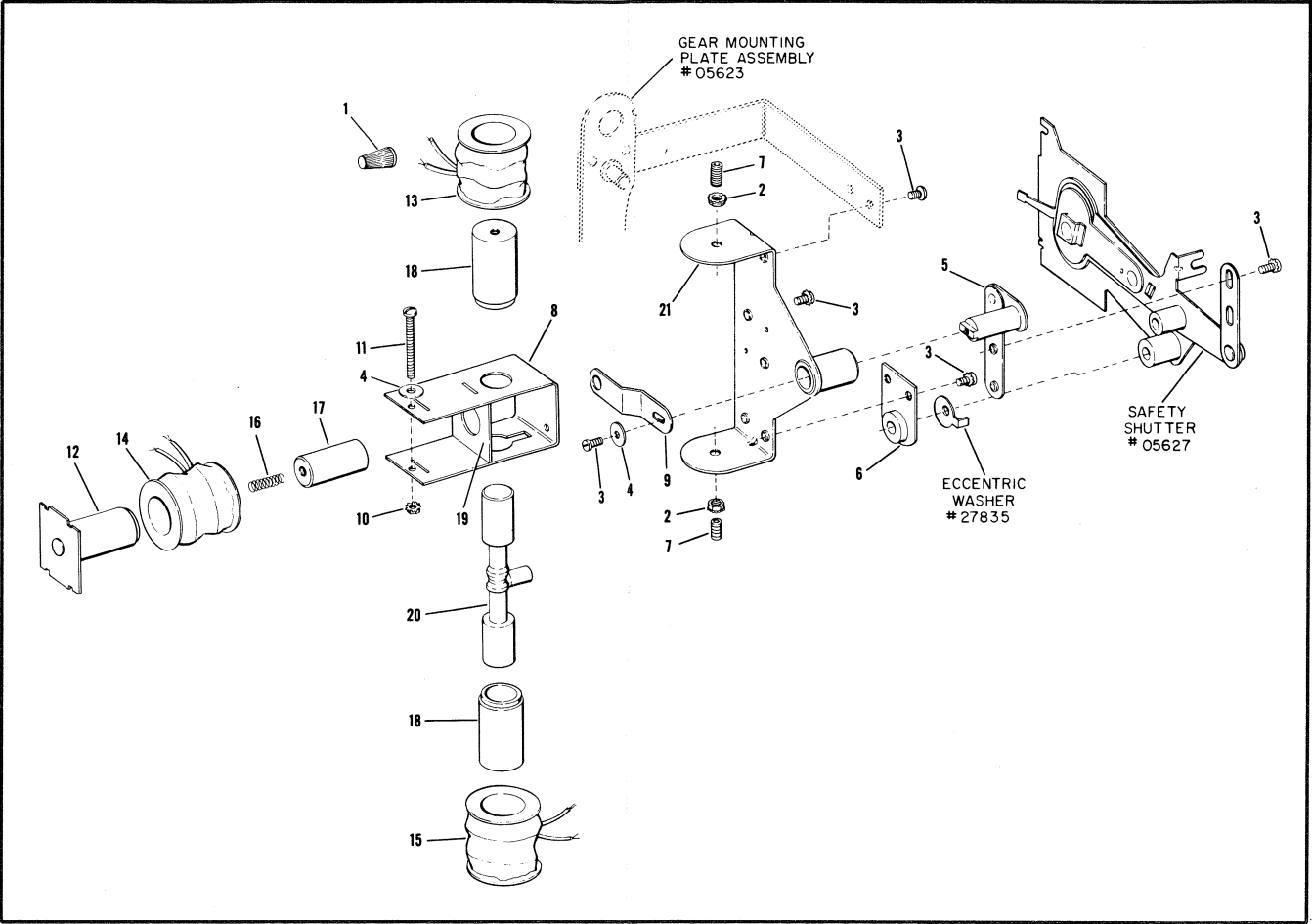


Figure 2. Solenoid Components, Exploded View

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS	USABLE
			PER ASSY	ON CODE
SOLENOID COMPONENTS				
2-1	82794	CONNECTOR, Closed end (for solenoid leadwires)	1	
-2	35164	NUT AND WASHER	2	
-3	35144	SCREW, Sems	9	
-4	35173	WASHER, Flat.	2	
-5	011403	PIVOT ARM ASSY	1	
-6	35110	PLATE, Support	1	
-7	35165	SETSCREW, Plunger adjusting	2	
-8	35117	BRACKET, Solenoid plunger	1	
-9	35115	CRANK, Pivot.	1	
-10	26906	NUT AND WASHER	1	
-11	35123	SCREW, Fil hd	1	
-12	011405	PLATE AND BUSHING ASSY, Support	1	
-13	35143	SOLENOID, Reverse	1	
-14	35135	SOLENOID, Still	1	
-15	35136	SOLENOID, Forward	1	
-16	35111	SPRING, Plunger	1	
-17	011400	PLUNGER AND BALL ASSY	1	
-18	011404	CORE ASSY, Solenoid	2	
-19	35118	PLATE, Separator	1	
-20	011401	PLUNGER AND STUD ASSY	1	
-21	011402	BRACKET ASSY, Solenoid support	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
REEL ARMS AND GEARS				
3-1	23822	SCREW, Binding head	1	
-2	32861	SCREW, Tension adjusting	1	
-3	010725	ARM ASSY, Feed reel.	1	
-4	29706	GEAR, Spur	1	
-5	32979	SPRING, Torque	1	
-6	29726	SPACER, Tension adjusting	1	
-7	29723	GEAR, Spur	1	
-8	29725	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	35176	GEAR, Spur	1	
-13	010189	SHAFT ASSY, Feed arm	1	
-14	23822	SCREW, Binding head	2	
-15	32861	SCREW, Tension adjusting	1	
-16	010726	ARM ASSY, Take-up reel arm	1	
-16A	33119	. NAMEPLATE, Take-up reel arm	1	
-17	29707	GEAR, Spur	2	
-18	29706	GEAR, Spur	1	
-19	29726	SPACER, Tension adjusting	1	
-20	29723	GEAR, Spur	1	
-21	29725	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	010190	SHAFT ASSY, Take-up arm	1	
-27	21736	RING, Retaining.	3	
-28	34718	GEAR, Spur	3	
-28A	33154	WASHER, Flat.	2	
-29	29744	RING, Retaining.	2	
-30	34705	BEARING	2	
-31	010381	SUPPORT ASSY, Feed reel arm	1	
-32	010384	SUPPORT ASSY, Take-up reel arm	1	
-33	30165	SCREW, Binding head.	1	
-34	05623	PLATE ASSY, Gear mounting.	1	
-35	30238	SPRING, Reel arm tension	2	
-36	29736	WASHER, cam.	2	
-37	145	BALL, Steel	4	

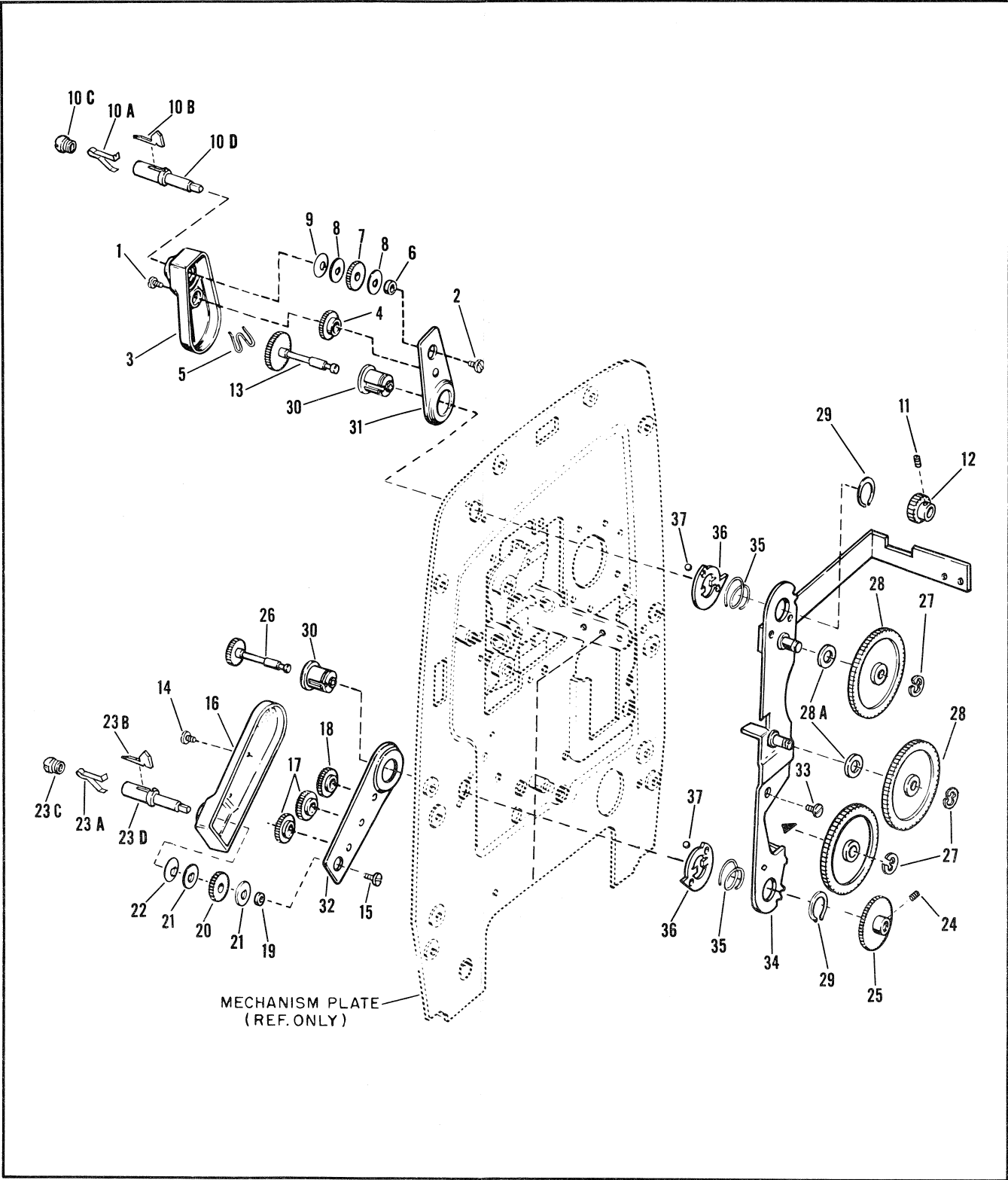


Figure 3. Reel Arms and Gears

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
MOTOR, FAN, AND SPEED CONTROL				
4-1	30237	SCREW, Slotted hex head tapping, No. 4-40	3	
-2	26329	SCREW, Slotted hex hd	1	
-3	33179	TERMINAL BOARD	1	
-4	32498	SEAL, Blower housing	1	
-5	32921	COVER, Blower housing	1	
-6	32974	SETSCREW, Fan	2	
-7	34639	FAN, Blower (complete with set screw)	1	
-8	32858	BELT, Drive	1	
-9	32486	FAN, 10-bladed (complete with set screw)	1	
-10	32767	WASHER, Spring	1	
-11	26923	SCREW, Round head, No. 6-32	4	
-12	33188	DAMPER, Vibration	2	
-13	32736	BUSHING, Motor	4	
-14	33189	BUSHING, Stem-type (rubber)	4	
-15	12498	SCREW, Socket head set, No. 6-32	1	
-16	32140	HALF PULLEY, Drive (right half)	1	
-17	33	PIN, Dowel	1	
-18	010285	HALF PULLEY ASSEMBLY, Drive (left half)	1	
-19	32622	BEARING, Thrust	1	
-20	21736	RING, Retaining	1	
-21	010493	MOTOR, 60-cycle	1	
-22	20808	RING, Retaining	1	
-23	25715	RING, Retaining	1	
-24	32653	SCREW, Socket head set, No. 6-32	1	
-25	32146	CAM, Speed control	1	
-26	33041	SHAFT, Speed control	1	
-27	32161	RIVET	2	
-28	32621	SPRING, Actuating	1	
-29	30778	FOLLOWER, Cam (nylon pressure button)	1	
-30	29248	NUT, Type J speed, No. 6-32 (See note. *)	1	

NOTE* Nut (30) is attached 3/16 inch above notch in spring (28) to eliminate vibration and noise.

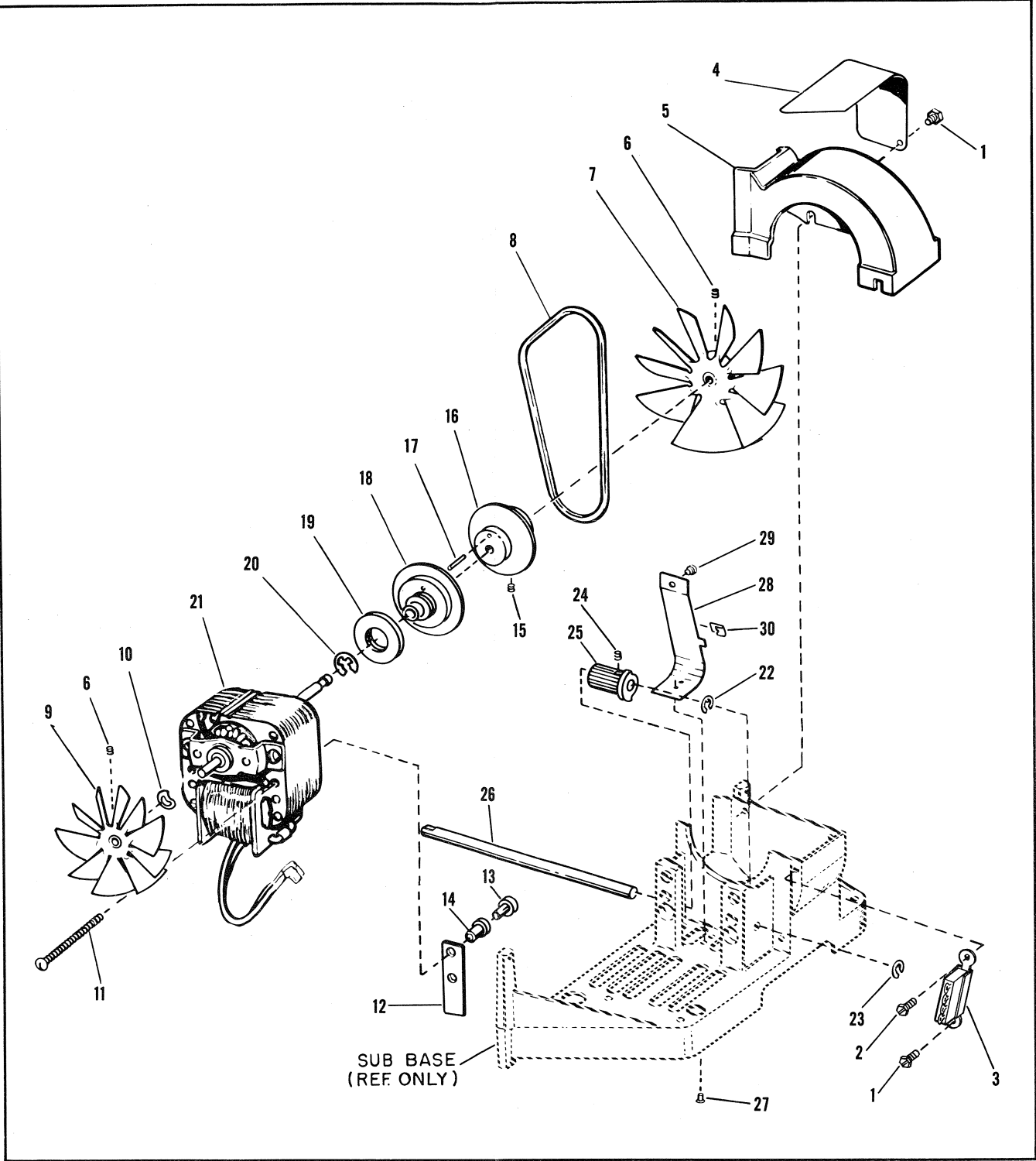


Figure 4. Motor, Fan, and Speed Control

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
SPROCKETS, LOOP FORMERS AND LENS CARRIER				
5-1	35181	SPRING	2	
-2	30667	WASHER.	1	
-3	35184	SPRING, Ratchet	2	
-4	35186	WASHER.	2	
-5	33153	GEAR	1	
-6	35177	GEAR	3	
-7	26085	WASHER, Thrust	1	
-8	30667	WASHER, Friction	1	
-9	011459	LEVER AND STUD ASSY, Drive gear	1	
-10	30650	SPRING, Trip lever assy	1	
-11	30651	SPRING, Lever return	1	
-12	30165	SCREW.	2	
-13	24153	WASHER.	1	
-14	011297	IDLER STUD AND TRIP LEVER ASSY	1	
-15	010694	LOCK LEVER AND STUD ASSY, Actuator	1	
-16	30612	SCREW, Pin	2	
-17	011457	LOOP FORMER ASSY, Upper	1	
-18	010637	LOOP FORMER ASSY, Lower	1	
-19	30611	ROLLER, Film	2	
-20	30613	WASHER, Spacer	2	
-21	30625	ROLLER, Upper loop former	1	
-22	34580	SCREW, Binding head	2	
-23	32352	BRACKET, Upper loop former	1	
-24	30642	PIN, Roller	1	
-25	32354	BRACKET, Lower loop former	1	
-26	011454	SPROCKET ASSEMBLY	2	
-27	26030	PIN, Hinge (lens carrier)	2	
-28	33100	DISC, Focus knob trim	1	
-29	34324	SCREW, Lens holder	1	
-30	6419	WASHER, Spring	1	
-31	600760	PIN, Drive	2	
-32	33091	NAMEPLATE, Lens mount	1	
-33	34325	KNOB, Focus	1	
-34	010723	SLEEVE AND STUD ASSY, Lens carrier	1	
-35	34960	SPRING	1	
-36	30627	PLATE, Retainer	1	
-37	33680	PLATE, Pressure	1	
-38	010724	CARRIER AND PIN ASSY, Lens	1	
-39	30621	SCREW, Truss head	2	
-40	30626	GUIDE, Film	1	
-41	30620	SCREW, Truss head	2	
-42	28067	SPRING, Side tension	1	
-43	30639	ARM, Side tension	1	
-44	011114	PLATE AND PIN ASSY, Aperture	1	
-45	30634	SCREW, Lens mount adjusting	1	
-46	30619	SCREW, Trip linkage adjusting	2	
-47	26642	RIVET, Lens mount catch	2	
-48	30615	CATCH, Lens mount	1	
-49	21736	RING, Retaining	1	
-50	33159	SHAFT, Frame knob	1	

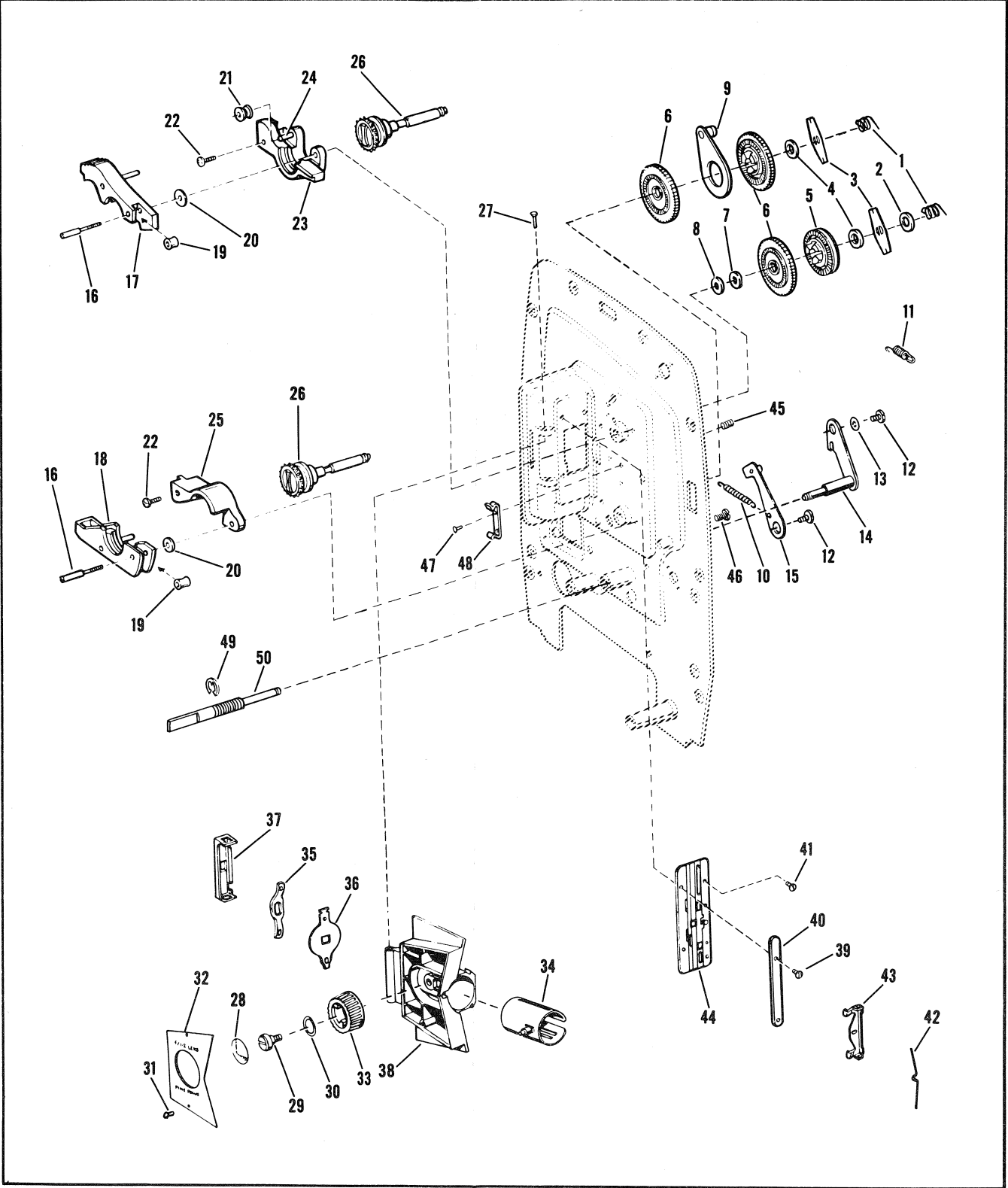


Figure 5. Sprockets, Loop Formers, and Lens Carrier

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
SHUTTER AND SHUTTLE MECHANISM				
6-1	26906	NUT AND LOCKWASHER	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	010667	ROLLER ASSY, Drive	2	
-7A	27313	. RIM, Drive roller	1	
-8	32172	WASHER	2	
-9	010278	BRACKET ASSY, Mounting	1	
-10	29472	SCREW, Pivot	1	
-11	35148	SPRING, Pivot	1	
-12	32136	SCREW, Round head	1	
-13	05627	SAFETY SHUTTER AND BRACKET ASSY	1	
-14	30551	SCREW, Shutter retaining	2	
-15	29175	WASHER, Shutter	1	
-16	32417	SHUTTER	1	
-17	29040	CAM, In-out	1	
-18	32117	PIVOT	1	
-19	30800	WASHER, Spring	1	
-20	011455	SHUTTLE AND FRAMING LEVER ASSY	1	
-21	32947	SHOE, Cam (white) (NOTE A).	AR	
-21	33712	SHOE, Cam (black) (NOTE A).	AR	
-22	27835	WASHER, Eccentric	1	
-23	35109	SPACER, Shuttle	1	
-24	80591	SETSCREW, Pulldown cam	2	
-25	29184	CAM, Pulldown	1	
-26	26085	WASHER, Thrust	1	
-27	12498	SETSCREW, Drive pinion	1	
-28	80591	SETSCREW, Main shaft knob	1	
-29	33040	KNOB, Main shaft	1	
-30	26131	RING, Retaining	1	
-31	33039	SHAFT ASSY, Main	1	
-32	30667	WASHER, Friction	1	
-33	33196	PINION, Drive	1	
-34	29065	SCREW, Hex head	4	
-35	No Number	PLATE ASSY, Mechanism	1	
-36	33108	SCREW, Hex head	5	
-37	33182	SUB-BASE, Projector	1	
-38	22113	RING, Retaining (tilt shaft)	1	
-39	010187	SHAFT AND FOOT ASSY, Tilt	1	
-40	28145	SPRING, Tilt shaft	1	
-41	No Number	BASE ASSY, Projector	1	
-41A	30648	. RIVET, Tubular	2	
-41B	30628	. CUTTER, Film	1	
-41C	010777	. FILM CUTTER BRACKET AND PIN ASSY	1	
-41D	33105	. RIVET, Tubular	1	
-41E	26135	. FOOT, Rubber	1	
-41F	33181	. BASE, Projector	1	

NOTE A: Select any combination of cam shoes to obtain required fit on pulldown cam.

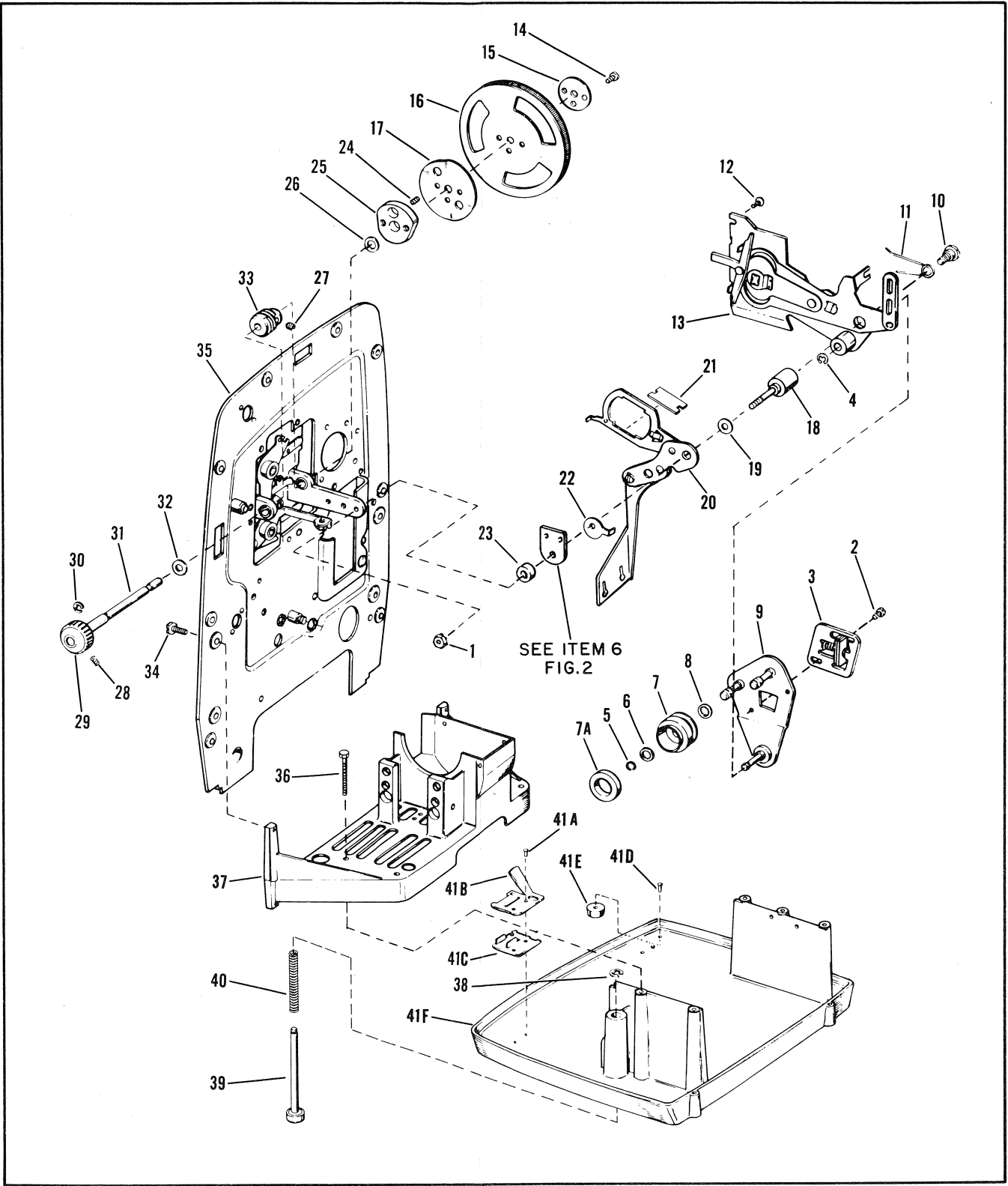


Figure 6. Shutter and Shuttle Mechanism