

## **SERVICE INSTRUCTIONS**

# **8-MM AUTOLOAD PROJECTOR**

**DESIGN 256**

*finer products through imagination*

**Bell & Howell**

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**GENERAL SERVICE DEPT.  
7125 N. KIMBALL AVE.  
CHICAGO 45, ILLINOIS**

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SERVICE INSTRUCTIONS

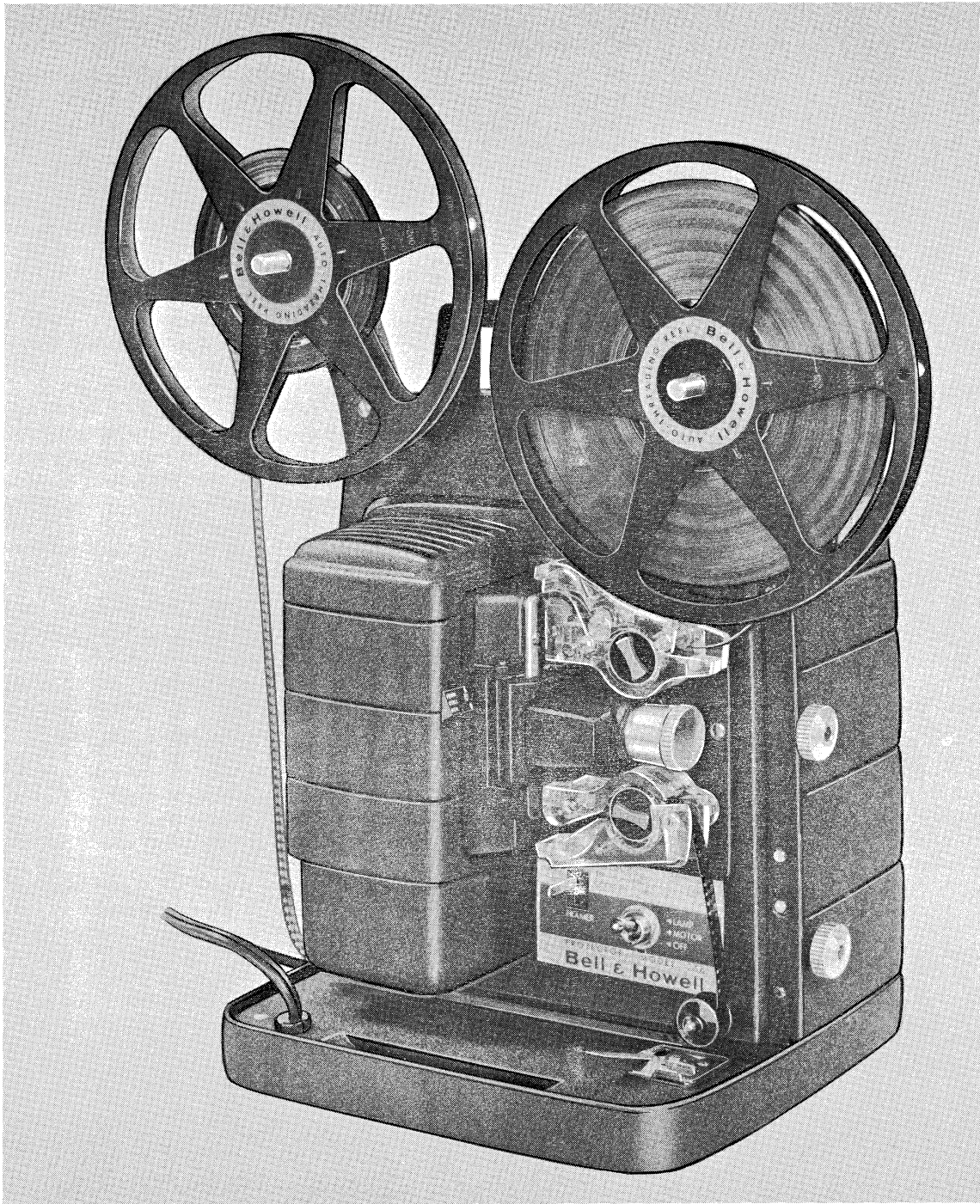


Figure A. Design 256 Autoload 8-mm Projector (Model A and B shown)

# Introduction

## GENERAL.

This manual has been prepared to aid in servicing the Bell & Howell Design 256 Autoload 8-mm Movie Projector. 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.

Five models of the Design 256 projector are covered by these instructions: The 256-A, 256-B, 256-AS, 256-EX and 256-EXL. With the exception of the motors and a few miscellaneous parts, all are basically identical in design and construction. For example, the 256-A and 256-B are completely identical, except that the model B is not equipped with a front cover; the 256-AS is completely identical to the 256-A except for a difference in motors, motor fans and motor mounting screws. The 256-EX and 256-EXL are easily distinguished by the more modernistic design of the lamphouse cover and the presence of a voltage selector switch to the left of the lamphouse. For the 256-EX, the switch nameplate will designate 220 and 240 volts; for the 256-EXL, 115 and 220 volts. Both the EX and EXL models have a transformer mounted in the rear cover.

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

a. Note, in Figure B, that when the upper loop former (4) is pressed downward from its normal position "B" to the threading position "A", the linkage system automatically pivots the lower loop former from position "B" to position "A". The upper loop former must be held down firmly during the entire threading process.

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). While holding the upper loop former (4)

down firmly, the film is 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

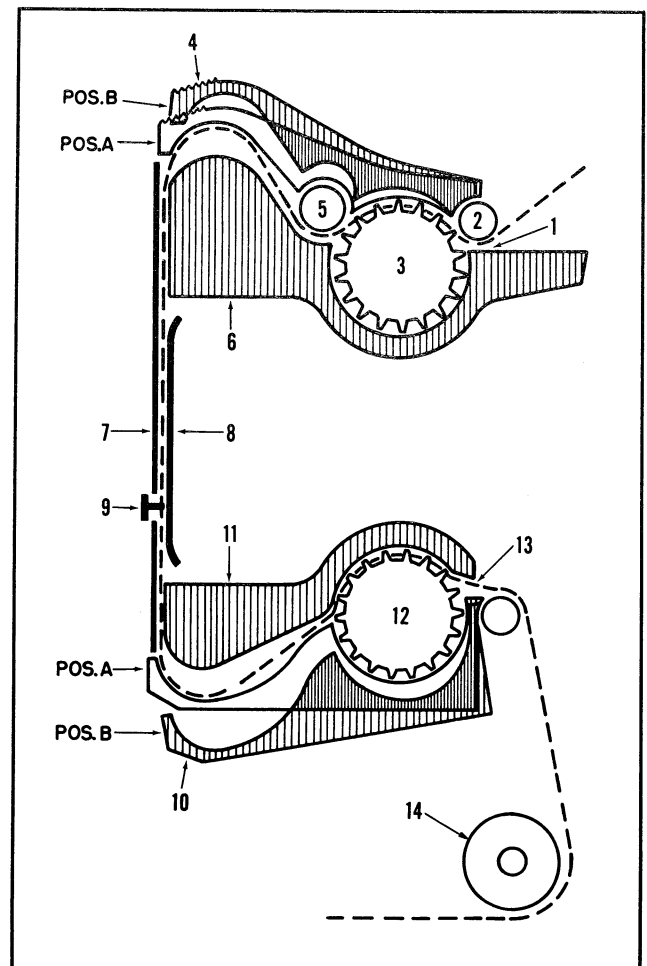


Figure B. Film Path - Self-Threading Procedure

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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 releases the upper loop former (4) and places the film direction lever in the "still" position. The film can be threaded under the guide rollers and up to the take-up reel.

### 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. 1543) 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.

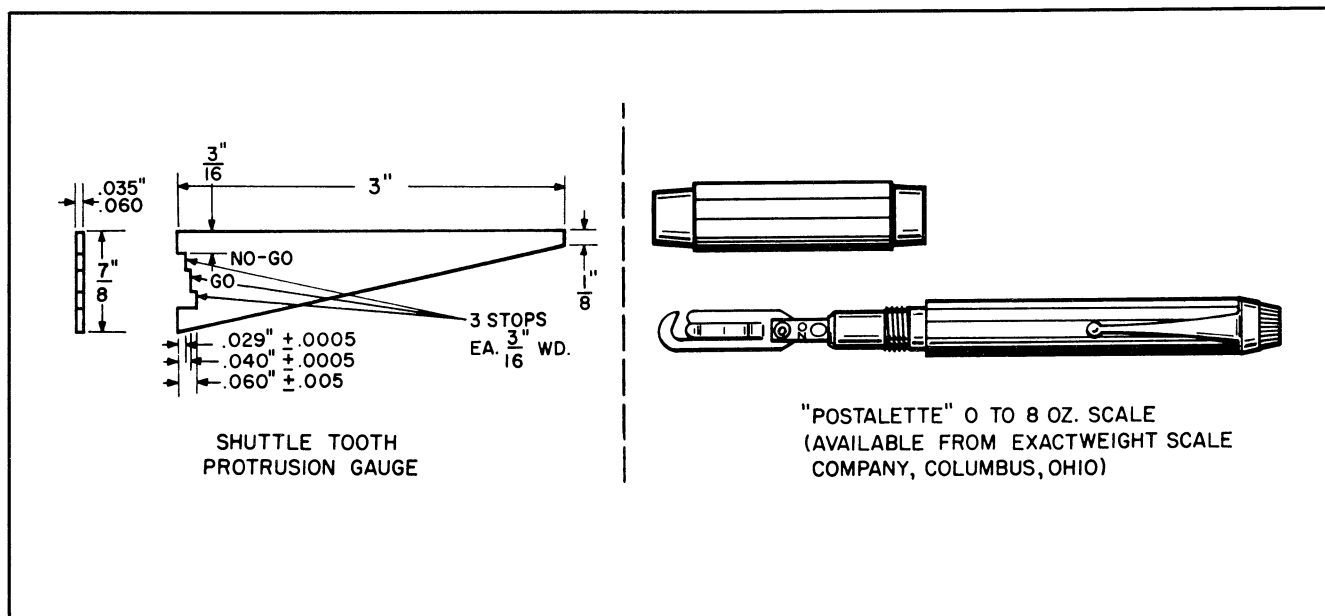


Figure C. Special Service Tools

# Disassembly Procedure

## 1. GENERAL INSTRUCTIONS.

a. When optical parts, such as the projector lamp and lens, are removed from a 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 or 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 its slot.

b. The integral studs of the rewind shield (27) are heat sealed to secure the shield to the base. Do not attempt to remove this shield unless actually in need of replacement.

c. The EX and EXL models only are equipped with a voltage selector slide switch (14) which is fastened to the mechanism plate by rivets (13).

d. The transformer and bracket assembly (37) is used only in the EX and EXL models and is secured to the projector back cover (5) with two screws (36).

e. Bell & Howell does not supply a projection lamp with the model 256-EX projector.

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

a. Removal of screw (1) will permit the withdrawal of the feed reel arm assembly (3) and the assembled spindle parts (5 through 9) which are secured by screw (2). The spur gear (4) can be lifted from the gear stud of the feed reel arm support assembly (33). Note the manner in which the spring (13) is assembled within the reel arm (3).

b. Remove two screws (14) and screw (15), and disassemble the take-up reel arm parts (16 through 23) from the take-up arm support (34).

c. Loosen the setscrews (10 and 24) and disassemble the gears (11 and 25) and gear and shaft assemblies (12 and 26) from the mechanism plate. Remove retaining rings (27 and 29) and gears (28 and 30) from gear mounting plate (36).

d. Remove the two large retaining rings (31) and disassemble the bearings (32) and the reel arm supports (33 and 34) from the mechanism plate. The tension springs, cam washers (38 and 39) and steel balls (40) will fall from position when the bearings are withdrawn.

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

a. Note that the models A and B are equipped with a two-bladed fan (8) which is pressed onto the motor shaft, while the AS, EX and EXL models are equipped with a ten-bladed fan (8A) secured by setscrew (8B).

b. If the motor requires replacement, be sure to check the parts list carefully for the proper motor part number.

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

a. Note the manner in which sprocket springs (1) are engaged and gears (6, 7 and 9) are installed so that they can be reassembled in the same manner. Also, note the manner in which the lever return spring (11) is engaged to the linkage of the mechanism plate.

b. The tension spring (25), retainer plate (26) and pressure plate (27) can be removed from the lens carrier (24) without disassembling the carrier from the mechanism plate. Swing open the lens carrier, and grasp the top and bottom of the pressure plate (27) between the thumb and forefinger. Press the upper end of the retainer plate (26) away from the lens carrier casting to disengage the retainer plate and tension spring (25) from the pins in the casting. To remove the lens carrier (24), the hinge pins (23) must be pried out.

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

a. One of the driver roller assemblies (7) is exposed and can be serviced quite easily. To gain access to the inner roller, remove retaining ring (4),

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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 (15), remove the pivot screw (10), pivot spring (11), knob screw (12), "forward-still-reverse" knob

(13), and screw (14). Note manner in which legs of pivot spring (11) are engaged.

c. Note carefully the engagement of cam shoes (23) with surface of pulldown cam (27) before disassembling the shutter (18), shuttle and framing lever assembly (22), or pulldown cam (27).

# Reassembly Procedure

## 7. GENERAL INSTRUCTIONS.

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

b. Parts which must be lubricated during reassembly are listed in the following lubrication table. Lubricate sparingly, and wipe away excess lubricant with a lint-free cloth. Use only Bell & Howell grease (Spec. 1956) and oil (Spec. 1543) or the best available grades of ball bearing grease or projector oil.

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

a. Hold the drive pinion (31) in position between the two cast ears of the mechanism plate while installing the framer shaft assembly (30). Note that the hub of pinion (31) must face in the direction shown in Figure 5. Tighten setscrew (29) just enough to hold.

b. Assemble shutter washer (17), shutter (18), in-out cam (19), and pulldown cam (27) with screws (16). Select any combination of white and/or black cam

shoes (23) for proper fit on cam (27). The white cam 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 (23) in place while assembling the shuttle and framing lever assembly (22) to pulldown cam (27). Install thrust washer (28) 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 (26) securely, and remove feeler gauge.

c. Assemble the pivot (20) and spring washer (21) to the shuttle and framing lever assembly (22), sliding the eccentric washer (24) and shuttle spacer (25) 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 (15), and install pivot screw (10) so that loop of spring slips around the shoulder of the screw.

TABLE I. LUBRICATION

| ITEM   | LUBRICATION   |
|--|---|
| All Oilite bearings in mechanism plate and reel arms   | Light film of oil.  |
| All gear mounting studs and gearshafts (Figs. 2 and 4) | Light film of grease.   |
| Film rollers (21, Fig. 1)                              | Light film of grease on roller shafts.  |
| Spur gears (6) and (20), Fig. 2                        | Light film of grease, both faces of each gear.                                |
| Reel arm supports (33 and 34, Fig. 2)                  | Light film of grease between supports and mechanism plate.                    |
| Bearing balls (40, Fig. 2)                             | Speck of grease on each ball.   |
| Projector gear train                                   | After projector assembly, apply grease with brush to entire gear train teeth. |

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 "forward-reverse" knob (13) in the center ("still") position. With the spring-loading bracket screws (2) loose, insert a 0.062-inch ( $\pm 0.015$  inch) shim between the upper drive roller rim (7A) and the outer rim of the shutter (18). While maintaining a light pressure on the roller against the shim, tighten the two spring loading bracket screws (2) securely. Withdraw the shim and remove the "forward-reverse" knob. Test the operation of the assembled parts as instructed in paragraph 17.

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

a. If the lens mount catch (36) 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 (32) and spring (31) to the aperture plate assembly (33). 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 (28 and 30) and film guide (29).

c. Assemble the spring (25), retainer plate (26), and pressure plate (27). Note, when assembling, that the elongated hole in the spring (25) must be toward the top, while the slot openings in the plates (26) and (27) must be toward the bottom. 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 (24). Release the pressure on the parts, guiding the retainer plate and spring as necessary to engage the pins protruding from the lens carrier casting.

d. Assemble the sprockets and loop formers (12 through 21) to the mechanism plate. The tension spring (11) is located just behind the upper sprocket and engages a hole in the mechanism plate and the upper end of the mechanism plate linkage.

e. Install three gears (6 and 7) on their respective sprocket shafts. Then assemble the driver gear lever and stud assembly (10), another gear (7), washers (5), ratchet springs (4), the friction washer (2) and sprocket springs (1) to the ends of the sprocket shafts. Now refer to Figure 5 and position the drive pinion (31) so that the pinion teeth are centered at the top of the sprocket gear (6, Figure 4) and tighten the pinion setscrew securely.

f. Thread the end of a six-inch length of 8-mm film one inch past the upper film sprocket and hook a 0 to 10 lb. spring scale to the reinforced end of the film. Pull the film steadily and smoothly toward the front

of the projector while watching the spring scale. Repeat the procedure with the lower film sprocket. The upper sprocket must turn or ratchet at 2 to 5 pounds on the scale; the lower sprocket at 1-1/2 to 5 pounds. Increase or decrease tension, as necessary, by bending ratchet springs (4).

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

a. Engage the drive belt (7) around the drive pulley and the two drive rollers before securing the motor in place with the screws (9). The motor fan (8 or 8A) also should be in position.

b. The face of the blower fan (6) should be centered in the blower fan housing when the setscrew (5) is tightened. The blower housing cover (4) is merely pressed down into place with notches in the cover engaging studs screwed into the blower fan housing.

c. Refer to Figure D for wiring connections for the 256-A, 256-B and 256-AS projectors; to Figures E and F for the 256-EX projector; to Figures G and H for the 256-EXL projector.

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

a. Assemble the reel arm supports (33 and 34), bearings (32), cam washers (38 and 39), tension springs (37) and plate (36) to mechanism plate with screw (35) loosely installed. Insert steel balls (40) between cam washers and detent hole in me-

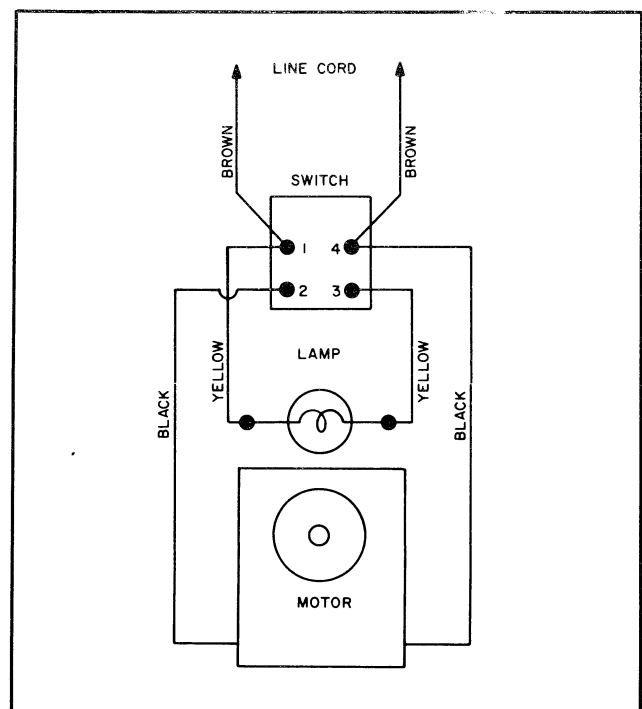


Figure D. Wiring Diagram - 256A, 256B, 256AS



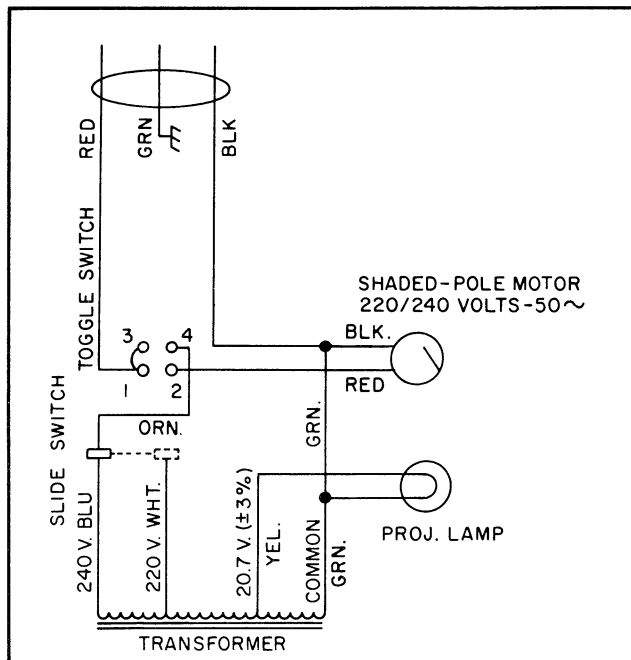


Figure E. Schematic Diagram - 256EX only

chanism plate and tighten screw (35). Install retaining rings (31).

b. Install the gear and shaft assemblies (12 and 26) and the gears (11 and 25). Use a 0.003-inch feeler gauge to maintain the proper gear shaft end play before tightening the setscrews (10 and 24). Install gears (28 and 30) with retaining rings (27 and 29).

#### NOTE

Gears (25 and 28) are always in mesh and the driving power from the sprocket gears to either reel arm gear (11 or 25) is determined by the position of the arm-mounted drive gear (9, Figure 4).

c. Assemble reel arms and gears in reverse order of disassembly. Use new spring washers (8 and 22) and be sure to lubricate all items referred to in Table I.

12. REASSEMBLY OF PARTS IN FIGURE 1. Reassemble parts in reverse order of disassembly, but do not install the back cover (5) until all final projector adjustments have been made.

13. 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 J. The method of checking take-up torque is illustrated in Figure J; to measure rewind torque, the film reel must be rotated so that the sheet metal screw is at position A,

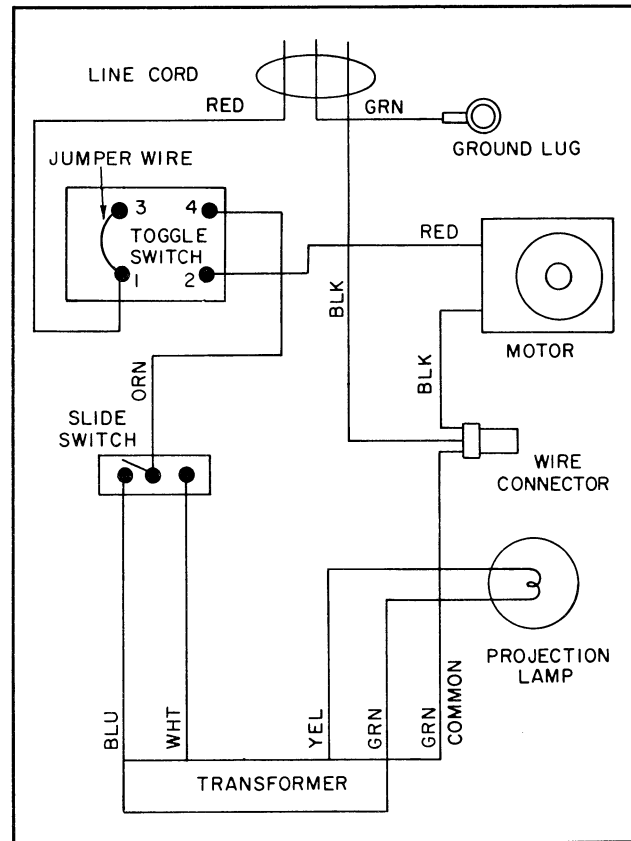


Figure F. Wiring Diagram - 256EX only

with the scale held directly above the screw. Torque can be increased or decreased by either tightening or loosening the respective screw (2 or 15, Figure 2).

14. 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 lever in the approximate center of its travel range, and swing open the lens carrier.

b. Rotate the main shaft knob (30, Figure 5) 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.

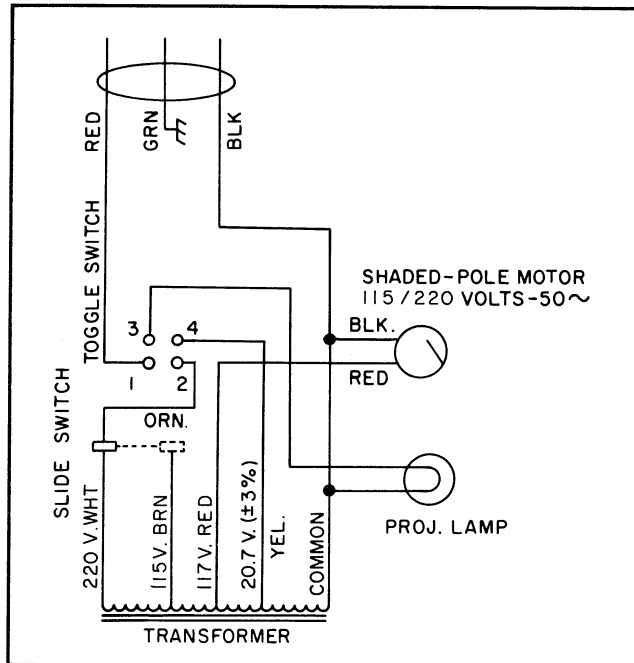


Figure G. Schematic Diagram - 256EX only

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

f. When the shuttle tooth protrusion has been properly adjusted, check the position of the shuttle teeth in relation to the sides of the slot in the aperture plate. By means of the eccentric washer (item 24, Figure 5), the shuttle teeth can be shifted toward one side or the other of the slot. The shuttle must be adjusted so that the teeth enter the center of the film perforations.

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

- Place the framer lever in midposition.
- Thread the projector with film known to be in correct frame. Start projector and focus picture on screen.
- Note the binding head screw in the elongated hole at the bend or "knee" of the framing lever (22, Figure 5). Loosen this screw and shift the shuttle bracket arm (Figure 5) 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.



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

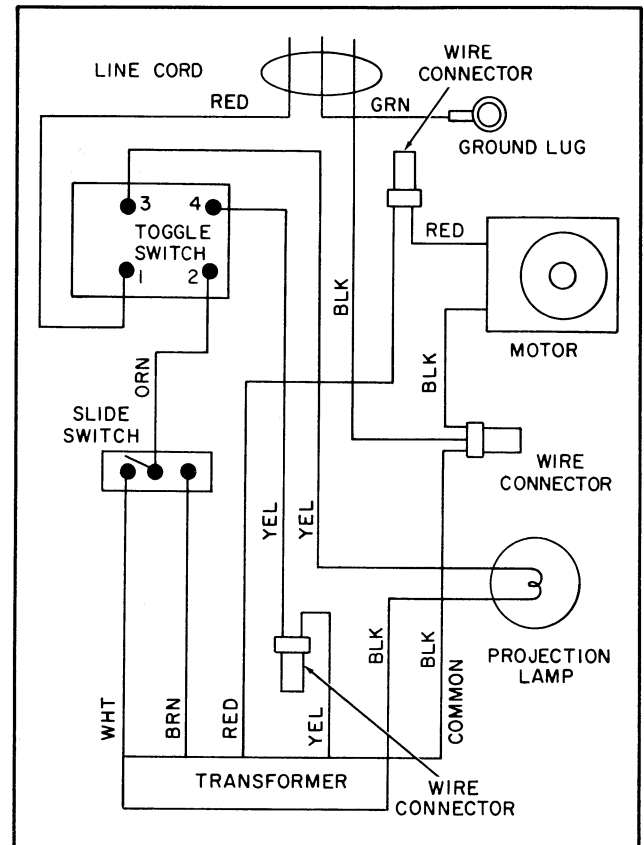


Figure H. Wiring Diagram - 256EX only

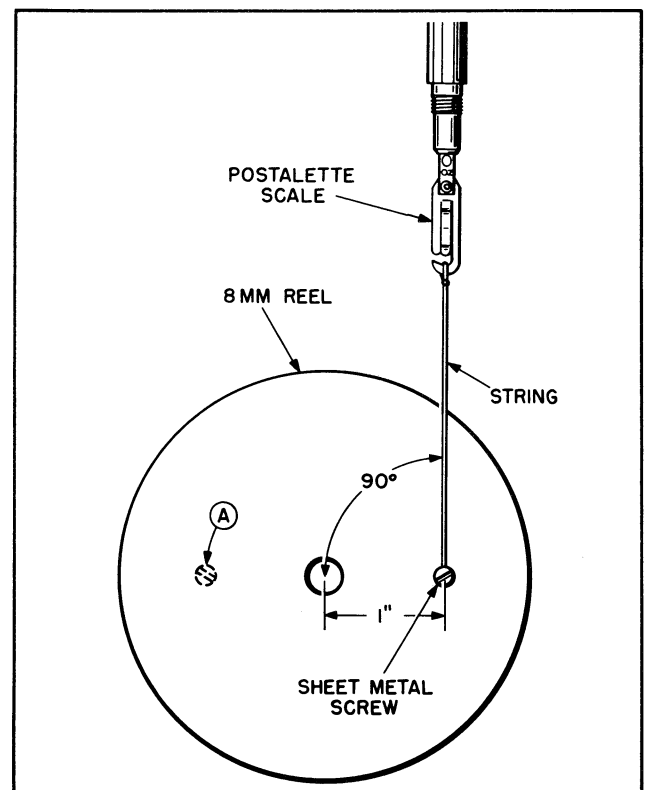


Figure J. Checking Reel Arm Torque

## Final Test

### 16. 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

The 256-A, 256-B and 256-AS projectors are designed for 115-volt, 60-cycle operation only; the 256-EXL can be operated either on 115-volt or 220-volt current (slide switch must be in correct position); the 256-EX operates on 220- or 240-volt current. Use proper power source when operating projector.

**17. 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 lever is moved from the "still" position to either of the operating positions.

b. Proper operation of the fire shutter is controlled by the clearance between the upper drive roller (7, Figure 5) and rim of shutter (18). The nominal clearance is 0.062 inch ( $\pm 0.015$  inch). If the fire shutter tends to clear the aperture opening before the shutter 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," the clearance should be reduced toward the lower (0.047 inch) tolerance limit. To adjust, place lever in "still" position and loosen bracket screws (2, Figure 5). Insert shim stock of proper thickness between drive roller and rim of shutter and, while maintaining light pressure on the roller, tighten screws (2) securely. Retest operation in forward and reverse, readjusting as necessary.

**18. 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 34, Figure 4). This setscrew bears against the machined surface of the lens carrier and determines the angular relationship between the optical axis and the aperture plate.

c. Apply adhesive (B & H Spec. 1761) to setscrew threads. 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.

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

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

b. If film should spill from the feed reel during operation, it may be necessary to tighten screw (2, Figure 2) slightly to apply additional tension. Refer to paragraph 13 for proper reel arm torque adjustments.

c. If the film fails to maintain its loop above or below the aperture, check the shuttle tooth protrusion as described in paragraph 14 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 18, and adjust if necessary.

# *Trouble Shooting Chart*

| TROUBLE   | PROBABLE CAUSE  | REMEDY   |
|---|---|--|
| Projector inoperative with switch in the MOTOR or LAMP position | <ol style="list-style-type: none"> <li>1. No electrical power</li> <li>2. Loose drive pulley</li> <li>3. Broken drive belt</li> <li>4. Defective switch or wiring</li> </ol>  | <ol style="list-style-type: none"> <li>1. Check power source.</li> <li>2. Tighten pulley setscrew.</li> <li>3. Replace belt.</li> <li>4. Check circuit.</li> </ol>   |
| Picture flicker   | <ol style="list-style-type: none"> <li>1. Drive roller assemblies not adjusted properly</li> <li>2. Defective drive belt pulley</li> <li>3. Dirt, wear or binding</li> </ol>  | <ol style="list-style-type: none"> <li>1. Readjust as instructed in paragraph 17.</li> <li>2. Replace drive belt pulley.</li> <li>3. Clean and repair or adjust gearing as instructed in paragraph 11.</li> </ol>  |
| Film scratches  | <ol style="list-style-type: none"> <li>1. Excessively dirty film channel parts (sprockets, guides, etc.)</li> <li>2. Worn pressure and aperture plates (27 and 33, Figure 4)</li> <li>3. Worn or damaged film guide (29, Figure 4)</li> </ol> | <ol style="list-style-type: none"> <li>1. Clean projector thoroughly.</li> <li>2. Replace if worn or marred.</li> <li>3. Replace film guide.</li> </ol>  |
| Jumpy picture   | <ol style="list-style-type: none"> <li>1. Loss of film loop due to damaged film</li> <li>2. Green film</li> <li>3. Shuttle tooth worn</li> <li>4. Misaligned shuttle tooth</li> <li>5. Grooves worn in film guide (29, Figure 4)</li> </ol>   | <ol style="list-style-type: none"> <li>1. Inspect and splice as required.</li> <li>2. Run film through projector two or three times to age the film.</li> <li>3. Replace shuttle assembly (22, Figure 5).</li> <li>4. Adjust and align shuttle as instructed in paragraph 14.</li> <li>5. Replace film guide.</li> </ol> |
| Soft focus  | <ol style="list-style-type: none"> <li>1. Dirty projection lens</li> <li>2. Lens mount out of alignment</li> <li>3. Loose lens mount catch (36, Figure 4)</li> </ol>  | <ol style="list-style-type: none"> <li>1. Clean projector lens.</li> <li>2. Readjust as instructed in paragraph 18.</li> <li>3. Reset tension by bending catch carefully.</li> </ol>   |
| Auto-threading not operating properly                           | <ol style="list-style-type: none"> <li>1. Loop former linkage binding</li> <li>2. Loop formers not releasing</li> </ol>   | <ol style="list-style-type: none"> <li>1. Realign loop formers and straighten linkage.</li> <li>2. Linkage binding or springs stretched or broken on linkage.</li> </ol>   |

# SERVICE INSTRUCTIONS

| TROUBLE                    | PROBABLE CAUSE                          | REMEDY                                     |
|----------------------------|---|--|
| Film spills                | 1. Insufficient tension on feed spindle | 1. Adjust, paragraph 19, step b.           |
| Fails to take up or rewind | 1. Defective drive belt                 | 1. Replace belt.                           |
|                            | 2. Worn rim on drive roller             | 2. Replace rim (7A, Figure 5).             |
|                            | 3. Drive rollers not adjusted           | 3. Readjust as instructed in paragraph 17. |
| Noisy                      | 1. Loose attaching parts                | 1. Tighten as necessary.                   |
|                            | 2. Gearing dry                          | 2. Lubricate as necessary.                 |

# **PARTS CATALOG**

## **8-MM AUTOLOAD PROJECTOR**

**DESIGN 256**

*finer products through imagination*

**Bell & Howell**

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**GENERAL SERVICE DEPT.  
7125 N. KIMBALL AVE.  
CHICAGO 45, ILLINOIS**

# *Replacement Parts*

The following pages illustrate and list by part number and part name all replacement parts of the Design 256 Autoload 8-mm projectors. Since the illustrations are indexed 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 or selection of parts.

The Usable on Code column identifies by code letter those parts which are applicable only to one model

projector. Where this column is blank, the part in question applies to all models. The following code letters are used to identify parts usable only on specific models.

| CODE LETTER | MODEL   |
|-------------|---------|
| A           | 256-A   |
| B           | 256-B   |
| C           | 256-AS  |
| D           | 256-EX  |
| E           | 256-EXL |

| FIG. &<br>INDEX<br>NO. | PART<br>NO.   | DESCRIPTION   | UNITS<br>PER<br>ASSY | USABLE<br>ON<br>CODE |
|------------------------|---------------|---|----------------------|----------------------|
|                        |               | COVERS, LAMP AND TILT MECHANISM                     |                      |                      |
| 1-1                    | 05640         | COVER ASSY, Front . . . . .                         | 1                    | AC                   |
| -1                     | 05637         | COVER ASSY, Front . . . . .                         | 1                    | DE                   |
| -1A                    | 19025         | . RIVET, Front cover catch . . . . .                | 1                    | ACDE                 |
| -1B                    | 26321         | . CATCH, Front cover . . . . .                      | 1                    | ACDE                 |
| -1C                    | 26320         | . BUTTON, Front cover catch . . . . .               | 1                    | ACDE                 |
| -1D                    | 26310         | . RIVET, Front cover nameplate . . . . .            | 1                    | ACDE                 |
| -1E                    | 34946         | . NAMEPLATE, Front cover . . . . .                  | 1                    | AC                   |
| -1E                    | 36614         | . NAMEPLATE, Front cover . . . . .                  | 1                    | DE                   |
| -2                     | 29065         | SCREW, Hex head self threading . . . . .            | 4                    |                      |
| -3                     | 30029         | SCREW, Hex head self threading . . . . .            | 2                    |                      |
| -4                     | 14175         | WASHER, Lock . . . . .                              | 2                    |                      |
| -5                     | 36102         | COVER, Back . . . . .                               | 1                    |                      |
| -5                     | 36605         | COVER, Back . . . . .                               | 1                    |                      |
| -6                     | 34957         | CABLE, Power . . . . .                              | 1                    | ABC                  |
| -6                     | 012067        | CABLE, Power (less connector plug) . . . . .        | 1                    | DE                   |
| -7                     | 22464         | BUSHING, Strain relief . . . . .                    | 1                    | ABC                  |
| -7                     | 706011        | BUSHING, Strain relief . . . . .                    | 1                    | DE                   |
| -7A                    | 36612         | CLIP, Strain relief . . . . .                       | 1                    | DE                   |
| -8                     | 05645         | COVER ASSY, Lamphouse . . . . .                     | 1                    | ABC                  |
| -8                     | 05638         | COVER ASSY, Lamphouse . . . . .                     | 1                    | DE                   |
| -8A                    | 30226         | . RIVET, Lamphouse catch . . . . .                  | 1                    | ABC                  |
| -8A                    | 29144         | . RIVET, Lamphouse catch . . . . .                  | 1                    | DE                   |
| -8B                    | 35360         | . CATCH, Spring, lamphouse . . . . .                | 1                    |                      |
| -9                     | 36601         | NAMEPLATE, Lamphouse cover . . . . .                | 1                    | DE                   |
| -10                    | 33201(Note A) | LAMP, Projector (Tru-Flector) . . . . .             | 1                    | ABC                  |
| -10                    | 35300         | LAMP, Projector (super Tru-Flector) . . . . .       | 1                    | E                    |
| -11                    | 30226         | RIVET, Lamp baffle . . . . .                        | 2                    |                      |
| -12                    | 32478         | BAFFLE, Lamp . . . . .                              | 1                    |                      |
| -13                    | 29144         | RIVET, Voltage switch . . . . .                     | 2                    | DE                   |
| -14                    | 32961         | SWITCH, Slide, voltage selector . . . . .           | 1                    | DE                   |
| -15                    | 36599         | NAMEPLATE, Voltage switch . . . . .                 | 1                    | D                    |
| -15                    | 36619         | NAMEPLATE, Voltage switch . . . . .                 | 1                    | E                    |
| -16                    | 32136         | SCREW, Lamp socket . . . . .                        | 3                    |                      |
| -17                    | 011969        | SOCKET ASSY, Lamp . . . . .                         | 1                    |                      |
| -18                    | 30648         | RIVET, Film cutter . . . . .                        | 2                    |                      |
| -19                    | 36115         | CUTTER, Film . . . . .                              | 1                    |                      |
| -20                    | 20808         | RING, Retaining . . . . .                           | 2                    |                      |
| -21                    | 30662         | ROLLER, Filmguide . . . . .                         | 2                    |                      |
| -22                    | 20415         | NUT, Switch . . . . .                               | 1                    |                      |
| -23                    | 30714         | SCREW, Forward-Reverse knob . . . . .               | 1                    |                      |
| -24                    | 30664         | KNOB, Forward-Reverse . . . . .                     | 1                    |                      |
| -25                    | 36111         | NAMEPLATE, Projector . . . . .                      | 1                    | ABC                  |
| -25                    | 36598         | NAMEPLATE, Projector . . . . .                      | 1                    | D                    |
| -25                    | 36620         | NAMEPLATE, Projector . . . . .                      | 1                    | E                    |
| -26                    | 36635         | NAMEPLATE, Model designation (256AS only) . . . . . | 1                    | C                    |
| -27                    | 30663         | SHIELD, Rewind . . . . .                            | 1                    |                      |
| -28                    | 22113         | RING, Retaining . . . . .                           | 1                    |                      |
| -29                    | 010169        | TILT KNOB ASSY . . . . .                            | 1                    |                      |
| -30                    | 010187        | SHAFT & FOOT ASSY, Tilt . . . . .                   | 1                    | ABC                  |
| -30                    | 011294        | SHAFT & FOOT ASSY, Tilt . . . . .                   | 1                    | DE                   |
| -31                    | 30093         | RIVET, Carrying handle . . . . .                    | 2                    |                      |
| -32                    | 17632         | WASHER, Flat . . . . .                              | 2                    |                      |
| -33                    | 36103         | HANDLE, Carrying . . . . .                          | 1                    |                      |
| -34                    | 26170         | RIVET, Base foot . . . . .                          | 2                    |                      |
| -35                    | 26135         | FOOT, Rubber . . . . .                              | 2                    |                      |
| -36                    | 34577         | SCREW, Transformer mounting . . . . .               | 2                    | DE                   |
| -37                    | 012062        | TRANSFORMER & BRACKET ASSY . . . . .                | 1                    | D                    |
| -37                    | 012071        | TRANSFORMER & BRACKET ASSY . . . . .                | 1                    | E                    |

NOTE A: Projection lamp not supplied for Design 256-EX projectors.

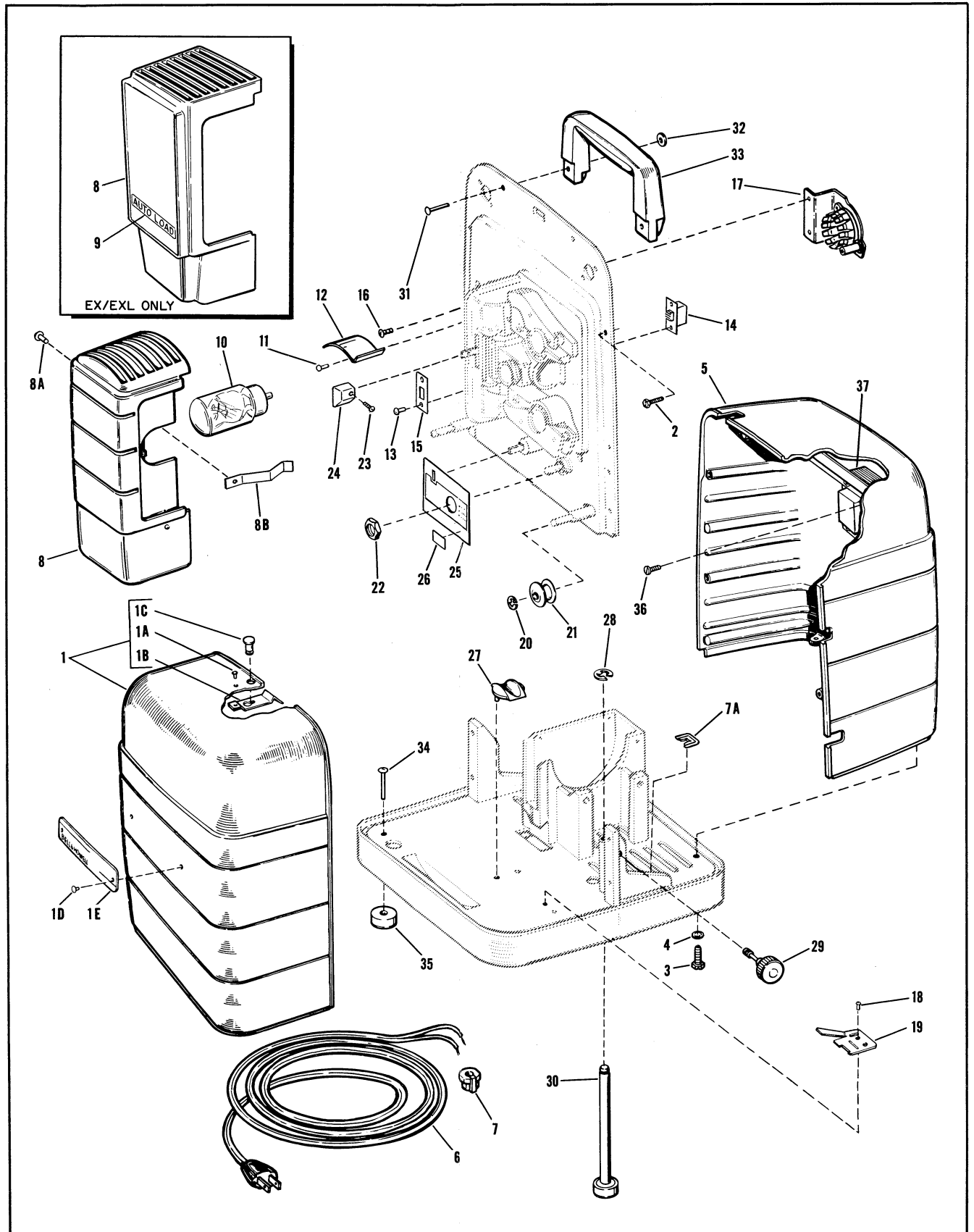


Figure 1. Cover, Lamp and Tilt Mechanism



| FIG. &<br>INDEX<br>NO. | PART<br>NO. | DESCRIPTION                               | UNITS<br>PER<br>ASSY | USABLE<br>ON<br>CODE |
|------------------------|-------------|---|----------------------|----------------------|
| REEL ARMS AND GEARS    |             |   |                      |                      |
| 2-1                    | 23822       | SCREW, Binding head . . . . .             | 1                    | ABC<br>DE            |
| -2                     | 32861       | SCREW, Tension adjusting . . . . .        | 1                    |                      |
| -3                     | 05641       | ARM AND BEARING ASSY, Feed reel . . . . . | 1                    | ABC<br>DE            |
| -4                     | 29706       | GEAR, Spur . . . . .                      | 1                    |                      |
| -5                     | 29726       | SPACER, Tension adjusting . . . . .       | 1                    | ABC<br>DE            |
| -6                     | 35579       | GEAR, Spur . . . . .                      | 1                    |                      |
| -7                     | 35580       | DISC, Friction . . . . .                  | 2                    | ABC<br>DE            |
| -8                     | 29724       | WASHER, Spring . . . . .                  | 1                    |                      |
| -9                     | 010062      | SPINDLE ASSY, Feed . . . . .              | 1                    | ABC<br>DE            |
| -9                     | 05639       | SPINDLE ASSY, Feed . . . . .              | 1                    |                      |
| -10                    | 29192       | SETSCREW . . . . .                        | 1                    | ABC<br>DE            |
| -11                    | 35176       | GEAR, Spur . . . . .                      | 1                    |                      |
| -12                    | 010189      | GEAR AND SHAFT ASSY, Feed arm . . . . .   | 1                    | ABC<br>DE            |
| -13                    | 32979       | SPRING, Torque . . . . .                  | 1                    |                      |
| -14                    | 23822       | SCREW, Binding head . . . . .             | 2                    | ABC<br>DE            |
| -15                    | 32861       | SCREW, Tension adjusting . . . . .        | 1                    |                      |
| -16                    | 05642       | ARM AND BEARING ASSY, Take-up . . . . .   | 1                    | ABC<br>DE            |
| -17                    | 29706       | GEAR, Spur . . . . .                      | 1                    |                      |
| -18                    | 29707       | GEAR, Spur . . . . .                      | 2                    | ABC<br>DE            |
| -19                    | 29726       | SPACER, Tension adjusting . . . . .       | 1                    |                      |
| -20                    | 35579       | GEAR, Spur . . . . .                      | 1                    | ABC<br>DE            |
| -21                    | 35580       | DISC, Friction . . . . .                  | 2                    |                      |
| -22                    | 29724       | WASHER, Spring . . . . .                  | 1                    | ABC<br>DE            |
| -23                    | 010062      | SPINDLE ASSY, Take-up . . . . .           | 1                    |                      |
| -23                    | 05639       | SPINDLE ASSY, Take-up . . . . .           | 1                    | ABC<br>DE            |
| -24                    | 29192       | SETSCREW . . . . .                        | 1                    |                      |
| -25                    | 30203       | GEAR, Spur . . . . .                      | 1                    | ABC<br>DE            |
| -26                    | 010190      | GEAR AND SHAFT ASSY, Take-up . . . . .    | 1                    |                      |
| -27                    | 20808       | RING, Retaining . . . . .                 | 2                    | ABC<br>DE            |
| -28                    | 35919       | GEAR ASSY, Large . . . . .                | 1                    |                      |
| -29                    | 21736       | RING, Retaining . . . . .                 | 1                    | ABC<br>DE            |
| -30                    | 29706       | GEAR, Spur . . . . .                      | 1                    |                      |
| -31                    | 29744       | RING, Retaining . . . . .                 | 2                    | ABC<br>DE            |
| -32                    | 34705       | BEARING . . . . .                         | 2                    |                      |
| -33                    | 010779      | SUPPORT ASSY, Feed reel arm . . . . .     | 1                    | ABC<br>DE            |
| -34                    | 010998      | SUPPORT ASSY, Take-up arm . . . . .       | 1                    |                      |
| -35                    | 80147       | SCREW, Binding head . . . . .             | 1                    | ABC<br>DE            |
| -36                    | 05631       | PLATE ASSY, Gear mounting . . . . .       | 1                    |                      |
| -37                    | 30238       | SPRING, Reel arm tension . . . . .        | 2                    | ABC<br>DE            |
| -38                    | 29736       | WASHER, Cam (feed arm) . . . . .          | 1                    |                      |
| -39                    | 32948       | WASHER, Cam (take-up arm) . . . . .       | 1                    | ABC<br>DE            |
| -40                    | 145         | BALL, Steel . . . . .                     | 4                    |                      |
| -41                    | 26081       | SWITCH, Toggle (LAMP-MOTOR-OFF) . . . . . | 1                    |                      |

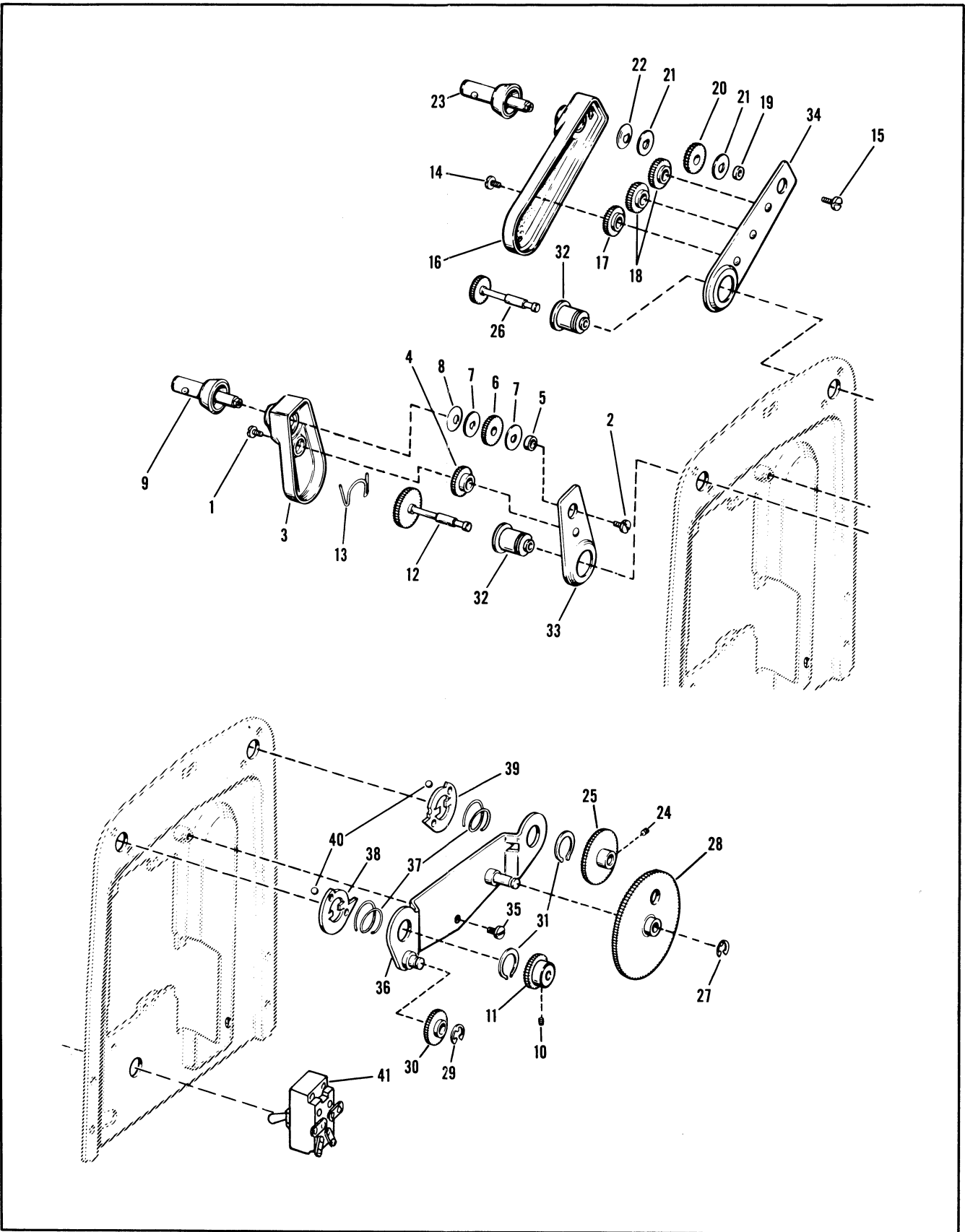


Figure 2. Reel Arms and Gears

| FIG. &<br>INDEX<br>NO. | PART<br>NO. | DESCRIPTION                             | UNITS<br>PER<br>ASSY | USABLE<br>ON<br>CODE |
|------------------------|-------------|---|----------------------|----------------------|
|                        |             | 1 2 3 4 5 6 7                           |                      |                      |
|                        |             | MOTOR AND BLOWER FAN                    |                      |                      |
| 3-1                    | 34784       | SCREW, Hex head self tapping . . . . .  | 2                    | ABC                  |
| -1                     | 29065       | SCREW, Hex head self tapping . . . . .  | 2                    | DE                   |
| -2                     | 26329       | WASHER . . . . .                        | 2                    | ABC                  |
| -2                     | 17632       | WASHER . . . . .                        | 2                    | DE                   |
| -3                     | 83286       | CLAMP, Electrical . . . . .             | 1                    | DE                   |
| -3A                    | 82794       | NUT, Leadwire . . . . .                 | 1                    | DE                   |
| -4                     | 35595       | COVER, Blower housing . . . . .         | 1                    |                      |
| -5                     | 32974       | SETSCREW, Blower fan . . . . .          | 1                    |                      |
| -6                     | 34639       | FAN, Blower . . . . .                   | 1                    |                      |
| -7                     | 32858       | BELT, Drive . . . . .                   | 1                    |                      |
| -8                     | 32485       | FAN, Motor . . . . .                    | 1                    | AB                   |
| -8A                    | 32486       | FAN, Motor (10-bladed). . . . .         | 1                    | CDE                  |
| -8B                    | 32974       | SETSCREW, Motor fan . . . . .           | 1                    | CDE                  |
| -9                     | 30030       | SCREW, Motor mounting . . . . .         | 2                    | AB                   |
| -9                     | 32170       | SCREW, Motor mounting . . . . .         | 2                    | CDE                  |
| -10                    | 26163       | BARRIER, Switch . . . . .               | 1                    | ABDE                 |
| -10                    | 32271       | BARRIER, Switch . . . . .               | 1                    | C                    |
| -11                    | 30676       | MOTOR, Projector . . . . .              | 1                    | AB                   |
| -11                    | 35251       | MOTOR, Projector . . . . .              | 1                    | C                    |
| -11                    | 36593       | MOTOR, Projector, 220 to 240V . . . . . | 1                    | D                    |
| -11                    | 36617       | MOTOR, Projector, 115 to 220V . . . . . | 1                    | E                    |
| -12                    | 12498       | SETSCREW, Motor pulley. . . . .         | 1                    |                      |
| -13                    | 33589       | PULLEY, Motor. . . . .                  | 1                    | ABC                  |
| -13                    | 36602       | PULLEY, Motor. . . . .                  | 1                    | DE                   |

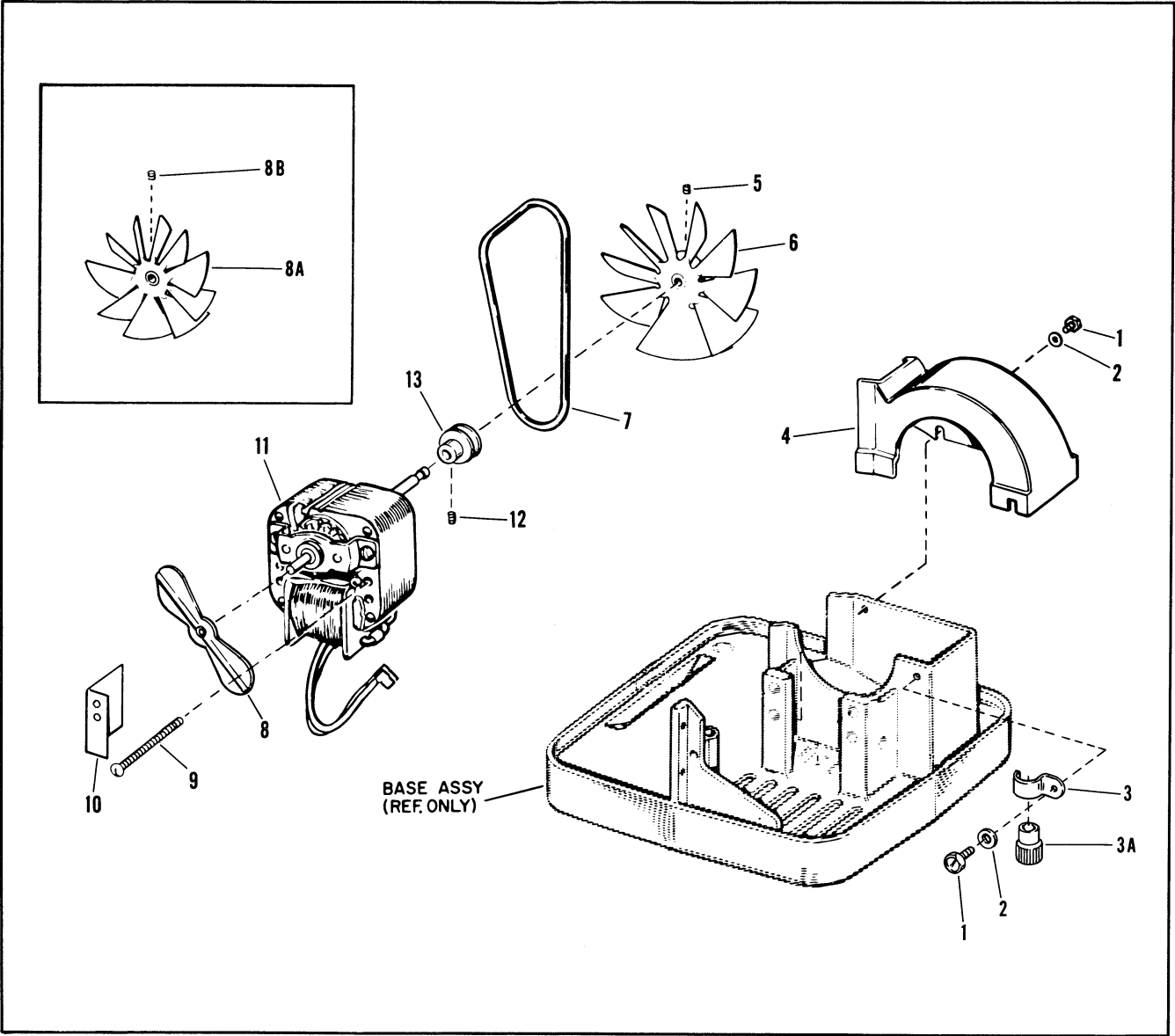


Figure 3. Motor and Blower Fan

| FIG. &<br>INDEX<br>NO.                   | PART<br>NO. | DESCRIPTION                                    | UNITS<br>PER<br>ASSY | USABLE<br>ON<br>CODE |
|--|-------------|--|----------------------|----------------------|
| SPROCKETS, LOOP FORMERS AND LENS CARRIER |             |  |                      |                      |
| 4-1                                      | 35181       | SPRING, Sprocket. . . . .                      | 2                    | ABC<br>DE            |
| -2                                       | 30667       | WASHER, Friction . . . . .                     | 1                    |                      |
| -3                                       | 31015       | WASHER, Friction (early models only - discard) | 1                    |                      |
| -4                                       | 35184       | SPRING, Ratchet . . . . .                      | 2                    |                      |
| -5                                       | 35186       | WASHER, Spacer . . . . .                       | 2                    |                      |
| -6                                       | 33153       | GEAR, Sprocket . . . . .                       | 1                    |                      |
| -6                                       | 35177       | GEAR, Sprocket . . . . .                       | 1                    |                      |
| -7                                       | 35177       | GEAR, Sprocket . . . . .                       | 3                    |                      |
| -8                                       | 21736       | RING, Retaining . . . . .                      | 1                    |                      |
| -9                                       | 34718       | GEAR, Drive . . . . .                          | 1                    |                      |
| -10                                      | 011459      | LEVER AND STUD ASSY, Driver gear . . . . .     | 1                    |                      |
| -11                                      | 30651       | SPRING, Lever return . . . . .                 | 1                    |                      |
| -12                                      | 30612       | SCREW, Pin . . . . .                           | 2                    |                      |
| -13                                      | 011457      | LOOP FORMER ASSY, Upper . . . . .              | 1                    |                      |
| -14                                      | 010637      | LOOP FORMER ASSY, Lower . . . . .              | 1                    |                      |
| -15                                      | 30611       | ROLLER, Film . . . . .                         | 2                    |                      |
| -16                                      | 30613       | WASHER, Spacer . . . . .                       | 2                    |                      |
| -17                                      | 30625       | ROLLER, Upper loop former . . . . .            | 1                    |                      |
| -18                                      | 34580       | SCREW, Binding head . . . . .                  | 2                    |                      |
| -19                                      | 011319      | BRACKET ASSY, Upper loop former . . . . .      | 1                    |                      |
| -20                                      | 33588       | BRACKET, Lower loop former . . . . .           | 1                    |                      |
| -21                                      | 011454      | SPROCKET ASSY, Film . . . . .                  | 2                    |                      |
| -22                                      | 36116       | DECAL, "PUSH" . . . . .                        | 1                    |                      |
| -23                                      | 26030       | PIN, Lens carrier hinge . . . . .              | 2                    |                      |
| -24                                      | 05643       | CARRIER ASSY, Lens . . . . .                   | 1                    |                      |
| -25                                      | 34960       | SPRING, Tension . . . . .                      | 1                    |                      |
| -26                                      | 33937       | PLATE, Retainer . . . . .                      | 1                    |                      |
| -27                                      | 33680       | PLATE, Pressure . . . . .                      | 1                    |                      |
| -28                                      | 30621       | SCREW, Truss head . . . . .                    | 2                    |                      |
| -29                                      | 30626       | GUIDE, Film . . . . .                          | 1                    |                      |
| -30                                      | 30620       | SCREW, Truss head . . . . .                    | 2                    |                      |
| -31                                      | 28067       | SPRING, Side tension . . . . .                 | 1                    |                      |
| -32                                      | 30639       | ARM, Side tension . . . . .                    | 1                    |                      |
| -33                                      | 011114      | PLATE ASSY, Aperture . . . . .                 | 1                    |                      |
| -34                                      | 30634       | SCREW, Lens mount adjusting . . . . .          | 1                    |                      |
| -35                                      | 26642       | RIVET, Lens mount catch . . . . .              | 2                    |                      |
| -36                                      | 30615       | CATCH, Lens mount . . . . .                    | 1                    |                      |

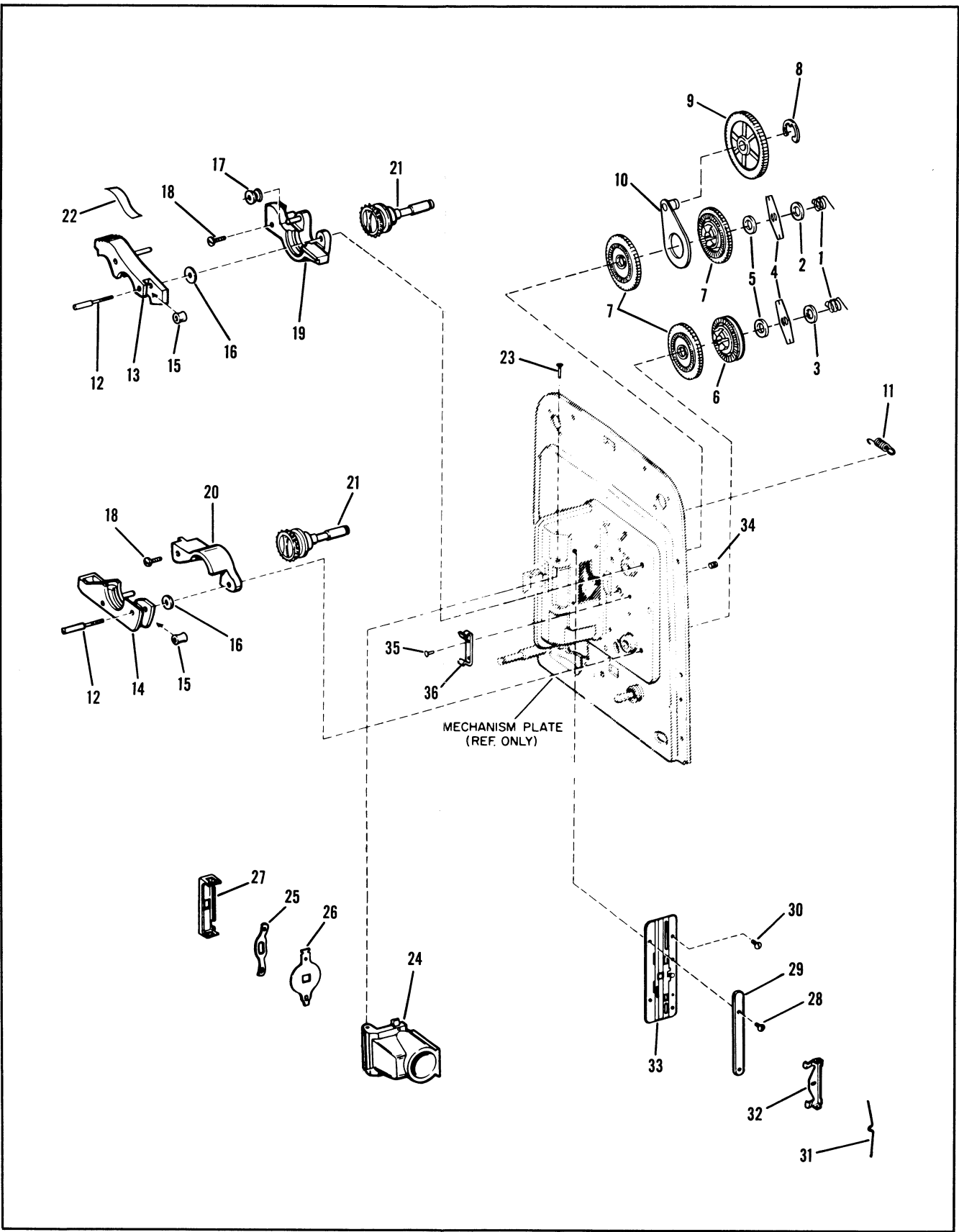


Figure 4. Sprockets, Loop Formers and Lens Carrier

| FIG. &<br>INDEX<br>NO. | PART<br>NO.    | DESCRIPTION                                       | UNITS<br>PER<br>ASSY | USABLE<br>ON<br>CODE |
|------------------------|----------------|---|----------------------|----------------------|
|                        |                | 1 2 3 4 5 6 7                                     |                      |                      |
|                        |                | SHUTTER AND SHUTTLE MECHANISM                     |                      |                      |
| 5-1                    | 26906          | NUT AND LOCKWASHER . . . . .                      | 1                    |                      |
| -2                     | 27641          | SCREW, Fillister head . . . . .                   | 2                    |                      |
| -3                     | 010181         | BRACKET ASSY, Spring loading . . . . .            | 1                    |                      |
| -4                     | 25715          | RING, Retaining (safety shutter) . . . . .        | 1                    |                      |
| -5                     | 27322          | RING, Retaining (drive roller) . . . . .          | 2                    |                      |
| -6                     | 32172          | WASHER, FLAT. . . . .                             | 2                    |                      |
| -7                     | 010667         | ROLLER ASSY, Drive . . . . .                      | 2                    |                      |
| -7A                    | 27313          | . RIM, Drive roller . . . . .                     | 1                    |                      |
| -8                     | 32172          | WASHER, Flat . . . . .                            | 2                    |                      |
| -9                     | 010278         | BRACKET ASSY, Pulley mounting . . . . .           | 1                    |                      |
| -10                    | 29472          | SCREW, Pivot. . . . .                             | 1                    |                      |
| -11                    | 32169          | SPRING, Pivot . . . . .                           | 1                    |                      |
| -12                    | 30714          | SCREW, Forward-Reverse knob (REF. only) . . . . . | 1                    |                      |
| -13                    | 30664          | KNOB, Forward-Reverse (REF. only) . . . . .       | 1                    |                      |
| -14                    | 32136          | SCREW, Safety shutter . . . . .                   | 1                    |                      |
| -15                    | 05632          | SHUTTER AND BRACKET ASSY, Safety . . . . .        | 1                    |                      |
| -16                    | 30551          | SCREW, Shutter retaining. . . . .                 | 2                    |                      |
| -17                    | 29175          | WASHER, Shutter . . . . .                         | 1                    |                      |
| -18                    | 32417          | SHUTTER . . . . .                                 | 1                    |                      |
| -19                    | 29040          | CAM, In-out. . . . .                              | 1                    |                      |
| -20                    | 32117          | PIVOT . . . . .                                   | 1                    |                      |
| -21                    | 36615          | WASHER, Spring . . . . .                          | 1                    |                      |
| -22                    | 011140         | SHUTTLE AND FRAMING LEVER ASSY . . . . .          | 1                    |                      |
| -23                    | 32947 (Note A) | SHOE, Cam (white) . . . . .                       | AR                   |                      |
| -23                    | 33712 (Note A) | SHOE, Cam (black) . . . . .                       | AR                   |                      |
| -24                    | 35319          | WASHER, Eccentric . . . . .                       | 1                    |                      |
| -25                    | 30745          | SPACER, Shuttle . . . . .                         | 1                    |                      |
| -26                    | 80591          | SETSCREW, Pulldown cam . . . . .                  | 2                    |                      |
| -27                    | 29184          | CAM, Pulldown . . . . .                           | 1                    |                      |
| -28                    | 26085          | WASHER, Thrust . . . . .                          | 1                    |                      |
| -29                    | 12498          | SETSCREW, Drive pinion. . . . .                   | 1                    |                      |
| -30                    | 010448         | SHAFT AND KNOB ASSY, Main . . . . .               | 1                    |                      |
| -31                    | 33196          | PINION, Drive . . . . .                           | 1                    |                      |
| -32                    | 30667          | WASHER, Friction . . . . .                        | 1                    |                      |
| -33                    | 26131          | RING, Retaining. . . . .                          | 1                    |                      |
| -34                    | 29065          | SCREW, Hex head. . . . .                          | 4                    |                      |
| -35                    | NO NUMBER      | PLATE ASSY, Mechanism . . . . .                   | 1                    |                      |
| -36                    | 36108          | BASE, Projector . . . . .                         | 1                    | ABC                  |
| -36                    | 36597          | BASE, Projector . . . . .                         | 1                    | DE                   |

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

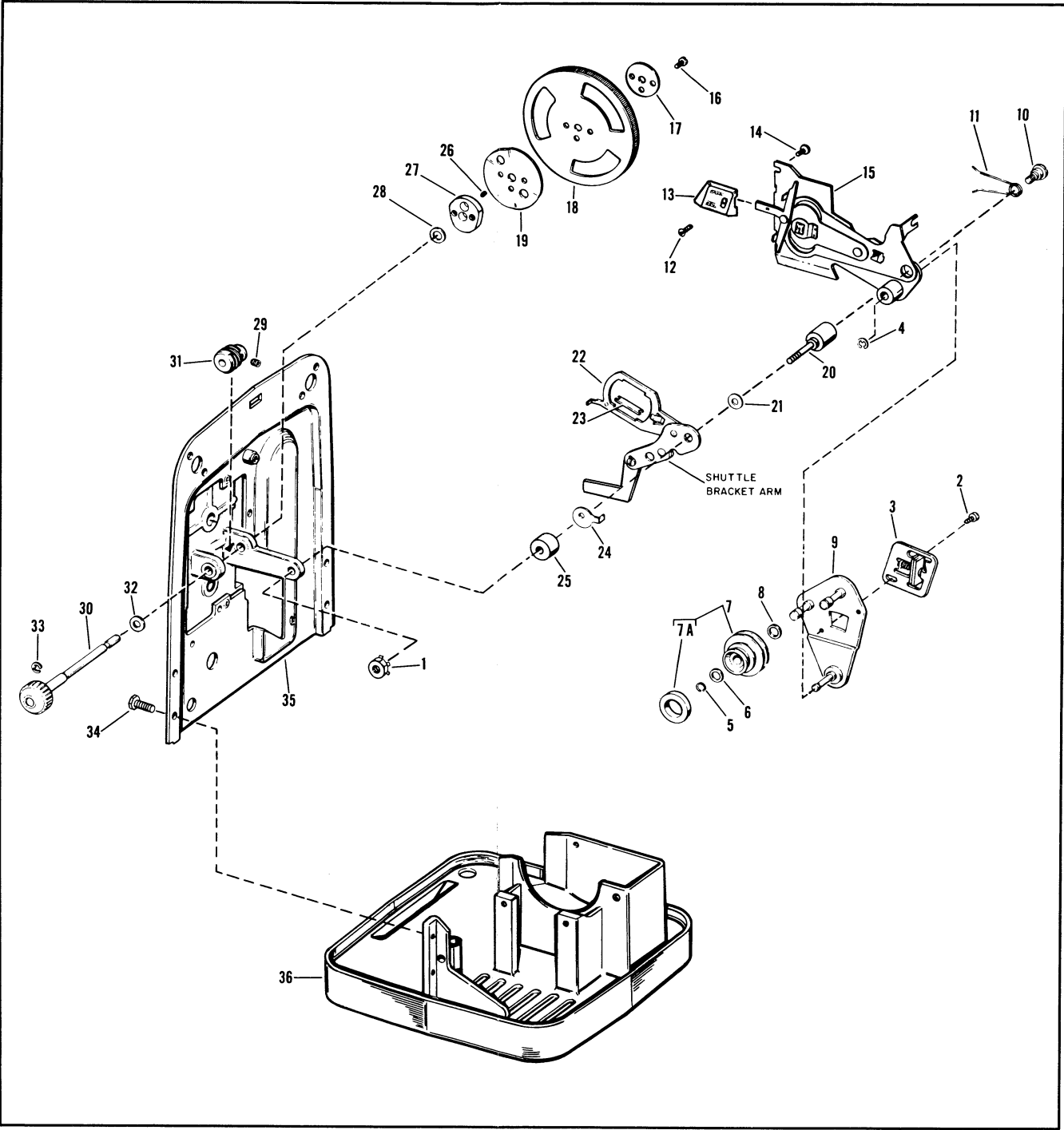


Figure 5. Shutter and Shuttle Mechanism