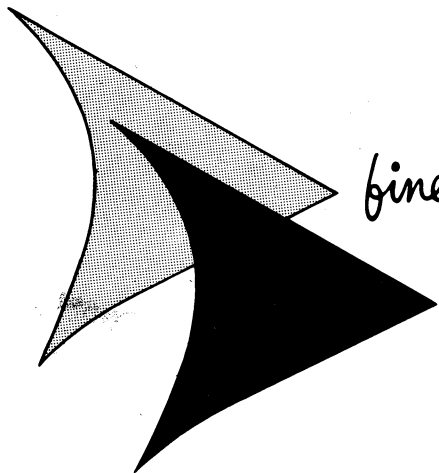


SERVICE INSTRUCTIONS

DESIGN 253 PROJECTORS



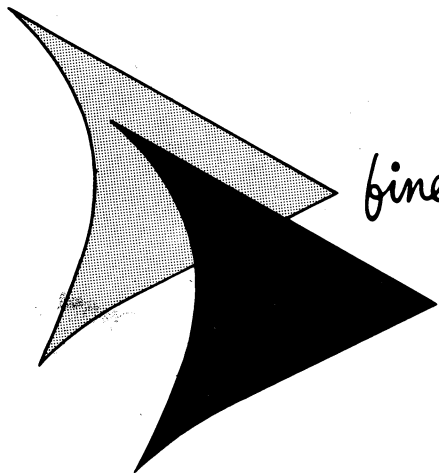
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SERVICE INSTRUCTIONS

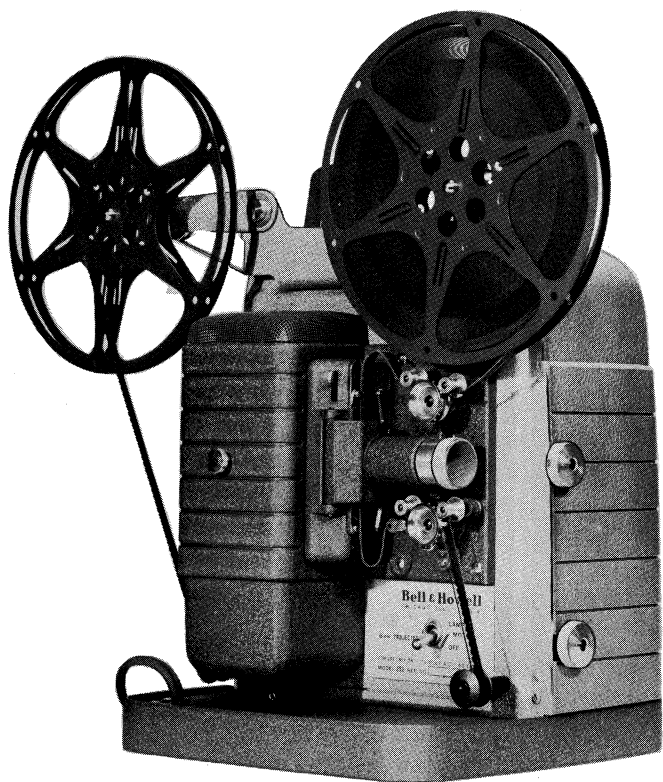
DESIGN 253 PROJECTORS



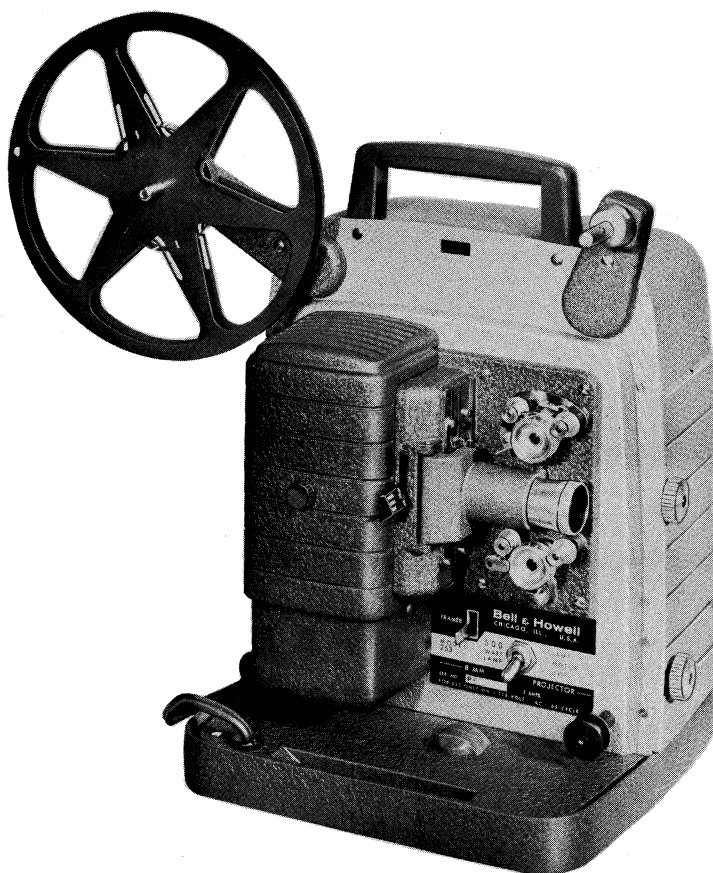
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**Figure A. Design 253 Projector
(Belt-Driven Model Shown)**



**Figure B. Design 253 Projector
(Gear-Driven Model Shown)**

Introduction

This instruction book has been prepared to aid the serviceman in the repair of all Bell & Howell Design 253 projectors. Replacement parts for these projectors are illustrated and listed in the Parts Catalog section at the end of this book.

All parts in the exploded view illustrations in the Parts Catalog section are indexed in their order of removal. The serviceman must use his own judgement in eliminating unnecessary steps of disassembly when making specific repairs to the projector. No special tools are required for the repair and adjustment of these projectors other than a zero-to-eight ounce Postalette scale. (Figure D.)

The most distinctive physical difference in projectors involves the method of driving the reel arms. In one group (Models 253A, 253AR and 253B), the reel arms are driven by belts. In the other group (Models 253AX, 253RX and 253BRX), the reel arms are gear-driven. These and other differences between models are indicated in the exploded view illustrations and their accompanying lists. To simplify the instructions

and the parts listings, the projector models and their variations have been identified by code letters. When repairing projectors or ordering parts, be sure to note whether or not the instructions or parts are applicable to the projector being serviced.

SPECIAL MAINTENANCE PRECAUTIONS

For the most part, disassembly of the projectors is a simple mechanical procedure and can be accomplished by referring to the exploded view illustrations in the Parts Catalog section and removing the parts in their indicated sequence of disassembly. However, when reassembling the projectors, be sure to follow any special adjustment procedures outlined in the instructions.

When lubricating projector parts, it is recommended that only Bell & Howell grease (Spec. No. 1516 and/or 1544) and oil (Spec. No. 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.

CODE LETTER	PROJECTOR MODEL
A	Design 253A (early models)
B	Design 253A (current models)
C	Design 253AR
D	Design 253AX
E	Design 253B (early models)
F	Design 253B (current models)
G	Design 253BRX
H	Design 253RX

NOTE: The Model 253RY Projector has not been specifically identified in these instructions. Except for its special Filmovara "Zoom" lens (part no. 020118), the 253RY projector is identical in all respects to the 253RX projector. Therefore, all instructions and parts lists which apply to the 253RX are applicable to the 253RY projector.

Disassembly Procedure

1. GENERAL INSTRUCTIONS.

a. When optical parts (projection lamp, lens, condenser, reflector) are removed, wrap 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 casting to prevent loss.

2. REMOVAL OF PARTS IN FIGURE 1 — (All models). The parts illustrated in Figure 1 are, in most instances, applicable to all projector models. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

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

b. To remove the reflector (14), press down on the top curve of its retaining spring until the reflector can be lifted free of the lamphouse casting.

c. The integral studs of the rewind shield (17) are peened over to secure the shield to the base. Do not attempt to remove this shield unless actually in need of replacement.

d. Reel arm belts (8) and (9) are used only on Models 253A, 253AR and 253B projectors.

e. In Model 253AR projectors only, the feed belt (9) is installed with a single twist to provide proper driving action. Therefore, a belt separator (26) has been provided to prevent belt wear due to rubbing of the belt during operation. The separator is attached with one of the handle rivets (24).

3. DISASSEMBLING THE REEL ARMS (Models 253A, 253AR and 253B only). Remove Figure 2 parts, as necessary, in their indexed order of disassembly. There are no special precautions.

4. DISASSEMBLING REEL ARMS AND GEARS (Models 253AX, 253RX and 253BRX only). Remove Figure 3 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 the screw (2). The spur gear (4) and spring washer (5) can be lifted from the gear stud of the feed reel arm support (45).

b. Note the special rewind linkage (52 through 59) used in the 253AX projector. (See inset, Figure 3.)

5. REMOVING MOTOR AND FAN (Model 253AR and early Models 253A and 253B only). Remove Figure 4 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. In Model 253AR projectors, the blower housing (6) is supported by an angle support bracket (4).

b. Note the pulley and spring arrangement used in Model 253A and 253B projectors as compared to that for Model 253AR projectors (shown in inset of Figure 4).

6. REMOVING MOTOR AND FAN (Current Models 253A and 253B and all 253AX, RX and BRX). Remove Figure 5 parts, as necessary, in their indexed order of disassembly, noting the pulley and spring arrangement used in Model 253A, 253AX and 253B projectors as compared to that for Model 253RX and 253 BRX projectors (shown in inset of Figure 5).

7. REMOVING SPROCKETS AND LENS CARRIER PARTS (All models). Remove Figure 6 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. In order to remove the sprocket and shaft assemblies (6 and 6A) for replacement, the corresponding gears at the rear of the mechanism plate first must be removed. See Figure 7 (253A, 253AX, 253B), Figure 8 (253AR) or Figure 9 (253RX, 253BRX) for proper sprocket gears and associated parts.

b. The film channel parts (12 through 18) can be removed without disassembling the lens carrier (9) from the mechanism plate. Note that early Model 253A and 253B projectors are equipped with an upper and a lower side tension arm (15 and 15A). All other projectors are equipped with a one-piece tension arm (16). To remove the lens carrier (9), the hinge pins (8) must be pried out.

c. Before removing the aperture plate (18), note carefully the manner in which the side tension spring (17) is installed.

8. REMOVING SHUTTLE AND GEARING (Models 253A, 253AX and 253B). Remove Figure 7 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Note that the Model 253AX projector is not equipped with a belt retainer (2), intermediate belt (3) or idler pulley (6).

b. Before removing the shuttle and framer assembly (14), note carefully the manner in which the shuttle spring (17) is installed.

9. REMOVING SHUTTLE AND GEARING (Model 253AR only). Remove Figure 8 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Early Model 253AR projectors were equipped with a spring-loading bracket arrangement (23 through 27) which could be disassembled. In the latest bracket design (item 28), all parts are secured with a long rivet. When early design spring-loading bracket parts are in need of replacement, the new assembly (28) should be installed.

b. When removing sprocket pulleys (9) and (10), note carefully the manner in which the clutch cam (14), steel balls (15) and retainer (16) are assembled. Be careful not to lose the steel balls during disassembly.

c. Note carefully the engagement of the cam shoes

(50) with the surface of the pull-down cam (55) before disassembling the shutter pulley (44), shuttle and framer assembly (49) or pull-down cam (55).

10. REMOVING SHUTTLE AND GEARING (Models 253RX and 253BRX only). Remove Figure 9 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Early Model 253RX and 253BRX projectors were equipped with a spring-loading bracket arrangement (8 through 12) which could be disassembled. In the latest bracket design (13), all parts are secured with a long rivet. When early design spring-loading bracket parts are in need of replacement, the new assembly (13) should be installed.

b. One of the drive roller assemblies (17) is exposed and can be serviced quite easily. To gain access to the inner roller, remove retaining ring (14) and lift the assembled pulley mounting bracket (20) and roller parts (15 through 19) from the projector.

c. To free the fire shutter assembly (26), remove the pivot screw (21), pivot spring (22), knob screw (23), "forward-still-reverse" knob (24) and two hex nuts (25). Note manner in which hairpin legs of pivot spring (22) are engaged.

d. Note carefully the engagement of cam shoes (35) with surface of pull-down cam (40) before disassembling the shutter pulley (29), shuttle and framing lever assembly (34) or pull-down cam (40).

Reassembly and Adjustments

11. 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 Chart. Lubricate sparingly, and wipe away excess lubricant with a lint-free cloth. Use only Bell & Howell grease (Spec. 1516 or 1544 as noted) and oil (Spec. 1543) or the best available commercial grades of ball bearing grease or projector oil.

12. LUBRICATION CHART.

ITEM	PROJECTOR MODEL	APPLICATION
Film guide rollers	All models	Apply grease (1516) to roller shafts with brush.
All oilite bearings	All models	One or two drops of oil (1543).
Motor shaft	All models	Apply grease (1544) to area of shaft covered by pulley.

12. LUBRICATION CHART (continued)

ITEM	PROJECTOR MODEL	APPLICATION
Shuttle cam (item 21, Figure 7)	253A, 253AX, 253B	Apply grease (1516) liberally to cam groove.
Pulley spring sleeve	253A, 253AR, 253AX, 253B	Light film of oil (1543) in assembly.
Bearing balls (item 51, Figure 3)	253AX, 253RX, 253BRX	Speck of grease (1544) on each ball.
Reel arms	All models	Light film of oil (1543) on spindle shafts.
Cam oiler (item 21, Figure 8, item 6, Figure 9)	253AR, 253RX, 253BRX	Saturate with oil (1543); allow excess to drain away.
Bearing balls (item 15, Figure 8)	253AR	Speck of grease (1544) on each ball.
Gear and shaft assemblies (items 15 and 34, Figure 3)	253AX, 253RX, 253BRX	Apply grease (1544) between face of gear and face of bearings (item 44, Figure 3).
Spur gears (items 7 and 22, Figure 3)	253AX, 253RX, 253BRX	Apply grease (1544) to both faces of each gear.
Projector gear train	All models	With projector running, apply grease (1544) with brush to entire gear train for one revolution of the sprocket gears. CAUTION: Do not get grease into pulley grooves.

13. INSTALLING SHUTTLE AND GEARING (Models 253RX and 253BRX). Reassemble Figure 9 parts in reverse order of disassembly, noting the following special precautions.

a. Hold the drive pinion (44) in position between the two cast ears of the mechanism plate while installing the framer shaft assembly (43). Note direction in which pinion gear hub must face (Figure 9). Do not tighten setscrew (42).

b. Assemble shutter washer (28), shutter pulley (29), in-out cam (30) and pull-down cam (40) with screws (27). Hold cam shoes (35) in place while assembling shuttle and framing lever assembly (34) to pull-down cam (40). Install thrust washer (41) over end of framer shaft; then hold the assembled shutter pulley and shuttle in position while pressing the framer shaft (43) into place. Insert a 0.002-inch feeler gauge between the washer (41) and the bearing which is pressed into the cast arm of the mechanism plate. Press the shutter pulley and framer shaft knob toward one another until the feeler gauge is held in place; then tighten the pull-down cam setscrews (39) securely and remove feeler gauge.

c. Assemble the pivot (31), friction washer (32) and framing spring (33) to the shuttle and framing lever assembly (34). Slide the eccentric washer (36), hex head framing spacer (37) and knurled framing spacer (38) onto the pivot before inserting the threaded end of the pivot shaft through the cast arm of the mechanism plate assembly. Assemble the cam oiler (6) into its retainer (5) and secure the retainer to the pivot shaft with special nuts (4). The tip of the wick should be twisted slightly so that it touches the cam surface of the pull-down cam (40).

NOTE

A newly-designed, one-piece framing spacer (part no. 30745) is available and can be used as a replacement for items (37) and (38). Also, in the latest design projectors, a powdered-metal pull-down cam (part no. 29184) has been installed. This new cam can be used as a replacement for the earlier cam (part no. 29044), in which case the oiler (6) and its retainer (5) can be discarded.

d. Engage the crossed legs of the pivot spring (22) with the groove in a spring stud protruding from the fire shutter (26), and install pivot screw (21) so that loop of spring encircles the shoulder of the screw.

e. Assemble drive rollers (17) and spring-loading bracket assembly (13) — or bracket parts (8 through 12) — to the pulley mounting bracket (20), and secure the pulley bracket to the fire shutter assembly with the retaining ring (14). Place the "forward-still-reverse" knob (24) in the center (still) position. With the spring-loading bracket screws (7) loose, insert a 0.062 (± 0.015)-inch shim between the upper drive roller rim (18) and the outer rim of the shutter pulley (29). While maintaining a light pressure on the roller against the shim, tighten the two spring-loading bracket screws securely and withdraw the shim.

f. The gear assemblies (2) and (3) will be mounted to the sprocket shafts. If sprockets were not removed for service, install the two gear assemblies with the setscrews (1). These gear and shaft assemblies should have a minimum (0.001 to 0.005-inch) end play after gear assemblies are installed.

14. INSTALLING SHUTTLE AND GEARING (Model 253AR only). Reassemble Figure 8 parts in reverse order of disassembly, noting the following special precautions.

a. Hold the drive pinion (59) in position between the two cast ears of the mechanism plate while installing the shaft and knob assembly (58). Note direction in which pinion gear hub must face (Figure 8). Install but do not tighten setscrew (57).

b. Assemble shutter pulley washer (43), shutter pulley (44), in-out cam (45) and pull-down cam (55) with screws (42). Hold cam shoes (50) in position while assembling the shuttle and framer assembly (49) to pull-down cam (55). Install thrust washer (56) over end of framer shaft; then hold the assembled shutter pulley and shuttle in position while pressing the framer shaft into place. Insert a 0.002-inch feeler gauge between the thrust washer (56) and the face of the bearing pressed into the cast arm of the mechanism plate. Press the shutter pulley (44) and framer shaft and knob (58) toward one another until the feeler gauge is held in place; then tighten the pull-down cam setscrews (54) securely and remove feeler gauge.

c. Assemble the pivot (46), friction washer (47) and framing spring (48) to the shuttle and framer assembly (49). Slide the eccentric washer (51), hex head framing spacer (52) and knurled framing spacer (53) onto the pivot before inserting the threaded end of the pivot shaft through the cast arm of the mechanism plate. Assemble the cam oiler (21) into its retainer (20) and secure the retainer to the pivot shaft with the special nuts (19).

NOTE

A newly-designed, one-piece framing spacer (part no. 30745) is available and can be used as a replacement for items (52) and (53). Also, in the latest design projectors, a powdered-metal pull-down cam (part no. 29184) has been installed. This new cam can be used as a replacement for the earlier cam (part no. 29044), in which case the oiler (21) and its retainer (20) can be discarded.

d. Engage the crossed legs of the pivot spring (37) with the groove in the spring stud protruding from the fire shutter (41), and install the pivot screw (36) so that the loop of the spring encircles the shoulder of the screw.

e. Assemble the drive rollers (32) and spring-loading bracket assembly (28) — or bracket parts (23 through 27) — to the pulley mounting bracket (35), and secure the mounting bracket to the fire shutter assembly with the retaining ring (29). Place the "forward-still-reverse" knob (39) in the "still" position. With the spring-loading bracket screws (22) loose, insert a 0.062 (± 0.015)-inch shim between the upper drive roller rim (33) and the outer rim of the shutter pulley (44). While maintaining a light pressure on the roller against the shim tighten the two screws (22) securely and withdraw the shim stock.

f. Install the two hub and gear assemblies (18) to the film sprocket shafts with setscrews (17). On the lower (take-up) sprocket shaft, install the clutch ball retainer (16), three steel balls (15), clutch cam (14), two washers (13) and (12) and a spring washer (11) with its curved side facing out. Proper installation of the retainer (16) is very important. Note, in the inset of Figure 8, that the retainer must be installed with the deepest portion of the detents at the counterclockwise end. Duplicate this installation of parts on the upper (feed) sprocket shaft, and install the two pulley assemblies (9) and (10) with the friction washers (8) and retaining rings (7).

g. Loop the intermediate belt (3) around the lower pulley assembly (10) and engage the belt with the groove in the idler pulley (6). Install idler pulley with friction washer (5) and retaining ring (4). Then fasten belt retainer (2) in place with the push-on type nuts (1). The belt retainer must not rub against either the idler pulley or feed pulley. Correct, if necessary, by bending the retainer carefully.

15. INSTALLING SHUTTLE AND GEARING (Models 253A, 253AX and 253B). Reassemble Figure 7 parts in reverse order of disassembly, noting the following special precautions.

a. Hold the drive pinion (24) in position between the two cast ears of the mechanism plate while installing the shaft and knob assembly (25). Note direction in which pinion gear hub must face (Figure 7). Install but do not tighten setscrew (23).

b. Assemble shuttle cam (21) to the pin protruding from the hub of the shutter assembly (20). Install thrust washer (22) and assembled shutter and cam to the knob and shaft assembly (25), and secure the shutter with the two setscrews (19).

c. Place the friction washer (12) and framing spring (13), in that order, on the framing stud (11) and insert the stud through the shuttle and framer assembly (14). Carefully install the shuttle and framer assembly so that the follower pin of the shuttle arm rides in the groove of the cam (21) and the framing lever protrudes through the rectangular opening in the mechanism plate to the left of the toggle switch opening. Withdraw the framing stud (11) slightly so that the eccentric washer (15), hex head framing spacer (16), shuttle spring (17) and knurled framing spacer (18) can be installed on the stud. Insert threaded end of framing stud through cast arm of mechanism plate and install the special nut (10). Note that the short bent leg of the shuttle spring (17) must hook over the cast arm, while the long bent leg of the spring hooks below the shuttle arm. This will tend to hold the shuttle arm up against the cam (21).

NOTE

A newly-designed, one-piece framing spacer (part no. 30745) is available and can be used as a replacement for items (16) and (18).

d. Install the sprocket gears (8) and (9) to their respective sprocket shafts with the setscrews (7).

e. On Models 253A and 253B only, loop the intermediate belt (3) around the pulley of the lower sprocket gear and engage the belt with the groove in the idler pulley (6). Install the idler pulley (6), friction washer (5) and retaining ring (4). Then fasten the belt retainer (2) in place with the push-on type nuts (1). The belt retainer must not rub against either the idler pulley or feed pulley; bend retainer carefully, if necessary.

16. INSTALLING SPROCKETS AND LENS CARRIER PARTS (All Models). Reassemble Figure 6 parts in reverse order of disassembly, noting the following special precautions.

a. If the lens mount catch (11) was removed for replacement, the original rivet holes should be tapped with a No. 4-40NC-2 thread tap. Reinstall catch with two No. 4-40NC binder head screws (part no. 30243).

b. In early Model 253A and 253B projectors, two side tension arms (15 and 15A) were used. The loop of the side tension spring (17) encircles the aperture plate stud, and the spring legs enter the small holes in the bent ear of each arm. All other models use the one-piece side tension arm (16), but the method of spring installation is the same. Hold the aperture plate (18) in position against the casting so that the shuttle tooth is in the approximate center of its slot, and install the film guide (13) and four screws (12) and (14).

c. In those instances where the sprocket and shaft assemblies (6) were removed for repair or replacement, even though the shuttle and gearing required no maintenance, it was necessary to remove the sprocket shaft gears at the rear of the mechanism plate. When the idler rollers (7) and sprocket and shaft assemblies are reassembled to the mechanism plate, these gears and their associated parts must be reinstalled. For Models 253A, 253AX and 253B, refer to paragraph 15. For Model 253AR, refer to paragraph 14. For Models 253RX and 253BRX, refer to paragraph 13. Install these gears so as to maintain a minimum of end play (0.001 to 0.005-inch) in the sprocket shafts.

d. Install loop roller (5) and press the threading guard (4) onto the end of the loop roller shaft so that the guard overlaps the take-up sprocket.

e. Note that early Model 253A and 253B projectors are equipped with two identical film strippers (2). All other models are equipped with a newly designed guard (3) for the feed sprocket and a regular stripper (2) for the take-up sprocket. The mounting screw hole in the guard (3) is oversize. Be sure that the guard does not touch the sprocket after screw (1) is tightened.

17. INSTALLING MOTOR AND FAN (Models 253AX, 253RX, 253BRX and current Models 253A and 253B). Reassemble Figure 5 parts in reverse order of disassembly, noting the following special precautions.

a. When reassembling Model 253A, 253AX and 253B projectors, assemble the spring sleeve (6) to

the pulley (9) with retaining ring (8). Slide the spring (7) over the sleeve and the pulley hub, inserting bent end of spring into hole in face of pulley and securing the loop end of the spring loosely to the spring sleeve with screw (5). Slip this group of parts onto the motor shaft and tighten the screw (5) securely. After motor is installed, it may be necessary to loosen screw (5) and align pulley (9) with shutter pulley.

b. When reassembling Model 253RX and 253BRX projectors, install the spring (11) and drive pulley (9) onto the motor shaft. The straight leg of the spring must catch the spring pin (10) in the pulley as the motor shaft revolves.

c. Loop the drive belt (4) around the shutter pulley and the drive pulley. Slide the blower fan (3) onto the motor shaft and position the motor (14) on the base. Secure the motor with the screws (12), making certain that switch barrier (13) is in place.

d. With the face of the blower fan approximately 1/8-inch away from the blower housing, tighten the fan setscrew securely. Then install the blower housing cover (2) with screws (1).

18. INSTALLING MOTOR AND FAN (Model 253AR and early Models 253A and 253B). Reassemble Figure 4 parts in reverse order of disassembly, noting the following special precautions.

a. Note that the early Model 253A and 253B projectors are equipped with an integral blower cover and bracket assembly (27), whereas the Model 253AR projector has a separate bracket (26) and cover (25). In both instances, the brackets are secured to the base with rivets and should not require removal. For the Model 253AR projector, the cover (25) is secured to the mounting bracket (26) with hex nuts (23) and lock washers (24).

b. When reassembling Model 253A and 253B projectors, assemble the spring sleeve (10) to the pulley (13) with the retaining ring (12). Slide the spring (11) over the sleeve and the pulley hub, inserting bent end of spring into hole in face of pulley and securing the loop end of the spring loosely to the spring sleeve with screw (9). Install these parts per paragraph 17a.

c. When reassembling Model 253AR projectors, install the spring (15) and drive pulley (13) onto the motor shaft. The straight leg of the spring must catch the pin (14) as the motor shaft revolves.

d. Loop the drive belt (8) around the shutter pulley and the drive pulley. Slide the blower fan (7) onto the motor shaft and position the motor (22) on the base. With the proper support bracket (21) and the switch barrier (18) in place, secure the motor to the mounting bracket with the two screws (16) and nuts (17). Attach the support bracket (21) to the base with its attaching parts (19) and (20).

e. Allowing sufficient (1/8-inch) clearance between the face of the blower fan and the housing cover, tighten the fan setscrew securely.

19. INSTALLING REEL ARMS AND GEARS (Models 253RX and 253BRX). Reassemble Figure 3 parts (coded G and H) in reverse order of disassembly, noting the following special precautions.

a. Assemble the reel arm supports (45) and (46), bearings (44), cam washers (50), tension springs (49) and gear mounting plate (48) to the mechanism plate with the screw (47) tightened just enough to hold all parts together. Insert a steel ball (51) between each cam washer (50) and the corresponding detent hole in the mechanism plate, and hold all parts firmly together while tightening screw (47) securely. Install the two retaining rings (43) in the grooves of the bearings (44).

b. Install gears (19, 20 and 34) into take-up reel arm support (46) and lubricate gears as instructed in paragraph 12. Install gears (4) and (15) and a new spring washer (5) into feed reel arm support (45) and lubricate gears.

c. Assemble take-up spindle parts (21 through 25), using new spring washer (24), into take-up reel arm (18) and install screw (17). Install assembled reel arm to reel arm support (46), rotating the shaft of the take-up gear (34) until the teeth of the spur gear (22) mesh with those of its mating gear. Install and tighten the screws (16).

d. Assemble feed spindle parts (6 through 10), using new spring washer (9), into feed reel arm (3) and install screw (2). Install assembled reel arm to feed reel arm support (45), rotating the shaft of the feed gear (15) until the teeth of the spur gear (7) mesh with those of its mating gear. Install and tighten the screw (1).

e. Install parts (26 through 33) onto the shaft of the take-up gear (34), engaging the bent end of each spring (28 and 30) with the hole in the clutch washer (29). Using a feeler gauge, maintain 0.002 to 0.003 inch play between the driver (32) and spur gear (33). Tighten setscrews (31) securely into groove of take-up gear shaft. When pressing on the retaining ring (26) use feeler-gauge to maintain 0.002 to 0.003 inch clearance between ring and bushing (27).

f. Install spur gear (14), clutch spring (13) and bushing (12) onto the shaft of the feed gear (15), engaging bent end of spring with narrow notch in bushing. Use feeler gauge to maintain 0.005-inch end play between bushing (12) and spur gear (14). Tighten setscrew (11).

g. Install gears (39 and 40), bushing retainer (36) and retaining rings (35). The "tongue" of the bushing retainer (36) should engage the wide notch in the bushing (27).

20. INSTALLING REEL ARMS AND GEARS (Model 253AX). Reassemble Figure 3 parts (coded D) in reverse order of disassembly, noting the following special precautions.

a. Assemble the arm and stud assembly (53) to

the gear mounting plate (48) with retaining ring (52) and install the small gear assembly (40) to the stud with the push-on type retaining ring (38). Install the assembled reverse lever (56) and link arm (57) to the stud in the mechanism plate with the retaining ring (55). Hook the spring (54) between upper end of reverse lever (56) and the spring pin located just below and to the left of the upper sprocket gear. Install rewind button (59) to lower end of link arm (57) with the push-on nut (58). Install large gear assembly (39) to stud of mounting plate (48) with retaining ring (37).

b. Assemble the reel arm supports (45) and (46), bearings (44), cam washers (50), tension springs (49) and assembled gear mounting plate (48) to the mechanism plate, and install and tighten the screw (47) just enough to hold all parts together. Insert a steel ball (51) between each cam washer (50) and the corresponding detent hole in the mechanism plate, and hold all parts firmly together while tightening the screw (47) securely. Install the two retaining rings (43) in the grooves of the bearings (44). Manipulate the lever (56) until the round "nib" engages the fork at the lower end of the arm and stud assembly (53).

c. Install gears (19), (20) and (34) into take-up reel arm support (46). Install gears (4) and (15) and a new spring washer (5) into feed reel arm support (45). Lubricate gears as instructed in paragraph 12.

d. Assemble the take-up spindle parts (21 through 25), using a new spring washer (24), into the take-up reel arm (18) and install screw (17). Install assembled reel arm to reel arm support (46), rotating the shaft of the take-up gear (34) until the teeth of the spur gear (22) mesh with those of its mating gear. Install and tighten screws (16).

e. Assemble feed spindle parts (6 through 10), using a new spring washer (9), into the feed reel arm (3) and install the screw (2). Install assembled arm to feed reel arm support (45), rotating the shaft of the feed gear (15) until the teeth of the spur gear (7) mesh with those of its mating gear. Install and tighten the screw (1).

f. Install the small spur gear (14) on the shaft of the feed gear assembly (15). Insert a 0.003-inch feeler gauge between spur gear and bearing (44), press lightly against spur gear to hold the gauge in place, and tighten setscrew (11) securely. Install the large spur gear (33) on the shaft of the take-up gear assembly (34). Insert a 0.003-inch feeler gauge between spur gear and bearing (44), press lightly against spur gear to hold the gauge in place, and tighten setscrew (31) securely.

21. INSTALLING REEL ARMS (Models 253A, 253AR and 253B). Reassemble Figure 2 parts in reverse order of disassembly, noting the following special precautions.

a. Install the tension washer (10) onto the shoulder screw (9) so that the curved face of the washer is against the head of the screw.

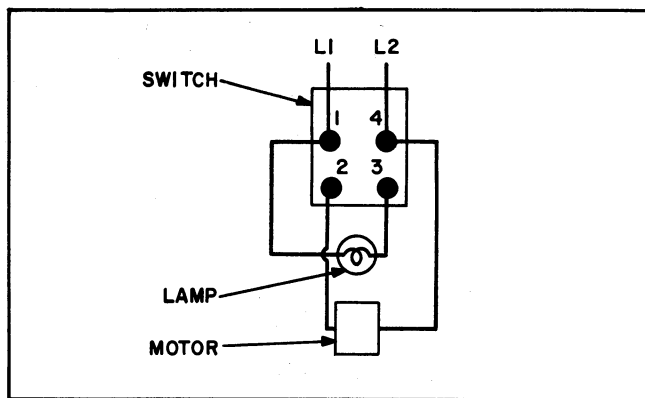


Figure C. Projector Wiring Diagram (All Models)

b. Insert threaded end of screw (9) through the take-up reel arm (13), spacer washer (11) and feed reel arm (12), in that order, and install the cap nut (7) and lockwasher (8).

c. Hold the feed reel arm (12) in position outside the two ears of the reel arm bracket (14) and install the two reel arm hinge studs (2). Secure the studs with retaining rings (1).

d. Place the spring (6) over the latch knob (5), insert the shaft of the knob through the center opening in the feed reel arm (12) and install the retaining ring (4). Press the groove pin (3) through the small hole in the end of the knob shaft.

22. INSTALLING FIGURE 1 PARTS (All Models).

Reassemble parts, as necessary, in reverse order of disassembly, noting the following special precautions.

a. All wiring connections to the toggle switch and motor are made as shown in the wiring diagram, Figure C.

b. Lamp socket (part no. 26162) must be installed with the key way to the rear. Model 253A projectors above serial number P-67797 and 253AX projectors above serial number O-91589 have been equipped with a "Truflect" projection lamp (part no. 30759) which eliminates the need for the condenser lens assembly (part no. 07905). When servicing such projectors, refer to Note A below the Figure 1 parts list for proper associated parts.

c. If the cover screw and knob assembly (11) was replaced, be sure to flare inner end of assembly to insure captivity.

d. Note that Model 253A, 253AR and 253B projectors are belt driven. When installing the feed belt for 253AR projectors, be sure that the belt has a single twist (so as to form a simulated figure "8"). The belt separator (26) will prevent the belt from rubbing during operation.

23. ADJUSTING TAKE-UP AND REWIND TORQUE (Models 253AX, 253RX and 253BRX).

The take-up torque of the rear (take-up) spindle should measure

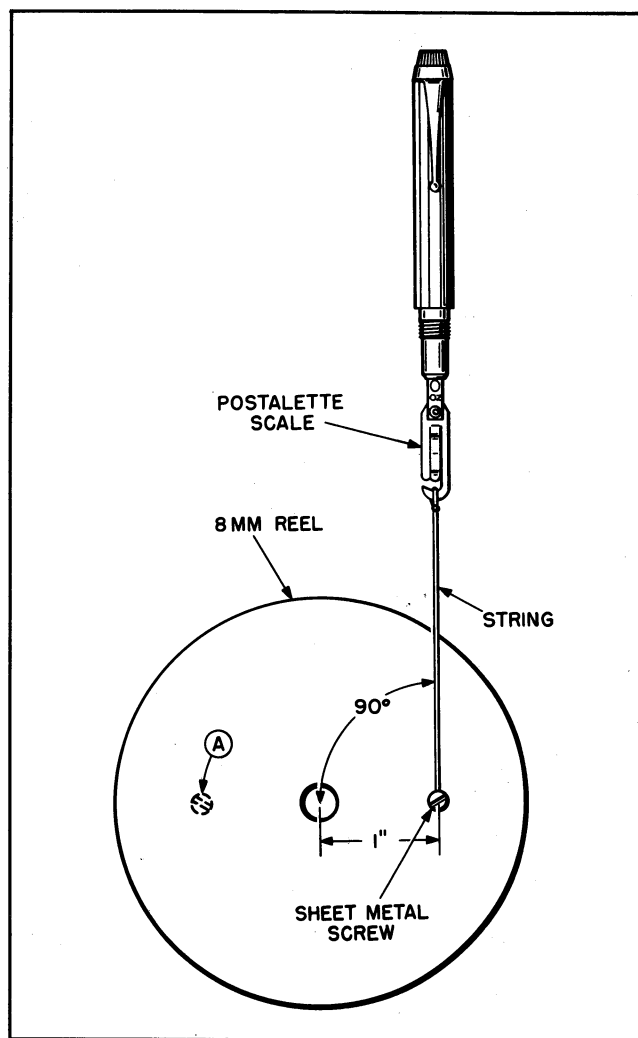


Figure D. Checking Reel Arm Torque

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 D. The method of checking take-up torque is illustrated in Figure D; 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 17, Figure 3). The Postalette scale illustrated in Figure D can be purchased from the Exact Weight Scale Co., Columbus, Ohio.

24. ADJUSTING SHUTTLE TOOTH PROTRUSION (All models).

Excessive or inadequate protrusion of the shuttle tooth will result in improper film transport during operation. Proper shuttle tooth protrusion must be checked at the center of the down-stroke and should be 0.025 (± 0.003) inch for the 253A, 253AX and 253B projectors and 0.034 (± 0.006) inch for all other projectors.

a. Place the framing lever in the approximate center of its travel range and swing open the lens

carrier. Rotate the framer shaft knob at the front of the projector until the shuttle tooth reaches the approximate center of the down stroke. This is its point of maximum protrusion.

b. Shuttle tooth protrusion is adjusted by means of the hex head framing spacer (item 16, Figure 7), which is screwed into or out of the knurled framing spacer (item 18, Figure 7) as necessary. As the hex head framing spacer is unscrewed from the knurled framing spacer, the shuttle tooth will protrude more and more above the surface of the aperture plate. As the hex head framing spacer is screwed inward, the shuttle tooth withdraws.

c. When the shuttle tooth protrusion has been properly adjusted, check the position of the shuttle tooth in relation to the sides of the slot in the aperture plate. By means of the eccentric washer (item 15, Figure 7) the shuttle tooth can be shifted toward one side or the other of the slot. The tooth must be adjusted so that it enters center of film perforations.

NOTE

Although Figure 7 illustrates the shuttle and gearing for Model 253A, 253AX and 253B projectors, the method for adjusting shuttle tooth protrusion is identical in all models.

Final Test

25. GENERAL INSTRUCTIONS.

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

26. FIRE SHUTTER OPERATION TEST (Models 253AR, 253RX and 253BRX). 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, operate the projector without film.

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

b. If the fire shutter clears the aperture opening before the shutter pulley begins to revolve, the clearance between the drive rollers and edge of shutter pulley must be readjusted, as follows.

c. With the lever in the "still" position, loosen the two spring-loading bracket retaining screws (item 22, Figure 8) or (item 7, Figure 9). Insert a piece of shim stock 0.062 (± 0.015)-inch thick between the upper

drive roller (item 32, Figure 8) or (item 17, Figure 9) and the rim of the shutter pulley (item 44, Figure 8) or (item 29, Figure 9). Maintain a light pressure on the drive roller against the shim stock and tighten the two screws securely. Retest the fire shutter operation and, if necessary, repeat the adjustment, using thicker or thinner shim stock until the fire shutter operates properly.

27. OPERATION TEST. Thread the projector with film and operate projector to check the film advancing mechanism.

a. Failure of the projector to maintain a proper loop above and below the aperture plate can be caused by improper shuttle tooth protrusion (paragraph 24) or inadequate tension of the side tension spring (item 17, Figure 6). Spring tension can be corrected by careful bending.

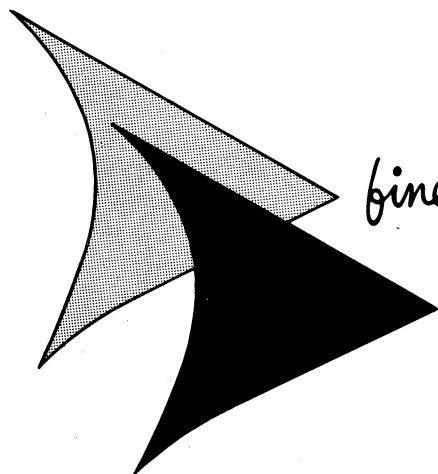
b. In the 253AR projector, film spilling usually is caused by a sticking clutch. Some of the earliest models of this projector were not equipped with a clutch ball retainer (item 16, Figure 8). To remedy this situation, remove the feed and take-up pulley and bearing assemblies (9 and 10, Figure 8) and the clutch cams (14, Figure 8). Demagnetize the cams and polish the inside surface of the pulley and bearing assemblies. This surface must be smooth and all surfaces in the feed and take-up arm clutch must be dry. Reassemble, using a clutch ball retainer (16). Make certain that the retainer is installed as shown in the inset of Figure 8.

Trouble Shooting Chart

TROUBLE	PROBABLE CAUSE	REMEDY
Projector inoperative with switch in the motor or lamp position	1. No electrical power 2. Defective switch or wiring 3. Broken drive belt 4. Broken pulley drive spring	1. Check power source 2. Check circuit 3. Replace belt 4. Replace spring
Picture flicker	1. Drive roller assemblies not adjusted properly (253AR, 253RX, 253BRX only) 2. Dirt, wear or binding 3. Defective drive belt pulley	1. Readjust as instructed in para. 26 2. Clean and repair or adjust gearing 3. Replace drive belt pulley
Film scratches	1. Excessively dirty film channel parts (sprockets, guides, etc.) 2. Worn pressure and aperture plates 3. Worn or damaged film guide	1. Clean projector thoroughly 2. Replace if worn or marred 3. Replace film guide
Jumpy picture (Unsteadiness)	1. Improper threading 2. Loss of film loop due to damaged film 3. Green film 4. Shuttle teeth worn 5. Misaligned shuttle tooth 6. Grooves worn in film guide rail	1. Check threading 2. Inspect and splice as required 3. Run film through projector 2 or 3 times to age 4. Replace shuttle 5. Adjust and align shuttle as instructed in para. 24 6. Replace guide rail
Soft focus	1. Dirty projection lens 2. Loose lens carrier retaining spring	1. Clean projector lens 2. Reset tension by bending spring carefully
Film spills	1. Insufficient tension on spring in feed reel arm 2. Sticking clutch	1. Correct by bending the washer to supply more tension 2. Readjust as instructed in para. 27
Fails to take-up or rewind	1. Defective drive belt 2. Worn rim on drive roller 3. Drive rollers not adjusted properly 4. Broken clutch springs	1. Replace belt 2. Replace rim 3. Readjust as instructed in para. 26 4. Replace springs

PARTS CATALOG

DESIGN 253 PROJECTORS



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Replacement Parts

The following pages illustrate and list, by part number and part name, all serviceable parts of the Design 253 projectors. Since the exploded view illustrations are indexed in the order of parts disassembly, they also may be used as a visual aid in the removal of parts for service and repair.

Before ordering replacement parts, it is very important that the "Usable on Code" column be checked carefully to make certain that the correct part is being ordered for the particular projector being serviced. For example, the parts list for Figure 1 lists two strain reliefs bearing the index number 20. Part number 26308 is used on code letter A, C and E projectors, while part number 30136 is used on code letter B, D, F, G and H projectors.

Following is a list of the code letters used in this Parts Catalog together with the corresponding projector model number for each. You will note that the Model 253RY projector has not been specifically identified in the parts catalog. Except for its special Filmovára

"Zoom" lens (part no. 020118), the 253RY projector is identical in all respects to the 253RX projector (coded "H"). Therefore, all parts which are coded with the letter H are applicable to the 253RY projector.

CODE LETTER	PROJECTOR MODEL
A	Design 253A (early models)
B	Design 253A (current models)
C	Design 253AR
D	Design 253AX
E	Design 253B (early models)
F	Design 253B (current models)
G	Design 253BRX
H	Design 253RX

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
COVERS, LAMP & TILT MECHANISM (ALL MODELS)				
1-1	08721	COVER ASSEMBLY, Front	1	All
-1A	19025	. RIVET, Cover catch	1	All
-1B	26321	. CATCH, Front cover.	1	All
-1C	26320	. BUTTON, Front cover catch.	1	All
-2	82531	RIVET, Nameplate	2	All
-3	29163	NAMEPLATE	1	All
-4	29065	SCREW, Hex hd (mechanism plate to back cover) . . .	4	All
-5	30029	SCREW, Hex hd (base to back cover).	2	All
-6	14175	LOCKWASHER, Internal teeth	2	All
-7	26315	COVER, Back	1	AE
-7	29234	COVER, Back	1	C
-7	29743	COVER, Back	1	BF
-7	29749	COVER, Back	1	DGH
-8	26057	BELT, Take-up	1	ABCEF
-9	26058	BELT, Feed	1	ABCEF

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
COVERS, LAMP & TILT MECHANISM (ALL MODELS) (CONT)				
1-10	09098	COVER ASSEMBLY, Lamphouse (see NOTE A)	1	All
-11	08479	SCREW AND KNOB ASSEMBLY, Cover (see NOTE A).	1	All
-12	26083	LAMP, Projection (see NOTES A and B)	1	All
-13	07905	LENS ASSEMBLY, Condenser (see NOTE A).	1	All
-13A	26073	. RING, Condenser	1	All
-13B	26150	. LENS, Condenser	1	All
-13C	26072	. HOLDER, Condenser lens	1	All
-14	24698	REFLECTOR	1	All
-15	27637	SCREW, Lamp socket (see NOTES A and B)	2	All
-16	26162	SOCKET, Projection lamp (see NOTES A and B)	1	All
-17	27342	SHIELD, Rewind.	1	All
-18	20808	RING, Retaining.	2	All
-19	26302	ROLLER, Film guide	2	All
-20	26308	RELIEF, Strain	1	ACE
-20	30136	RELIEF, Strain	1	BDFGH
-21	26307	CABLE, Power	1	All
-22	No Number	NUT, Switch (supplied with switch, item 37).	1	All
-23	26904	NAMEPLATE, Switch.	1	AB
-23	27337	NAMEPLATE, Switch.	1	C
-23	30222	NAMEPLATE, Switch.	1	D
-23	26905	NAMEPLATE, Switch.	1	EF
-23	30422	NAMEPLATE, Switch.	1	G
-23	29733	NAMEPLATE, Switch.	1	H
-24	26130	RIVET, Carrying handle	2	AE
-24	27242	RIVET, Carrying handle	2	BCF
-24	30093	RIVET, Carrying handle	2	DGH
-25	17632	WASHER, Flat	2	All
-26	30196	SEPARATOR, Feed belt.	1	C
-27	26303	HANDLE, Carrying	1	All
-28	20808	RING, Retaining.	1	ACE
-29	08387	KNOB ASSEMBLY, Tilt.	1	ACE
-29	010169	KNOB ASSEMBLY, Tilt.	1	BDFGH
-30	26047	RING, Retaining.	1	AE
-30	22113	RING, Retaining.	1	BCDFGH
-31	29278	WASHER, Flat	1	All
-32	28145	SPRING, Tiltshaft.	1	All
-33	26044	COLLAR, Tiltshaft locking	1	ACE
-34	010188	SHAFT & FOOT ASSEMBLY, Tilt (see NOTE C).	1	ACE
-34	010187	SHAFT & FOOT ASSEMBLY, Tilt	1	BDFGH
-35	26170	RIVET, Tubular.	2	All
-36	26135	FOOT, Rubber	2	All
-37	26081	SWITCH, Toggle	1	All

*NOTE A: Models 253A (above serial #P-67797) and 253AX (above serial #O-91589) have been equipped with "Truflect" projection lamp, part #30759, which eliminates the #07905 condenser lens assembly. Projectors so equipped also require the #30763 lamphouse cover, #010166 screw and knob, #30707 lamp socket, and two #21579 lamp socket rivets.

*NOTE B: Model 253RX projectors (above serial #S-40535) have been equipped with a "Tru-focus" projection lamp, part #30708, and therefore will require a #30707 lamp socket and three #21579 socket rivets.

*NOTE C: An early model tiltshaft (#26045) was equipped with a removable rubber foot (#26134) and washers (#24153). Use new tiltshaft and foot assembly (#010188) for replacement purposes.

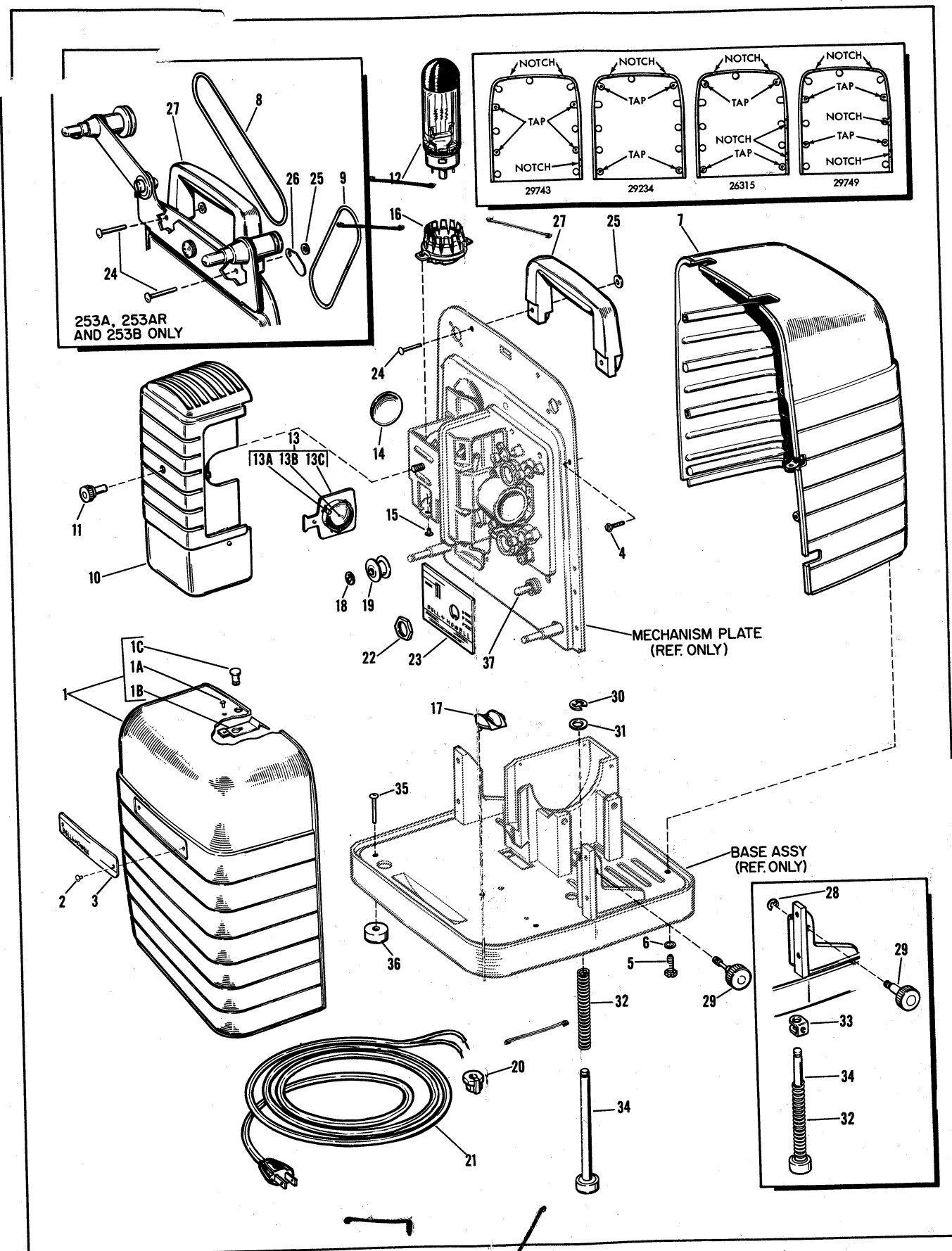


Figure 1. Covers, Projection Lamp and Tilt Mechanism (All Models)

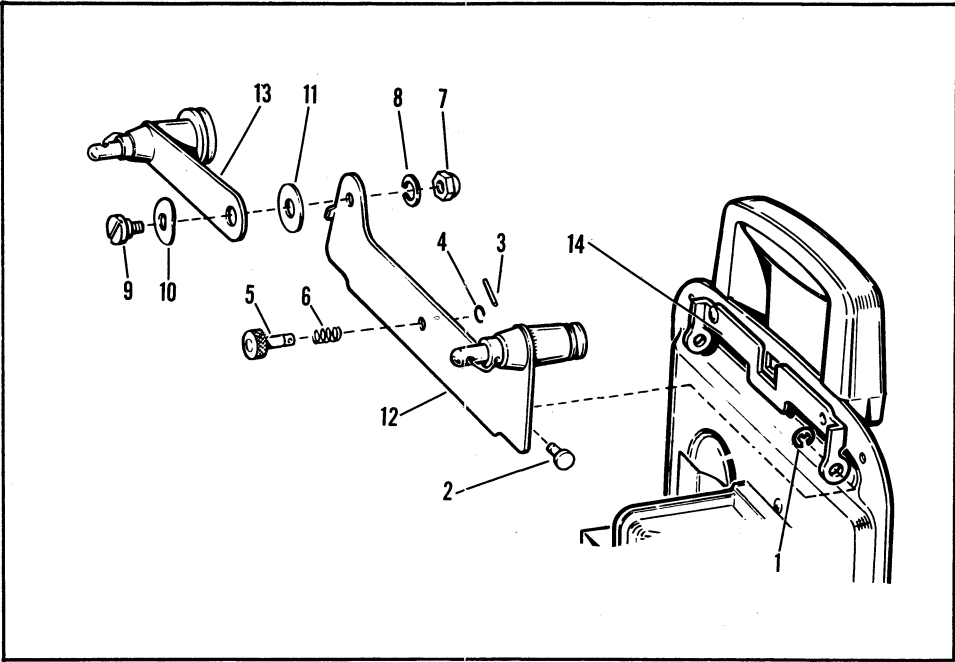


Figure 2. Reel Arms (Models 253A, 253AR and 253B)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE		
					1	2
REEL ARMS (MODELS 253A, 253AR, 253B)						
2-1	26132	RING, Retaining.	2	ABCEF		
-2	26116	STUD, Reel arm hinge	2	ABCEF		
-3	26122	PIN, Groove	1	ABCEF		
-4	24711	RING, Retaining.	1	ABCEF		
-5	26121	KNOB, Latch	1	ABCEF		
-6	26123	SPRING, Latch knob	1	ABCEF		
-7	11643	NUT, Cap	1	ABCEF		
-8	26734	LOCKWASHER	1	ABCEF		
-9	26059	SCREW, Take-up arm shoulder	1	ABCEF		
-10	26138	WASHER, Tension.	1	ABCEF		
-11	10508	WASHER, Spacer	1	ABCEF		
-12	09648	ARM ASSEMBLY, Feed reel	1	ABCEF		
-13	08720	ARM ASSEMBLY, Take-up reel	1	ABCEF		
-14	26306	BRACKET, Reel arm.	1	ABCEF		

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE		
					1	2
REEL ARMS & GEARS (MODELS 253AX, 253BRX, 253RX)						
3-1	23822	SCREW, Binding head, No. 5-40	1	DGH		
-2	29727	SCREW, Fillister head, No. 3-56	1	DGH		
-3	010193	ARM AND BEARING ASSEMBLY, Feed reel	1	DGH		
-4	29706	GEAR, Spur	1	DGH		
-5	30252	WASHER, Spring	1	DGH		
-6	29726	SPACER, Tension adjusting	1	DGH		
-7	29723	GEAR, Spur	1	DGH		
-8	29725	DISC, Friction	2	DGH		
-9	29724	WASHER, Spring	1	DGH		
-10	010062	SPINDLE ASSEMBLY, Feed	1	DGH		
-11	29192	SETSCREW, Headless, No. 4-40	1	DC		
-12	30198	BUSHING	1	GH		
-13	29719 34927	SPRING, Clutch	1	GH		
-14	29692	GEAR, Spur (0.223 in. ID)	1	GH		
-14	30202	GEAR, Spur (0.126 in. ID)	1	D		
-15	010185	GEAR AND SHAFT ASSEMBLY, Feed (1-7/8 in. lg)	1	GH		
-15	010189	GEAR AND SHAFT ASSEMBLY, Feed (1-3/16 in. lg)	1	D		
-16	23822	SCREW, Binding head, No. 5-40	2	DGH		
-17	29727	SCREW, Fillister head, No. 3-56	1	DGH		
-18	010194	ARM AND BEARING ASSEMBLY, Take-up reel	1	DGH		
-19	29706	GEAR, Spur	1	DGH		
-20	29707	GEAR, Spur	2	DGH		
-21	29726	SPACER, Tension adjusting	1	DGH		
-22	29723	GEAR, Spur	1	DGH		
-23	29725	DISC, Friction	2	DGH		
-24	29724	WASHER, Spring	1	DGH		
-25	010062	SPINDLE ASSEMBLY, Take-up	1	DGH		
-26	30746	RING, Retaining	1	GH		
-27	29699	BUSHING	1	GH		
-28	29719 34927	SPRING, Clutch (outer)	1	GH		
-29	29718 34683	WASHER, Clutch	1	GH		
-30	29717	SPRING, Clutch (inner)	1	GH		
-31	29192	SETSCREW, Headless, No. 4-40	2	DGH		
-32	29698	DRIVER	1	GH		
-33	29693	GEAR, Spur (0.223 in. ID)	1	GH		
-33	30203	GEAR, Spur (0.126 in. ID)	1	D		
-34	010186	GEAR AND SHAFT ASSEMBLY, Take-up (1-7/8 in. lg)	1	GH		
-34	010190	GEAR AND SHAFT ASSEMBLY, Take-up (1-3/16 in. lg)	1	D		
-35	25715	RING, Retaining	1	GH		
-36	29702	RETAINER, Bushing	1	GH		
-37	20808	RING, Retaining (large gear)	1	D		
-38	30201	RING, Retaining push-on type (small gear)	1	D		
-39	010179	GEAR AND BEARING ASSEMBLY (large)	1	DGH		
-40	010180	GEAR AND BEARING ASSEMBLY (small)	1	DGH		
-41	21736	RING, Retaining	1	GH		
-42	29706	GEAR, Spur	1	GH		
-43	29744	RING, Retaining	2	DGH		
-44	29738	BEARING (1 in. lg)	2	GH		
-44	30205	BEARING (11/16 in. lg)	2	D		
-45	09569	SUPPORT ASSEMBLY, Feed reel arm	1	DGH		
-46	09568	SUPPORT ASSEMBLY, Take-up reel arm	1	DGH		
-47	80147	SCREW, Binding head, No. 5-40	1	DGH		

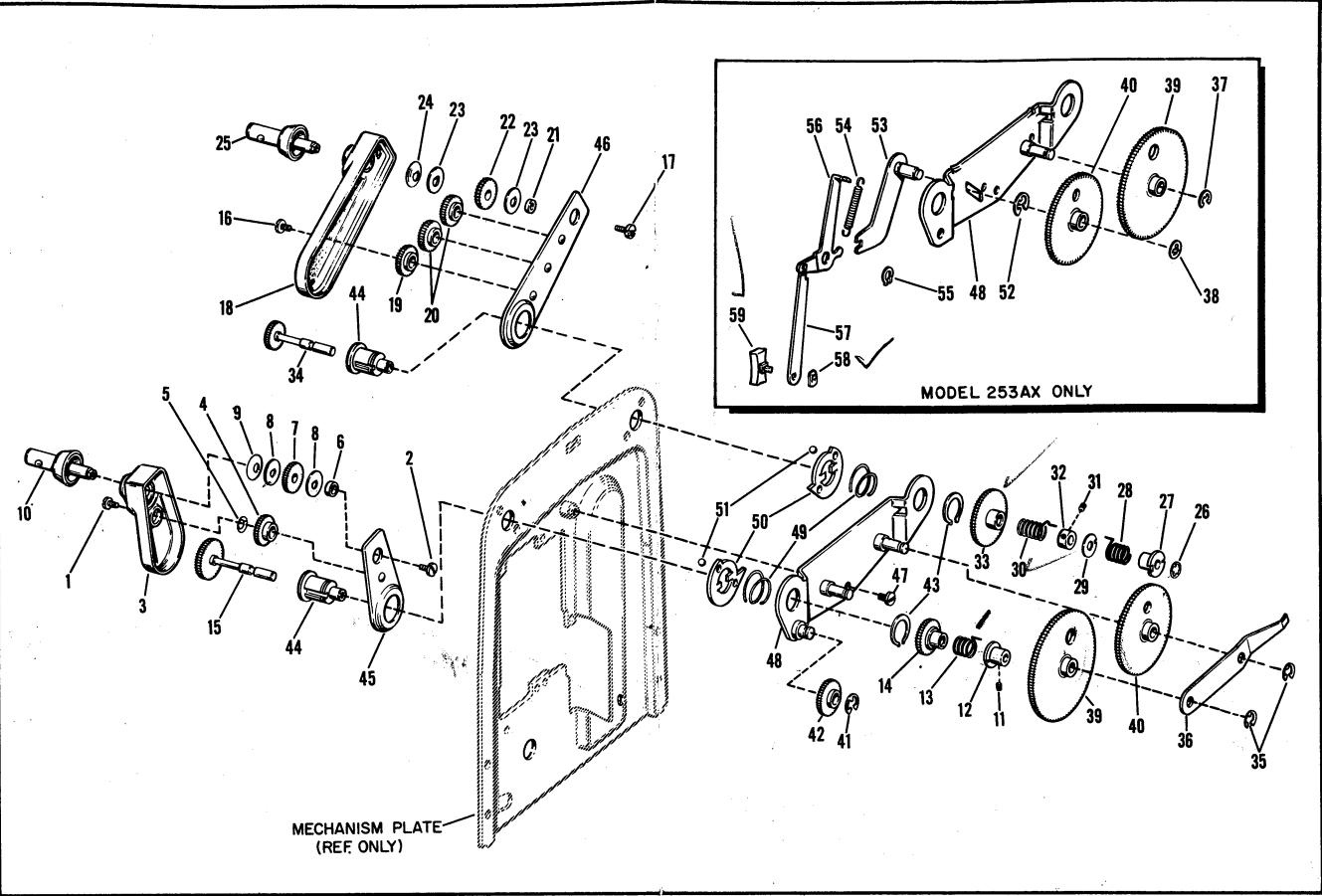


Figure 3. Reel Arms and Gears (Models 253AX, 253BRX and 253RX)

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY	USABLE ON CODE
		1	2	3	4	5	6	7		
REEL ARMS & GEARS (MODELS 253AX, 253BRX, 253RX) (CONT)										
3-48	09671	PLATE ASSEMBLY, Gear mounting							1	GH
-48	09953	PLATE ASSEMBLY, Gear mounting							1	D
-49	30238	SPRING, Reel arm tension							2	DGH
-50	29736	WASHER, Cam							2	DGH
-51	145	BALL, Steel							2	DGH
-52	21736	RING, Retaining							1	D
-53	09951	ARM AND STUD ASSEMBLY							1	D
-54	30215	SPRING, Tension							1	D
-55	30211	RING, Retaining							1	D
-56	30209	LEVER, Reverse							1	D
-57	30213	ARM, Link							1	D
-58	26133	NUT, Push-on							1	D
-59	30235	BUTTON, Rewind							1	D

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
1	2	3 4 5 6 7		
MOTOR, FAN & BASE				
MODELS 253A (early), 253AR, 253B (early)				
4-1	27639	SCREW, Fil hd, No. 6-32	1	C
-2	28981	WASHER	1	C
-3	26159	SCREW, Self tapping	1	C
-4	27809	BRACKET, Support	1	C
-5	26329	SCREW, Hex hd self tapping, No. 4-40	3	ACE
-6	07906	HOUSING ASSEMBLY, Blower	1	AE
-6	09670	HOUSING ASSEMBLY, Blower	1	C
-7	26063	FAN, Blower (use w/ 26433 motor)	1	A
-7	26921	FAN, Blower	1	ACE
-8	26019	BELT, Drive	1	AE
-8	31858	BELT, Drive	1	C
-9	26630	SCREW, Fil hd, No. 6-32	1	AE
-10	26316	SLEEVE, Pulley spring (use with 26433 motor)	1	A
-10	26924	SLEEVE, Pulley spring	1	AE
-11	26319	SPRING	1	AE
-12	26317	RING, Retaining	1	AE
-13	26318	PULLEY, Drive (1-3/16 in. OD)	1	A
-13	29452	PULLEY, Drive (1-3/8 in. OD with V groove)	1	C
-13	26327	PULLEY, Drive (1-3/8 in. OD with round groove)	1	E
-14	98763	PIN, Spring	1	C
-15	29689	SPRING, Pulley	1	C
-16	26923	SCREW, Round hd, No. 6-32	2	ACE
-17	26906	NUT, Special	2	ACE
-18	26163	BARRIER, Switch	1	ACE
-19	27639	SCREW, Fil hd, No. 5-32 (2 req'd for Code C)	1	ACE
-20	26906	NUT, Special (2 req'd for Code C)	1	ACE
-21	26922	BRACKET, Motor support	1	AE
-21	27808	BRACKET, Motor support	1	C
-22	26433	MOTOR, 60 cycle (0.1815 in. dia shaft)	1	A
-22	26926	MOTOR, 60 cycle (0.2176 in. dia. shaft)	1	A
-22	30676	MOTOR, 60 cycle (0.2176 in. dia. shaft)	1	C
-22	26925	MOTOR, 50 cycle (0.2176 in. dia. shaft)	1	E
-23	19037	NUT, Hex, No. 8-32	2	C
-24	17631	WASHER	2	C
-25	27474	COVER, Blower housing	1	C
-26	08690	BRACKET ASSEMBLY, Motor mount	1	C
-27	08416	COVER & BRACKET ASSY, Blower (w/o bracket spacers)	1	AE
-27	08811	COVER & BRACKET ASSY, Blower (w/bracket spacers)	1	AE
-28	26313	BASE, Projector (interchangeable with 29596 base)	1	AE
-28	29596	BASE, Projector	1	ACE

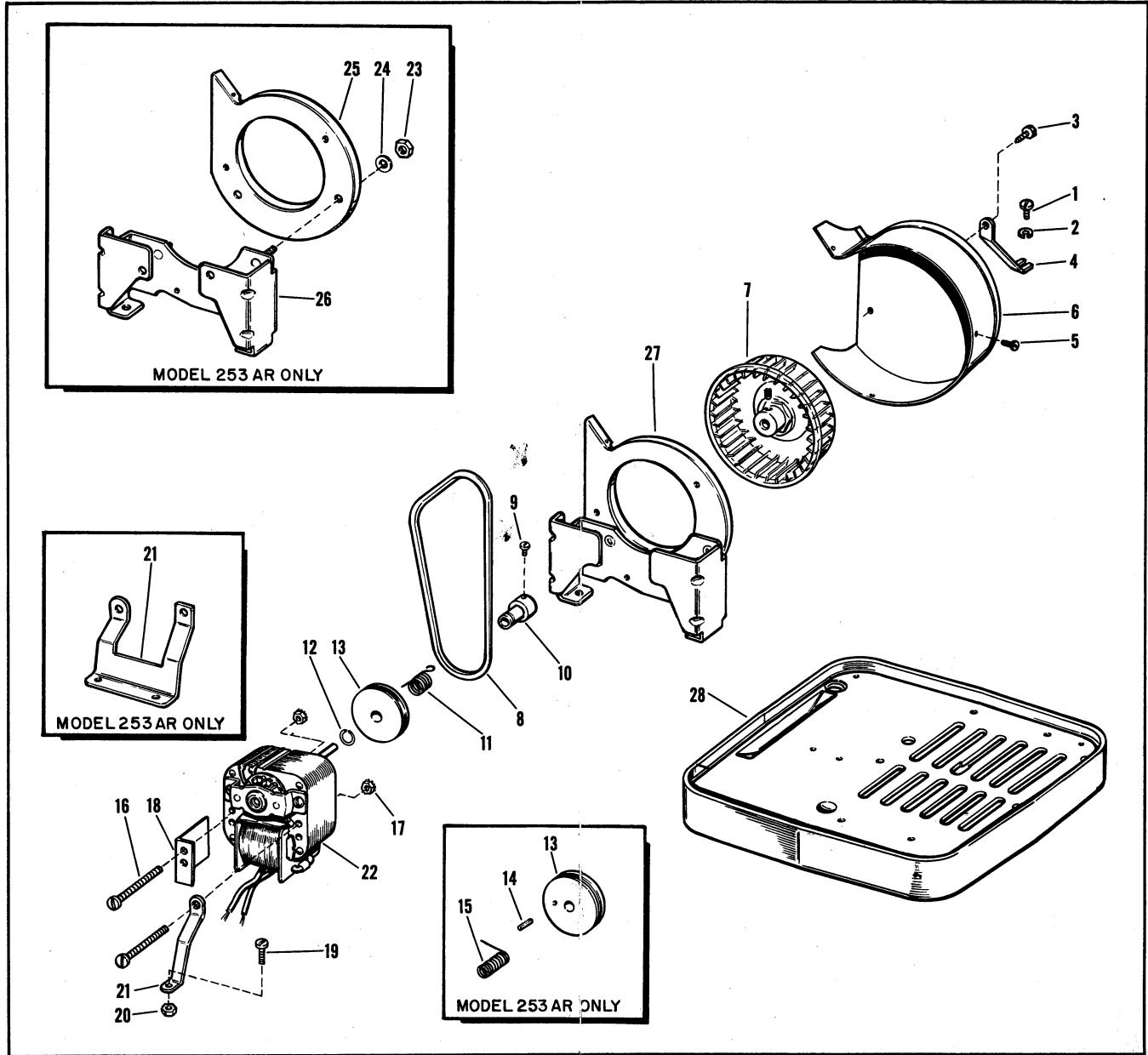


Figure 4. Motor, Fan and Base (Models 253AR and Early Models 253A and 253B)

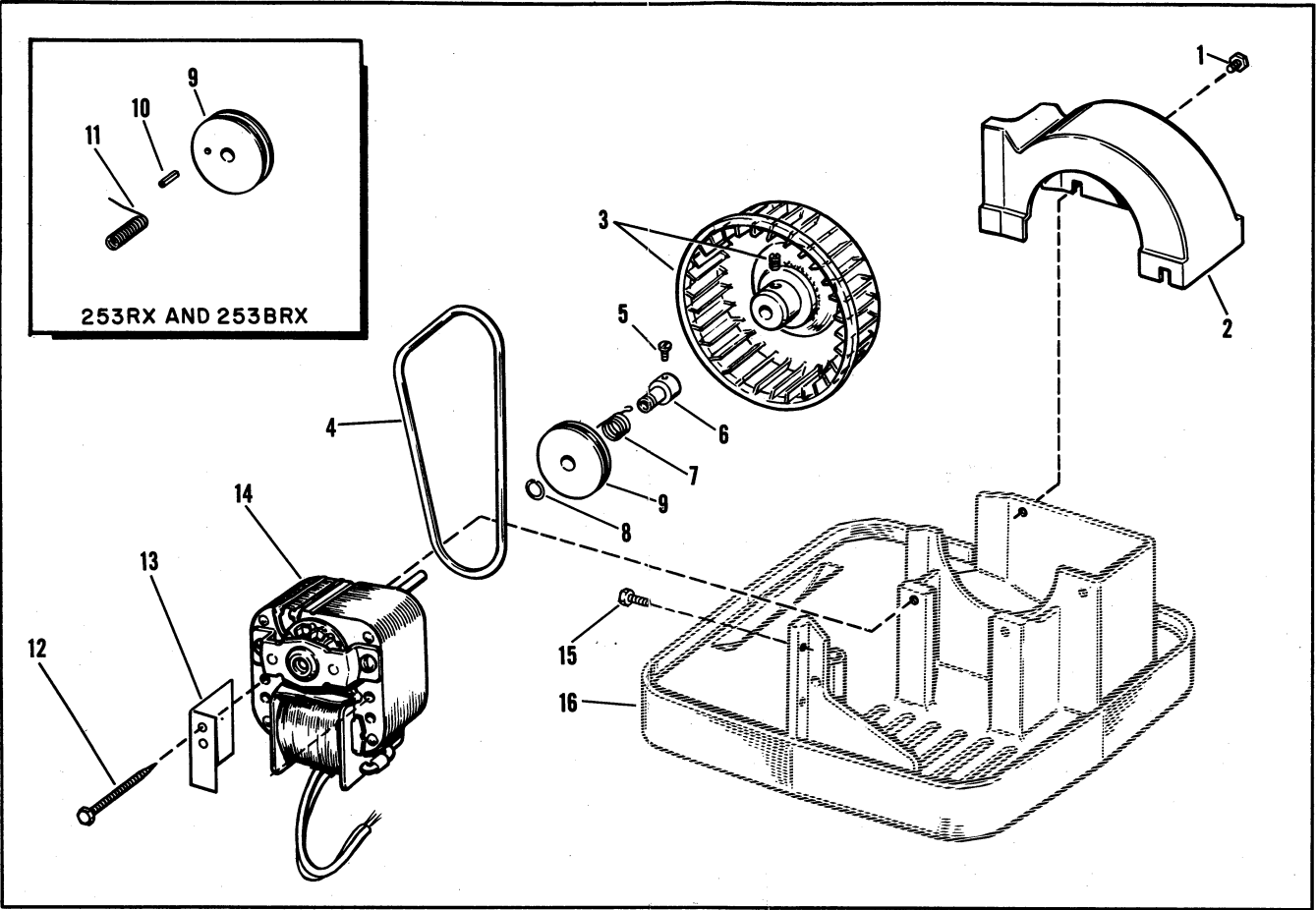


Figure 5. Motor, Fan and Base (Current Models 253A and 253B, and Models 253AX, 253BRX and 253RX)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
MOTOR, FAN & BASE				
MODELS 253A (CURRENT), 253AX, 253B (CURRENT), 253BRX, 253RX				
5-1	30237	SCREW, Hex hd tapping, No. 4-40	2	BDFGH
-2	29557	COVER, Blower housing	1	BDFGH
-3	26921	FAN, Blower (with screw)	1	BDFGH
-4	29451-32858	BELT, Drive (forward and reverse models)	1	GH
-4	26019	BELT, Drive (forward only models)	1	BDF
-5	26630	SCREW, Fil hd, No. 6-32.	1	BDF
-6	26924	SLEEVE, Pulley spring.	1	BDF
-7	26319	SPRING	1	BDF
-8	26317	RING, Retaining.	1	BF
-9	26318	PULLEY, Drive (1-3/16 in. OD, single groove)	1	BD
-9	30393	PULLEY, Drive (double groove, with hub)	1	F
-9	30402	PULLEY, Drive (double groove, no hub)	1	G
-9	29452	PULLEY, Drive (1-3/8 in. OD, single groove)	1	H
-10	98763	PIN, Spring	1	GH
-11	29689	SPRING, Drive pulley.	1	GH
-12	30030	SCREW, Hex hd special.	2	BDFGH
-13	26163	BARRIER, Switch	1	BDFGH
-14	30676	MOTOR, 60 cycle (0.2176 in. dia. shaft).	1	BDH
-14	26925	MOTOR, 50 cycle (0.2176 in. dia. shaft).	1	FG
-15	29065	SCREW, Hex hd No. 4-40.	4	BDFGH
-16	29595	BASE, Projector	1	BDFGH

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
SPROCKETS & LENS CARRIER (All Models)				
6-1	27640	SCREW, Fil hd No. 4-40	2	All
-2	26017	STRIPPER, Film	2	AE
-2	26017	STRIPPER, Film (lower sprocket only)	1	BCDFGH
-3	28868	GUARD, Upper sprocket	1	BCDFGH
-4	26141	GUARD, Threading	1	All
-5	26104	ROLLER, Loop	1	All
-6	08285	SPROCKET & SHAFT ASSEMBLY, Feed	1	AE
-6A	08286	SPROCKET & SHAFT ASSEMBLY, Take-up	1	AE
-6	09509	SPROCKET & SHAFT ASSEMBLY, Feed and take-up	2	BF
-6	09990	SPROCKET & SHAFT ASSEMBLY, Feed and take-up	2	C
-6	010172	SPROCKET & SHAFT ASSEMBLY, Feed and take-up	2	DGH
-7	26016	ROLLER, Idler	4	All
-8	26030	PIN, Hinge	2	All
-9	08719	CARRIER ASSEMBLY, Lens	1	AE
-9	010094	CARRIER ASSEMBLY, Lens	1	BCDFGH
-10	26642	RIVET, Lens mount catch	2	All
-11	26031	CATCH, Lens mount	1	AE
-11	29341	CATCH, Lens mount	1	BCDFGH
-12	7495	SCREW, Film guide	2	AE
-12	27641	SCREW, Film guide	2	BCDFGH
-13	26027	GUIDE, Film	1	All
-14	26034	SCREW, Tension arm	2	AE
-14	27641	SCREW, Tension arm	2	BCDFGH
-15	26022	ARM, Side tension (upper)	1	AE
-15A	26023	ARM, Side tension (lower)	1	AE
-16	28065	ARM, Side tension (one-piece)	1	BCDFGH
-17	26049	SPRING, Side tension	1	AE
-17	28067	SPRING, Side tension	1	BCDFGH
-18	08291	PLATE ASSEMBLY, Aperture	1	AE
-18	010056	PLATE ASSEMBLY, Aperture	1	BCDFGH

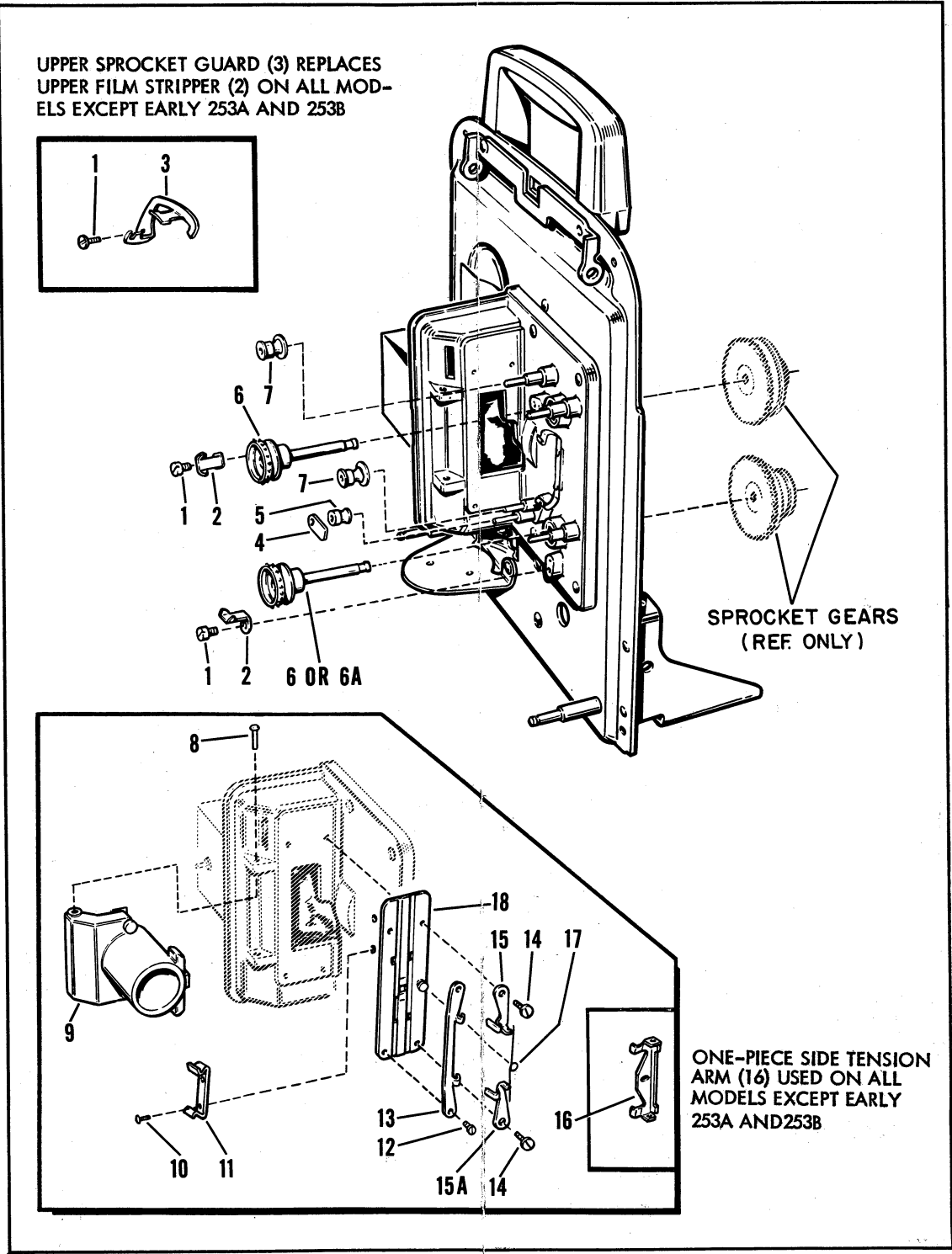
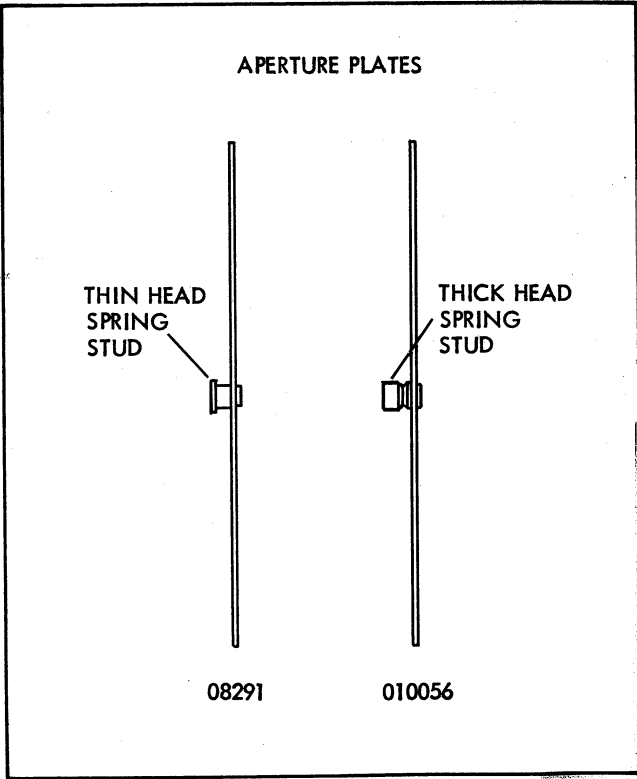
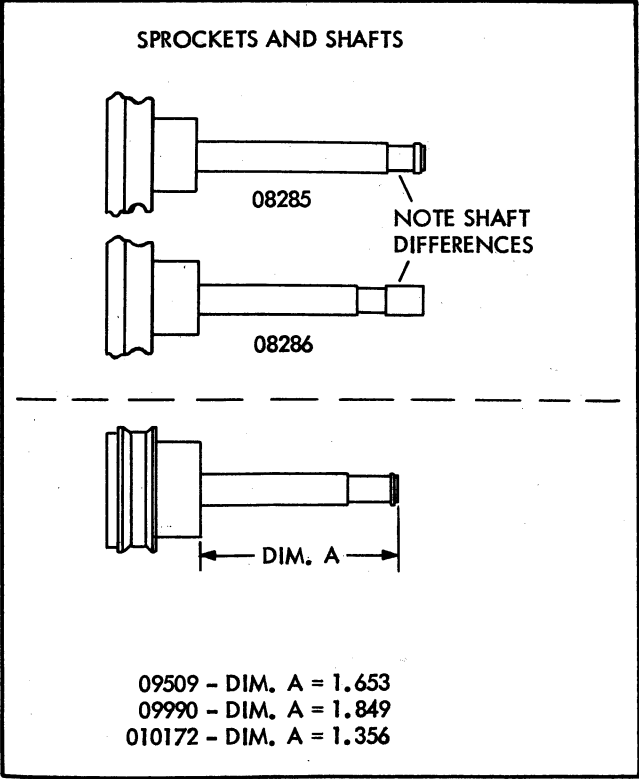


Figure 6. Film Sprockets and Lens Carrier Parts (All Models)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
		SHUTTLE & GEARING (MODELS 253A, 253AX, 253B)		
7-1	26133	NUT, Push on (253A, 253B only)	2	ABEF
-2	26051	RETAINER, Belt (253A, 253B only)	1	ABEF
-3	26056	BELT, Intermediate (253A, 253B only).	1	ABEF
-4	20808	RING, Retaining (253A, 253B only).	1	ABEF
-5	26119	WASHER, Friction (253A, 253B only)	1	ABEF
-6	08601	PULLEY ASSEMBLY, Idler (253A, 253B only)	1	ABEF
-7	12498	SETSCREW, Bristol	2	ABDEF
-8	08801	SPROCKET & GEAR ASSEMBLY, Upper	1	ABEF
-8	09572	HUB & GEAR ASSEMBLY, Upper	1	D
-9	08802	SPROCKET & GEAR ASSEMBLY, Lower	1	ABEF
-9	09571	HUB & GEAR ASSEMBLY, Lower	1	D
-10	26906	NUT, Special	1	ABDEF
-11	26177	STUD, Framing	1	AE
-11	27839	STUD, Framing	1	BDF
-12	26119	WASHER, Friction	1	ABDEF
-13	25851	SPRING, Framing	1	ABDEF
-14	08392	SHUTTLE & FRAMER ASSEMBLY	1	AE
-14	08932	SHUTTLE & FRAMER ASSEMBLY	1	BF
-14	09983	SHUTTLE & FRAMER ASSEMBLY	1	D
-15	27835	WASHER, Eccentric	1	BDF
-16	26178	SPACER, Framing (hex head) (see NOTE A).	1	AE
-16	27840	SPACER, Framing (hex head) (see NOTE A).	1	BDF
-17	26529	SPRING, Shuttle	1	ABDEF
-18	26186	SPACER, Framing (knurled)	1	ABDEF
-19	12498	SETSCREW, Bristol	2	ABDEF
-20	08766	SHUTTER & PULLEY ASSEMBLY	1	ABDEF
-21	26432	CAM, Shuttle	1	ABDEF
-22	26085	WASHER, Thrust	1	ABDEF
-23	12498	SETSCREW, Bistol	1	ABDEF
-24	30387	PINION, Drive	1	ABDEF
-25	08499	SHAFT & KNOB ASSEMBLY	1	ABDEF
-26	26131	RING, Retaining	1	ABDEF
-27	26119	WASHER, Friction	1	ABDEF

NOTE A: A newly-designed, one-piece framing spacer (part No. 30745) is available and can be used as a replacement for items (16) and (18).

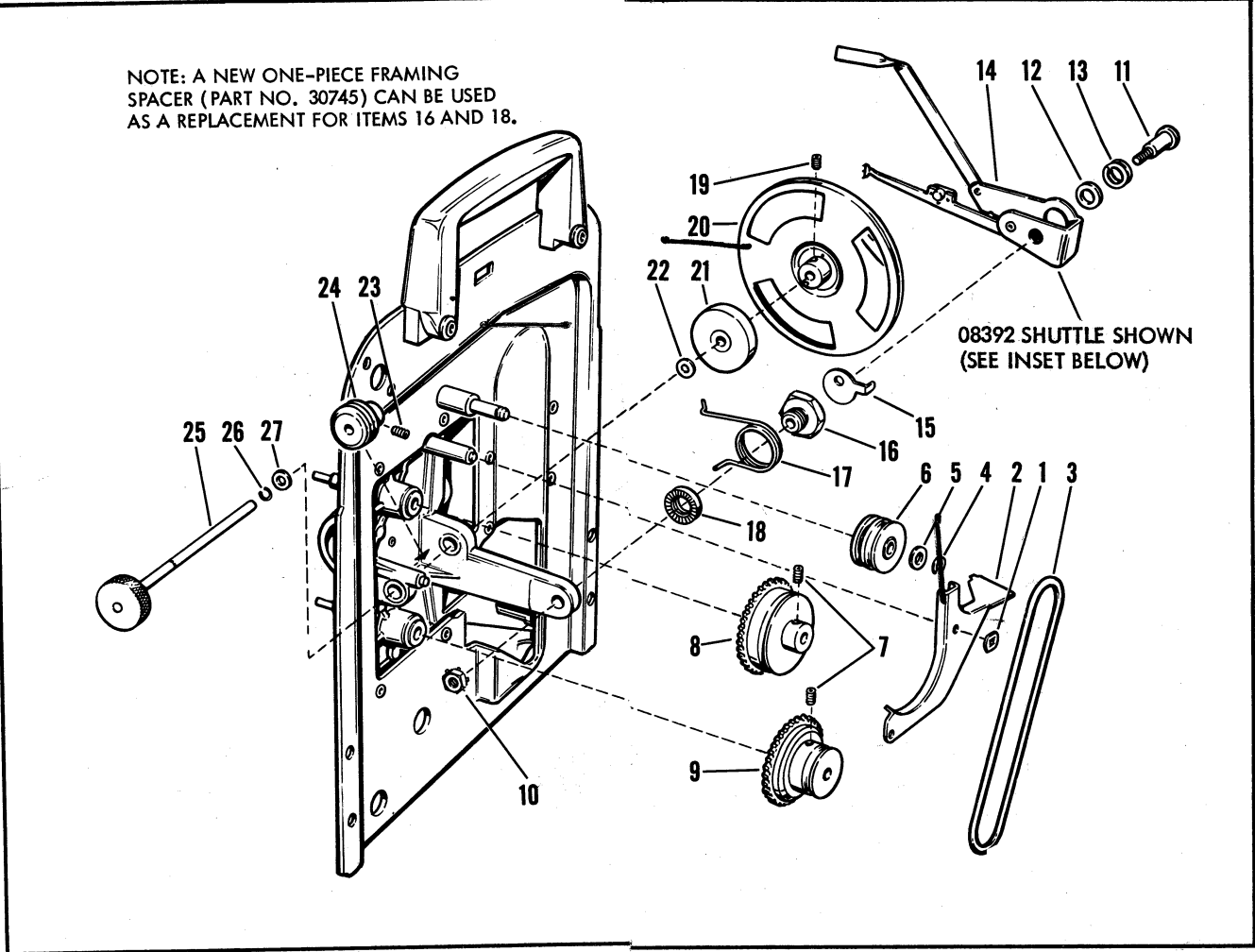


Figure 7. Shuttle and Gearing Models 253A, 253AX and 253B)

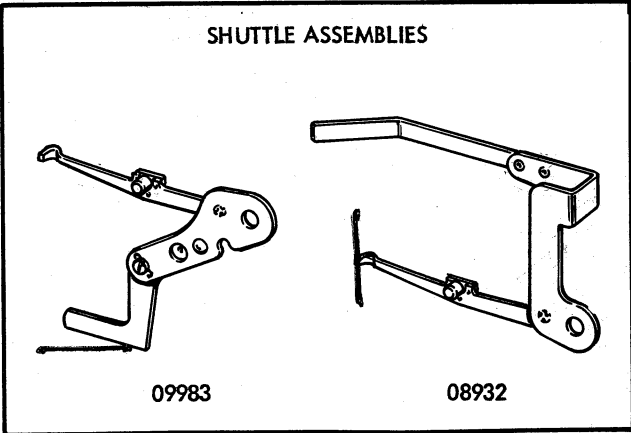


FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
SHUTTLE & GEARING (Model 253AR)				
8-1	26133	NUT, Push-on	2	C
-2	29476	RETAINER, Belt	1	C
-3	26056	BELT, Intermediate	1	C
-4	20808	RING, Retaining	1	C
-5	26119	WASHER, Friction	1	C
-6	08601	PULLEY & BEARING ASSEMBLY, Idler	1	C
-7	20808	RING, Retaining	2	C
-8	26119	WASHER, Friction	2	C
-9	08692	SPROCKET PULLEY ASSEMBLY, Feed	1	C
-10	08693	SPROCKET PULLEY ASSEMBLY, Take-up	1	C
-11	28696	WASHER, Spring	2	C
-12	28695 - 28733	WASHER	2	C
-13	4013	WASHER	2	C
-14	27305	CAM, Clutch	2	C
-15	5238	BALL, Steel	6	C
-16	27373	RETAINER, Clutch ball	2	C
-17	12498	SETSCREW, Bristol	2	C
-18	08803	HUB & GEAR ASSEMBLY	2	C
-19	26906	NUT, Special	2	C
-20	29181	RETAINER, Oil wick (see Note A)	1	C
-21	30424	OILER, Cam (see Note A)	1	C
-22	27641	SCREW, Fil hd, No. 3-48	2	C
-23	17639	RING, Retaining (early models)	2	C
-24	29460	PIN, Bracket (early models)	1	C
-25	29461	SHOE, Pulley loading spring (early models)	2	C
-26	30368	SPRING, Pulley loading (early models)	2	C
-27	29459	BRACKET, Spring loading (early models)	1	C
-28	010181	BRACKET ASSEMBLY, Spring loading (can be used as replacement for items 23 thru 27)	1	C
-29	20808	RING, Retaining	1	C
-30	27322	RING, Retaining	2	C
-31	28982	WASHER	2	C
-32	09510	ROLLER ASSEMBLY, Drive	2	C
-33	27313	RIM, Drive roller	2	C
-34	28559	WASHER, Plain	2	C
-35	09516	BRACKET ASSEMBLY, Pulley mounting	1	C
-36	29472	SCREW, Pivot	1	C
-37	29473	SPRING, Pivot	1	C
-38	30714	SCREW, Fil hd No. 2-56	1	C
-39	29477	KNOB, Forward-Still-Reverse	1	C
-40	10693	NUT, Hex No. 4-48	2	C
-41	09517	SHUTTER ASSEMBLY, Fire	1	C
-42	26214	SCREW, Fil hd 3-48	2	C
-43	29175	WASHER, Shutter pulley	2	C
-44	29172	PULLEY, Shutter	1	C
-45	29040	CAM, In-out	1	C
-46	29468	PIVOT	1	C
-47	26119	WASHER, Friction	2	C
-48	25851	SPRING, Framing	1	C
-49	09515	SHUTTLE & FRAMER ASSEMBLY	1	C
-50	30050	SHOE, Cam	2	C
-51	27835	WASHER, Eccentric	1	C
-52	27840	SPACER, Framing (hex head) (see Note B)	1	C
-53	26186	SPACER, Framing (knurled) (see Note B)	1	C
-54	80591	SETSCREW, Cup pt, No. 6-32	2	C
-55	29044	CAM, Pull-down (see Note A)	1	C
-56	26085	WASHER, Thrust	1	C
-57	12498	SETSCREW, Bristol	1	C
-58	09403	SHAFT & KNOB ASSEMBLY, Framer	1	C
-59	30387	PINION, Drive	1	C

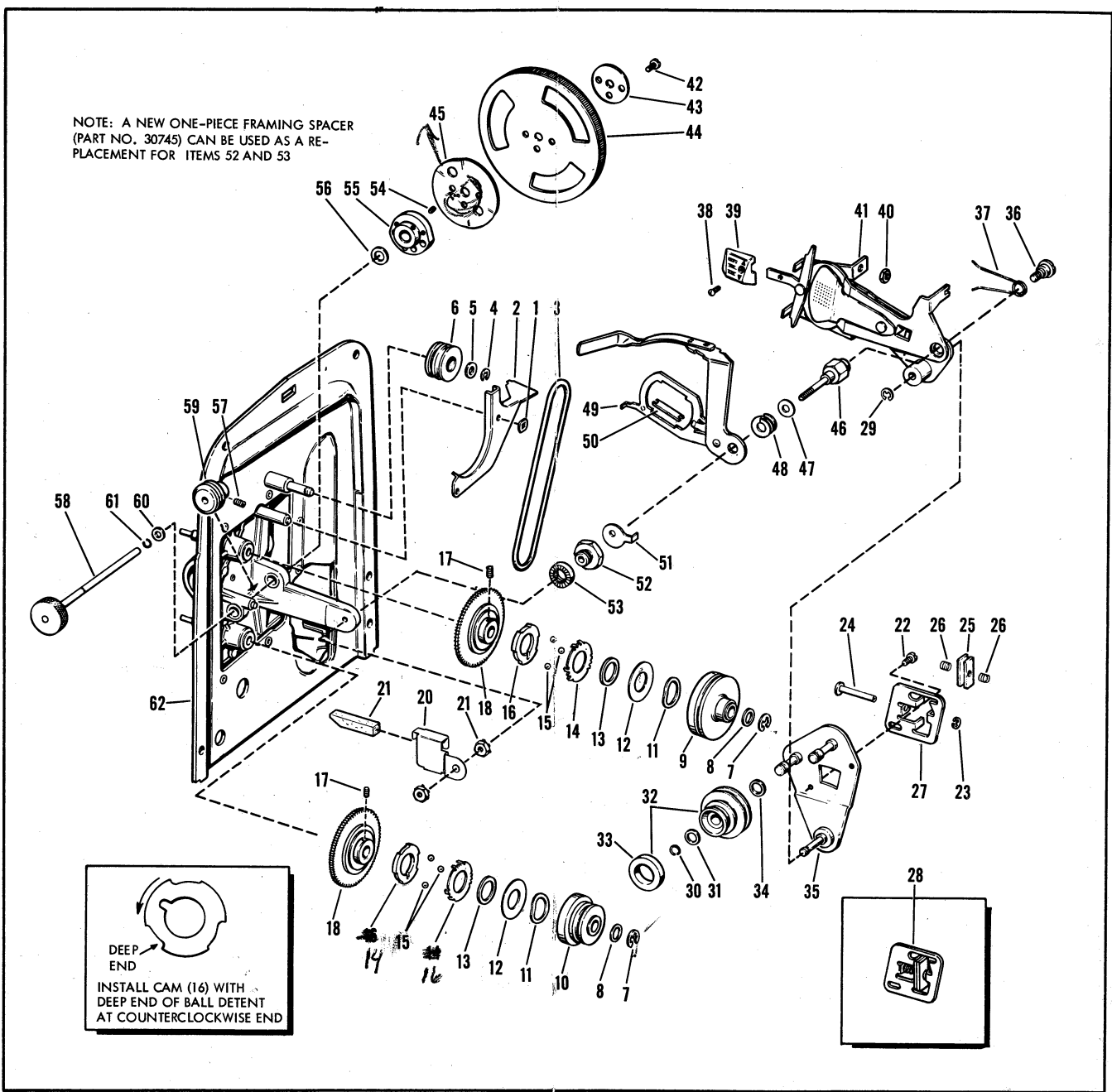


Figure 8. Shuttle and Gearing (Model 253AR only)

FIG. & INDEX NO.	PART NO.	DESCRIPTION							UNITS PER ASSY	USABLE ON CODE
		1	2	3	4	5	6	7		
SHUTTLE & GEARING (Model 253AR) (CONT)										
8-60	26119	WASHER, Friction							1	C
-61	26131	RING, Retaining.							1	C
-62	No Number	MECHANISM PLATE AND STUD ASSEMBLY							1	C

NOTE A: A newly-designed, powdered-metal cam (part no. 29184) is available and can be used as a replacement for the pull-down cam (55), in which case the oiler (21) and its retainer (20) can be discarded.

NOTE B: A newly-designed, one-piece framing spacer (part no. 30745) is available and can be used as a replacement for items (52) and (53).

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
		SHUTTLE & GEARING (MODELS 253RX, 253BRX)		
9-1	12498	SETSCREW, Bristol	2	GH
-2	09571	HUB & GEAR ASSEMBLY, Lower	1	GH
-3	09572	HUB & GEAR ASSEMBLY, Upper	1	GH
-4	26906	NUT, Special	2	GH
-5	29181	RETAINER, Oil wick (See NOTE A)	1	GH
-6	30424	OILER, Cam (see NOTE A)	1	GH
-7	27641	SCREW, Fillister head, No. 3-48	2	GH
-8	17639	RING, Retaining	2	GH
-9	29460	PIN, Bracket	1	GH
-10	29461	SHOE, Pulley loading spring	2	GH
-11	30368	SPRING, Pulley loading	2	GH
-12	29459	BRACKET, Spring loading	1	GH
-13	010181	BRACKET ASSEMBLY, Spring loading	1	GH
		(Can be used as a replacement for items 7 thru 12)		
-14	20808	RING, Retaining	1	GH
-15	27322	RING, Retaining	2	GH
-16	28982	WASHER	2	GH
-17	09510	ROLLER ASSEMBLY, Drive	2	GH
-18	27313	. RIM, Drive roller	2	GH
-19	28559	WASHER, Plain	2	GH
-20	09516	BRACKET ASSEMBLY, Pulley mounting	1	GH
-21	29472	SCREW, Pivot	1	GH
-22	29473	SPRING, Pivot	1	GH
-23	30714	SCREW, Fillister head, No. 2-56	1	GH
-24	29477	KNOB, Forward-Still-Reverse	1	GH
-25	10693	NUT, Hex, No. 4-48	2	GH
-26	09517	FIRE SHUTTER ASSEMBLY	1	GH
-27	30551	SCREW, Fillister head, No. 3-48	2	GH
-28	29175	WASHER, Shutter	1	GH
-29	29172	PULLEY, Shutter	1	GH
-30	29040	CAM, In-out	1	GH
-31	29468	PIVOT	1	GH
-32	26119	WASHER, Friction	1	GH
-33	25851	SPRING, Framing	1	GH
-34	09698	SHUTTLE & FRAMING LEVER ASSEMBLY	1	GH
-35	30050	SHOE, Cam	2	GH
-36	27835	WASHER, Eccentric	1	GH
-37	27840	SPACER, Framing (hex head) (see NOTE B)	1	GH
-38	26186	SPACER, Framing (knurled) (see NOTE B)	1	GH
-39	80591	SETSCREW, Headless, No. 6-32 cup pt.	2	GH
-40	29044	CAM, Pull-down (see NOTE A)	1	GH
-41	26085	WASHER, Thrust	1	GH
-42	12498	SETSCREW, Bristol, No. 6-32	1	GH
-43	09403	SHAFT ASSEMBLY, Framer	1	GH
-44	30387	PINION, Drive	1	GH
-45	26119	WASHER, Friction	1	GH
-46	26131	RING, Retaining	1	GH
-47	No Number	PLATE AND STUD ASSEMBLY, Mechanism	1	GH

NOTE A: A newly-designed, powdered-metal cam (part No. 29184) is available and can be used as a replacement for the pull-down cam (40), in which case the oiler (6) and its retainer (5) can be discarded.

NOTE B: A newly-designed, one-piece framing spacer (part No. 30745) is available and can be used as a replacement for items (37) and (38).

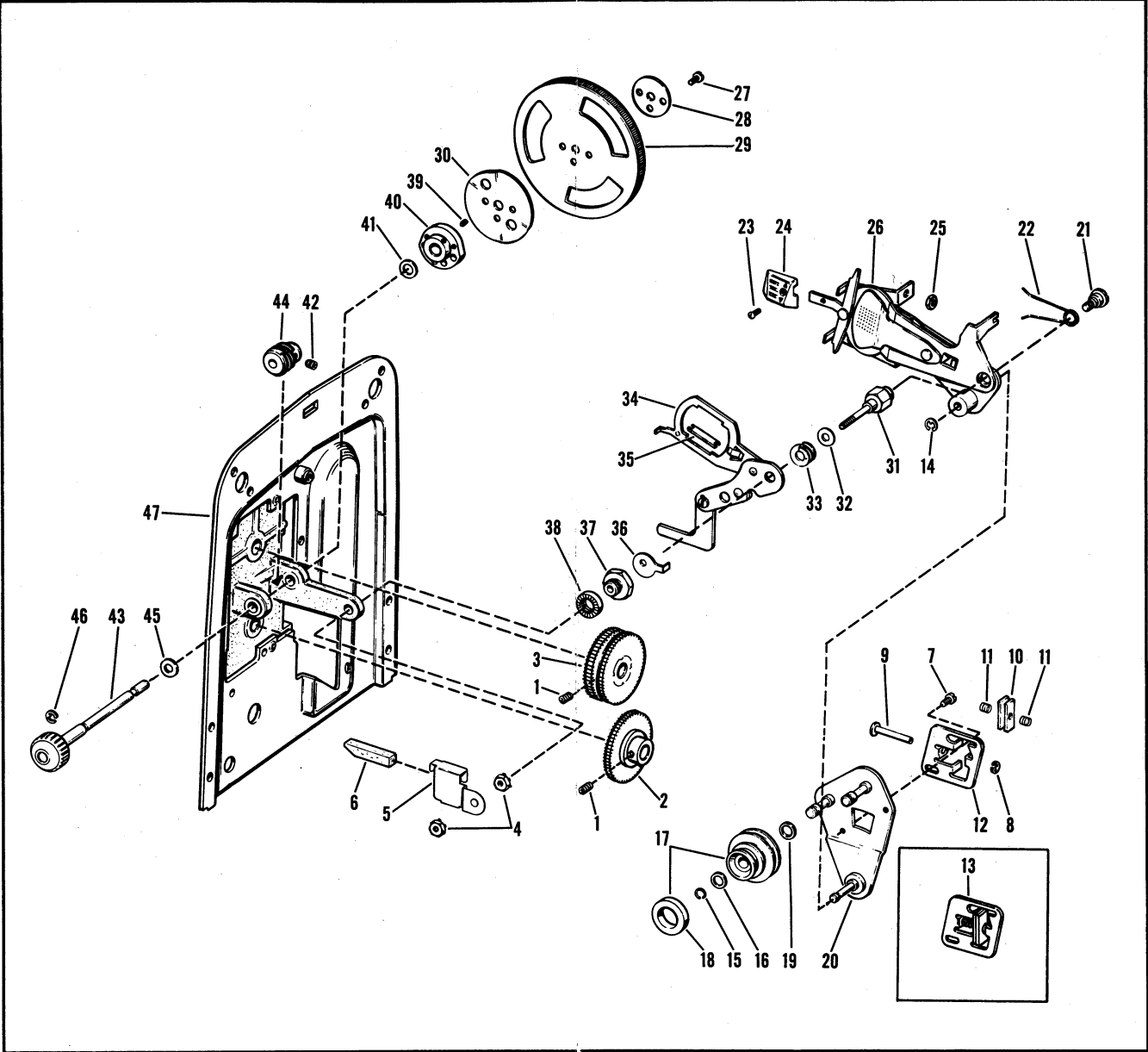


Figure 9. Shuttle and Gearing (Models 253BRX and 253RX)