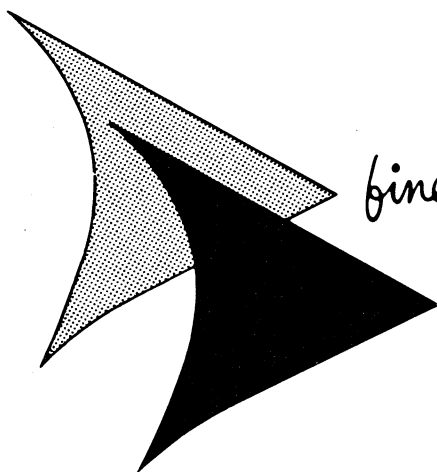


SERVICE INSTRUCTIONS

FILMOSOUND PROJECTOR

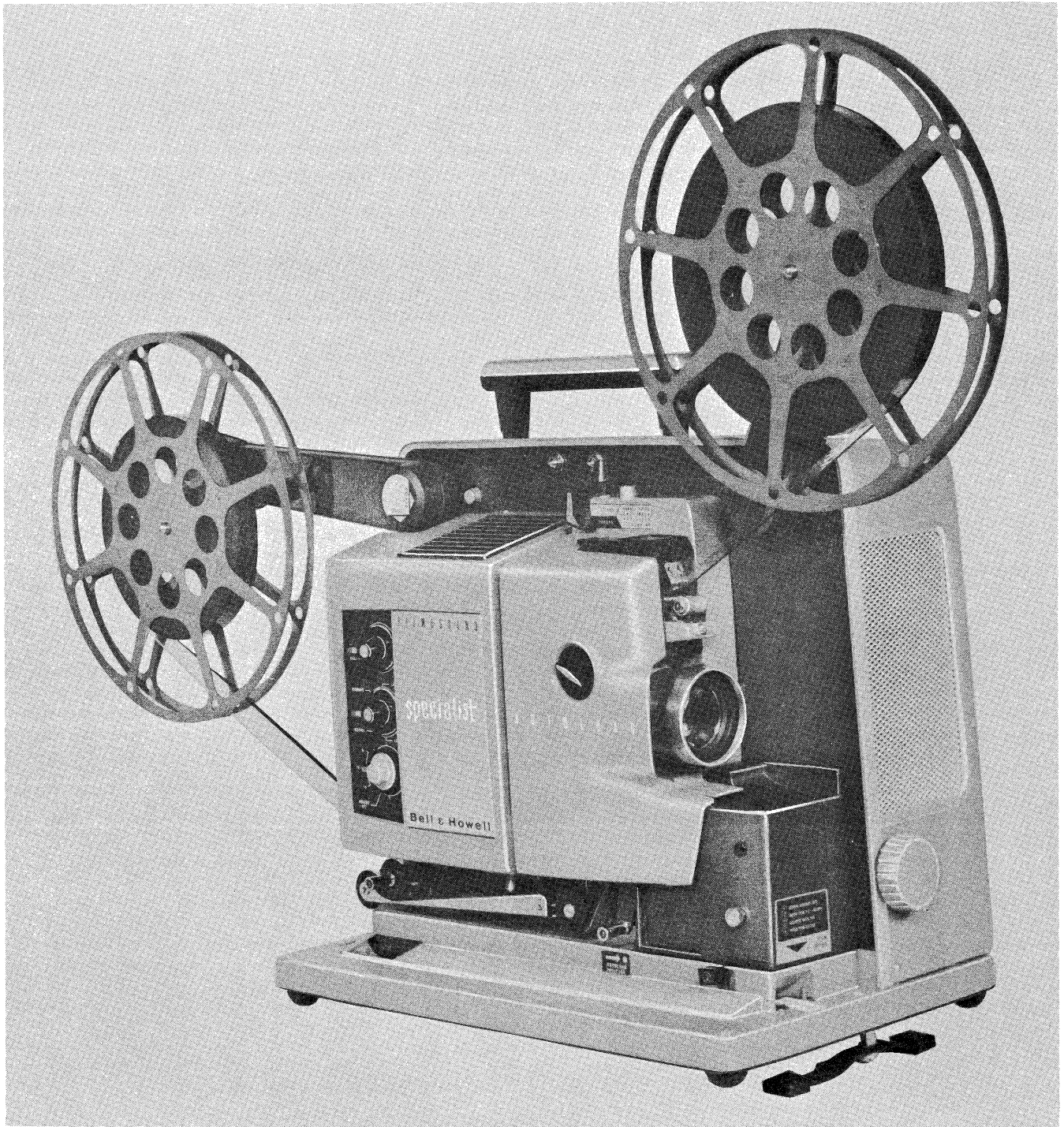
DESIGN 552



finer products through imagination

Bell & Howell

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



Design 552 Filmosound Projector

NOTE

The castings for Design 552 Auto-Threadprojector are magnesium. Adhere to standard shop safety practices when machining or drilling castings.

Introduction

GENERAL.

This manual has been prepared to aid in servicing the Bell & Howell Design 552 Auto-Thread Filmosound 16-mm motion picture 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 and reassembly of the projector.

All parts in Parts Catalog illustrations are indexed, as much as possible, in a suggested order of disassembly, and with attaching parts immediately preceding those parts which they attach. Where disassembly and reassembly procedures are quite obvious, no attempt has been made to elaborate on removal or installation instructions. When making specific projector repairs and replacements, the serviceman must use his own judgment in eliminating unnecessary steps of procedure.

Before proceeding with repairs, refer to the following Trouble Shooting guide for possible causes and remedies of specific customer complaints.

1. CLEANING.

All film path areas must be kept free from emulsion buildup, or film jamming will take place during the automatic threading operation. Use Toluol, and/or an orange stick to remove emulsion from film path areas, being careful not to scratch the surfaces. Pay particular attention to sound head cover around sound head.

Do not use Trichlorethylene solvents to clean plastic parts. Use a naphtha base cleaning fluid and be sure that grease is NOT wiped off critical areas of lubrication. Do not use solvents on these critical areas, especially in the auto-threading linkage, since lubrication is applied during assembly and it would be difficult to replace without disassembling the linkage. Use a soft lint free cloth when necessary to remove any accumulation of dust or film chips.

During overhaul of the projector, the transport mechanism should be removed and thoroughly cleaned. Brush or blow out all large particles of dirt. Wash all moving parts except "Oilite" bearings with any good petroleum solvent. Wash "Oilite" bearings and the pull-down cams with naphtha. Wash the cam oilers in naphtha and replace if not thoroughly cleaned by washing. As soon as parts have been washed and dried, coat with a light film of the specified lubricant.

2. LUBRICATION.

a. GENERAL. Unless otherwise specified, apply one or two drops of oil (Spec. 341) to all shafts, sleeve bearings, and sliding parts before assembly. Place felt pads in a shallow container of specified oil until saturated; then allow to drain before installation.

b. LUBRICATION OF SPECIFIC PARTS. See the following table for lubrication of specific parts and Bell & Howell Spec. number of lubricant to be used.

LUBRICANT	PARTS TO BE LUBRICATED
Oil, Spec. 341	Bearing surfaces of reel arm shafts (Fig. 5 and 6). Clutch ball retainers (26 and 35, Fig. 1). Sprocket shafts (41 and 42, Fig. 10).
Grease, Spec. 1516	Tilt rack and pinions (20, Fig. 4).
Oil, Spec. 1543	Framer shaft (27, Fig. 12). Bearing face of worm gear (24, Fig. 13) Pin of rewind sprocket (30, Fig. 1). Meshing gears in reel arms (Fig. 5 and 6). All bearing holes in mechanism housing (38, Fig. 13).
Grease, Spec. 1553	Friction surfaces of trigger (19, Fig. 13). Slots in bearing assembly (23, Fig. 13).
Grease, Spec. 1566	Friction surface of lamp release ring (17, Fig. 9).
Oil, Spec. 1918	Non-bearing machined surfaces of all castings.
Grease, Spec. 1926	In-out cam and cam follower (21 and 22A, Fig. 12). Shuttle link bearings (17A, Fig. 12). All nylon gears.
Grease, Spec. 1956	Cam wiper and wick (14 and 15, Fig. 12). Pivot posts for all film guides. Upper and lower sprocket bearings. Shuttle guides and guide bearings.

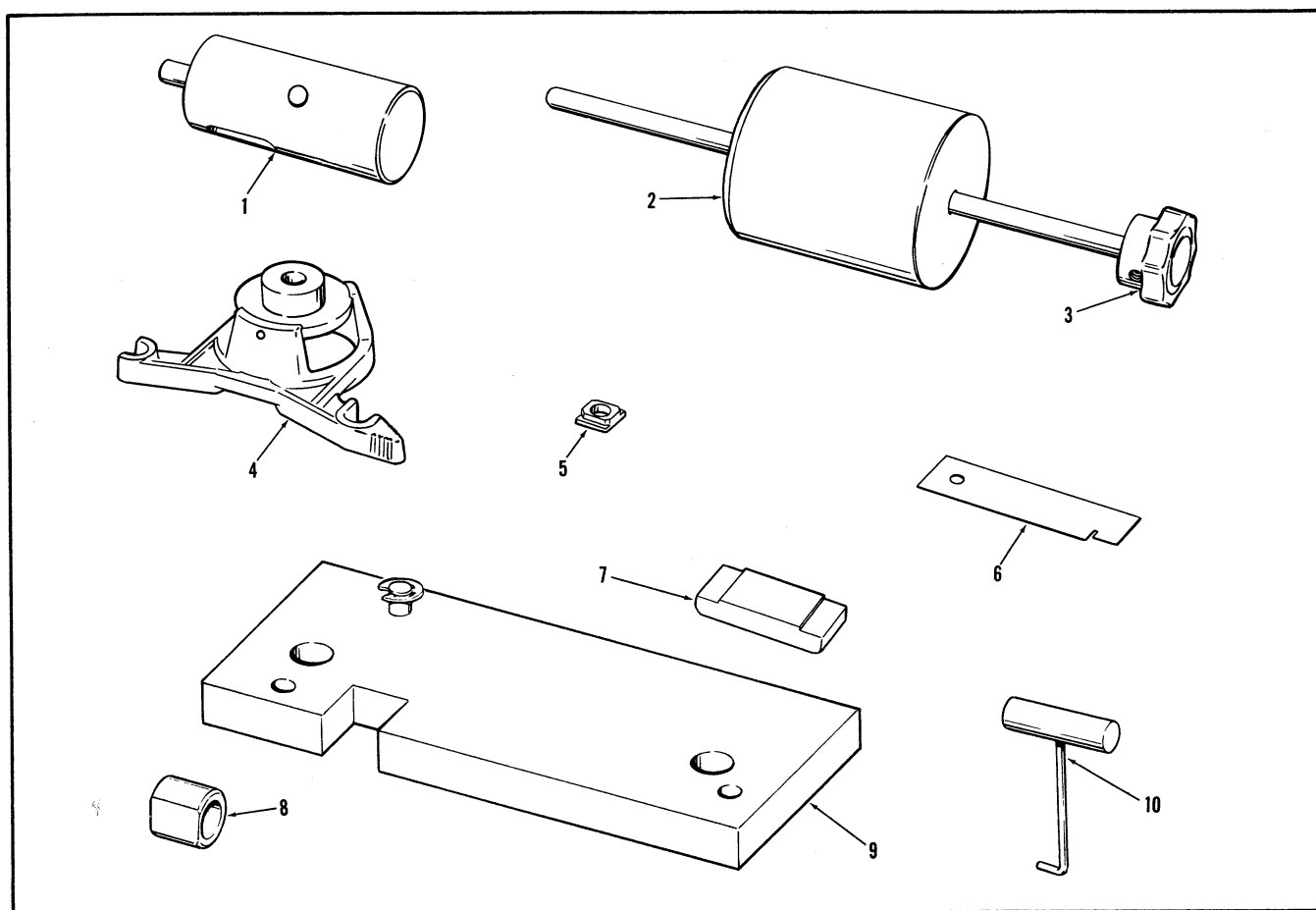


Figure A. Special Service Tools

INDEX NO	TOOL NO.	NOMENCLATURE	TOOL APPLICATION
1	SER-550-2-N5	Lamp Plug	Alignment of optical system (see Fig. B)
2	SER-550-2-N1	Lens Plug	
3	SER-550-2-N2	Alignment Rod	
4	SER-550-2-N4	Condenser Plug	
5	SER-550-2-N3	Aperture Plug	
6	SER-550-5-N2	Stroke Gage	Measure of shuttle stroke
7	SER-550-6-N1	Shuttle Height Gage	Check shuttle protrusion
8	SER-552-2-N1	Restorer Positioning Tool	Adjusting the loop restorer
9	SER-552-1-N1	Timing and Alignment Plate	Timing the sprockets
10	SER-552-5-N1	Soundhead Locating Gage	Positioning the soundhead
-	SER-550-8-N1	Alignment Tool	Sound drum and light pipe alignment (see Fig. D).
-	SER-550-5-N1	Shuttle Stroke Target	Measurement of shuttle stroke (see Fig. C).

Trouble Shooting

3. MISCELLANEOUS TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSE	REMEDY
a. Nothing runs	Protective switch not operating	Use correct screw in lower left rear corner of case. Replace switch.
	Damaged power cable	Repair or replace cable.
	Loose connections	Repair.
b. Motor hums but does not run	Starting circuit open or shorted	Repair loose or transposed connections. Replace starting capacitor. Replace starting relay.
	Damaged switch	Replace switch.
	Transposed leads on main switch	Connect leads to proper terminals.
c. Motor runs but mechanism does not run	Drive belt off of pulley	Reinstall belt.
	Motor or driven pulley loose on shaft	Position pulley and tighten setscrews.
	Damaged belt	Replace belt.
	Animation clutch spring broken	Replace spring.
d. Rewind does not operate	Rewind clutch not engaging	Adjust (para. 48).
	Rewind clutch slipping	Adjust (para. 48).
e. Takeup does not operate	Clutch balls or spring lost	Replace.
f. Feed spindle does not revolve in reverse	Dirt in feed spindle clutch	Clean.
	Clutch spring lost	Replace.
g. Gate will not lock	Latch spring set too close to lens mount stop	Adjust.
	Pressure shoe out of line	Realign.
h. Shuttle runs but sprockets do not revolve	Animation clutch spring broken or lost	Replace.

3. MISCELLANEOUS TROUBLES AND REMEDIES (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
i. Short lamp life	Line voltage in excess of lamp voltage	Use lamp of correct voltage rating.
	Blower belt off of pulley	Replace.
	Dirt in blower	Clean.
j. Speed changer does not work	Knob or shifter crank loose	Tighten setscrew.
k. Speeds slow	Binding in mechanism	Free binding condition.
	Slipping belt	Clean or replace.
l. Runs at speed between 18 and 24 F.P.S.	Pulleys out of line	Realign.
	Belt shifter out of adjustment	Adjust.
	Belt shifter toggle spring broken	Replace.
	Power line frequency other than 60 cycles	Use proper voltage and frequency.
m. Solenoids buzz	Plungers not seating	Adjust (para. 46c and 47b).

4. PICTURE TROUBLES AND REMEDIES.

TROUBLE	PROBABLE CAUSE	REMEDY
a. Film jump	Damaged film	Replace or repair.
	Loose shuttle	Tighten (para. 43d).
	Dirty gate	Clean.
	Damaged or lost pressure shoe spring	Replace.
	Pressure shoe misaligned	Realign.
	Incorrect shuttle stroke	Adjust (para. 44d).
b. Double image	Incorrect shuttle stroke	Adjust (para. 44d).
	Excessive shuttle protrusion	Adjust (para. 44b).
c. Weave	Sticking edge guide	Clean.
	Side tension spring lost	Replace.
	Fixed edge guide out of position	Reposition.
d. Poor illumination	Optics out of line	Realign (para. 43).
	Fire shutter sticking	Free solenoid or linkage (para. 47).
	Front condenser reversed	Reassemble correctly.
e. Poor focus	Dirty lens	Clean.
	Dirty aperture	Clean.
	Warped film	Recondition or replace.
	Projector lens mount out of line	Realign (para. 45).
	Pressure shoe spring lost	Replace.
	Bent pressure shoe	Replace.
	Pressure shoe out of line	Realign.
f. Frame line creeps	Framer eccentric loose	Align and tighten (para. 44e).
g. Insufficient framing	Framer eccentric out of adjustment	Adjust (para. 44e).
h. Trailer ghost	Shutter out of time	Reassemble properly.

5. FILM TRANSPORT TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSE	REMEDY
a. Loss of loops	Damaged film	Repair or replace.
	Inadequate shuttle protrusion	Adjust (para. 44b).
	Inadequate or excessive shuttle stroke	Adjust (para. 44d).
	Pressure shoe spring lost	Replace.
	Pressure shoe mounting plate screws loose	Tighten.
	Sprocket shoe locks not closing	Clean or adjust.
	Sprocket drive gear loose on shaft	Retime and tighten.
	In-out bracket spring broken	Replace.
b. Shuttle operates but sprockets do not revolve	Animation clutch spring broken or lost	Replace.
c. Lower loop not restored	Loop restorer stroke too short	Adjust (para. 54).
	Loop restorer does not engage restorer cam	Adjust (para. 54).
d. Film rubs on loop restorer roller.	Restorer arm out of position	Reposition (para. 54).
e. Excessive film slap	Damaged film	Recondition or replace.
	Green film	Age or buff.
	Dirty gate	Clean.
	Pressure shoe rubbing on edge guides	Realign.
	Incorrect shuttle stroke	Adjust (para. 44d).
f. Animation clutch does not operate	Open circuit	Repair.
	Solenoid plunger set too high or too low	Adjust.
	Stop pawl clearance excessive	Adjust (para. 46a).
g. Animation clutch stops sprocket but shuttle pulls film	Insufficient shuttle retraction	Adjust (para. 46b).
h. Splices jam in sprocket shoes	Bad splices	Replace.
	Emulsion build-up	Clean (para. 1).

6. SOUND SYSTEM TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSE	REMEDY
a. Projector runs, tubes do not light	Loose connection	Repair.
	Tube burned out	Replace.
	Amplifier switch damaged	Replace.
	Heater series resistor open	Replace.
b. Tubes light, exciter does not light	Exciter lamp cable disconnected	Connect cable.
	Wrong exciter lamp used	Replace with correct lamp.
	Damaged oscillator tube	Replace.
	Projector switch open or leads disconnected	Replace switch or connect leads.
c. Tubes and exciter light, but no sound	Speaker jack disconnected	Connect leads.
	Speaker jack switch open	Repair or replace jack.
	Photocell cable disconnected	Connect cable.
	Photocell cable leads reversed	Connect to proper terminals.
	Damaged tubes	Replace.
	Photocell out of line	Realign (para. 49b).
	Dirt on end of photocell	Clean.
	Wrong exciter lamp used	Replace with correct lamp.
d. Low volume	Damaged tubes	Replace.
	Wrong exciter lamp used	Replace with correct lamp.
	Photocell out-of-line	Realign (para. 49b).
	Dirt on photocell or slit	Clean.
	Slit misaligned	Realign (para. 49d).
	Buzz track misaligned	Realign (para. 49e).
e. Distortion at all volume levels	Wrong exciter lamp used	Replace with correct lamp.
	Inverter or output tubes damaged	Replace.
	Open element in one output tube	Replace.
f. Crackling noises	Damaged tubes	Replace.
	Broken ground lead to mechanism or blower housing	Repair.
	Grounding springs loose, bent or lost	Repair or replace.
	Buzz track out of line	Realign (para. 49e).
	Broken cable shield	Repair.

6. SOUND SYSTEM TROUBLES AND REMEDIES (CONT)

TROUBLE	PROBABLE CAUSE	REMEDY
g. Wow or flutter	Stabilizer guide roller sticking	Clean.
	Stabilizer guide roller spring broken, unhooked or lost	Repair or replace.
	Film edge guide (sound head) out of line	Realign (para. 49e).
	Loose flywheel	Tighten.
	Damaged sound drum bearing	Replace.
	Dirt causing guide roller arm pivot bearing to bind	Clean and polish.
	Photocell or exciter cable rubbing against flywheel	Reposition.
	Chip or dirt in takeup sprocket gear teeth	Remove.
	Loop restorer stroke is too short or restorer set too low	Adjust (para. 54).
h. Clicking noises	Dirt on sound drum	Clean.
	Broken ground lead to mechanism or blower housing	Repair.
	Sound drum grounding spring loose, bent or lost	Repair or replace.
i. High frequencies fade (jumps focus)	Warped film	Recondition or replace.
	Film edge guide (sound head) out of line	Realign (para. 49e).
	Dirt on sound drum	Clean.
j. Hum	Tube shield lost	Replace.
	Screws holding amplifier base shield to PC board loose or lost	Tighten or replace.
	Frame by-pass condenser open or disconnected	Replace or repair.
	Amplifier not at same potential as test equipment (TEST CONDITION)	Operate amplifier from isolation transformer.
	Grounded wiring	Correct grounded condition.

7. TROUBLE SHOOTING THE AUTOLOAD SYSTEM.

a. GENERAL. Any obstruction in the film path, such as caked emulsion, film chips or splicing tape, can be expected to interfere with proper threading. Time will be saved by cleaning the threading path and, at the same time, making a visual inspection of all shoes and guides before attempting to localize the trouble. Do not use metal tools to remove material adhering to guides or rollers. Use an orange stick, plastic rod or toothpick whenever scraping is necessary. Pipe cleaners dampened with Toluol, Naphtha or Isopropyl-Alcohol are very convenient for cleaning in restricted areas. Do not use Trichlorethylene or Carbon tetrachloride as cleaning solvents as they might damage or stain plastic parts. Do not use excessive amounts of solvents, or lubricants will be removed from linkage pivots, slides, etc., and will have to be replenished.

b. TEST FILM. The autoloader system has been designed to function properly with all films which can be described as being in projectable condition (see Operators Instructions for limits of shrinkage, curl, etc.). Generally, any film which functions properly in other Bell & Howell projectors (such as Designs 399, 540 and 542) can be used for testing the autoloader system. Any film which does not thread properly should be inspected. The end of the leader must be properly trimmed and free from sharp bends. All sprocket holes in the first 18 inches of leader must be in good condition. Splices must be properly registered and in good condition. Sprocket holes restricted by cement or splicing tape must be cleared or the splice remade. The repairman is cautioned that it would be a waste of time to adjust or attempt to adjust the autoloader system to autothread a film which is in such poor condition as to be incapable of being the source of an uninterrupted film presentation of acceptable quality.

c. AUTOLOAD TROUBLESHOOTING CHART.

TROUBLE	PROBABLE CAUSE	REMEDY
Film cannot be inserted into feed sprocket	1. Obstruction below arm of sprocket guard (1, Fig. 13A)	1. Remove obstruction.
	2. Sprocket guard arm (1, Fig. 13A) bent or binding	2. Straighten or replace arm.
	3. Excessive pressure on leaf spring (33, Fig. 11)	3. Adjust leaf spring (para. 53j)
Film will not pull between feed sprocket and sprocket shoe.	1. Entrance guide (11, Fig. E) mis-aligned	1. Realign per para. 53g.
	2. Feed sprocket shoe sticking	2. Clean sprocket shoe pivot.
	3. Feed sprocket shoe spring (37, Fig. 10) broken	3. Replace spring.
	4. Caked emulsion or burr on sprocket shoe film rails	4. Clean; remove burr with crocus cloth.
Film comes out the side of top sprocket	1. Obstruction in sprocket shoe	1. Remove obstruction.
	2. Damaged sprocket shoe	2. Replace sprocket shoe.
	3. Sprocket shoe and sprocket mis-aligned laterally.	3. Realign
Film strikes top of aperture plate and begins to pile up	1. Upper loop former (8, Fig. F) bent or out of adjustment	1. Straighten or replace if bent; or readjust per para. 53d.
	2. Lower loop former (4, Fig. F) set too close to aperture plate	2. Readjust per para. 53c.
Film butts into or goes under top end of aperture plate side tension rail or strikes fixed rail	1. Upper loop former (8, Fig. F) bent, causing sidewise deflection of film	1. Straighten or replace.
	2. Lower loop former (4, Fig. F) bent or out of adjustment	2. Straighten or replace if bent; or readjust per para. 53c.

TROUBLE	PROBABLE CAUSE	REMEDY
Film butts into top of film pressure plate (7, Fig. 14) or passes over outside of pressure plate	1. Lower loop former (4, Fig. F) out of adjustment 2. Pressure shoe not lifting off of aperture plate when film gate is closed	1. Readjust per para. 53c. 2. Bent parts need straightening (para. 53f) or replacing.
Film ejects between bottom of gate and top of takeup sprocket, or piles up in this area.	1. Lower loop form (14, Fig. 11) bent or sticking 2. Lower loop form spring (15, Fig. 11) broken 3. Loop restorer out of adjustment or restorer roller stud bent 4. Obstruction or burr in takeup sprocket upper shoe 5. Sprockets out of time	1. Straighten, remove bind, or replace as necessary. 2. Replace spring. 3. Readjust loop restorer (para. 54); replace damaged parts. 4. Clean; remove burr with crocus cloth. 5. Time sprockets per para. 55.
Film not threading over takeup sprocket	1. Sprocket guard mounting plate (28, Fig. 11) out of position 2. Obstruction in upper sprocket shoe 3. Sprocket shoe spring (37, Fig. 10) broken 4. Takeup sprocket shaft loose in gear (39, Fig. 10)	1. Reposition per para. 53b. 2. Remove obstruction. 3. Replace spring. 4. Retime sprockets (para. 55) and tighten setscrews (38, Fig. 10).
Film piles up ahead of sound drum	1. Insufficient clearance between soundhead threading guides (4 and 5, Fig. G) 2. Backup bracket (23, Fig. 11) bent downward 3. Exciter lamp cover loose 4. Obstruction in gap between sound drum and exciter lamp cover 5. Not enough clearance between sound drum and cover 6. Edge guide adjusting screw (23, Fig. 9) out too far	1. Readjust all guides per para. 53. 2. Straighten bracket. 3. Tighten cover retaining screw. 4. Remove obstruction. 5. Check clearance per para. 57 6. Adjust per para. 49e.
Film ejects ahead of lower takeup sprocket shoe or piles up in this area	1. Insufficient clearance between soundhead threading guides (4 and 5, Fig. G) 2. Soundhead loose or improperly positioned 3. Obstruction or burr in lower takeup sprocket shoe 4. Film guide (6, Fig. 9) improperly positioned	1. Readjust all guides per para. 53. 2. Reposition per para. 56. 3. Remove obstruction; remove burr with crocus cloth. 4. Reposition guide.

TROUBLE	PROBABLE CAUSE	REMEDY
Film sticks in or is ejected from lower takeup sprocket shoe	1. Obstruction or burr in lower takeup sprocket shoe 2. Sprocket shoe sticking 3. Broken sprocket shoe spring (37, Fig. 10) 4. Sprocket shoe and sprocket mis-aligned laterally 5. Film exit guide (12, Fig. 11) bent or improperly positioned	1. Remove obstruction; remove burr with crocus cloth. 2. Clean sprocket shoe pivot. 3. Replace spring. 4. Realign. 5. Reposition or straighten guide.
Film piles up ahead of idler roller (6, Fig. 11) or is ejected from this area	1. Film exit guide (12, Fig. 11) bent or improperly positioned 2. Idler roller sticking or roller stud loose or bent	1. Reposition or straighten guide. 2. Remedy sticking condition; re-locking lever (21, Fig. 11).
System will not lock	1. Locking lever (21, Fig. 11) binding 2. Release spring (18, Fig. 11) dis-engaged or broken 3. Eccentric pivot (20, Fig. 11) improperly adjusted	1. Repair or replace lever. 2. Engage spring with locking lever, or replace spring. 3. Readjust pivot per para. 53h.
System locks when actuator (13, Fig 10) is depressed	1. Stop screw below actuator not set high enough	1. Reset stop screw per para. 53i.
Loop restorer cycles continuously	1. Restorer out of adjustment 2. Shuttle retractor pin (40, Fig. 12) sticking 3. Pressure plate (7, Fig. 14) binding on aperture plate edge guide	1. Adjust per para. 54. 2. Clean and lubricate pin. 3. Realign pressure plate.
Slack film in soundhead area	1. Sprocket shoes sticking 2. Takeup jerking 3. Jockey rollers sticking 4. Soundhead improperly positioned 5. Dirt or obstruction between sound drum and exciter lamp cover	1. Clean sprocket shoe pivots. 2. Check takeup torque and check for binding in takeup reel arm. 3. Clean and lubricate. 4. Reposition per para. 56. 5. Remove obstruction.
Film scratches	1. Caked emulsion on film path parts 2. Film chips in sprocket shoes 3. Scratches or burrs on film guides, shoes, aperture or pressure plate 4. Jockey rollers sticking	1. Clean film path. 2. Remove film chips. 3. Polish with crocus cloth or replace. 4. Clean and lubricate.

TROUBLE	PROBABLE CAUSE	REMEDY
Perforations checked	1. Shuttle not retracting	1. Adjust per para. 53e.
	2. Pressure plate not lifting from aperture plate	2. Adjust per para. 53f.
	3. Excessive feed or takeup tension	3. Adjust tension.
Film dimpled between perforations	1. Sprocket shoes sticking	1. Clean sprocket shoe pivots.
	2. Shuttle not retracting	2. Adjust per para. 53e.
	3. Sprockets out of time	3. Retime per para. 55.
	4. Inadequate pressure on leaf spring (33, Fig. 11)	4. Adjust per para 53j.
	5. End of film leader not cut clean and square	5. Check film cutter; replace if dull or broken.

Disassembly Procedure

8. GENERAL INSTRUCTIONS.

a. Remove "breakage" items (optical parts, lamps, etc.) before proceeding with projector repairs. Wrap such items in tissue paper to protect them from damage.

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

9. DISASSEMBLING FIGURE 1 PARTS. Remove parts, as necessary, in their indexed order of disassembly. When removing reel arms, note carefully the manner in which the clutch parts (22 thru 36) are installed. Be careful not to lose the steel balls.

10. DISASSEMBLING FIGURE 2 PARTS. Insert 1/16 in. punch through hole in sound drum shaft housing and into the hole in shaft. Hold the shaft firmly while loosening sound drum nut (40).

11. DISASSEMBLING FIGURE 3 PARTS. Remove parts, as necessary, in their indexed order of disassembly noting the following special precautions.

a. Setscrews (1) must be loosened and mounting screws (4) removed before clutch solenoid (5) can be removed.

b. Note carefully the installation of motor and belt shifter parts (36 thru 48) before disassembling parts for replacement.

12. DISASSEMBLING FIGURE 4 PARTS. Remove parts, as necessary, in their indexed order of disassembly. Note that fiber insulator (23) covers interlock switch and terminal parts in recess of base (42).

13. DISASSEMBLING FRONT REEL ARM. Remove Figure 5 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Be careful not to damage the teeth of nylon gears (20) during disassembly.

b. Unless necessary for replacement, needle bearings (30A, 34A and 34B) should not be pressed out.

14. DISASSEMBLING REAR REEL ARM. Remove Figure 6 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Be careful not to lose springs (1 and 18).

b. Unless necessary for replacement, needle bearings (5A and 28A) should not be pressed out.

c. Be careful not to damage the teeth of nylon gears (11 and 12) during disassembly.

15. DISASSEMBLING LAMPHOLDER. Remove Figure 7 parts, as necessary, in their indexed order of disassembly.

16. DISASSEMBLING LAMPHOUSE. Remove Figure 8 parts, as necessary, in their indexed order of disassembly.

17. DISASSEMBLING SOUND HEAD. Remove Figure 9 parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Do not remove optical slit assembly (11) unless in need of replacement or cleaning.

b. The sound drum shaft (22) must be handled carefully to avoid damage to the drum. To remove, loosen setscrews (20 and 21) and press shaft from sound head housing. As shaft is withdrawn, note the manner in which photocell (22) and retainer (21) are installed in slot of sound drum shaft.

c. Note the manner in which springs (28 and 34) are engaged before removing the related parts.

18. DISASSEMBLING FIGURE 10 PARTS. Remove Figure 10 mechanism assembly parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Pry out the hinge pins (1 and 2) with a wire cutter or similar implement to free the lens carrier (5).

b. When removing speed change knob parts (6 thru 11), note the manner in which spring (10) is installed.

c. Remove three screws (16) and washers (17), two retaining rings (18) and the clutch lever shaft (19) to free the outboard bearing assembly (20) and rewind clutch lever (21). As the clutch is removed, the rewind button (22) and spring (23) will be released.

d. When removing sprocket guards, note carefully the manner in which torsion springs (37) are assembled to apply proper tension to the guards.

e. When sprocket assemblies (41 and 42) are removed, be careful not to damage sprocket teeth.

NOTE

When the actuating assembly (13) is removed, observe the setscrew protruding up from the casting immediately below the mounted position of the actuating assembly. The height of this setscrew above the casting has been set to insure that the auto-threading system does not lock when the actuating assembly is depressed. Do not disturb this setscrew.

19. DISASSEMBLING FIGURE 11 PARTS. Remove Figure 11 mechanism assembly parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Before disassembling, make a careful note of the manner in which the various springs (9, 15, 18, and 44) are installed. It is important that these springs be reassembled in the same manner.

b. Removal of parts in this illustration will necessitate the re-adjustment of the auto-threading mechanisms as outlined in paragraph 52.

20. DISASSEMBLING FIGURE 12 PARTS. Remove Figure 12 mechanism assembly parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Be careful not to bend the blades of the shutter (9) during disassembly.

b. The shuttle link bearings (17A) are secured in place within the notches of the shuttle arms (17) and should not be pressed out. Also, do not remove ball and stud assemblies (12) from shuttle arms (17).

c. Inspect the pull-down cam followers (17B) for wear. These followers, or shoes, can be turned end for end or reversed if they appear badly worn.

d. The felt wicks (14 and 15) should be replaced with new wicks if they appear unusually dirty. New wicks should be lubricated as instructed in paragraph 2.

e. Note that the upper forked end of the shuttle arm plate (25) engages the framer knob shaft (27). The framer knob and shaft unscrew from the casting.

f. When disassembling items (28 thru 37), note the manner in which the torsion spring (30) is engaged.

21. DISASSEMBLING FIGURE 13 PARTS. Remove Figure 13 mechanism assembly parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. The animated clutch bracket assembly (7) can be freed by removing two screws (1 and 2), lock washers (3), round nut (4), flat washer (5) and adjustment bracket (6). Before disassembling the clutch bracket assembly (7), note carefully the manner in which parts are assembled.

b. Remove retaining ring (8), screws (9) and bearing loading spring (10). Loosen the setscrew (11) in the loop restoring cam (27) and force the bearing (12) from its seat by pressing the camshaft (30) in that direction. With the bearing (12) removed, shift the camshaft (30) to the right until the clutch parts (13 thru 28) can be removed. Be sure to note the manner in which clutch parts are assembled.

22. DISASSEMBLING THE SPROCKET GUARD. Remove Figure 13A parts in their indexed order of disassembly, noting the manner in which the torsion spring (2) is assembled.

23. DISASSEMBLING LENS CARRIER. Remove Figure 14 parts, as necessary, in their indexed order of disassembly. Wrap the pressure plate (7) in tissue paper to prevent damage to the film contact surface.

24. DISASSEMBLING APERTURE PLATE. Remove Figure 15 parts, as necessary, in their indexed order of disassembly. Wrap these parts in tissue paper to prevent damage to the film contacting surfaces.

25. DISASSEMBLING FIRESHUTTER. Remove Figure 16 parts, as necessary, in their indexed order of disassembly. The retaining prongs, or ears, must be carefully straightened to free the heat filter (5).

26. DISASSEMBLING WORM GEAR. Remove Figure 17 parts, as necessary, in their indexed order of disassembly.

27. DISASSEMBLING BLOWER. The two halves of the blower housing (8, Figure 18) are assembled with eyelets (3) which are staked over. If disassembly is necessary, the eyelets must be discarded and new ones used in reassembly. Also note that the bronze bearings (19) in either housing are secured with retaining rings (17).

28. PRE-AMP AND AMPLIFIER REPAIR. Amplifier and pre-amp replacement parts are illustrated and listed in Figures 19 and 20. Check per normal practices, referring to the amplifier schematic wiring diagram for proper resistances, voltages and capacitances.

Reassembly Procedure

29. GENERAL INSTRUCTIONS.

a. When the reassembly procedure includes the staking of rivets or similar parts, all staking and riveting should be done in the early stages of reassembly to avoid damage to other parts. Be sure to support the main casting solidly when riveting or staking.

b. Parts which require lubrication are listed in paragraph 2 (page 1). Lubricate sparingly and wipe away excess lubricant with a clean cloth. Use only the specified Bell & Howell lubricants. During assembly, place a drop of oil in each tapped hole to facilitate screw installation.

c. The following component assemblies require no adjustment and can be reassembled by reversing the disassembly procedure.

Amplifier and Pre-Amp, Figures 19 and 20
Worm Gear Assembly, Figure 17
Fire Shutter Assembly, Figure 16
Aperture Plate Assembly, Figure 15
Lens Carrier Assembly, Figure 14
Sprocket Guard Assembly, Figure 13A
Lamphouse Assembly, Figure 8
Lampholder Assembly, Figure 7

30. REASSEMBLING THE BLOWER (Figure 18). Reassemble the blower in reverse order of disassembly, noting the following special precautions.

a. Insert bearings (19) and nylon washers (20) into housings. Install large washers (18) and press retaining rings (17) in until they snap into the ring grooves.

b. Install collar (13) so that shaft (16) has a barely perceptible amount of end play (0.002 to 0.005 inch).

c. After the blower housings have been assembled with the eyelets, loosen the setscrew (14) through the blower opening and shift the blower wheel (15) until it is accurately centered between the inner surfaces of the housings.

31. REASSEMBLING THE MECHANISM (Figure 13).

a. Press bearing (12) into mechanism housing. Install bearing (29) onto camshaft until it is seated against the shoulder of the shaft. Install retaining ring (28) onto camshaft with convex side of ring away from bearing (29).

b. Assemble the animated clutch bracket parts (7A through 7L). Attach the clutch bracket assembly (7) with screws (1 and 2) and washers (3). Install shuttle

adjustment bracket (6), washer (5) and round nut (4); then press down on bracket assembly (7) with fingers and tighten screws (1 and 2) securely.

c. Assemble bushings (25) into each of the three holes in the worm gear (24). Assemble the bearing assembly (23) to the worm gear so that the ears of the bearing assembly are in line with the notches in the worm gear. Assemble the two shoulder pins (20) into the bearing assembly. Insert ears of clutch yoke (21) through the slots in the bearing assembly, and press the pins (20) in to engage the holes in the clutch yoke ears. Install the spring (22) over the protrusion of the clutch yoke and into hole in bearing assembly. Assemble bearing (18) and trigger (19) to bearing assembly.

d. Apply a light film of grease to bearing hole in the cast arm of the mechanism housing and insert unthreaded end of camshaft through bearing hole. Install cam (27), washer (26) and assembled worm gear parts (step c) over the end of the camshaft. Assemble spring (14) over hub of driven clutch (15), spreading legs of spring so that they straddle the bent ear of the clutch. Insert hub of driver clutch (13) into hub of driven clutch, spreading legs of spring still further until one of the lugs of the driver clutch is straddled. Install washer (17) and assembled clutches onto camshaft. The driver clutch must fit over the flats of the camshaft in such a manner that the bent ear of the driven clutch is parallel with the flat for the loop restorer cam (27).

e. Insert free end of camshaft into bearing (12) and press camshaft in place until bearing (29) is seated. Install the two retaining rings (16). Check to make certain that the actuating ear of the clutch yoke (21) extends past the inside edge of the strike (7K). Adjust by bending this ear as necessary.

f. Secure bearing loading spring (10) with screws (9). Install large retaining ring (8) over camshaft and into groove in housing. The convex side of the retaining ring must be against the bearing.

g. Insert a 0.15 feeler gage between the loop restoring cam (27) and the cast arm of the mechanism housing. Press against cam to hold feeler gage against cast arm, and tighten the setscrew (11) against flat in camshaft. Remove the feeler gage. Screw the rewind adjustment stud (33) down into place so that the top of the stud is approximately 1/16 inch below the surface of the housing.

32. REASSEMBLING THE MECHANISM (Figure 12).

a. Assemble bearing support (23) to the shuttle arm plate (26) so that the nylon pads face one another.

Thread in the support to the full length of its thread. Install the framer knob and shaft (27) so that prongs of shuttle arm plate framing arm can be engaged with groove in framer shaft. Secure plate (26) to cast arm of mechanism housing with screws (24).

b. Assemble the in-out cam (21) to the in-out bracket assembly (22) so that the nylon pad of the cam follower (22A) will ride against the polished surface of the cam. Install this assembled group over the end of the camshaft and fasten the bracket assembly to the mechanism housing with two screws (19) and washers (20).

c. At this point, refer to Figure 11 and install aperture plate (62) with screws (61). Adjust aperture plate as instructed in paragraph 43, step a. Then return to Figure 12 and continue with the reassembly procedure.

d. Check the ball and stud assemblies (12) to make certain that the locking hex nuts (11) are tightened. Press the link bearings (17A) into notches at the front of each shuttle arm. Assemble cam followers (17B) burr side down, into the notched center section of each shuttle arm (17). Insert front end of upper shuttle arm between the two phenolic guide shoes of the bracket assembly (22) until the ball of item (12) rests in the socket of the nylon pad on the shuttle arm plate. Hold temporarily in place with a rubber band. Hang the shuttle (16) in the slot of the shuttle arm so that the shuttle teeth extend through the slot in the aperture plate and back toward the camshaft.

e. Insert front end of lower shuttle arm between the two phenolic guide shoes of the bracket assembly (22). Engage the slot of the arm with the shuttle (16) and rest the ball of item (12) in the socket of the nylon pad on the shuttle arm plate. Position the in-out cam (21) so that the tongue on the unpolished side of the cam rests in the slot in the shoulder of the camshaft. Install pull-down cam (18) onto camshaft so that the cam notch fits over the protrusion of the in-out cam (21). Temporarily install the shutter nut (7). Tighten the bearing support (23) just enough to hold all parts securely in place. Then remove the rubber band from around the shuttle arm, and install the felt wiper (14). Insert cam wiper wick (15) into extension spring (13) and assemble spring to shuttle arms.

NOTE

At this point, adjust the shuttle as instructed in paragraph 44 and the clutch as instructed in paragraph 46, steps a and b.

f. Remove shutter nut (7). Install fiber washer (10) over camshaft and up against the pull-down cam so that the slot in the washer is aligned with the slot in the cam. Assemble the shutter (9) to the camshaft and install counterbalance weight (8) so that pin of weight enters the slots in shutter and pull-down cam. Install nut (7) so that its shoulder enters center hole in weight (8) and tighten nut securely, holding the end of the camshaft with an open-end wrench.

g. Assemble grommets (34) into bracket (33). Install retaining ring (28) into groove nearest the end of the

shaft (29), and assemble the bracket (37), stop pawl (31) and remaining retaining ring (28) onto the shaft. Attach clutch stop (36) and bracket (37) loosely to the cast arm of mechanism housing with screws (35). Install torsion spring (30) and mounting bracket (33) to shaft. The spring must be hooked to the stop pawl (31) and bracket (33) in such a manner that the stop pawl will be spring-loaded against the clutch stop. Secure the bracket (33) with screws (32). Loosen screws (35) slightly and adjust the clutch stop (36) to obtain 0.010-inch clearance between the stop pawl (31) and the trigger (19, Figure 13). It may be necessary to rotate the worm gear until the trigger is positioned below the stop pawl.

h. Slip the rounded end of the heat baffle (6) under the shutter and secure the baffle with screws (3) and washers (3A). Install pulley (2) on camshaft and tighten setscrews (1). Secure the fire shutter assembly (5) with two screws (3). Special screw (4) is the lower supporting post for the condenser lens assembly (item 3, Figure 2). Install this screw. Then refer to Figure 13 and install the screw (34), holder (35), washer (36) and spring (37) that make up the upper supporting post.

33. REASSEMBLING THE MECHANISM (Figure 11).

a. Install lens stop screw (67) into the housing casting until only one thread is visible. Attach lens carrier catch (65) and spacer washer (66) to casting with screw (63) and lock washer (64). The stop screw and catch will be adjusted after lens carrier is installed.

b. Secure the connecting link (60) and shuttle retractor (59) to the casting with screw (56) and washers (57 and 58).

c. Attach self-centering assembly (55) to rear of casting with screws (52) and washers (53 and 54). Assemble lever and shaft assembly (51) to casting and install washer (42) and arm assembly (50) on shaft. Tighten screw (49).

d. Assemble cam follower parts (48) and fasten to the arm assembly (50) with screw (45) and washers (46 and 47). Attach spring (44) to casting and hook loose end of spring into hole in cam follower support (48E).

e. Assemble upper loop form shaft (68) to casting and install washer (42) and upper loop form (41); tighten setscrews (35). Install upper sprocket guard plate (40). Assemble lower loop form (38) so that loop form shaft passes through guard plate and casting while upper stud of connecting link passes through holes in upper loop form. Install retaining ring (37) on connecting link stud and the threading lever (36) on end of loop form shaft. Secure the threading lever with setscrew (35). Install spring (34) so that it supplies return tension to shaft (38).

f. Assemble toggle lever (31) to lower sprocket guard plate (28) with retaining ring (30). Fasten guard plate to casting with screws (27). Install upper film guide (29), large washer (25), lower film guide

(26) and a second large washer (25) over lower bearing protruding through sprocket guard plate (28). Note that the lower stud of the connecting link (60) must pass through a hole in the left ear of the lower film guide. Spring (15) and lower loop form (14) are then installed on this stud and secured with retaining ring (13). Legs of spring (15) must be positioned to apply proper tension to lower loop form. Install large retaining ring (24). Fasten backup bracket (23) to sprocket guard plate.

g. Attach auto-thread locking lever (21) and eccentric pivot (20) to casting with screw (19). Attach release spring (18) and bushing (17) to casting just above and to the left of lever (21), hooking long leg of spring behind rear edge of lever. Install film exit guide (12) with screw (11). Install bracket and handle assembly (8) and spring (9) with retaining ring (7). Install all rollers.

34. ASSEMBLING THE MECHANISM (Figure 10).

a. Assemble two retaining rings (9) to belt shift crank (11), and insert long end of crank into opening in housing. Install end of spring (10) with the least amount of coils over end of crank and the opposite end over the spring anchor post. The large center coil of the spring must project toward the rear edge of the housing. Secure the spring to the crank and anchor post with two more retaining rings (9).

b. Install thrust washer (44) over shaft of upper sprocket assembly (41) and insert sprocket shaft through bearing hole in housing until shaft protrudes about 1/8 inch from rear of housing. Install tension washer (40) and sprocket gear (39), aligning either setscrew (38) with flat on sprocket shaft. Carefully mesh the sprocket gear with the worm gear (24, Fig. 13); then slide the shaft through the sprocket gear until the sprocket rests against the bearing in the housing. Tighten both setscrews (38). Install the take-up drive sprocket (31) on sprocket shaft, and tighten setscrews (30).

c. Install rewind button (22) and spring (23). Depress the button while assembling the rewind clutch lever (21) to the mechanism. The small forked end engages a groove in the button shaft; the large forked end encircles the sprocket shaft. Install the spline driver (29) on the sprocket shaft with the spline fitting through the forked end of the clutch lever and meshing with the drive sprocket (31). Install spring (28), washer (27), retaining rings (25) and rewind drive sprocket (26). Install the timing belt (24) over the rewind drive sprocket (26). Assemble the outboard bearing assembly (20) onto the sprocket shaft and install clutch lever shaft (19) and retaining rings (18). Secure the outboard bearing assembly to the mechanism housing with three screws (16) and washers (17).

d. Refer to Figure 13 and turn the rewind adjusting stud (33) in or out to obtain 0.010-inch clearance between the rewind clutch lever (21, Figure 10) and the spline driver (29, Figure 10). Then tighten the setscrew (32, Figure 13) securely against the adjusting stud. Remove the paper backing from new rewind nameplate (31, Figure 13) and press nameplate in place.

e. Assemble flange (43) and thrust washer (44) onto lower sprocket assembly (42) and insert sprocket shaft through bearings in mechanism housing. Install tension washer (40) and sprocket gear (39) onto shaft, meshing teeth of sprocket gear with worm gear. Tighten setscrews (38) securely so that sprocket shaft turns freely but without noticeable end play.

f. Assemble sprocket guards (35), rollers (36) and torsion springs (37) to mechanism with screws (34). Springs must be assembled so that tension tends to hold them in the open position. Attach sprocket guard assembly (33) with three screws (32) inserted from rear of mechanism plate. Install actuating assembly (13) on protruding loop form shaft (68, Fig. 11) with retaining ring (12, Fig. 10). Attach hood (15) with screws (14). Install speed change knob (7) onto belt shift crank (11), and hold knob against the mechanism housing while tightening setscrew (6). Hold the knob firmly and push spring (10) toward the sprocket gear; then hold spring in this position and switch the knob to the SILENT setting.

g. Hold the lens carrier (5) between the hinge bosses of the mechanism housing. Insert washers (4 and 3) between the lens carrier hinge ears and mechanism housing hinge bosses and press hinge pins (1 and 2) into place. The lens carrier catch installed in paragraph 33, step a, must be adjusted as necessary to permit the lens carrier to be opened freely; yet must hold carrier firmly against the stop screw (15, Figure 11) in the closed position.

35. REASSEMBLING THE SOUND HEAD (Figure 9). Reassemble sound head parts in reverse order of disassembly, noting the following special precautions.

a. Apply a light film of oil to all roller shafts before installing rollers. Do not over-lubricate.

b. Assemble photocell (22), retainer (21) and sound drum shaft (20) loosely before inserting shaft into sound head housing. Setscrew (18) bears against the retainer (21), while two setscrews (19) secure the sound drum shaft.

c. Refer to paragraph 49 for all sound head adjustments to be performed.

36. REASSEMBLING REAR REEL ARM (Figure 6). Reassemble rear reel arm parts in reverse order of disassembly, noting the following special precautions.

a. Make certain that all gear teeth are meshing properly (without binding, but with no obvious looseness).

b. Lubricate all gear teeth sparingly with grease, and check gear action before installing reel arm cover (8).

c. Use shims (part no. 34874) as required to prevent the cover from "dimpling".

37. REASSEMBLING FRONT REEL ARM (Figure 5). Reassemble front reel arm parts in reverse order of disassembly, noting the following special precautions.

a. Make certain that all gear teeth are meshing properly (without binding, but with no obvious looseness).

b. Lubricate gear teeth sparingly with grease, and check gear action and clutching action before installing reel arm cover (3).

c. Use shims (3A) as required to prevent the cover from "dimpling".

38. REASSEMBLING THE PROJECTOR (Figure 4). Reassemble Figure 4 parts in reverse order of disassembly, except as noted in the following special precautions.

a. All wiring connections are to be made in accordance with Figure 24 in the Parts Catalog.

b. After tilt mechanism (20) is installed, rotate knob (14) to retract tilt bar (17) up against base.

c. Do not tighten blower screws (5) until rear mechanism plate parts are assembled and blower pulley can be aligned with motor pulley.

39. REASSEMBLING THE PROJECTOR (Figure 3). Reassemble Figure 3 parts in reverse order of disassembly, noting the following special precautions.

a. Slip one ear of bracket (37) onto belt shifter (42). Position the stop (46) between ears of bracket (37) so that setscrew (45) is accessible through center hole in bracket. Assemble stop and bracket onto belt shifter. Then assemble bar bracket (44) to belt shifter and tighten setscrew (43) enough to hold. Insert spring (38) between the stop (46) and stop bracket (37), aligning holes in spring and bracket. Temporarily put this assembly aside until the assembled mechanism (50, Figure 2) has been installed (step b, following).

b. Refer to Figure 2. Fasten the mechanism assembly (50) in place with screws (48) and washers (49). The lower right screw (toward rear of main plate) also secures the ground lead of the blower assembly.

c. Refer to Figure 3. Position the bar bracket (44) over the belt shift crank of the mechanism assembly. Attach the assembled shift lever parts to mechanism assembly with two screws (36). Do not install reel arm lock plunger parts (items 31 through 34) until the reel arms have been installed.

d. After installing motor mounting brackets (52), and spring (39A), assemble pulley (48) to motor shaft with setscrews (47). Install belt (41) over small diameter of mechanism assembly pulley and thread free loop of belt through belt shifter (42). Engage other end of belt with motor pulley (48). Hook large belt (35) between motor and blower pulleys and install the motor, positioning the grooves of the motor cushion supports (40B) in the brackets (52). Then install motor bracket straps (39).

e. Install idler assemblies (29 and 30), but do not tighten the attaching screws at this time.

f. When assembling clutch solenoid (5), install one collar (2), tapered end up, onto clutch rod. Insert rod through the stop pawl (31, Figure 12) before securing solenoid with screws (4) and washers (4A). Assemble spring (3) and remaining collar (2), tapered end down, onto rod. Set lower collar so that the solenoid plunger protrudes approximately 3/16 inch from solenoid and tighten setscrew (1). Adjust upper collar so that distance from top of upper collar to bottom of lower collar is approximately 7/8 inch, and tighten setscrew (1).

40. REASSEMBLING THE PROJECTOR (Figure 2). Reassemble Figure 2 parts in reverse order of disassembly, noting the following special precautions.

a. All wiring connections are as illustrated in Figure 24 in the Parts Catalog.

b. The end of the grounding spring (39) must apply tension to the end of the sound drum shaft. Bend spring if necessary.

c. Screw snubber mounting post (36) securely into main plate casting and install snubber roller parts (28 through 35). Assemble roller (27) and film guide (25) to mounting post with screw (23). Attach spacer (26) and front end of film guide (25) to main plate with stud (24).

d. After installing pilot light bracket (22) and lamphouse assembly (19), adjust the pilot light bracket so that the contour of the lamphouse matches with the mechanism housing and the lamphouse opens and closes without binding. If necessary, adjust the lamphouse latch (Figure 8) so that the lamphouse is held securely against the projector main plate.

e. Install knobs (11) so that there is approximately 1/32-inch clearance between knob and nameplate.

f. Perform the optical alignment procedure outlined in paragraph 43.

41. REASSEMBLING THE PROJECTOR (Figure 1). Reassemble Figure 1 parts in reverse order of disassembly, noting the following special precautions.

a. Assemble washer (44) over spline of each reel arm, and install reel arms to main plate. Install black lock disk (41) over spline of front reel arm so that notch in outer circle of disc is at approximately 10 o'clock position (when viewing rear of main plate). Install nickel-plated lock disc (41A) over spline of rear reel arm so that the smallest notch is centered at the 3 o'clock position. Install collars (40) over reel arm bearings and tighten setscrews (39).

b. Assemble reverse take-up sprocket (36) and washers (37 and 38) onto front reel arm shaft. Install retainer (35), formed legs out, over reel arm shaft and into counterbore of sprocket. Assemble clutch cam (34) against retainer so that the three notches in the cam straddle the three legs of the retainer. The shallow end of the notches must point in a counterclockwise direction. Rotate cam counterclockwise against legs of retainer and insert a steel ball (33)

between each of the three pairs of legs on the re-tainer. Insert spring (32) into the radial slot of the cam so that the spring tends to rotate the cam in a clockwise direction. Install rewind sprocket (30) and collar (29) onto reel arm shaft so that tongue of collar enters groove of sprocket. Insert a 0.003 inch shim stock between washers (38 and 37). Press all parts together and tighten setscrews (28). Remove shim stock.

c. Assemble rear reel arm parts in a manner similar to the front reel arm parts (step b) except that the shallow end of the notches in cam (24) should point in a clockwise direction and the spring (22) must be installed so that it tends to rotate the cam in a counter-clockwise direction.

d. Refer to Figure 3. Install reel arm lock plungers (34), springs (33) and brackets (32) with screws (31). The narrow portion of each lock plunger bar must rest on the flange of the reel arm lock discs. The groove in each bracket (32) must straddle the narrow portion of the bar.

e. Install timing belt over small sprocket of mechanism assembly, around large sprocket of front reel arm, and around reel arm sprocket. Adjust roller tension as instructed in paragraph 50.

f. Perform all necessary adjustments and alignments as directed in the Adjustment section.

g. Touch up chipped paint spots where necessary.

Adjustments

WARNING

Many of the procedures listed in this section require operation with rear cover removed and protective switch defeated. To avoid shock hazards, disconnect power and discharge motor starting capacitor, when not required. Use of an isolation transformer is recommended.

42. INTRODUCTION.

The adjustments listed in this section are those which either require special tools, are of such nature as to require tolerances or sequential adjustments not readily determinable by inspection or which differ radically from service procedures applicable to prior Filmosound designs. Routine adjustments such as those applicable to sliding fits, bearing clearances and end-play (within normal shop practices) have not been listed. All special tools required to perform adjustment procedures are illustrated in Figure A.

43. OPTICAL ALIGNMENT (See Fig. B) (Proceed in sequence listed).

a. **APERTURE PLATE.** Remove projection lens, condensing lens, projection lamp and pressure shoe assembly. Turn mechanism until shutter is opened. Loosen two screws (61, Figure 11) enough to permit free movement of aperture plate. Tip projector over on its back, open lens mount and insert aperture plug (SER-550-2-N3) into aperture opening. Close lens mount and insert lens plug (SER-550-2-N1) into lens mount. Insert alignment rod (SER-550-2-N2) into hole in lens plug. Lower rod carefully and shift aperture plate as required until rod enters hole in aperture plug. Tighten aperture plate retaining screws securely.

b. **CONDENSING LENS ASSEMBLY.** Withdraw alignment rod, if necessary, so that end of rod will not interfere with installation of condenser plug. Install condenser plug (SER-500-2-N4) on condensing lens holder mounting screws. Carefully push alignment rod through hole in condenser plug. If rod strikes top or bottom of hole, tighten or loosen screw (34, Fig. 13) as required, to bring plug into alignment with rod. **NOTE:** Due to overhung suspension, plug may shift slightly from side to side as rod is inserted. This is not of any importance.

c. **LAMP SOCKET.** Tip projector forward onto its base. Loosen two screws (4, Fig. 2) which hold lampholder assembly to main frame. Insert lamp plug (SER-550-2-N5) into projection lamp socket and rotate plug until hole lines up with alignment rod. Push rod through hole in plug. Place thumb under lamp socket mounting casting and second finger on

top of lamp plug. Push mounting upward until socket bears evenly against base of plug. Slide complete holder assembly forward along rod until lamp plug comes in contact with condenser plug. Insert screwdriver through slot in lamp plug and tighten lampholder retaining screw until resistance is noted. Remove screwdriver and tighten retaining screw at rear of lampholder; then tighten screw which is accessible through slot in lamp plug.

d. **FINAL CHECK.** Slide alignment rod back and forth in alignment plugs. Since rod is a lapped fit in holes, light resistance should be felt. Make sure that lamp plug does not rise in socket. If rod binds, determine point of binding and relocate the mis-aligned part. Tip projector over on its back and remove the alignment rod with plugs. Be careful not to lose aperture plug. Install pressure shoe assembly and visually center in aperture plate before tightening retaining screws.

44. INTERMITTENT ADJUSTMENTS (See Fig. 12.)

a. **SHUTTLE TOOTH SIDE CLEARANCE.** When shuttle is at center of stroke, clearance between sides of shuttle teeth and edge of shuttle slot in aperture plate should be approximately 0.009 in. Use a feeler gage. If clearance varies from top to bottom of shuttle and is less than 0.005 in. at either end, aperture plate is probably out of alignment (see para. 43a). Slide clearance is related to stroke; therefore, make sure that stroke is correct (see para. 44d) if clearance is inadequate. If stroke is correct, but clearance is inadequate, it is probable that a link bearing (17A, Fig. 12) is missing. It is possible though not

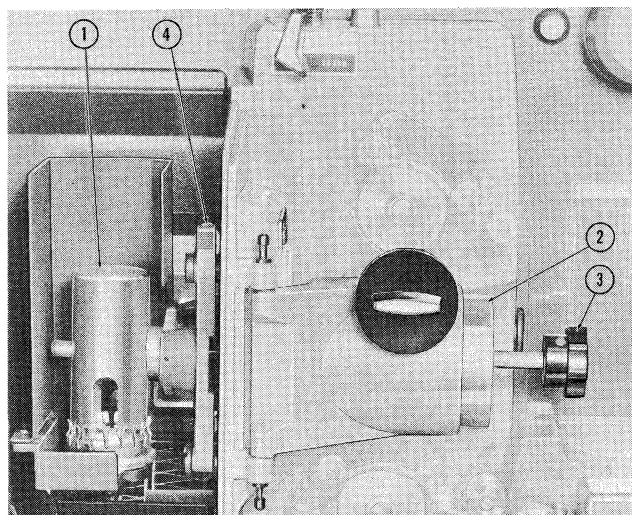


Figure B. Optical Alignment Adjustment

very probable that a ball and stud assembly (12) could have slipped on a shuttle arm (17).

b. **SHUTTLE TOOTH PROTRUSION.** If transport mechanism has been removed from main frame, turn mechanism drive pulley until shuttle is near mid-stroke and notched hole in shutter blade (9) is aligned with access hole in fire shutter mounting plate (5). If transport is assembled to main frame, remove condenser assembly, lampholder assembly (5, Fig. 2), and pulley shield (7, Fig. 2). Access hole in fire shutter mounting plate can now be reached through lamphouse. After turning drive pulley to align notched hole in shutter with access hole, insert short end of #4 Bristo Wrench and engage in-out cam follower screw. Open film gate and check shuttle tooth protrusion with height gage (SER-550-6-N1). If "NO-GO" step passes over shuttle tooth, turn cam follower screw counter-clockwise to increase protrusion. If "GO" step will not pass over tooth, turn follower screw clockwise to decrease protrusion.

c. **FIT OF SHUTTLE TO PULL-DOWN CAM.** Remove blower belt and projection lamp. Insert wrench in screw in top shuttle arm pivot. Run projector at sound speed, without film, and tighten screw just enough to stop tapping noise produced by cam shoes on pull down cam, then tighten screw $1/8$ to $1/4$ turn. If in doubt about source of noise, loosen screw until shuttle hammer is pronounced, then tighten down to reduce this noise. After making adjustment, disconnect projector from power source, discharge motor starting capacitor and disengage drive belt. Turn drive pulley by hand through one complete revolution. Load will normally increase slightly as stroke starts. If shuttle is tight during stroke but loose and noisy during backstroke, check for missing shuttle link bearing (17A).

CAUTION

Do not tighten shuttle more than is specified to remove cam noise. Excessive tightening of shuttle in an attempt to load mechanism for the purpose of reducing other noises will reduce life of cam and cam shoes.

d. **SHUTTLE STROKE.** Normal shuttle stroke (vertical travel of shuttle teeth) is 0.3025 in. The most convenient means of measuring the stroke is to use the projector as an optical comparitor. The step on stroke gage (SER-550-5-N2) is the length of the nominal stroke. When it is inserted in the aperture and projected, it provides a reference dimension with which the actual stroke can be compared. Figure C is a sketch of a target. The A to B section is a 100 to 1 enlargement of the gage. The C and D lines represent 100 to 1 enlargements of the limits of tolerance.

(1) PROCEDURE FOR MEASURING SHUTTLE STROKE.

- (a) Remove pressure shoe assembly, condensing lens assembly and drive belt.

- (b) Reinstall blower belt and set framer at mid-point.
- (c) Suspend target approximately 18 ft. from the projector with center of target on same horizontal line as optical axes of projector. If room arrangement necessitates tilting projector, target must also be tilted so that angle between target and optical axis is 90 degrees. If this is not done, "Keystone" error will be produced.
- (d) Turn projector mechanism by hand until shuttle is at bottom of stroke and shutter just clears aperture.
- (e) Insert stroke gage (SER-550-5-N2) in aperture plate and push down against top tooth of the claw. Close film gate.
- (f) Turn on projector lamp and focus shuttle slot on target. Move projector toward or away from target until sharply focused image of step at end of stroke gage just reaches from line A to line B (Fig. C).
- (g) Slide gage up out of field of view and turn mechanism pulley until center tooth of shuttle is at top of stroke as indicated by image of tooth near line A. Adjust framer, if required, until projected image of edge of tooth just touches line A.
- (h) Turn mechanism pulley until center tooth of shuttle reappears at top of target. Rock mechanism pulley to find top of shuttle stroke. Edge of tooth used as reference in step (g) must fall between lines C and D (Fig. C). If image falls between C and A, stroke is too short. If image falls beyond D, stroke is too long.

(2) PROCEDURE FOR ADJUSTING SHUTTLE STROKE.

Loosen two screws (24, Fig. 12) just enough to permit movement of the shuttle arm plate (25).

- (a) To lengthen the stroke, move shuttle arm plate (25, Fig. 12) toward pull-down cam.
- (b) To shorten the stroke, move shuttle arm plate assembly away from pull-down cam.
- (c) After adjusting stroke, recheck shuttle tooth side clearance as instructed in paragraph 44a, and readjust if necessary.

CAUTION

Do not attempt to eliminate film slap by setting stroke outside established tolerances. This will produce double image and/or jump with films having different shrink or stretch.

e. **FRAMING ADJUSTMENT.** Thread projector with film having proper frame line position. Project film

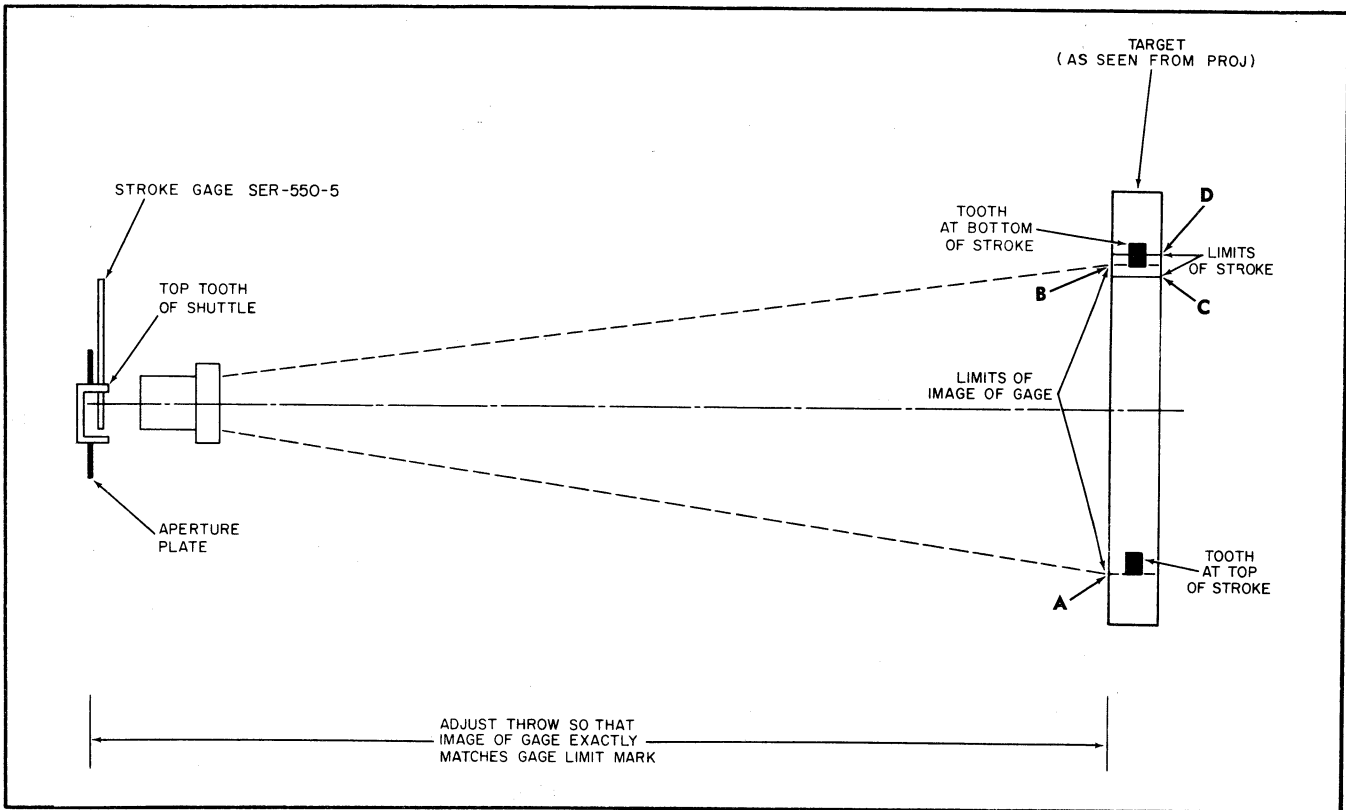


Figure C. Checking and Adjusting Shuttle Stroke

and turn framing knob from one limit to the other. If at one limit a frameline is not visible, loosen nut on framing eccentric (located at top of shuttle arm plate assembly (25, Fig. 12)) and turn eccentric until the frame line appears. Hold eccentric while tightening nut. Check adjustment by again turning framing knob from limit to limit while observing picture. When eccentric is properly adjusted, either frame line can be projected and movement of film should be approximately equal at top and bottom of framer travel.

45. LENS MOUNT ADJUSTMENT. Angular relationship between projection lens mount and aperture plate is controlled by lens mount stop screw (67, Fig. 11). Thread projector with roll title or target film having sharp images in corners and project a picture approximately 30 in. high onto a matte surface. NOTE: Projector must be square with screen. Focus the picture and compare resolution of the two sides of the image when viewed from a distance of approximately twice the width of the picture. If one side appears to be soft, refocus to sharpen that edge of the picture and note whether the lens is moved toward or away from the aperture. For example, if image at right hand edge of screen is soft until lens is moved toward aperture, then lens stop screw is set too far forward and should be turned clockwise.

CAUTION

This adjustment is critical. Lens stop screw should be turned only a few degrees between tests for sharpness.

46. ANIMATION CLUTCH ADJUSTMENTS.

a. CLEARANCE BETWEEN STOP PAWL AND TRIGGER. Correct clearance between the stop pawl (31, Fig. 12) and trigger (19, Fig. 13) is 0.010 to 0.015 in. Adjust by loosening screws (35, Fig. 12) and moving stop (36, Fig. 12) up or down, as required, to establish correct clearance.

b. SHUTTLE RETRACTION (Fig. 13). Depress stop pawl and turn mechanism by hand until clutch latches. Check to make sure that clutch stop engages stop retainer on rear end of retainer by approximately 0.040 in.

- (1) Loosen Allen nut (4) at upper rear corner of slide bar, and slide bracket (6) toward shuttle until shuttle teeth are retracted below level of aperture rails. Tighten nut.
- (2) Adjust setscrew (7A) at front end of slide bar bracket so that slide bar assembly (7G) clears end of setscrew by 0.080 to 0.082 in.
- (3) Turn mechanism manually until clutch engages and clutch yoke (21) is in line with strike (7K). Loosen screw (7H) and move strike (7K) until clearance between yoke and strike is 0.040 in.
- (4) Loosen screw in adjusting bracket (6). Insert 0.040 in. feeler gage between bracket and the ear on the clutch yoke (21). Push bracket against gage and tighten retaining screw.

c. **SOLENOID LINKAGE** (See Fig. 3). Loosen setscrews (1) so that collars (2) slide freely on link of solenoid (5). With clutch stop pawl disengaged, lift solenoid plunger by means of link until top of plunger extends approximately $\frac{3}{16}$ in. out of top of solenoid frame. Slip lower collar up against bottom of stop pawl and tighten setscrew. Hold lower collar against bottom of stop pawl and depress upper collar just enough to provide sufficient compression of spring (3) to prevent rattling. Tighten the setscrew in the upper collar. Start projector and check operation of clutch. If solenoid is sluggish in pull-in, plunger is set too high. If solenoid produces buzzing noise, plunger is either set too high or spring (3) is compressed too much. If plunger seats and stop pawl is not fully engaged, the plunger is set too low or spring (3) is not sufficiently compressed.

47. FIRE SHUTTER ADJUSTMENTS (See Fig. 3).

a. **LINKAGE CLEARANCE.** Turn mechanism pulley until one blade of interrupter shutter is adjacent to fire shutter rod (10). Check that rod clears interrupter shutter by least $\frac{3}{32}$ in. If clearance is less than $\frac{3}{32}$ in., remove solenoid (12) and loosen two bracket retaining screws (13). Shift bracket to provide minimum link clearance of $\frac{3}{32}$ in.; then tighten retaining screws securely.

b. **ALIGNMENT.** Open film gate and turn mechanism pulley until interrupter shutter clears aperture. Loosen two screws (11) which secure solenoid (12) to bracket (14). Place thumb of right hand against outer end of solenoid frame and index finger on clevis at end of solenoid plunger. NOTE: Be sure to press on clevis; not on the linkage. Press solenoid against plunger. While looking straight into the aperture, position solenoid so that fire shutter covers aperture; then tighten screw (11) at outer end of solenoid bracket enough to hold solenoid in place. Release solenoid plunger and trip rocker arm several times to make sure that plunger slides freely in solenoid. Tip solenoid if necessary to free plunger, then tighten both retaining screws (11) securely.

48. **REWIND CLUTCH ADJUSTMENT** (See Fig. 1). The rewind clutch should be adjusted to produce a supply spindle torque of 5-1/2 to 6 in-oz. when rewind button is depressed. Use standard reel and spring balance method of measuring torque. Clutch is adjusted by means of hex nut on outer end of clutch (30). Tighten nut to increase torque. Loosen to decrease torque.

49. SOUND HEAD ADJUSTMENTS.

a. **REMOVAL.** Due to the ease with which the head can be removed and the greater accessibility thereby obtained, time will be saved by removing the head if major work is required.

- (1) Remove the projection lens from the projector. Note that the rear lens element is held in

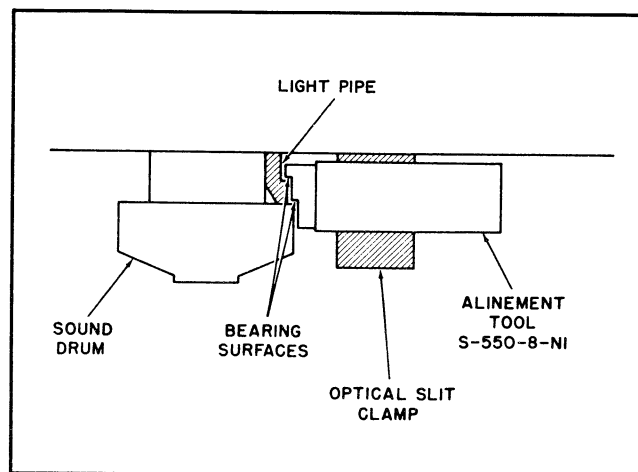


Figure D. Photocell Adjustment

place with a retaining ring and can be replaced if necessary. Wrap lens in tissue paper.

- (2) Disconnect photocell and exciter lamp cable from amplifier and release cables from retaining clips.
- (3) Remove grounding spring (39, Fig. 2). Insert the end of an Allen wrench or short steel pin in hole in sound drum bearing housing directly behind flywheel until wrench or pin drops through hole in sound drum shaft. Remove flywheel retaining nut (40, Fig. 2), flywheel, (41) and washer (42).
- (4) With a sharp pencil, draw a line on the main frame where the front edge of the soundhead meets the frame. This will provide a reference mark when reassembling.
- (5) Take out the three screws (43 and 44, Figure 2) which tap into the sound head from the rear of the main frame, and carefully withdraw the sound head.

b. PHOTOCELL ALIGNMENT (Figure 9).

- (1) The light pipe must be positioned under the edge of the sound drum so that the full length of the beam falls on the photocell. Loosen setscrews (18 and 19).
- (2) Remove exciter lamp (8), loosen clamping screw (10) and withdraw optical slit (11). Insert alignment tool (SER-550-8-NI) into optical slit hole in casting as shown in Figure D. Note the proper position of photocell and sound drum as determined by the alignment tool. When alignment has been made, tighten setscrews (18 and 19) securely. Remove tool and re-install optical slit (11). The optical slit must be adjusted as outlined in step d, following.

c. TENSION ROLLERS (See Fig. 9). Arms upon which

rollers (26 and 27) are mounted are linked by torsion spring (34). Therefore, roller arms move as a pair. Counterbalance spring (28) offsets the weight of the rollers and arms. Place soundhead on a level surface and move roller arms (as a set) to various positions. If spring tension is incorrect, roller arms will not remain in the position in which placed. If roller arms swing downward, loosen retaining screw for anchor (30) and move anchor downward until weight of arms is counterbalanced. If roller arms move upward, move anchor upward to reduce counterbalancing force.

d. OPTICAL SLIT ASSEMBLY (See Fig. 9).

- (1) Loosen clamping screw (10). If slit does not slide freely in holder, insert bit of small screwdriver in slot in clamp and wedge clamp open to free slit assembly. Thread projector with 7000 CPS optical setting film and connect 16-ohm, 10-watt load resistor and output meter to speaker jack.

NOTE

A pair of hairpin tongs approximately 6 in. long and formed with the ends turned inward and tapered to engage holes in end of slit barrel are very useful in adjusting the slit. They can be made from 20 to 26 gage music wire or 1/16 in. diameter drill rod.

- (2) Set volume control at approximately 12 o'clock position and start projector. Move slit toward or away from film, as required, to obtain output reading. Rotate slit to obtain peak reading and simultaneously move in or out until maximum output is obtained. If film was threaded with emulsion toward slit, move slit toward film until output drops 1-1/2 to 2DB. If emulsion is toward sound drum, move slit away from film to obtain 1-1/2 to 2DB drop in output. Tighten slit clamping screw.

e. BUZZ TRACK ADJUSTMENT (See Fig. 9). Lateral position of the film in the sound head is controlled by the flanged roller (26) and edge guide screw (23). Unless the adjustment has been disturbed, it is not probable that the edge guide screw (23) will require resetting. Thread the projector with buzz track film and adjust volume control to a suitable listening level. Turn adjusting screw (13) to move flanged roller laterally.

NOTE

There are two type of buzz track in use. On one, the track spacing exceeds the length of the scanning beam. This track can be positioned so that little or no signal is reproduced. On the other type of track, spacing is less than the length of the beam. This track should be positioned so that both tones are reproduced at approximately the same volume level. If, after adjustment of guide roller position, signal levels cannot be balanced (or eliminated on

wide track), or level of tones fluctuates, adjust edge guide screw (23) to clear up the condition. If the edge guide screw is far out of adjustment, turn it clockwise until it clears edge of film, adjust rollers and then set guide screw to stop side weave of film.

50. TIMING BELT IDLER ADJUSTMENT. Belt tension is not critical, although excessive tension will reduce belt life. Set rewind belt idler so that midpoint of slack side of belt can be pushed inward approximately 1/8 in. by light pressure. Set take-up belt idler so that belt can be pushed down against motor relay mounting bracket by light pressure.

51. PROJECTOR SPEED CHECKS. Speed of the projector is not adjustable. Therefore, speed checks are primarily for the purpose of determining that the equipment is operating properly and as a means of detecting excessive mechanism loads, damaged drive belt or similar conditions.

a. METHODS OF MEASUREMENT. Various devices and procedures can be used to check projector speed. The most common ones are as follows:

- (1) PHOTOCCELL AND FREQUENCY METER. Used to measure the number of pulsations of the projection beam per second. Pulsations per second is then converted to projector speed. This method is quite practical in large volume shops.
- (2) "STROBOTAC" or similar strobe light. Usually synchronized with interrupter shutter or shuttle. Shutter makes one revolution per frame. Shuttle makes one stroke per frame.
- (3) TACHOMETER (preferably having a speed range with a maximum speed of 150-200 RPM). Used to measure RPM of sprocket.
- (4) STROBE DISC. Attached to sprocket by means of suction cup or rubber foot. For viewing with light from 60 CPS source, disc should have 70 dots for sound speed, 93 dots for silent speed. Count number of apparent revolutions of pattern for one minute. If pattern drifts in direction of rotation, add to design speed to obtain true speed. If pattern drifts against rotation, subtract from design speed to obtain true speed.
- (5) TIMED LOOP. Make loop of exactly 120 frames. At sound speed splice will pass aperture 12 times per minute plus or minus the permissible variation in speed and the timing error.

b. SPEEDS AT 120 VOLTS 60 CPS AC.

- (1) SOUND SPEED (24 FPS $\pm$ 2%).
Shutter - 1440 RPM $\pm$ 2%
Sprocket - 102.86 RPM $\pm$ 2%
- (2) SILENT SPEED (18 FPS $\pm$ 5%).
Shutter - 1080 RPM $\pm$ 5%
Sprocket - 77.1 RPM $\pm$ 5%

52. AUTO-LOAD SYSTEM ADJUSTMENTS — GENERAL.

a. The auto-load system consists of a series of guides and rollers which, when the system is in the load position, are so located as to guide the film through the threading path. When the system is in the open position, the guides and rollers clear the film path.

b. When the system is on the open position, the location of the guiding parts is not critical. Therefore, adjustments to assure proper location of the guiding parts are made with the system in the load position.

c. The guides are connected by mechanical linkage. The system is actuated by a cocking lever at the lower end of the linkage and the movement is stopped at the top end of the linkage. The specified clearances must be checked with the system in the load position. If the need for adjustments is detected, it is important that the repairman proceeds in the sequence listed in this section. The sprocket timing and the locating of the soundhead may be done without disturbing the guide adjustments.

53. CHECKING AND ADJUSTING THE LOADING GUIDES.

a. Open the film gate and the upper take-up sprocket shoe (1, Fig. E) and remove the retaining screw (2).

b. Place timing plate (SER-552-1-N1) over sprocket hubs (3 and 4). The timing plate locating pin should enter the counterbore from which screw (2) was removed. If the locating pin does not enter counterbore, loosen three sprocket guard plate attaching screws (1, Fig. F) and rotate the lower guard plate (2) until pin enters hole. Then tighten the three screws securely.

c. Remove retaining ring that secures the actuating assembly (5, Fig. E) and lock the auto-load system. Place a 0.015 inch feeler gage between the film support rails of the aperture plate and the rear surface of the lower loop form assembly (4, Fig. F). This surface should touch the feeler gage just as the heel of the loop form (5, Fig. F) strikes the shoulder on the mounting stud for the entrance guide roller (6, Fig. F). To adjust, loosen two screws (7, Fig. F) which attach the upper sprocket guard plate. Press downward on front end of loop form assembly and rotate upper sprocket guard plate until heel of loop form strikes shoulder of stud and rear surface clears aperture rails by 0.015 inch. Then tighten screws (7, Fig. F) securely.

NOTE

While depressing lower loop form assembly, check to make certain that the pin in the threading lever (36, Parts Catalog Figure 11) clears the bottom of the slot in arm of loop form shaft (68) by 1/64 inch. If pin is touching bottom of slot, loosen setscrews (35) in threading lever and move lever upward to obtain the proper clearance.

d. Again depress the loop form assembly and check to make certain that there is 0.012 to 0.015 inch clearance between the top surface of the lower loop form (4, Fig. F) and the bottom surface of the upper loop form (8). If adjustment is required, remove the two screws which attach the hood (9). Loosen two setscrews (10) and rotate upper loop form (8) to obtain desired clearance. Tighten setscrews and reinstall hood. Before tightening hood retaining screws, press hood toward rear of projector.

e. With the auto-load system locked and film gate open, check to make certain that the shuttle teeth do not protrude through the slot in the aperture plate. If shuttle teeth protrude, loosen screw (6, Fig. E) and carefully raise the shuttle retractor (7) until teeth are retracted; then tighten screw (6) securely. CAUTION: The top end of the shuttle retractor must not strike the casting.

f. Close film gate while observing to see that the film pressure plate does not contact the aperture plate. If pressure plate remains in contact with aperture plate, either the pressure plate lift-off ear (8, Fig. E) or the ear (9) on the threading guide linkage is bent. Reform ear, or ears, as necessary.

g. Loosen screw (10, Fig. E) and align the film guide (11) so that film will feed squarely to the sprocket; then retighten screw (10).

h. Loosen screw (11, Fig. F), lock the system, and check to make certain that loop form heel (5) is bearing on shoulder of roller stud (6). If necessary, rotate the eccentric pivot (12) with a wire pick or pin punch until heel bears against stud shoulder. When loop form is pressed downward, there must be no clearance between heel and stud shoulder. Recheck clearance between rear of loop form and aperture rails. Also, make certain that end of upper loop form (8) is tangent to or slightly ahead of the plane of the aperture plate film support rails. If readjustment is necessary, refer to steps c and d, preceding.

i. Install actuating assembly (5, Fig. E) and press it down to make certain that system does not lock. If system locks when actuating assembly is depressed, remove the assembly and raise the setscrew protruding up from boss in casting. This setscrew acts as a stop for the actuating assembly. When height of setscrew is properly adjusted, seal setscrew with shellac or cement and reinstall actuating assembly with retaining ring.

j. Lock the system and try inserting film in to the feed sprocket. If film slips in too freely, loosen the two screws (13, Fig. F) and move leaf spring (14) downward to increase pressure on film. If film buckles as it is inserted, move leaf spring upward to reduce pressure; then tighten screws (13).

54. CHECKING AND ADJUSTING LOOP RESTORER.

a. Place restorer positioning tool (SER-552-2-N1) over loop restorer roller (1, Fig. G). The tool should

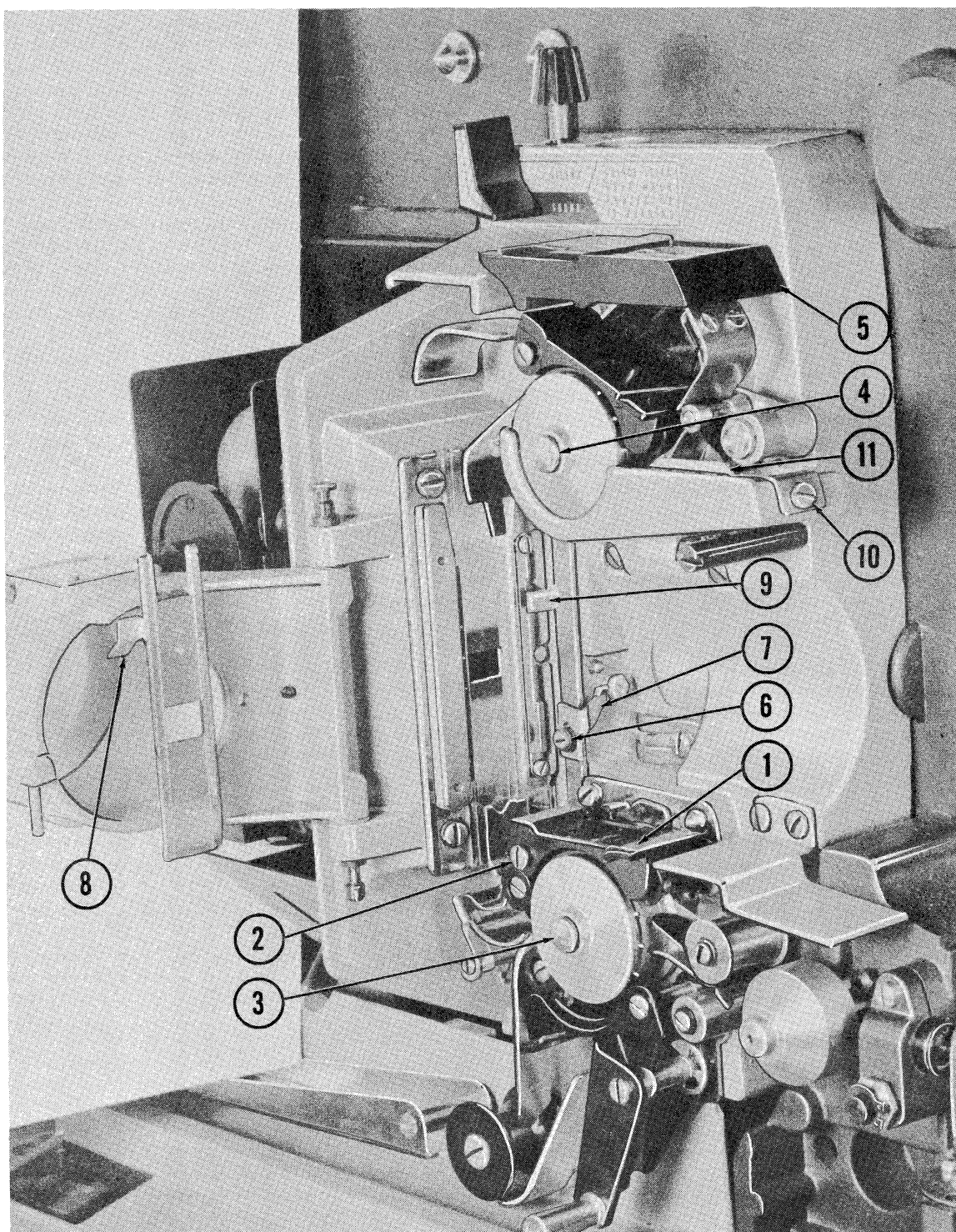


Figure E. Autoload System Adjustment Points (Sheet 1)

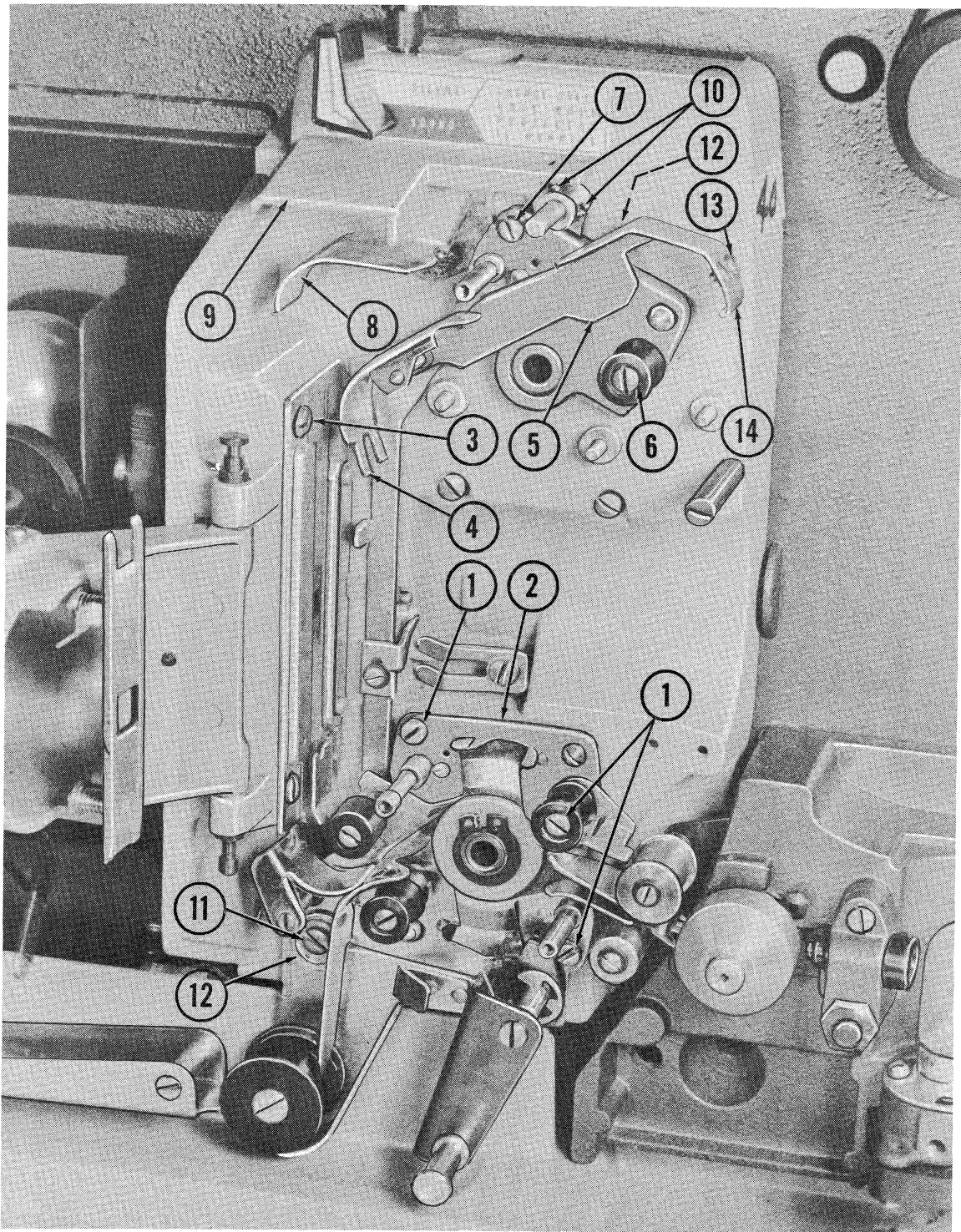


Figure F. Autoload System Adjustment Points (Sheet 2)

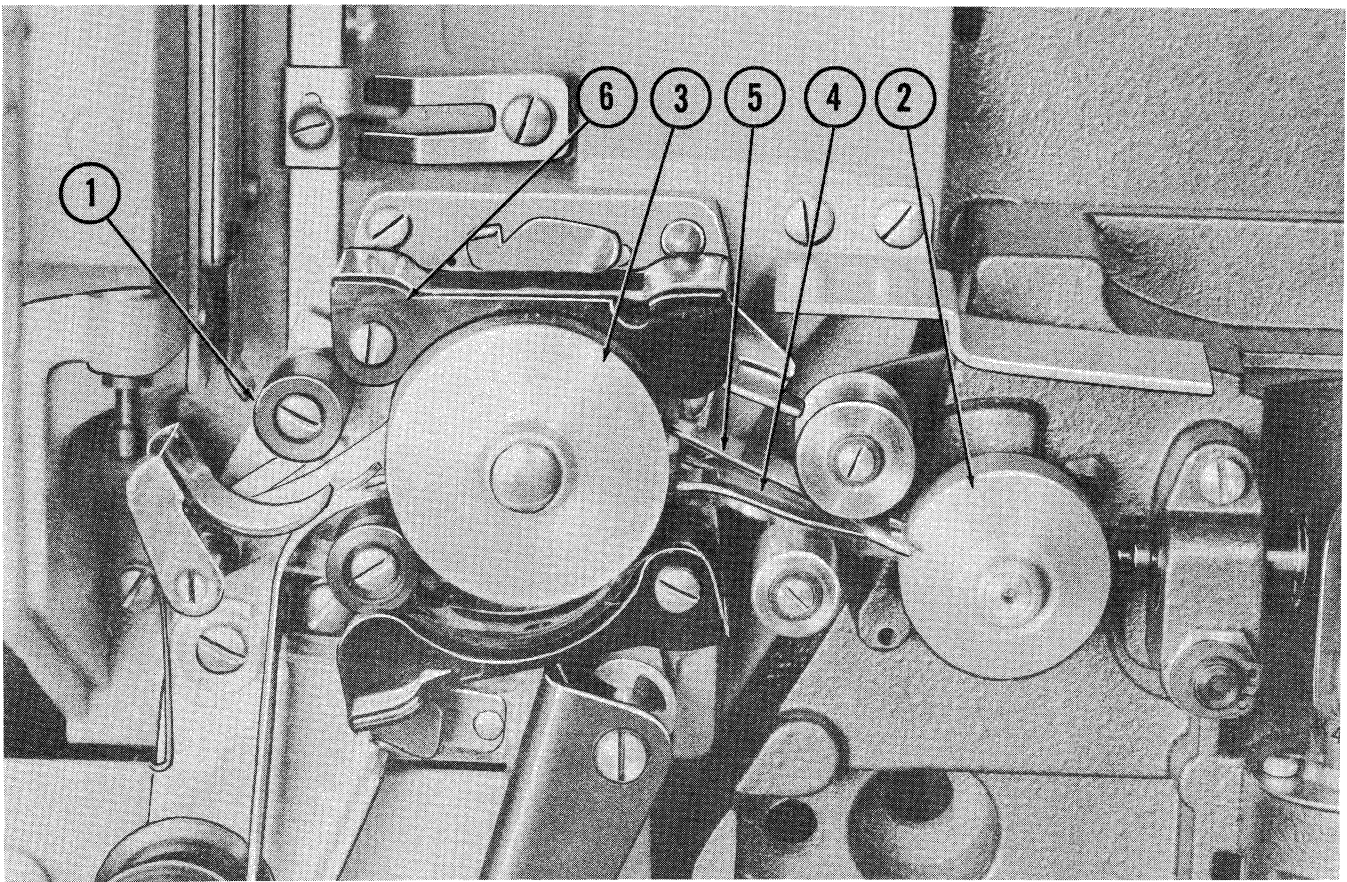


Figure G. Autoload System Adjustment Parts (Sheet 3)

touch the guide roller at the rear end of the upper sprocket shoe (6). If the clearance between rollers is inadequate or excessive, refer to Parts Catalog Figure 11 and adjust as follows: Loosen two screws (52) and raise or lower the self-centering assembly (55) as required to position the loop restorer roller properly. Tighten screws (52) securely.

NOTE: Both spring-loaded "keeper" plates near the bottom of the self-centering assembly must be in contact with the ear of the assembly.

b. Manually rotate the camshaft (30, Parts Catalog Figure 13) until the restorer cam setscrew (11) is at the bottom of the camshaft. Check the clearance between the loop restorer cam (27) and the upper end of the cam follower (48D, Figure 11) with a 0.015 inch feeler gage. If clearance is incorrect, loosen screw (45, Figure 11) and rotate the cam follower support (48E, Figure 11) slightly to obtain the proper clearance. Then tighten screw (45).

c. Manually rotate the camshaft until the restorer cam setscrew is at the top of the camshaft. Actuate the restorer manually and check the clearance between the upper end of the cam follower and the loop restorer cam. Clearance should now be approximately 1/32 inch. If clearance is incorrect, loosen cam follower screws (48A, Figure 11) and move the cam

follower up or down to establish the proper clearance. Then tighten screws (48A) securely.

d. Loop restorer operation can be checked by running the projector with film. If the loop is not restored, or if the film rubs on the loop restorer roller during film advance, move the cam follower (48D, Figure 11) upward slightly to increase size of loop.

55. TIMING THE SPROCKETS.

a. Open the film gate and turn down the framer shaft (27, Figure 12) as far as it will go. Then turn the mechanism manually until the shuttle is at the bottom of the stroke (teeth protruding) and the edge of the shutter blade bisects the aperture opening.

b. Push upward on the outside of worm gear (24, Figure 13) and check to make certain that the tongue on the driver clutch (21) bears against edge of notch in driven clutch (15).

c. Open the film sprocket shoes and place the timing plate (SER-552-1-N1) over the sprocket hubs. Note which sprocket teeth are nearest to the peep holes in the timing plate. Remove the timing plate and place a pencil mark on the face of each sprocket (near the rim) exactly in line with the sprocket teeth which were nearest the peep holes. Then reinstall the timing plate

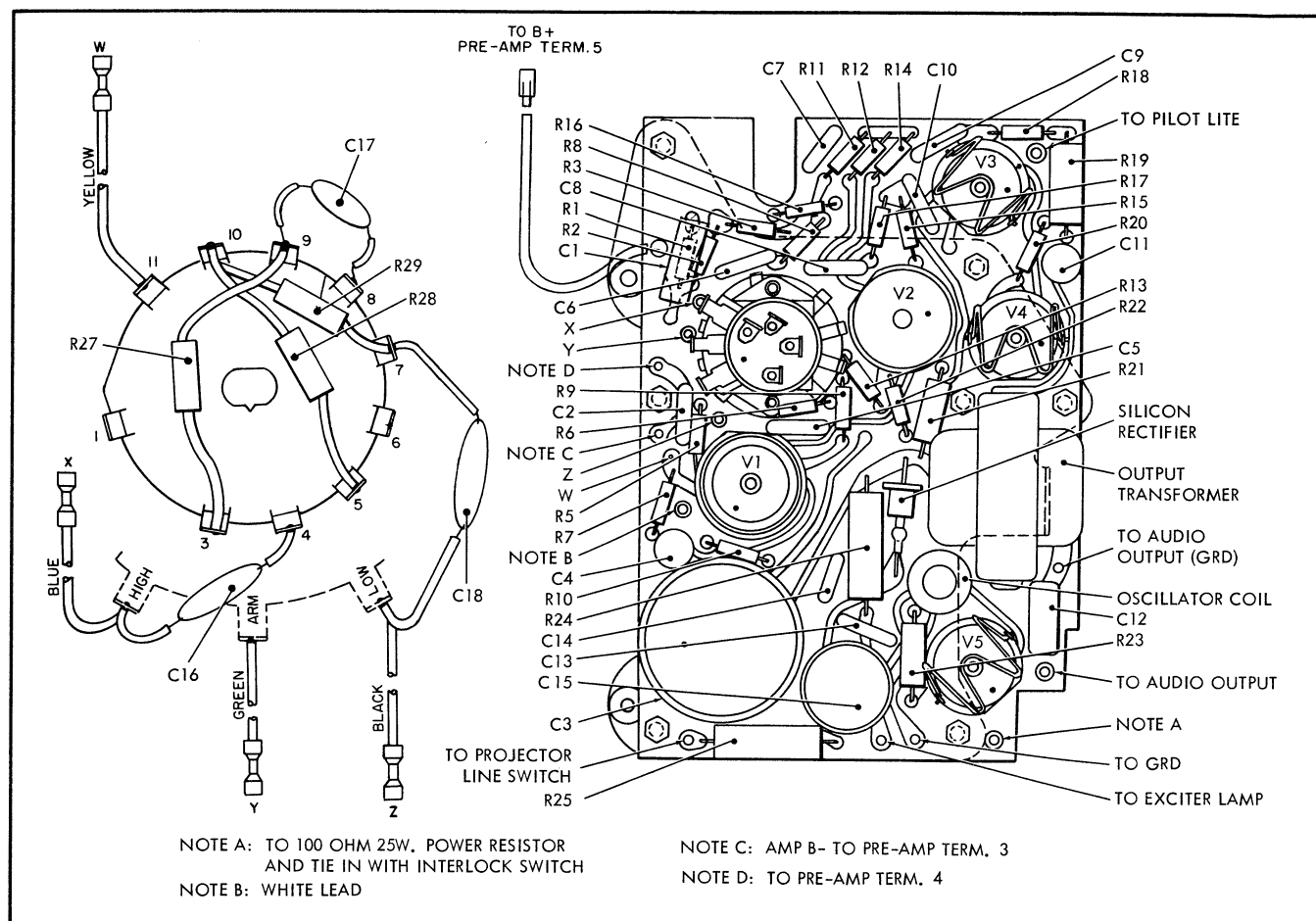


Figure H. Amplifier Reference Designators

on the sprocket hubs. If the sprockets are properly timed, the pencil marks will be visible through the peep holes. If the sprockets are out-of-time, proceed as follows:

d. To retune the feed (upper) sprocket, remove the sprocket shoe. Remove the two sprocket setscrews to expose the inner setscrews and loosen the inner setscrews. Rotate the sprocket until the pencil mark appears in the upper peep hole. Then tighten all four setscrews securely.

e. To retune the takeup (lower) sprocket, loosen the setscrews (38, Figure 10) in the hub of the lower sprocket gear (39) and rotate the sprocket until the pencil mark appears in the lower peep hole. Then tighten gear setscrews securely.

NOTE: Sprocket shafts should have approximately 0.003 inch end play when tension washers (40, Figure 10) are completely compressed.

56. POSITIONING THE SOUNDHEAD.

a. Lock the system in the "thread" position and loosen the three screws (43 and 44, Figure 2) which attach the soundhead to the main frame casting.

b. Hold the sound head locating gage (SER-552-5-N1) by its handle and insert the gage carefully between the sound drum (2, Figure G) and take up sprocket (3).

The gage must be between the sound drum threading guides (4 and 5). Position the gage so that one end bears against the supporting ribs for the sound track edge of the film and with the round body of the gage in contact with the rear sprocket flange.

c. Tilt the gage so that it lies on a centerline between the take-up sprocket and sound drum. Shift the soundhead toward the take-up sprocket until the sound drum bears lightly against the end of the gage, and tighten the soundhead attaching screws.

57. CHECKING EXCITER LAMP COVER CLEARANCE. Since the film must pass between the sound drum and exciter lamp cover, the clearance between these two items should be checked. Insert a #77 drill or a straight piece of #25 gage wire into the channel between the drum and cover. Gage should enter channel with slight friction but without forcing. If clearance is inadequate, the exciter cover locating pins probably have been bent and must be straightened to obtain proper clearance.

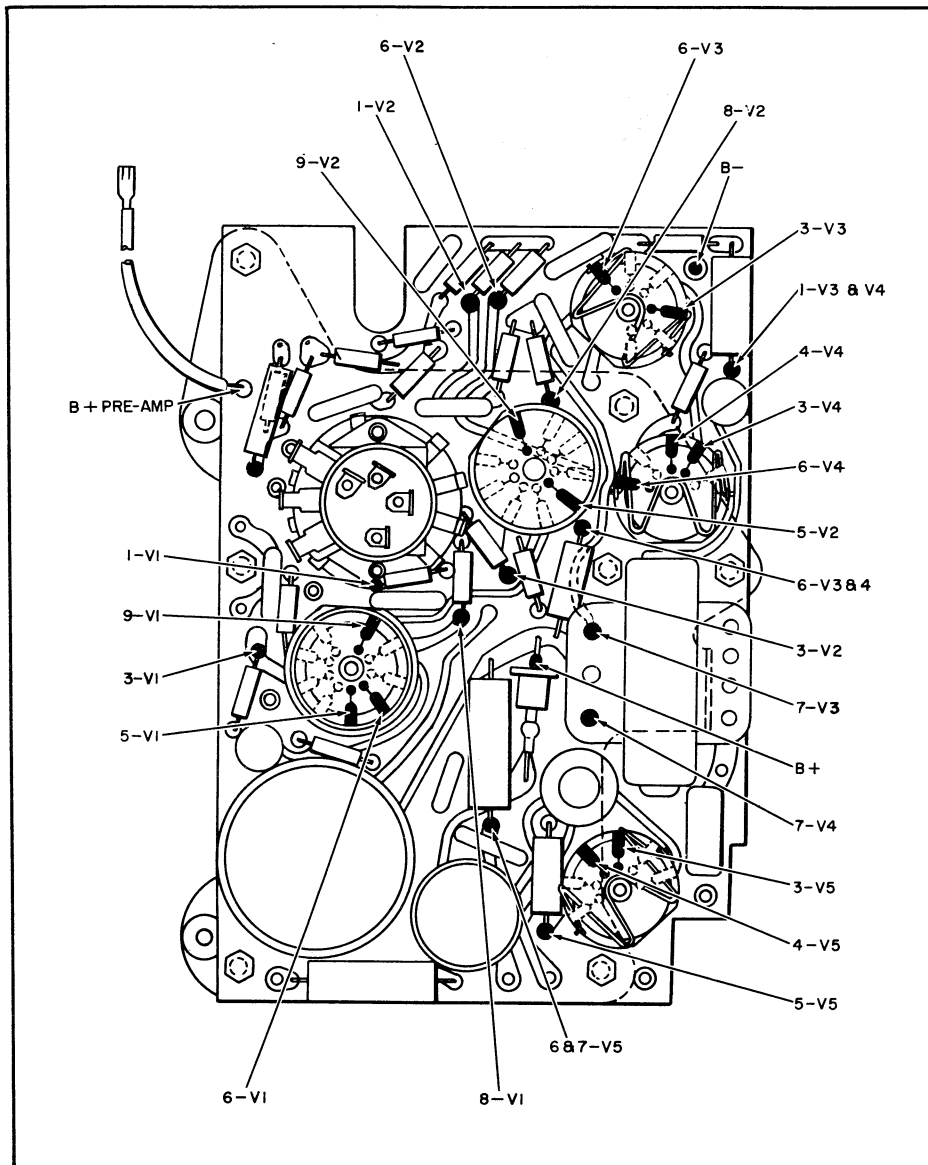
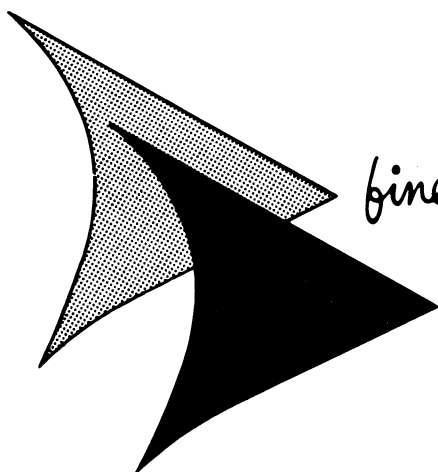


Figure J. Location of Amplifier Test Points

PARTS CATALOG

FILMOSOUND PROJECTOR

DESIGN 552



finer products through imagination

Bell & Howell

**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 for the Bell & Howell Filmosound Projector Design 552. Be sure to check all notes for special replacement instructions and parts information.

FIG. & INDEX NO.	PART NO.	1	2	3	4	5	6	7	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN PLATE											
1-1	09913								COVER ASSY, Front	1	
-1A	33388								. SCREW, Cover latch plate	2	
-1B	33390								. SPEED NUT, Cover latch plate	2	
-1C	33383								. PLATE, Latch	1	
-1D	33373								. SCREW, Cover foot	4	
-1E	33372								. FOOT, Cover.	4	
-1F	31941								. PLATE, Operating instructions	1	
-1G	09909								. PANEL, Front cover	1	
-1H	400422								. NAMEPLATE, Bell & Howell	1	
-1J	400479								. NAMEPLATE, Specialist	1	
-2	33388								SCREW, Rear cover attaching	7	
-3	09914								COVER ASSY, Rear	1	
-3A	33494								. GUARD, Rubber (ventilation grille)	2	
-3B	011175								. GRILLE, Ventilation (front)	1	
-3C	09946								. GRILLE, Ventilation (rear)	1	
-3D	33374								. BEZEL, Speaker receptacle	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN PLATE (CONT)				
1-4	33438	ADAPTER, Grounding, 3-wire	1	
-5	09809	CABLE ASSY, Power	1	
-6	400476	MOLDING, Main plate.	1	
-7	33391	SCREW, Carrying handle cap.	2	
-8	33371	CAP, Carrying handle	1	
-9	33368	BODY, Carrying handle.	1	
-10	33370	GRIP, Rubber	1	
-11	33392	SCREW, Carrying handle strap.	4	
-12	33369	STRAP, Carrying handle	1	
-12A	34845	PAD, Felt	2	
-13	33300	SPACER, Handle strap (front end only)	2	
-14	33299	RING, Retaining (cover latch stud)	2	
-15	33301	STUD, Cover latch	2	
-16	09910	LEVER ASSY, Cover release.	1	
-17	33302	SPRING, Release lever	1	
-18	31342	BELT, Take-up timing	1	
-19	24047	BELT, Take-up	1	
-20	34875	SETSCREW, Rear reel arm bearing	2	
-21	09772	BEARING, Rear reel arm	1	
-22	10750	SPRING, Clutch cam	1	
-23	5238	BALL, Steel	3	
-24	35876	CAM, Clutch	1	
-25	31237	WASHER, Nylon.	1	
-26	31351	RETAINER, Clutch ball (rear arm)	1	
-27	09771	SPROCKET ASSY, Rear arm	1	
-28	34875	SETSCREW, Front reel arm collar	2	
-29	31345	COLLAR, Front reel arm	1	
-30	09770	SPROCKET ASSY, Rewind	1	
-31	31237	WASHER, Nylon.	1	
-32	10750	SPRING, Clutch cam	1	
-33	5238	BALL, Steel.	3	
-34	35876	CAM, Clutch	1	
-35	31346	RETAINER, Clutch ball (front arm)	1	
-36	011183	SPROCKET ASSY, Reverse take-up	1	
-37	31237	WASHER, Nylon.	1	
-38	31372	WASHER, Brass	4	
-39	700420	SETSCREW	4	
-40	35811	COLLAR, Reel arm retaining	2	
-41	31358	DISC, Reel arm lock (front)	1	
-41A	34765	DISC, Reel arm lock (rear)	1	
-42	09849	ARM ASSY, Front (See Figure 5 for breakdown)	1	
-43	09850	ARM ASSY, Rear (See Figure 6 for breakdown)	1	
-44	31370	WASHER, Bronze	2	
-45	34760	DECAL, Rear reel arm.	1	
1-46	33491	SPRING, Tension	1	
-47	31943	SCREW	3	
-48	09808	CUTTER ASSY, Film	1	
-49	09804	ARM ASSY, Cutter	1	
-50	34759	LABEL, Film location	1	
-51	36030	LABEL, Autoload Position	1	

PROJECTOR MAIN PLATE (CONT)				
2-1	09901	SHIELD ASSY	1	
-1A	31550	. SCREW, Latch spring	1	
-1B	31609	. SPRING, Latch.	1	
-1C	31049	. SCREW	2	
-1D	31610	. BRACKET Hinge	1	
-1E	33359	. SHIELD	1	
-1F	34874	. WASHER, Spacer	AR	

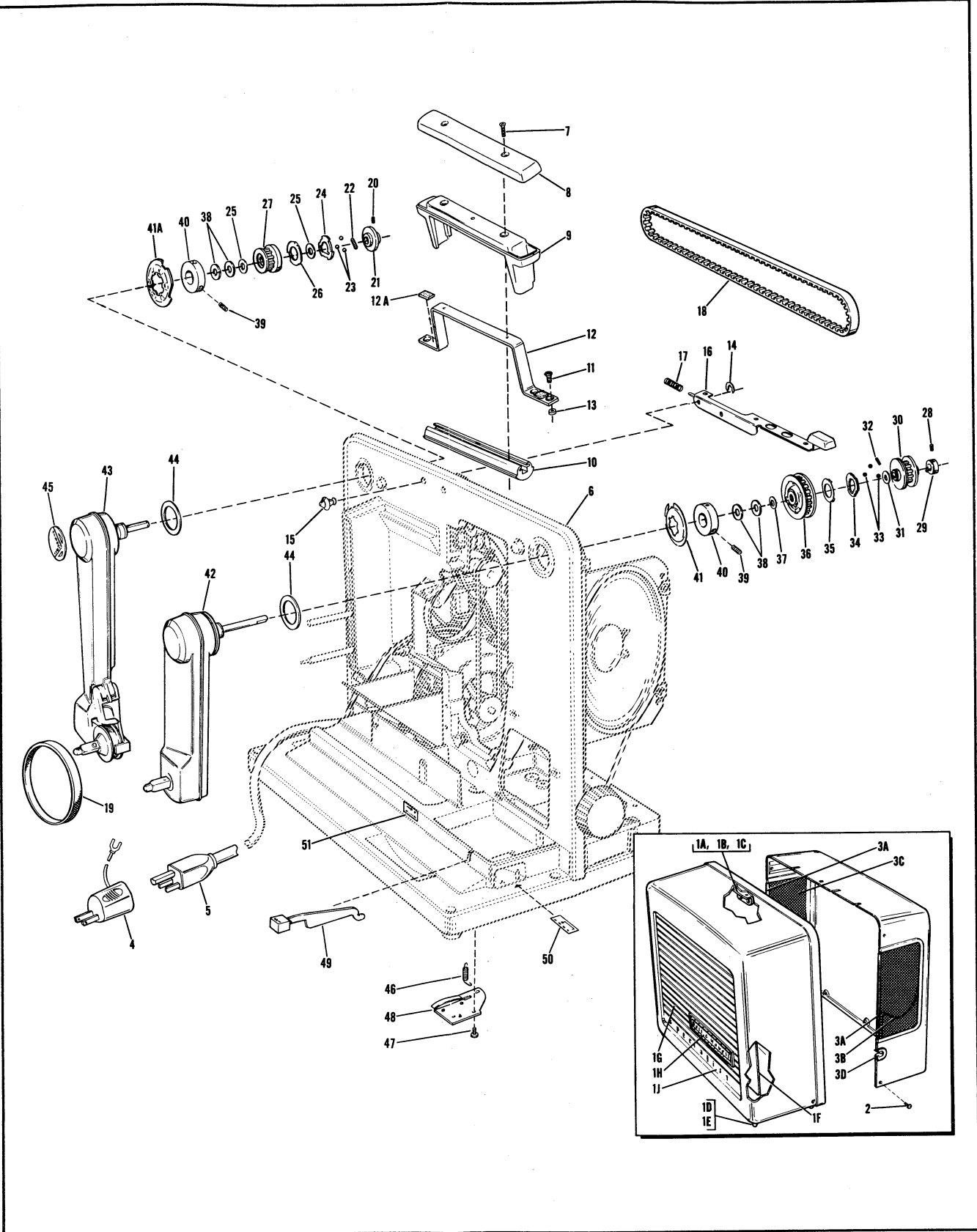


Figure 1. Filmosound Projector Main Plate Exploded (Sheet 1)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN PLATE (CONT)				
2-2	33459	LAMP, Projection, 1000 watt	1	
-3	09311	CONDENSER LENS ASSY	1	
-3A	31583	. SPRING, Condenser retaining	1	
-3B	200454	. LENS, 2nd condenser	1	
-3C	31584	. SPRING, Condenser	1	
-3D	200453	. LENS, 1st condenser	1	
-3E	31582	. HOUSING, Condenser lens	1	
-4	31930	SCREW, Projection lampholder attaching	2	
-5	09759	LAMPHOLDER ASSY, Projection (See Fig. 7 for breakdown).	1	
-6	30164	SCREW, Pulley shield attaching	2	
-7	31340	SHIELD, Pulley	1	
-8	09896	KNOB, Volume control	1	
-9	09887	KNOB, Tone control.	1	
-10	34793	SETSCREW, Projector control knob	2	
-11	09813	KNOB, Projector control	2	
-12	31943	SCREW, Switch nameplate	3	
-13	011246	NAMEPLATE, Switch.	1	
-14	98757	SCREW, Lamp designation nameplate.	2	
-15	31622	NAMEPLATE, Lamp designation.	1	
-16	011180	SWITCH ASSY, Selector (includes the following 3 items)	1	
	34829	. SWITCH, Selector	1	
	33279	. GUARD, Switch	1	
	33280	. BRACKET, Switch mounting	1	
-17	430076	LAMP, Pilot.	1	
-18	30164	SCREW, Lamphouse attaching	3	
-19	011160	LAMPHOUSE ASSY (See Fig. 8 for breakdown)	1	
-20	31971	NAMEPLATE	1	
-21	31930	SCREW, Pilot lamp bracket attaching	2	
-22	09822	BRACKET ASSY, Pilot lamp	1	
-22A	19025	. RIVET, Pilot lamp socket	1	
-22B	09823	. SOCKET ASSY, Pilot lamp.	1	
-23	30164	SCREW, Idler roller	1	
-24	35861	STUD, Film guide mounting	1	
-25	35852	GUIDE, Film	1	
-26	35862	SPACER	1	
-27	35884	ROLLER Idler	1	
-28	36035	HANDLE, Snubber	1	
-29	36033	INSERT, Number 5	1	
-30	35885	ROLLER, Idler	1	
-31	97509	RING, Retaining.	1	
-32	011222	SHAFT ASSY, Snubber roller.	1	
-33	35859	SPRING, Snubber	1	
-34	35858	RETAINER, Snubber spring	1	
-35	35856	COVER, Snubber spring.	1	
-36	35860	POST, Snubber mounting	1	
-37	35886	NAMEPLATE, Snubber threading	1	
-38	301502	SCREW, Grounding spring	1	
-39	33418	SPRING, Grounding	1	
-40	31476	NUT, Flywheel	1	
-41	31592	FLYWHEEL	1	
-42	31017	WASHER, Flat.	1	
-43	31491	SCREW, Bdg hd, sound head attaching (rear)	2	
-44	31491	SCREW, Bdg hd, sound head attaching (front)	1	
-45	011205	SOUND HEAD ASSY (See Fig. 9 for breakdown)	1	
-46	31905	SCREW, Cover shield.	1	
-47	33355	SHIELD, Cover	1	
-48	399026	SCREW, Mechanism assembly attaching	4	
-49	31243	WASHER, Steel	4	
-50	011231	MECHANISM ASSY (See Fig. 10 for breakdown)	1	

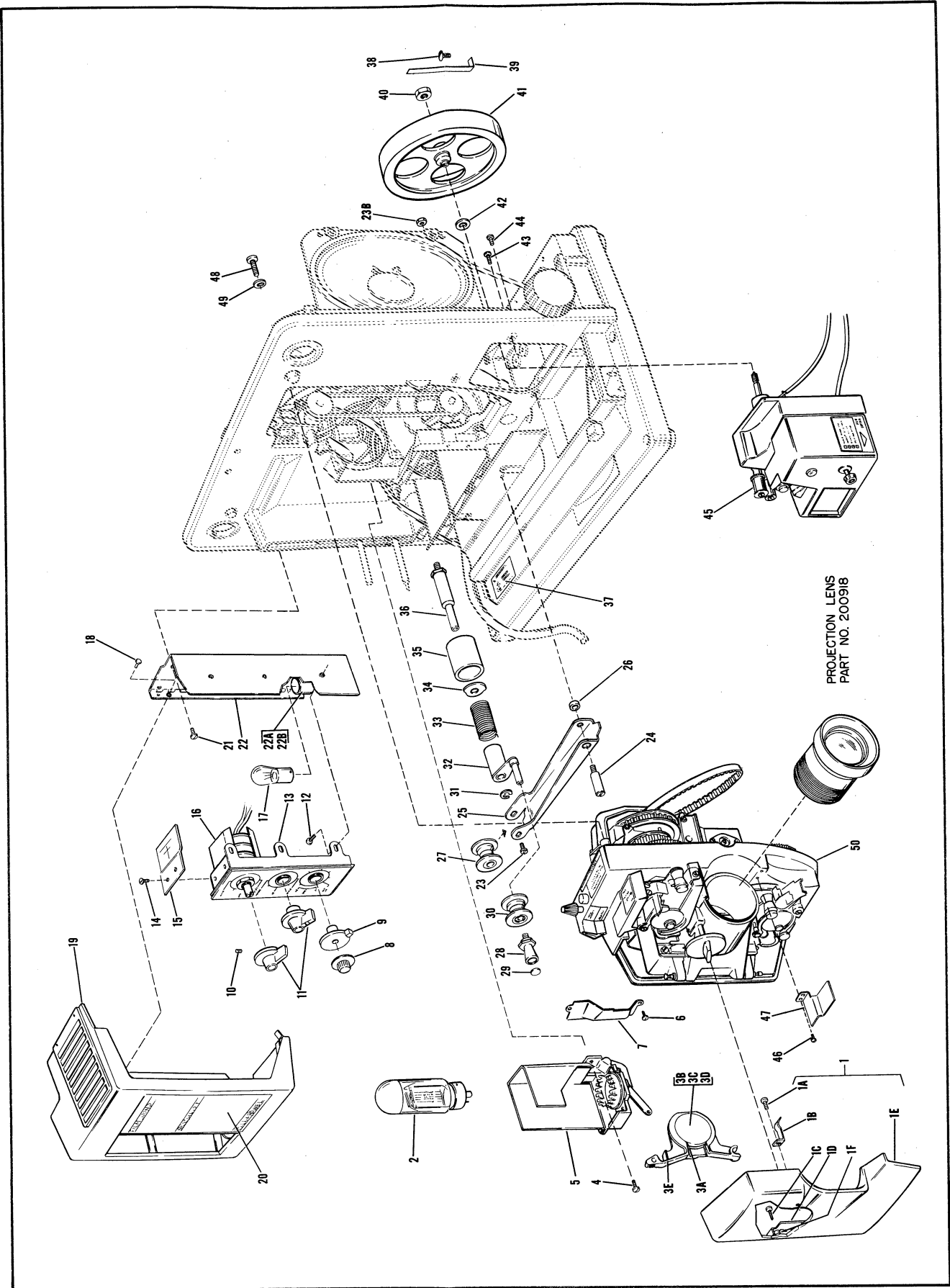


Figure 2. Filmosound Projector Main Plate Exploded (Sheet 2)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN PLATE (CONT)				
3-1	11445	SETSCREW, Collar	2	B
-2	31481	COLLAR, Clutch rod	2	B
-3	31482	SPRING, Clutch rod	1	B
-4	399019	SCREW, Clutch solenoid	2	B
-4A	99301	WASHER.	2	
-5	011162	SOLENOID AND ROD ASSY, Clutch.	1	B
-6	301366	SCREW, Solenoid bracket.	3	B
-7	33285	BUSHING.	3	B
-8	31489	GROMMET, Rubber.	3	B
-9	33281	BRACKET, Solenoid mounting	1	B
-10	33283	ROD, Fire shutter solenoid.	1	B
-10A	34843	SPRING, Fire shutter.	1	
-11	34896	SCREW, Fire shutter solenoid	2	B
-11A	14175	WASHER.	2	
-12	011163	SOLENOID ASSY, Fire shutter	1	B
-13	31943	SCREW, Solenoid bracket.	2	B
-14	09879	BRACKET, Solenoid.	1	B
-15	31493	SCREW, Speaker bracket	1	
-16	31499	SCREW, Speaker mounting	2	
-17	31936	NUT, Push-on.	2	
-18	09810	SPEAKER ASSY.	1	
-19	31928	SCREW, Starting capacitor	1	
-20	601190	NUT, Hex	1	
-21	31503	CLAMP, Starting capacitor.	1	
-22	31266	CAPACITOR, Starting.	1	
-23	34899	SCREW, Motor relay	2	
-24	601190	NUT, Hex	2	
-25	33427	RELAY, Motor	1	
-26	31049	SCREW, Relay bracket	2	
-27	31914	BRACKET, Relay	1	
-28	31049	SCREW, Idler assembly attaching	3	
-28A	31499	SCREW.	1	
-28B	21238	WASHER.	1	
-29	09768	IDLER ASSY.	1	
-29A	614240	. RING, Retaining	1	
-29B	611107	. ROLLER, Idler	1	
-30	09769	IDLER ASSY.	1	
-30A	614240	. RING, Retaining	1	
-30B	611107	. ROLLER, Idler	1	
-31	31493	SCREW, Lock bracket.	4	
-31A	24436	WASHER, LOCK, INTERNAL TOOTH	4	
-32	31232	BRACKET, Reel arm lock	2	
-33	31231	SPRING, Reel arm plunger	2	
-34	09888	PLUNGER ASSY, Reel arm lock	2	
-35	31687	BELT, Blower.	1	
-36	31550	SCREW, Bar stop bracket.	2	
-37	31919	BRACKET, Bar stop	1	
-38	31921	SPRING, Belt shift	1	
-39	31265	STRAP, Motor bracket (includes screw and nut).	2	
-39A	34900	SPRING, MOTOR discharge	1	
-40	09817	MOTOR ASSY, Drive (includes 40A thru 40D)	1	
-40A	33428	. MOTOR, Drive.	1	
-40B	70345	. SUPPORT, Cushion (motor)	2	
-40C	28820	. TERMINAL, Tab snap-on	1	
-40D	32093	. TERMINAL, Flag snap-on.	2	
-40E	31608	TUBE, Insulating	1	
-41	31341	BELT, Flat	1	
-42	31339	SHIFTER, Belt	1	
-43	33348	SETSCREW, Bar bracket	1	

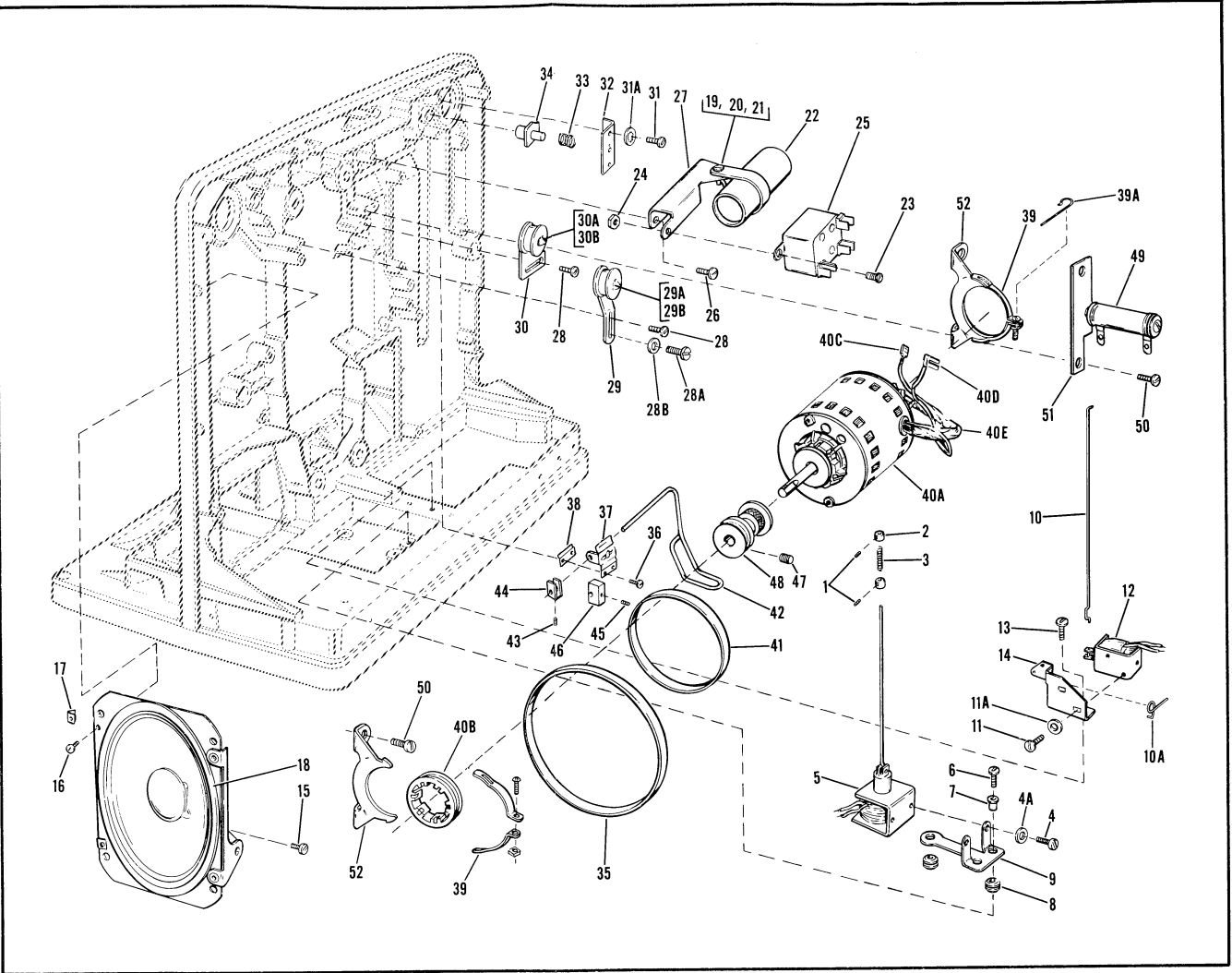


Figure 3. Filmosound Projector Main Plate Exploded (Sheet 3)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS	USABLE
			PER ASSY	ON CODE
PROJECTOR MAIN PLATE (CONT)				
3-44	34817	BRACKET, Bar	1	
-45	31909	SETSCREW, Belt shift stop.	1	
-46	31920	STOP, Belt shift.	1	
-47	12498	SETSCREW, Motor pulley	2	
-48	35379	PULLEY, Motor (See Note below)	1	
-49	31939	RESISTOR (with mounting parts)	1	
-49A	99301	WASHER, Shakeproof	1	
-50	399023	SCREW, Mounting plate and motor bracket.	4	
-51	31698	PLATE, Resistor mounting.	1	
-52	31263	BRACKET, Motor mounting.	2	

NOTE: When replacing the pulley (item 48), note the color and replace with a like pulley.

Blue pulley, part no. 35380
Black pulley, part no. 35381
Red pulley, part no. 35379

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR MAIN PLATE (CONT)				
4-1	600803	SCREW, Switch bracket	2	
-2	24436	WASHER, Lock	2	
-3	31923	BRACKET, Rotary switch	1	
-4	31940	SWITCH, Rotary	1	
-5	31499	SCREW, Blower bracket	4	
-6	14175	WASHER, Lock.	4	
-7	31692	BRACKET, Blower.	2	
-8	09762	BLOWER ASSY (See Fig. 19 for breakdown)	1	
-9	011174	DEFLECTOR, Air	1	
-10	34833	SCREW, Amplifier mounting.	3	
-11	34834	WASHER, Flat	3	
-12	011207	AMPLIFIER ASSY (See Fig. 20 for breakdown).	1	
-13	12636	SETSCREW, Tilt knob	1	
-14	09902	KNOB, Tilt	1	
-15	34889	SCREW, Tilt bar	1	
-16	8179	WASHER, Lock.	1	
-17	34766	BAR, Tilt.	1	
-17A	31561	FOOT, Rubber	2	
-18	31694	SCREW, Tilt mechanism.	2	
-19	600797	WASHER, Lock.	2	
-20	09803	MECHANISM ASSY, Tilt.	1	
-20A	31567	PIN, Spring	2	
-20B	31559	RACK, Tilt	1	
-20C	31568	PIN, Spring	1	
-20D	31565	PINION, Tilt	1	
-20E	21736	RING, Retaining.	1	
-20F	31039	WASHER, Flat	1	
-20G	34822	WASHER, Spring	1	
-20H	31564	GEAR, Tilt worm	1	
-20J	31039	WASHER, Flat	1	
-20K	31563	HOUSING, Tilt	1	
-21	09935	JACK ASSY, Speaker (incl. mtg. parts).	1	
-22	34814	NAMEPLATE, Speaker jack	1	
	25368	WASHER, Lock (between jack and casting)	1	
-23	31931	INSULATOR, Upper	1	
-24	31550	SCREW, Terminal strip	1	
-25	09877	STRIP ASSY, Terminal	1	
-26	33421	INSULATOR, Terminal strip	1	
-27	31684	SWITCH, Interlock (incl. mtg. parts).	1	
-28	31928	SCREW, Interlock switch bracket	2	
-29	601190	NUT, Hex.	1	
-30	31695	BRACKET, Interlock switch.	1	
-31	31696	SPRING, Leaf (between bracket and casting)	1	
-32	34788	SCREW, Interlock switch adjusting	1	
-33	33495	INTERLOCK NAMEPLATE		
-34	31938	INSULATOR (Below interlock switch)	1	
-35	31550	SCREW (See Note)	2	
-36	31491	SCREW (See Note)	1	
-37	011240	PRE-AMPLIFIER (See Note)	1	
-37	011206	PRE-AMPLIFIER (See Note)	1	
-37A	36004	SPACER (See Note)		
-38	18086	FOOT, Rubber	4	
-39	31491	SCREW, Base to plate.	3	
-40	31929	SCREW, Base to plate.	2	
-41	No Number	PLATE & BEARING ASSY.	NP	
-42	33360	BASE, Projector.	1	

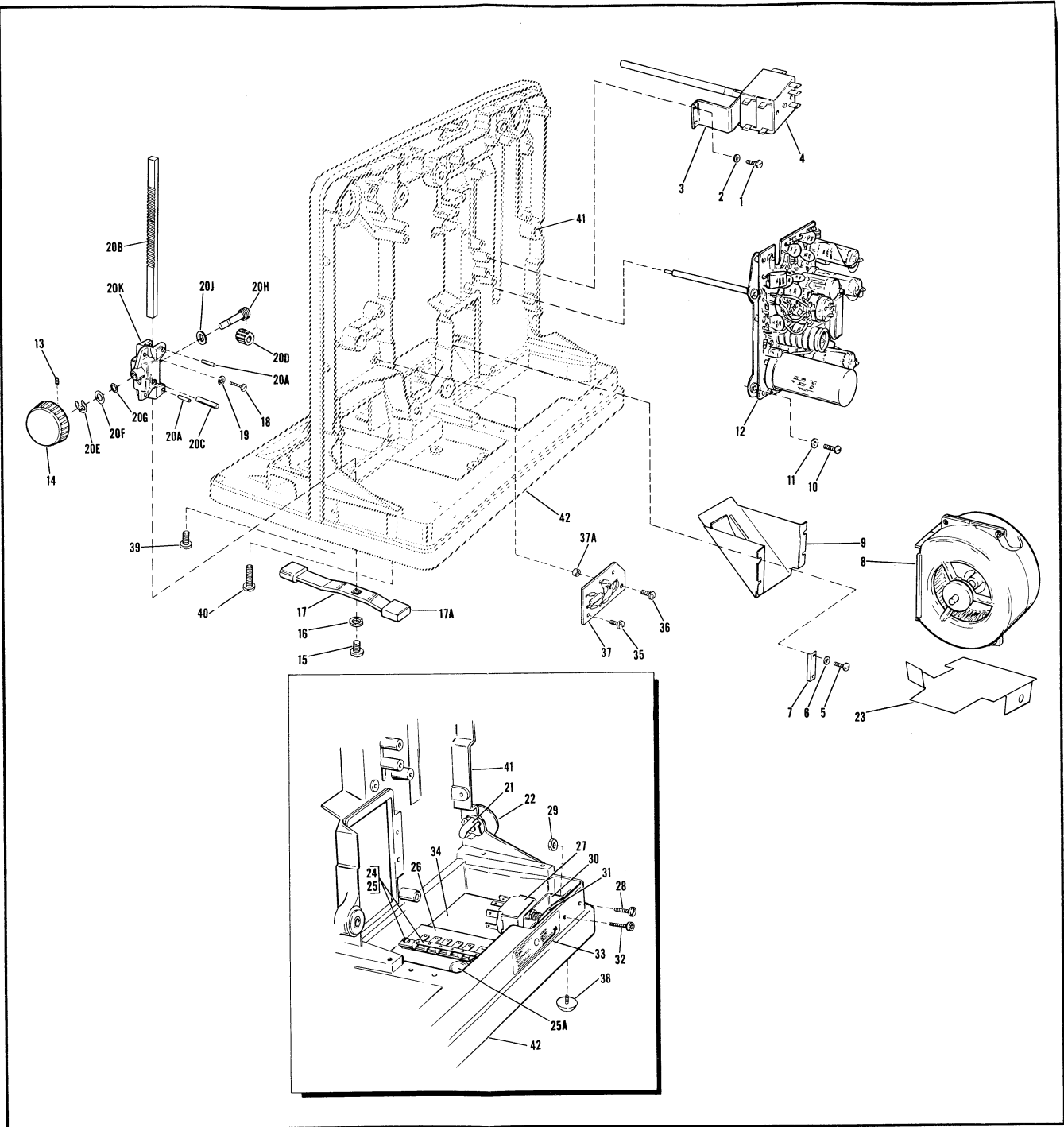


Figure 4. Filmosound Projector Main Plate Exploded (Sheet 4)

NOTE: 011206 Preamp is supplied with mounting spacer 36004 and is held in place with 31491 screw (one that fastens sound head)

011240 Preamp does not have a mounting spacer and is fastened by two screws 31550 directly to bosses on the main frame

FIG & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
FRONT REEL ARM ASSY				
5-	09849	REEL ARM ASSY, Front	REF	
-1	24270	. SCREW, Reel arm cover.	2	
-2	14175	. WASHER, Lock	2	
-3	31361	. COVER, Front reel arm.	1	
-3A	34874	. WASHER, Steel	AR	
-4	31366	. PIN, Spring.	1	
5	31363	. COLLAR, Feed spindle	1	
-6	31365	. PIN, Straight.	1	
-7	31364	. SPRING, Torsion.	1	
-8	09776	. GEAR ASSY, Lower	1	
-9	31371	. WASHER, Brass	2	
-9A	34860	. WASHER, Thrust.	1	
-10	09774	. SPINDLE ASSY, Feed	1	
-11	31359	. WASHER, Steel	1	
-12	34875	. SETSCREW, Upper gear.	2	
-13	09754	. GEAR ASSY, Upper	1	
14	31369	. SPRING, Clutch	1	
-15	24903	. RING, Retaining, clutch disc	2	
-16	09779	. DISC ASSY, Clutch.	1	
-17	31372	. WASHER, Brass	2	
-17A	34861	. WASHER, Tension	1	
-18	31245	. RING, Retaining	1	
-19	31241	. CLIP, Gear retaining	2	
-20	31239	. GEAR, Spur	2	
-21	31243	. WASHER, Steel.	1	
-22	31360	. SHAFT, Drive	1	
-23	31236	. BEARING, Nylon.	2	
-24	17639	. RING, Retaining	2	
-25	31367	. SHOE, Friction	1	
-26	09778	. BRACKET ASSY, Friction shoe	1	
-27	09777	. DISC ASSY, Spline bearing.	1	
-28	31370	. WASHER, Bronze	1	
-29	31356	. SHAFT, Front reel arm	1	
-30	09752	. BEARING ASSY, Splined.	1	
-30A	31911	. . BEARING, Needle.	2	
-31	30171	. SCREW, Eccentric stop	1	
-32	34854	. SPRING, Brake	1	
-33	31368	. STOP, Eccentric.	1	
-34	09775	. ARM AND BEARING ASSY, Front.	1	
-34A	31911	. . BEARING, Needle.	1	
-34B	31375	. . BEARING, Needle (closed end).	1	

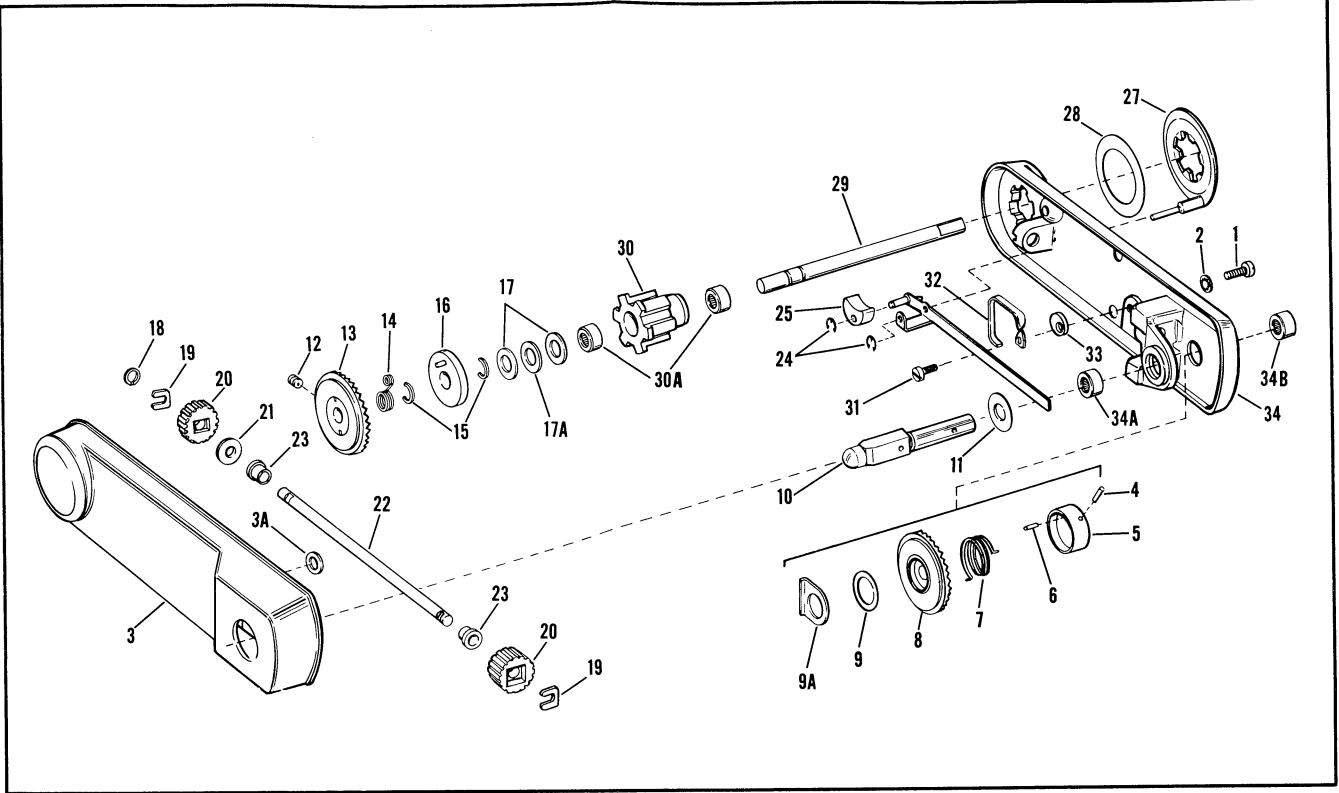


Figure 5. Front Reel Arm Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
REAR REEL ARM ASSY				
6-	09850	REEL ARM ASSY, Rear	REF	
-1	36038	. SPRING, Tension (take-up arm)	1	
-2	31247	. SCREW, Socket head	1	
-3	09753	. SPINDLE AND PULLEY ASSY, Take-up	1	
-4	24043	. PIN, Take-up arm	1	
-5	09755	. ARM ASSY, Take-up	1	
-5A	31911	. . BEARING, Needle	2	
-6	24270	. SCREW, Reel arm cover	2	
-7	14175	. WASHER, Lock	2	
-8	31251	. COVER, Rear reel arm	1	
-9	31245	. RING, Retaining (upper spur gear)	1	
-10	31241	. CLIP, Gear retaining	2	
-11	31239	. GEAR, Spur (lower)	1	
-12	33385	. GEAR, Spur (upper)	1	
-13	31243	. WASHER, Steel	1	
-14	614240	. RING, Retaining (lower gear assy)	1	
-15	011247	. PULLEY AND GEAR ASSY, Lower	1	
-16	31235	. BEARING, Nylon	2	
-17	31242	. PLUNGER, Spring	1	
-18	31246	. SPRING, Compression	1	
-19	33966	. RING, Retaining	1	
-20	80951	. SETSCREW, Rewind drive shaft	1	
-21	31234	. SHAFT, Rewind drive	1	
-22	31238	. SHAFT, Drive	1	
-23	31236	. BEARING, Nylon	2	
-24	34875	. SETSCREW, Upper gear assembly	2	
-25	09754	. GEAR ASSY, Upper	1	
-26	31372	. WASHER, Brass	1	
-27	31233	. SHAFT, Rear reel arm	1	
-28	09752	. BEARING ASSY, Splined	1	
-28A	31911	. . BEARING, Needle	2	
-29	31249	. ARM, Rear	1	
-30	36037	. SLEEVE, Lower pulley hub	1	
PROJECTION LAMPHOLDER ASSY				
7-	09759	LAMPHOLDER ASSY, Projection	REF	
-1	31943	. SCREW, Heat shield attaching	3	
-2	31273	. BAFFLE, Lamp	1	
7-	011280	. SOCKET AND BRACKET ASSY (includes 3 thru 8)	1	
-3	31604	. . PIN, Lamp release lever	1	
-4	31605	. . LEVER, Lamp release	1	
-5	31019	. . WASHER, Tension	1	
-6	700816	. . RIVET, Lamp socket attaching	2	
-7	30707	. . SOCKET, Projection lamp	1	
-8	31602	. . BRACKET, Lamp socket	1	
LAMPHOUSE ASSY				
8-	No Number	LAMPHOUSE ASSY, Complete	REF	
-1	31971	. NAMEPLATE, Specialist (reference only)	1	
-2	34812	. SCREW, Reflector attaching	2	
-3	31933	. SHIELD, Lamp	1	
-4	34753	. WASHER	4	
-5	34751	. BUSHING	2	
-6	31937	. REFLECTOR, Heat	1	
	011160	. LAMPHOUSE SUBASSY	1	
-7	36026	. . HANDLE, Lamphouse	1	
-8	09806	. . LATCH, Lamphouse	1	
-9	83234	. . SCREW, Drive	2	
-10	33306	. . GRILLE, Lamphouse	1	
-11	33488	. . GUARD, Film	1	
-12	33361	. . HOUSING	1	

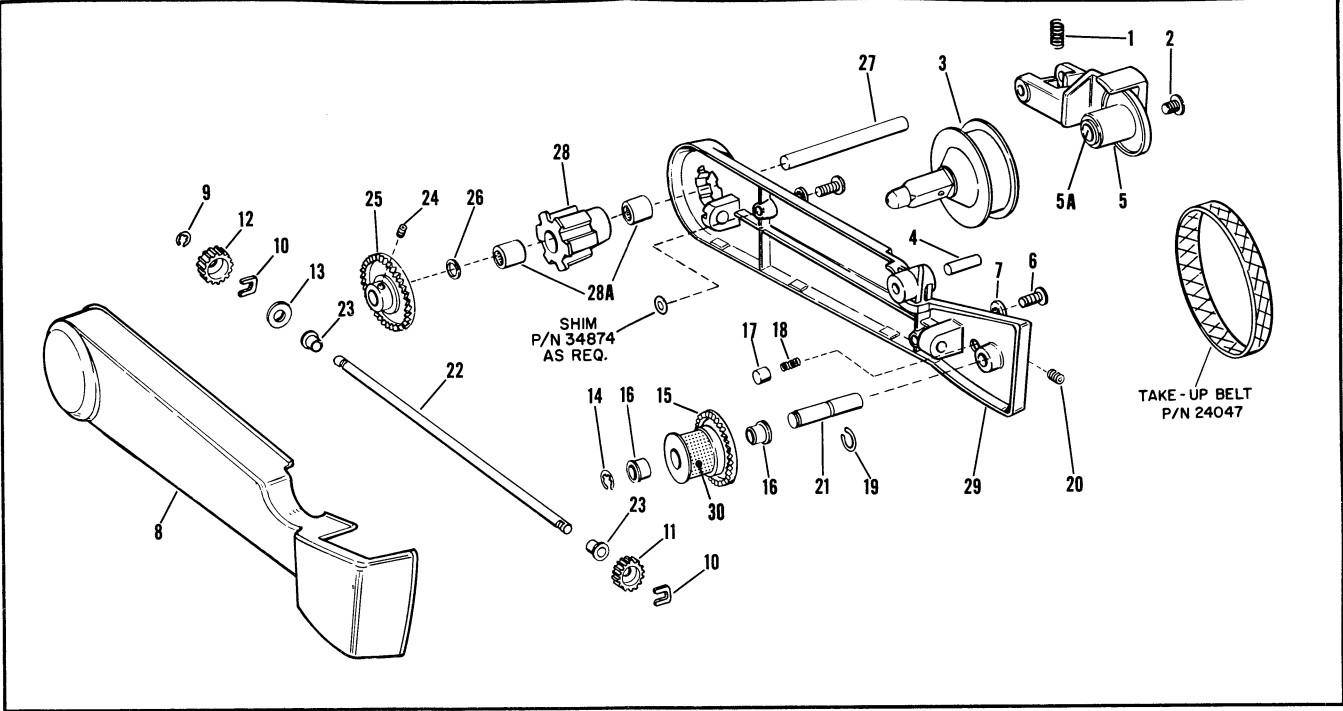


Figure 6. Rear Reel Arm Assembly

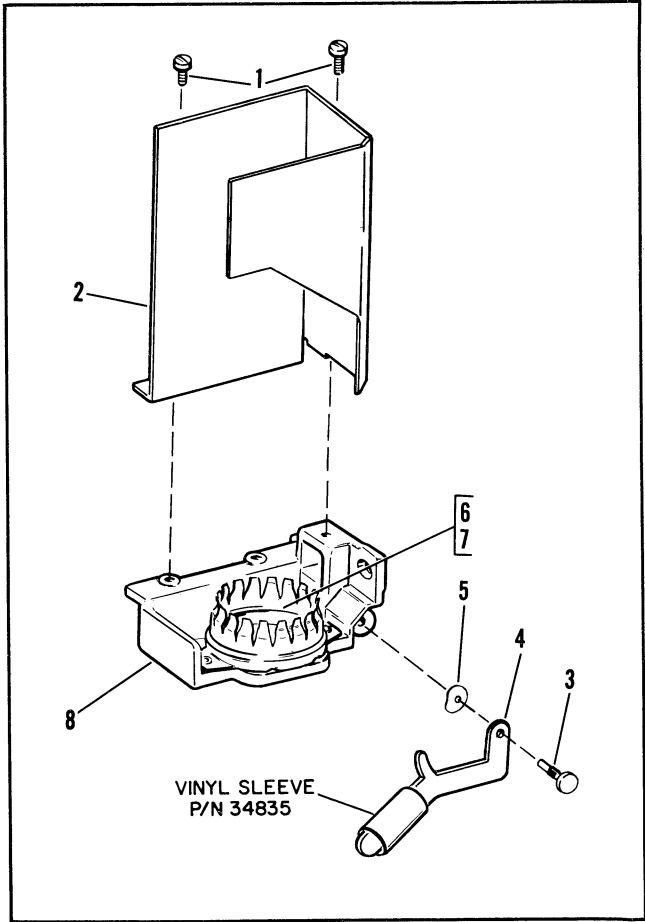


Figure 7. Projection Lampholder Assembly

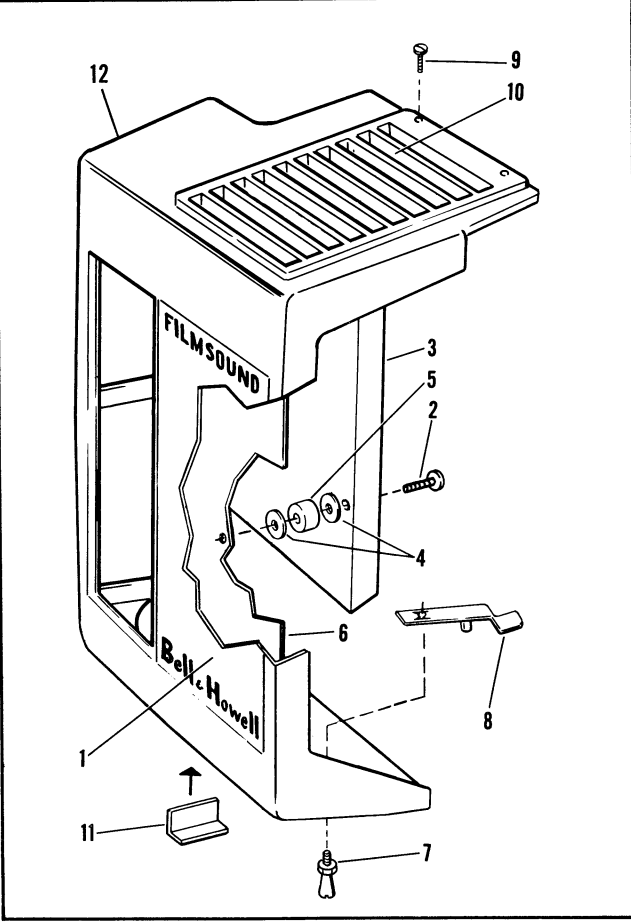


Figure 8. Lamphouse Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		SOUND HEAD ASSY		
9-	011205	SOUND HEAD ASSY	REF	
-1	20808	. RING, Retaining	1	
-2	34837	. SCREW, Cover retaining	1	
-3	31536	. INSERT, Retaining screw	1	
4	34787	. RUBY, Indicating	1	
-5	29526	. SCREW, Film guide	2	
-6	35823	. GUIDE, Film	1	
-7	09830	. COVER ASSY, Exciter lamp	1	
-7A	31643	. NAMEPLATE, Film cutter	1	
-8	34884	. LAMP, Exciter.	1	
-9	34892	. NAMEPLATE, Exciter lamp.	1	
-10	24271	. SCREW, Clamping	1	
-11	020240	. SLIT ASSY, Optical	1	
-12	31671	. RING, Retaining	1	
-13	31630	. SCREW, Guide roller adjusting	1	
-14	31638	. SCREW, Lamp contact	1	
-15	09828	. CONTACT ASSY, Exciter lamp	1	
-16	09840	. LEADWIRE ASSY, Lamp contact	1	
-17	31636	. RING, Lamp release	1	
-18	11521	. SETSCREW, Light pipe locking	1	
-19	12636	. SETSCREW, Sound drum shaft locking	2	
-20	011203	. SOUND DRUM and SHAFT ASSY	1	
-21	31669	. RETAINER, Light pipe	1	
-22	011244	. LIGHT PIPE and SILICON CELL ASSY	1	
-23	09826	. SCREW ASSY, Edge guide	1	
-24	30163	. SCREW, Film guide roller	2	
-25	31674	. WASHER, Steel	2	
-26	09834	. ROLLER, Flanged	1	
-27	09835	. ROLLER, Plain	1	
-28	31673	. SPRING, Extension	1	
-29	30164	. SCREW, Spring terminal	1	
-30	31675	. TERMINAL, Spring	1	
-31	30164	. SCREW, Stabilizer arm	2	
-32	09833	. ARM ASSY, Stabilizer	1	
-33	09832	. ARM ASSY, Stabilizer, lower	1	
-34	31672	. SPRING, Stabilizer arm	1	
-35	09838	. ARM ASSY, Stabilizer, upper	1	
-36	35384	. HOUSING, Sound head	1	

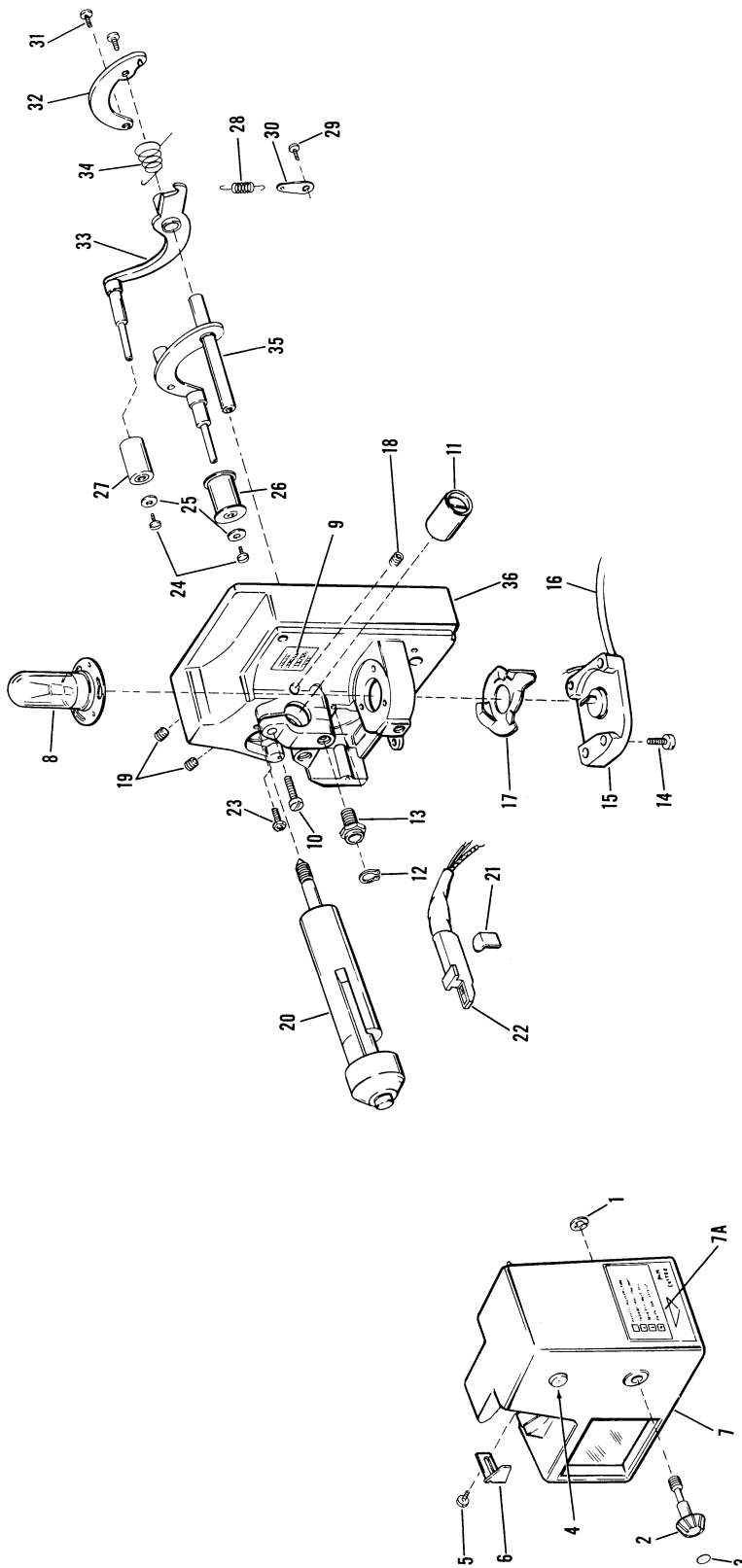


Figure 9. Sound Head Assembly

FIG & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
MECHANISM ASSY, COMPLETE				
10-	011231	MECHANISM ASSY, Complete	1	
-1	31958	. PIN Hinge (upper)	1	
-2	31957	. PIN, Hinge (lower)	1	
-3	31019	. WASHER, Spring	1	
-4	31020	. WASHER, Flat	1	
-5	09899	. LENS CARRIER ASSY (See Fig. 14 for breakdown)	1	
-6	34793	. SETSCREW, Speed change knob	1	
-7	09844	. KNOB, Speed change	1	
-8	34894	. NAMEPLATE, Silent-Sound	1	
-9	31038	. RING, Retaining	4	
-10	31012	. SPRING, Belt shift lever	1	
-10A	31013	. POST, Spring anchor	1	
-11	31014	. CRANK, Belt shift	1	
-12	20808	. RING, Retaining	1	
-13	09853	. ACTUATING ASSY, Spring and button	1	
-13A	36046	. NAMEPLATE, Threading bar	1	
-14	31049	. SCREW, Hood	2	
-15	33358	. HOOD	1	
-16	36016	. SCREW, Outboard bearing	3	
-17	14175	. WASHER, Lock	3	
-18	17639	. RING, Retaining	2	
-19	31045	. SHAFT, Clutch lever	1	
-20	09721	. BEARING ASSY, Outboard (includes following parts)	1	
	31906	. RIVET	3	
	31121	. RETAINER, Bearing	1	
	7994	. BEARING	1	
	31120	. RING, Felt	1	
-21	31041	. LEVER, Rewind clutch	1	
-22	31044	. BUTTON, Rewind	1	
-23	31042	. SPRING, Rewind button	1	
-24	31023	. BELT, Rewind timing	1	
-25	614240	. RING, Retaining	2	
-26	09724	. SPROCKET ASSY, Rewind drive	1	
-27	31039	. WASHER, Flat	1	
-28	31040	. SPRING, Compression	1	
-29	09730	. DRIVER ASSY, Spline	1	
-30	34875	. SETSCREW	2	
-31	09723	. SPROCKET ASSY, Takeup drive	1	
-32	24452	. SCREW, Sprocket guard	3	
-33	09897	. GUARD ASSY, Sprocket (See Fig. 13A for details)	1	
-34	30164	. SCREW, Sprocket guard	3	
-35	35814	. GUARD, Sprocket	3	
-36	35824	. ROLLER	3	
-37	35830	. SPRING, Torsion	3	
-38	620901	. SETSCREW	4	
-39	09757	. GEAR ASSY, Sprocket	2	
-40	31015	. WASHER, Sprocket tension	2	
-41	011228	. SPROCKET ASSY, upper	1	
-42	011226	. SPROCKET ASSY, lower	1	
-43	35910	. FLANGE, Lower sprocket	1	
-44	31017	. WASHER, Thrust	2	
-45	34768	. PIN, Cover stop	1	

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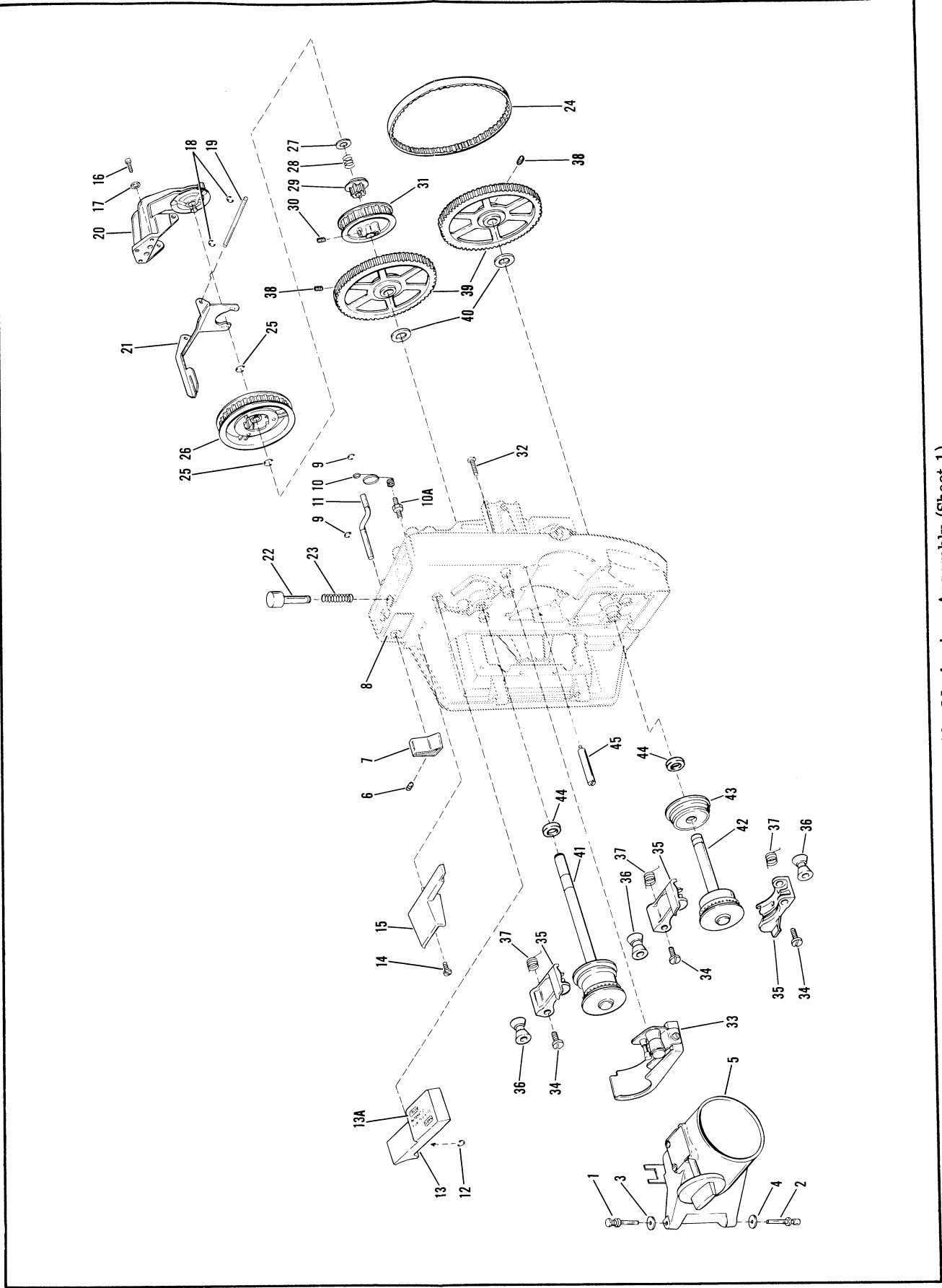


Figure 10. Mechanism Assembly (Sheet 1)

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

MECHANISM ASSY, COMPLETE (CONT)

11-1	30164	SCREW, Roller	4	
-2	35829	ROLLER, Flanged	3	
-3	35840	ROLLER, Plain	1	
-4	20808	RING, Retaining	1	
-5	605222	SCREW, Roller	1	
-6	35885	ROLLER, Idler	1	
-7	97509	RING, Retaining	1	
-8	011245	BRACKET AND HANDLE ASSY	1	
-9	36023	SPRING, Torsion	1	
-10	36031	INSERT, Number 3	1	
-11	31049	SCREW	1	
-12	35849	GUIDE, Film exit	1	
-13	17676	RING, Retaining	1	
-14	35874	FORM, Lower loop	1	
-15	35838	SPRING, Torsion	1	
-16	30164	SCREW	1	
-17	35867	BUSHING, Release spring	1	
-18	35866	SPRING, Release	1	
-19	31049	SCREW	1	
-20	35863	PIVOT, Locking lever	1	
-21	011220	LEVER ASSY, Auto thread locking	1	
-22	31551	SCREW	1	
-23	35822	BRACKET, Backup	1	
-24	31413	RING, Retaining	1	
-25	35834	WASHER, Flat	2	
-26	35850	GUIDE, Film (lower)	1	
-27	31551	SCREW	2	
-28	011213	PLATE ASSY, Sprocket guard	1	
-29	35846	GUIDE, Film (upper)	1	
-30	17639	RING, Retaining	1	
-31	011221	LEVER AND PIVOT ASSY, Toggle	1	
-32	303541	SCREW	2	
-33	36018	SPRING, Leaf	1	
-34	35869	SPRING, Tension	1	
-35	34793	SETSCREW	3	
-36	09789	LEVER ASSY, Threading	1	
-37	17639	RING, Retaining	1	
-38	011233	FORM ASSY, Lower loop	1	
-39	31551	SCREW	2	
-40	011212	PLATE ASSY, Sprocket guard (upper)	1	
-41	011217	FORM AND HUB ASSY, Upper loop	1	
-42	34878	WASHER, Flat	1	
-43	31049	SCREW	1	
-44	36044	SPRING, Tension	1	
-45	31049	SCREW	1	
-46	17632	WASHER, Flat	2	
-47	14175	WASHER, Lock	2	
-48	011249	CAM FOLLOWER AND SUPPORT ASSY	1	
-48A	31555	SCREW	2	
-48B	31474	BRACKET, Follower alinement	1	
-48C	36027	SPRING, Cam follower	2	
-48D	36047	FOLLOWER, Cam	1	
-48E	36028	SUPPORT, Cam follower	1	
-49	33347	SCREW, Hex head	1	
-50	011250	ARM ASSY	1	
-51	011219	LEVER AND SHAFT ASSY	1	
-52	31551	SCREW	2	
-53	31020	WASHER, Flat	2	
-54	31977	WASHER, Lock	2	
-55	011248	SELF CENTERING ASSY	1	

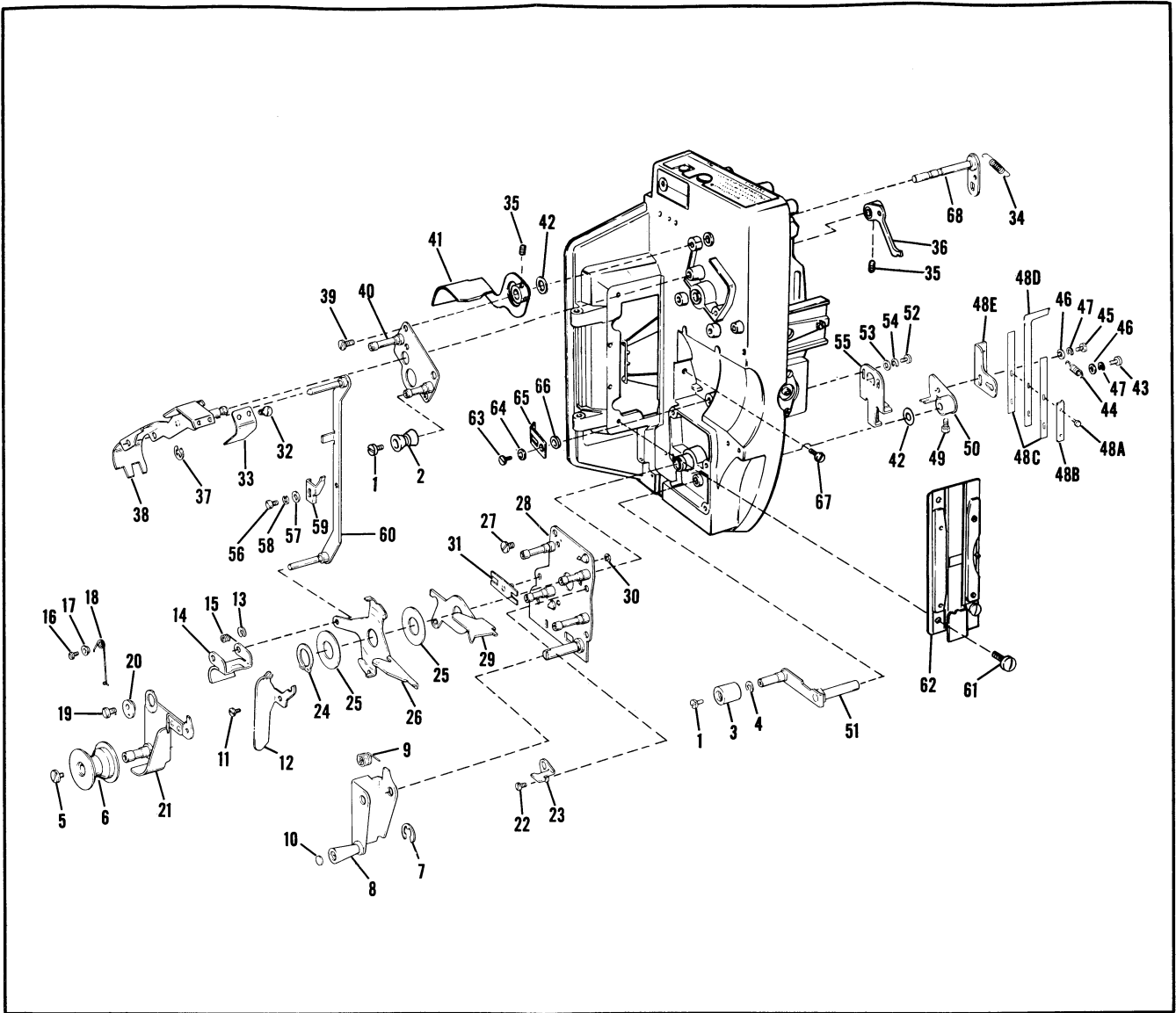


Figure 11. Mechanism Assembly, Complete (Sheet 2)

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

MECHANISM ASSY, COMPLETE (CONT)

11-56	31555	SCREW	1	
-57	31451	WASHER, Flat	1	
-58	83663	WASHER, Lock	1	
-59	35820	RETRACTOR, Shuttle	1	
-60	011218	LINK AND STUD ASSY, Connecting	1	
-61	31049	SCREW, Aperture plate	2	
-62	No Number	PLATE ASSY, Aperture (see Fig. 16 for breakdown)	1	
-63	31049	SCREW	1	
-64	14175	WASHER, Lock	1	
-65	34885	CATCH, Lens carrier	1	
-66	13918	WASHER, Flat	1	
-67	33260	SCREW, Lens stop	1	
-68	011214	SHAFT AND LINK ASSY, Upper loop form	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
MECHANISM ASSY, COMPLETE (CONT)				
12-1	12636	. SETSCREW	2	
-2	31021	. PULLEY, Mechanism	1	
-3	31943	. SCREW	4	
-3A	700639	. WASHER, Flat	2	
-4	31960	. SCREW, Condenser	1	
-5	09729	. SHUTTER ASSY, Fire (see Fig. 17 breakdown)	1	
-6	31022	. BAFFLE, Heat	1	
-7	31005	. NUT, Shutter	1	
-8	31037	. WEIGHT, Counterbalance	1	
-9	31004	. SHUTTER, Three-bladed	1	
-10	34797	. WASHER, Fiber	1	
-11	31010	. NUT, Stud assembly	2	
-12	09703	. STUD ASSY	2	
-13	36015	. SPRING, Extension	1	
-14	36013	. WIPER, Felt	1	
-15	36014	. WICK, Cam wiper	1	
-16	31557	. SHUTTLE	1	
-17	011235	. ARM AND BEARING ASSY, Shuttle	2	
-17A	31011	. . BEARING, Shuttle link	1	
-17B	31003	. . FOLLOWER, Pull-down cam	1	
-18	33346	. CAM, Pull-down	1	
-19	31049	. SCREW, In-out bracket	2	
-20	14175	. WASHER, Lock	2	
-21	31001	. CAM, In-out	1	
-22	011236	. BRACKET ASSY, In-out	1	
-22A	09702	. . FOLLOWER, In-out cam	1	
-22B	31100	. . SPRING, In-out	1	
-23	09712	. SUPPORT ASSY, Bearing	1	
-24	36017	. SCREW, Sems	2	
-25	09705	. PLATE ASSY, Shuttle arm	1	
-26	36048	. PIN, Framer stop	1	
-27	09732	. KNOB AND SHAFT ASSY, Framer	1	
-28	20808	. RING, Retaining	2	
-29	31396	. SHAFT, Stop pawl	1	
-30	33258	. SPRING, Torsion	1	
-31	31026	. PAWL, Stop	1	
-32	24851	. SCREW, Shoulder	2	
-33	31027	. BRACKET, Stop pawl shaft	1	
-34	24852	. GROMMET, Rubber	2	
-35	31049	. SCREW, Clutch stop	2	
-36	33259	. STOP, Clutch	1	
-37	31398	. BRACKET, Bearing	1	
-38	30163	. SCREW	1	
-39	35837	. SPRING, In-out	1	
-40	35831	. PIN, Shuttle retracting	1	

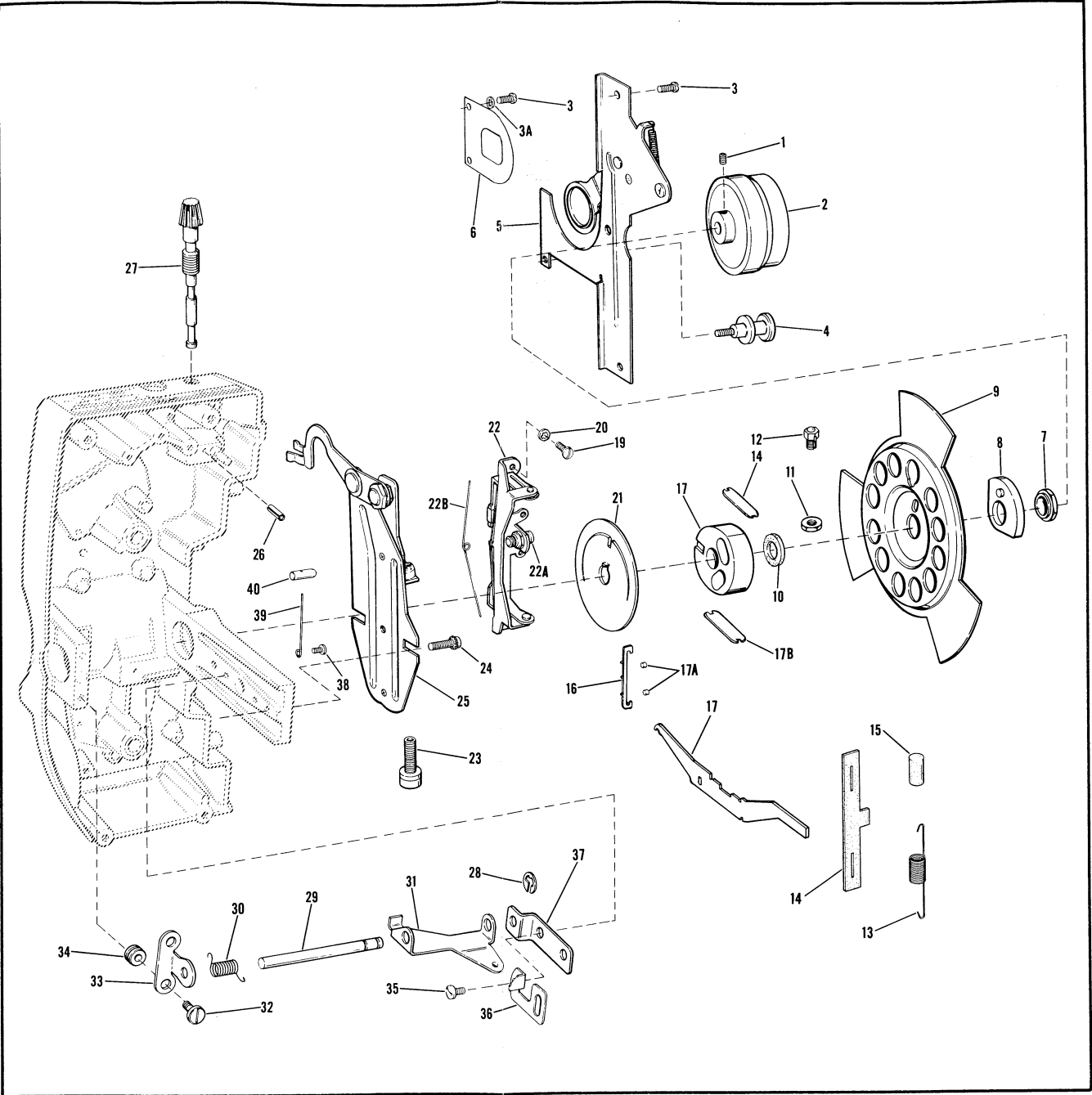


Figure 12. Mechanism Assembly (Sheet 3)

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
MECHANISM ASSY, COMPLETE (CONT)				
13-1	31976	SCREW, Clutch bracket (short)	1	
-2	30162	SCREW, Clutch bracket (long)	1	
-3	31977	WASHER, Lock	2	
-4	31397	NUT, Round	1	
-5	31457	WASHER, Flat	1	
-6	31048	BRACKET, Shuttle adjustment	1	
-7	09870	BRACKET ASSY, Animated clutch	1	
-7A	31405	SETSCREW, Slide bar adjusting	1	
-7B	17639	RING, Retaining	3	
-7C	31403	SHAFT, Clutch bracket	1	
-7D	31399	BUMPER, Slide	1	
-7E	31456	WASHER, Flat	1	
-7F	31036	SPRING, Compression	1	
-7G	09886	BAR ASSY, Clutch slide	1	
-7H	31555	SCREW, Strike	1	
-7F	31451	WASHER, Flat	1	
-7K	31050	STRIKE	1	
-7L	09885	BRACKET ASSY, Clutch mounting	1	
-8	31009	RING, Retaining	1	
-9	31094	SCREW, Loading spring	2	
-10	31553	SPRING, Bearing loading	1	
-11	32653	SETSCREW, Loop restorer cam	1	
-12	31007	BEARING, Ball	1	
-13	09710	CLUTCH ASSY, Driver	1	
-14	31035	SPRING, Clutch torsion	1	
-15	09711	CLUTCH ASSY, Driven	1	
-16	21736	RING, Retaining	2	
-17	31029	WASHER, Flat	1	
-18	31400	BEARING, Sleeve	1	
-19	31145	TRIGGER	1	
-20	31149	PIN, Shoulder	2	
-21	31147	YOKE, Clutch	1	
-22	31148	SPRING, Compression	1	
-23	09728	BEARING ASSY	1	
-24	09709	GEAR ASSY, Worm (See Fig. 17 for breakdown)	1	
-25	31031	BUSHING, Rubber	3	
-26	31029	WASHER, Flat	1	
-27	36042	CAM, Loop restorer	1	
-28	31078	RING, Retaining	1	
-29	31006	BEARING, Ball	1	
-30	31008	CAMSHAFT	1	
-31	31954	NAMEPLATE, Framer-Rewind	1	
-32	80591	SETSCREW, Rewind adjustment stud	1	
-33	35875	STUD, Rewind adjustment	1	
-34	33490	SCREW, Condenser holder	1	
-35	33489	HOLDER, Condenser	1	
-36	31962	WASHER, Special	1	
-37	31959	SPRING, Condenser holder	1	
-38	09874	HOUSING ASSY, Mechanism	1	
SPROCKET GUARD ASSY #09897				
-1	09799	GUARD AND SHAFT ASSY	1	
-2	31466	SPRING	1	
-3	31467	ROLLER	1	
-4	31551	SCREW	1	
-5	09798	CHANNEL ASSY	1	
-6	30164	SCREW	2	
-7	31963	STRIKE, Cover	1	
-8	33356	GUARD, Sprocket	1	

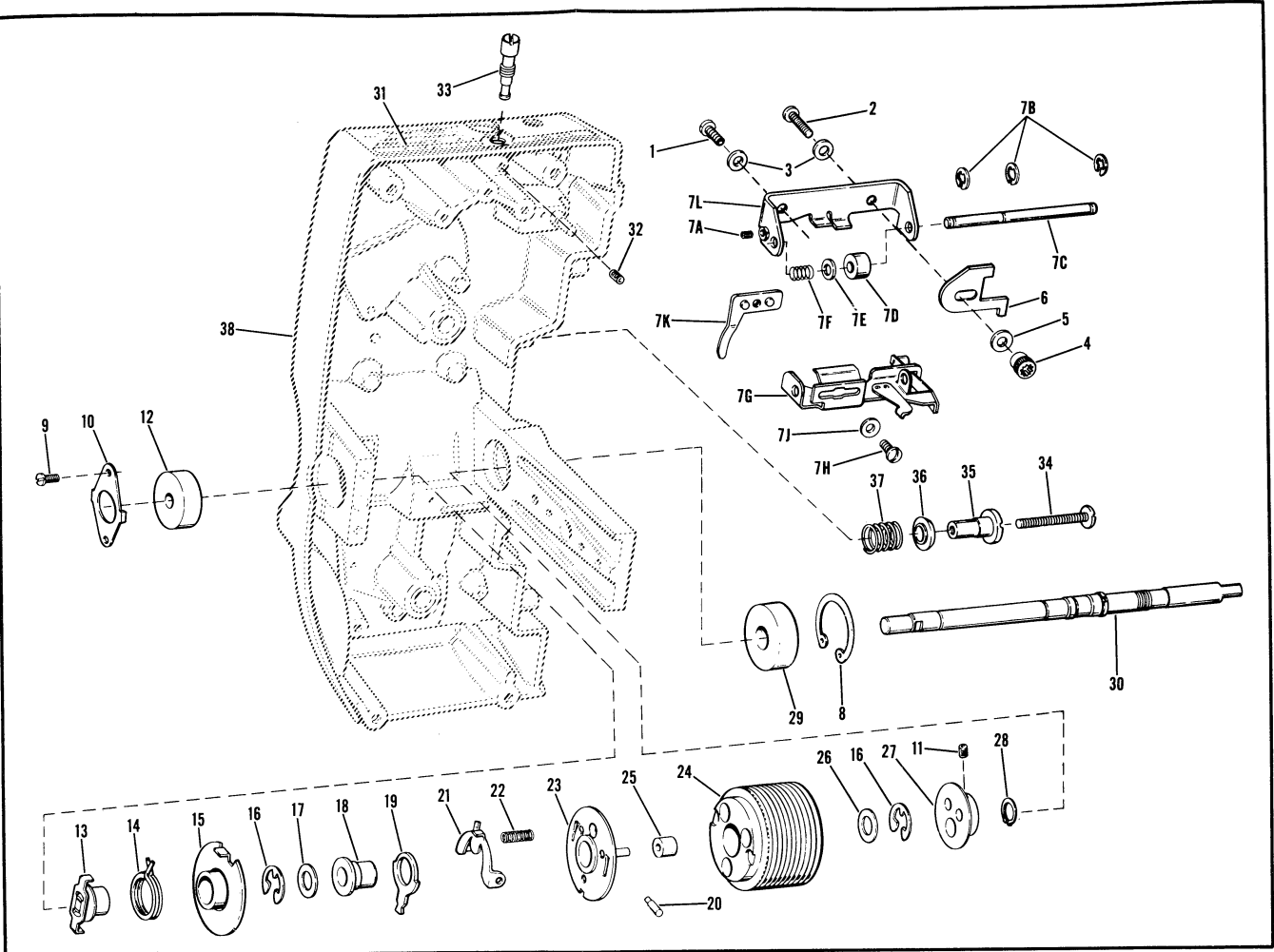


Figure 13. Mechanism Assembly (Sheet 4)

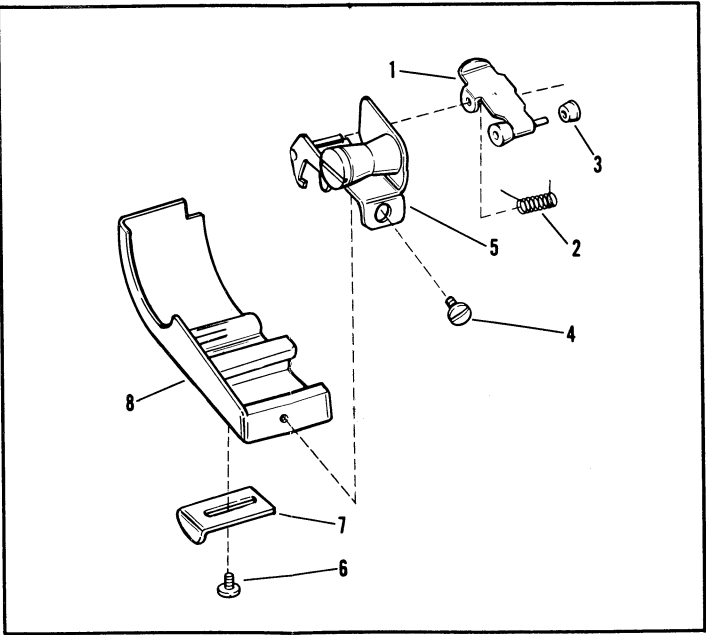


Figure 13A. Sprocket Guard Assembly

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

14-	09899	LENS CARRIER ASSY	REF	
-1	31094	. SCREW, Hold-down spring	2	
-2	31093	. SPRING, Hold-down	1	
-3	09847	. KNOB ASSY, Focus	1	
-4	35880	. SCREW, Pressure plate	2	
-5	35868	. BUSHING, Spacer (upper)	1	
-6	31097	. BUSHING, Spacer (lower)	1	
-7	31092	. PLATE, Pressure	1	
-8	34897	. SPRING, Compression	2	
-9	35819	. LEVER, Pressure plate	1	
-10	31905	. SCREW, Adjustment plate	2	
-11	31095	. PLATE, Adjustment	1	
-12	33309	. BUTTON, STOP	1	
-13	09898	. CARRIER, Lens	1	

APERTURE PLATE ASSY

15-	No Number	APERTURE PLATE ASSY.	REF	
-1	31978	. SCREW, Guide rail	2	
-2	35883	. RAIL, Film guide	1	
-3	31555	. SCREW, Tension rail	2	
-4	34820	. COVER, Spring retaining	1	
-5	10689	. WASHER, Spacing	2	
-6	33256	. RAIL, Film tension	1	
-7	31135	. SPRING, Side tension	1	
-8	30164	. SCREW	1	
-9	25042	. NUT, Hex	1	
-10	24397	. WASHER, Lock	1	
-11	33432	. GUIDE, Film	1	
-12	011243	. PLATE, Aperture	1	

FIRE SHUTTER ASSY

16-	09729	FIRE SHUTTER ASSY.	REF	B
-1	31143	. SPRING, Extension	1	B
-2	34823	. SPRING, Filter retainer	1	B
-3	31153	. RETAINER, Heat filter glass	1	B
-4	31407	. DISC, Fire shutter	1	B
-5	200508	. FILTER, Heat	1	B
-6	011282	. BRACKET ASSY, Fire shutter	1	B

WORM GEAR ASSY

17-	09709	GEAR ASSY, Worm	REF	B
-1	31081	. RETAINER, Shuttle interlock	1	B
-2	31063	. SCREW, Interlock retainer	2	B
-3	31083	. SETSCREW	1	B
-4	31082	. BANC-LOK	1	B
-5	09784	. GEAR, Worm.	1	B

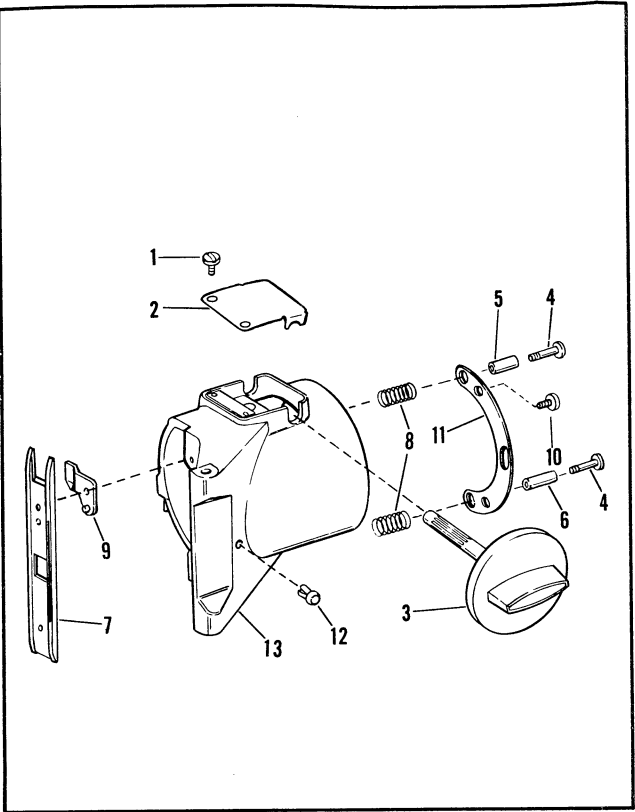


Figure 14. Lens Carrier Assembly

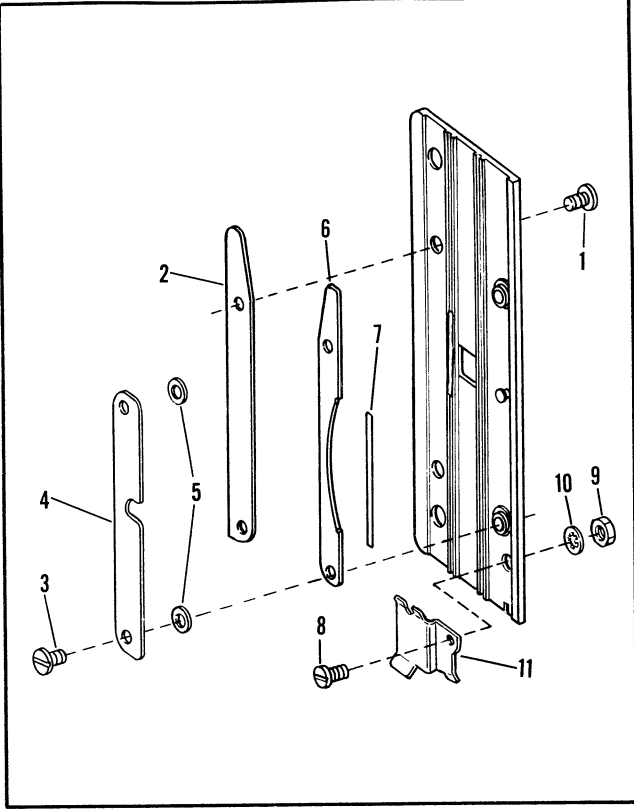


Figure 15. Aperture Plate Assembly

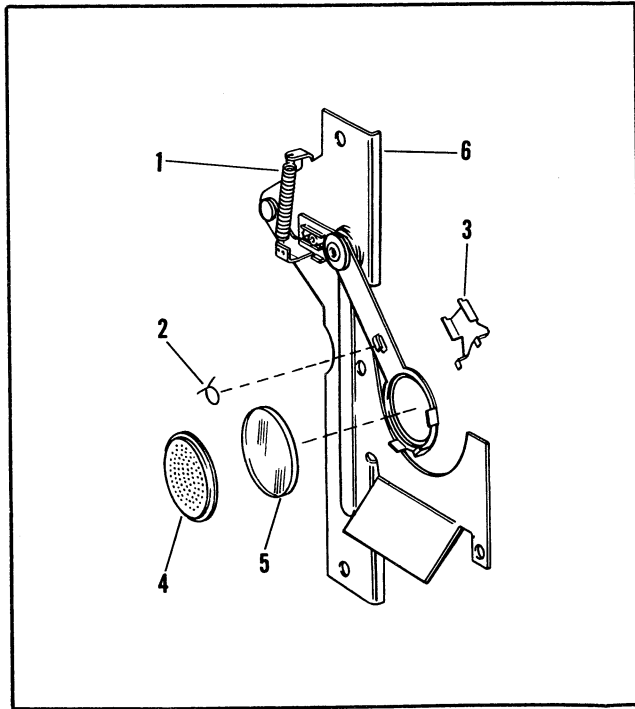


Figure 16. Fire Shutter Assembly

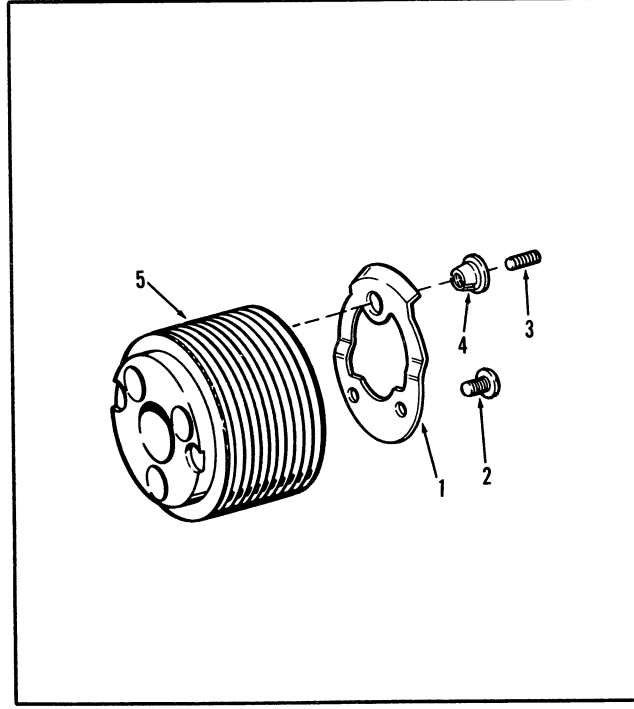


Figure 17. Worm Gear Assembly

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

BLOWER ASSY

18-	09762	BLOWER ASSY								REF	
-1	12636	. SETSCREW Pulley								2	
-2	31586	. PULLEY, Blower								1	
-3	31588	. EYELET								3	
-4	31585	. CLAMP, Leadwire								1	
-5	30029	. SCREW								1	
-6	601190	. NUT, Hex								1	
-7	17196	. TERMINAL								1	
-8	31948	. HOUSING, Blower wheel (half)								2	
-9	21736	. RING, Retaining								1	
-10	31029	. WASHER, Bronze								2	
-11	31015	. WASHER, Spring								1	
-12	21793	. SETSCREW, Collar								1	
-13	82655	. COLLAR								1	
-14	12636	. SETSCREW, Blower wheel								2	
-15	09783	. WHEEL ASSY, Blower								1	
-16	31590	. SHAFT, Blower								1	
-17	31589	. RING, Internal retaining								2	
-18	33422	. WASHER, Nylon								2	
-19	31587	. BEARING, Bronze								2	
-20	34890	. WASHER, Nylon								2	

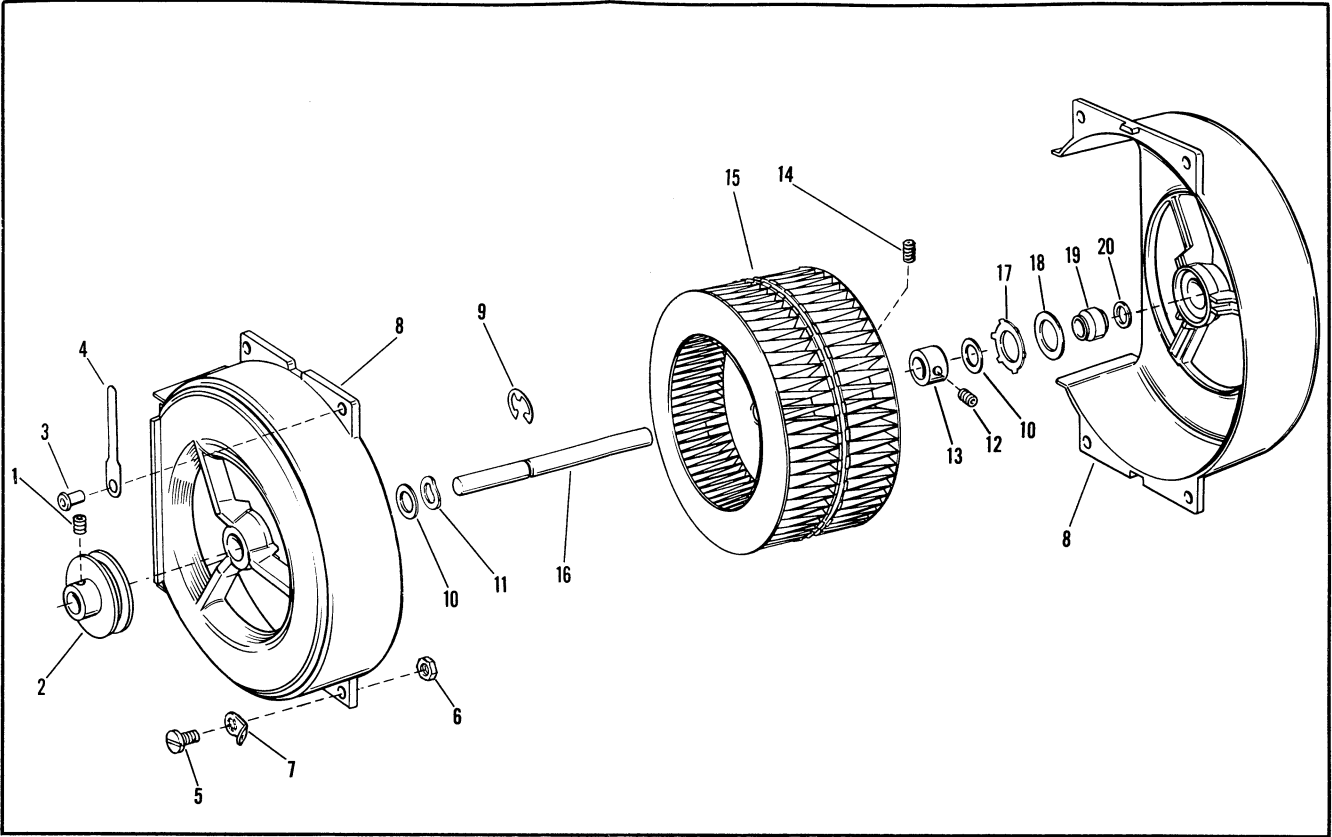


Figure 18. Blower Assembly

PREAMPLIFIER ASSY

19-	011240	PREAMPLIFIER ASSY								REF	
-1	36009	. RESISTOR, Fixed carbon 1200 ohms 1/2 watt (R33)								1	
-2	36007	. RESISTOR, Fixed carbon 180 ohms 1/2 watt (R34)								1	
-3	31737	. CAPACITOR, Ceramic 0.0015 mfd ±20% (C20)								1	
-4	31742	. RESISTOR, Fixed carbon 10,000 ohms 1/2 watt (R31)								1	
-5	36008	. RESISTOR, Fixed carbon 56 K 1/2 watt (R30)								1	
-6	35385	. TRANSISTOR (Q1)								1	
-7	35897	. CAPACITOR, Electrolytic 50 mfd (C19)								1	
-8	31749	. RESISTOR, Fixed carbon 3900 ohms 1/2 watt(R32).								1	
-9	31767	. TERMINAL, Push-on								5	
-10	011229	. CIRCUIT BOARD ASSY								1	

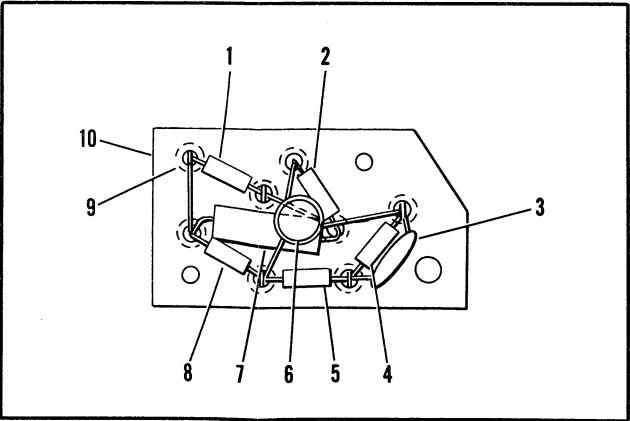


Figure 19. Preamplifier Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
PROJECTOR AMPLIFIER ASSEMBLY				
20-	09920	AMPLIFIER ASSY, Projector (see *NOTE)	REF	
-1	35898	. CAPACITOR, Electrolytic 35 mfd 16 volts	1	
-2	31744	. RESISTOR, Carbon 1/2 watt (R3) 22K	1	
-3	31739	. RESISTOR, Carbon, 100,000 ohm 1/2 watt	5	
		(R6, R8, R12, R14, R16)		
-4	31735	. CAPACITOR, Ceramic disc 100 mmfd (C7)	1	
-5	31740	. RESISTOR, Carbon, 470,000 ohm 1/2 watt (R10, (R17, R18, R20)	4	
-6	31741	. RESISTOR, Carbon, 3300 ohm 1/2 watt (R15)	1	
-7	31727	. CAPACITOR, Ceramic disc 0.01 mfd (C5, C6, C8, C9, C10)	5	
-8	31728	. RESISTOR, Carbon 100 ohm 2 watt (R19)	1	
-9	*31721	TUBE, Type 25C5 (V3, V4, V5)	3	
-10	31758	. SOCKET, Tube (with retainer clip)	3	
-11	31718	. CAPACITOR, Electrolytic, 35 mfd (C11)	1	
-12	*22577	TUBE, Type 12AX7 (V1, V2)	2	
-13	31757	. SOCKET, Tube	1	
-14	31747	. RESISTOR, Carbon 1800 ohm 1/2 watt (R13)	1	
-15	31744	. RESISTOR, Carbon, 22,000 ohm 1/2 watt (R22)	1	
-16	31729	. RESISTOR, Carbon, 820 ohm 1 watt (R21)	1	
-17	31715	. TRANSFORMER, Output	1	
-18	34810 or 34811	. RECTIFIER, Silicon	1	
-19	34891	. RESISTOR, Wire-wound 700 ohm 5 watt (R24)	1	
-20	33426	. CAPACITOR, Ceramic disc 220 mmfd (C14)	1	
-21	31719	. COIL, Oscillator	1	
-22	31733	. CAPACITOR, Mylar 0.22 mfd (C12)	1	
-23	31734	. CAPACITOR, Ceramic disc 0.005 mfd (C13)	1	
-24	31720	. RESISTOR, Carbon 1000 ohm 1 watt (R23)	1	
-25	31717	. CAPACITOR, Electrolytic 80 mfd (C15)	1	
-26	31730	. RESISTOR, Wire- wound 5 ohm 5 watt (R25)	1	
-27	31716	. CAPACITOR, Electrolytic, 3-section (C3)	1	
-28	31731	. CAPACITOR, Electrolytic, 10 mfd (C4)	1	
-29	31756	. SHIELD, Tube (beaded)	1	
-30	31759	. SOCKET, Tube	1	
-31	31749	. RESISTOR, Carbon 3900 ohm 1/2 watt (R7) and (R11)	2	
-32	31747	. RESISTOR, Carbon 1800 ohm 1/2 watt (R9)	1	
-33	31740	. RESISTOR, Carbon 470,000 ohm 1/2 watt (R5)	1	
-34	36011	. CAPACITOR, Ceramic disc 0.0039 mfd (C2)	1	
-35	09921	CONTROL ASSY, Volume and tone (see inset)	1	
-35A	31722	. . CONTROL, Volume and tone (with line switch)	1	
-35B	70343	. . VARIABLE RESISTOR AND LINE SWITCH	1	
-36	31744	. RESISTOR, Carbon 22K 1/2 watt (R2)	1	
-37	31749	. RESISTOR, Carbon 3900 ohm 1/2 watt (R1)	1	
-38	31705	. BOARD, Printed circuit	1	
-39	09922	. SUBPLATE ASSY, Amplifier	1	
-40	17078	. RESISTOR, Carbon 220 K 1/2 watt (R27, R28)	2	
-41	31732	. RESISTOR, Carbon 1500 ohm 1/2 watt (R29)	1	
-42	27789	. CAPACITOR, Ceramic disc 0.002 mfd (C17)	1	
-43	25824	. CAPACITOR, Ceramic disc 0.02 mfd (C16, C18)	2	

*NOTE: For amplifier less tubes V1 thru V5 and volume control 09921, order part no. 011164

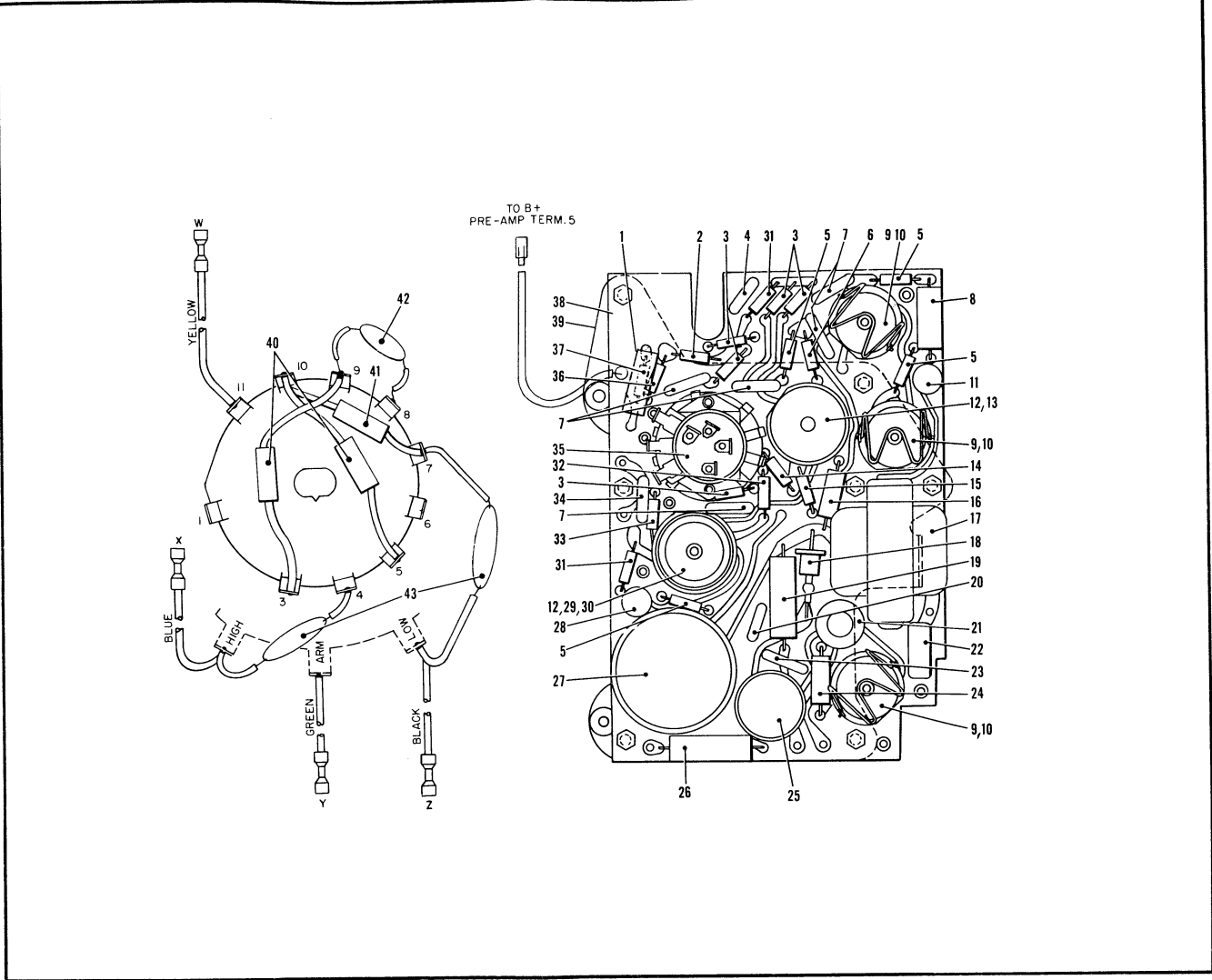


Figure 20. Amplifier Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		25-WATT POWER SPEAKER		
21-	040322	POWER SPEAKER, 25-watt	1	
	01873	. REEL, 1600 foot (not shown)	1	
	08985	. CABLE ASSY, 50-foot (not shown)	1	
-1	82034	. SCREW, Amplifier cover	4	
-2	620004	. WASHER	4	
-3	22045	. NUT, Speed	4	
-4	23736	. COVER, Amplifier	1	
-5	08995	. AMPLIFIER ASSY	1	
-6	23336	. KNOB, Volume control	1	
	040323	. CASE ASSY, Speaker	1	
-7	28037	. SCREW, Speaker attaching	4	
-8	28035	. SPEAKER	1	
-9	1973	. SCREW, Wood	1	
-10	17455	. CLAMP, Cable	1	
-11	09050	. CABLE ASSY, 12-inch	1	
-12	23414	. SCREW, Reel clip attaching	4	
-13	23619	. CLIP, Reel	1	
-14	28048	. RIVET, Tubular	20	
-15	400304	. HINGE	1	
-16	28042	. DRAWBOLT	2	
-17	28043	. CATCH, Drawbolt	2	
-18	18086	. FOOT, Rubber	4	
-19	18087	. NUT, Tee	1	
-20	23414	. SCREW, Wood, guide bracket	2	
-21	28026	. BRACKET, Guide	1	
-22	430145	. SCREW, Machine, handle top	2	
-23	24736	. NUT, Tinnerman	2	
-24	430062	. HANDLE, Top	1	
-25	21736	. RING, Retaining	2	
-26	430142	. WASHER, Flat	2	
-27	430144	. CUSHION	2	
-28	430193	. SPRING	2	
-29	430192	. SLEEVE, Stop	2	
-30	430097	. PIN, Roll	2	
-31	430189	. POST, Handle	2	
-32	430037	. CHANNEL, Handle	1	

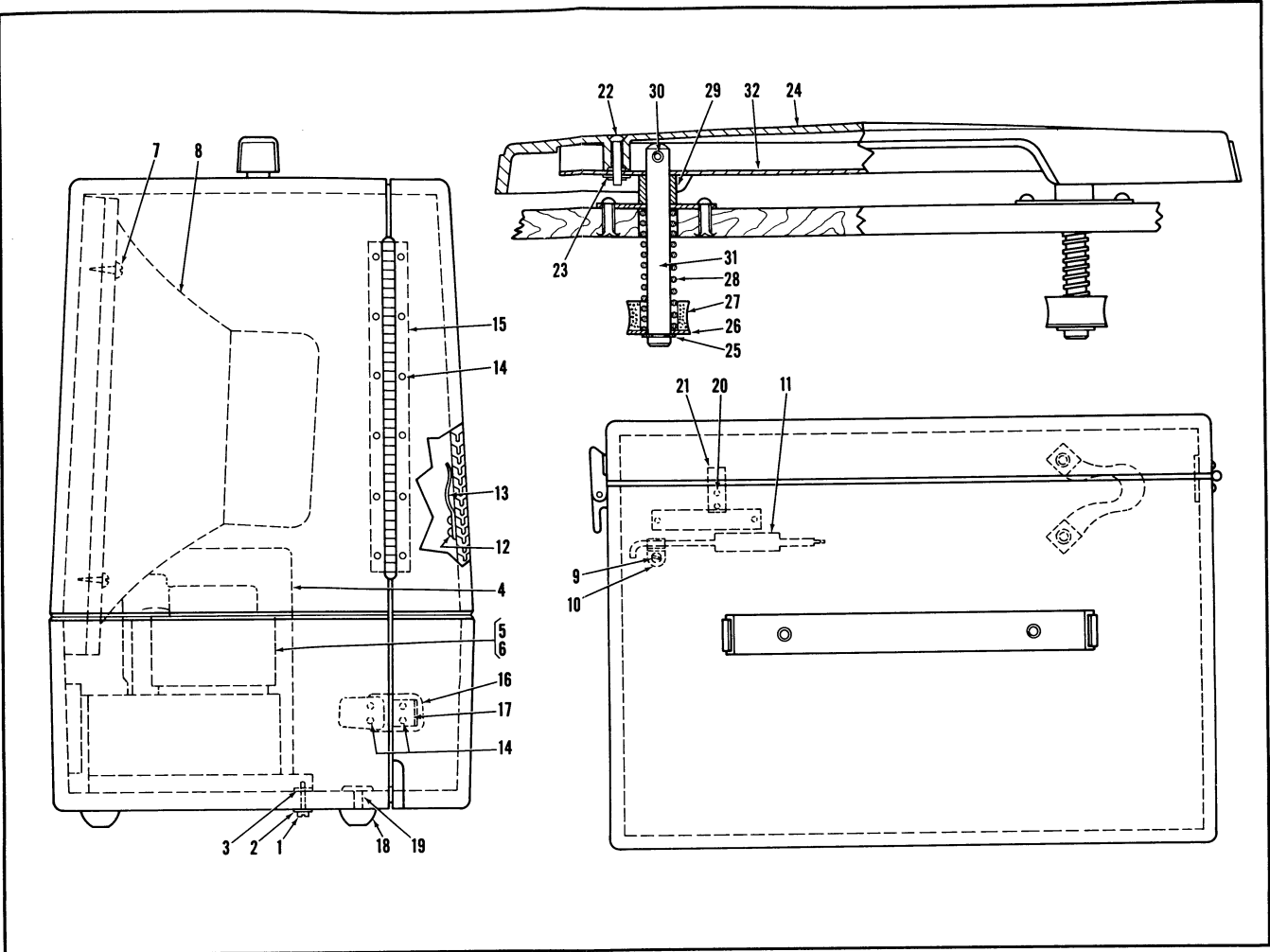


Figure 21. 25-Watt Power Speaker Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
DUAL AV SPEAKERS				
NOTE: Dual AV Speakers are available in black (code A) and green (code B). When ordering spares, be sure to check the Usable on Code column for proper parts.				
22-	011193	SPEAKER ASSY, Complete (black)		A
22-	011194	SPEAKER ASSY, Complete (green)		B
-1	33479	. SCREW, Front cover	9	
-2	33486	. SCREW, Front cover	2	
-3	33481	. NUT, Tinnerman, front cover	2	
-4	09939	. COVER ASSY, Front (black)	1	A
-4	09942	. COVER ASSY, Front (green)	1	B
	09940	. COVER ASSY, Rear, not shown (black)	1	A
	09943	. COVER ASSY, Rear, not shown (green)	1	B
-5	18086	. FOOT, Rubber	4	
-6	33482	. SCREW, Speaker attaching	8	
-7	34876	. SPEAKER, Woofer	1	
-8	33444	. SPEAKER, Tweeter	1	
-9	33485	. SCREW, Handle bracket	4	
-10	33483	. SPEEDNUT, Twin	4	
-11	33471	. BRACKET, Handle	2	
-12	33484	. SCREW, Handle attaching	4	
-13	33369	. STRAP, Handle	1	
-14	33368	. BODY, Handle	1	
-15	33391	. SCREW, Handle cap	2	
-16	33371	. CAP, Handle	1	
-17	33370	. GRIP, Handle	1	
-18	33470	. GROMMET, Rubber, speaker cable	1	
-19	33877	. CAPACITOR	1	
-20	19010	. NUT, Input jack	1	
-21	25368	. WASHER, Key	1	
-22	400449	. WASHER	1	
-23	28059	. INPUT JACK	1	
-24	28088	. PLUG, Phone-jack	1	

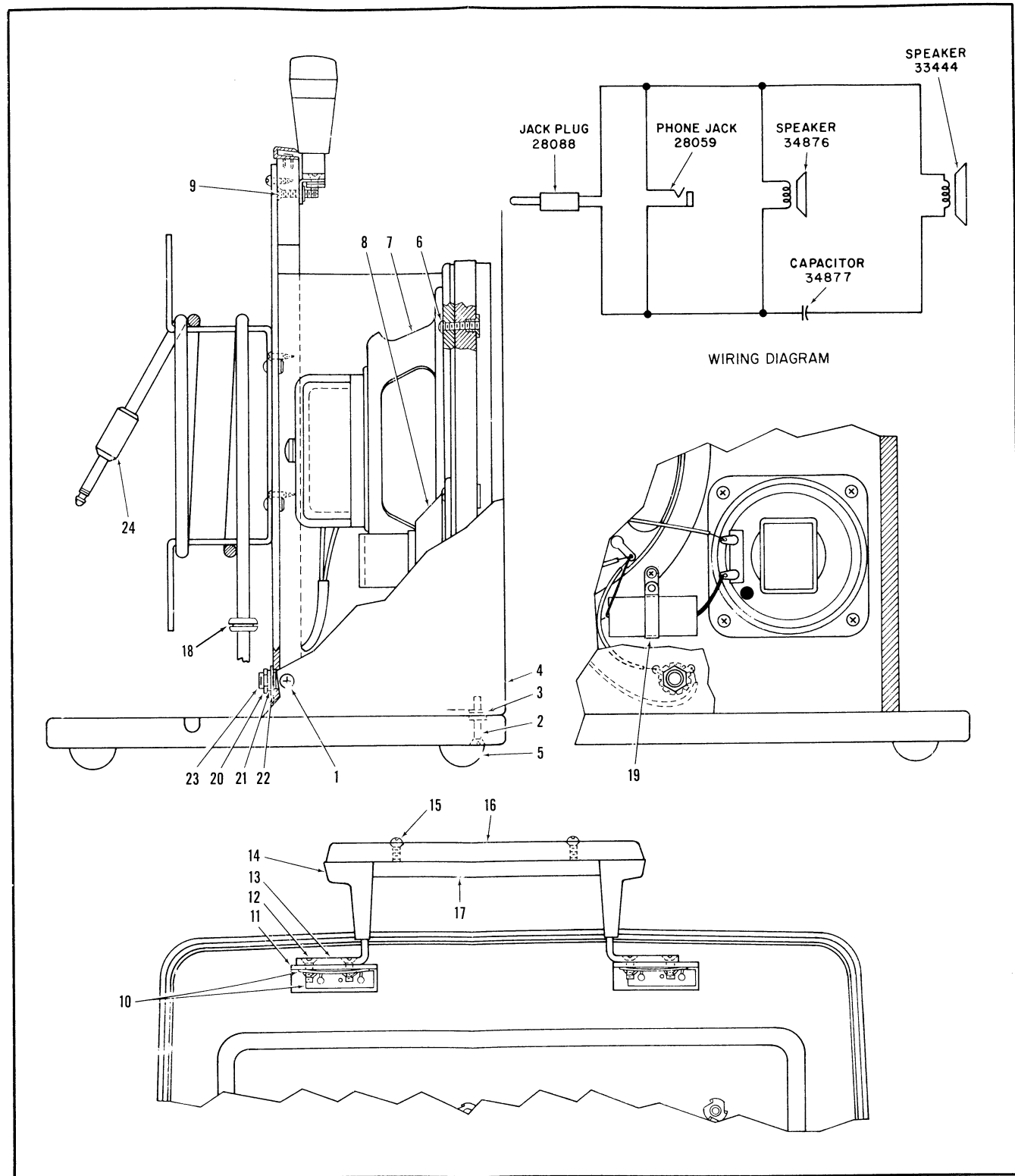


Figure 22. Dual AV Speaker Assembly

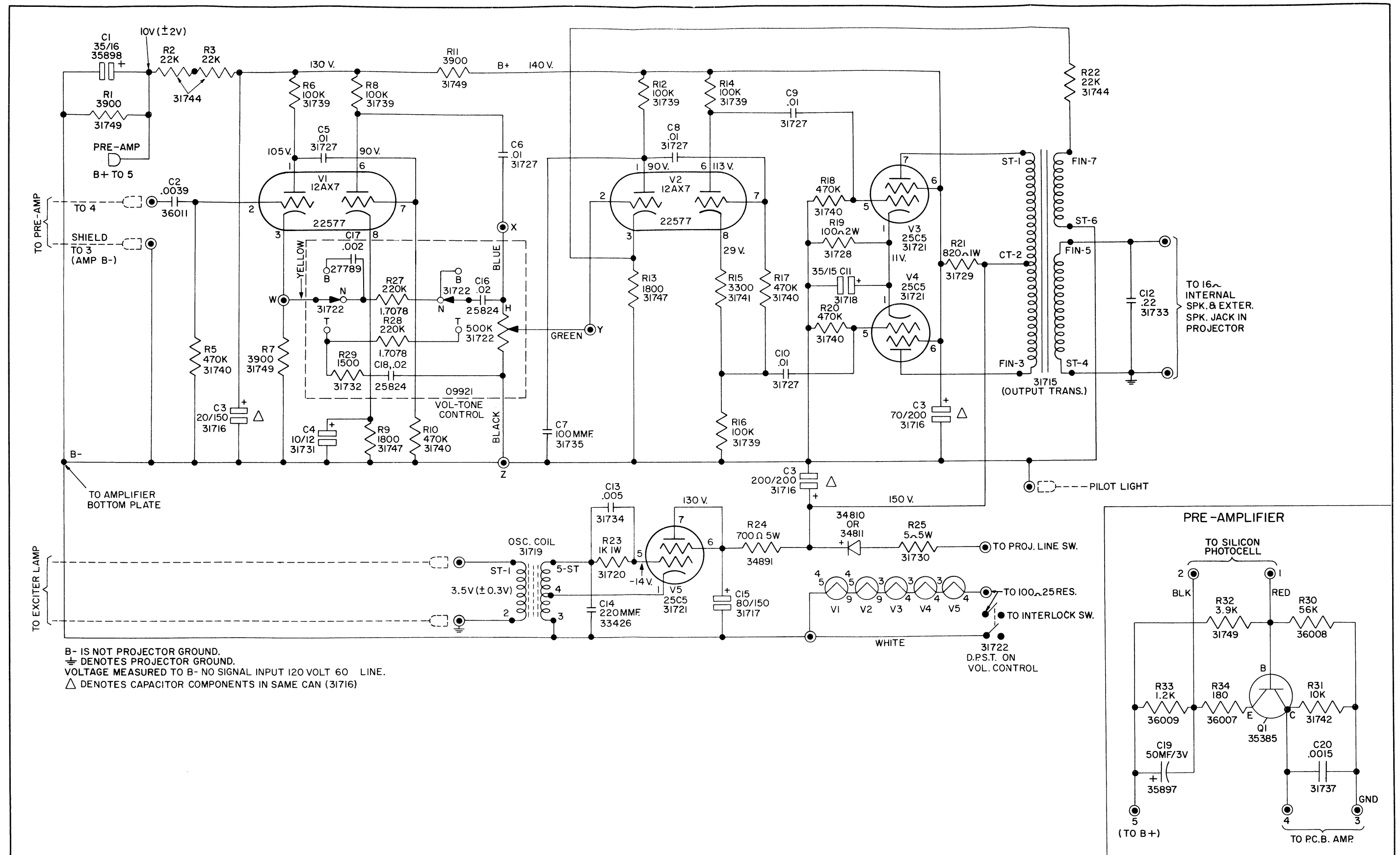


Figure 23. Amplifier Schematic Wiring Diagram

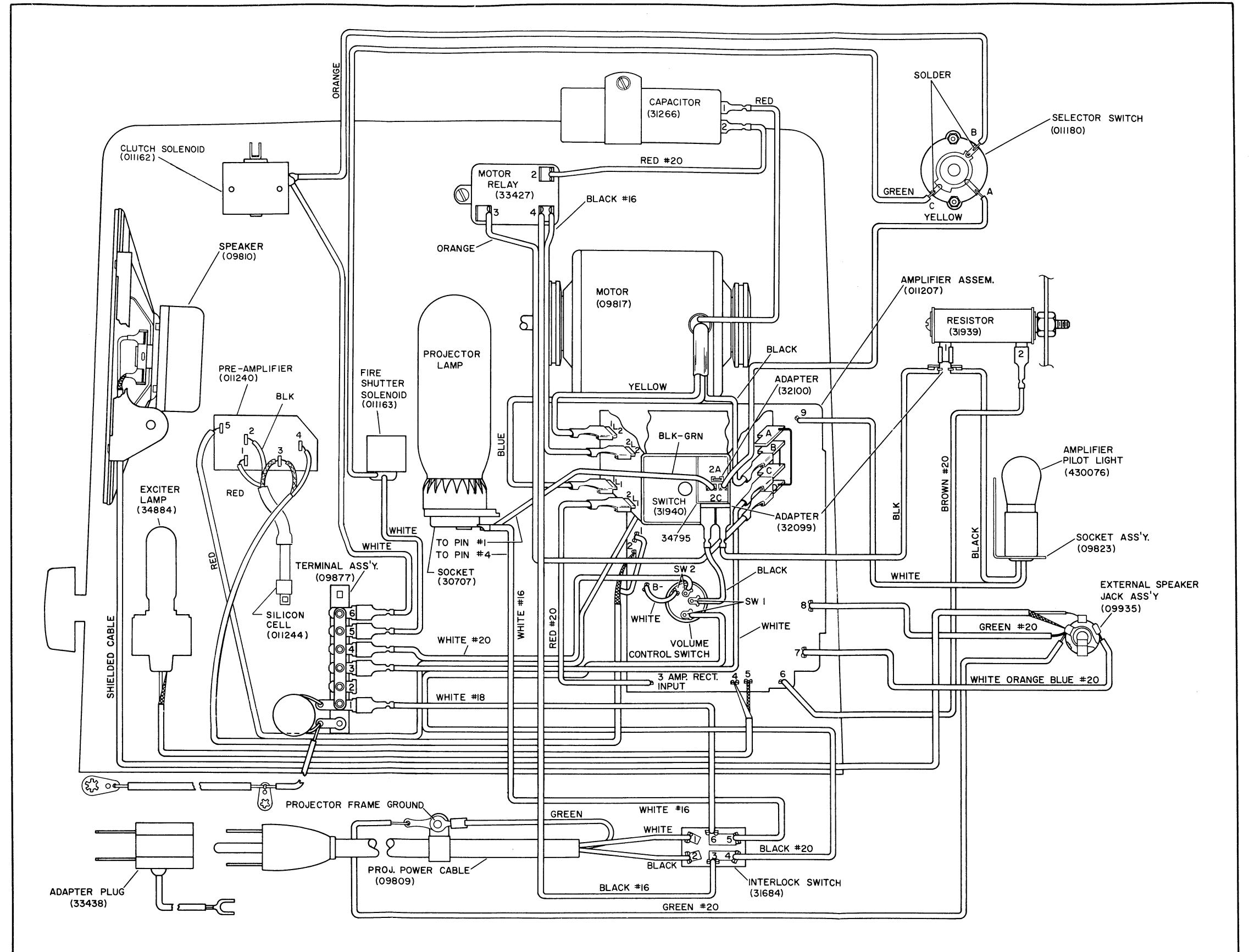


Figure 24. Design 552 Projector Pictorial Wiring Diagram

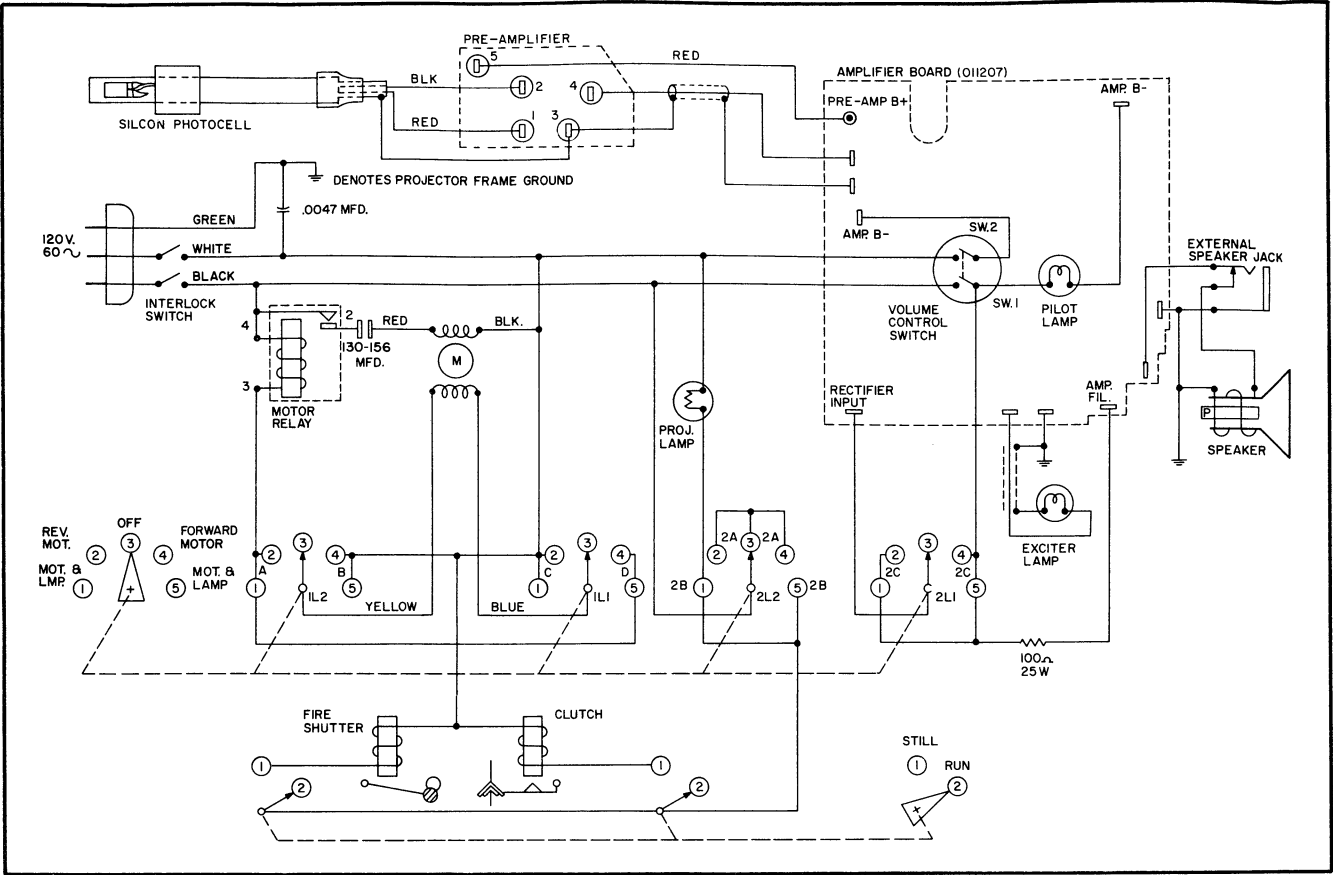


Figure 25. Projector Schematic Wiring Diagram

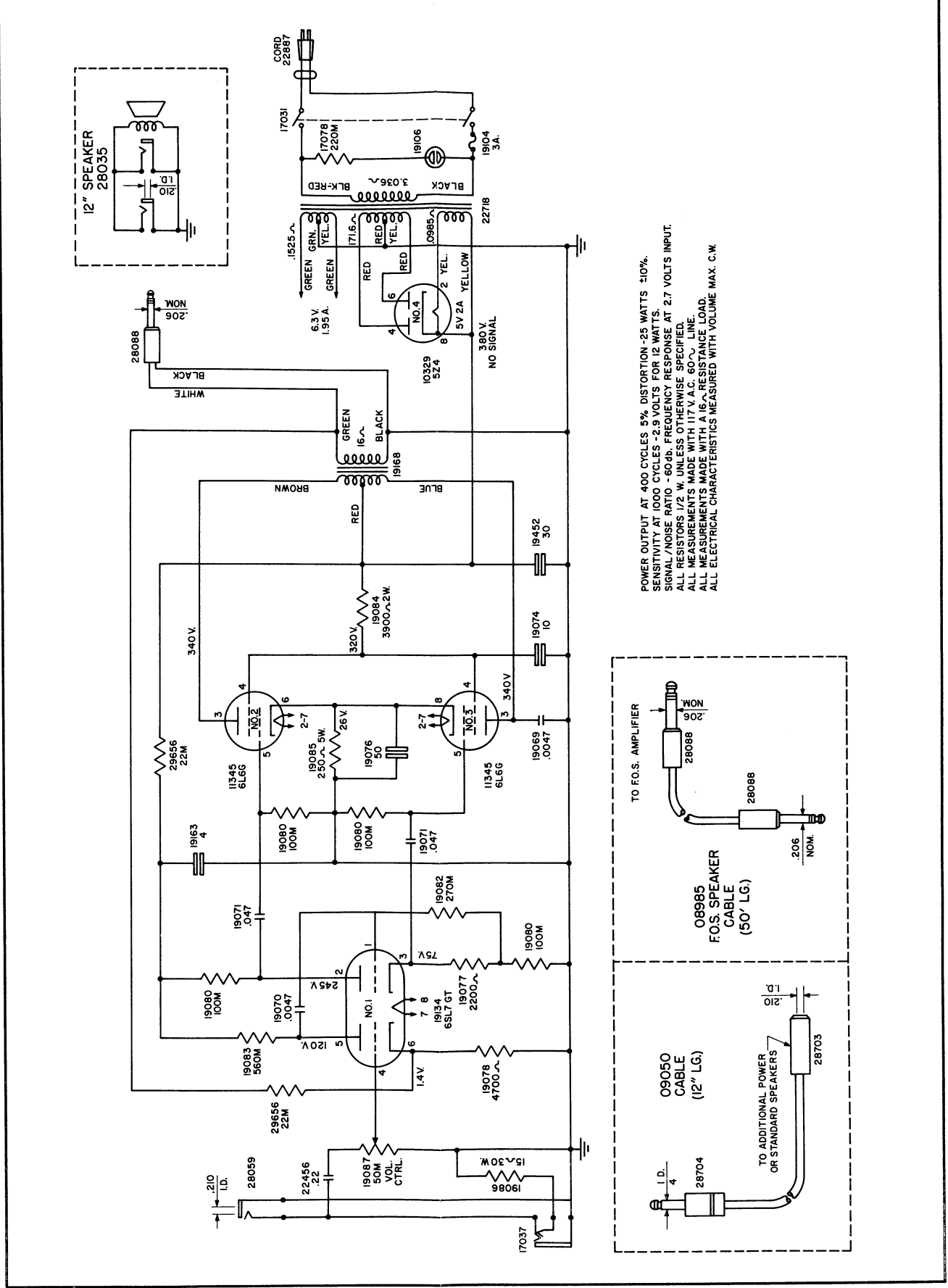


Figure 26. 25-Watt Speaker Schematic Diagram