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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

STILL PICTURE PROJECTOR AP-6 (1)

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STILL PICTURE PROJECTOR AP–6(1)

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual contains a description of Still Picture Projector AP–6(1), instructions for its operation, information on its organizational and field maintenance, and a discussion of the theory of operation.

b. Throughout the text the projector component of Still Picture Projector AP–6(1) is referred to as *projector.*

c. Forward comments on this manual directly to: Commanding Officer, The Signal Corps Publications Agency, Fort Monmouth, N. J.

2. Forms and Records

a. Unsatisfactory Equipment Reports. Fill out and forward DA Form 468, Unsatisfactory Equipment Report, to Commanding General, Signal Corps Engineering Laboratories, Fort Monmouth, N. J., as prescribed in AR 700–38.

b. Damaged or Improper Shipment. Fill out and forward DD Form 6, Report of Damaged or Improper Shipment, as prescribed in AR 700–58 (Army); Navy Shipping Guide, Article 1850–4 (Navy); and AFR 71–4 (Air Force).

c. Preventive Maintenance Forms.

(1) Prepare DA Form 11–256, Operator First Echelon Maintenance Check List for Signal Corps Equipment, (Projector Equipment), in accordance with instructions on the back of the form (fig. 10).

(2) Prepare DA Form 11–257, Second and Third Echelon Maintenance Check List for Signal Corps Equipment, (Projector Equipment), in accordance with instructions on the back of the form (fig. 11).

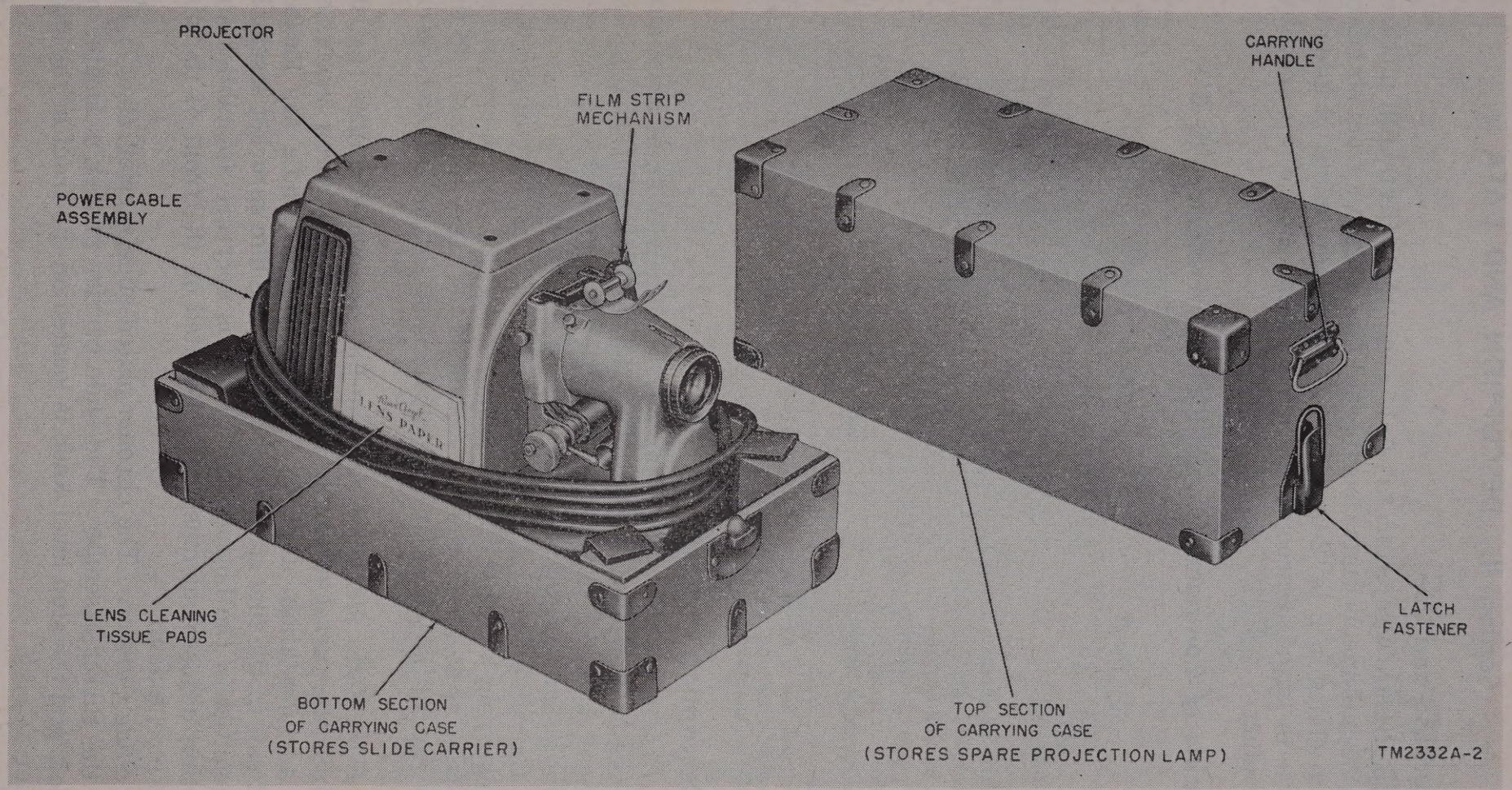


Figure 1. Still Picture Projector AP–6(1), top section of carrying case removed.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

Still Picture Projector AP–6(1) (fig. 1) projects still pictures from 35-millimeter (mm) perforated film strips or from standard 35-mm slides in 2 by 2-inch mounts. The equipment is intended for use in large classrooms or theaters as a visual aid in teaching or briefing.

4. Table of Components of Still Picture Projector AP–6(1)

Component	Quantity	Width (in.)	Height (in.)	Depth (in.)
Carrying case	1	10½	12½	21¾
Projector	1	9⅜	10¾	19⅜
Film strip mechanism	1	3⅛	4½	5⅝
Slide carrier	1	1⅛	4⅝	9
Lens cleaning tissue	1 pad, 50 sheets	6	4	⅛
Spare parts consisting of:				
Projection lamp	1			
Lens cleaning tissue	1 pad, 50 sheets	6	4	⅛

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts. Refer to paragraph 7 for a list of additional equipment required but not supplied.

5. Description

a. Projector. The projector (fig. 2), includes eight aluminum castings that support the projector mechanical parts and optics: the base, housing, housing cover, nosepiece, motor mount, turret assembly, fan shroud, and elevating leg assembly.

b. Carrying Case. The plywood carrying case is equipped with two carrying handles, one on each end (fig. 1). The spare projection lamp is stored in the top section of the carrying case and the slide carrier is stored in a compartment in the bottom section (fig. 3).

c. Film Strip Mechanism. The film strip mechanism (fig. 6) fits into the turret assembly. The single frame screw knob, the film advance knob, and the framing clutch handle are located right side of the film strip mechanism. The film sprocket assembly is mounted in the bottom and the glass aperture assemblies and aperture adjustment masks are mounted on the front of the film strip mechanism.

d. Slide Carrier. The chrome plated slide carrier (fig. 7) fits into the turret assembly. The slide carrier pusher is located on the left and the stop lever knob is located on the front of the slide carrier.

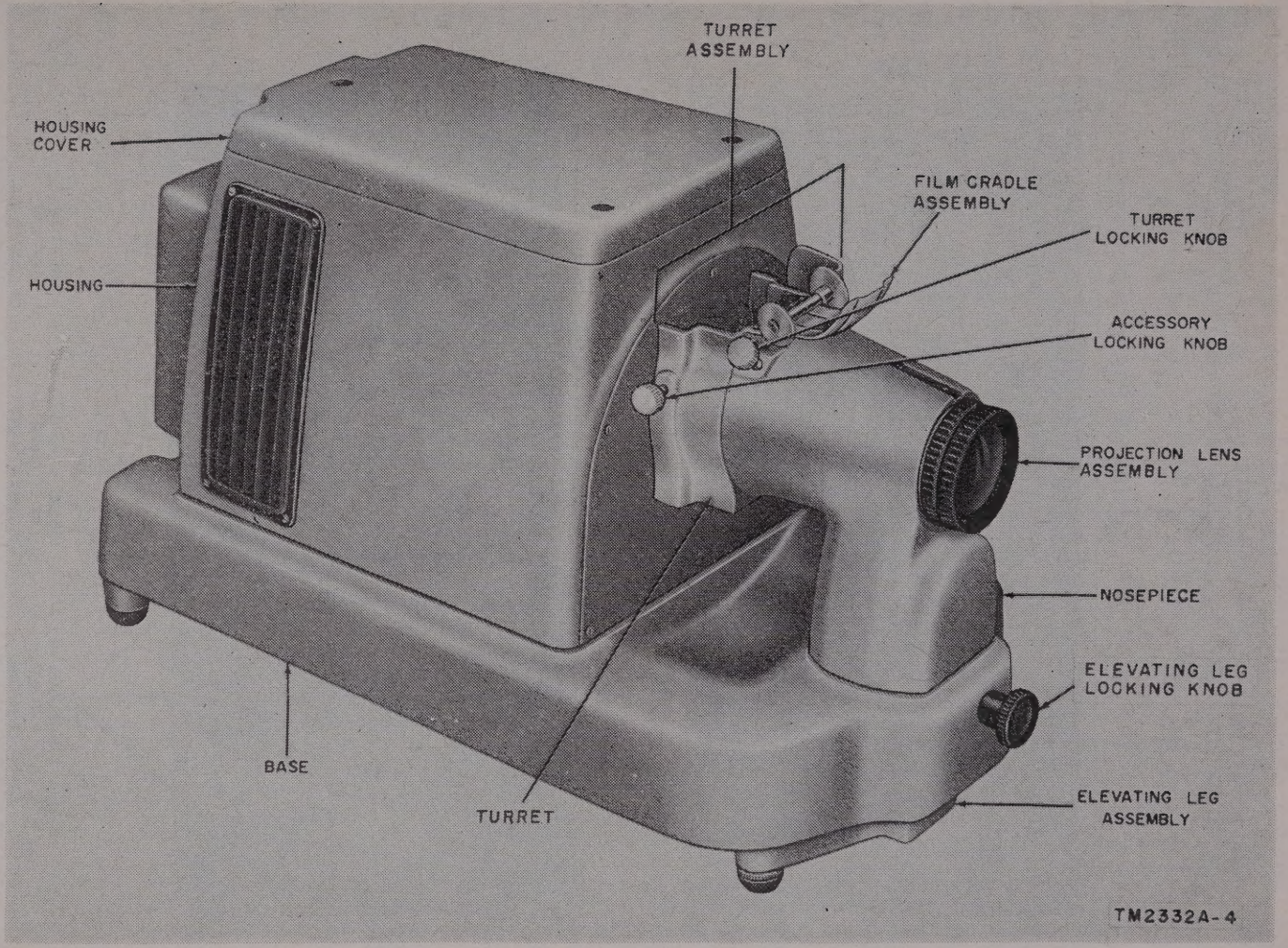


Figure 2. Projector.

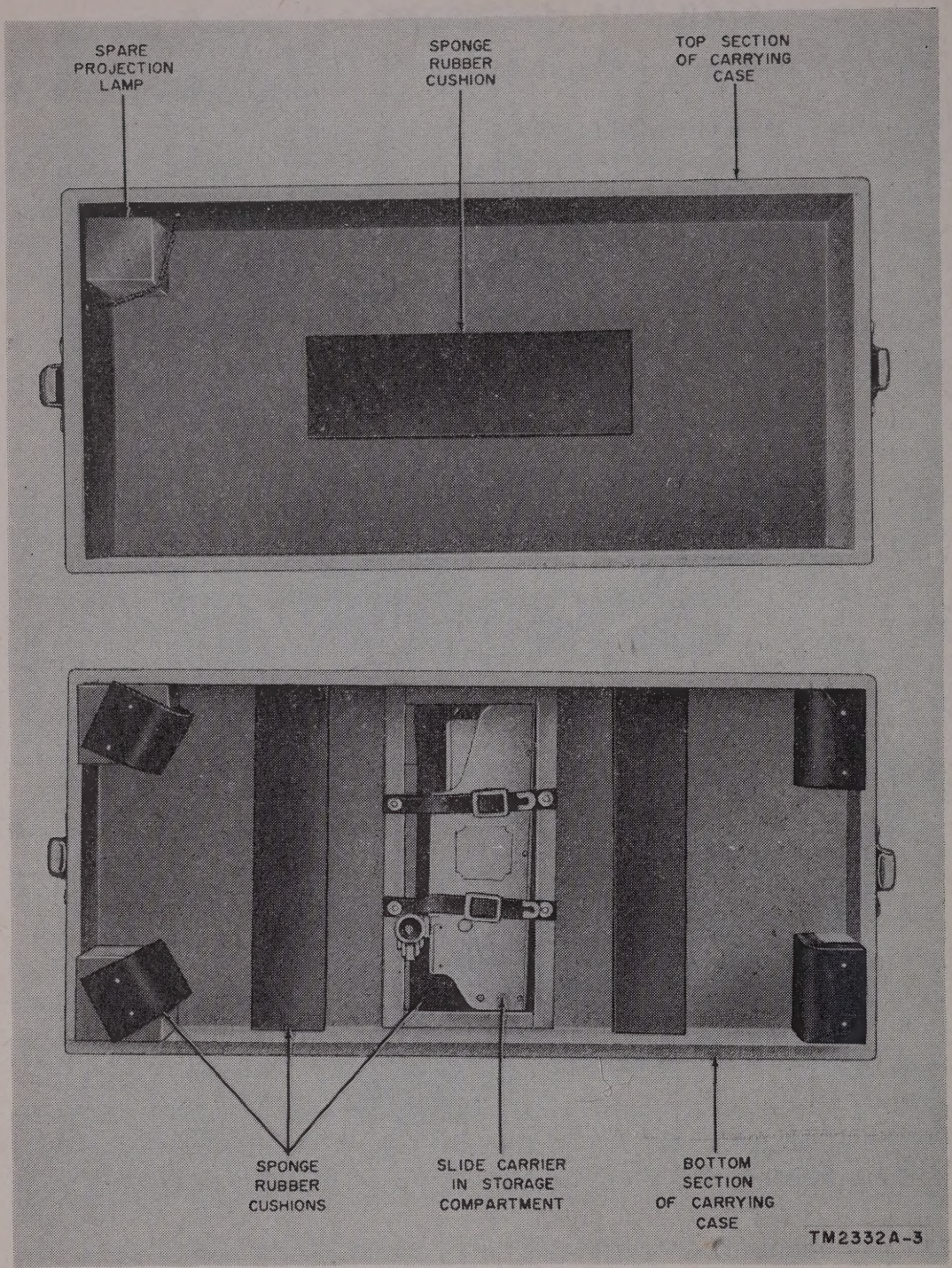


Figure 3. Still Picture Projector AP–6(1), carrying case with slide carrier in storage compartment.

6. Technical Characteristics

Projection material ----------Single or double frame 35-mm perforated film strips, or single or double frame 35-mm standard 2 × 2-inch mounted slides.
Slide mounts accommodated ----All types not thicker than .125 inch.
Projection lamp ----------1,000 watt, medium prefocus, 10-hour.
Voltage requirement ----------117-volt, 50 to 60-cps ac.

Projection lens	f/3.5 anastigmatic, color-corrected, air-to-glass surfaces coated; 5-inch focal length.
Blower motor	Single-phase, 3,000 rpm, 1.4 amp.
Fan	6-inch diameter, 4-bladed.

7. Additional Equipment Required

a. Screen. In theaters, use the permanently installed screen. For large classrooms, a 6-foot ceiling-mounted screen is recommended. For small audiences, use a portable 5- by 5-foot screen. A smooth white surface, such as a wall or sheet, may be used under emergency conditions. Refer to TM 11–487F, Directory of Signal Corps Equipment, Photographic Equipment, for information concerning screens.

b. Table. A sturdy stand or table approximately 3 feet high is required to support the projector. The dimensions of the table top should be at least 1 by 2 feet.

CHAPTER 2

INSTALLATION

8. Unpacking

a. Packaging Data. Still Picture Projector AP–6(1) is packed in an inner and an outer corrugated carton. Each carton is sealed with pressure-sensitive tape. The size, weight, and volume of the packaged and unpackaged equipment (fig. 4) are given in the following chart.

Equipment	Height (in.)	Depth (in.)	Width (in.)	Volume (cu ft)	Unit weight (lb)
Unpackaged	12½	21¾	10½	1.75	50
Packaged	15	23	12¾	2.5	57

b. Unpacking and Checking (fig. 4).

(1) Open the outer corrugated carton and remove the corner spacers.
(2) Lift out the inner corrugated carton.
(3) Open the inner corrugated carton and remove the carrying case.
(4) Unlatch the top section of the carrying case and remove it from the bottom section. Inspect the equipment to be sure it is not damaged.
(5) Check the contents of the carrying case against the table of components (par. 4).

9. Locating Equipment

a. Screen. Erect the screen (par. 7*a*) at the front of the room or in a position that will afford the best view to the entire audience.

b. Stand. Place a stand, table (par. 7*b*), or other sturdy support in the location where the projector is to be set up. Refer to the chart in *d* below to determine the image size required and set the table at the distance from the screen shown in the chart. Place the projector on the table *after* positioning the table.

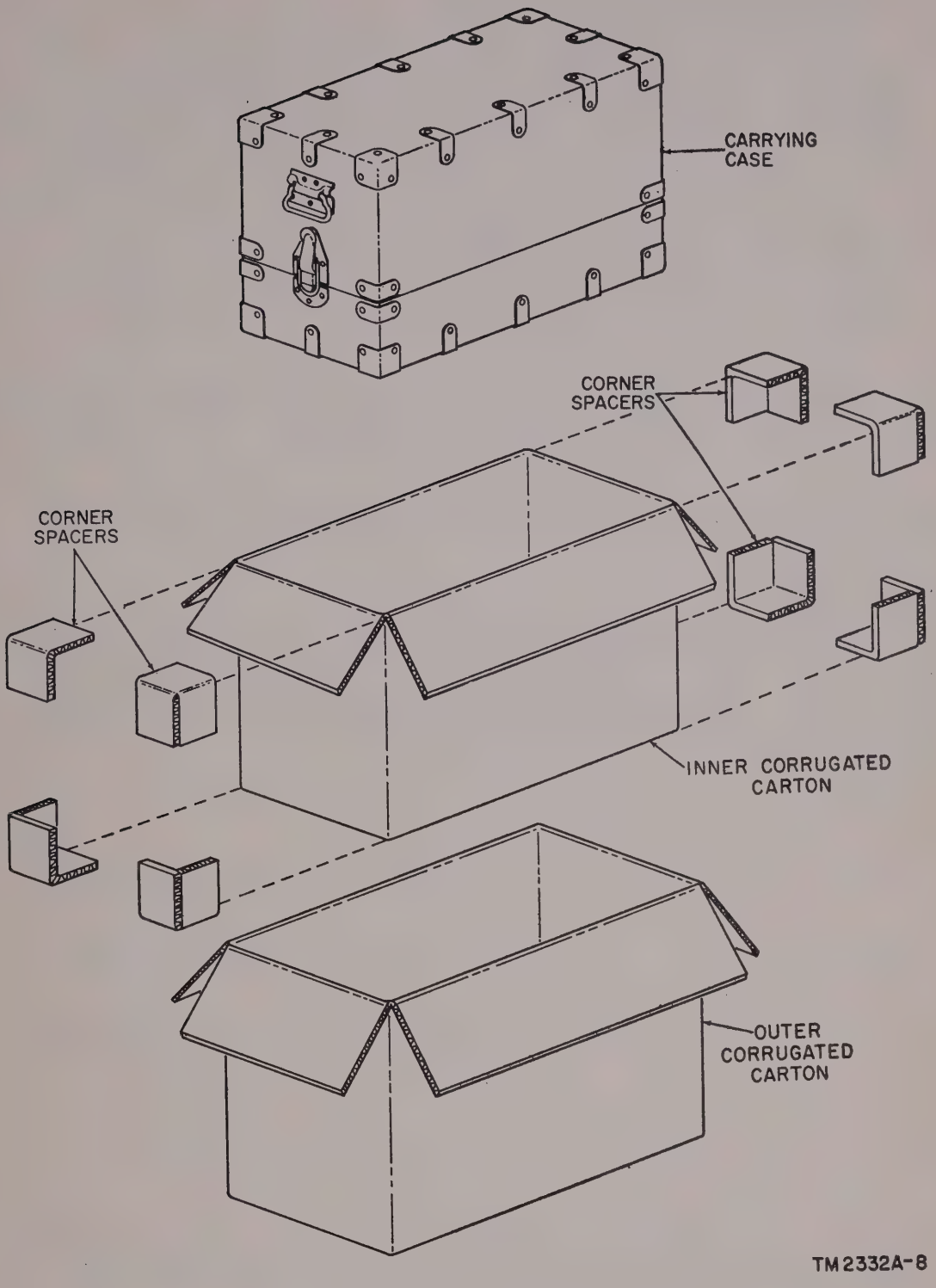


Figure 4. Still Picture Projector AP–6(1), packing diagram.

c. Projector. If the projector does not sit solidly on the table, turn one of the front rubber feet on the elevating leg assembly, counterclockwise, until the projector is steady. Do not attempt to square the image (correct for tilt) on the screen by this method. Refer to paragraph 15*a*(14).

d. Image Size and Distance Chart.

Distance from projection lens to screen (ft)	Width of image on screen		Height of image on screen	
	Single frame (18x24-mm)	Double frame (24x36-mm)	Single frame (18x24-mm)	Double frame (24x36-mm)
10	1′ 9″	2′ 7″	1′ 3″	1′ 10″
12.5	2′ 2″	3′ 3″	1′ 6″	2′ 3″
15	2′ 8″	3′ 11″	1′ 10″	2′ 9″
20	3′ 7″	5′ 3″	2′ 6″	3′ 8″
30	5′ 4″	7′ 11″	3′ 9″	5′ 7″
40	7′ 2″	10′ 7″	5′ 0″	7′ 5″
50	9′ 0″	13′ 3″	6′ 4″	9′ 3″
75	13′ 6″	19′ 11″	9′ 6″	13′ 11″
100	18′ 1″	26′ 8″	12′ 7″	18′ 7″

Note. This chart is based on a 5-inch focal length projection lens.

10. Connection

The projector is shipped ready for operation. Move the FAN and LAMP switches to the off positions. Plug the male connector of the power cable assembly into a 117-volt, 50 to 60-cycles per second (cps) alternating-current (ac) outlet, and the projector is ready for use.

CHAPTER 3

OPERATION

Section I. CONTROLS

11. Projector Controls

(fig. 5)

Control	Function
FAN switch	Turns fan motor on or off.
LAMP switch	Controls the projector lamp when the FAN switch is in the *on* position.
Accessory locking knob	Positions and locks either the slide carrier or the film strip mechanism into the turret assembly of the projector.
Turret locking knob	Locks turret assembly either in the horizontal or vertical position.
Projection lens assembly	Focuses image on screen.
Elevating leg locking knob	Locks elevating leg assembly at the desired position.

12. Film Strip Mechanism Controls

(fig. 6)

Control	Function
Film advance knob	Advances film strip by frames.
Framing clutch handle	Permits proper framing of film strip.
Single frame screw knob	Regulates advancing of mechanism for single or double frame film strips.

13. Slide Carrier Controls

(fig. 7)

Control	Function
Slide carrier pusher	Moves slides into the projector optical system for projection.
Stop lever knob	Provides proper positioning of slides in front of optical system. When raised, it permits the last slide of a series to be ejected from the slide carrier.

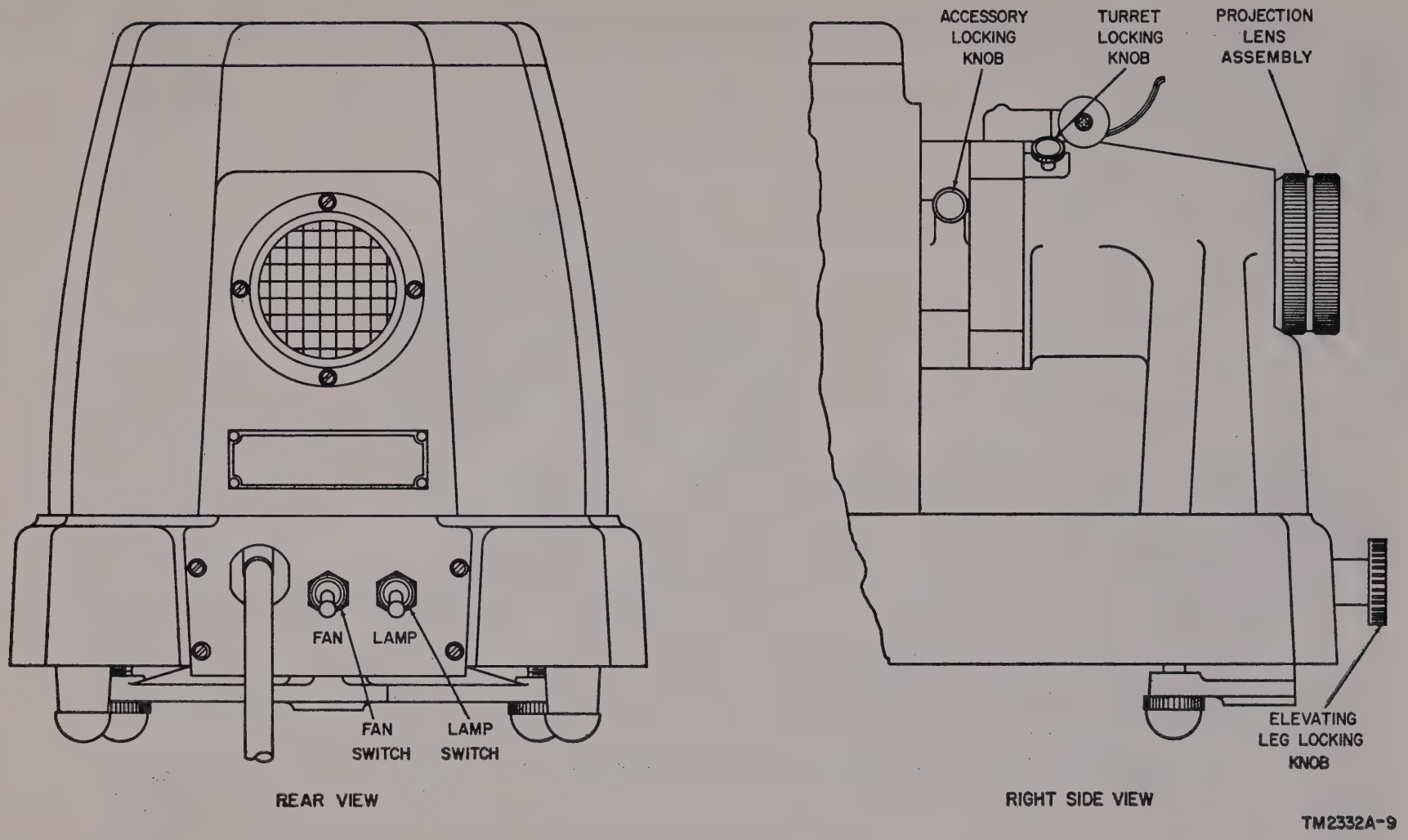


Figure 5. Projector controls.

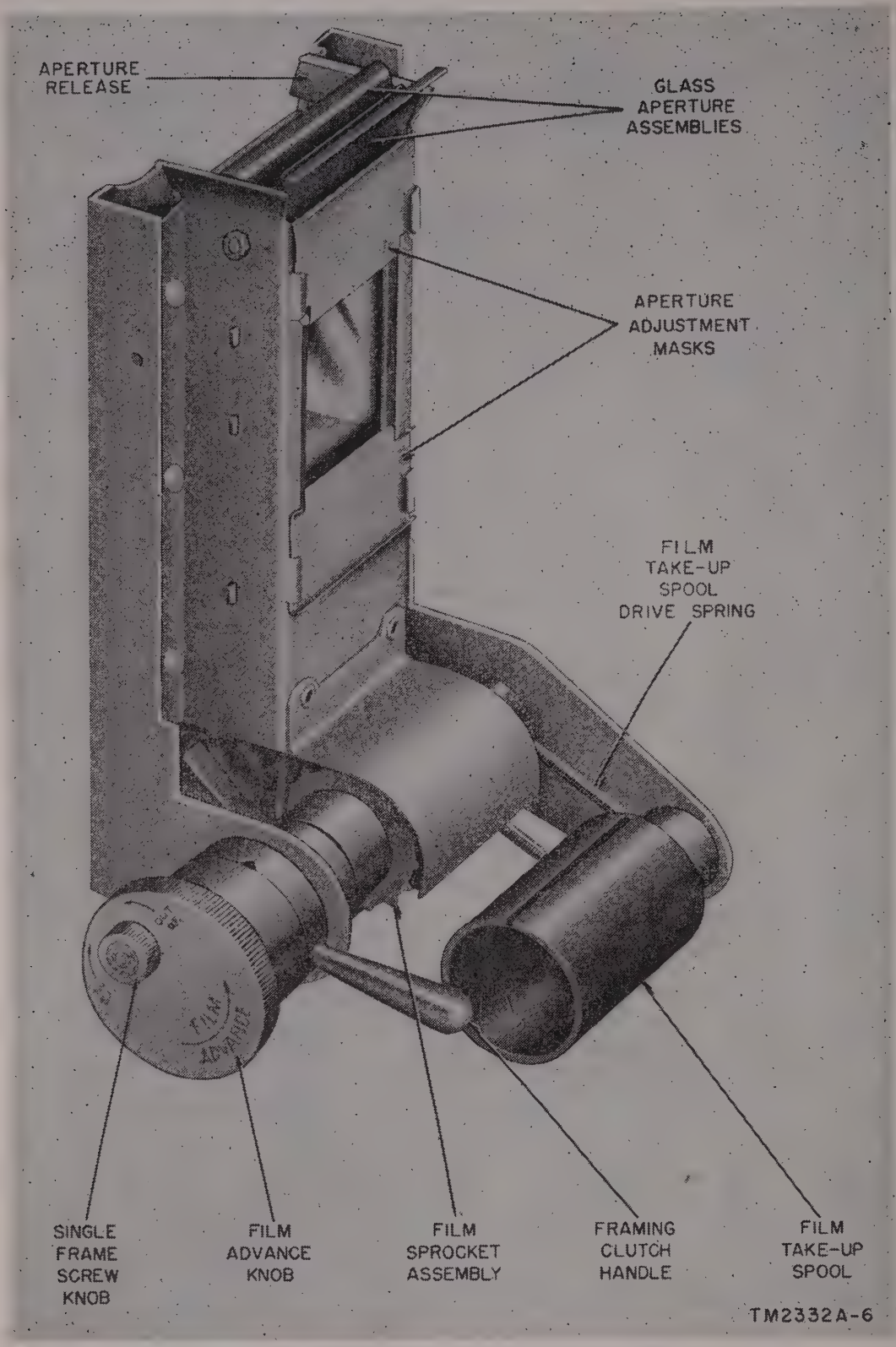


Figure 6. Film strip mechanism.

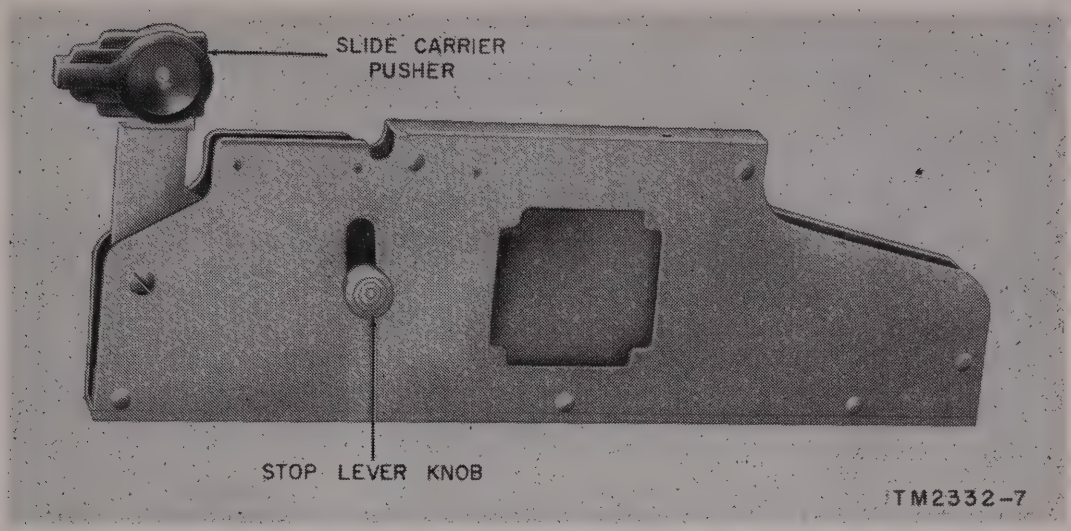


Figure 7. Slide carrier.

Section II. OPERATION UNDER USUAL CONDITIONS

14. Preloading and Cleaning

a. Projector. When in use, clean the projector daily before it is operated.

(1) Dust the outer surface of the projection lens assembly with a camel's-hair brush.

(2) Dampen a lens tissue with liquid lens cleaner and wipe off any dust that cannot be removed with the camel's-hair brush. Use a circular motion to wipe the lens.

(3) Dry the lens with a clean dry lens tissue.

Caution: Do not use any cleaning fluid that has not been approved for use on lens. *Do not touch the lens with the fingers.*

b. Film Strip Mechanism. Clean the film strip mechanism (fig. 6) as follows:

(1) Remove dust from the film strip mechanism with a soft camel's-hair brush. Avoid scratching the glass pressure plates.

(2) Remove all emulsion or dirt from the film strip mechanism with an orange stick or toothpick dipped in Cleaning Compound Federal stock No. 7930–395–9545 (par. 31).

Warning: Provide adequate ventilation when using cleaning compound. Prolonged breathing of the fumes is dangerous. Cleaning compound is inflammable; never use it near a flame.

(3) Remove dirt, dust, or lint from the edge of the aperture opening.

c. Slide Carrier. Remove dust or dirt from the slide carrier (fig. 7) in the same manner as described in *b* above.

15. Film Strip Operation

a. Single Frame Operation.

(1) Place the glass aperture assemblies (fig. 6) of the film strip mechanism *in front of* the center plate.

(2) Move the aperture adjustment masks of the film strip mechanism so that the aperture is as small as possible.

(3) Loosen the turret locking knob (fig. 9) and rotate the turret until the opening is positioned as shown in figure 8.

(4) Insert the film strip mechanism into the turret.

(5) Fasten the film strip mechanism in the turret with the accessory locking knob.

(6) Turn the turret until the film strip mechanism is in the position shown in figure 9. Tighten the turret locking knob.

(7) Turn the single frame screw knob all the way to the right (maximum clockwise position). The film advance knob then will rotate ¼ turn per index as required for single frame projection.

(8) See that the film strip is wound properly (the emulsion (dull) side out) and the first frame at the beginning of the roll of film). Film strips must be rewound after each showing.

(9) Lift the film loop guide and slip the roll of film onto the guide. The end of the film leader should rest on the film cradle assembly.

(10) Feed the end of the film leader into the glass aperture assemblies between the front and rear glass pressure plates (fig. 6). Push the film down as far as possible.

(11) Retain a slight downward pressure on the film and turn the film advance knob (fig. 9) in a counterclockwise direction (toward the rear of the projector) until the sprocket teeth engage the film perforations

(12) Turn the film advance knob until several inches of film leader are available for threading into the film take-up spool.

(13) Move the FAN switch (fig. 5) and then the LAMP switch to the on position.

(14) Turn the film advance knob (fig. 9) until the first frame is seen on the screen. Focus the image on the screen by rotating the projection lens assembly in or out of the nosepiece (fig. 2). If the projected image is tilted on the

screen, loosen the turret locking knob (fig. 9) and turn the turret to square the image on the screen; retighten the turret locking knob.

(15) Move the framing clutch handle in either direction until the image is framed properly on the screen. The film advance mechanism now will index the picture in the proper position automatically, frame by frame, for each ¼ turn of the film advance knob.

(16) Insert the end of the film leader into the slot of the film take-up spool (fig. 6). The spring-driven film take-up spool will continue to take up the film strip as it is advanced. If the film leader is too short, wait until a sufficient length of film has been projected before inserting the end of the film leader into the film take-up spool.

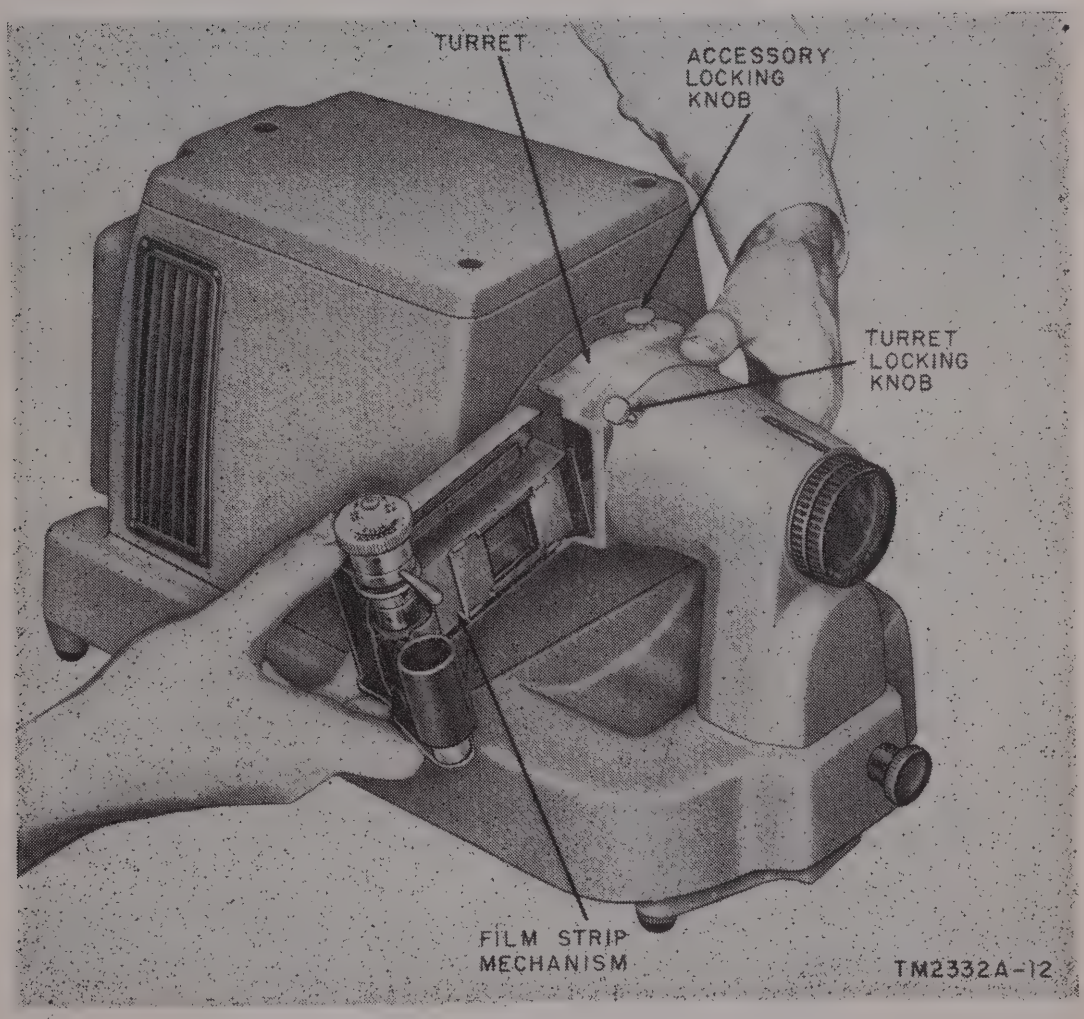


Figure 8. Inserting film strip mechanism into turret.

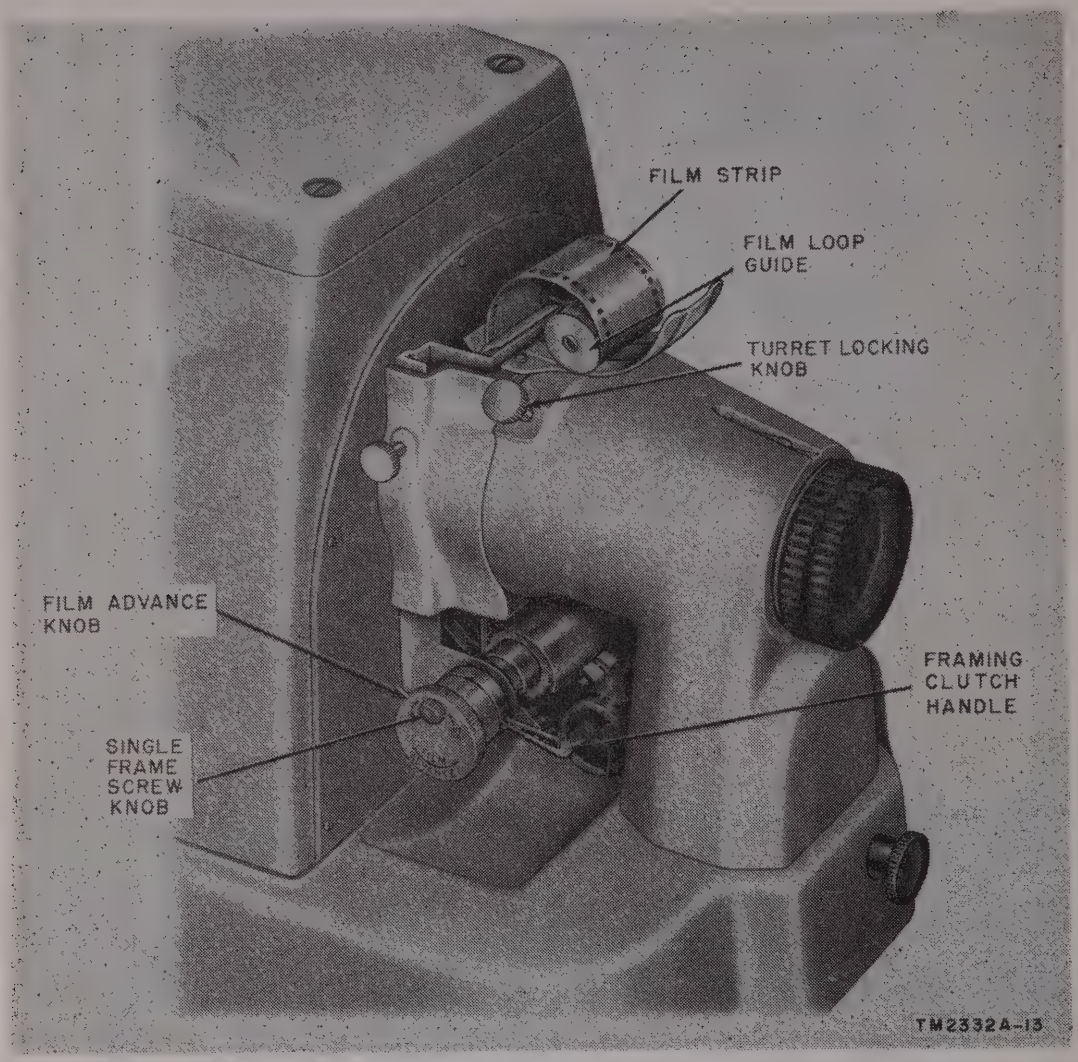


Figure 9. Film strip mechanism with film strip inserted.

b. Double Frame Operation.

(1) Place the glass aperture assemblies (fig. 6) of the film strip mechanism *behind* the center plate.

(2) Move the aperture adjustment masks of the film strip mechanism so that the aperture is as large as possible.

(3) Loosen the turret locking knob (fig. 9) and rotate the turret until the opening is positioned as shown in figure 8.

(4) Insert the film strip mechanism into the turret.

(5) Secure the film strip mechanism in the turret with the accessory locking knob.

(6) Turn the single frame screw knob (fig. 9) all the way to the right (maximum counterclockwise position). The film advance knob will then rotate ½ turn per index as required for double frame projection.

(7) See that the film strip is wound properly, with the emulsion (dull) side out and the first frame at the beginning of the roll of film.

(8) Lift the film loop guide and slip the roll of film onto the guide. The end of the leader film should rest on the film cradle assembly.

(9) Feed the film leader into the glass aperture assemblies between the front and rear glass pressure plates. Push the film down as far as possible.

(10) Retain a slight downward pressure on the film and turn the film advance knob in a counterclockwise direction (toward the rear of the projector) until the sprocket teeth engage the film perforations.

(11) Continue to advance the film, using the film advance knob, until several inches are available for threading into the film take-up spool.

(12) Move the FAN switch (fig. 5) and then the LAMP switch to the on position.

(13) Focus the image on the screen by rotating the projection lens assembly in or out of the nosepiece (fig. 2). If the projected image is tilted on the screen, loosen the turret locking knob (fig. 9) and adjust the turret; retighten the turret locking knob.

(14) Move the framing clutch handle in either direction until the image is framed properly on the screen. The film advance mechanism now will index the picture automatically, frame by frame, for each ½ turn of the film advance knob.

(15) Insert the end of the film leader into the slot of the film take-up spool (fig. 6). The spring-driven film take-up spool will continue to take up the film strip as it is advanced. If the film leader is too short, wait until a sufficient length of film has been projected before inserting the end of the film leader into the film take-up spool.

16. Slide Operation

a. Loosen the turret locking knob (fig. 8) on the turret of the projector.

b. Rotate the turret until the film strip mechanism is in a horizontal position and then tighten the turret locking knob.

c. Loosen the accessory locking knob and remove the film strip mechanism.

d. Mount the slide carrier by sliding it into the rear (wide) groove of the turret. The slide carrier pusher (fig. 7) should be

on the right side of the projector. Lock the slide carrier in place by tightening the accessory locking knob (fig. 8).

e. Tighten the turret locking knob with the slide carrier in a horizontal position.

f. Insert the first slide of the series into the right compartment of the slide carrier with the slide carrier pusher in the extreme right position. The slides *must* be placed in the carrier upside down and reversed to get proper projections. Slides usually are marked in the upper right hand corner.

g. Push the slide carrier pusher (fig. 7) to the left to position the slide for projection; then return the pusher to the right side and insert the next slide.

17. Final Adjustments

a. Center the image on the screen horizontally by turning the projector to the left or right.

b. Center the image on the screen vertically as follows:

(1) Loosen the elevating leg locking knob (fig. 5).

(2) Raise the front end of the projector until the projected image is at the desired height.

(3) Tighten the elevating leg locking knob.

c. Square the image on the screen as follows:

(1) Loosen the turret locking knob.

(2) Rotate the turret until the image is squarely on the screen.

(3) Tighten the turret locking knob.

d. Focus the image on the screen as follows:

(1) Push in or pull out the projection lens assembly until the image is roughly focused.

(2) Rotate the projection lens assembly either clockwise or counterclockwise until the sharpest focus is achieved.

18. Operating Procedure

a. General. After darkening the assembly room, follow the procedure outlined in *b* below for film strips and the procedure outlined in *c* below for mounted slides.

b. Film Strip. To operate the projector for film strips, follow the procedure outlined below.

(1) Move the FAN switch (fig. 5) to the on position.

(2) Move the LAMP switch to the on position.

(3) Wait for the instructor to complete the explanation of the first frame.

(4) Turn the film advance knob (fig. 9) one step (¼ turn for single frame and ½ turn for double frame film

strips) in a counterclockwise direction to show the second frame.

(5) Continue to advance the film strip one step at a time until the entire film strip has been shown.

(6) If it is necessary to repeat the showing of one frame or move the film back one frame, turn the film advance knob clockwise one step.

c. Slide Carrier. To operate the projector for slides, turn on the FAN switch and then the LAMP switch, and follow the procedure outlined below.

(1) Place the first slide in the right compartment in the slide carrier with the slide pusher in the extreme right position.

(2) Move the slide pusher from the extreme right position to the extreme left position, then return it to the extreme right position.

(3) Insert the second slide in the right compartment while the instructor is explaining the first slide.

(4) After the instructor has completed the explanation of the first slide, move the slide pusher from the extreme right to the extreme left and back to the extreme right again, and insert the third slide in the right compartment.

(5) While the second slide is being shown, remove the first slide from the left compartment and return it to the container.

(6) Follow the procedure outlined above until all of the slides have been shown.

(7) Remove the last slide from the projector by raising the stop lever knob (fig. 7) and moving the slide pusher to the extreme left position.

19. Stopping Procedure

a. Turn on the assembly room lights.

b. Move the LAMP switch (fig. 5) to the off position. *Leave the FAN switch in the on position.* Keep the fan running without moving the projector for at least 2 minutes to cool the projector lamp and optical system.

c. Rewind the film strips or rearrange and stack the slides for the next showing.

d. After at least 2 minutes, move the FAN switch to the off position.

e. Loosen the elevating leg locking knob; return the elevating leg assembly to minimum height so that the legs are recessed in the base of the projector; tighten the elevating leg locking knob.

f. If slides have been projected, loosen the accessory locking knob, remove the slide carrier from the turret, reinsert the film strip mechanism, and tighten the accessory locking knob. Return the slide carrier to the bottom section of the carrying case and secure it in place with the provided straps.

g. Disconnect the power cable assembly from the power source and wrap it around the projector.

h. Set the projector in the bottom section of the carrying case and cover it with the top section of the carrying case. Lock the latch fasteners.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

20. General

The projector is intended for operation under shelter at mild temperatures, where unusual conditions are not encountered. However, should the equipment be used under unusual climatic conditions, special operating precautions must be taken.

21. Operation in Arctic Climates

When the equipment has been stored outdoors or in an unheated shelter, or has been kept at low temperatures for an extended period of time, follow the procedure explained below before operating the equipment.

a. Gradually transfer the equipment from the cold to the warmer temperature. Allow 6 hours or more for the equipment to reach room temperature.

b. Whenever possible, while the equipment is in cold atmosphere, inclose the unpacked equipment in water repellent material, such as waterproof bags, a shelter cloth, or other improvised covering. The water repellent material must be as airtight as possible. After the equipment has been transferred to the warmer room, keep the covering on for approximately 6 hours to permit the equipment to reach the room temperature. This procedure will further reduce the possibility of condensation on the equipment.

c. Before using the equipment, use a lint-free cloth to remove any water that has condensed on the outside surfaces of the equipment, the glass pressure plates, and the film riding surfaces. Clean the condensing lenses with lens tissue. When moisture has condensed on the inside surface of the projection lens assembly, keep the lens at room temperature until it is clear. To dry the lens rapidly, move the FAN and LAMP switches to the on position

without a slide or film strip; operate the projector until it is completely dry.

22. Operation in Desert Climates

When the equipment has been used outdoors where dust, wind, and sand are present, these abrasive materials must be removed to avoid damage to the projector.

a. Use a camel's-hair brush to clean the pressure plates, all film riding surfaces, and the projection lens assembly. *Do not use lens tissue to clean the lens unless it first has been dusted with a camel's-hair brush.* Cleaning the lens with tissue before it has been dusted will scratch the lens. Do this cleaning indoors or under cover.

b. Avoid storing the projector outdoors if possible. However, when this is necessary, cover it with a sheltering cloth or other improvised material to protect it from dust.

23. Operation in Tropical Climates

a. If it is necessary to store the projector outdoors in tropical areas, cover the equipment with a sheltering cloth to protect it from moisture.

b. Before using the equipment, use a soft bristle brush to remove dust from the housing. Use a soft camel's-hair brush and carefully dust the rear condensing lens, heat filter, front condensing lens, and projection lens assembly. Be sure that all of the moving parts are free from dust and sand.

c. Under conditions of high humidity, inspect the equipment for traces of fungus, mold, and metallic corrosion. Remove all traces immediately.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

24. Scope of Organizational Maintenance

a. Organizational maintenance is performed by the operator or the organizational repairman. Corrective measures in the equipment performance check list that refer to a *higher maintenance authority indicate that the corrective action must be performed by an experienced repairman.*

b. The maintenance that can be performed by the operator is limited to cleaning and inspecting the equipment. The organizational repairman can repair or replace easily accessible items as explained in paragraphs 32 through 35. If the equipment cannot be repaired by the unit repairman, return it to field maintenance for repair.

c. The paragraphs in this section will help to determine which of the parts of the projector is at fault and give instructions for its repair or replacement.

25. Tools and Test Equipment

There are no tools supplied with the equipment. The following tools and test equipment, are required for organizational maintenance.

Tools or test equipment	Used to
Air syringe	Blow dust from projector parts.
Camel's-hair brush	Brush dirt and dust from optics.
Knife TL–29	Remove wire covering.
Multimeter TS–297/U	Check electrical circuits.
Pliers TL–13A	Repair and install wiring.
Screwdriver TL–360/U (large)	Remove slot-drive screws.
Screwdriver TL–457/U (Phillips)	Remove Phillips-head screws.
Screwdriver (small)	Remove small screws.
Wrench (Allen) No. 8–32 set screw	Remove Allen-head screws.

26. Materials

Two packages of lens tissue are issued with the equipment. In addition, the following materials are required for organizational maintenance.

Material	Used to
Lint-free cloth	Remove dust and dirt from mechanical parts.
Liquid lens cleaner	Clean optics.
Cleaning Compound	Clean metal parts.

Section II. PREVENTIVE MAINTENANCE SERVICES

27. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order. Preventive maintenance lessens equipment breakdowns and interruptions in service.

28. Use of Preventive Maintenance Forms

(fig. 10 and 11)

a. DA Form 11–256.

(1) DA Form 11–256 is a preventive maintenance check list to be used by the operator.

(2) Items not applicable to the projector are lined out on figure 10. References in the ITEM block are to paragraphs in this manual that contain additional maintenance information pertinent to the particular item.

b. DA Form 11–257.

(1) DA Form 11–257 is a preventive maintenance check list to be used by a second echelon repairman.

(2) Items not applicable to the projector are lined out on figure 11. References in the ITEM Block are to paragraphs in this manual which contain additional maintenance information pertinent to the particular item.

29. Performing Preventive Maintenance

a. Daily.

(1) Check to see that all of the parts listed in paragraph 4 are with the equipment.

(2) Inspect the exterior of the carrying case for scratched or chipped paint. Touch up any spots that are badly scratched.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

PROJECTOR EQUIPMENT

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.
STILL PICTURE PROJECTOR AP6(1)	

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; ⊗ Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	INSPECT EQUIPMENT FOR COMPLETENESS - PROJECTOR, CASES, ~~LOUDSPEAKER, CABLES~~, CORDS, ~~SCREEN, TRIPOD, AMPLIFIER, MICROPHONE~~, ACCESSORIES, RUNNING SPARES. PAR. 29 a (1)							
2	INSPECT OUTSIDE SURFACES OF COMPONENTS FOR CRACKS, CHIPPED PAINT, RUST, MILDEW, FUNGI, LOOSE OR MISSING SCREWS, DENTS, MOISTURE, ~~BROKEN STRAPS~~. PAR. 29 a (2)							
3	CLEAN OUTSIDE SURFACES OF COMPONENTS OF DIRT, DUST, LINT, OIL, GREASE, GRIME, MOISTURE, MILDEW, FUNGI. PAR. 29 a (4)							
4	TIGHTEN ALL LOOSE EXTERIOR SCREWS, ~~FASTENINGS~~, MOUNTINGS, TO A SNUG FIT. PAR. 29 a (4)							
5	CLEAN PROJECTION LENS SURFACE OF OIL, HAZE, MOISTURE, DUST. PAR. 29 a (5)							
6	INSPECT APERTURE PLATE ~~AND PRESSURE SHOE FOR BURRS~~. PAR. 29 a (6)							
7	INSPECT TAKEUP, ~~REWIND FEED~~ BELTS FOR PROPER JOINING, BENDS, STRETCHED CONDITION. PAR. 29 a (6)							
8	INSPECT PROJECTION LAMP TO DETERMINE IF REPLACEMENT IS REQUIRED. PAR. 29 a (9)							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
9	CLEAN CONDENSING LENSES, REFLECTOR OF DIRT, DUST, MOISTURE, OILY FILM. PAR. 29 a		11	~~CLEAN FEED REEL, SPINDLE AND TAKEUP REEL SPINDLE OF DIRT, DUST, LINT.~~	
10	INSPECT SWITCHES AND CONTROL KNOBS FOR FREE MOVEMENT, POSITIVE ACTION. PAR. 29 a (7), (8)		12	WHEN STORING OR TRANSPORTING EQUIPMENT, TURN ~~"PROJECTOR VOLUME" CONTROL TO "OFF" POSITION AND~~ "MOTOR SWITCH" TO "STOP" POSITION. PAR. 19 b	

13 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 11-256 (Formerly DA AGO) REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM2332A-15

Figure 10. DA Form 11–256.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
PROJECTOR EQUIPMENT

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE: STILL PICTURE PROJECTOR AP6 (1)

EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; I Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
1	INSPECT EQUIPMENT FOR COMPLETENESS - PROJECTOR, CASES, ~~LOUDSPEAKER~~, ~~CABLES~~, CORDS, ~~SCREEN, TRIPOD, AMPLIFIER~~, ~~MICROPHONE~~, ACCESSORIES, RUNNING SPARES. PAR. 29 a (1)		11	~~CLEAN FEED REEL, SPINDLE AND TAKEUP REEL SPINDLE OF DIRT, DUST, LINT~~.	
2	INSPECT OUTSIDE SURFACES OF COMPONENTS FOR CRACKS, CHIPPED PAINT, RUST, MILDEW, FUNGI, LOOSE OR MISSING SCREWS, DENTS, MOISTURE, ~~BROKEN STRAPS~~. PAR. 29 b (1), (2)		12	WHEN STORING OR TRANSPORTING EQUIPMENT, TURN "~~PROJECTOR VOLUME~~" ~~CONTROL TO "OFF" POSITION AND~~ "MOTOR SWITCH" TO "STOP" POSITION. PAR. 19 b	
3	CLEAN OUTSIDE SURFACES OF COMPONENTS OF DIRT, DUST, LINT, OIL, GREASE, GRIME, MOISTURE, MILDEW, FUNGI. PAR. 29 b (3)		13	CLEAN APERTURE PLATE ASSEMBLY, ~~FILM PRESSURE SHOE ASSEMBLY~~, SPROCKET ~~SHOE ASSEMBLY~~, GUIDEWAYS, ~~SOUND DRUM~~, OF DIRT, OIL, DUST, CAKED EMULSION. PAR. 29 a (6)	
4	TIGHTEN ALL LOOSE EXTERIOR SCREWS, ~~FASTENINGS~~, MOUNTINGS, TO A SNUG FIT. PAR. 29 a (4)		14	LUBRICATE ~~IN ACCORDANCE WITH LATEST DEPARTMENT OF THE ARMY LUBRICATION ORDER~~. PAR. 49 b	
5	CLEAN PROJECTION LENS SURFACE OF OIL, HAZE, MOISTURE, DUST. PAR. 29 a (5)		15	~~INSPECT DRIVE PULLEY FOR SLIPPAGE~~.	
6	INSPECT APERTURE PLATE ~~AND PRESSURE SHOE~~ FOR BURRS. PAR. 29 a (6)		16	~~INSPECT DRIVE CLUTCH FOR SLIPPAGE~~.	
7	INSPECT TAKEUP, ~~REWIND FEED~~ BELTS FOR PROPER JOINING, ~~BENDS~~, STRETCHED CONDITION. PAR. 29 a (6)		17	~~INSPECT FOR PROPER FILM SPEED~~.	
8	INSPECT PROJECTION LAMP TO DETERMINE IF REPLACEMENT IS REQUIRED. PAR. 29 a (9)		18	CLEAN ~~INTERMITTENT MECHANISM AND~~ LAMP HOUSE OF DIRT, DUST, LINT, EXCESS OIL. PAR. 29 b (7)	
9	CLEAN CONDENSING LENSES, REFLECTOR OF DIRT, DUST, MOISTURE, OILY FILM. PAR. 29 a (5)		19	INSPECT FOR ~~FILM JUMP, FILM SLAP, FILM PICKING~~, FILM SCRATCH. PAR. 29 b (5)	
10	INSPECT SWITCHES AND CONTROL KNOBS FOR FREE MOVEMENT, POSITIVE ACTION. PAR. 29 b (8)		20	OPERATE PROJECTOR AND CHECK FOR OVERHEATING, SMOOTHNESS OF OPERATION, UNUSUAL NOISES, SQUEAKS, RATTLES, VIBRATIONS, SATISFACTORY OPERATION. PAR. 29 c (2), (4)	

21 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA FORM 1 MAY 51 11-257 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

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Figure 11. DA Form 11–257.

(3) Check to be sure that all the rubber cushions in the carrying case are in place. Glue any found to be loose and replace any that are missing.

(4) Wipe the exterior of the projector. Remove all dust, dirt, or grease. Tighten all loose exterior screws and mountings.

(5) Remove the dust and dirt from all lenses with a camel's-hair brush; then use lens tissue.

(6) Check the film strip mechanism and slide carrier. If they have been bent or broken, obtain a replacement. Check the film take-up spool drive spring (fig. 6) for bends, proper joining, or stretched condition. If any of these symptoms are evident, replace the drive spring.

(7) Check the LAMP and FAN switches for proper operation.

(8) Loosen the elevating leg locking knob and lift the front of the projector to be sure that the elevating leg assembly is not corroded or broken.

(9) Inspect the projector lamp. If the filament is broken, or the lamp is blackened, replace the lamp.

b. Weekly.

(1) Inspect the case for bent or broken re-enforcing brackets.

(2) Inspect the latch fasteners to be sure they clamp the upper section of the carrying case to the lower section.

(3) Wipe the dust, dirt, and grease from the exterior of the carrying case.

(4) Inspect the film strip mechanism and slide carrier for broken or missing parts.

(5) Unscrew the three cover locking screws and remove the housing cover (fig. 2). Inspect the front and rear condensing lens (fig. 16) and heat filter for cracks and scratches. Replace any damaged lens.

(6) Rotate the projection lens assembly out of the nosepiece. Be sure that it is clean and can be adjusted easily for focusing.

(7) Inspect the reflector for dents, scratches, and dust. Replace the reflector if it is damaged. Clean the reflector if it is dusty or dirty. Use a camel's-hair brush; then use lens tissue.

(8) Operate the FAN and LAMP switches to be sure they operate properly.

(9) Check the film guide assembly to be sure that there are no broken or missing parts.

(10) Check all assembly screws to be sure that they are tight.

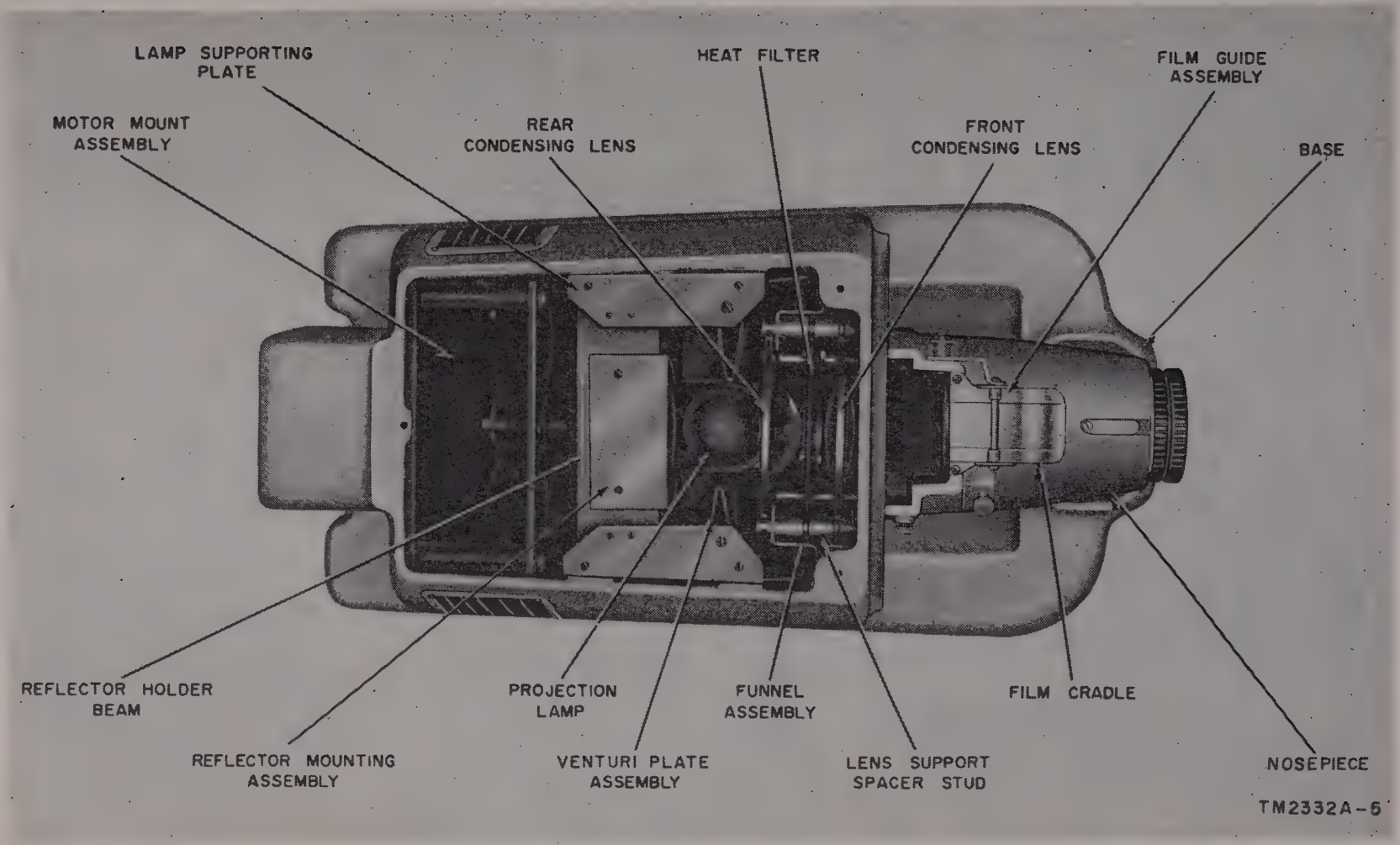


Figure 12. Projector, top view, with housing cover removed.

(11) Inspect the base to be sure that the rubber feet are in good condition.

c. Monthly.

(1) Inspect the power cable assembly for cracks, cuts, or other damage.

(2) Connect the projector to the proper power outlet and move the FAN switch to the on position; then move the LAMP switch to the on position. The fan should operate before the projection lamp lights.

(3) Clean the condensing lens and the heat filter with a camel's-hair brush, then with lens tissue and liquid lens cleaner if required.

(4) Check to be sure that the fan is cooling the projection lamp while the projector is turned on.

(5) Clean the projector with Cleaning Compound wherever dirt cannot be removed with a cloth.

Section III. TROUBLESHOOTING AND REPAIR AT ORGANIZATIONAL MAINTENANCE LEVEL

30. Equipment Performance Check List

The equipment performance check list below will help locate trouble in the equipment. This list gives the item to be checked, the normal indications and tolerances of correct operations, and the corrective measures that can be taken by the operator. *To use this list effectively, follow the items in numerical sequence.*

	Item No.	Item	Action	Normal indications	Corrective measures
PREPARATORY	1	Projector (fig. 1).	Set up on table or bench about 3 feet high.	Projector sets level.	Adjust the front rubber feet.
	2	Film strip mechanism (fig. 6).	Remove from turret by loosening accessory locking knob.		
	3	Power cable assembly (fig. 1).	Connect to 117-volt, 50- to 60-cps, ac source.		
START	4	FAN switch (fig. 5).	Move to the on position.	Fan motor starts.	Tighten all loose connections. Check fan motor. Replace FAN switch (par. 35).

	Item No.	Item	Action	Normal indications	Corrective measures
START	5	LAMP switch (fig. 5).	Move to the on position.	Projection lamp lights.	Replace lamp (par. 32). Replace LAMP switch (par. 35).
	6	Elevating leg locking knob (fig. 5).	Loosen the elevating leg locking knob, elevate the front of the projector to the desired height; then tighten.	Front of projector is secured at desired height.	Turn in equipment for repair.
EQUIPMENT PERFORMANCE	7	Slide carrier (fig. 7).	Insert into turret (par. 16).	Slide carrier is secured in turret.	
	8	Mounted slide.	Insert slide into right compartment with pusher at extreme right position.	Slide drops into right compartment of slide carrier.	Move slide carrier pusher to extreme right position.
	9	Slide carrier pusher (fig. 7).	Push to extreme left.	Slide image is projected on screen.	Replace slide carrier (par. 16).
	10	Projection lens assembly (fig. 2).	Rotate clockwise or counterclockwise.	Image is focused on screen.	Replace projection lens assembly (par. 33).
	11	Stop lever knob (fig. 7).	Elevate and move slide carrier pusher to extreme left position.	Slide is moved to left compartment for removal from slide carrier.	Replace slide carrier (par. 16).
	12	Slide carrier (fig. 7).	Remove from projector turret.		
	13	Film strip mechanism (fig. 6).	Insert into projector turret (par. 15).	Film strip mechanism is secured in turret.	
	14	Film loop guide (fig. 9).	Lift and slip film strip onto guide.	Film is held between film loop guide and film cradle assembly.	Turn in equipment for repair.
	15	Glass aperture assemblies (fig. 6).	Insert film between plates.	Glass aperture assembly guides film through film strip mechanism.	

	Item No.	Item	Action	Normal indications	Corrective measures
	16	Film sprocket assembly (fig. 6).	Rotates with film advance knob.	Engages and advances film.	Turn in equipment for repair.
	17	Framing clutch handle (fig. 6).	Move forward or backward.	Frames picture.	Turn in equipment for repair.
	18	Film take-up spool (fig. 6).	Insert film into spool and rotate film advance mechanism.	Film take-up spool winds up film.	Replace film take-up spool drive spring.
	19	Film strip.	Remove from film strip mechanism.		
	20	LAMP switch (fig. 5).	Move to off position.	Projection lamp is extinguished.	Replace LAMP switch (par. 35).
	21	FAN switch (fig. 5).	After 2 minutes, move to off position.	Fan motor stops.	Replace FAN switch (par. 35).
S T O P	22	Power cable assembly (fig. 1).	Disconnect from power source.		
	23	Elevating leg locking knob (fig. 5).	Loosen and restore elevating leg assembly.	Elevating leg assembly retracts.	Turn in equipment for repair.
	24	Projector (fig. 1).	Replace projector and associated components in carrying case.		

31. Visual Inspection

Inspection by sight and touch often will determine the general condition of the projector and the amount of repair required. Maintenance functions must be performed by an authorized repairman.

a. Inspect all parts of the projector for loose screws, nuts, and bolts.

b. Tighten all knurled clamps and locking screws.

c. Examine the projection lens assembly for cracks, scratches, or discoloration. Be sure the projection lens assembly moves freely in the nosepiece. Replace the projection lens assembly if it is damaged. *Never* attempt to repair the projection lens assembly.

d. Inspect all electrical connections to be sure that they are not loose.

e. Inspect the projector wiring for damaged or frayed insulation.

32. Projection Lamp Replacement

a. Unscrew the three captive screws in the housing cover and lift the housing cover from the housing.

b. Press down on the top of the projection lamp (fig. 12) and turn it ¼ turn to the left (counterclockwise). Remove the lamp.

Warning: Do not touch the projection lamp with bare fingers if the projector has been operating. The projection lamp is very hot.

c. Position the new projection lamp so that the small flange is toward the rear of the projector.

d. Press down on the top of the projection lamp and turn it ¼ turn to the right (clockwise).

e. Replace the housing cover and tighten the three cover locking screws.

33. Projection Lens Assembly Replacement

Pull the projection lens assembly (fig. 2) out of the nosepiece. Push a new projection lens assembly into the nosepiece. Be sure that the projection lens assembly is held firmly in place by the detent pin.

34. Rear Condensing Lens, Heat Filter, and Front Condensing Lens Replacement

a. Unscrew the three cover locking screws in the housing cover and lift off the housing cover.

b. The front condensing lens (fig. 12), heat filter, and rear condensing lens can now be lifted from the projector.

Caution: Handle the lenses very carefully to prevent damage to them.

c. Replace damaged condensing lenses and heat filter.

d. Clean each condensing lens with lens tissue and replace it in the projector. Be sure that the condensing lenses are positioned properly in the lens support spacer pins.

e. Replace the housing cover and tighten the three cover locking screws.

35. Projector Switches and Power Cable Assembly Replacement

a. Disassembly.

(1) Remove the four fillister head machine screws (2, fig. 13) and the four lock washers (3) that secure the switch mounting plate (1) to the base (9). The switch mounting plate (1), with the FAN switch (4), the LAMP switch (5), and the power cable assembly (8) will be

held to the base by the fan motor and projection lamp wiring.

(2) Tag and disconnect the wiring to the FAN switch (4) and the LAMP switch (5). Remove the switch mounting plate (1) which now is free from the base (9).

(3) Unscrew the hexagonal nut (6) and remove the FAN switch (4) from the switch mounting plate (1).

(4) Unscrew the hexagonal nut (6) and remove the LAMP switch (5) from the switch mounting plate (1).

(5) Slide the upper portion of the insulator bushing (7) from the hole in the switch mounting plate (1).

(6) Remove the lower portion of the insulator bushing (7) and the power cable assembly (8) from the hole in the switch mounting plate (1).

b. Cleaning and Inspection.

(1) Clean the switch mounting plate (1) with Cleaning Compound; dry with a lint-free cloth.

(2) Inspect the power cable assembly (8) and replace it if required.

(3) Check the switches for proper operation. Replace if necessary.

(4) Test the switches and wiring for continuity with Multimeter TS–297/U.

c. Reassembly.

(1) Place the lower half of the insulator bushing (7) in the power cord hole of the switch mounting plate (1).

(2) Insert the power cable assembly (8) through this hole in the switch mounting plate (1).

(3) Press the upper half of the insulator bushing (7) in place.

(4) Insert the FAN switch (4) through the switch mounting plate (1) in the proper mounting hole. Secure it in place with the hexagonal nut (6).

(5) Insert the LAMP switch (5) through the switch mounting plate in the proper mounting hole. Secure it in place with the hexagonal nut (6).

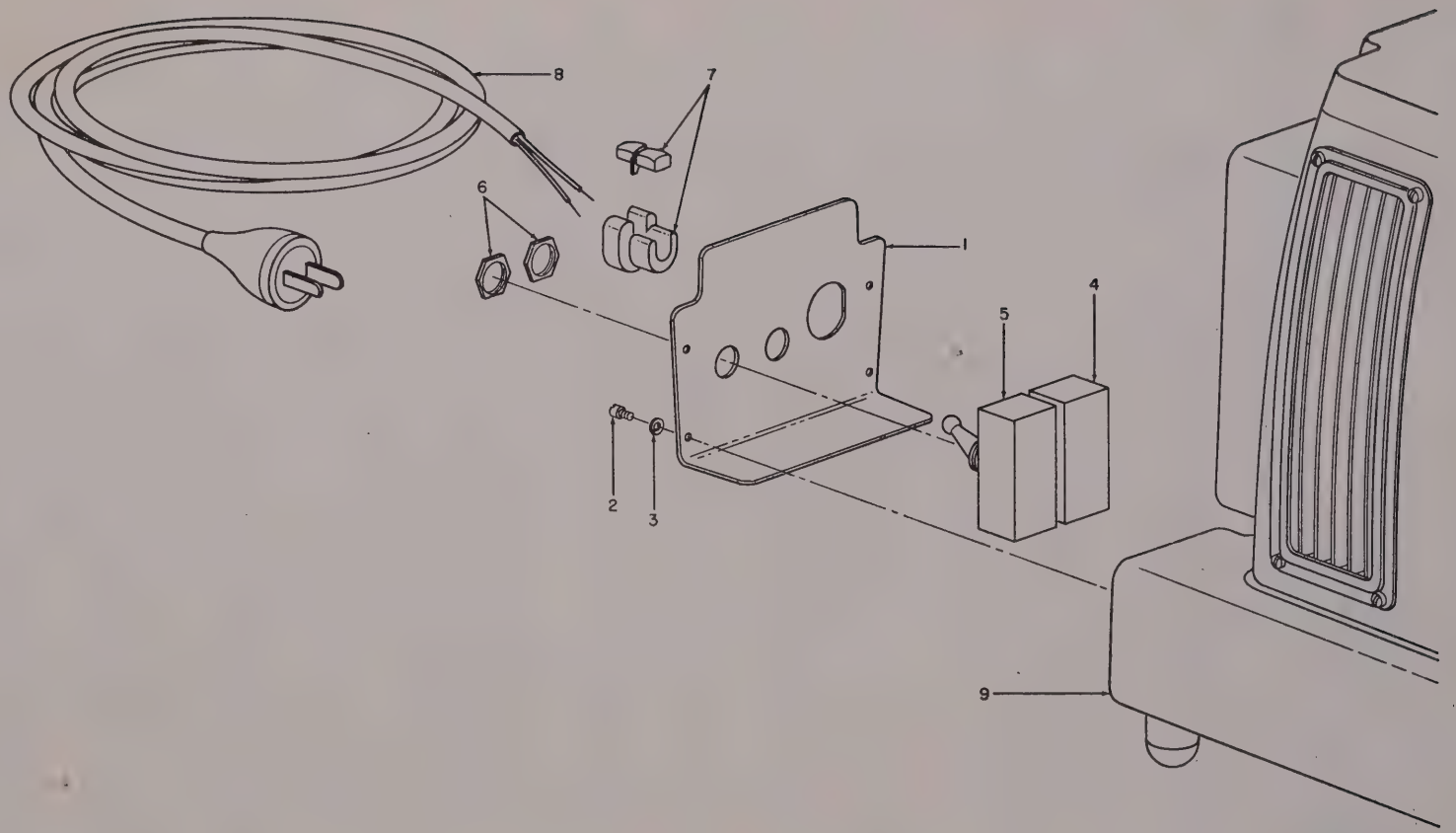
(6) Reconnect the tagged leads to the proper screw terminals of the switches (4 and 5).

(7) Place the switch mounting plate (1) in the proper position against the base (9) and secure it in place with the four fillister head machine screws (2) and four lock washers (3).

d. Testing.

(1) Connect the projector to a 117-volt, 50- to 60-cps, ac power source.

(2) Move the FAN switch (4) to the on position. The fan motor must operate.
(3) Move the LAMP switch (5) to the on position. The projection lamp must light.
(4) Move the FAN switch (4) to the off position. The fan motor must stop and the projection lamp must extinguish.
(5) Move the LAMP switch (5) to the off position.



1 Switch mounting plate (N1).
2 Fillister head machine screw.
3 Lock washer.
4 FAN switch (S1).
5 LAMP switch (S2).
6 Hexagonal nut.
7 Insulator bushing (E1).
8 Power cable assembly, including power cord (W2) and power plug (P1).
9 Base (A4).

Figure 13. Projector switches and power cable assembly, exploded view.

CHAPTER 5

THEORY

36. General

(fig. 14)

a. Single Frame Slides and Film Strips (Motion Picture Camera). Single frame slides and film strips are exposed in the Signal Corps with a motion picture camera. The film is exposed when it is positioned vertically behind the camera lens. This exposes a usable area of about 18 by 24-mm for each frame of 35-mm film. When the slides or film strip taken in this manner are shown, they can be positioned vertically or horizontally in the turret in accordance with the picture format.

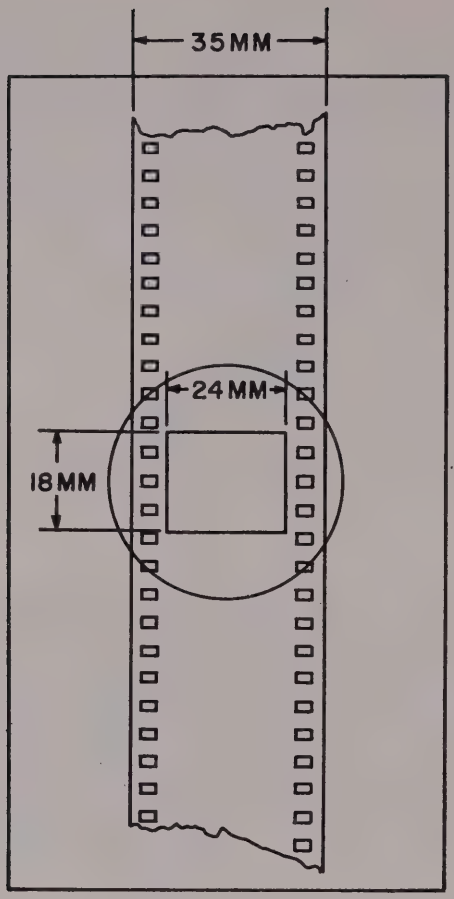
b. Double Frame Slides and Film Strips (Still Picture Camera). Double frame slides and film strips are exposed by using a still picture camera such as Camera PH–629/UF or Camera Equipment AN/GFQ–2. The film is exposed when it is in a horizontal position behind the camera lens. The camera can be turned to the vertical position when photographing. The still camera exposes a usable area of about 24 by 36-mm for each frame of 35-mm film. When the slide or film strips taken with a still camera are shown, they can be positioned horizontally or vertically in the projector turret in accordance with the picture format.

Note. Single frame *and* double frame slides are both mounted in standard 2 by 2-inch mounts. The mounts differ only in the cutout area. Slides made in other formats can also be accommodated by the projector if the slides are mounted in standard 2 by 2-inch mounts not thicker than .125 inch.

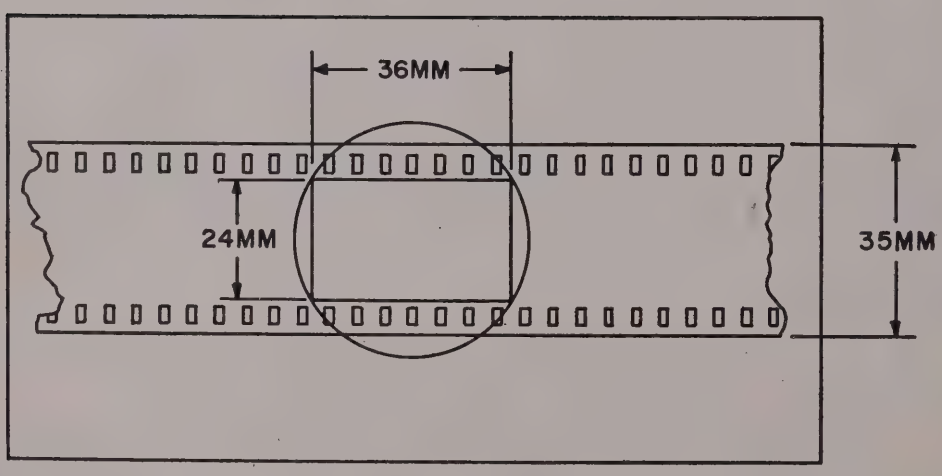
37. Projector

The projector is essentially a device for projecting a selected image onto a smooth, white plane surface or screen.

a. The projection lamp radiates light primarily forward and backward (fig. 15). A reflector is mounted behind the lamp to reflect the radiated light forward. The light, is intercepted by the rear condensing lens and is concentrated into a narrow beam of parallel rays. The light then passes through a heat filter (heat-



A. SINGLE FRAME IMAGE



B. DOUBLE FRAME IMAGE

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Figure 14. Single and double frame film sizes.

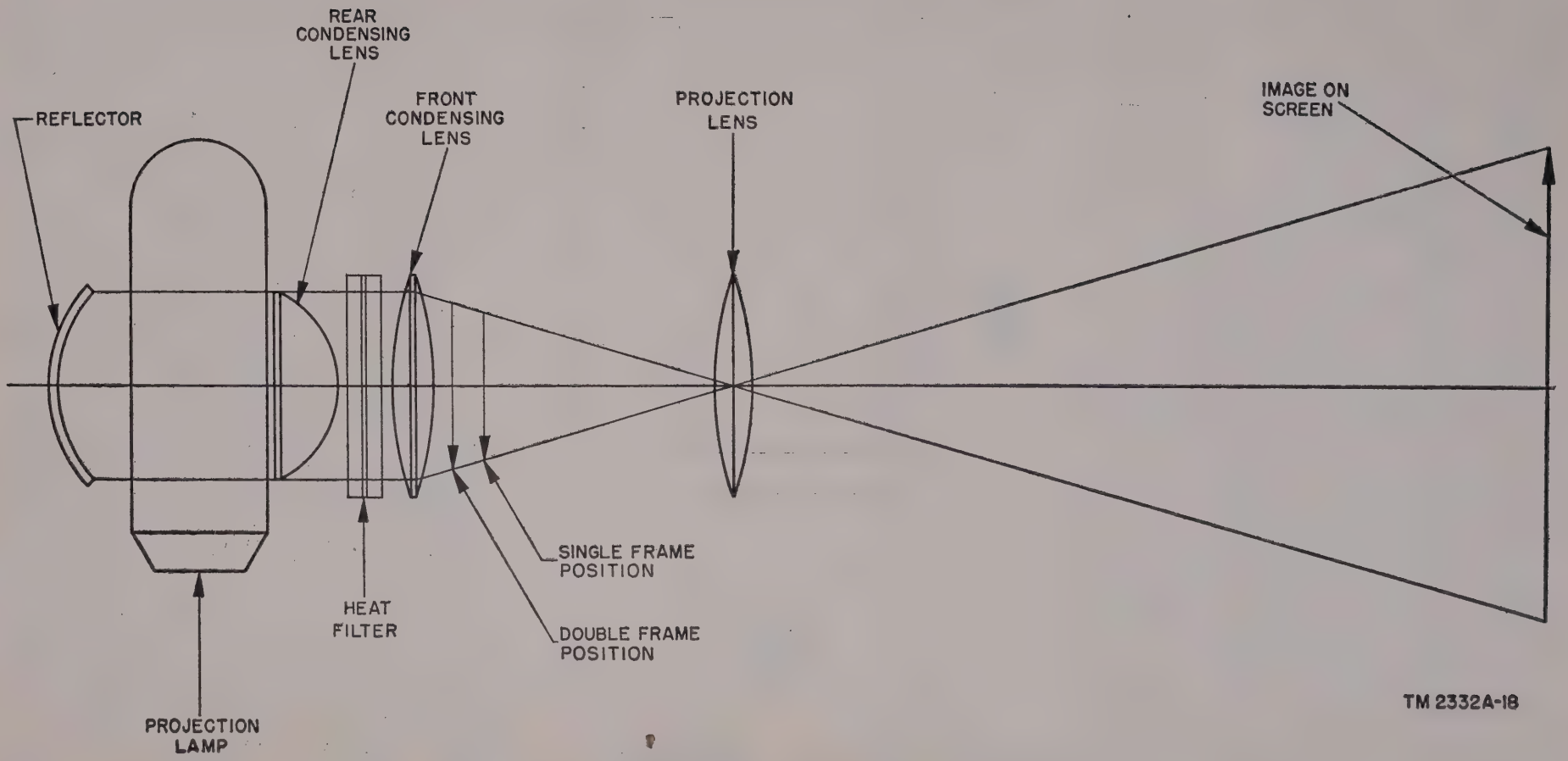


Figure 15. Projector lens system, schematic diagram.

absorbing glass) which filters out most of the infrared or heat rays. The light continues through the front condensing lens which converges it through the slide or film strip to the projection lens. The projection lens gathers the light passing through the slide or film strip, and inverts and projects the light on the screen.

b. Cooling is accomplished by a fan which draws air through the openings in the slide carrier and film strip mechanism, cooling the slide or film strip. The air stream passes the condensing lenses and the heat filter and is concentrated on the projection lamp. The air is then forced out through the side grills.

c. The projector is wired so that the projection lamp cannot be operated unless the FAN switch is moved to the on position (fig. 16). This eliminates the possibility of having the projection lamp on when the fan is not operating.

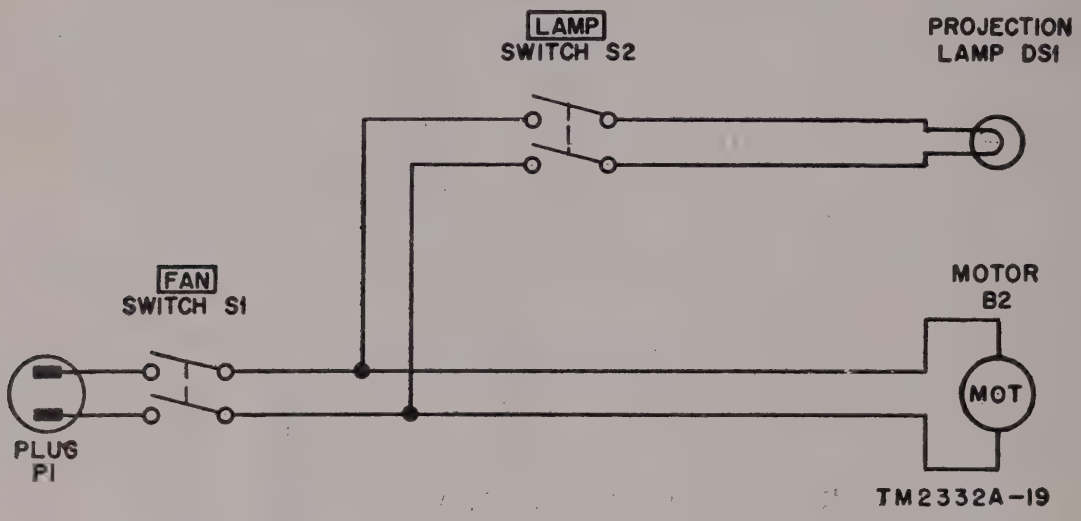


Figure 16. Projector electrical circuit, schematic diagram.

38. Film Strip Mechanism

The film strip mechanism is used to project a series of pictures on one strip. It transports the film strip from frame to frame, either single or double, and indexes each frame so that it is always positioned properly on the screen.

a. For double frame projection, the glass aperture assembly is placed behind the center plate, and for single frame projection, the glass aperture assembly is placed in front of the center plate. As a result, the film strip in the glass aperture assembly is in one of the positions shown in figure 15. This procedure allows the maximum uniformly distributed light to pass through the entire film or slide area for both types of projection.

b. For double frame projection, the film advance knob is rotated ½ turn (½ revolution), and for single frame projection, ¼

turn. The amount of rotation is controlled by the single frame screw knob. The face of the clutch bearing (20, fig. 24) has a slot milled across it. For double frame projection, the single frame screw knob is rotated clockwise as far as possible, withdrawing the detent rod into the film advance knob. When the detent has been withdrawn, only the spring loaded ball bearing will engage the slot in the face of the clutch bearing and stop the rotation after each ½ turn. For single frame projection, the single frame screw knob is turned clockwise as far as possible moving the detent rod out of the film advance knob and against the face of the clutch. The spring-loaded ball bearing and the detent are at a 90° angle to each other. As a result, either the ball bearing or the detent will engage the slot in the face of the clutch bearing and stop the rotation after each ¼ turn of the film advance knob.

39. Slide Carrier

The slide carrier is used to carry the mounted slides into alignment with the projector aperture. It has two compartments for slides so that while one slide is being projected, the preceding slide can be removed and the next slide inserted, ready for projection.

CHAPTER 6

FIELD MAINTENANCE

Note. This chapter contains information for field maintenance. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available, and by the skill of the repairman.

Section I. INSPECTING, STRIPPING, AND CLEANING

40. Inspecting

Inspection by sight and touch often will determine the general condition of the projector and the amount of repair required. Inspect the equipment as follows:

a. Perform the visual inspection outlined in paragraph 31.

b. Inspect the projection lens assembly for chips, scratches, cracks, or breaks. If the projection lens assembly is damaged, replace it (par. 41*b*).

c. Inspect the front and rear condensing lenses for chips, scratches, cracks, or breaks. If a condensing lens is damaged, replace it (par. 41*c* and *d*).

d. Inspect the heat filter for cracks or breaks. Scratches on the filter do not make the filter useless. Replace a cracked, split, or broken filter immediately to prevent damage to the film (par. 41*c* and *d*).

41. Stripping

a. Stripping consists of removing the projection lens assembly, the projection lamp, the rear condensing lens, the heat filter, and the front condensing lens.

b. Remove the projection lens assembly (1, fig. 19) by pulling the assembly out of the nosepiece (6). The projection lens assembly is held in place by a detent pin (5).

c. Loosen the three cover locking screws (35, fig. 17) and remove the housing cover (34). The rear condensing lens (39), the heat filter (40), and the front condensing lens (41) now can be reached for removal. They are supported and aligned by four lens support spacer studs (45) and the funnel assembly (42).

d. Remove the rear condensing lens, the heat filter, and the front condensing lens. Note the position of the elements for reassembly purposes.

e. Be sure the projection lamp is cool. Then remove it (1, fig. 22) by pressing down on the top of it and rotating the lamp 90° counterclockwise.

Note. When replacing the projection lamp, be sure that the small flange at the base is toward the rear of the projector and the wide flange is toward the front.

42. Cleaning

Clean the optical components as described for the projection lens assembly (par. 14*a*). Clean all external metal parts with Cleaning Compound and a lint-free cloth. Do not allow solvents or abrasives to come in contact with lenses or the reflector. Do not allow water or solvents to remain in the wooden carrying case; they will soak into the case. Refer to paragraphs 45 through 53 for the cleaning of disassembled parts.

Section II. TROUBLESHOOTING AT FIELD MAINTENANCE LEVEL

43. Tools and Materials Required for Troubleshooting

All tools and materials required for troubleshooting, repair, and alignment are listed in paragraphs 30 and 31 except the following:

Hand Oiler TL–623/U.
Multimeter TS–352/U.
Variable Power Transformer TF–171/USM.
Foot Candle Photoelectric Meter ME–86/U.

44. Troubleshooting Chart

The following chart lists the symptoms the repairman observes while making a few simple tests. The chart lists the probable causes of each symptom and the method for correcting the defect. Figures referenced in the *Probable trouble* column are illustrations of the part. Figures referenced in the *Correction* column are exploded views of the parts. Paragraphs referenced in the *Probable trouble* column contain information pertaining to the repair of the respective defective parts. The troubleshooting chart must be used in the order that it is presented. Succeeding steps in the chart are based on the equipment performing satisfactorily prior to that step.

Warning: If possible, before working inside the projector, turn the projection lamp off and operate the fan motor for 2 min-

utes to cool the lamp; then turn off the fan motor. If it is necessary to work inside the projector with the projection lamp lighted, be very careful as contact with the lamp or the rotating fan blades will cause severe personal injury.

Symptom	Probable trouble	Correction
Fan motor does not operate with FAN switch in the on position.	External power not being supplied.	Turn on external power.
	Defective wiring	Repair wiring.
	Defective FAN switch	Repair or replace FAN switch (par. 35, fig. 13).
	Defective fan motor	Repair or replace motor (par. 51, fig. 23).
Motor operates, but projection lamp does not light with FAN and LAMP switches in the on positions.	Defective projection lamp (fig. 22). *Note.* The average life of the lamp is 10 hours.	Replace projection lamp (par. 32, fig. 22).
	Defective wiring	Repair wiring.
	Defective LAMP switch	Replace LAMP switch (par. 35, fig. 13).
Projection lamp lights but does not give enough light.	Lamp excessively blackened.	Replace lamp (par. 32, fig. 22).
	Lamp filaments have sagged or lamp is defective.	Replace lamp (par. 32, fig. 22).
	Misalinement of lamp in relationship to optical axis.	Optically align the projector (par. 55). *Note.* Misalinement should not occur unless the projector has been severely jarred or abused.
Dark, irregular black streaks, spots, smudges, or lines on screen without film being projected. projected.	Dirt or dust on either the rear condensing lens, heat filter, front condensing lens, or projection lens.	Clean carefully (par. 42, fig. 17 and 19).
	A cracked or broken projection lens assembly, front condensing lens, heat filter, or rear condensing lens.	Replace defective component (par. 33 and 34, fig. 17).
	Scratched reflector	Replace reflector (par. 51, fig. 22).
	Note. A badly scratched reflector seldom will show up on the screen. The reflector should be checked after all other remedial actions have been taken.	

Symptom	Probable trouble	Correction
Color bands or patches of light on screen without film being projected.	Alignment of the optical system has been disturbed.	Align the optical system (par. 55).
Film sticks, buckles, or goes out of focus with either film strip mechanism or slide carrier being used.	Cracked or broken heat filter.	Replace the heat filter (par. 34, fig. 17).
Projector cannot be sharply focused with either the film strip mechanism or the slide carrier being used, or focus cannot be maintained (film in equipment).	Detent spring in turret does not exert proper pressure on projection lens assembly.	Replace the detent spring (par. 47, fig. 19).
Projected image from either film strip mechanism or slide carrier is not squarely on screen.	Turret not set correctly (fig. 9).	Loosen the turret lock-screw and adjust the turret.
Dark spots, smudges, or streaks discernible in projected image with use of film strip mechanism.	Glass aperture assembly broken (fig. 6).	Replace the defective glass aperture assembly (par. 52, fig. 24).
Film does not advance when film advance knob of film strip mechanism is rotated.	Film perforations not pressed against sprocket teeth (fig. 6).	Realine film strip mechanism (par. 52, fig. 24).
Film take-up spool of film strip mechanism does not wind up film.	Film take-up spool drive spring is out of position (fig. 6).	Place the film take-up spool drive spring in the grooves of the film take-up spool and take-up drive sheave (par. 52, fig. 24).
	Film take-up spool drive spring broken (fig. 6).	Repair or replace the film take-up spool drive spring (par. 52, fig. 24).

Section III. REPAIRS

45. Projector Grille and Plate Assemblies

(fig. 17)

a. Disassembly.

(1) Remove the four fillister head machine screws (2) and the four lock washers (3), and take off the right side grille holder (1) from the housing (36).

(2) Remove the left side grille holder by using the procedure described in (1) above.

(3) Remove the four fillister head machine screws (5) and

the four lock washers (6) and take off the rear grille holder (4) and the rear grille (7) from the housing (36).

(4) Remove the five flat head machine screws (9) and the five countersunk external tooth lock washers (10), and take off the front housing plate (8) from the housing (36).

(5) Remove the ten fillister head machine screws (12) and the ten lock washers (13) and take off the air duct plate (11) from the base (62).

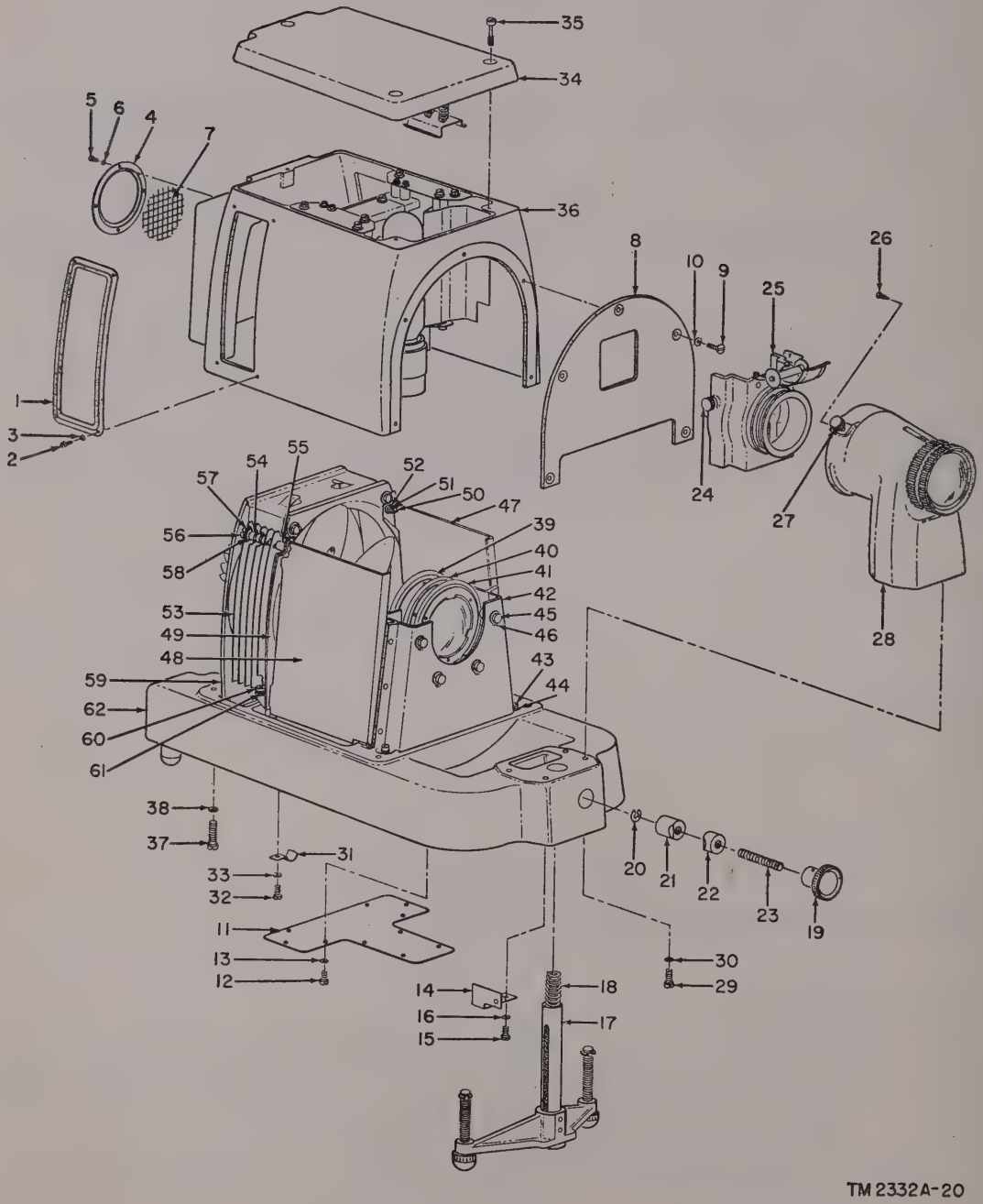


Figure 17. Projector, exploded view.

1 Side grille holder (A 26, A 27).
2 Fillister head machine screw.
3 Lockwasher.
4 Rear grille holder (A 25).
5 Fillister head machine screw.
6 Lockwasher.
7 Rear grille (A 24).
8 Front housing plate (A 37).
9 Flat head machine screw.
10 Countersunk external tooth lock washer.
11 Air duct plate (A 35).
12 Fillister head machine screw.
13 Lockwasher.
14 Stop pin and bracket assembly (A 42).
15 Fillister head machine screw.
16 Lockwasher.
17 Elevating leg assembly (MP11).
18 Elevating leg spring (MP25).
19 Elevating leg locking knob (MP14).
20 Retaining ring (H17).
21 Elevating leg locking nut (H1).
22 Elevating leg locking cam (MP10).
23 Elevating leg locking shaft (MP16).
24 Accessory locking knob (H31).
25 Turret assembly (MP29).
26 Turret locking knob retaining screw (R23).
27 Turret locking knob (H32).
28 Nosepiece (A 33).
29 Fillister head machine screw.
30 Lockwasher.
31 Wire clamp (A 13, A 14).
32 Fillister head machine screw.
33 Lockwasher.
34 Housing cover (A 18).
35 Cover locking screw (H20, H21, H22).
36 Housing (A 28).
37 Fillister head machine screw.
38 Lockwasher.
39 Rear condensing lens (A 30).
40 Heat filter (A 20).
41 Front condensing lens (A 29).
42 Funnel assembly (A 21).
43 Fillister head machine screw.
44 Lockwasher.
45 Lens support spacer stud (H3, H4, H5, H6).
46 Retaining ring (H13, H14, H15, H16).
47 Left hand baffle (A 2).
48 Right hand baffle (A 3).
49 Fan shroud (A 34).
50 Fillister head machine screw.
51 Lockwasher.
52 Flat washer.
53 Vanes.
54 Vane spacer
55 Tapped vane spacer
56 Fillister head machine screw.
57 Lockwasher.
58 Flat washer.
59 Motor mount assembly (B1).
60 Fillister head machine screw.
61 Lockwasher.
62 Base (A 4).

Figure 17—Continued.

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b. Cleaning and Inspection.

(1) Clean all parts with cleaning compound to remove dust and dirt; dry with a lint-free cloth.

(2) Inspect all parts for wear or damage. Replace parts as required.

c. Reassembly.

(1) Attach the air duct plate (11) to the base (62) with the ten fillister head machine screws (12) and the ten lock washers (13).

(2) Attach the front housing plate (8) to the housing (36) with the five flat head machine screws (9) and the five countersunk external tooth lock washers (10).

(3) Attach the rear grille holder (4) and the rear grille (7) to the housing (36) with the four fillister head machine screws (5) and the four lock washers (6).

(4) Attach the right side grille holder (1) to the housing (36) with the four fillister head machine screws (2) and the four lock washers (3).

(5) Replace the left side grille holder by using a procedure similar to that described in (4) above.

46. Elevating Leg Assembly

a. Disassembly.

(1) Loosen the elevating leg locking knob (19, fig. 17) and allow the elevating leg assembly (17) to extend down from the base (62) about 3 inches; then tighten the elevating leg locking knob.

(2) Remove the two fillister head machine screws (15) and the two lockwashers (16) and take off the elevating leg stop pin and bracket assembly (14) from the base (62).

(3) Loosen the elevating leg locking knob (19) and remove the elevating leg assembly (17) and elevating leg spring (18) from the base (62).

(4) Horizontally withdraw the elevating leg locking knob (19), the elevating leg locking shaft (23), the elevating leg locking cam (22), the elevating leg locking nut (21), and the retaining ring (20) from the front end of the base (62).

(5) Remove the retaining ring (20), the elevating leg locking nut (21), and the elevating leg locking cam (22) from the elevating leg locking shaft (23).

(6) Loosen the elevating leg locking knob setscrew and remove the elevating leg locking knob (19) from the elevating leg locking shaft (23).

(7) Remove the retaining ring (2, fig. 18) from each elevating screw (1).

(8) Unscrew the two elevating screws (1) from the elevating leg (6).

(9) Unscrew the rubber foot (3) from each elevating screw (1).

(10) Remove the two press fit roll pins (5) from the elevating leg (6).

(11) Remove the elevating leg tube (4) from the elevating leg (6).

b. Cleaning and Inspection.

(1) Inspect the rubber feet. Replace if the rubber is dry or cracked.

(2) Clean all metal parts with cleaning compound to remove dust and dirt. Dry with a lint-free cloth.

(3) Inspect the elevating leg spring. It should have a free length of 11¼ inches. Replace if the free length is less than 10 inches.

c. Reassembly.

(1) Attach the elevating leg tube (4, fig. 18) to the elevating leg (6) with the two press fit roll pins (5).

(2) Screw one rubber foot (3) into each of the two elevating screws (1).

(3) Screw one elevating screw (1) into each side of the elevating leg (6).

(4) Secure each elevating screw (1) to the elevating leg (6) with the retaining ring (2).

(5) Place the elevating leg spring (18, fig. 17) in the elevating leg assembly (17).

(6) Attach the elevating leg locking knob (19) to the elevating leg locking shaft (23) and tighten the elevating leg locking knob set screw.

(7) Slip the elevating leg locking cam (22) and the elevating leg locking nut (21) on the elevating leg locking shaft (23) and secure them in place with the retaining ring (20). The elevating leg locking cam (22) and the elevating leg locking nut (21) must be placed on the elevating leg locking shaft (23) so that they form a V between them.

(8) Insert the elevating leg locking assembly (19, 20, 21, 22, 23) into the front end of the base (62).

(9) Insert the elevating leg assembly (17) into the bottom of the base (62).

(10) Tighten the elevating leg locking knob (19) with the elevating leg assembly (17) extending about 3 inches from the base (62).

(11) Secure the stop pin and bracket assembly (14) to the base (62) with the stop pin in the slot of the elevating leg tube (4, fig. 18) with the two fillister head machine screws (15, fig. 17) and the two lock washers (16).

(12) Loosen the elevating leg locking knob (19) and push the elevating leg assembly (17) into the base (62); then tighten the elevating leg locking knob.

47. Projection Lens Detent Assembly

(fig. 19)

a. Disassembly.

(1) Pull out the projection lens assembly (1) from the nosepiece (6).

(2) Remove the fillister head machine screw (3) and the lock washer (4), and take off the detent spring (2) from the nosepiece (6).

(3) Remove the detent pin (5) from the nosepiece (6).

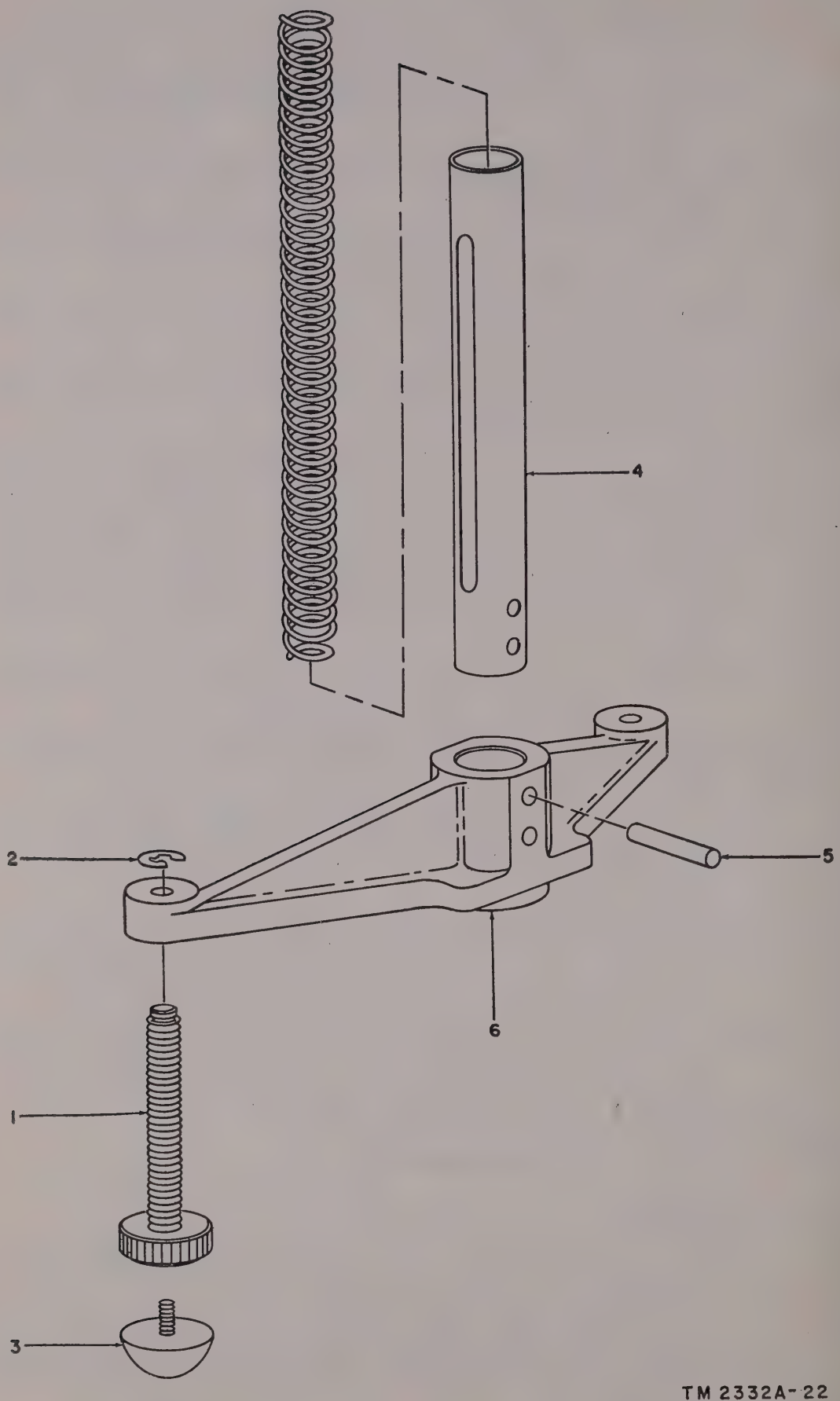


Figure 18. Elevating leg assembly, exploded view.

1 Elevating screw (H29, H30).
2 Retaining ring (H18, H19).
3 Rubber foot (A 11, A 12).
4 Elevating leg tube (A 43).
5 Roll pin (H2, H7).
6 Elevating leg (MP15).

Figure 18—Continued.

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b. Cleaning and Inspection.

(1) Clean the parts with cleaning compound to remove dust and dirt; dry with a lint-free cloth.

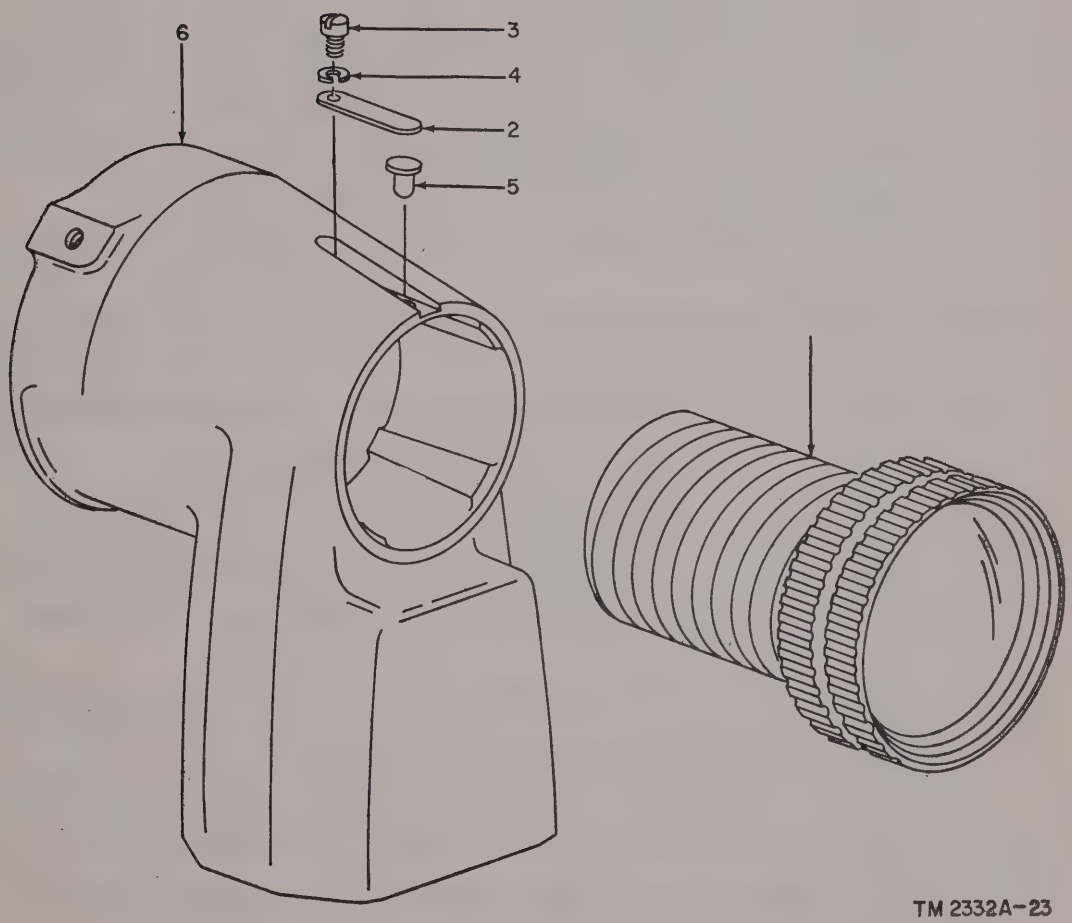
(2) Inspect the parts for wear or damage. Replace parts as required.

c. Reassembly.

(1) Place the detent pin (5) in the hole on the nosepiece (6).

(2) Secure the detent spring (2) in place with the fillister head machine screw (3) and the lockwasher (4).

(3) Insert the projection lens assembly (1) into the nosepiece (6).



1 Projection lens assembly (D52).
2 Detent spring (MP27).
3 Fillister head machine screw.
4 Lockwasher.
5 Detent pin (H8).
6 Nosepiece (A 33).

Figure 19. Projection lens detent assembly, exploded view.

48. Turret Assembly

a. General. Usually, it will only be necessary to remove the parts of the turret assembly which are accessible without removing the turret. If it is necessary to replace the turret locking knob, use the disassembly procedure given in *b*(5) through (12) below and the reassembly procedure in *d*(1) through (7) below.

b. Disassembly.

(1) Remove the projection lens assembly. Lay the projector on its side to remove the fillister head machine screws (29, fig. 17). Be sure to lay the projector on a cloth or blotter to prevent scratching the projector.

(2) Remove the four fillister head machine screws (29) and the four lock washers (30) and take off the nosepiece (28) with the turret assembly (25). When removing the last screw, hold the nosepiece with one hand to prevent it from dropping.

(3) Rotate the turret assembly (25) to a vertical position so that the hole in the turret assembly is over the turret locking knob retaining screw (26). Unscrew and remove the turret locking knob through this hole.

(4) Unscrew and remove the turret locking knob (27) and then the turret assembly (25) from the nosepiece (28).

(5) Remove the accessory locking knob (24) from the turret assembly (25).

(6) Remove the retaining ring (2, fig. 20) from the bearing stud (1).

(7) Remove the end of the torsion spring (3) held in place by the bearing stud (1).

(8) Slide off the film guide assembly (4, 5, 6, 7, and 8) and the torsion spring (3) from the bearing stud (1).

(9) Remove the bearing stud (1) from the turret (13).

(10) Remove the two Phillips fillister head machine screws (11) and the two lockwashers (12) and take off the film cradle (9) and the film cradle mounting plate (10) from the turret (13).

(11) Remove the torsion spring (3) from the arm assembly (4).

(12) Remove the two fillister head machine screws (7) and the two lockwashers (8), one at each end of the film guide assembly, that secure the two film retaining washers (6) and the film retaining hub (5) to the arm assembly (4).

c. Cleaning and Inspection.

(1) Clean all parts with cleaning compound to remove dust and dirt; dry with a lint-free cloth.

(2) Inspect the torsion spring. It must have 8 turns at free length. If necessary, replace the torsion spring.

(3) Inspect all parts for wear or damage. Replace parts as required.

d. Reassembly.

(1) Attach one film retaining washer (6, fig. 20) to one end of the film retaining hub (5) with the fillister head machine screw (7) and the lock washer (8).

(2) Attach the arm assembly (4) and the other film retaining washer (6) to the other end of the film retaining hub (5) with the fillister head machine screw (7) and the lock washer (8).

(3) Attach the extending end of the torsion spring (3) to the arm assembly (4).

(4) Attach the film cradle (9) and the film cradle mounting plate (10) to the turret (13) with the two Phillips fillister head machine screws (11) and the two lockwashers (12).

(5) Screw the bearing stud (1) into the turret (13).

(6) Slip the film guide assembly (4, 5, 6, 7, and 8) and torsion spring (3) into the bearing stud (1). Place the free end of the torsion spring (3) into the hole in the bearing stud (1) so that the torsion spring holds the film guide assembly against the film cradle mounting plate (10).

(7) Replace the retaining ring (2) on the end of the bearing stud (1).

(8) Screw the accessory locking knob (24, fig. 17) into the turret assembly (25).

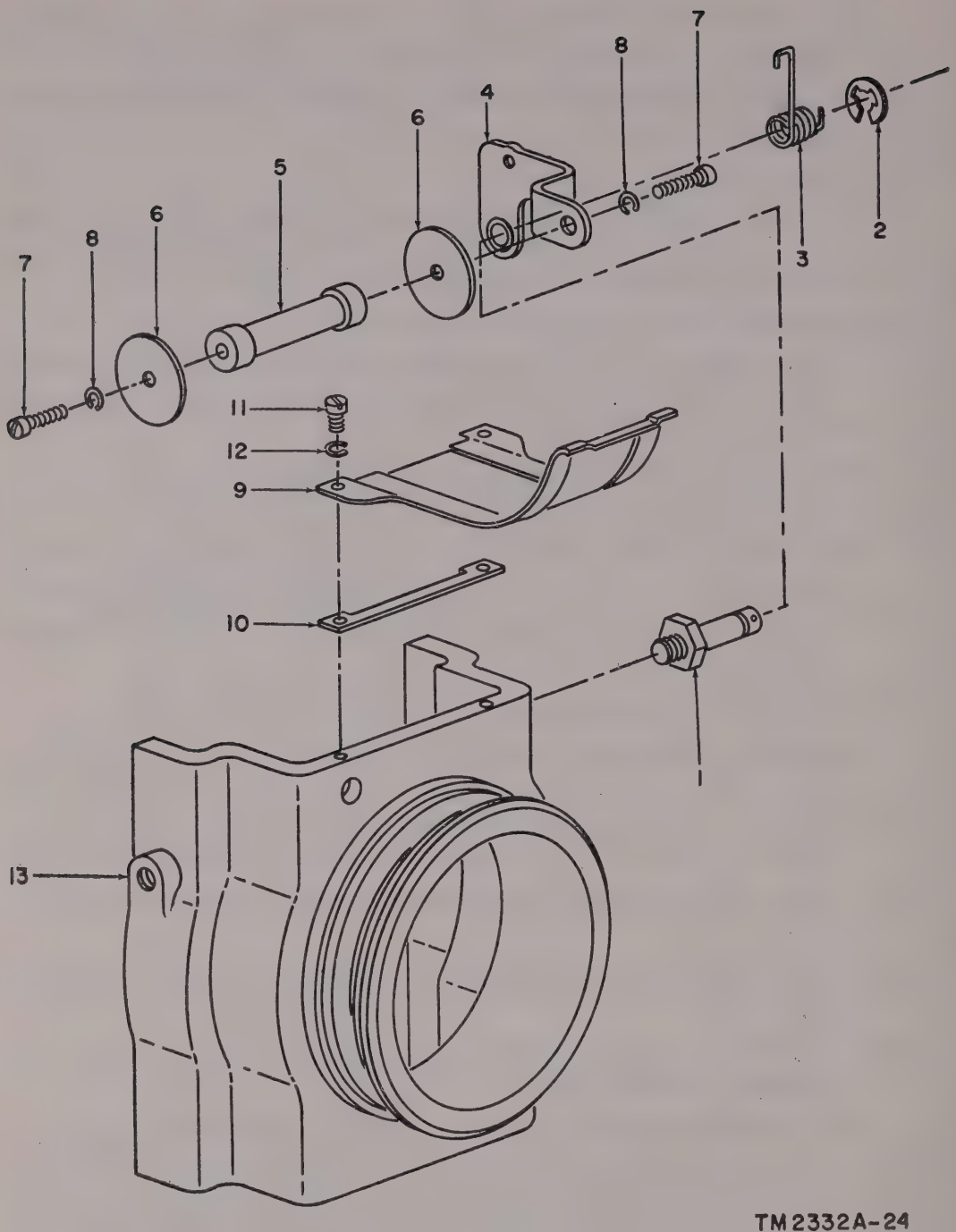
(9) Insert the turret assembly (25) into the nosepiece (28).

(10) Screw the turret locking knob (27) into the nosepiece (28) with the turret assembly (25) in a vertical position with the hole in the turret assembly over the turret locking knob screw hole.

(11) Insert and secure the turret locking knob retaining screw (26) to the nosepiece (28) through the hole in the turret assembly (25).

(12) Mount the nosepiece (28) and turret assembly (25) onto the base (62) and secure them in place with the four fillister head machine screws (29) and the four lock washers (30).

(13) Carefully set the projector upright and replace the projector lens assembly.



1 Bearing stud (H24).
2 Retaining ring (H12).
3 Torsion spring (MP26).
4 Arm assembly (MP3).
5 Film retaining hub (MP13).
6 Film retaining washers (H33, H34).
7 Fillister head machine screw.
8 Lockwasher.
9 Film cradle (A 19).
10 Film cradle mounting plate (A 36).
11 Phillips fillister head machine screw.
12 Lockwasher.
13 Turret (MP28).

Figure 20. Turret assembly, exploded view.

49. Condensing Lens Retaining Plate Mount Assembly

a. Disassembly.

(1) Unscrew the three cover locking screws (35, fig. 17) and lift the housing cover (34) from the housing (36).

(2) Remove the four fillister head machine screws (3, fig. 21) and the four lock washers (4), and take off the condensing lens retaining plate mount (2) from the housing cover (1).

(3) Remove the two retaining rings (5), and take off the condensing lens plate and stud assembly (7) and the two pressure springs (6) from the condensing lens retaining plate mount (2).

b. Cleaning and Inspection.

(1) Clean the parts with Cleaning Compound to remove dust and dirt; dry with a lint-free cloth.

(2) Inspect the pressure spring. It must have a free length of 1½ inches. Replace if the free length is less than 1½ inches.

c. Reassembly.

(1) Slip the two pressure springs (6, fig. 21) onto the two studs of the condensing lens plate and stud assembly (7), and secure the condensing lens plate and stud assembly to the condensing lens retaining plate mount (2) with the two retaining rings (5).

(2) Attach the condensing lens retaining plate mount (2) to the housing cover (1) with the four fillister head machine screws (3) and the four lock washers (4).

(3) Attach the housing cover (34, fig. 17) to the housing (36) with the three cover locking screws (35). Be sure the cover is tightened securely to the housing so that there is no air leak between the housing cover (34) and the housing (36).

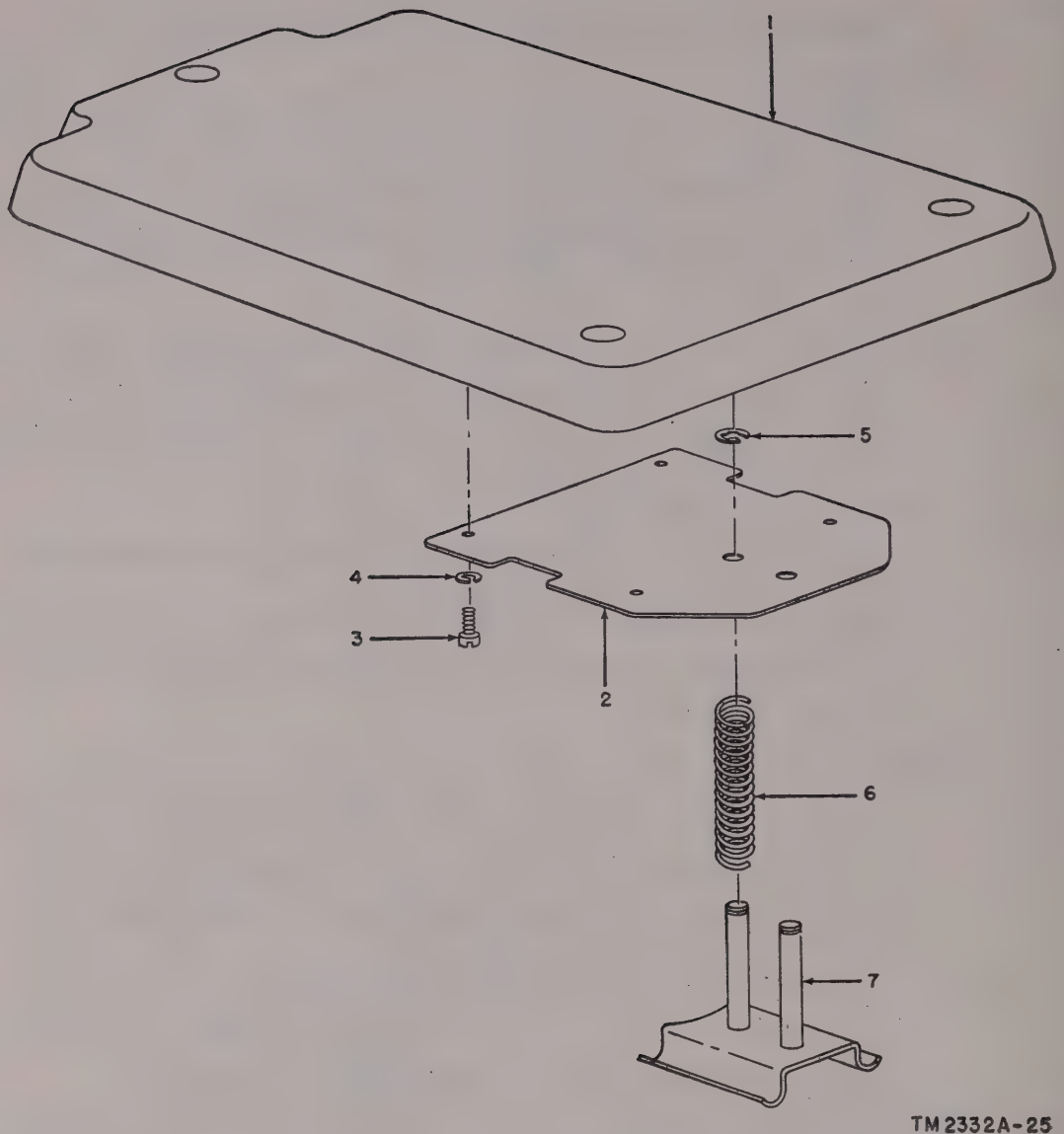
50. Projection Lamp and Reflector Assembly

a. Disassembly.

(1) Remove the four fillister head machine screws (2, fig. 13) and the four lock washers (3) that secure the switch mounting plate (1) to the base (9). The switch mounting plate with the FAN switch (4), the LAMP switch (5), and the power cable assembly (8) will be fastened to the base by the fan motor and projection lamp wiring.

(2) Tag and disconnect the projection lamp wiring to the LAMP switch (5).

(3) Loosen the fillister head machine screws (32, fig. 17) so



1 Housing cover (A 18).
2 Condensing lens retaining plate mount (A 31).
3 Fillister head machine screw.
4 Lockwasher.
5 Retaining ring (H10, H11).
6 Pressure spring (MP23, MP24).
7 Condensing lens plate and stud assembly (A 15).

Figure 21. Condensing lens retaining plate mount assembly, exploded view.

that the projector lamp wiring is free from the two wire clamps (31).

(4) Remove the three cover locking screws (35) and lift the housing cover (34) from the housing (36).

(5) Press down on the projection lamp (1, fig. 22) and turn it counterclockwise; remove the projection lamp from the lamp socket (26).

(6) Remove the four fillister head machine screws (3), the four lock washers (4), and the four flat washers (5),

and lift the two lamp supporting plates (2) from the housing (30).

(7) Remove the four fillister head machine screws (7), the four lockwashers (8), the four flat washers (9), and the four hexagonal nuts (10) that secure the reflector holder beam (6) to the lamp supporting plates (2) through the four reflector holder spacers (11). Remove the reflector holder beam and the four spacers from the lamp supporting plates.

(8) Remove the two fillister head machine screws (13), the two lockwashers (14), the two flat washers (15), and the nut plate (16); remove the reflector (12) from the reflector beam holder (6).

(9) Remove the fillister head machine screw (18), the lockwasher (19), and the flat washer (20); take off the two venturi plate assemblies (17) from the two lamp supporting plates (2).

(10) Remove the two fillister head machine screws (18) and the two lockwashers (19) (not shown on figure 22) and take off the lamp bracket (21) from the two venturi plate assemblies (17).

(11) Note the *exact* position of the socket mounting bracket (22) with respect to the lamp bracket (21). *Mark the lamp bracket (21) to show the position of the socket mounting bracket (22) before disassembling the parts.* Remove the two fillister head machine screws (23), the two lockwashers (24), and the two flat washers (25); remove the socket mounting bracket and the lamp socket from the lamp bracket (21).

(12) Remove the two fillister head machine screws (27), the two lockwashers (28), and the two nuts (29); remove the lamp socket (26) from the socket mounting bracket (22).

b. Cleaning and Inspection.

(1) Clean all metal parts except the reflector mounting assembly, the projection lamp, and the lamp socket with Cleaning Compound to remove dust and dirt; clean with a lint-free cloth.

(2) Inspect the reflector surface for severe scratches or dents that will affect its operation. Replace if required.

(3) Inspect the projection lamp for excessive blackening. Replace if required.

(4) Inspect remaining parts for wear or damage. Replace parts as required.

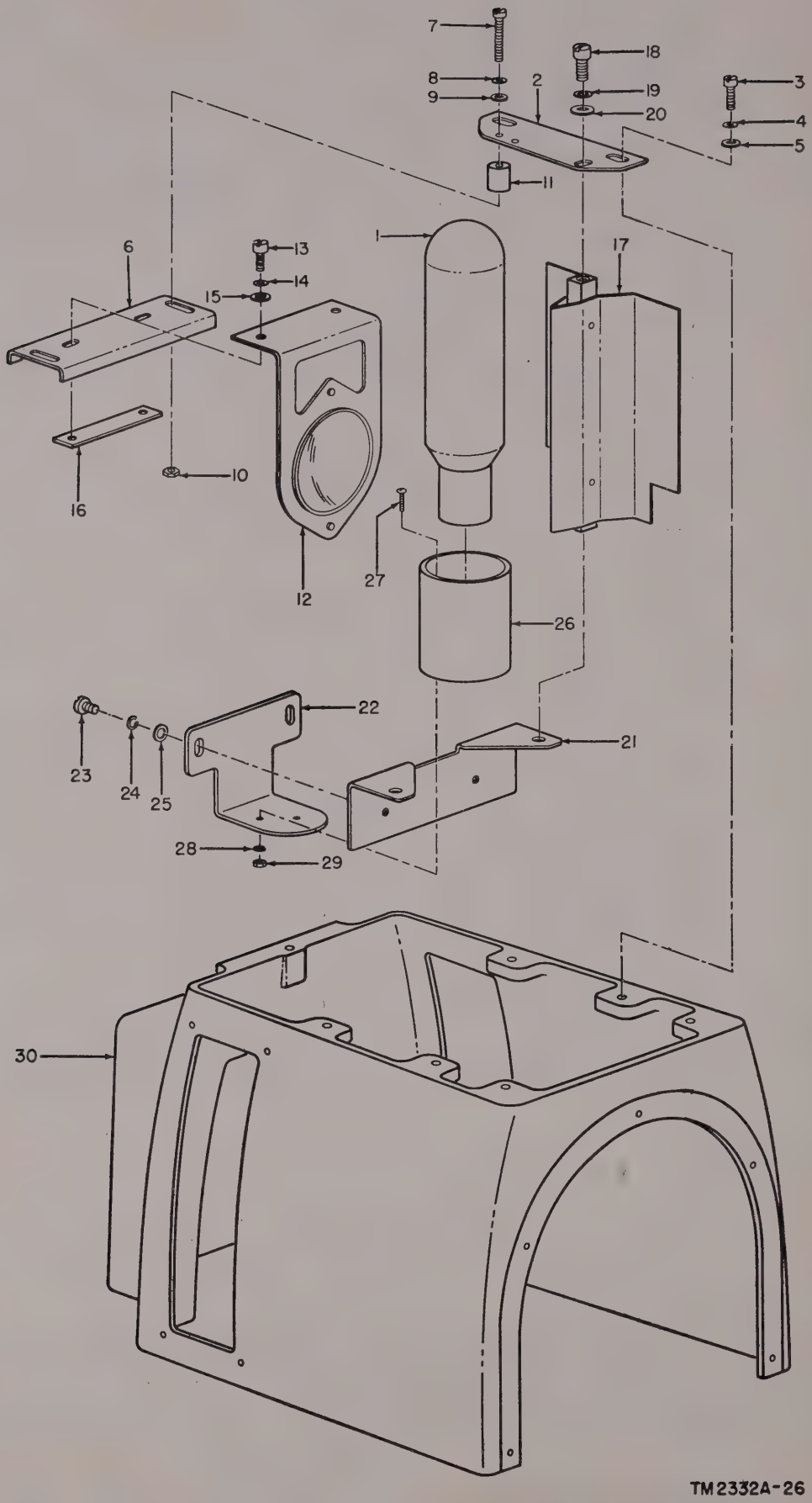


Figure 22. Projection lamp and reflector assembly, exploded view.

1 Projection lamp (DS1).
2 Lamp supporting plate (A 38, A 39).
3 Fillister head machine screw.
4 Lockwasher.
5 Flat washer.
6 Reflector holder beam (A 5).
7 Fillister head machine screw.
8 Lockwasher.
9 Flat washer.
10 Hexagonal nut.
11 Reflector holder spacer (MP6, MP7, MP8, MP9).
12 Reflector (A 41).
13 Fillister head machine screw.
14 Lockwasher.
15 Flat washer.
16 Nut plate (H9).
17 Venturi plate assembly (A 40).
18 Fillister head machine screw.
19 Lockwasher.
20 Flat washer.
21 Lamp bracket (A 7).
22 Socket mounting bracket.
23 Fillister head machine screw.
24 Lockwasher.
25 Flat washer.
26 Lamp socket (X1).
27 Fillister head machine screw.
28 Lockwasher.
29 Nut.
30 Housing (A 28).

Figure 22—Continued.

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c. Reassembly.

(1) Attach the lamp socket (26, fig. 22) to the socket mounting bracket (22) with the two nuts (29), the two lockwashers (28), and the two fillister head machine screws (27). Be sure to position the lamp socket so that the slot is facing toward the front of the projector (away from the socket mounting bracket).

(2) Attach the socket mounting bracket (22) to the lamp bracket (21) with the two flat washers (25), the two lock washers (24), and the two fillister head machine screws (23). *Be sure that the socket mounting bracket is aligned exactly on the previously marked lamp bracket (a(11) above)* as it was before disassembly.

(3) Attach the bottom of the two venturi plate assemblies (17) to the lamp bracket (21) with the two fillister head machine screws (18) (not shown) and the two lockwashers 19).

(4) Attach the lamp supporting plate (2) to the two venturi plate assemblies (17) with the two fillister head machine screws (18), the two lockwashers (19), and the two flat washers (20).

(5) Attach the reflector (12) to the reflector holder beam (6) with the two fillister head machine screws (13), the two lockwashers (14), the two flat washers (15), and the nut plate (16).

(6) Attach the reflector holder beam (6) to the lamp supporting plates (2) through the two reflector holder spacers (11) with the two fillister head machine screws (7), the two lock washers (8), the two flat washers (9), and the two hexagonal nuts (10).

(7) Attach the two lamp supporting plates (2) to the hous-

ing (30) with the four fillister head machine screws (3), the four lock washers 4), and the four flat washers (5).

(8) Insert the projection lamp (1) into the lamp socket (26).

(9) Secure the housing cover (34, fig. 17) to the housing (36) with the three cover locking screws 35).

(10) Slip the projection lamp wiring under the wire clamp (31) and tighten the fillister head machine screw (32).

(11) Reconnect the tagged leads of the projection lamp to the LAMP switch (5, fig. 13).

(12) Secure the switch mounting plate (1) to the base (9) with the four fillister head machine screws (2) and the four lock washers (3).

51. Motor, Motor Mount, Baffle, and Funnel Assemblies

a. Disassembly.

(1) Remove the four fillister head machine screws (2, fig. 13) and the four lock washers (3) that secure the switch mounting plate (1) to the base (9). The switch mounting plate with the FAN switch (4), the LAMP switch (5), and the power cable assembly (8) will be fastened to the base by the fan motor and projection lamp wiring.

(2) Tag and disconnect the wiring to the FAN switch (4) and the lamp switch (5). Remove the switch mounting plate (1), which is now free from the base (9).

(3) Loosen the two fillister head machine screws (32, fig. 17) and remove the projection lamp wiring from the two wire clamps (31).

(4) Remove the four fillister head machine screws (37) and the four lockwashers (38) that secure the housing (36) to the base (62).

(5) Carefully lift the housing (36) off the base (62). The projection lamp and reflector assembly will be removed with the housing. The funnel assembly (42), the front condensing lens (41), the heat filter (40), the rear condensing lens (39), the baffles (47, 48) and the motor mount assembly (59) will remain secured to the base (62).

(6) Remove the front condensing lens (41), the heat filter (40), and the rear condensing lens (39) from the funnel assembly (42). Be sure the lenses are stored in a safe place.

(7) Lay the base on its side so that the fillister head machine screws (29) can be removed easily. Be sure to cushion the base so that the components are not damaged.

(8) Remove the four fillister head machine screws (29) and

the four lockwashers (30), and take off the nosepiece (28) with the turret assembly (25). When removing the last screw, hold the nosepiece with one hand so it will not drop.

(9) Remove the four fillister head machine screws, (43) the four lockwashers (44), and remove the funnel assembly (42) from the base (62).

(10) Remove the four retaining rings (46) and the four lens support spacer studs (45) from the funnel assembly (42).

(11) Remove the four fillister head machine screws (50), the four lockwashers (51), and the four flat washers (52); then remove the left and right hand baffles (47, 48), the two fan shroud spacers (49), and the two vane assemblies (53, 54, 55, 56, 57, and 58).

(12) Remove the two fillister head machine screws (56), the two lockwashers (57), and the flat washers (58) from the left hand vane assembly consisting of four vanes (53), eight vane spacers (54), and two tapped vane spacers (55).

(13) Disassemble the right hand vane assembly in a similar manner to that given in (12) above.

(14) Remove the four fillister head machine screws (60) and the four lockwashers (61), and remove the motor mount assembly (59) from the base (62).

(15) Remove the motor mount cover (1, fig. 23).

(16) Remove the four roundhead screws (3), the four lockwashers (4), and the four flat washers (5) that secure the fan shroud (2) to the four motor mount and fan shroud spacers (13). Remove the fan shroud.

(17) Loosen the setscrew that secures the fan blade (6) and fan blade bushing (7) to the shaft of the motor (8). Remove the fan blade and the fan blade bushing.

(18) Remove the four fillister head screws (9), the four lockwashers (10), and the four flat washers (11) that secure the motor (8) through the four mounting studs (12) to the motor mount (14). Remove the motor and the four motor mounting studs.

(19) Remove the four roundhead screws (15), the four lockwashers (16), and the four flat washers (17); take off the four motor mount and fan shroud spacers (13) from the motor mount (14).

b. Cleaning, Inspection, and Lubrication.

(1) Clean all metal parts, *except the motor,* with cleaning compound to remove dust and dirt; dry with a lint-free cloth.

(2) Inspect the motor. If 2,000 hours of projector operation have elapsed since the last overhaul, lubricate the bearings of the motor with 1 or 2 drops of Oil, Lubricating, Preservative, Special (PL Special).

(3) Inspect the fan blades and baffles for dents or deformed edges. Straighten dents and deformities with a small ball peen hammer.

(4) Inspect the remaining parts to make sure that they are not deformed or otherwise damaged.

c. Reassembly.

(1) Attach the motor (8, fig. 23) to the motor mount (14) through the four motor mounting studs (12) with the four fillister headscrews (9), the four lockwashers (10), and the four flat washers (11).

(2) Slip the fan blade (6) with the fan blade bushing (7) onto the shaft of the motor (8). Tighten the setscrew of the fan blade so that the fan blade bushing (7) is $\frac{5}{16}$ inch away from the motor mount (14).

(3) Attach the four motor mount and fan shroud spacers (13) to the motor mount (14) with the four roundhead screws (15), the four lockwashers (16), and the four flat washers (17).

(4) Attach the fan shroud (2) to the four motor mount and fan shroud spacers (13) with the four roundhead screws (3), the four lockwashers (4), and the four flat washers (5). Spin the fan blade by hand to be sure it is not striking any parts.

(5) Replace the motor mount cover (1).

(6) Attach the motor mount assembly (59, fig. 17) to the base (62) with the four fillister head machine screws (60) and the four lockwashers (61).

(7) Assemble and secure the right hand vane assembly, consisting of the four vanes (53), eight vane spacers (54), and two tapped vane spacers (55), with the two fillister head machine screws (56), the two lockwashers (57), and the two flat washers (58).

(8) Assemble the left hand vane assembly in a similar manner to that given in (7) above.

(9) Secure the rear of the left and right hand baffles (47, 48), the fan shroud (49), and the two vane assemblies (53, 54, 55, 56, 57 and 58) to the motor mount assembly

(59) with the four fillister head machine screws (50), the four lockwashers (51), and the four flat washers (52).

(10) Attach the four lens support spacer studs (45) to the funnel assembly (42) with the four retaining rings (46).

(11) Secure the funnel assembly (42) and the front of the baffles (47, 48) to the base (62) with the four fillister head machine screws (43) and the four lockwashers (44).

(12) Mount the nosepiece (28) and the turret assembly (25) onto the base (62) and secure them in place with the four fillister head machine screws (29) and the four lockwashers (30).

(13) Loosen the elevating leg locking knob (19) and return the elevating leg assembly (17) into the nosepiece (28); then tighten the elevating leg locking knob.

(14) Replace the front condensing lens (41), the head filter (40), and the rear condensing lens (39) in the funnel assembly (42).

(15) Carefully replace the housing (36) on the base (62). Secure the housing to the base with the four fillister head machine screws (37) and the four lockwashers (38).

(16) Slip the projection lamp wiring under the wire clamps (31) and tighten the two fillister head machine screws (32).

(17) Reconnect the tagged leads of the motor and the projection lamp wiring to the FAN switch (4, fig. 13) and the LAMP switch (5).

(18) Secure the switch mounting plate (1) to the base (9) with the four fillister head machine screws (2) and the four lockwashers (3).

d. Testing.

(1) Connect the projector to a 117-volt, 50- to 60-cps ac power source.

(2) Move the FAN switch (4, fig. 13) to the on position. The fan motor should operate. Check to be sure that the fan blade is not hitting the fan shroud.

(3) Move the LAMP switch (5) to the on position. The projection lamp must light.

(4) Move the LAMP switch (5) to the off position. The projection lamp should extinguish.

(5) Move the FAN switch (4) to the off position. The fan motor should stop.

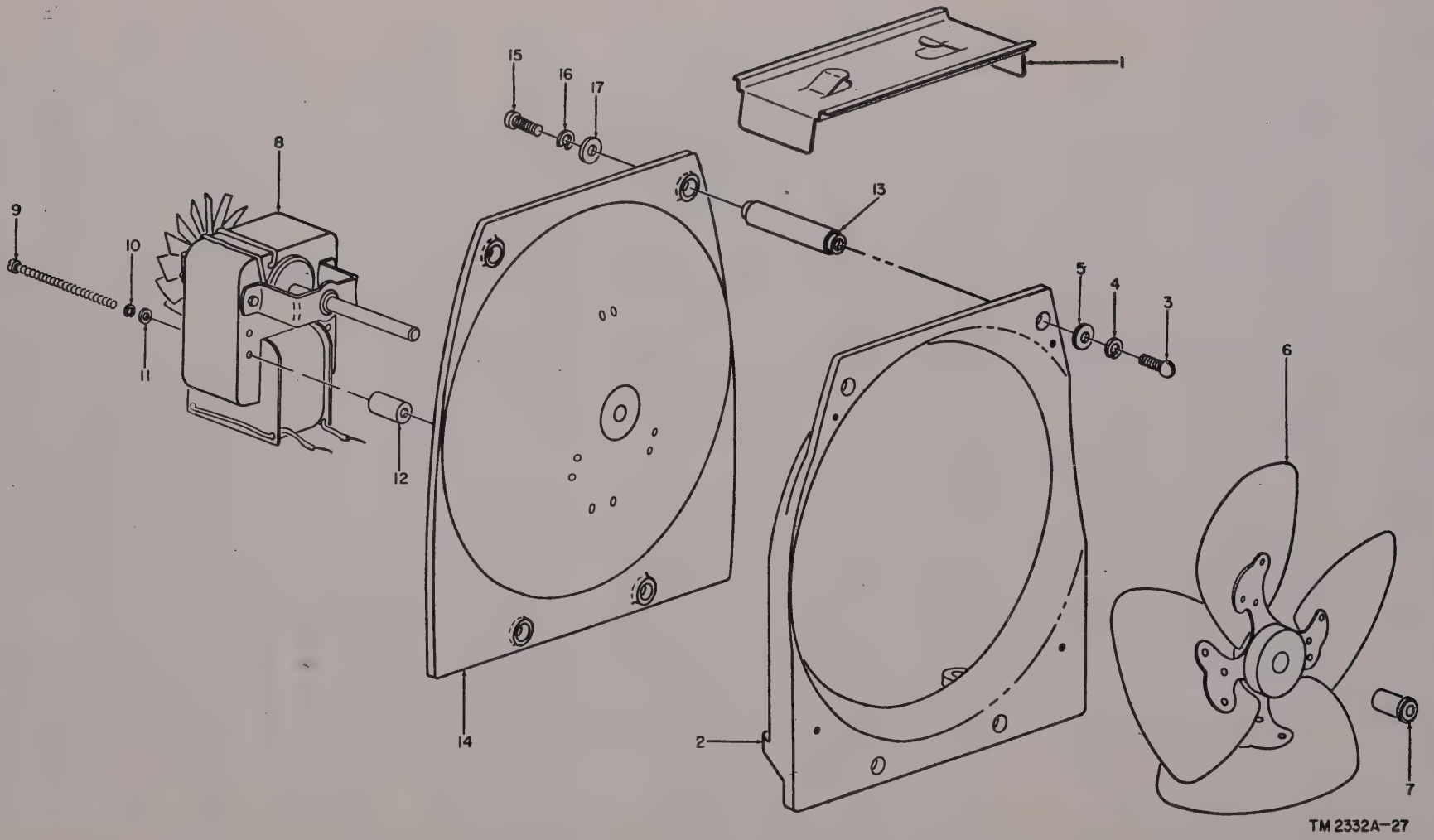


Figure 23. Motor mount assembly, exploded view.

1 Motor mount cover (A 17).
2 Fan shroud (A 34).
3 Roundhead screw.
4 Lockwasher.
5 Flat washer.
6 Fan blade (MP4).
7 Fan blade bushing (MP5).
8 Motor (B2).
9 Fillister head screw.
10 Lockwasher.
11 Flat washer.
12 Motor mounting stud (H25, H26, H27, H28).
13 Motor mount and fan shroud spacer (MP17, MP18, MP19, MP20).
14 Motor mount (A 32).
15 Roundhead screw.
16 Lockwasher.
17 Flat washer.

Figure 23—Continued.

52. Film Strip Mechanism

a. General. The shoe guide and shell assembly, the cover plate and stripper assembly, and the center plate assembly of the film strip mechanism are riveted together and cannot be disassembled. The exposed view of the film strip mechanism (fig. 24) illustrates these parts assembled, and the three assemblies together are called the center plate, cover plate, and shell assembly (29, fig. 24).

b. Disassembly (fig. 24).

(1) Press the aperture release knob (2) and remove the two glass aperture plate assemblies (1).

(2) Remove the aperture release knob (2), the aperture lock spring (3), the aperture release shaft (4), and the aperture plate lock (5) from the center plate, cover plate, and shell assembly (29).

(3) Disconnect and remove the film take-up spool drive spring (6).

(4) Unscrew the acorn nut (8) that secures the film take-up spool mounting screw (7) to the center plate, cover plate, and shell assembly (29). The film take-up spool mounting screw (7), the film take-up spool (9), and the film take-up spool spacer (10) now can be removed.

(5) Loosen the setscrew that secures the film advance knob (11) to the film advance shaft (28). The indexing ball (12) will drop out from between the film advance knob and the clutch bearing (20). Remove the film advance knob with the indexing knob spring (13) from the film advance shaft. Remove the indexing knob spring from the film advance knob.

(6) Remove the plastic retaining ring (14) from the single frame screw knob (15); unscrew and remove the single frame screw knob from the film advance knob. Remove the detent rod retaining ring (16), the detent rod (17), and the indexing knob spring (13) from the single frame screw knob.

(7) Loosen the set screw of the centering nut (18). Loosen the setscrew of the clutch bearing nut (19). Unscrew the

clutch bearing (20) from the clutch bearing nut (19). Remove the clutch bearing and the friction washer (21) from the film advance shaft (28).

(8) Unscrew and remove the framing clutch handle (22) from the clutch bearing (20).

(9) Loosen the setscrew of the film sprocket assembly (23). Loosen the setscrew of the take-up drive pulley (24). Withdraw the film advance shaft (28) from the film advance knob side of the center plate, cover plate, and shell assembly (29). As the film advance shaft is removed, the take-up drive pulley (24), the film sprocket assembly (23), the antifriction washer (25), the centering nut (18), the clutch bearing nut (19), the friction washer (26), and the spring washer (27) will drop off the film advance shaft in the order stated.

c. Cleaning and Inspection.

(1) Clean the glass of the glass aperture plates with lens cleaning tissue.

(2) Clean all metal parts with cleaning compound to remove dirt and dust; dry with a lint-free cloth.

(3) Inspect the two indexing knob springs. The free length must be 9/16 inch. Replace if necessary.

(4) Inspect the film take-up spool drive spring. The free length must be 3 7/8 inches. Replace if necessary.

(5) Inspect all parts to make sure that they are not deformed or otherwise damaged.

d. Reassembly.

(1) Insert the end of the film advance shaft (28) (end without the flat) into the right half of the center plate, cover plate, and shell assembly (29). Slip on the spring washer (27), the friction washer (26), the clutch bearing nut (19), the centering nut (18), the antifriction washer (25), the film sprocket assembly (23), and the take-up drive pulley (24), and push the film advance shaft (28) through to the other side of the center plate, cover plate, and shell assembly (29).

(2) Screw the framing clutch handle (22) into the clutch bearing (20). Slip the friction washer (21) onto the clutch bearing (20).

(3) Slip the clutch bearing (20) onto the film advance shaft (28) and screw the clutch bearing nut (19) onto the clutch bearing (20) until sufficient pressure is exerted to hold the clutch bearing in place. Tighten the setscrew of the clutch bearing nut.

(4) Screw the centering nut (18) on the clutch bearing (20) as far as possible.

(5) Position the pulley so that the set screw rests on the flat of the film advance shaft (28). Tighten the set screw of the take-up drive pulley (24). The take-up drive pulley should be against the left side of the shell assembly (29) and the film advance shaft should extend through the pulley about $\frac{1}{16}$ inch.

(6) Center the film sprocket assembly (23) in the slots of the shoe guide and tighten the set screws on the flat of the film advance shaft (28).

(7) Screw the centering nut (18) so that it exerts a slight pressure against the film sprocket assembly (23) and tighten the centering nut set screw.

(8) Secure the indexing knob spring (13) and the detent rod (17) to the single frame screw knob (15) with the detent rod retaining ring (16). Screw the single frame screw knob into the film advance knob (11) and secure it in place with the plastic retaining ring (14).

(9) Insert the indexing knob spring (13) and the indexing balls (12) into the film advance knob (11) and slip the film advance knob onto the film advance shaft (28). Secure the film advance knob (11), against the clutch bearing (20), to the film advance shaft (28) by tightening the film advance knob set screw.

(10) Slip the film take-up spool (9) and the film take-up spool spacer (10) onto the film take-up spool mounting screw (7), and secure the film take-up spool mounting screw to the center plate, cover plate, and shell assembly (29) with the acorn nut (8).

(11) Reconnect the film take-up spool drive spring (6).

(12) Check to see that the film sprocket assembly (23) is in the center of the film strip mechanism. There should be no play in the film advance shaft (28). The clutch bearing should operate satisfactorily. The film advance knob should index every $\frac{1}{2}$ turn with the single frame screw knob in the maximum counterclockwise position and every $\frac{1}{4}$ turn with the single frame screw knob in the maximum clockwise position. The film take-up spool (9) should advance with rotation of the film advance knob (11).

(13) Screw the aperture release shaft (4) into the aperture plate lock (5). Insert this assembly through the left side of the center plate, cover plate, and shell assembly

(29) and secure it in place with the aperture lock spring (3) and the aperture release knob (2).

(14) Press the aperture release knob (2) and insert the two glass aperture plate assemblies (1) into the center plate, cover plate, and shell assembly (29).

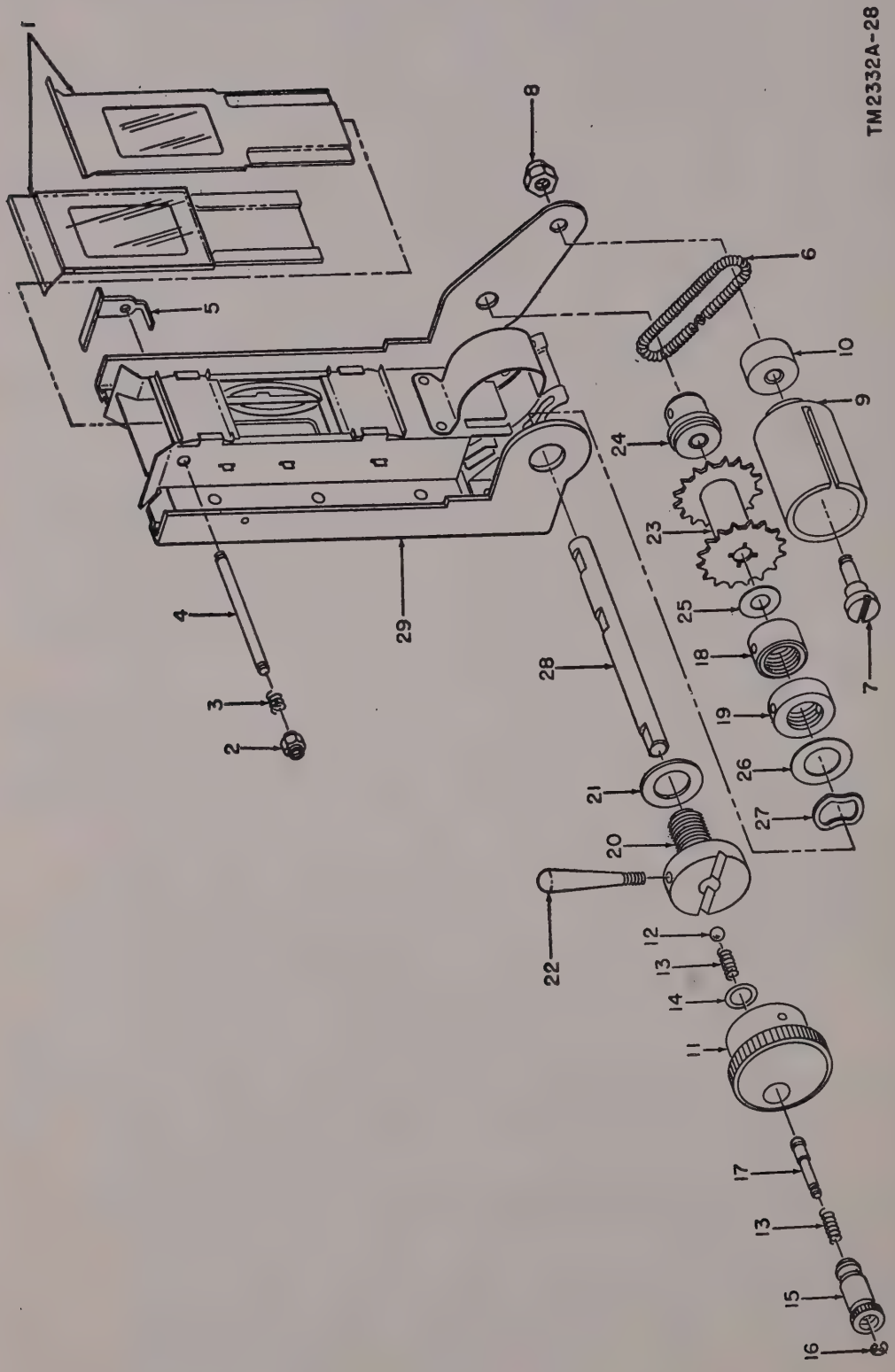


Figure 24. Film strip mechanism, exploded view.

1 Glass aperture plate assembly (A 101, A 102).
2 Aperture release knob.
3 Aperture lock spring.
4 Aperture release shaft.
5 Aperture plate lock.
6 Film take-up spool drive-spring (MIL5).
7 Film take-up spool mounting screw (M102).
8 Acorn nut.
9 Film take-up spool (MP111).
10 Film take-up spool spacer (MP110).
11 Film advance knob (MP106).
12 Indexing ball (MP101).
13 Indexing knob spring (MP112, MP113).
14 Plastic retaining ring.
15 Single frame screw knob (M103).
16 Detent rod retaining ring.
17 Detent rod.
18 Centering nut (M101).
19 Clutch bearing nut (MP105).
20 Clutch bearing (MP104).
21 Friction washer (M108).
22 Framing clutch handle (A 103).
23 Film sprocket assembly (MP116).
24 Take-up drive pulley (MP108).
25 Antifriction washer (H104).
26 Friction washer (M102).
27 Spring washer (H109).
28 Film advance shaft (MP109).
29 Center plate, cover plate, and shell assembly.

Figure 24—Continued.

53. Refinishing

If refinishing is required, observe the following precautions.

a. Use antireflection, dull black paint, or dull preservative finishes on all internal parts.

b. Do not apply paint to springs, plated parts, optical parts, or other surfaces that will affect the proper functioning of the projector. Since all metal parts are plated, they can be cleaned to remove finger and oil stains and foreign substances by wiping them with a moist, soapy cloth or cleaning compound. Wipe dry with a soft clean cloth.

Section IV. ALINEMENT OF OPTICAL SYSTEM

54. General

a. The projection lens, front and rear condensing lenses, heat filter, projection lamp, and reflector, have a definite relationship to each other, and their alignment is very important. All the components are fixed; however, the reflector mounting assembly and the projection lamp socket can be adjusted if necessary.

b. Under ordinary usage it never should be necessary to aline the optics. The instructions in paragraph 55 apply only when considerable abuse and possible shifting of parts have occurred. Major adjustments often indicate a damaged instrument; therefore, prior to a complete optics alinement, it is advisable to check the projector (par. 44) to determine whether it should be reconditioned or returned for replacement.

c. Uneven or spotty illumination indicates misalinement. If this occurs, try another lamp before realigning the optical system.

d. Maximum lumen output and uniformity of illumination is obtained by having the lamp filaments positioned evenly in the aperture when the filaments are viewed through the lens and the reflector is positioned for optimum output and uniformity of screen corner illumination.

55. Alinement Procedures

a. Set up the projector approximately 12.5 feet from a screen.

b. Move the FAN and LAMP switches to the off position.

c. Connect the projector power cable assembly to the output of Variable Power Transformer TF–171/USM. Connect the TF–171/USM power cord to a 117-volt, 50- to 60-cps power source. Set the voltage adjustment control on the TF–171/USM to the O position.

d. Move the projector FAN and LAMP switches to the on positions.

e. Turn the voltage adjustment control on the TF–171/USM to the 117-volt position. Focus the projector lens assembly on the screen to obtain maximum sharpness of aperture outline; turn the voltage adjustment control back to the 0 position. Look through the lens at the projector lamp filaments and slowly advance the voltage adjustment control until the projection lamp filaments can be seen clearly at a comfortable light level (approximately 10 volts).

f. Position the projection lamp to meet the following requirements. Refer to *g* below for projection lamp alinement procedures.

(1) The projection lamp filaments must fill the aperture.

(2) The projection lamp filaments must be centered in the aperture. If possible, the filaments should all be visible.

g. Aline the projection lamp as follows:

(1) If the top or bottom of the filaments cannot be seen in the aperture, try another projection lamp before attempting alinement.

Note. Because of lamp tolerances, it may not be possible to include all of the filaments in the aperture during alignment.

(2) If either side of the filaments cannot be seen in the aperture, remove the three cover locking screws (35, fig. 17) and lift the housing cover (34) from the housing (36). Loosen the two fillister head machine screws (18, fig. 22) that secure the venturi plate assemblies (17) to the two lamp supporting plates (2). Move the lamp, lamp socket, and venturi plate assembly to either side until the filaments are positioned properly; then tighten the fillister head machine screws (18).

h. Turn the voltage adjustment control on the TF–171/USM to

the 117-volt position. Position the projector to obtain a rectangular 40- by 28-inch image on the screen.

i. Use the TF–171/USM and measure the light intensity in the center of the screen. The reading on the TF–171/USM should be 125-foot-candles ±5 percent. If the light intensity is less than required, proceed as follows:

(1) Loosen the four fillister head machine screws (3, fig. 22) that secure the two lamp supporting plates (2) to the housing (30).

(2) Move the reflector, lamp, lamp socket, and venturi plate assembly forward or backward until the light intensity at the center of the screen is 125-foot-candles; then tighten the fillister head machine screws (3).

(3) If the optimum setting of the lamp socket does not produce at least 119 foot-candles, loosen the two fillister head machine screws (7), that secure the reflector holder beam (6) to the lamp supporting plates (2).

(4) Adjust the reflector (12) forward and backward for the optimum setting; then tighten the screws fillister head machine screw (7).

Caution: When making adjustments with the housing cover off and the projection lamp operating at rated voltage, do not keep the lamp on more than 3 minutes at a time. The glass envelope may expand.

j. Check the uniformity of illumination at *each* corner of the screen. The illumination average of the four corners must be not less than 75 percent of the illumination reading obtained at the center of the screen and the lowest reading must be not less than 65 percent: If the uniformity of illumination does not meet these requirements, proceed as follows:

(1) Loosen the two fllister head machine screws (13, fig. 22) that secure the reflector (12) to the reflector holder beam (6).

(2) Move the reflector (12) sideways until the uniformity of illumination meets the above requirements; then tighten the fillister head machine screws (13). Replace the housing cover.

Section V. FINAL TESTING

56. General

This section is used as a guide to determine the quality of a repaired projector. The final test outlined in paragraph 57 may be performed by maintenance personnel with adequate test equip-

ment and the necessary skills. These tests should be made after each overhaul or periodic inspection of the equipment.

57. Test Equipment Required for Final Testing

Test equipment repaired for final testing the quality of a repaired or overhauled projector is Foot Candle Photoelectric Meter ME–86/U. This meter is used to check the intensity and uniformity of the light projected on the screen after the equipment has been repaired.

58. Final Testing Procedure

Make final tests with the projector operating under actual operating conditions.

a. Set up the projector and plug the power cable assembly into a 117-volt, 50- to 60-cps as power source.

b. Inspect the elevating leg assembly to see that it is in proper working order. The elevating leg assembly should elevate the projector to an angle of 10° with respect to the horizontal.

c. Move the FAN and LAMP switches to the on position. Position the projector to fill an area of 40 by 28 inches (approximately 12.5 feet from the screen). The illuminated area must be free from masks, color rings or bands, dirt marks, and foreign matter. Dark lines indicate that one or more of the optical elements are cracked. Spots and smudges indicate dirt in the optics.

d. Check the intensity of illumination at the center of the screen and the uniformity of illumination at the corners. Illumination at the center must be 125 foot-candles ± 5 percent. Uniformity of illuminations must be as follows. If the projector does not meet these requirements, refer to paragraph 55 and realine the projector.

(1) Average of the four corners must be not less than 75 percent of illumination reading obtained at the center of the screen.

(2) Lowest corner reading must be not less than 65 percent.

e. Project an image onto the screen and focus the projector. The projected image must be clear, sharp, and evenly illuminated.

f. Use both the film strip mechanism and the slide carrier to be sure that both are in proper condition.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

59. Disassembly

Use the following instructions when preparing the projector for transportation and storage:

a. Loosen the elevating leg locking knob. Return the elevating leg assembly to minimum height so that the legs are recessed in the base of projector; tighten the elevating leg locking knob.

b. If slides were the last thing to be projected, loosen the accessory locking knob and remove the slide carrier from the projector turret. Reinsert the film strip mechanism. Tighten the accessory locking knob and return the slide carrier to the bottom of the carrying case; secure it in place with the provided straps.

c. Disconnect the power cable assembly and wrap it around the projector as shown in figure 1.

d. Set the projector in the bottom section of the carrying case.

e. Check the contents of the projector set against the table of components (par. 4).

f. Cover the projector with the top section of the carrying case and lock the four latch fasteners.

60. Repacking for Shipment or Limited Storage

Figure 4 illustrates one method of repacking the equipment. Specific directions for packing the projector are as follows:

a. Place the projector and technical manuals within a close-fitting, slotted, corrugated fiberboard box. Seal the entire closure with gummed tape and blunt all corners of the box.

b. Place carboard corners for spacing around each corner of the fiberboard box.

c. Place the fiberboard box and corners spacers into another close-fitting, slotted, corrugated fiberboard box. Seal the entire closure with gummed tape and blunt all corners of the box.

61. Methods of Destruction

Note. The demolition procedures outlined in *a* through *e* below will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

a. Smash. Smash the projector housing, base, elevating leg assembly, turret, projection lens barrel, rear condensing lens, heat filter, front condensing lens, reflector, lamps, film strip mechanism, slide carrier, and carrying case. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, or other heavy tools to destroy this equipment.

b. Cut. Cut the power cables and films; use axes, handaxes, or machetes.

c. Burn. Burn the films and instruction books; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend the cardboard slide mounts.

e. Dispose. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

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[AG 413.53 (17 Jul 56)]

By Order of *Wilber M. Brucker,* Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

JOHN A. KLEIN,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

CNGB (1)
ASA (3)
Tec Svc, DA (1) except
CSIGO (30)
Tec Svc Bd (1)
Hq CONARC (5)
CONARC Bd (incl ea Test
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Sig Sch (25)
Gen Depots (2) except
Atlanta Gen Depot (None)
Sig Sec, Gen Depots (10)
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Mil Dist (1)
Units org under fol TOE:
11–7C, Sig Co, Inf Div (2)
11–16C, Hq&HqCo, Sig Bn,
Corps or Abn Corps (2)
11–57C, Armd Sig Co (2)
11–127R, Sig Rep Co (2)
11–128R, Sig Depot Co (2)
11–500R (AA–AE), Sig
Svc Org (2)
11–557C, Abn Sig Co (2)
11–587R, Sig Base Maint
Co (2)
11–592R, Hq&Hq Co, Sig
Base Depot (2)
11–597R, Sig Base Depot
Co (2)

NG: State AG (6); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see SR 320–50–1.

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