Film-Tech

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SERVICE MANUAL

CX-350

ELMO CO., LTD.

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I INTRODUCTION

I – 1 FEATURES

1. Equipped with newly developed, miniaturized, 350W XENON—ARC LAMP: – Small as it is, the XENON are lamp ranks with the large-size lamps in image replay. With the lamp and the light condensing system compiled in a unit for double structure, as well as with the safety mechanism interlocked to the lamp cover, the XENON are lamp ensures utmost safety.

** Features of 350W XENON are lamp
- Being a point light source, it has high brightness, and provides bright and distinct image.
- Because of pure white light with excellent original color property, it ensures better reproduction of color at color film projection.
- The projection can be easily carried out because of instantaneous lighting and stabilization.
- The lamp has longer life.

2. Adoption of cold mirror: – Cold mirror is used in order to release the lamp heat to the rear side of the mirror and reflect the light only. Since it prevents the curling of film due to lamp heat, it ensures stable image even at high intensity of illumination.

3. Highly portable due to adoption of switching power circuit: – With the built-in switching power circuit of latest type as well as with the built-in dynamic speaker with 12.5 cm diameter adopted in the main body, and the two pieces of 12.5 cm speakers additionally mounted on the front cover for one-set one-case system, the machine boasts of excellent portability (30 x 30.5 x 24 cm – 15 kg).

4. Easy film loading due to channel loading mechanism: – A channel loading system is adopted, enabling the film to get set automatically to proper position simply by leading the film along the channel (groove); the film can, therefore, be loaded speedily with perfect safety even by a layman.

5. Remote control (supplied): – The supplied remote control unit enables free and remote control for forward projection, lamp ON/OFF, douser CLOSE/OPEN operations, etc.

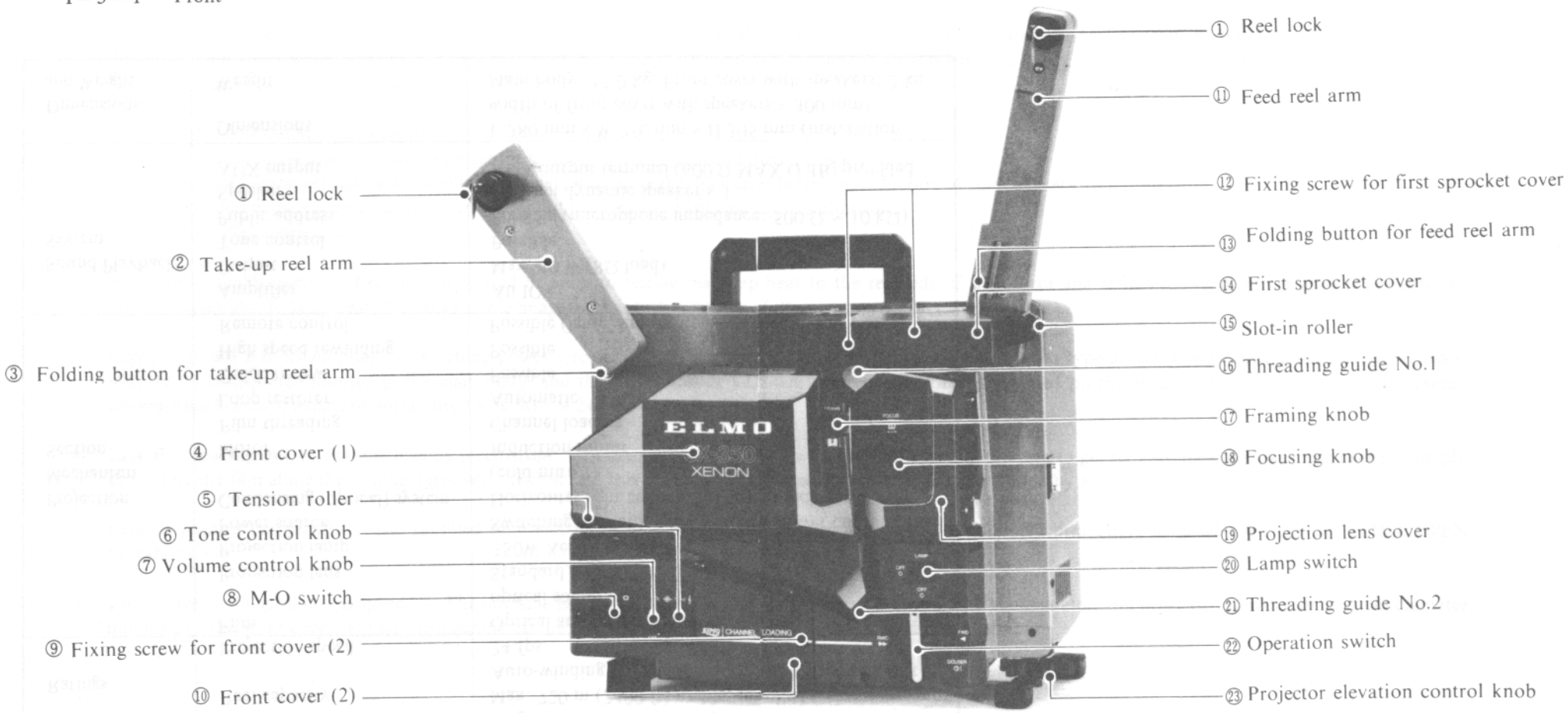
6. Front cover with speakers (supplied): – The machine is equipped with built-in dynamic speaker with 12.5 cm diameter, and other two speakers of 12.5 cm diameter mounted to the front cover, so that the machine can be used for projection at places (halls) with different size.

I – 2 SPECIFICATIONS:

Items		
Ratings	Power source	Single phase, AC 50/60 Hz, 750 VA
	Reel capacity	Max. 720 m (2400 ft) usable; supplied reel: Auto-winding type with capacity of 480 m (1600 ft)
	Projection speed	24 fps
Projection Mechanism Section	Film	Optical and magnetic sound films of 16 mm, laser optical sound film
	Projection lens	Standard lens 50 mm f/1.2
	Projection lamp	350W Xenon arc lamp
	Power source	Switching regulator type with low power consumption
	Condensing (optical) system	Horizontal light condensing system dichroic mirror (cold mirror)
	Motor	Induction motor
	Film threading	Channel loading
	Loop restorer	Automatic
	Quick review	Possible
	High speed rewinding	Possible
	Remote control	Possible (lamp, motor, douser); cord: 8 m
Sound Playback System	Amplifier	All IC's
	Output	Max. 40 W (8Ω load)
	Tone control	Possible
	Public address	Possible (microphone impedance: 500 Ω ~ 10 kΩ)
	Speaker	12.5 cm dynamic speaker x 1
	AUX output	AUX output terminal (600 Ω MAX O dB) provided
Dimensions and Weight	Dimensions	L 380 mm x W 250 mm x H 305 mm (installation width of front cover with speakers = 300 mm)
	Weight	Main body: 15.0 kg, Front cover with speakers: 2 kg

I – 3 PARTS DESCRIPTION AND FUNCTIONS

I – 3 – 1 Front



① Reel lock:
Fixes the reel to prevent the reel from getting detached from the arm.

② Take-up reel arm:
Supports and drives the take-up reel.

③ Folding button for take-up reel arm:
This button is depressed to fold the take-up reel arm.

④ Front cover (1):
Protects the lamp block, and as a safety switch for high tension generating circuit, it does not allow the lamp to light up unless the cover is done.

⑤ Tension roller:
Absorbs the tension irregularity exerted in the film during film take-up.

⑥ Tone control knob:
Controls the sound tone, with the tone getting high when turned clockwise.

⑦ Volume control knob:
Controls the sound volume, with the volume getting increased when turned clockwise.

⑧ M-O switch:
This is a select switch; for projecting optical sound film, set to "O" and to "M" for projecting magnetic sound film.

⑨ Fixing screw for front cover (2):
Remove the front cover (2) for easy cleaning of roller section, etc.

⑩ Front cover (2):
Protects the internal mechanism.

⑪ Feed reel arm:
Supports the projection reel, and drives for rewinding.

⑫ Fixing screw for first sprocket cover:
Remove this screw and cover for easy cleaning of sprocket section.

⑬ Folding button for feed reel arm:
Depress this button to fold feed reel arm.

⑭ First sprocket cover:
Protects the internal mechanism such as the first sprocket, etc.

⑮ Slot-in roller:
Controls the film from the reel to lead the film to the specified position in the projector.

⑯ Threading guide No. 1:
The guide No. for film threading.

⑰ Framing knob:
Adjust by turning knob when boundary lines appear on the screen.

⑱ Focusing knob:
This knob is used for focusing the projected image.

⑲ Projection lens cover:
Supplied with a spare fuse inside, this cover protects the projection lens.

⑳ Lamp switch:
This switch is used for turning the lamp to ON/OFF. (See P. 7 for detail)

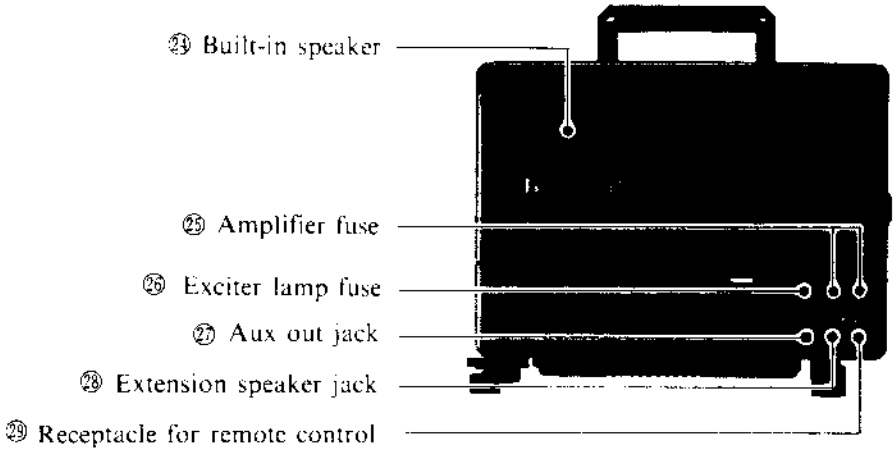
㉑ Threading guide No. 2:
The guide No. for film threading.

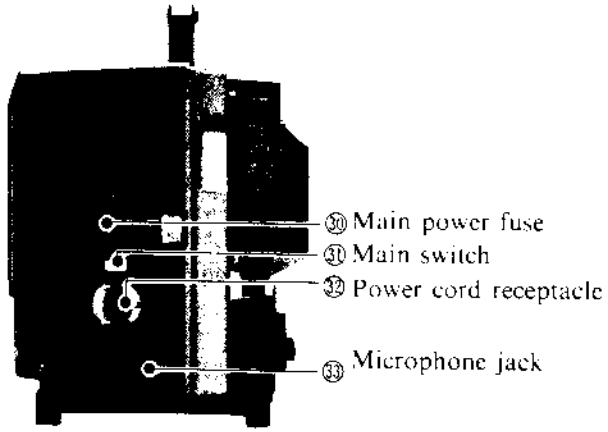
㉒ Operating switch:
This switch is used for STOP, FORWARD and BACKWARD operations of the projector. (See P. 7 for detail)

㉓ Projection elevation control knob:
This is used for adjusting the height of projected image.

I – 3 PARTS DESCRIPTION AND FUNCTIONS

I – 3 – 2 Rear and side





㉔ Built-in speaker:
This is a 12.5 cm dynamic speaker used for projection in small halls. etc.

㉕ Amplifier fuse:
This prevents the flow of overcurrent into the amplifier circuit.

㉖ Exciter lamp switch:
This prevents the flow of overcurrent into the exciter lamp circuit.

㉗ Aux out jack:
This is used to produce sound by using a different amplifier.

㉘ Extension speaker jack:
This is used when the speaker other than the built-in speaker is used for projection in large halls. (The built-in speaker circuit automatically turns off when extension speaker plug is inserted into this jack.)

㉙ Receptacle for remote control:
This receptacle is used for remote control.

㉚ Main power fuse:
This prevents the flow of overcurrent into the main power circuit of the projector.

㉛ Main switch:
This is used for turning the power to the projection to ON or OFF.

㉜ Power cord receptacle:
This is a receptacle for projector power cord.

㉝ Microphone jack:
This is a plug receptacle for microphone.

I 3 PARTS DESCRIPTION AND FUNCTIONS

I – 3 – 3 Operation switch functions

① Lamp switch:
Turn the lamp switch to DOUSER with the main switch turned to ON, the lamp then lights up and after several seconds, the lamp gets set to half-lit state, thus saving power during projector stand-by state.

② Operation switch:

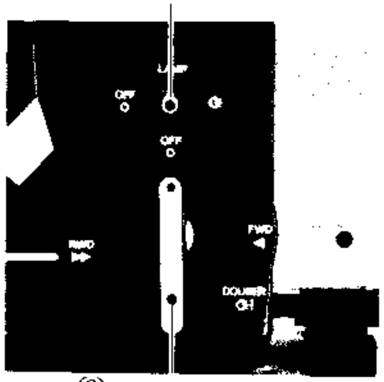
OFF: ○ — Turn the switch to OFF to stop the projector during forward projection and rewinding.

FWD: ◄ — Turn the switch to FWD ◄ to run the film forward by setting the film path to projection state and driving the main motor.

DOUSER: ON — Turn the switch further to DOUSER for forward projection. The douser plate then comes off the light path, and the projection lamp gets set from half-lit to full-lit position.

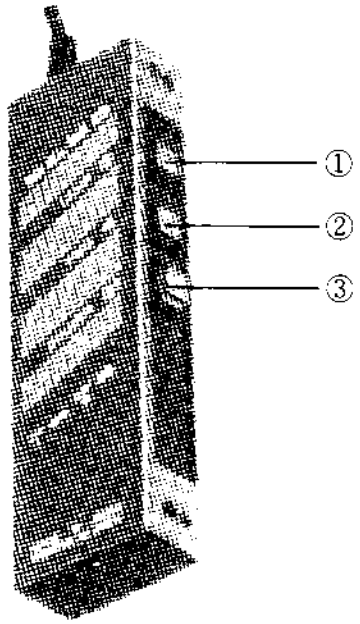
RWD: ▶▶ — Turn the switch to RWD ▶▶ to carry out high-speed rewinding of film from reel-to-reel. When the film is in the film path, the machine is set for quick review. (Refer to P. 12)

① Lamp swich



② Operation swich

I – 3 – 4 Remote Control



○ Insert the cord of Remote Control into the receptacle for remote control at the rear (back), and turn the operation switch to FWD or DOUSER, then the remote controls ①, ② and ③ can be carried out by using the Remote Control.

① LAMP : Like the lamp switch in the main body, this switch can turn the lamp to ON or OFF (half-lit up).

② FWD ◀ : On turning this switch to ON, the projector starts for forward projection; on turning this switch to OFF, the projector comes to a stop.

③ DOUSER : On turning this switch to ON, the douser plate comes off the light path, and the lamp gets set from half-lit to full-lit position.

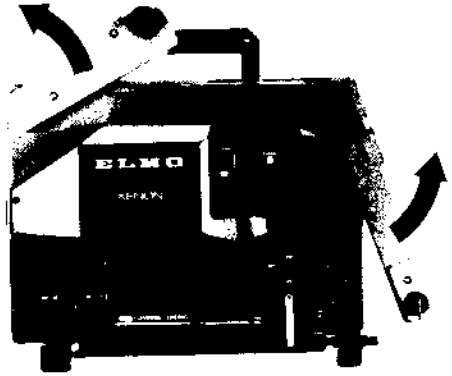
Note: Rewinding and quick rewinding can not be carried out by Remote Control; however, such operations are possible by using the operation switches in the projector main body, with the remote cord connected.

I – 4 PREPARATIONS FOR PROJECTION

(1) Set up the projector and screen properly. For steady projection, place the projector on a sturdy support at right angles to the screen.

(2) Make sure that the main switch is at OFF position before connecting the power cord. Use the earth clip for providing grounding of the power cord in order to prevent static electricity, leakage current, etc.

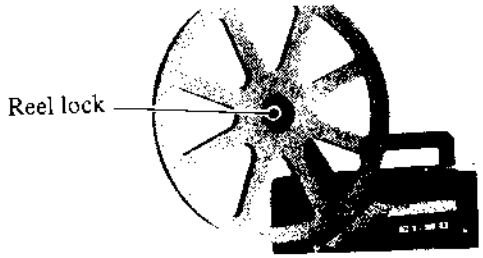
(3) Pull up the feed and take-up reel arms to maximum stop positions (till a "click" sound is produced).



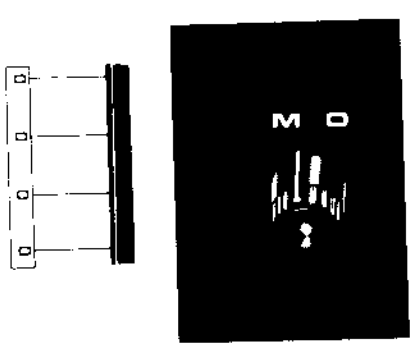
(4) Apply the projection film to the feed reel arm, and fix with the reel lock.

(5) Adjust the screen position by means of the elevation control knob.

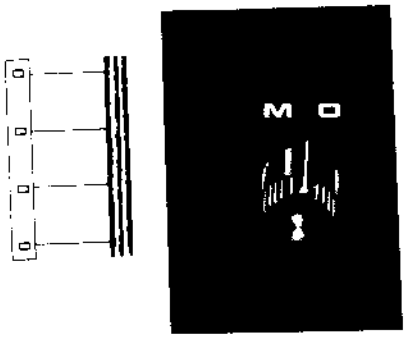
(6) Install the supplied take-up reel 480 m (1600 ft.) to the take-up reel arm, and be sure to fix the reel by turning down the reel lock.
Note: The reel capacity of this projector is max. 720 m (2400 ft.). For projection film beyond this capacity, use the suitable accessory reels available in the market.



(7) Set the M-O switch to "M" for projecting magnetic sound film and to "O" for optical sound film.



Magnetic sound film

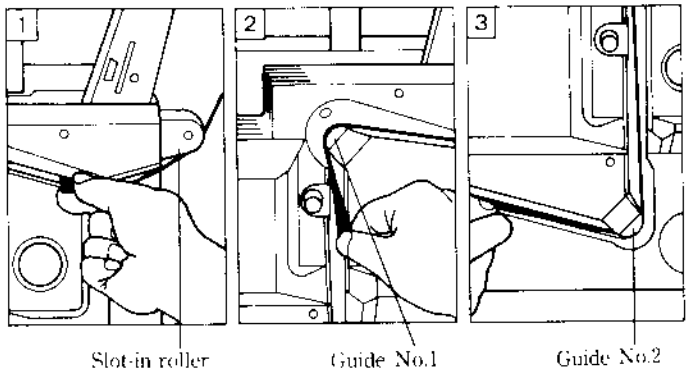


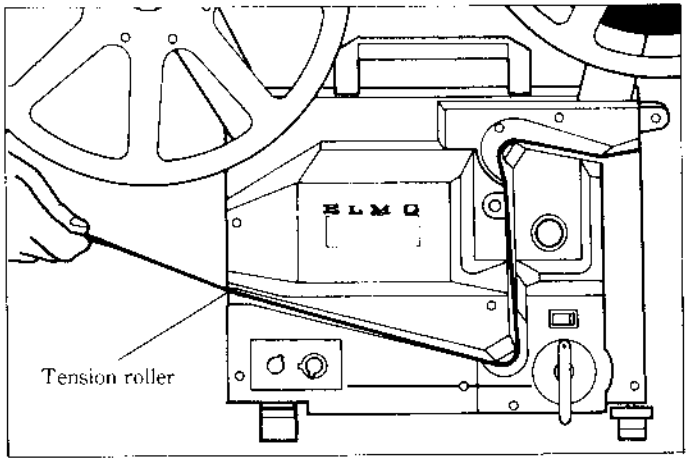
Optical sound film

(8) Refer to "Various Projections" on P. 12 for using the front speaker cover or/and the remote control.

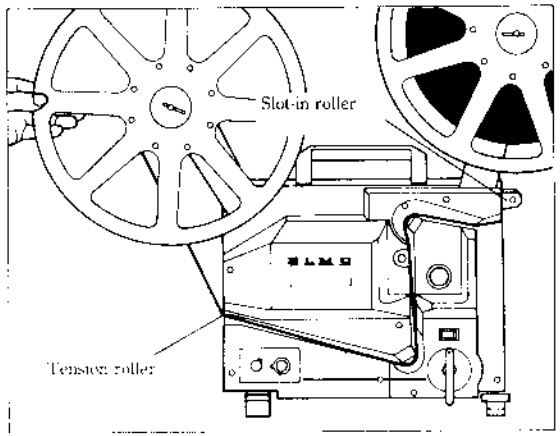
I - 5 FILM LOADING

(1) Hold the tip of film between thumb and index finger, then slowly lead the film, along the channel, to the take-up reel. First pass the film through the slot-in roller to Guide No. 1, Guide No. 2 and finally to the tension roller before winding the tip to the take-up reel (the winding can be easily done by inserting the tip and then turning the reel).

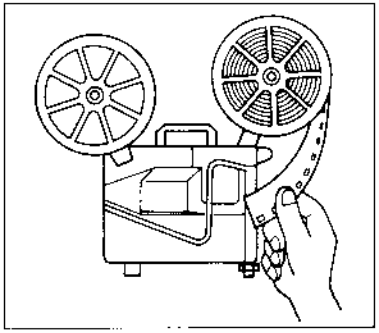




(2) Make sure that the film is duly threaded through the slot-in roller and tension roller by turning the take-up reel clockwise with hand (to provide tension to the film).



*Safety device for film loading (Specification for Japan only):
The safety device activates if the operation switch is set to FWD when the film still not rewound is loaded or when the film has not entered the gate. When the safety device activates, a warning is given by "pi . . . . pi . . . . " sound, and the projector does not start. When this happens, set the operation switch to OFF, make sure that the film perforations face this side as shown in the Fig., and restart for projection. In case the perforations are not facing this side, carry out rewinding of the film.

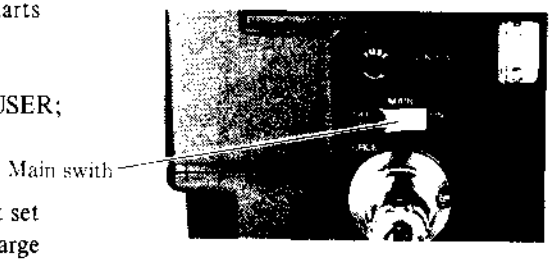


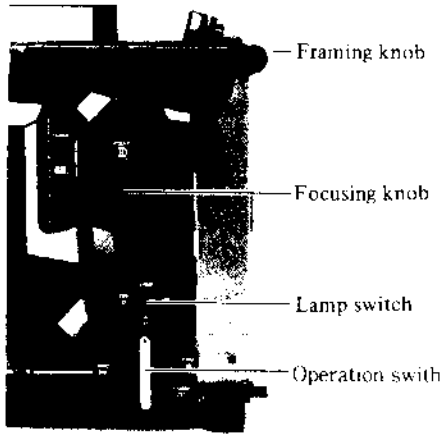
I – 6 PROJECTION

(1) Turn the main switch to ON; the auxiliary fan then starts rotation.

(2) Set the lamp switch to DOUSER; the lamp is then half lit.

Note:
In case the lamp fails to get set for half-lit state, after discharge of several times, set the lamp switch once to OFF and then to DOUSER again.





(3) Set the operation to FWD to feed the film and then to DOUSER for projection.

(4) Adjust focusing by turning the focusing knob.

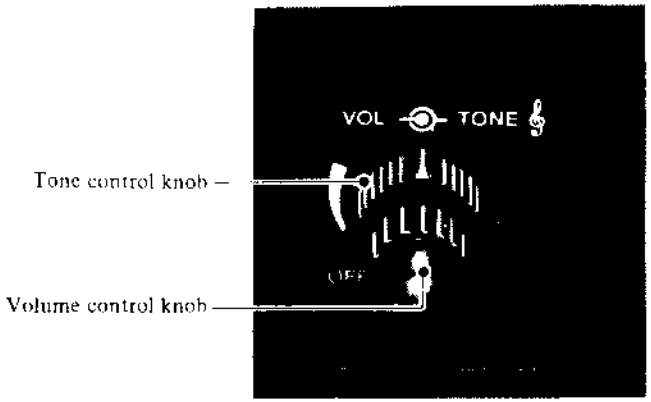
(5) Should a frame line appear on the screen, eliminate the line by turning the framing knob.
Use the projector elevation control knob to adjust the screen position.

(6) Adjust the sound volume by turning the volume control knob clockwise.
The outer tone control knob is used for controlling the sound tone.

(7) On completion of projection, turn the operation switch to OFF, taking care so as not to leave the switch in-between FWD and OFF. Keep the main switch to ON for approximately 1 minute after turning the lamp to OFF to let the lamp cool down.

Note:
In case film breakage occurs during projection, the broken film automatically gets out of the film path.

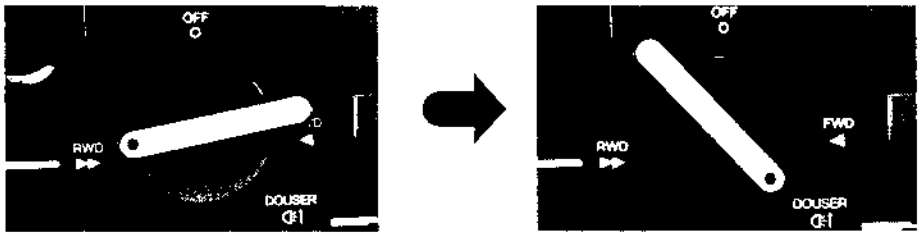
* In such case, turn the operation switch to OFF, remove the projection lens cover to take out the film, splice the broken part, and start reprojection.
* When exchange lens other than the standard lens is used, the broken film may not get out of the film path.



I 7 VARIOUS PROJECTIONS

I - 7 – 1 Quick review:

This feature enables you to review the specific frame you want to see again during projection. Turn the operation switch counter-clockwise from DOUSER to OFF and further down to RWD and the film in the path is quickly rewound. then turn the operation switch to OFF on getting the desired frame. When turning the operation switch to OFF, do not stop turning the knob on the way; turn the knob firmly down to the OFF position. After the film stops, turn the operation switch to DOUSER for reprojection.



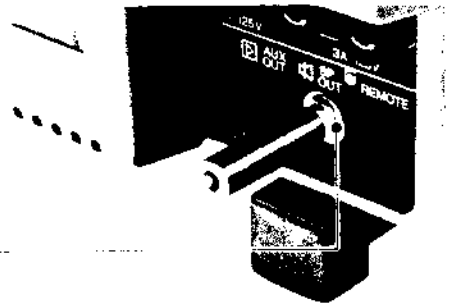
Notes: 1. When the operation switch is turned to RWD from OFF, the projector may start rewinding only after a few seconds pause depending on the film volume on the reel to be rewound. This is because the film is rewoulnd gently to protect the film, and is not a fault. (The same mechanism is effective for rewinding the film after projection.)

2. Be sure not to turn the operation switch from OFF to FWD before the film feeding comes to a complete stop. In case the film stops with some length of slackened loop when the operation switch is turned from RWD wind up the slackened portion by turning take-up reel clockwise with hand before projection.
3. Quick review projection is possible up to 480 m (1600 ft.) film. Use the feed reel and take-up reel of the same size for quick review projection.

I – 7 – 2 When using extension speaker:

When using an extension speaker at the time of projection for a large auditorium, connect the speaker plug to the extension speaker jack. This automatically turns off the built-in speaker circuit.

When using the supplied front cover with speaker, connect to the external speaker jack and front cover jack by using the supplied cords.



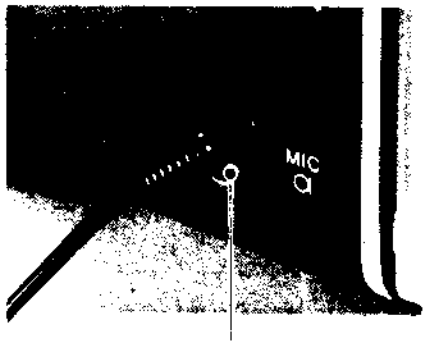
Extention speaker jack

(DIN type speaker jack is provided depending on the country)

I – 7 · 3 Public address system:

The projector can be used as a public address system by connecting the microphone to the microphone jack. Use the microphone with an impedance of 500 Ω ~ 10 kΩ .

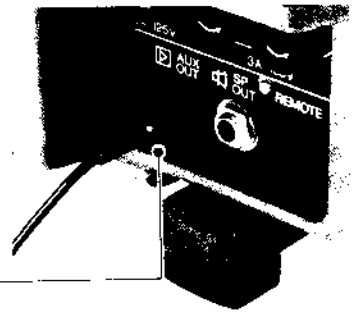
The sound through the microphone is given precedence over the sound from the film during projection.



Microphone jack

I – 7 – 4 Projection in large halls:

When using other main amplifier or mixing console for producing sound, connect the plug to AUX OUT jack. The output impedance is 600ΩMAX (output level O dB; unbalanced). When the plug is connected to AUX OUT jack, speaker circuit is automatically turned off, and both the built-in speaker and the extension speaker cannot be used.

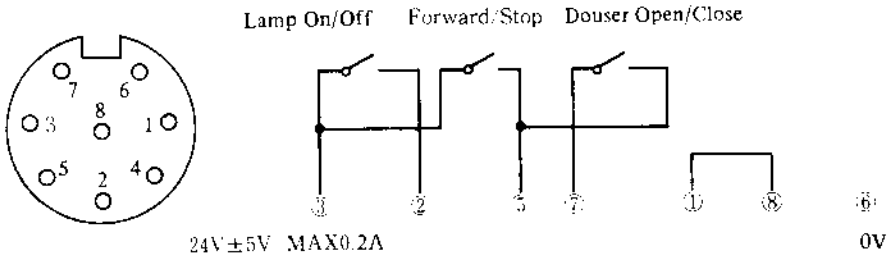


Aux out jack

I · 7 – 5 Remote control:

On connecting the supplied Remote Control to the remote control receptacle, and setting the operation switch to FWD ◀ or DOUSER position and the projection lamp switch to OFF position, the FORWARD/STOP, douser OPEN/CLOSE and lamp ON/OFF operations can be carried out by means of the Remote Control.

DIN 8P remote control receptacle is provided. Remote control is possible through control between contacts with the Remote Control.



Note:

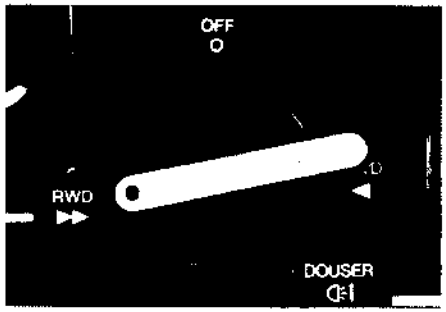
With the Remote Control connected, the operation switch in the projector cannot be used except for OFF ○ (strip) and RWD ▶▶.

I – 8 REWINDING OF FILM

When the projection is completed, rewind the film in the following manner.

1. Wind the film end to the feed reel.

2. Turn the operation switch to RWD ▶▶.
(Here, the projector may start rewinding only after a pause of a few seconds depending on the length of film on the reel to be rewound. The projector is designed to increase re-winding torque gradually for the protection of the film.)

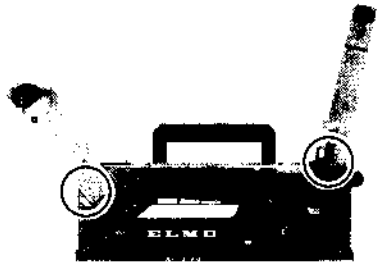


3. After the film is thoroughly rewound, turn the operation switch to OFF.

4. Remove the reels.

I – 9 STOWING

1. First of all disconnect the power cord. Fold the feed reel and take-up reel arms by depressing the respective folding buttons.



2. Turn the elevation control knob fully counter-clockwise to bring the projector in horizontal position. Make sure that the elevation leg is not extended during transportation of the projector.

3. Make sure that the operation, lamp and main switches are all turned to OFF.

4. Put the dust cover on the projector.

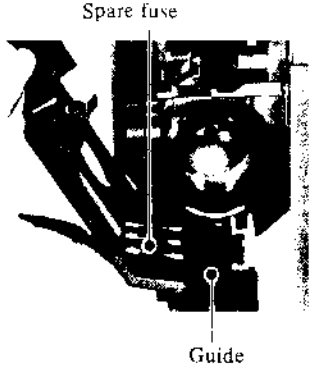
5. Return the power cord and supplied reel to the stowing pockets provided in the dust cover.

1 10 MAINTENANCE OF PROJECTOR

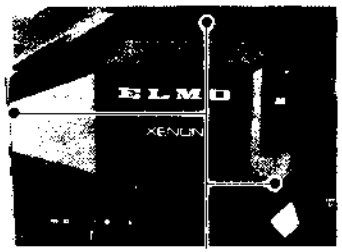
Clean the film path and lens prior to projection; accumulation of film particles, dust, etc. in the film gate may cause the film to get scratched and the projected image quality to get deteriorated.

1 – 10 – 1 How to remove and install cover:

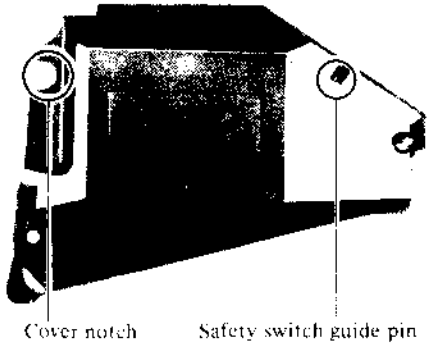
1. Projection lens covers:
   To remove, hold the cover as shown in the picture and pull it out this side. To install, align the guides at the bottom and push the upper part of the cover into place.

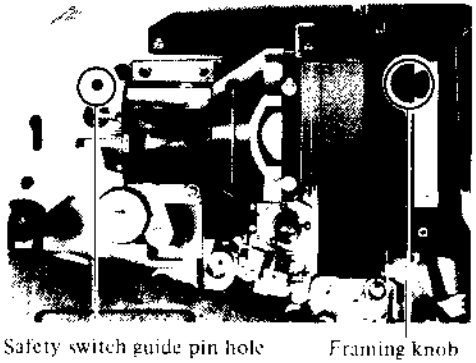


2. Front cover:
   Remove the front cover by loosening three screws as shown in the picture. When this cover is removed, the safety switch activates and the projection lamp does not light up. Here, do not touch the projection lamp and the lamp lead wire.

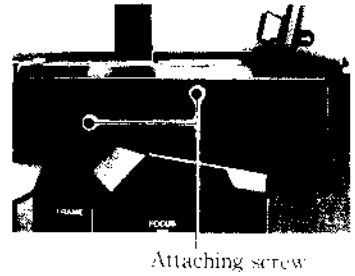


To install the cover, align the framing knob with the cover notch as well as the safety switch guide pins with the corresponding holes before fixing the three screws.

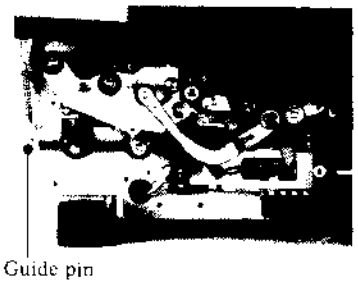




3. First sprocket cover:
   Remove the first sprocket cover by unscrewing the two screws as shown in the picture.

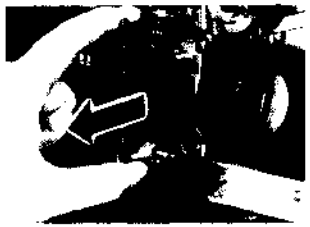


4. Front cover 2:
   Pull out the M-O switch and the tone/volume control knobs this side, then remove the front cover 2 by unscrewing two screws. To install the cover, align the guide pin hole with the guide pin on the left and put the cover back. Fix the two screws and attach the switch and knobs to their respective places.



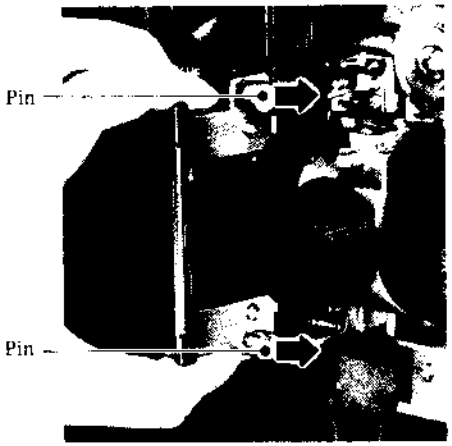
1 – 10 – 2 Cleaning of film gate

Be sure to remove the film when cleaning the film gate. Hold the pressure plate as shown in the picture and pull it out this side, then the pressure plate can be removed.



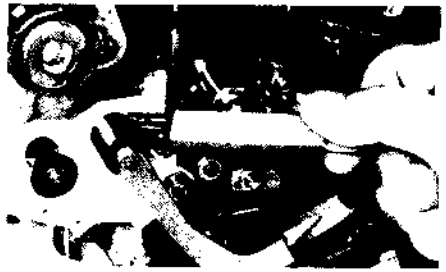
Use the brush, soft cloth, etc. to wipe off the dust, etc. from the aperture plate and pressure plate.

To install the pressure plate, align the two pins at the upper and lower parts of the pressure plate holder with the corresponding slots on the pressure plate base, and push it back to place.

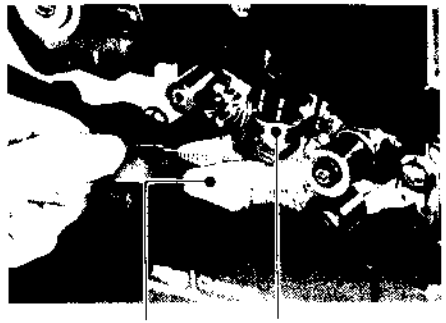


1 – 10 – 3 Cleaning of rollers, solar battery and lens

Brush off the dust, etc. from the rollers by using the supplied brush.



Adhesion of dust to the sound lens and solar battery may deteriorate the tone quality or/and the volume of sound. Use brush for cleaning this section.



I – 10 – 4 Cleaning of projection lens

Pull out the projection lens while pulling the focusing knob this side.

Wipe off the dust gently from the lens with lens cleaner, etc. by using a piece of soft cloth.

Groove

To put the lens back, push the lens all the way to position while pulling the focusing knob this side. Then release the knob, and pull the lens this side.

A "click" sound is heard to ensure that the pin at the end of the focusing knob is positively fit into the groove of the lens.

After the lens is inserted, make sure the lens can move back and forth by turning the focusing knob.

I 11 REPLACEMENT OF LAMP AND FUSE

Be sure to disconnect the power cord before replacing lamp and fuse.

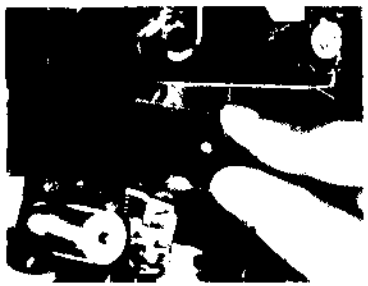
I – 11 – 1 Replacement of projection lamp

The projector is equipped with CX-350 Xenon-arc lamp. Since this lamp has longer life than the halogen lamp, etc., you can use this lamp over a long time without any trouble. However, in the long time, the brightness decreases or/and the lamp may hardly come to light. When the lamp does not light, refer to P. 60 and P. 95 for the necessary procedures.

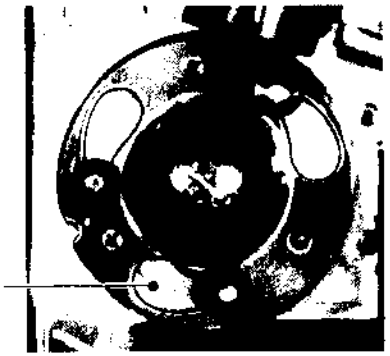
I – 11 – 2 Replacement of exciter lamp

Use KE-040 (ANSI BRK) exciter lamp.

Remove the blown exciter lamp by turning its head counter-clockwise.



To put the new exciter lamp, align the three prongs on the socket with the holes on the lamp flange, and turn the lamp head clockwise until it locks into place.

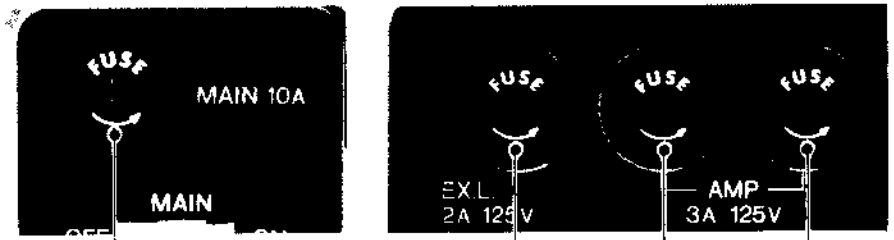


Hole on the lamp flange

I – 11 – 3 Replacement of fuse

Remove the fuse holder by turning the holder head counter-clockwise with a ⊕ screw driver.

"NEVER USE THE FUSE OTHER THAN THE FUSE WITH SPECIFIED VALUE."



Power (main) fuse Exciter lamp fuse Amplifier fuse

* Power fuse:
  The power fuse is for controlling the whole of projector. Check the fuse for blow-out when the auxiliary fan does not work after connecting the power cord and turning the main switch to ON.

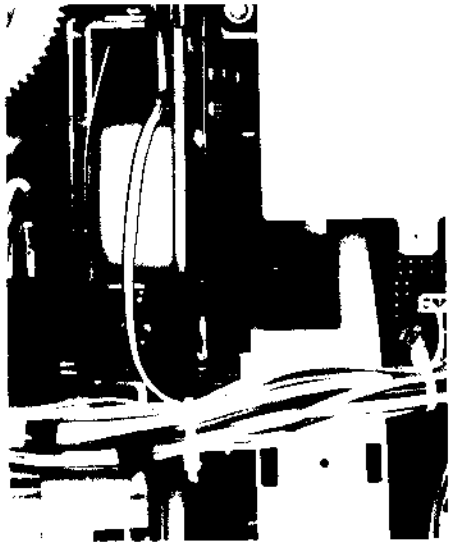
* Exciter lamp fuse:
  Check the exciter lamp fuse for blow-out if no sound is produced when projecting the optical sound film. Here, be sure also to check the exciter lamp filament for blow-out.

* Amplifier fuse:
  Check the amplifier fuse for blow-out if no sound is produced when projecting the sound film.

I – 12 WHEN CHANGING ELECTRIC CURRENT CYCLES (50 Hz – 60 Hz)

- When the power frequency is different from the frequency set in the projector, remove the power panel at the rear cover, and change the belt.

The frequency is: 60 Hz on the left and 50 Hz on the right.



I – 13 TROUBLESHOOTING HINTS

When motor fails to operate

- Check to see that the power cord is duly connected.
- Check the power fuse for blow-out. (Refer to P. 18)

When lamp does not light up

- Check to see that the front cover lamp is properly locked in place.

When no sound is produced

- Check to see that the volume control knob is turned clockwise.
- Check to see that the M-O switch is set to match with the type of film used.
- Check to see that the exciter lamp is lit up during optical review. (Check the exciter lamp and fuse for blow-out. Refer to P. 18)
- Check the amplifier fuse for blow-out. (Refer to P. 18)
- Check the sound lens or solar battery for adherence of dust, etc. (Refer to P. 16)

When image can't be properly focused

- Check the projection lens to see that the lens is properly aligned with the pin of the focusing knob. (Refer to P. 17)

When loop restorer operates continuously during projection

- This may result from the damaged perforations of several frames, causing the film between two sprockets to get too short for the loop to be restored (reset). In such case, stop the projector immediately, and mend the film to eliminate such trouble during the next projection.

When changing electric current cycles

- Change the belt position if sound is too fast or too slow.

Ⅱ DRIVING MECHANISM

Ⅱ – 1 DRIVING MECHANISM FUNCTIONS

Ⅱ – 1 – 1 Outline of driving mechanism

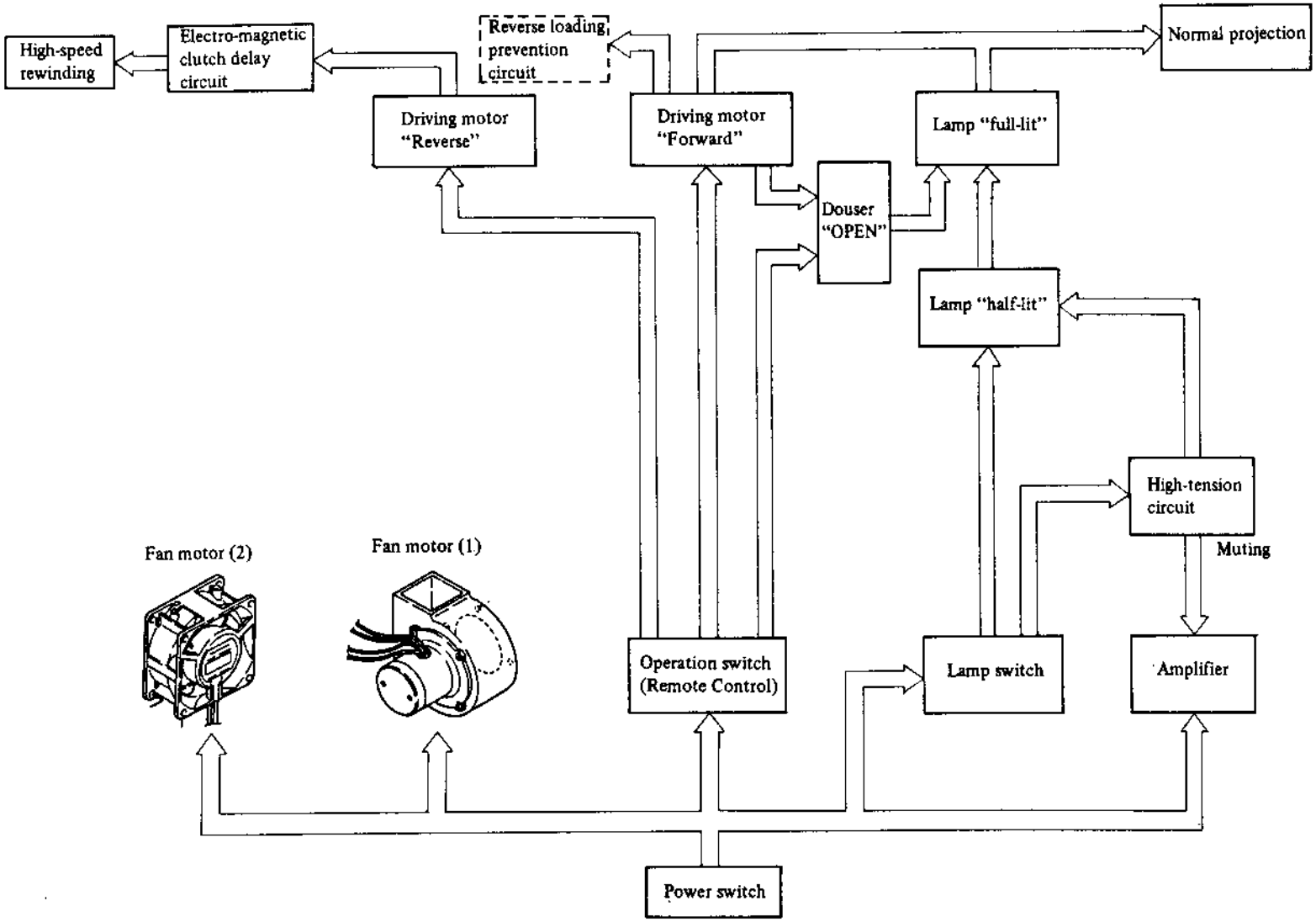


Fig. 1

Fig. 1

II – 1 – 2 Link lever mechanism

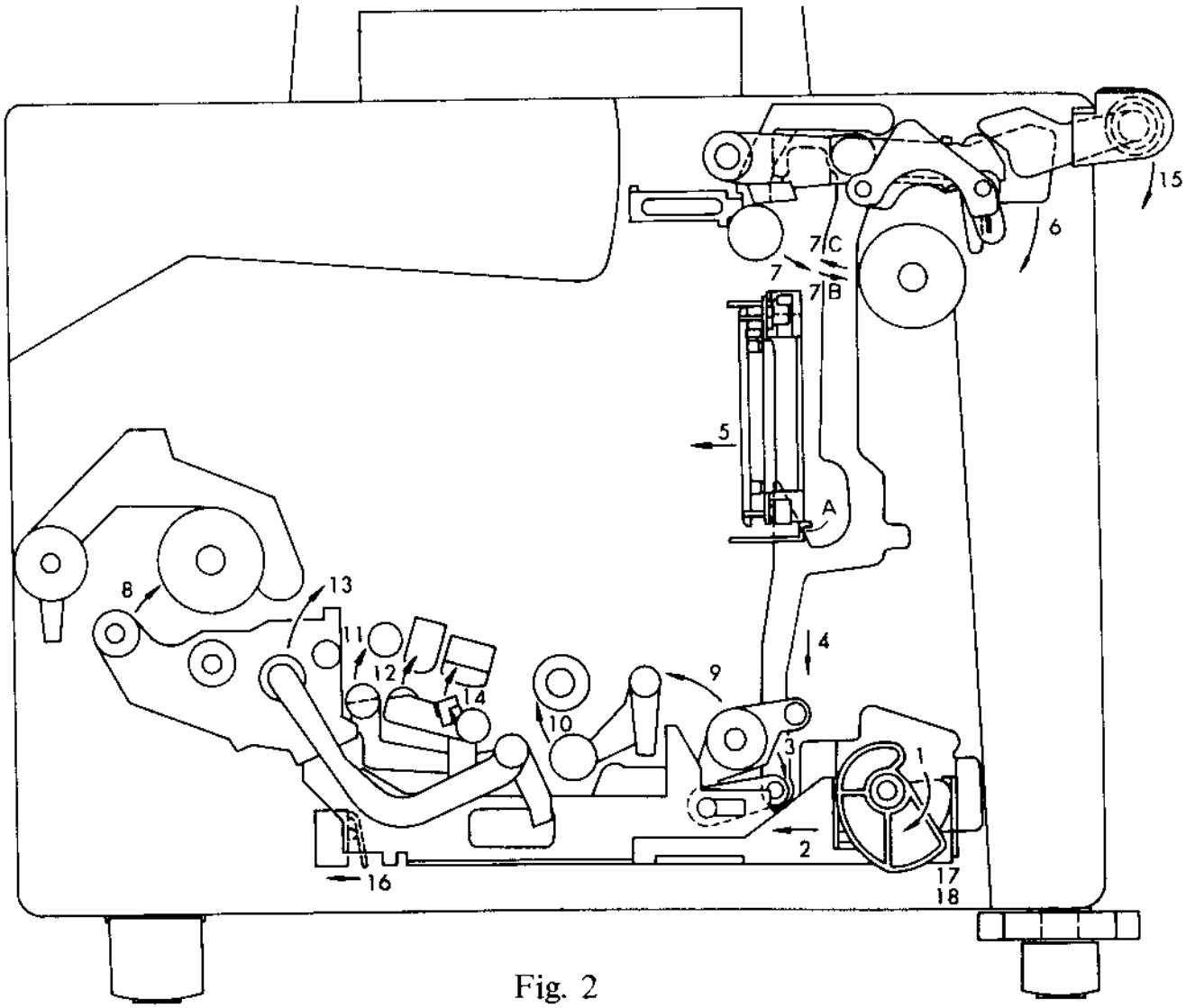


Fig. 2

II – 1 – 2 Link lever mechanism (Refer to Fig. 2)

When knob main is turned in the direction of FWD, ① rotates in the direction of arrow mark.

The ① pushes ②, and the ② starts rotating with the ①.

The motor switch turns to ON when the knob main is turned to FWD.

When the knob is further turned to DOUSER the lamp switch turns to ON.

With the turning of ③, ④ is pushed down, and as the A portion of ④ detaches from ⑤, the spring pressure plate holder causes the pressure plate to get tight fit with the aperture plate.

The ⑥ connected to ④ rotates and sets the first sprocket shoe to the first sprocket; then ⑦ sides off and secures the upper loop.

With the rotation of ⑩ , the assy brake roller ② gets tight fit to the assy brake roller ③.

The ⑨ starts rotation through the lock plate lever guide roller ③ to secure the lower loop.

The ⑫ and ⑭ start rotation, causing the assy pad roller to get tight fit to the assy shaft flywheel to set the ⑭ to specified position.

(The ⑫ rotates when M-O switch is set to M.)

The ⑬ rotates and gets set to specified position.

The ⑧ starts rotation, setting the second sprocket shoe to the second sprocket.

The ⑯ is pushed near the end of ② to turn the switch to ON.

The amplified muting circuit turns to ON and gets activated.

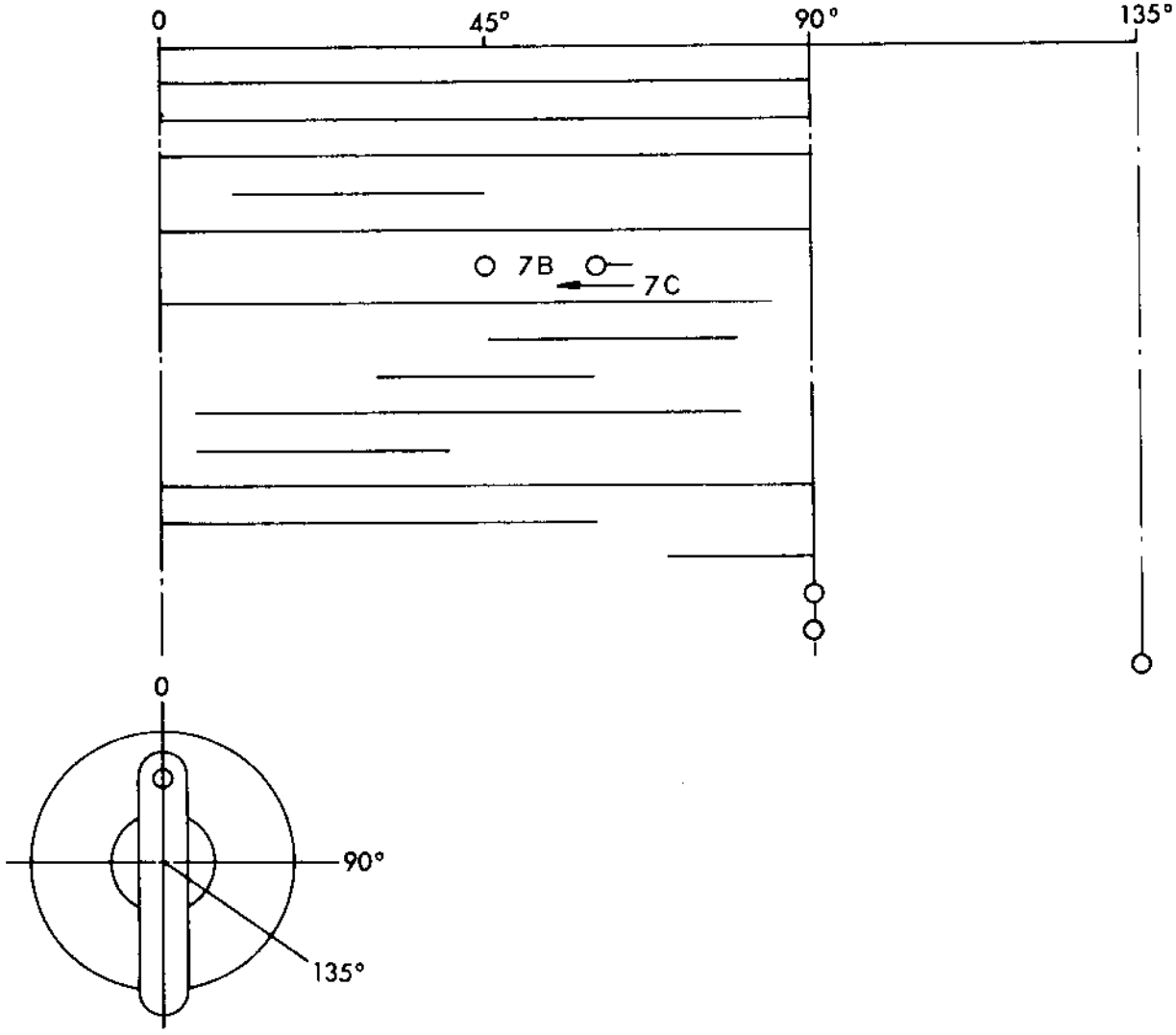
The ⑦ and ⑨ are rollers to secure the loops at the top and bottom of film gate, and their timing (for activation) is delayed so as to activate only after the film is set to the sprockets.

II – 1 – 2 Link lever mechanism (Refer to Fig. 2)

Names

1 Cam link lever
2 Link lever (1)
3 Assy link (2) sprocket shoe (2)
4 Link (1) sprocket shoe
5 Assy holder (1) pressure plate
6 Lever sprocket shoe
7 Assy lever guide roller
8 Assy lever second sprocket presser
9 Assy lever guide roller (3)
10 Lever brake roller
11 Lever pressure roller
12 Lever pad roller
13 Lever intermediate tension
14 Assy lever photodiode
15 Fixing plate guide roller (1)
16 Microswitch (reverse loading prevention, amplifier muting
17 Microswitch (motor)
18 Microswitch (lamp)

Timing chart of link levers after turning the knob main:



Knob main

Fig. 3

II – 1 – 3 Film take-up mechanism (Refer to Fig. 4)

The film take-up is carried out by turning the reel shaft through the transmission of rotation from Main motor ① → Intermittent feed section ② → Assy intermediate shaft (2) ③ → Worm (2) ④ → Assy worm gear (2) ⑤ → V-pulley (2) take-up ⑥ → Pully shaft take-up ⑦ → Worm belt ⑧ → Pulley (upper) take-up ⑨

* The motor rotates in reverse direction during rewinding, and the ⑨ rewinds the film through reverse rotation.

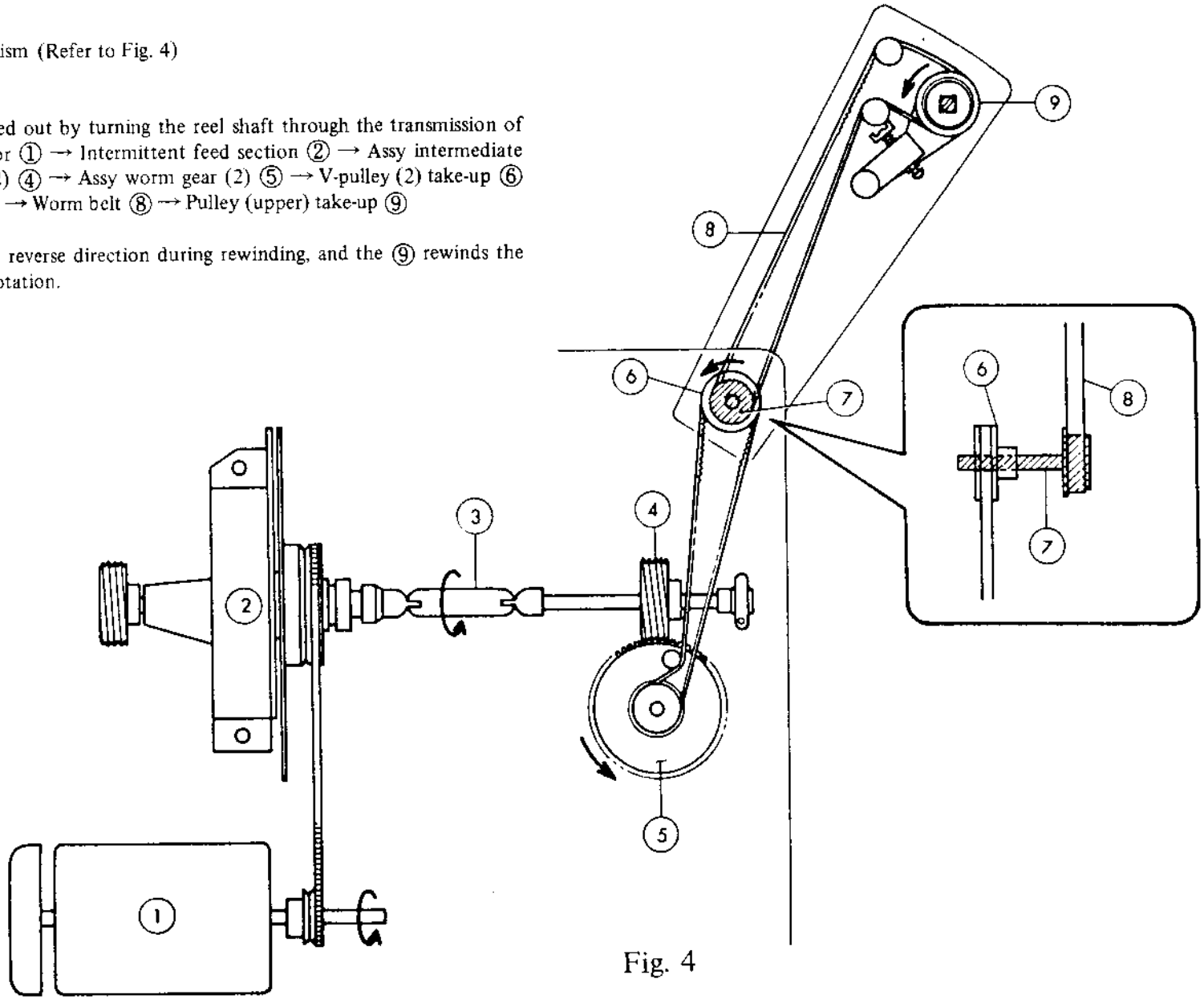


Fig. 4

II – 1 – 4 Film rewinding mechanism (Refer to Fig. 5)

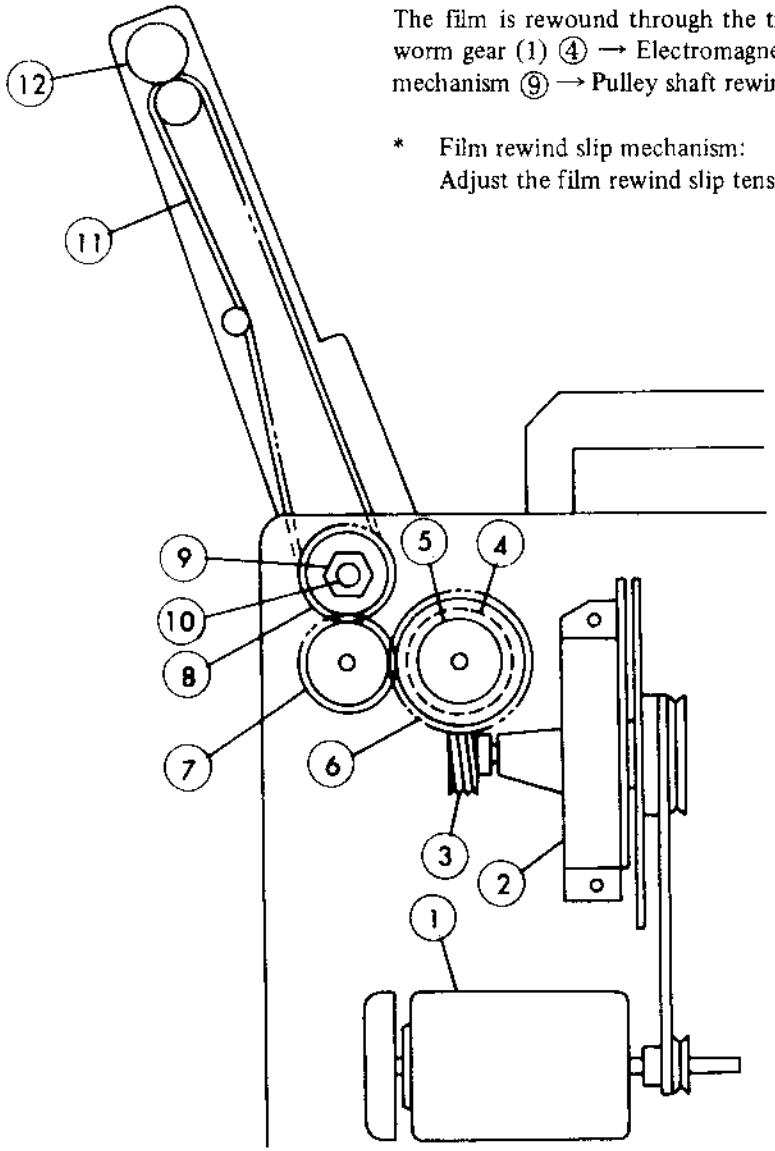


Fig. 5

The film is rewound through the transmission of rotation from Main motor ① → Intermittent feed section ② → Worm (1) ③ → Assy worm gear (1) ④ → Electromagnetic clutch ⑤ → Gear rewind ⑥ → Intermediate gear rewind ⑦ → Gear (2) rewind ⑧ → Rewind slip mechanism ⑨ → Pulley shaft rewind ⑩ → STS belt ⑪ → Assy reel shaft rewind.

* Film rewind slip mechanism:
Adjust the film rewind slip tension by adjusting the spring friction plate with the nut friction plate.

* Electromagnetic clutch:
Abrupt rewinding when the film has slackness, etc., may result in the cut-off of the film. In order to prevent this, the torque of electromagnetic clutch (ZCF-10C) is controlled in two steps to adjust the film tension. (Refer to P. 41 – 42 for circuit and torque adjustment of electromagnetic clutch.)

II – 1 – 5 Automatic loop restorer mechanism

When the film loop at the bottom of film gate gets shorter during forward projection due to damaged perforation or/and erroneous feeding, the automatic loop restorer activates to provide appropriate loop. However, this restorer does not activate for short film at the top of the film gate.

When the loop gets short, the film pushes up the Link (2) loop restorer ① to rotate the Assy holder link (2) ②.

↓

The Assy lever (1) loop restorer ③, coaxial and interlocked with ②, is pushed up, and the claw, linked with the Friction wheel (2) Loop restorer ④, gets detached.

↓

The ④ then touches the rubber roller of Assy worm gear (1) ⑥ due to the spring tension of panel loop restorer ⑤.

↓

Since the ⑥ is turning, the knurling tool of ④ gets engaged with the rubber roller, causing the ④ to rotate.

↓

The Link (1) loop restorer ⑦, connected to the ④, moves downward, pushing down the Assy lever guide roller (3) ⑧. In other words, the Guide roller (1) ⑨ on the ⑧ provides appropriate loop by pushing down the film.

↓

The ④ takes one turn, gets linked with the claw of ③, and stops.

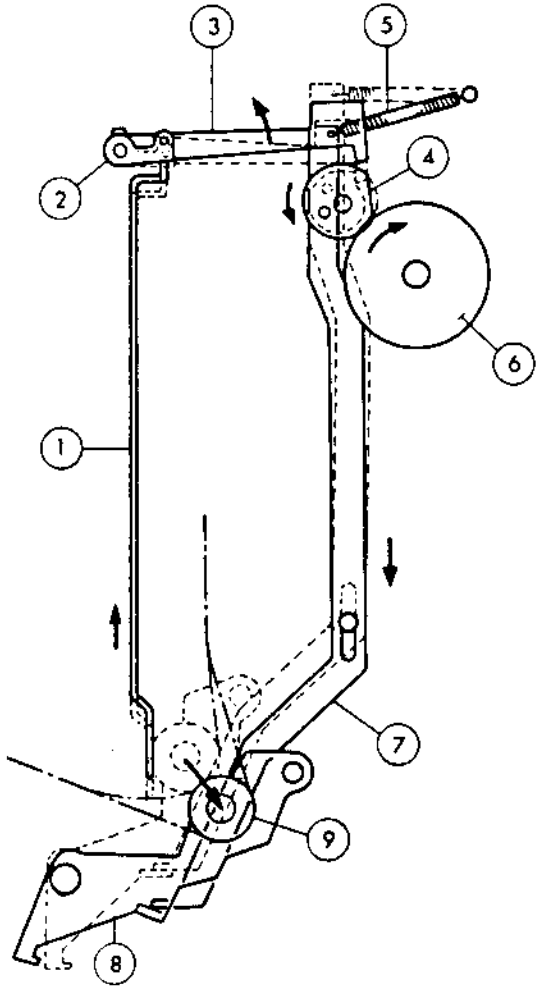
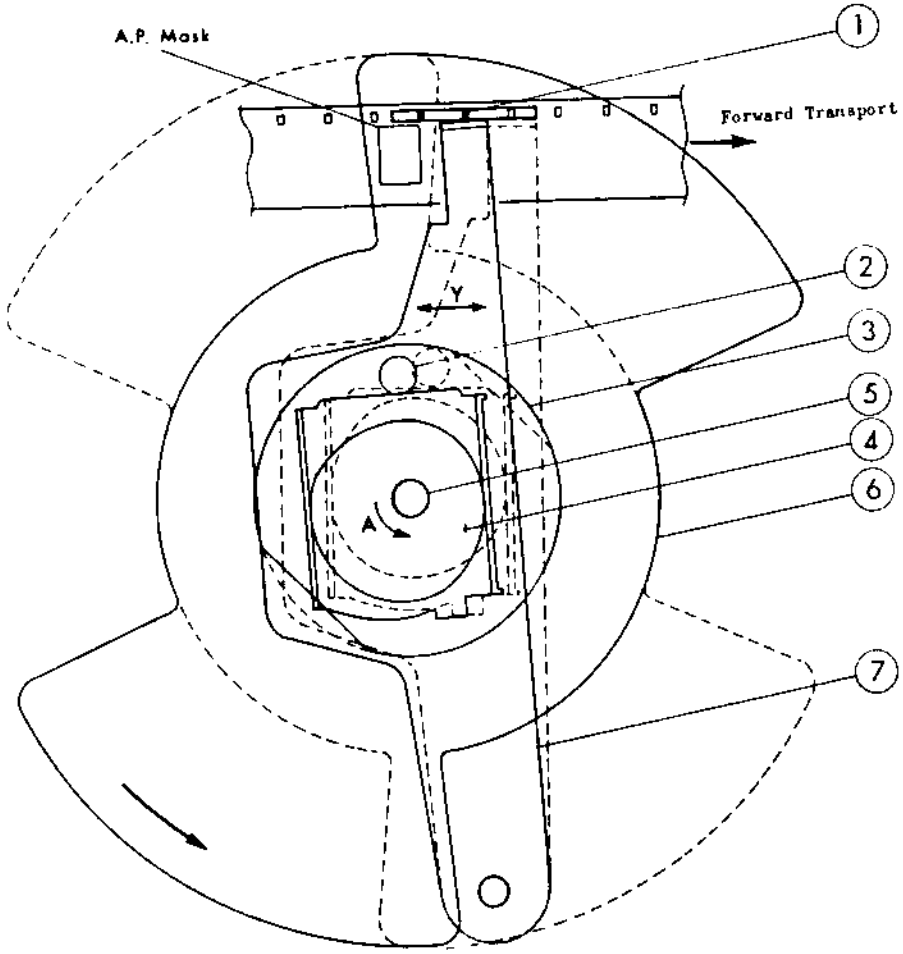
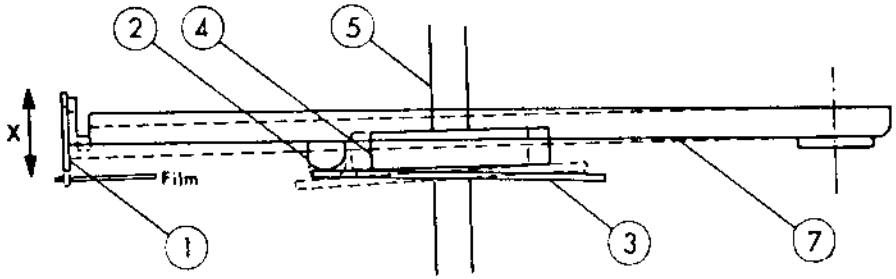


Fig. 6

II – 1 6 Intermittent film feeding mechanism

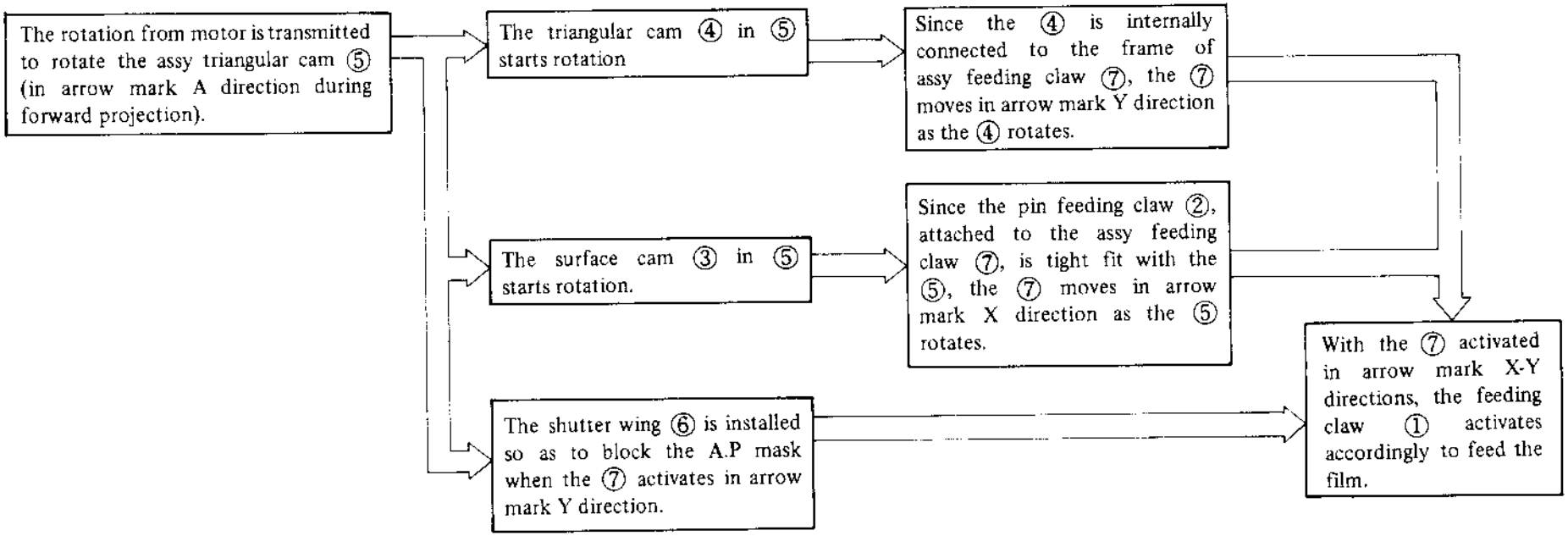




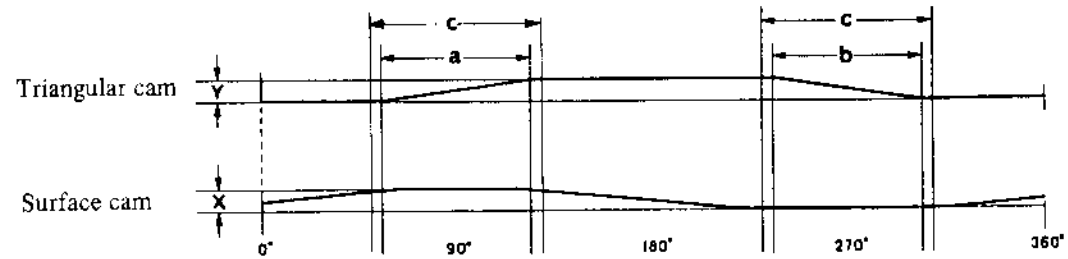
① Feeding claw
② Pin feeding claw
③ Surface cam
④ Triangular cam
⑤ Assy shaft triangular cam
⑥ Assy (1) shutter
⑦ Assy (2) feeding claw (1)

Fig. 7

II – 1 – 6 Intermittent film feeding mechanism



Timing chart of triangular cam, surface cam and shutter

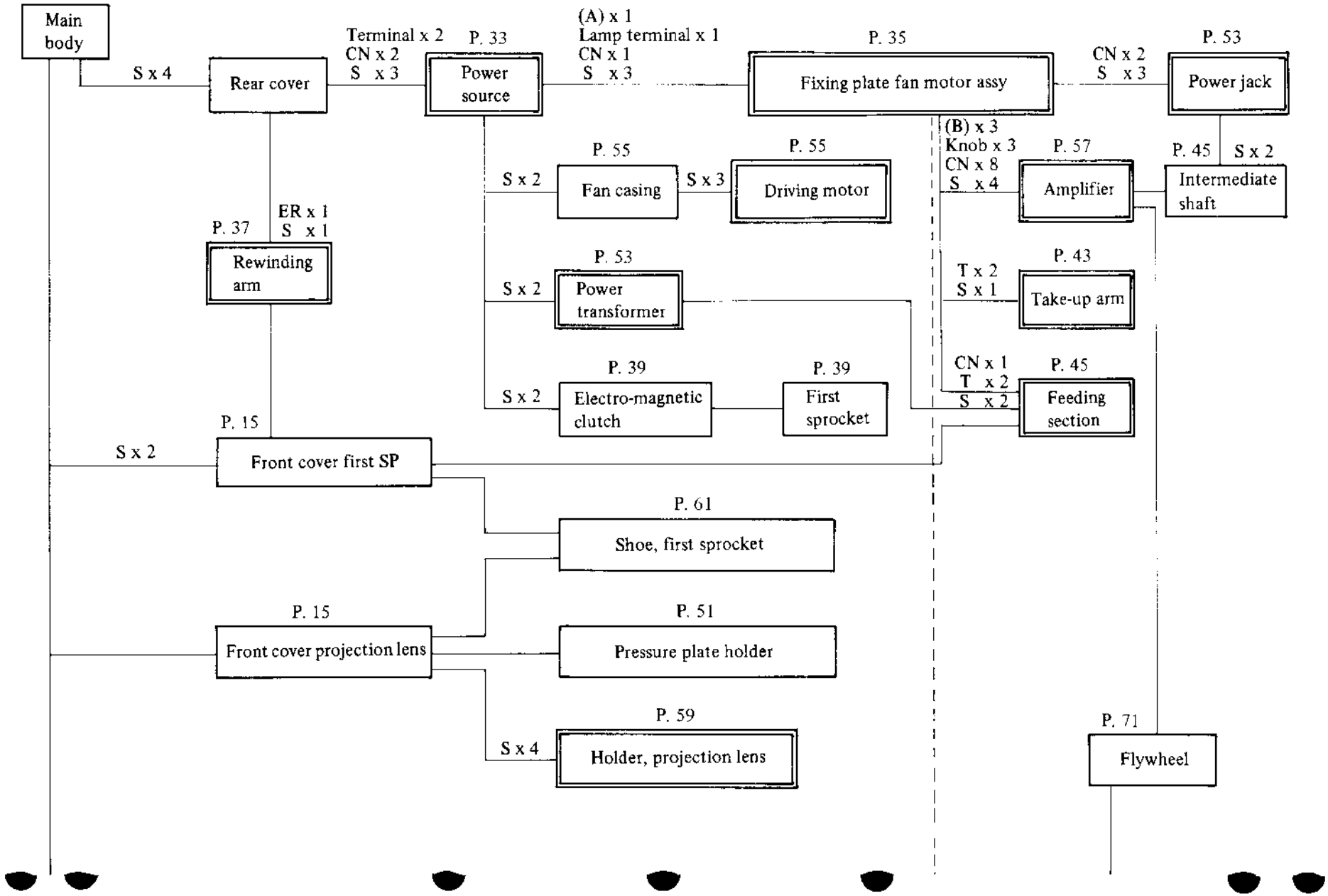


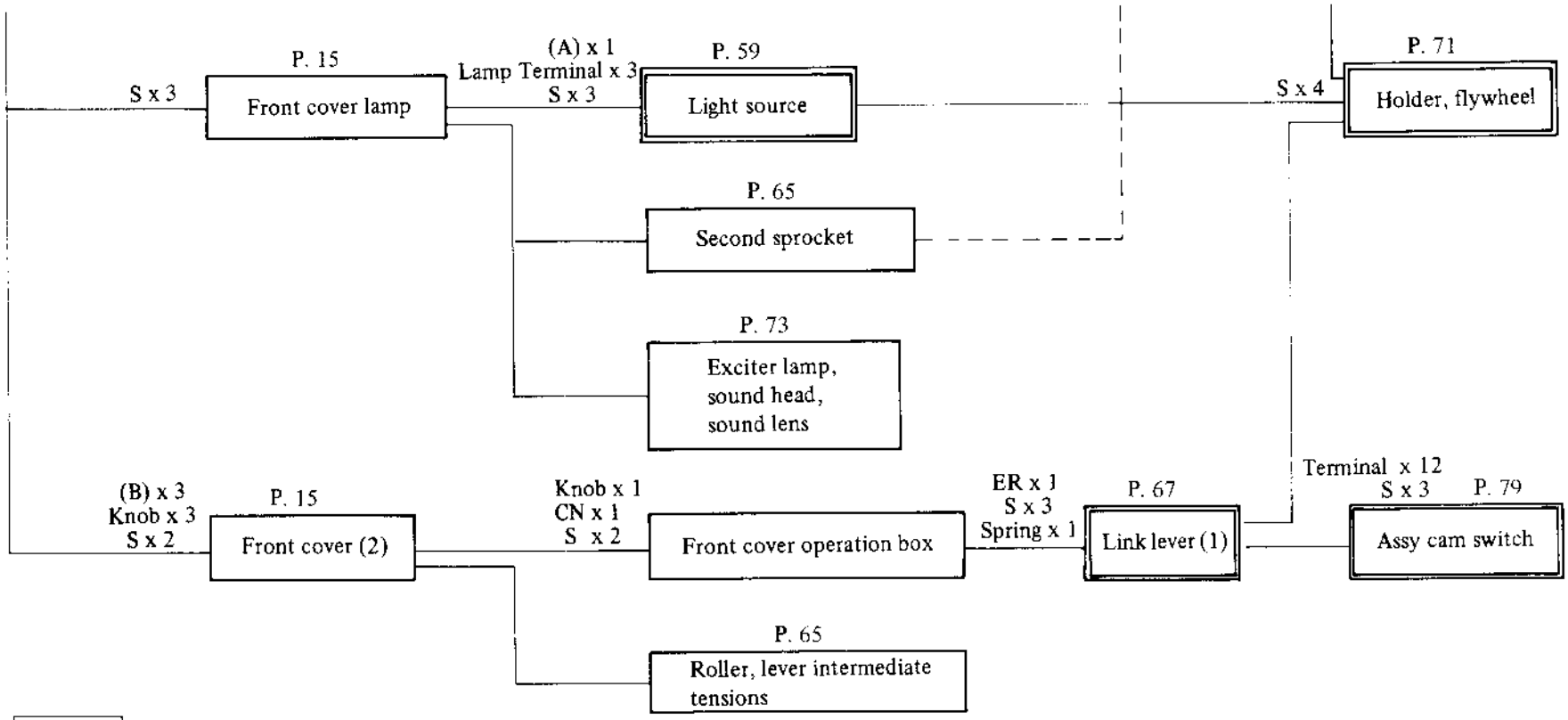
a Rear feeding
b Film feeding
c Shutter open/close

Fig. 8

Ⅱ – 2 DISASSEMBLY AND REASSEMBLY

Ⅱ – 2 – 1 Flow chart:





..... Assy block

(A) (B) ..... Reindication

CN	Connector
S	Screw
T	Stop screw
ER	"E" ring

Use the flow chart for disassembly; carry out partial repair or replacement in an appropriate manner.

Ⅱ – 2 – 2 Power unit assy

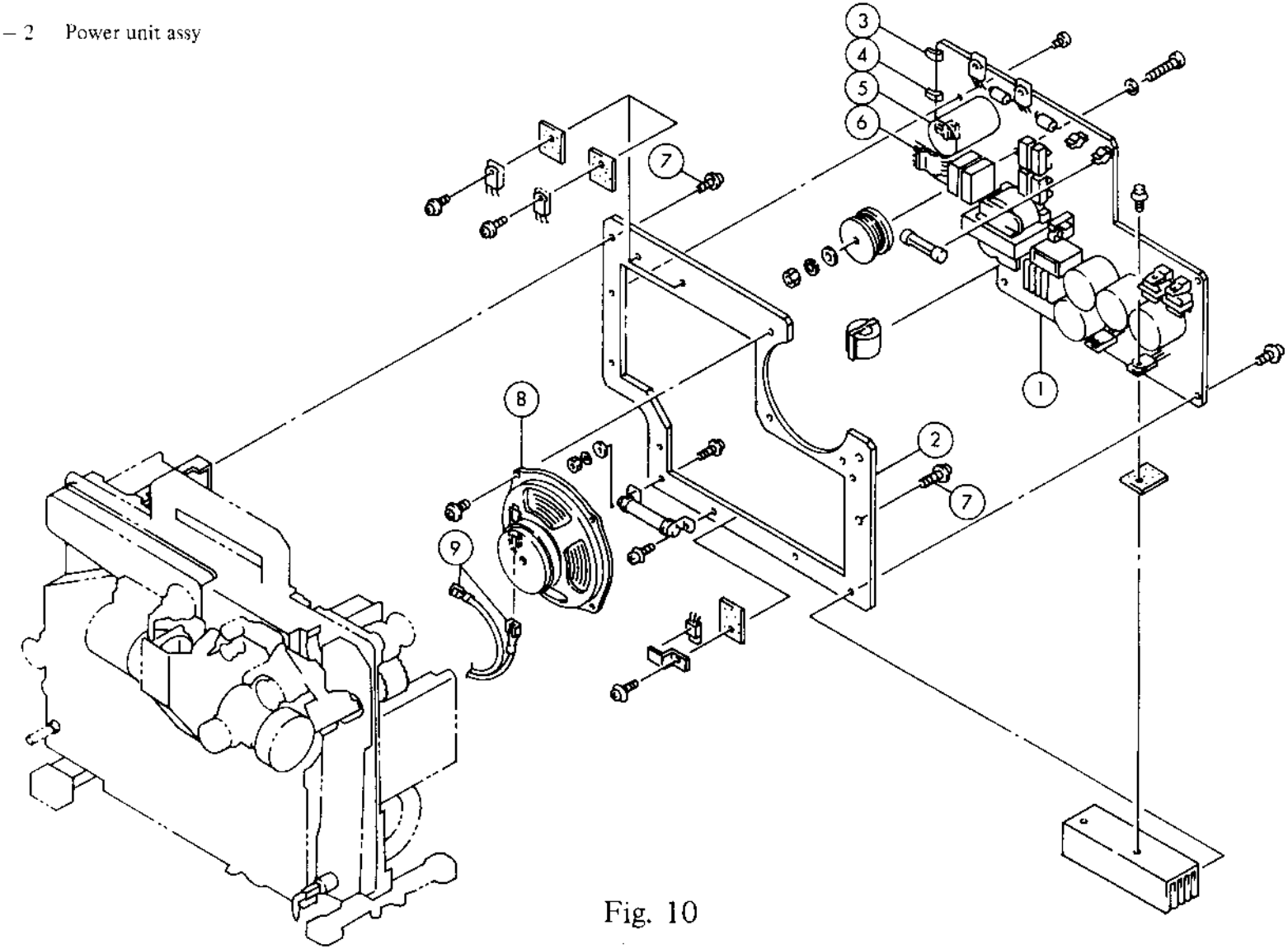


Fig. 10

II – 2 -- 2 Power unit assy

Power unit assy ① and ②

Troubleshooting hints: Refer to "III-ELECTRIC CIRCUIT" for power unit assy circuit.

Symptom	Cause
Sound is not produced.	Disconnection of ⑧ or improper contact of ⑨.

Disassembly:

1. Remove connectors ③ – ⑥.
2. Remove ⑦ x 3 and assy ① and ②.
3. For further disassembly, refer to Fig. 10.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. Be sure to connect the connector ③ firmly to red lead wire and the connector ④ to black lead wire.

II – 2 – 3 Installation plate fan motor assy

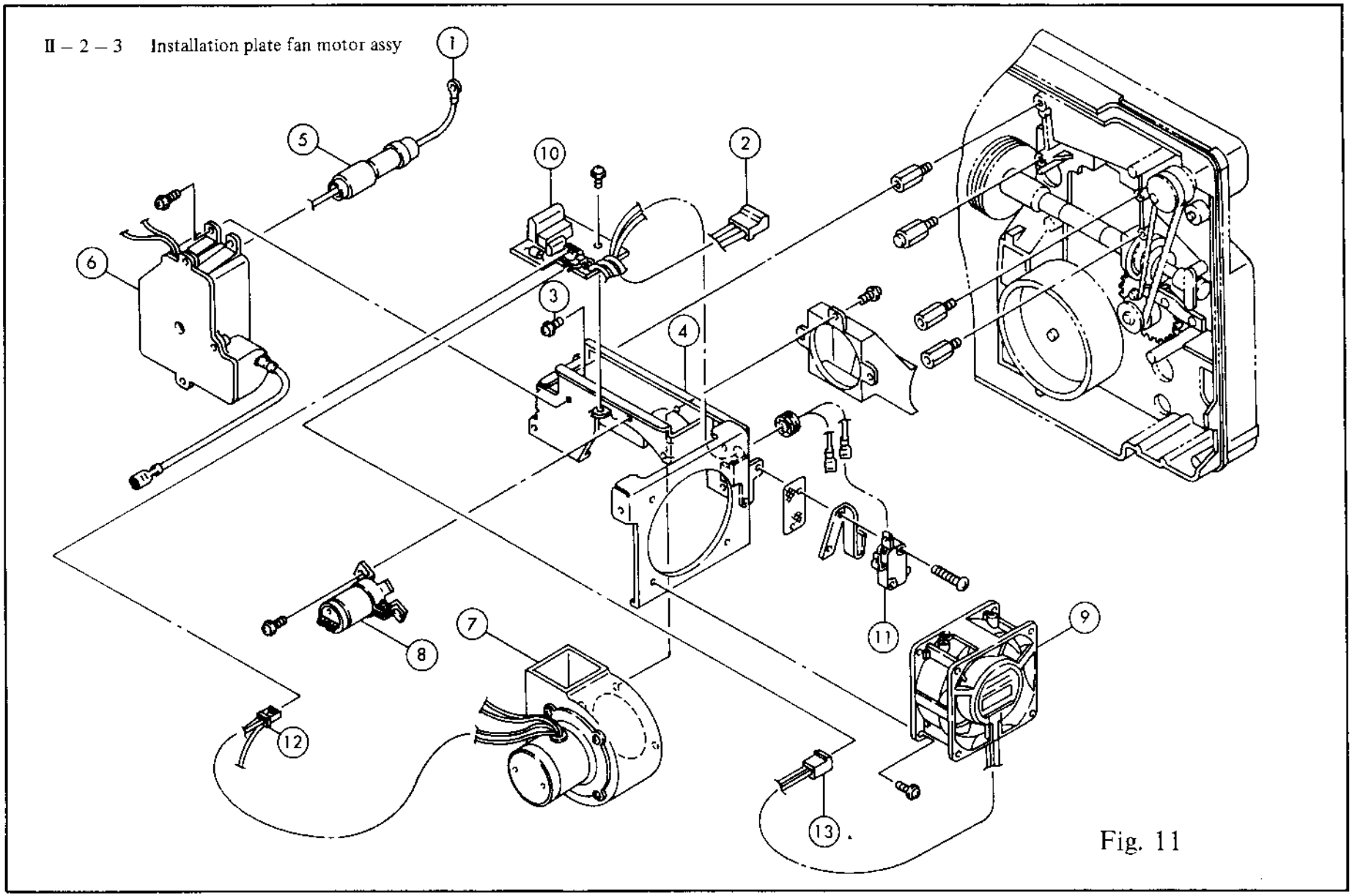


Fig. 11

II – 2 – 3 Installation plate fan motor assy

High-tension circuit ⑥ and ⑩ fan motor

Refer to "III-ELECTRIC CIRCUIT" for troubleshooting hints and lamp circuit:

Symptoms	Causes
Lamp does not light up.	Defect of ⑥ and ⑩, defective insulation of ⑤, misconnection of ②, and defect or improper contact of (1)
Fan motors ⑦ and ⑨ fail to rotate.	Defect of ⑦ and ⑧, misconnection of ⑫, defect of ⑩, defect of ⑨, misconnection of ⑬ and defect of ⑩

Disassembly:

1. Remove the connecting cord ① from the lamp.
2. Remove ② and ③ x 3, then remove the assy ④ by slightly lifting it up.
3. For further disassembly, refer to Fig. 11.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. Make sure that all connectors are firmly connected.

II 2 · 4 Take-up and rewind assy

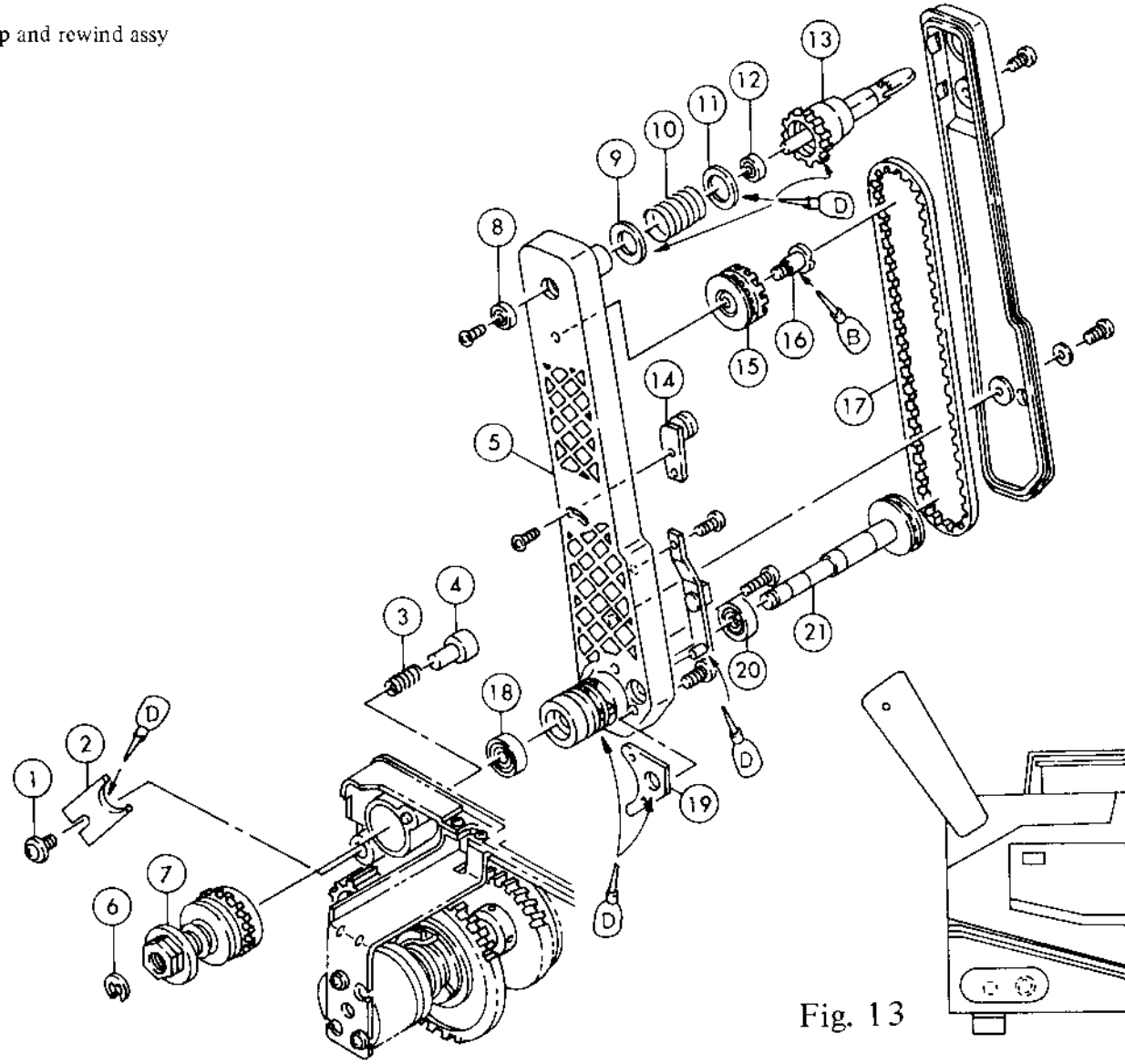


Fig. 12

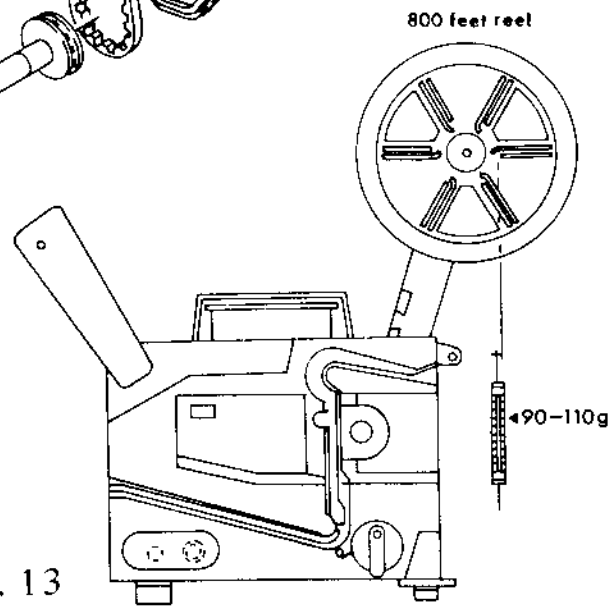


Fig. 13

II – 2 – 4 Take-up and rewind assy

A Rewind arm assy ⑤

Troubleshooting hints:

Symptoms	Causes
Failure in rewinding	Damaged ⑬ and ⑮ gears
Rewind arm cannot be fixed.	Wear of ④ and ⑲, deterioration of ③
Film slackens down during projection.	Weak tension of spring ⑩, inadequate tension of ⑰

Disassembly:

1. Pull out ⑦ by removing ⑥.
2. Remove ① to remove ②.
3. Pull out ⑤, with the knob main set to DOUSER. (Be careful since ③ and ④ may fly out.)
4. For further disassembly, refer to Fig. 12.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. Remove ⑰ to make sure that ㉑ has no irregular rotation. In the case of irregular rotation, replace the bearings of ⑱ and ⑳. Confirm ⑬ also in the same manner.
3. Replace ④ and ⑲ for wear, since ④ enters the cut-groove of ⑲ to fix ⑤ at projecting position.
4. Adjust the tension of ⑰ at fixing position of ⑭ if the film slackens down when the projector is stopped during projection. The spring ⑩ also prevents the slackening of film.
5. Braking measurement of ⑬
   Method: —— Refer to Fig. 13, and wind the film some 5 – 6 turns around the reel, with the knob turned to OFF, and pull in the direction of arrow mark by using the spring beam (C 067).
   Permissible range: —— 90 – 110 g
   Adjusting method: —— Tension of ⑰ (Adjust the fixing position of ⑭.)

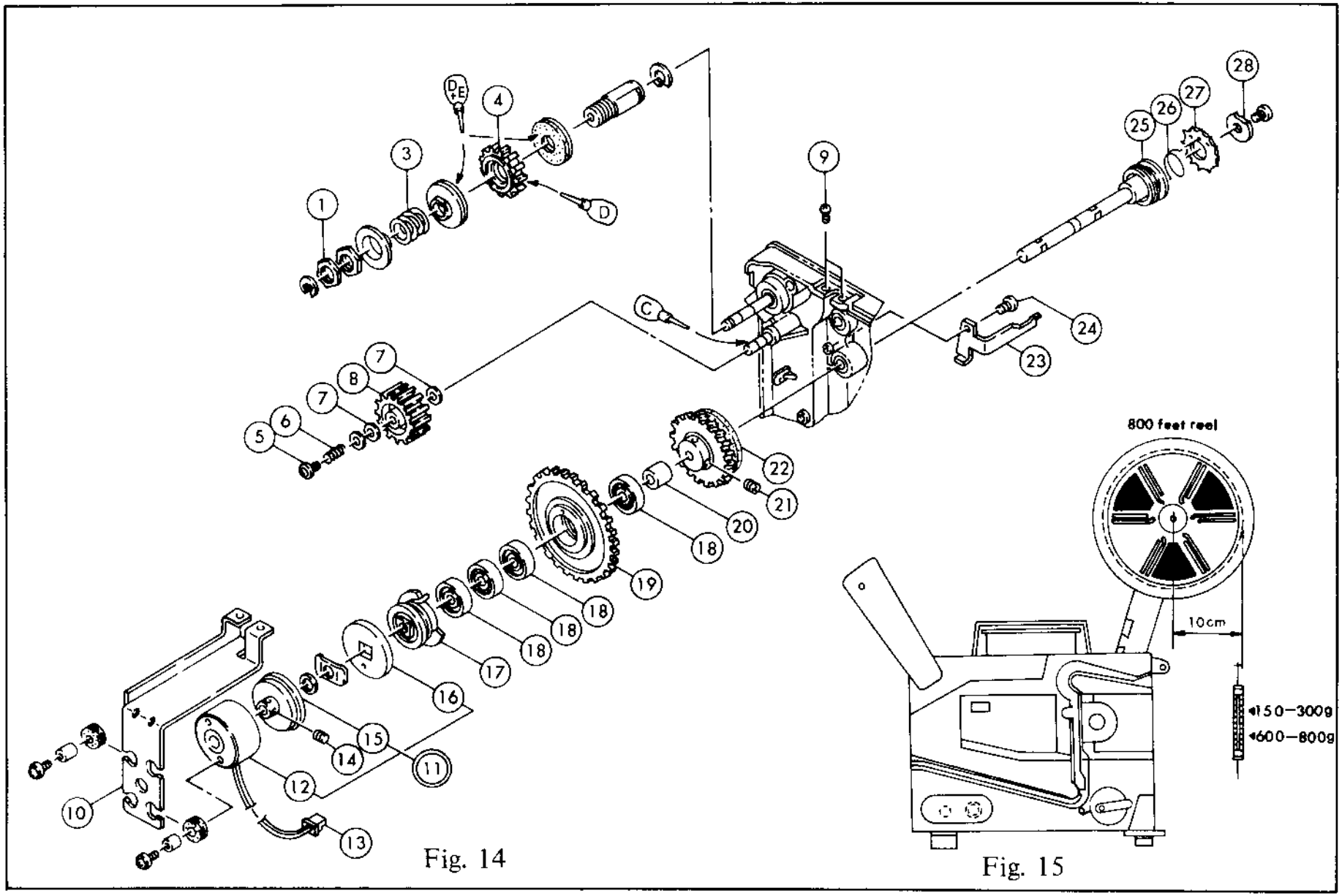


Fig. 14

Fig. 15

II – 2 – 4 Take-up and rewind assy

B Rewind quick review, electromagnetic clutch ⑪ and first sprocket ㉔

Troubleshooting hints:

Symptoms	Causes
Loop restorer fails to operate.	Wear or deformation of rubber of ㉒ or adherence of oil
Failure of rewinding	Defect or defective installation position of ⑪ or/and defect of gears
Scratch of film	Damage or deformation of ㉕ and ㉗
Large sound during rewinding	Defective ⑱ or accumulation of dust on gears

Disassembly:

1. Pull out ⑬ by cutting off the tie bands x 2. (This procedure may not be needed when ⑪ is not replaced.)
2. Remove ⑤ to take out ⑥ – ⑧.
3. Pull out ⑩ and ⑫ by removing ⑨ x 2 pcs.
4. Pull out ⑮ – ⑳ by removing ⑭ x 2 pcs.
5. Remove ㉒ by loosening ㉑ x 2 pcs.
6. For further disassembly, refer to Fig. 14.

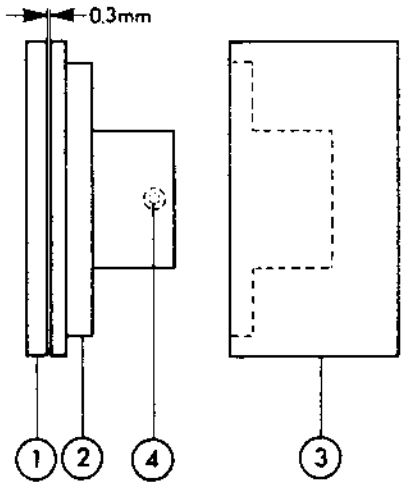


Fig. 16

Reassembly:

1. Replace ㉕ and ㉗ if damaged or deformed.
2. Replace the rubber pulley of ㉒ if worn out or deformed. Wipe off the oil, etc., if any, and make sure that there is no play or/and irregularity in rotation before fixing with ㉑.
3. Make fine adjustment of ⑮ so that the space between ⑮ and ⑯ is 0.3 mm (equivalent to the thickness of two films), and then fix with ⑭. (See Fig. 16)
4. Measurement of high-speed rewind tension
   Method: — Refer to Fig. 15, and measure by pulling the spring beam (P 048) in the direction of arrow mark.
   Permissible range: — 150 – 300 g (first 3 –4 seconds); measure at regular position.
   600 – 800 g (after 3 – 4 seconds); measure after pulling in arrow mark direction.
   Adjusting method: — Adjust the spring tension of ③ with ②, and fix with ②.

II – 2 – 4 Take-up and rewind assy

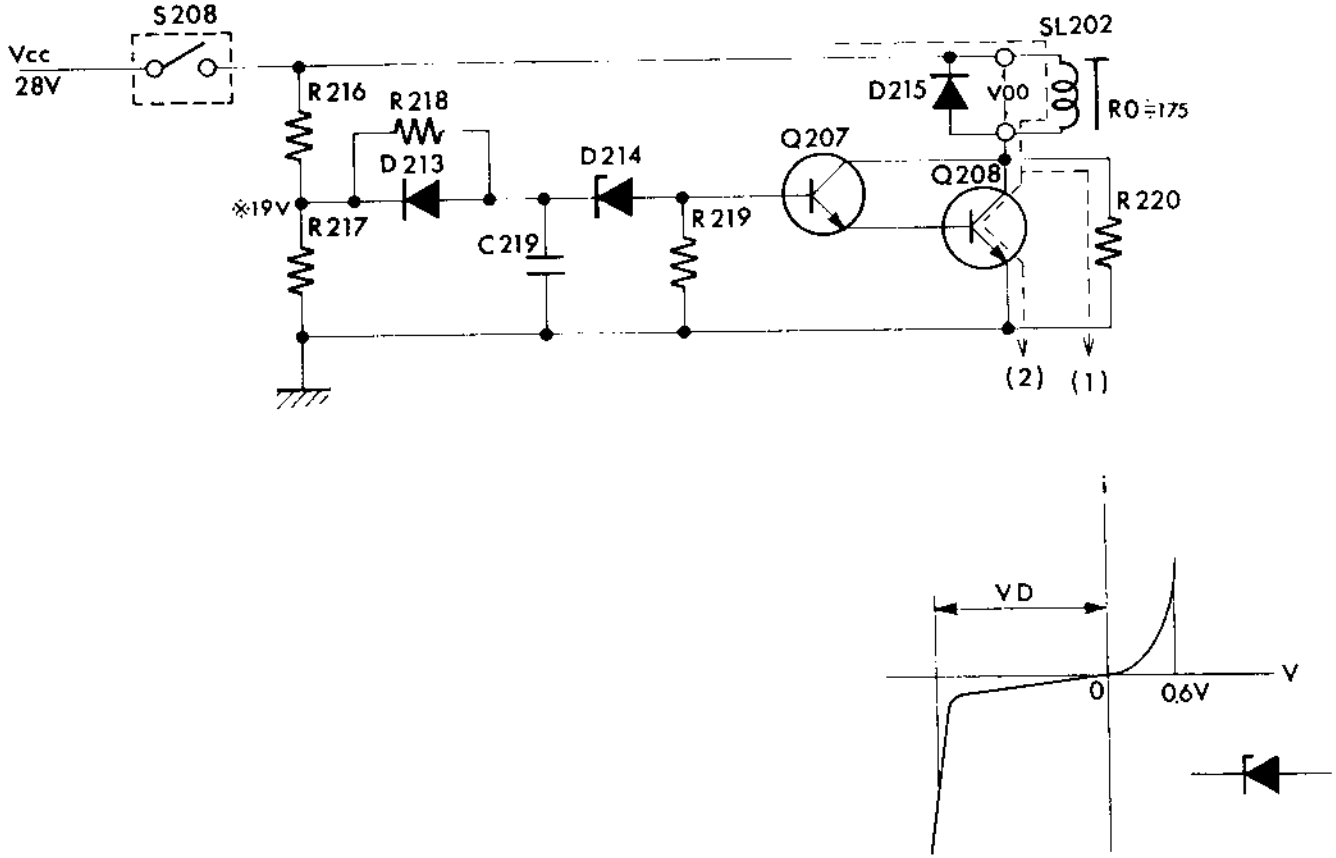


Fig. 17

II – 2 – 4 Take-up and rewind assy

C Electromagnetic clutch delay circuit (See Fig. 17)

1. The Zeuner diode (ZD) carries out normal commutation (rectification) for current in the direction of easy flow, but the current in reverse direction does not flow until the diode attains the Zeuner voltage (brake voltage VD), after which the current starts flowing. This property of Zeuner diode is made use of here, and the delay circuit is made by combining R, C and ZD.

2. Most of the current flows through SL 202 and R 220 immediately after the switch (S 205) is turned to ON (1), with the voltage applied to the electromagnetic clutch being:

$$Voo = \frac{Ro}{Ro + R220} \times 28 \fallingdotseq 11$$

That is, the voltage Voo, when Vcc = 28 V, is approximately 11 V. On the other hand, the current that has passed through R216 and R218 gets charged at C219. and when the terminal voltage of C219 becomes equvalent to the Zeuner voltage (brake voltage) of D214, the D214 turns on and the current starts to flow through (into) Q207 and Q208. The current through R222 begins to flow largely in the IC of Q208, till the saturation point of Q208 is attained. In this stage, the voltage Voo becomes 28 V. The time (3 – 4 seconds) elapsed for Voo to become 28 V from 11 V is called the delay time (lagging time).

3. The delay time can be varied by increasing/decreasing the ohmic value of R218, with the delay time getting approximately 1 second longer for 5 kΩ increase of R218, and 1 second shorter for 5 kΩ decrease of R218.

4. The initial rewinding torque (first 3 – 4 sec.) depends on the ohmic value of R220, and normally is 150 – 300 g. The torque is high if the resistance is small, and low if the resistance is large.

5. The torque after Voo = 28 V is 600 – 800 g.

II — 2 — 4 Take-up and rewind assy

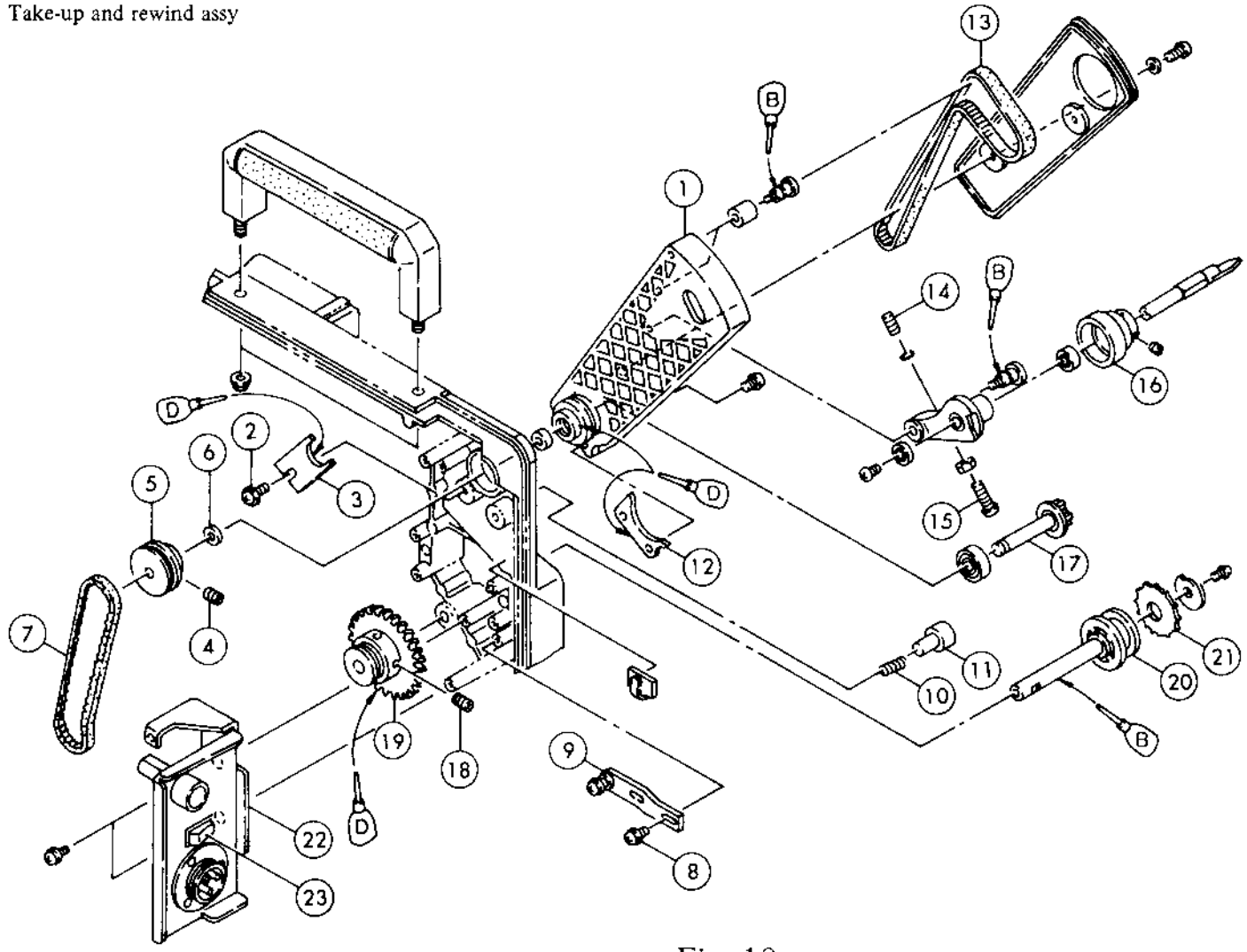


Fig. 18

II — 2 — 4 Take up rewind assy

II – 2 – 4 Take up rewind assy

D Take-up arm ① and second sprocket ⑳

Troubleshooting hints:

Symptoms	Causes
Fails to take up film.	Low spring tension of ⑭
Film slackens on take-up arm side during quick review (rewind → OFF).	Wear of ⑬
Take-up arm cannot be fixed.	Wear of ⑪ and ⑫, and deterioration of ⑩
Large wow/flutter	Defective adjustment of ⑦, damaged ⑲, scratched or deformed ⑳ and ㉑
Scratch in film	Scratched or deformed ⑳ and ㉑

Disassembly:

1. Take out ③ by removing ②.
2. Pull out assy ① by loosening ④ main, taking care so as not to let ⑥ fall down, or ⑩ and ⑪ fly out.
   (The operations in items 1 and 2 can be done more easily after removing ⑦ by loosening ⑧ x 2 pcs. and shifting ⑨ after the fixing plate fan motor assy (see P. 35), amplifier (see P. 51) and fixing plate power jack assy ② are removed.)
3. Pull out ⑳ after removing ⑲ by loosening ⑱ x 2 pcs.
4. For further disassembly, refer to Fig. 18.

Reassembly:

1. First make sure that the pulley ⑯ surface has no scratch, and carry out reassembly in the reverse order of disassembly.
2. Rotate ⑤, with ⑦ removed, and make sure that the ⑤ has no play or irregularity and has light and smooth rotation. Then install ⑦, adjust the belt tension with ⑨ and fix with ⑧ x 2 pcs.
3. Measurement of take-up tension
   Method: — Refer to Fig. 19, and carry out measurement by turning the knob main to FWD after fixing the spring beam (P 048).
   Permissible range: — 100 – 200 g (Wind 5 – 6 turns of film to the 800 ft. reel.)
   Adjusting method: — Adjust the tension of ⑭ with ⑮, and fix with nut.

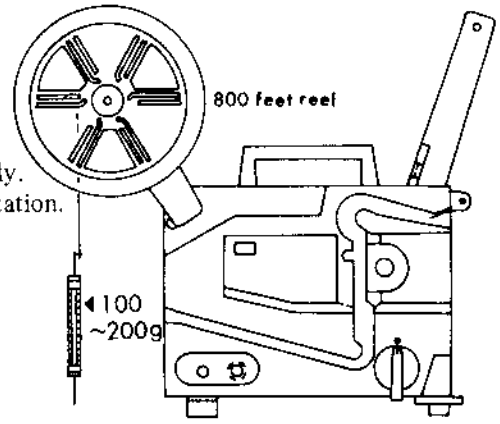


Fig. 19

II – 2 – 5 Film feeding section

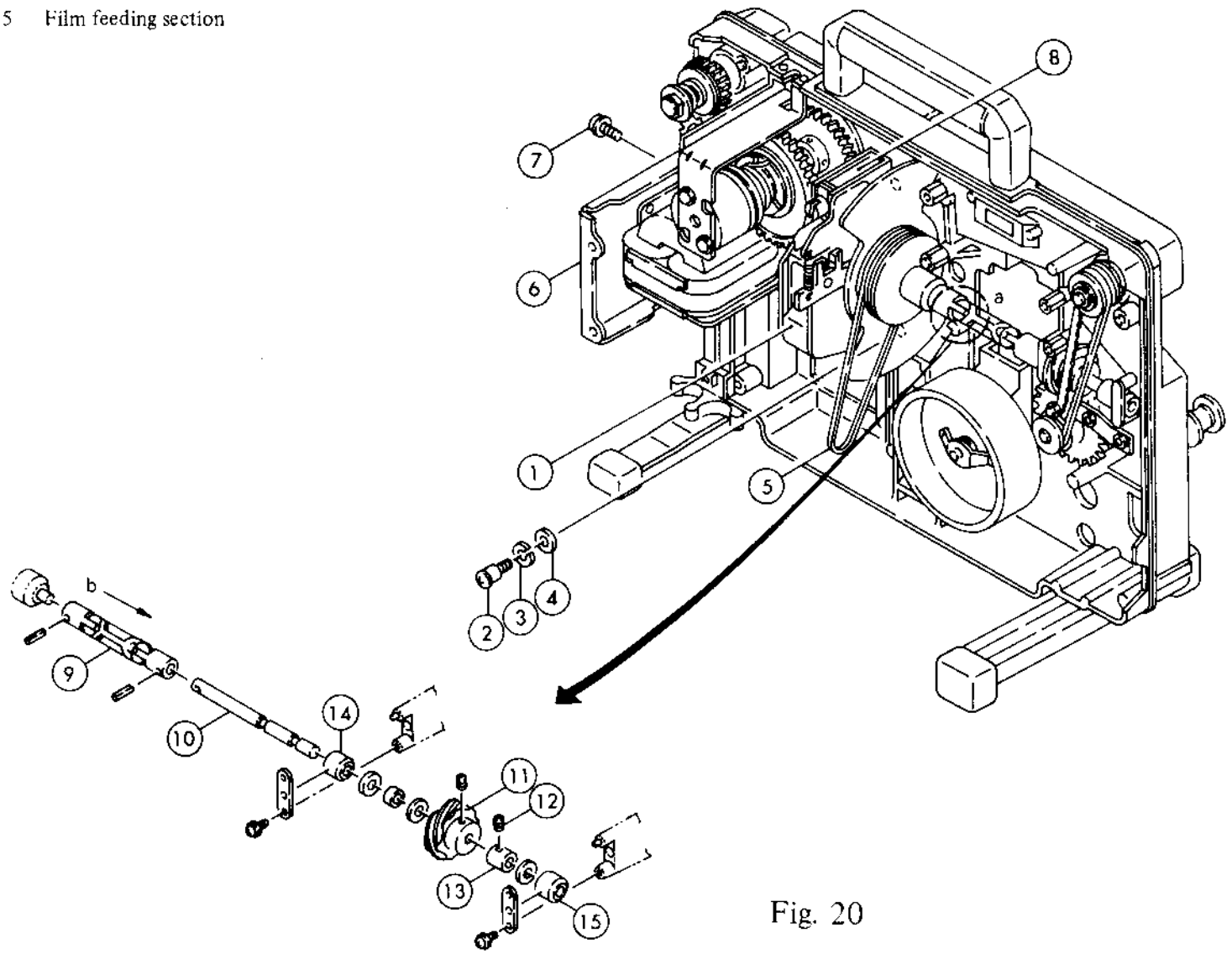


Fig. 20

Ⅱ - 2 – 5 Film feeding section

A Intermittent film feeding unit (1), intermediate shaft

Troubleshooting hints:

Symptoms	Causes
Unstable speed of projection	Deterioration of ⑤ or adherence of oil
Large wow/flutter	Damage and wear of ⑪
Abnormal noise	Damage of ⑪

Disassembly:

1. Remove the fixing plate fan motor assy (see P. 35) for removing ①.
2. Loosen ⑫ x 2 pcs. and pull a position toward arrow mark b position to separate the ⑨ and ⑩ assy.
3. Properly treat the cord connected to ⑧. (Remove the connector by removing the tie band or remove ⑧ by unscrewing the 3 pieces of screws). (See P. 47)
4. Remove ⑥ by removing ⑦ x 2 pcs. (connected state).
5. Set the knob main to DOUSER.
6. Remove ② x 2 pcs., taking care so as not to drop ③ and ④.
7. Slightly push ① down, and remove the worm, taking care so as not to let the worm touch other parts.
8. Remove the fixing plate power jack (see P. 53) before disassembly ⑨ – ⑫.
9. For further disassembly, refer to Fig. 20.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. Apply ⑤ to ① for assembly, with the knob main turned to DOUSER, and operate the knob main to confirm the normal operation of each link lever.
3. Insert ⑨ into ①, and fix ⑬ with ⑫ x 2 pcs. while pressing the ⑫ in arrow mark b direction. Fix ⑪, so that there is no play between metals ⑭ and ⑮ and the rotation is smooth.

II — 2 - 4 Take-up and rewind assy

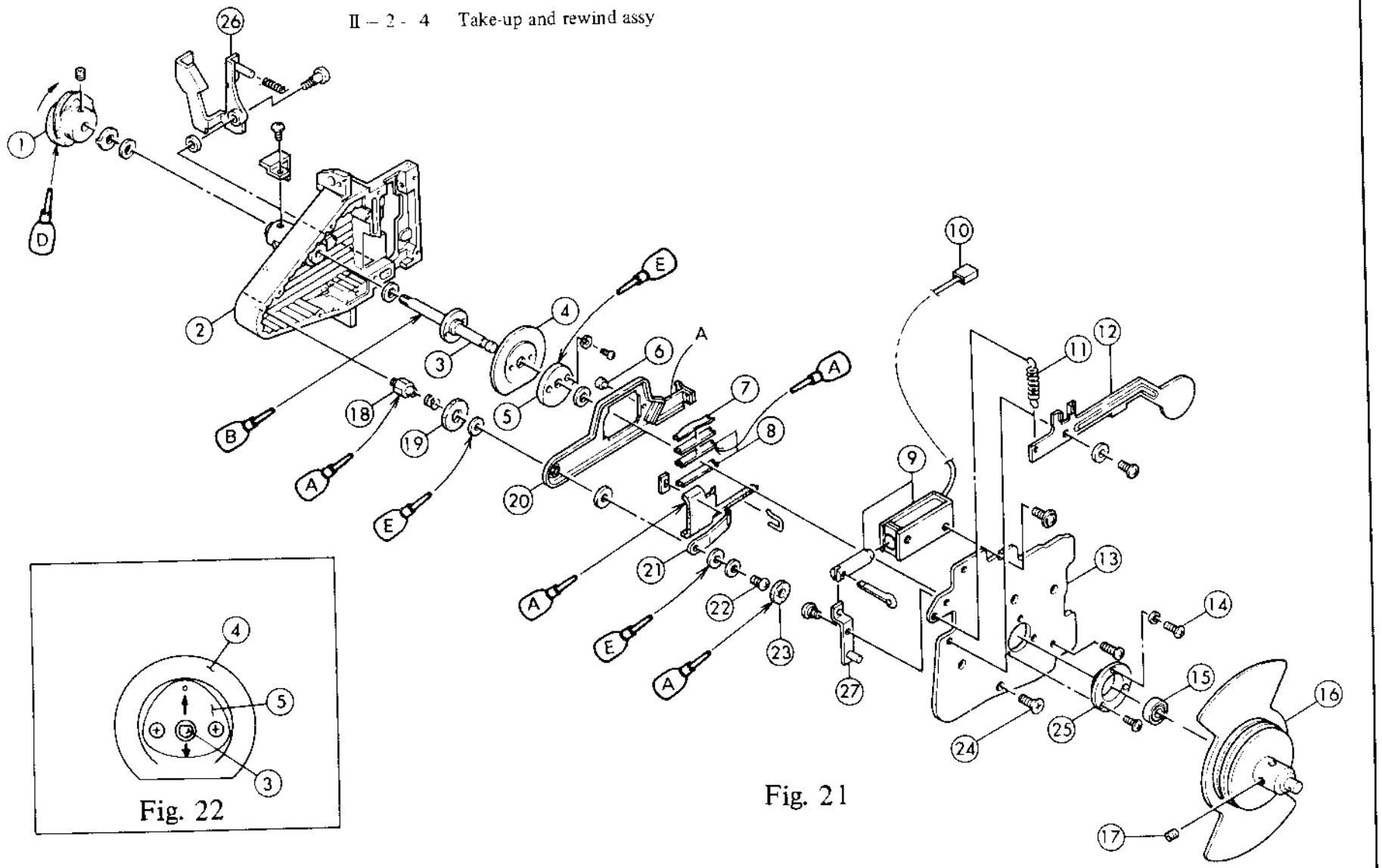


Fig. 21

Fig. 22

II – 2 – 5 Film feeding section

Intermittent film feeding unit

Troubleshooting hints:

Symptoms		Causes
Flickering of image	Forward feeding	Defective installation of ①, wear of ⑦, ⑧, ⑱, ⑳ and ㉑, and wear of bearing ② metal
	Rear feeding	Large claw extending allowance of ⑳, wear of ⑥
Improper film feeding		Small claw extending allowance of ⑳, wear of ⑱ and ⑳
Image flows (tails).		Defective installation position of ⑯
Unstable projection speed		Defective installation position of ①
Large noise during film feeding		Defective installation position or damage of ①, wear of ⑦, ⑧ and ⑮, damage of ④ and ⑤, shortage of grease, or/and misadjustment of ㉖
Image does not appear, with the lamp lit up.		Defective ⑨, malfunction of ⑫ or/and defective contact of ⑩

Disassembly:

1. Loosen ⑰ x 2 pcs. to remove ⑯.
2. Loosen ⑭ x 3 pcs., remove ㉔ x 4 pcs., and take out ⑬.
3. For further disassembly, refer to Fig. 21.

Reassembly:

1. Replace ② and ③, if the bearing ② metal is worn out causing play between the metal and ③.
2. Make sure that there is no damage (flaw) on the cam surface of ④ and ⑤. If damage is found, replace the cam.
3. Remove ⑥, if worn out, from ⑳ and replace with a new ⑥; attach with the adhesive (aron alpha).
4. Replace the ⑱ and ⑳ bearings if worn out.
5. Replace ① if the teeth are worn out or damaged.
6. Install ①, so that ③ rotates smoothly in axial direction and has no play.
7. Install ④ and ⑤. (Refer to Fig. 22)
8. Should play be found between ⑤ and ⑧, replace ⑦ and ⑧ they are likely to have worn out.
9. Bend the A section of ⑳ for adjustment, so that claw tip of ⑳ does not tilt from the rail surface of aperture plate and has extension of 0.9 – 1.0 mm.

Note: When replacing ⑤, keep the ⑤ immersed in silicon oil for one full day before replacement.

II — 2 — 5 Film feeding section

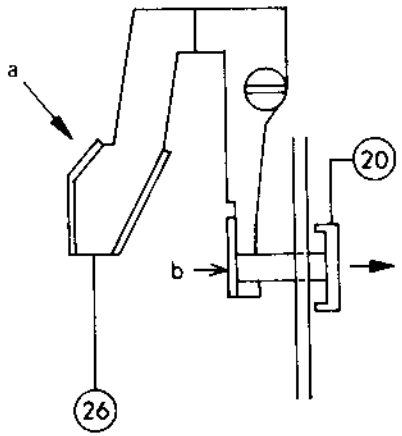


Fig. 23

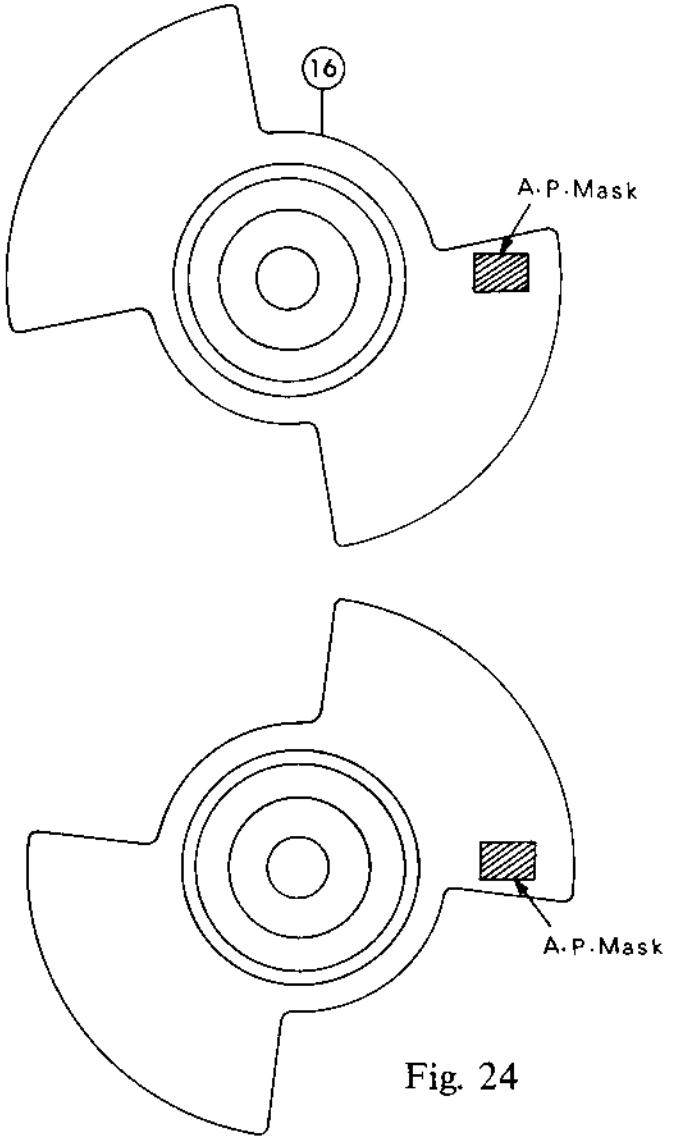


Fig. 24

10. Make sure that the stroke of ⑳ sets the film to aperture plate, and feeds the film by turning ① in arrow mark direction and that, after the film feeding, the claw end does not touch the film when it comes out of the perforation or when it starts to enter the next perforation.
(In case the stroke is excessively small, refer to Fig. 22, and adjust by shifting ⑤ in b direction, and in a direction if the stroke is excessively large. The shaft hole of ⑤ is approximately 0.05 mm larger than the shaft diameter of ③.)
11. For installing ㉕ and ⑮, rotate ① to find the position where ① rotates most lightly; fix at that position with ⑭ x 3 pcs.
12. The ⑫ constantly hides the aperture mask. When ⑨ turns to ON, the core gets drawn, causing ⑫ to escape from the aperture mask through ㉗. Make sure that ⑫ pushes the core of ⑨, completely escapes from the aperture mask, and moves most smoothly without touching the shutter.
(Adjust by correcting the installation position of ⑨ and bending the arm section of ⑫.)
13. The ㉖ is a safety device to prevent the film cut likely to occur when the film is fed in the reverse direction by means of the clutch tip (end) of ⑳ during rewinding.
(Adjust by bending the b section, with the ⑳ set for rear feed, so that the claw tip of ⑳ goes further deep when ㉖ a is pushed in the direction of arrow mark. Refer to Fig. 23)
14. Adjust ⑯, so that the shutter wing of ⑯ blocks the aperture mask while the film is being fed by the claw of ⑳, then fix with ⑰ x 2 pcs. (Refer to Fig. 24.)

Ⅱ – 2 – 5 Film feeding section

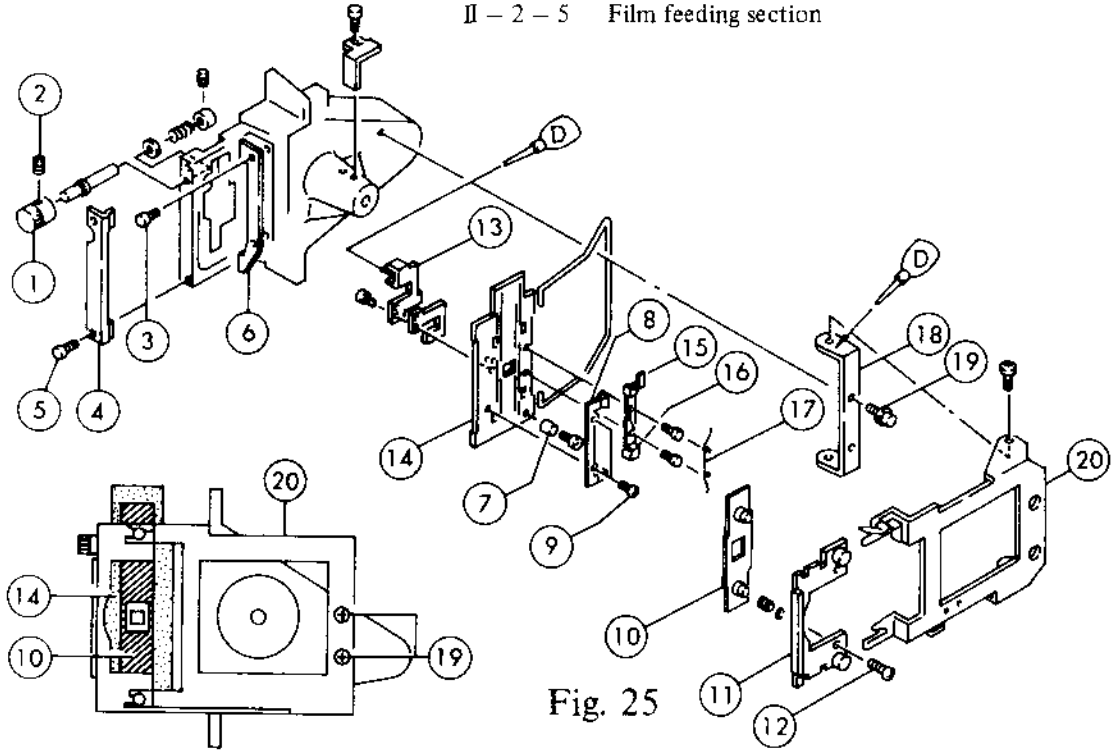


Fig. 25

Fig. 26

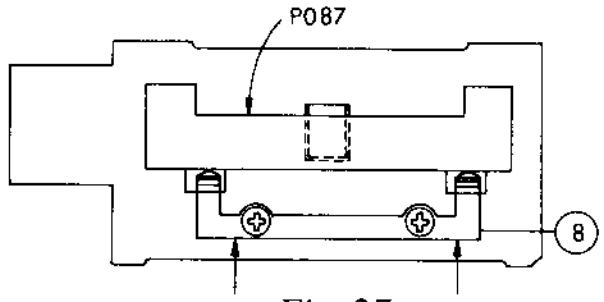


Fig. 27

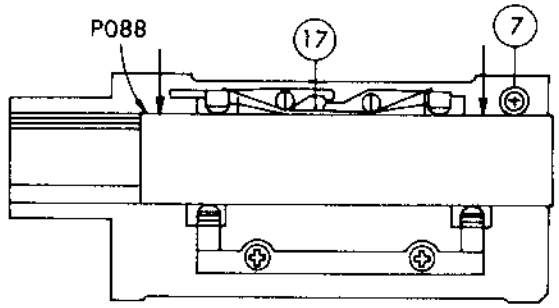


Fig. 28

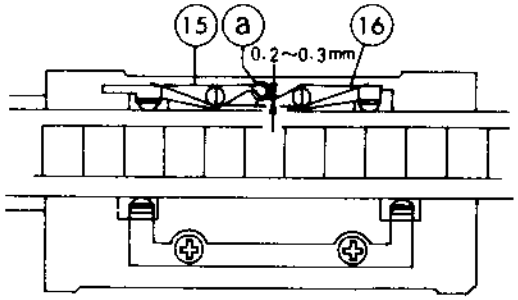


Fig. 29

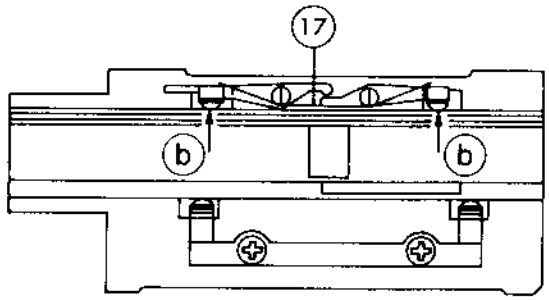


Fig. 30

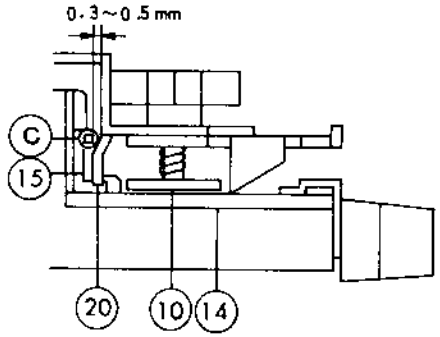


Fig. 31

Ⅱ – 2 – 5 Film feeding section

B Aperture plate

Troubleshooting hints:

Symptoms		Causes
Flickering of image	Transversal flickering	Defective spring tension of ⑰, defective installation place or wear of ⑦, ⑧, ⑮ and ⑯
	Longitudinal flickering	Wear of ⑧, ⑮ and ⑯, malfunction of ⑩
Film cannot be set.		Defective installation position of ⑩, defective adjustment for fixing ⑮ and ⑯
Scratch of film		Damage or wear of ⑩ and ⑭

Disassembly:

1. Refer to Fig. 25 for disassembly.

Reassembly:

1. Replace ⑩ and ⑭ if damaged or/and worn out.
2. Set the lateral guide fixing gauge (P087) to ⑭ as shown in Fig. 27, and install by pushing ⑧ in the direction of arrow mark.
3. Set the fixing guide installing gauge (P088) to ⑭ as shown in Fig. 28, and install ⑦ by slightly pushing it in arrow mark direction, so that the (7) gets tightfit with the gauge.
4. Install ⑮, ⑯ and ⑰ to ⑭, then set the film as shown in Fig. 29, and adjust by bending "a" section with the adjusting screw driver (P028) for pressing the film sidewise, so that the space between ⑮ and ⑯ is 0.2 – 0.3 mm.
5. Measurement of spring tension of ⑰
   Method: —Refer to Fig. 30, and measure at "b" point by using the dial tension gauge (C063).
   Permissible range: —45 – 55 g
   Adjusting method: —Adjust by bending ⑰.
6. Install the masks of ⑭ and ⑩ at positions shown in Fig. 26 while adjusting with (2) x 2 pcs.
7. Install the masks of ⑭ and ⑩ to the main body at fixing position of ⑬, and adjust by turning ① clockwise and counter-clockwise, so that the ratio of upper and lower mask is 3 : 7.
8. Set film to ⑩ and ⑭, turn the knob main to DOUSER, and adjust by bending the "c" section of ⑮, so that the space between ⑮ and ⑳ is 0.3 – 0.5 mm. (See Fig. 31)

II 2 – 6 Power Transformer

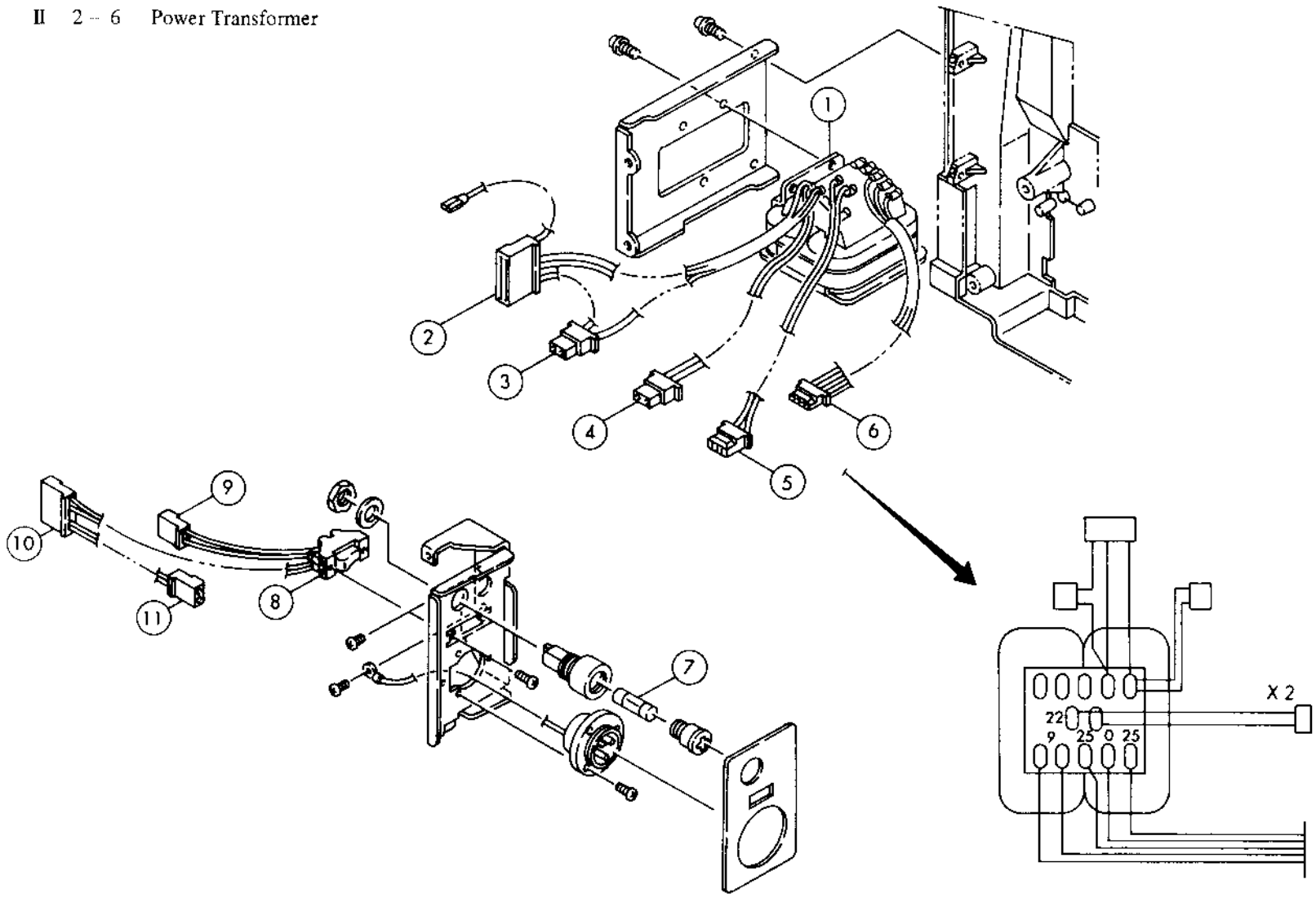


Fig. 32

II – 2 – 6 Power Transformer

Assy, power transformer and fixing plate, power receptacle assy

Troubleshooting hints:

Symptoms		Causes
Power fails to turn on.		Defective ①, disconnection or improper contact of ⑦
Motor fails to operate.	Fan motor	Defective ⑧, disconnection or improper contact of ⑨
	Drive motor	Disconnection or improper contact of ③
Lamp does not light up.		Disconnection or improper contact of ⑩ and ⑪
Amplifier fails to operate.		Disconnection or improper contact of ⑥
Excitor lamp does not light up.		Disconnection or improper contact of ⑥
Reverse loading prevention device does not activate.		Disconnection or improper contact of ④

Disassembly:

1. Refer to Fig. 32 for carrying out disassembly.

Reassembly:

1. In case the cord tying band is untied during repair, replacement, etc., be sure to tie the cords so that they may not touch the shutter, etc.
2. Be sure to make firm connection of each connector.

II – 2 – 5 Film feeding section

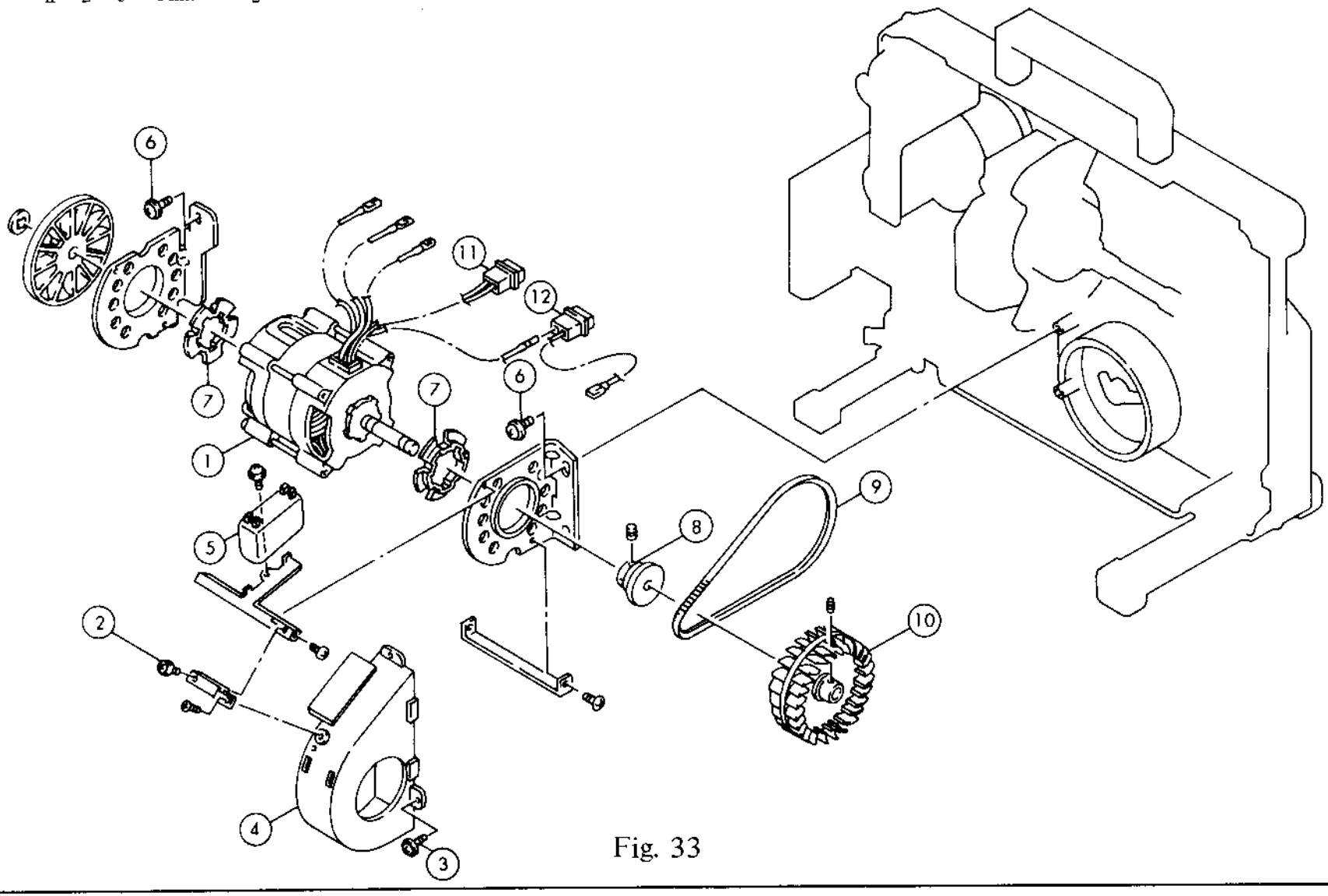


Fig. 33

II – 2 – 7 Motor

Motor assy

Troubleshooting hints:

Symptoms	Causes
Motor fails to operate.	Defective ① and ⑤, defective contact of ⑪, ⑫ and terminals
Unstable projection speed (wow/flutter)	Oil contamination of ⑧ and ⑨
Abnormal noise	Deteriorated ⑦ and damaged ⑩

Disassembly:

1. Cut off the cord tying bank x 2 pcs. (There is no need to cut off the bands for fan belt replacement.)
2. Take out ④ by removing ② and ③ x 2 pcs.
3. Take out the assy of ① by removing ⑥ x 4 pcs.
4. For further disassembly, refer to Fig. 33.

Reassembly:

1. Wipe off the oil, dust, etc. from ⑧ and ⑨.
2. Make sure that ⑦ is not deteriorated.
3. Make sure that the wing of ⑩ is not damaged.
4. Tighten ⑧ and ⑩ temporarily, apply ⑨ and install the assy (parts) of ① to base frame by means of ⑥ x 4 pcs.
5. Turn ① to see that it does not touch the base frame, then fix ⑩ at this position.
6. Fix ⑧, so that ⑨ has no twist and is placed linearly with shutter pulley.
7. Install ④, and tie the cord.

Ⅱ－2－8 Amplifier assy

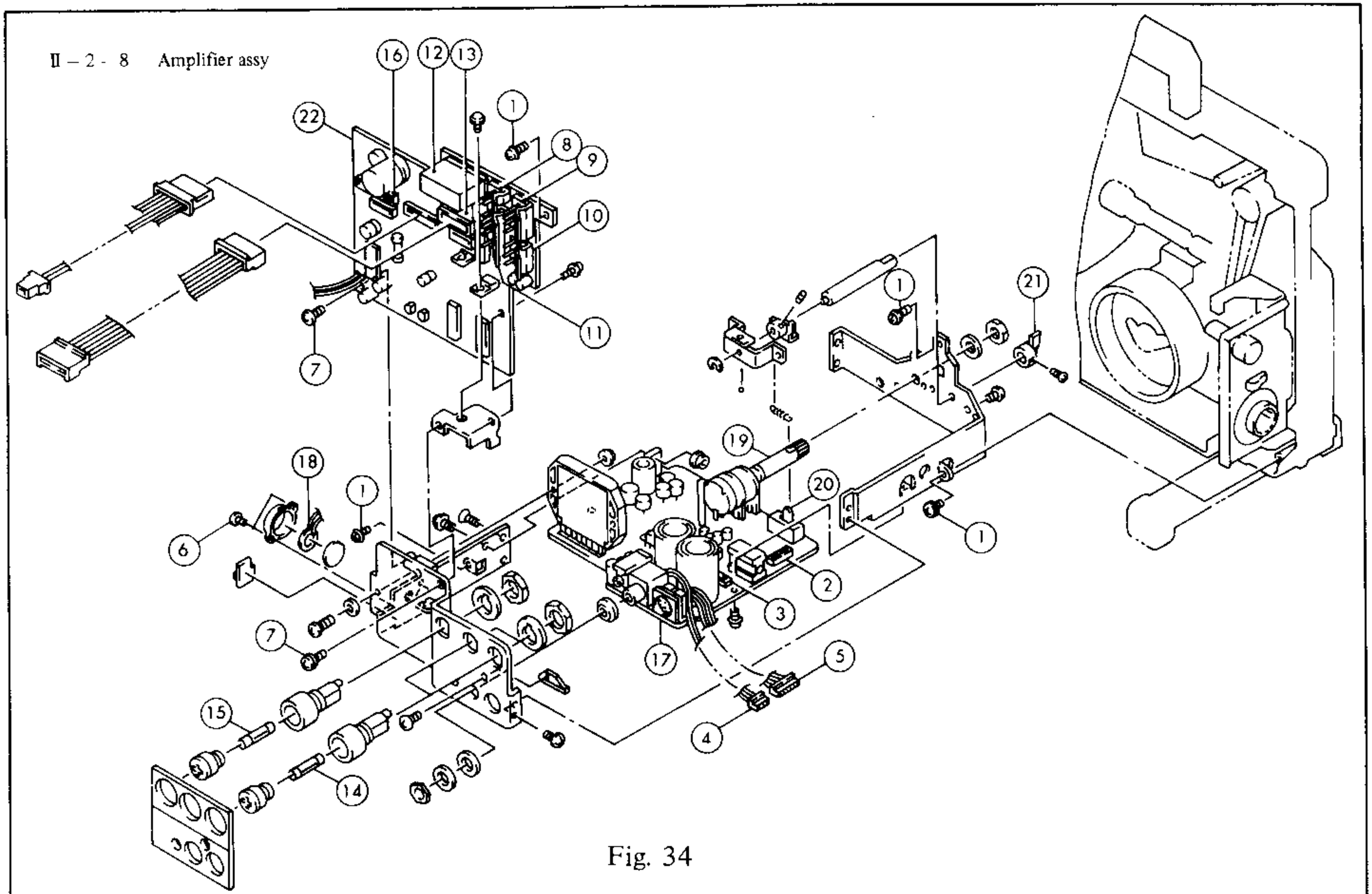


Fig. 34

Ⅱ – 2 – 8 Amplifier assy

Amplifier

Troubleshooting hints – Refer to "Ⅲ ELECTRIC CIRCUITS" for troubleshooting hints and circuits of amplifier and control circuit PC board.:

Symptoms	Causes
Power fails to turn on.	Improper contact of ⑧, ⑨, ⑩ and ⑪
Drive motor fails to operate.	Defective ⑫
Amplifier fails to activate (magnetic, optical).	Disconnection of ⑭, improper contact of ⑤ and ②, or/and defective ⑲
M-O switch fails to work.	Defective ⑳ or/and improper installation of ㉑
Exciter lamp fails to light up	Disconnection of ⑭ or/and improper contact of ②
Electromagnetic clutch fails to operate.	Improper contact of ⑯
Remote control does not work.	Defective ⑬ or/and improper contact of ⑰
Reverse loading prevention device fails to activate.	Improper contact of ③
Reverse loading prevention device activates, but buzzer does not ring.	Defective ⑱

Disassembly:

1. Set M-O switch to M.
2. Pull out M-O switch and double-knob amplifier x 2 pcs.
3. Remove ① x 4 pcs. and take out the amplifier assy while disconnecting the connectors from ② and ③.
4. Disconnect the connectors from ④ and ⑤, and take out ㉒ by removing ⑥ x 2 pcs. and ⑦ x 2 pcs.
5. For further disassembly, refer to Fig. 34.

Reassembly:

1. Firmly connect the connectors.
2. Install ㉑ at position shown in Fig. 35, with M-O switch set to M.
3. See to it that the cords connected to ② and ③ do not touch the flywheel, gear, etc.

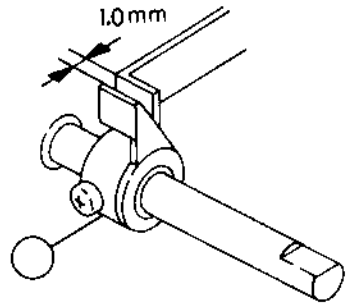


Fig. 35

II – 2 – 7 Motor

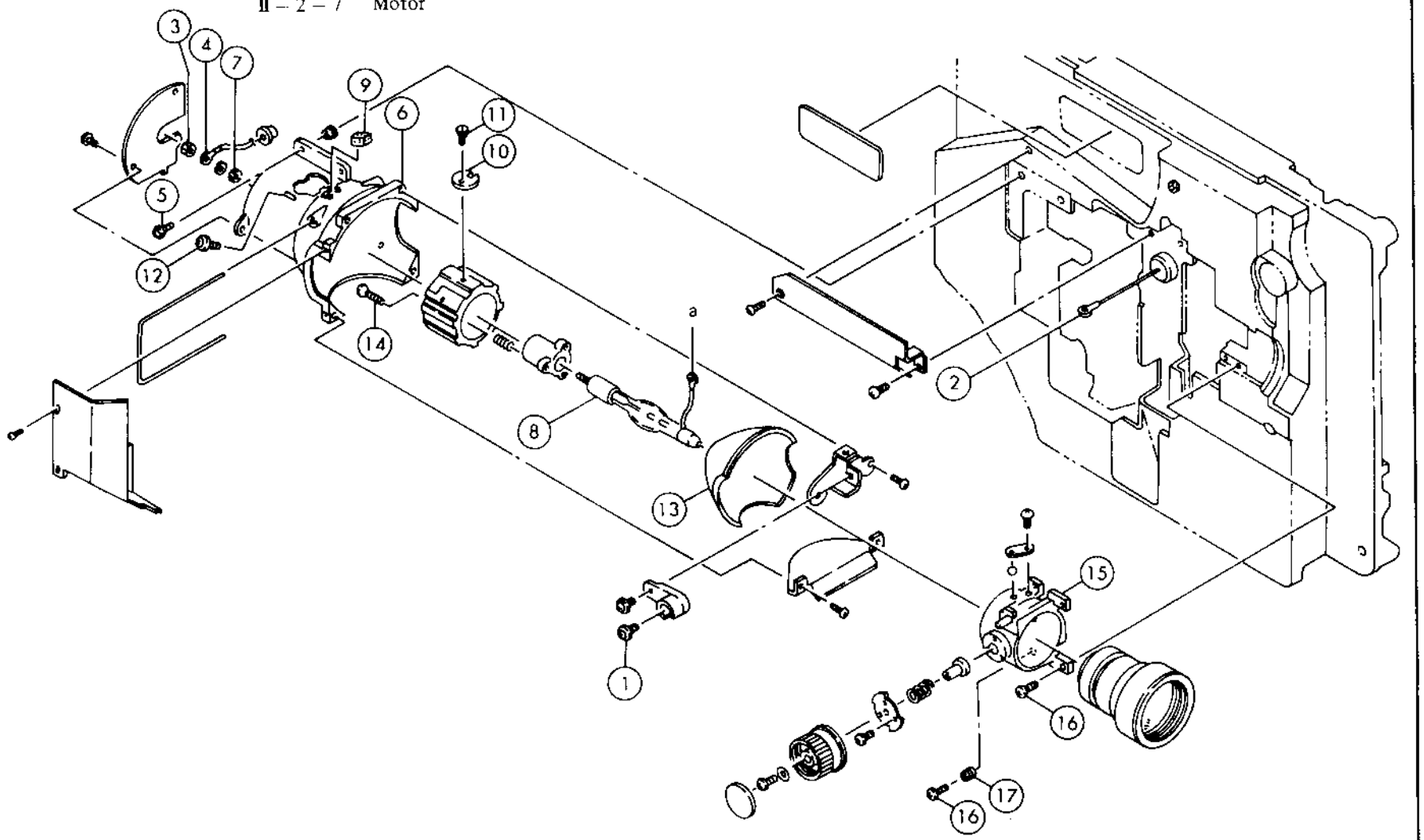


Fig. 36

II – 2 – 9 Light source section

Lamp house assy

Troubleshooting hints:

Symptoms	Causes
Lamp does not light up.	Defective ⑧, cord disconnection of ②, ⑧ and ④
Irregular brightness	Misadjustment of ⑧, contaminated or deteriorated ⑬, drop-out of ⑨
Failure in left-right focusing	Misadjustment of ⑰

Disassembly: * Lamp house assy

1. Remove ① to remove the terminal of ②.
2. Remove ③ to remove ④.
3. Take out assy of ⑥ by removing ⑤ x 3 pcs.
4. Remove ⑦ to remove ⑧.
5. For further disassembly, refer to Fig. 36.

* Holder, projection lens assy

1. Take out assy of ⑮ by removing ⑯ x 4 pcs. (Be sure to apply screw lock after removing ⑯.)
2. Screw ⑰ is the screw to provide perpendicularity of ⑮.
3. For further disassembly, refer to Fig. 36.

Reassembly:

1. Adhere ⑨, with the N-pole facing this side, by means of "Cemedine Super." (The colored side is N-pole.)
2. Fix ⑧ by means of ⑦, with the protruded portion facing downward. (Here, make sure that there is no stain due to fingerprint, dust, etc.)
3. Fix the section of ⑩ with ⑪ as shown in the Fig., and tighten ⑫ temporarily.
4. Make sure that the reflecting surface of ⑬ has no finger or hand prints, scratch, stain, etc.
5. After ⑥ is assembled, install it to the main body, then adjust the lamp for inclination by using ⑭ x 3 pcs. and for back and forth movement by turning ⑩, and confirm that there is no irregularity in brightness before fixing with ⑫.

II - 2 - 10 Link lever section

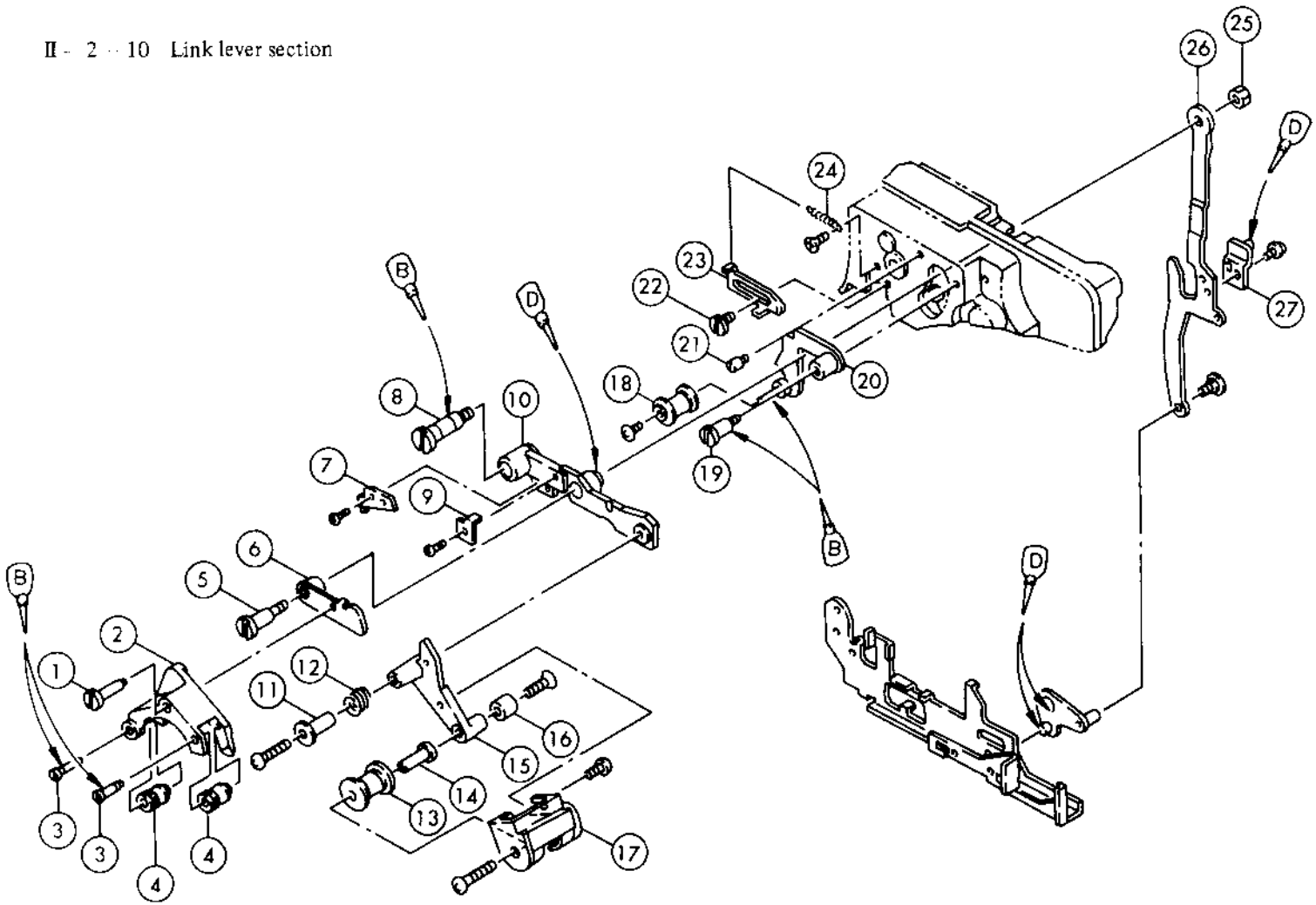


Fig. 37

Ⅱ – 2 – 10 Link lever section

A First sprocket shoe ② & lever sprocket shoe ⑩

Troubleshooting hints:

Symptoms	Causes
Upper loop disappears.	Defective installation position of ⑦, and ⑨, defective (inadequate) spring tension of ⑫ and defective tightening of ⑧
Scratch in film	Scratch or deformation of ④, ⑬ and ⑱, defective (inadequate) spring tension of ⑫, and defective installation position of ⑦
Defective film feeding	Defective installation position of ㉗

Disassembly:

1. Remove the power unit assy. (Refer to P. 33)
2. Remove the spring loop restorer. (Refer to P. 69)
3. Remove ⑧ and ㉕, then take out assy parts of ① – ⑦ and ⑨ – ⑰. Take utmost care when unscrewing ⑧ so as not to damage the screw head, taking note that the ⑧ is firmly tightened. Also, note that ㉕ is firmly tightened with ⑩ in W-nut method.
4. For further disassembly, refer to Fig. 37.

II – 2 – 9 Light source section

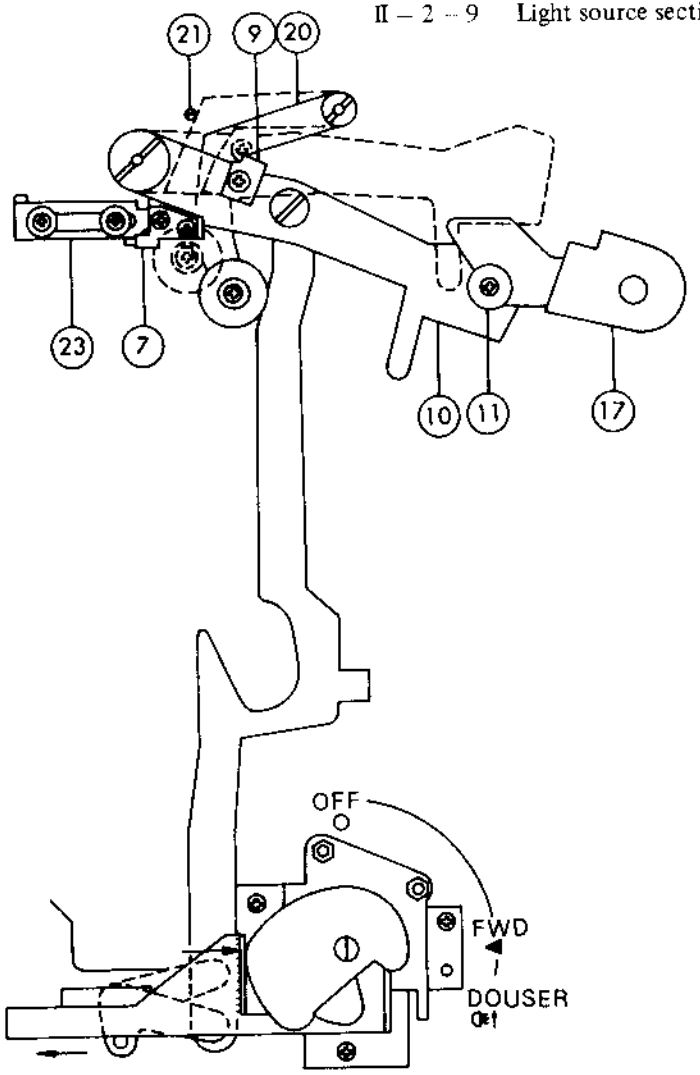


Fig. 38

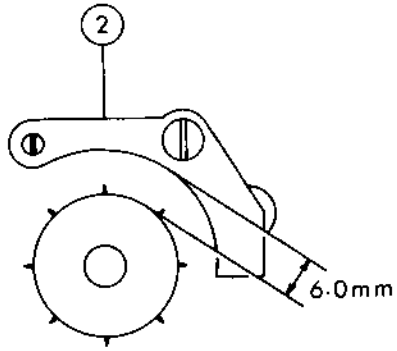


Fig. 39

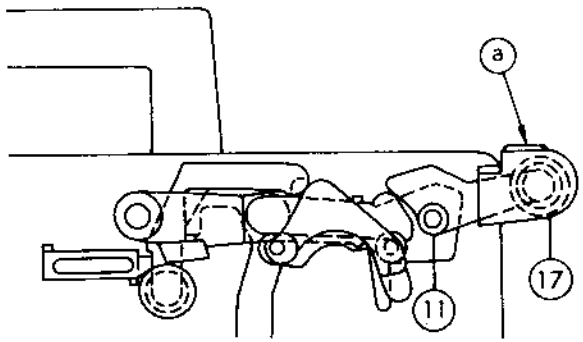


Fig. 40

II – 2 – 10 Link lever section

Reassembly & adjustment – Refer to "Link Lever Mechanism" on P. 22.

1. Carry out reassembly in the reverse order of disassembly, making confirmation and adjustment of the followings.
2. Replace ④, ⑬ or ⑱ if damaged or deformed.
3. Carry out temporary tightening of ⑦ and ⑨.
4. Make sure that rollers and link levers move smoothly.
5. Roller ⑳ provides loop at the upper part of film gate; adjust ⑨ and fix so that ⑳ slightly touches ㉑, with the knob main set to OFF.
6. Set the film, and turn the knob main gently from OFF to FWD. Then the roller ④ installed to ② pushes the film and gets engaged with the sprocket gears (teeth), and P.P. pushes the film down to A.P. Here, ⑳ detaches one step away from ㉓. Install ⑦ to this position. (See to it that the space between sprocket and ② is approx. 6 mm. Refer to Fig. 39)
7. Measurement of spring tension of ⑫
   Method: — Refer to Fig. 40, and measure by pushing ⑰ "a" in arrow mark direction with the rod spring beam (C043).
   Permissible range: — 50 – 80 g
   Adjusting method: — Adjust by turning ⑪.
8. Install ㉗ at a position such that, with the knob main set to DOUSER, a gap (space) is created between assy ① lever and claw releaser (P. 4) ㉖, and when the knob is set to OFF and RWD, the ㉗ is pushed allowing no extension of claw end from the aperture rail surface.

II -- 2 -- 10 Link lever section

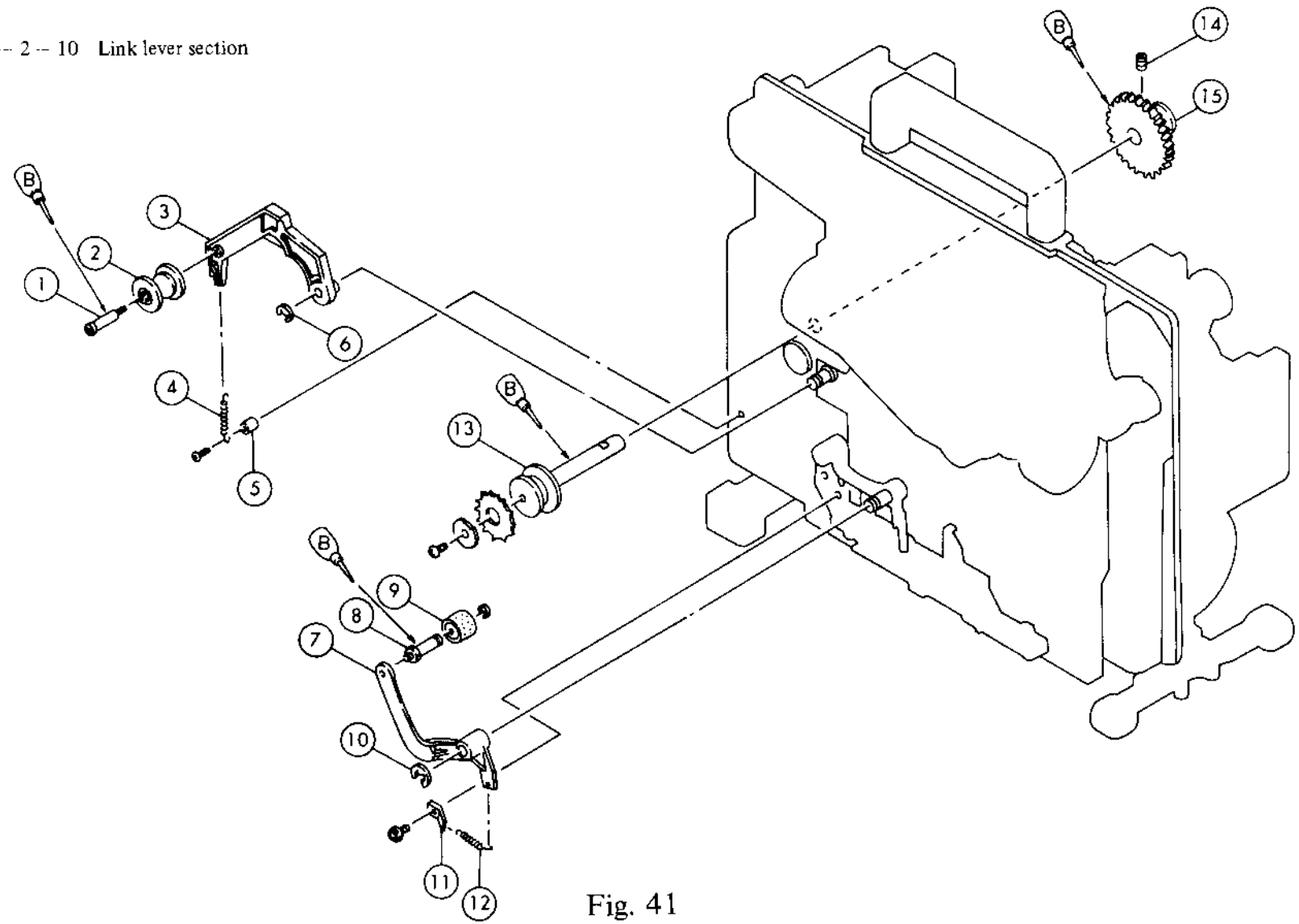


Fig. 41

II – 2 – 10 Link lever section

B Lever guide roller (4) (3) and lever intermediate tension (7)

Troubleshooting hints:

Symptoms	Causes
Scratch of film	Damaged or deformed ②, ⑨ and ⑬, defective spring tension of ④
Excessively large wow/flutter	Defective spring tension of ④ and ⑫, damage, deformation or irregular rotation of ⑨ damaged or deformed ⑬ and ⑮
Irregular take-up	Low tension of ④, defective ⑮
Cut of initial projection film	Low tension of ④
Defective quick review	Low tension of ④

Disassembly:

1. Take out ⑬ by removing ⑭ x 2 pcs. before removing ③.
2. For further disassembly, refer to Fig. 41.

Reassembly:

1. Replace ②, ⑨, ⑬ and ⑮ if damaged or deformed; after installation, make sure that they have light and smooth rotation.
2. Measurement of spring tension of ⑫
   Method: — Refer to Fig. 42, and measure at "a" point by using the rod spring beam (C043).
   Permissible range: — 30 – 70 g
   Adjusting method: — Turn ⑪ clockwise and counter-clockwise.
3. After the adjustment in preceding item 2 is made, feed the film and carry out fine adjustment with ⑪, so that the lever of ⑦ does not come in contact with both edges of link lever ① grooves. (Confirm for both the optical and magnetic films.)

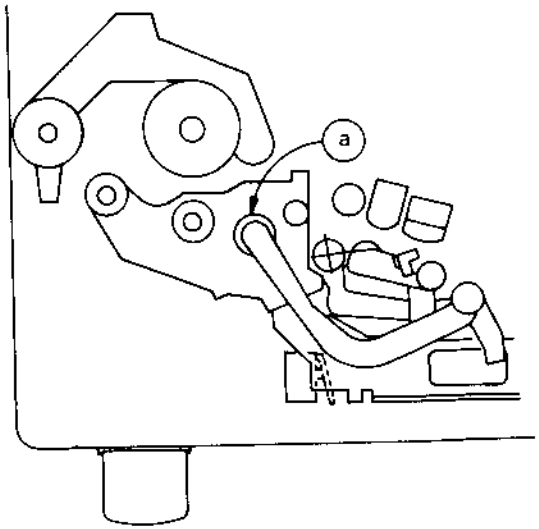


Fig. 42

II – 2 – 10 Link lever section

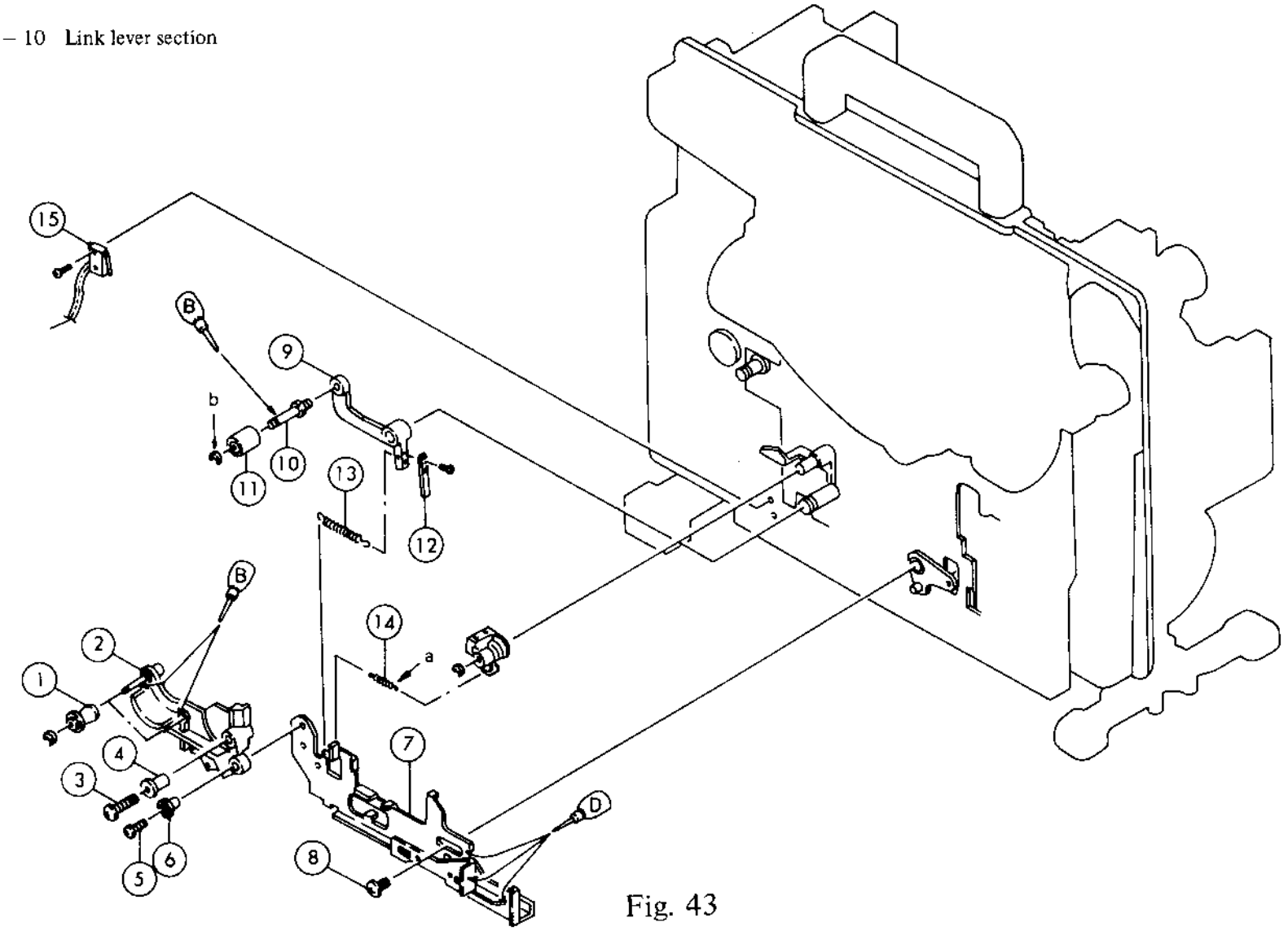


Fig. 43

II – 2 – 10 Link lever section

C Link lever (1) (7)

Troubleshooting hints:

Symptoms	Causes
Excessively large wow/flutter	Damage, stain or irregular rotation of ⑪, defective spring tension of ⑬
Lower loop disappears.	Defective installation position of ⑥
Scratch of film	Damage, deformation or irregular rotation of ① and ⑪, defective installation position of ②
Remote control unit does not work.	Defective ⑮ or defective installation position of ⑮
Amplifier does not activate.	

Disassembly:

1. Take out the assy parts of ① and ② by removing ⑤ and ③.
2. Remove ⑧ as well as ⑭ at "a" side, and take out knob main together with assy parts of ⑦ and ⑨, while turning the knob.
3. For further disassembly, refer to Fig. 43.

Reassembly:

1. Replace ① and ⑪ if damaged or deformed; after installation make sure that the rotation is smooth.
2. Adjustment of assy ② installation position: Since ⑥ is off-set, set two films between assy ② and second sprocket, set the knob main to $^{FWD}_{\blacktriangleleft}$, and turn ⑥ to the position where ① x 2 pcs. rotate lightly.
3. Activation of ⑦ interlocks ② with ⑫
4. Make sure that the rollers and link levers have smooth operation.
5. Measurement of spring tension of ⑬
   Method: — Set the knob main to $^{FWD}_{\blacktriangleleft}$ and measure at "b" point by using the rod spring beam (C067).
   Permissible range: — 200 – 300 g
   Adjusting method: — Replace ⑬

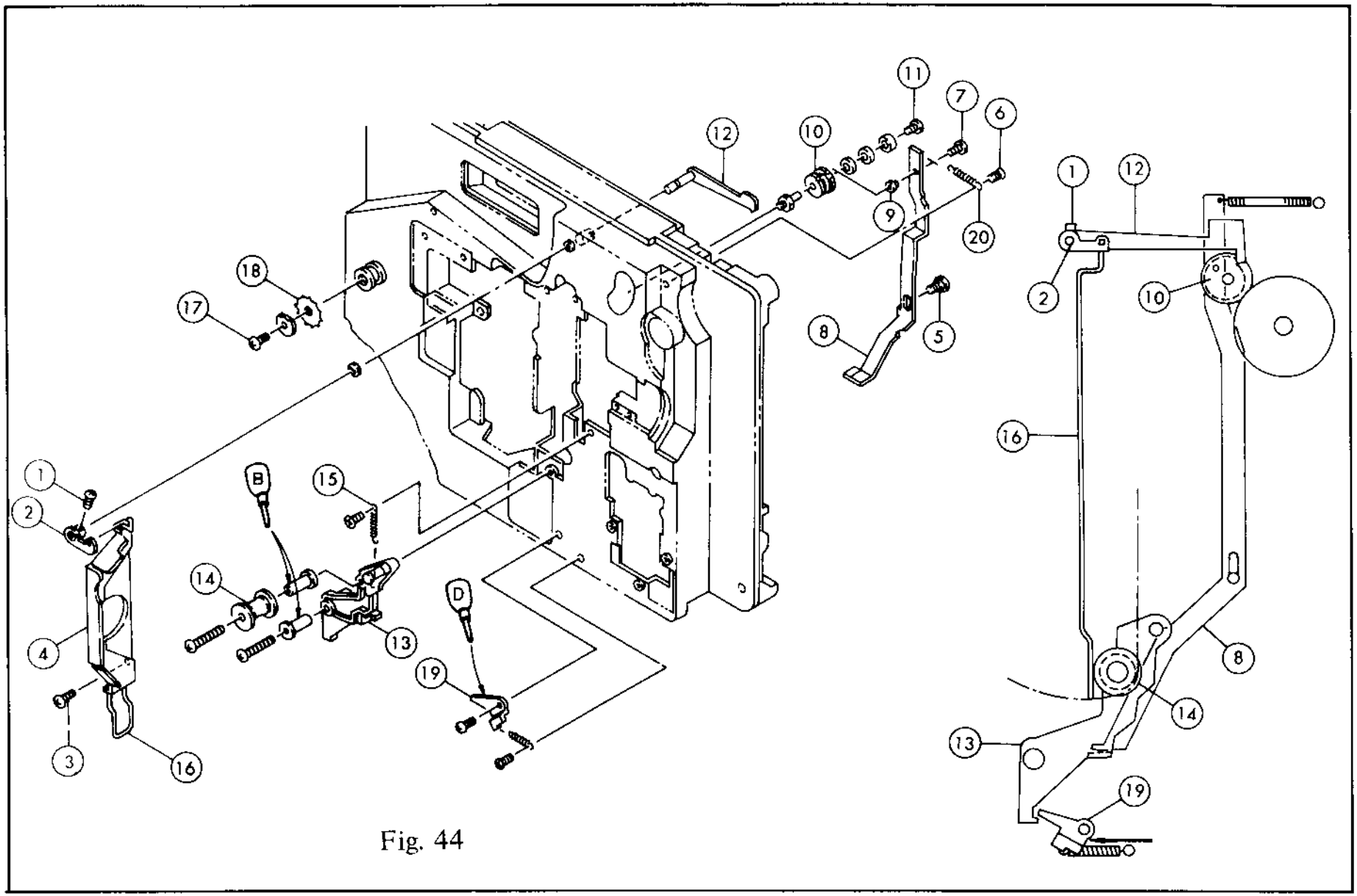


Fig. 44

II – 2 – 11 Loop restorer – Also refer to II – 1 5 Automatic Loop Restorer Mechanism.

Loop restorer

Troubleshooting hints:

Symptoms	Causes
Loop restorer fails to activate.	Defective installation of ②, excessively high spring tension of ⑮, ⑩ contaminated with oil, defective rotation of ⑩, defective installation of ⑱
Loop restorer keeps on functioning continuously.	Defective installation of ②

Disassembly:

1. Take out ⑧ by removeing ⑤, ⑥ and ⑦, taking care so as not to drop ⑨.
2. Take out ② by removing ①.
3. Take out ④ by removing ③ x 2 pcs.
4. For further disassembly, refer to Fig. 44.

Reassembly:

1. Replace ⑩ if worn out, and wipe off the oil, etc. if any; install with ⑪, and make sure that it rotates smoothly.
2. For further reassembly, carry out in the reverse order of disassembly.
3. Measurement of spring tension of ⑮: Install ⑬ and after confirming that it rotates lightly, install ⑮, making sure that ⑬ touches the upper stopper.
   Method: — Measure at "a" point by using the dial tension gauge (C063).
   Permissible range: — 20 – 30 g
   Adjusting method: — Replace or adjust ⑮
4. Adjustment of loop restorer:
   Make the lower loop shorter, 1 frame at a time, while feeding the film, then the loop comes to touch the roller ⑭ attached to ⑬. Fix ② with ①, so that, immediately before ⑭ starts rotation, the film touches the bottom of ⑯ to push ⑯ up, and ⑫ removes the lock of ⑩ to activate the loop restorer.
   In case the loop restorer does not activate even when the film touches ⑯ and produces vibration sound, loosen ⑰, and align the film by turning ⑱ gradually.

II – 2 – 10 Link lever section

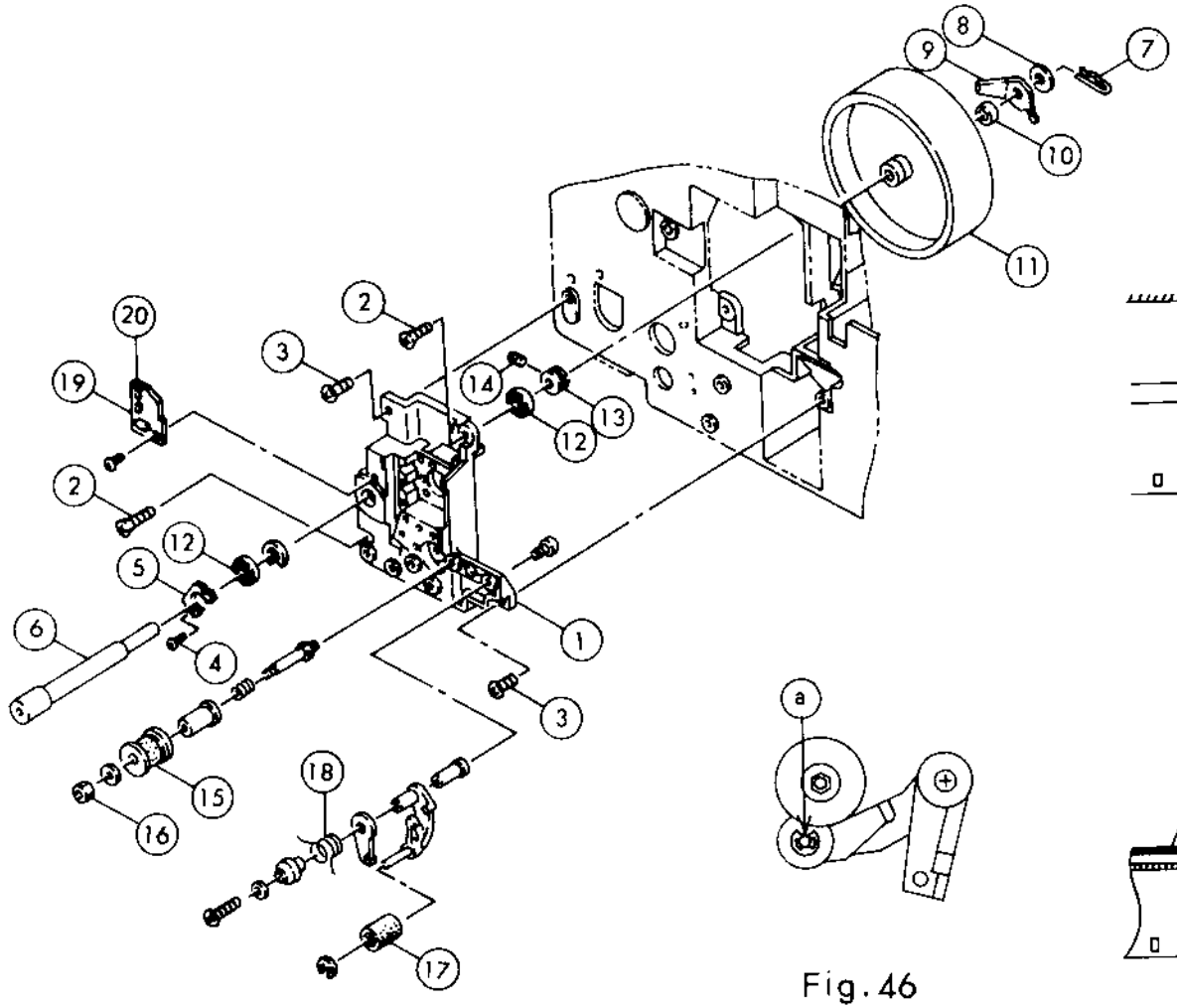


Fig. 45

Fig. 46

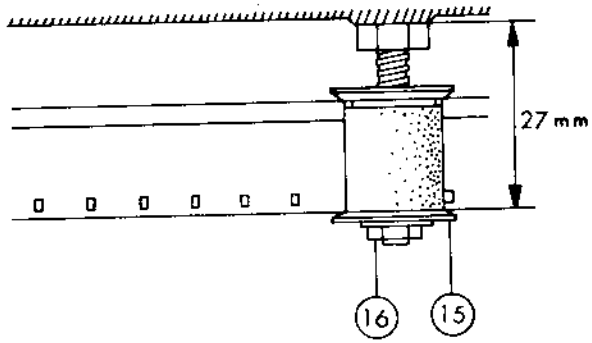


Fig. 47

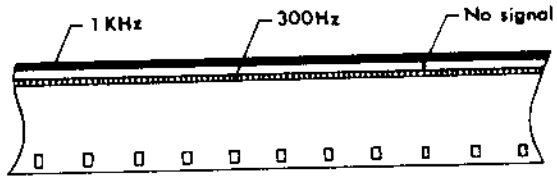


Fig. 48

Ⅱ – 2 – 12 Holder flywheel

A Assy shaft flywheel and assy lever brake roller

Troubleshooting:

Symptoms	Causes
Excessive large wow/flutter	Wear or unsmooth rotation of ⑥, ⑫, ⑮ and ⑰, defective installation position of ⑮, unbalance of ⑪ or contact of cords, etc., defective spring tension of ⑱
Scratch of film	Damage or unsmooth rotation of ⑥, ⑮ and ⑰

Disassembly:

1. Remove ⑦ and take out ⑧, ⑨, ⑩ and ⑪.
2. Remove ④ x 2 pcs. to take out ⑤, and pull out ⑥.
3. Remove ② x 2 pcs. and ③ x 2 pcs., disconnect the connectors from ⑲ and ⑳, and take out ①.
4. For further disassembly, refer to Fig. 45.

Reassembly:

1. Check ⑥, ⑮ and ⑰ for offset, deformation, scratch, etc., and ⑫ for abnormal rotation, then carry out reassembly in the reverse order of disassembly.
2. Adjust with ⑬ and fix with ⑭, so that ⑥ has no play in axial direction and has smooth rotation.
3. The ⑮ not only keeps the film feeding position but also works as the impedance roller. Hence, take utmost care in its adjustment; improper setting of its installation position may result in unstable film feeding and directly cause the deterioration in characteristics, such as wow/flutter, etc.
   - ○ Refer to Fig. 47, and make temporary adjustment with ⑯ so that the space between holder flywheel surface and side of film perforation is 27 mm.
   - ○ After temporary adjustment, set the optical buzz tracking film (PO32), set the amplifier volume to maximum level, and find a position where the double-band sound is not produced. Move ⑮ back and forth at this position before fixing with ⑯ and doing the screw lock. (Refer to Fig. 48)
4. Measurement of spring tension of ⑱: Since ⑮ is hard pressed by ⑰, make sure that the ⑮ is not deformed or worn out.
   Method: Measure at "a" point in Fig.46 by using the rod spring beam (C067), with the knob main set to FWD.
   Permissible range: 300 – 450 g
   Adjusting method: Replace ⑱.

II – 2 – 12 Holder flywheel

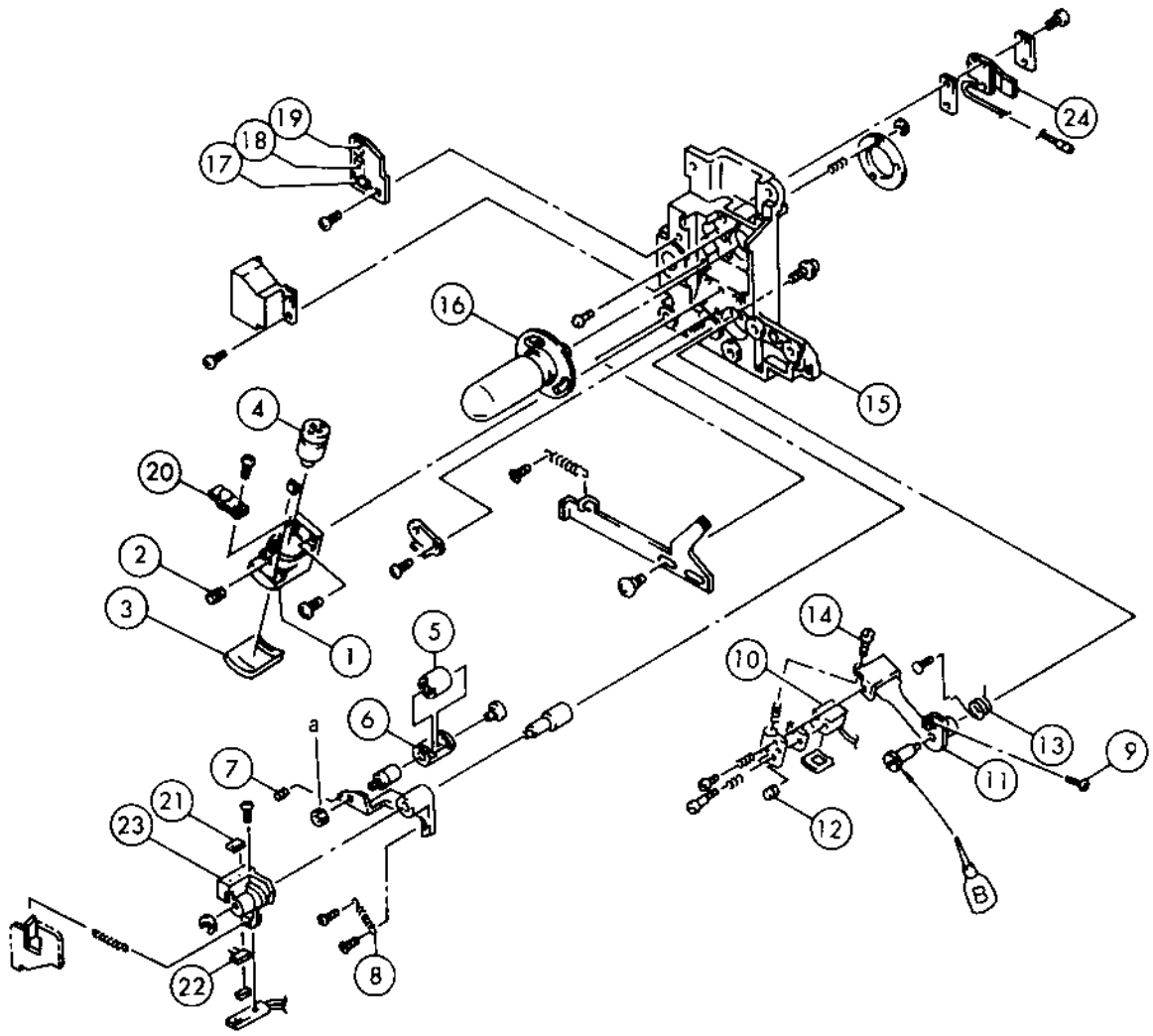


Fig. 49

II – 2 – 12 Holder flywheel

B Holder flywheel

Troubleshooting hints:

Symptoms	Causes
Excessively large wow/flutter	Wear or defective rotation of ⑤
Optical sound is not reproduced.	Disconnection of ⑯ and ㉒, defective contact of ⑱, malfunction of ㉓
Defective optical sound	Misadjustment or stain of ④, stain of ㉑, malfunction of ㉓
Exciter lamp does not light up.	Disconnection of ⑯, defective contact of ㉔
Magnet sound is not reproduced.	Disconnection of ⑩ and ⑰, defective contact of ⑱
Defective magnetic sound	Misadjustment of ⑩, defective rotation or deformation of ⑤
Improper S/N ratio	Defective installation of ⑥ and ⑰

Disassembly:

1. Never remove ① from ⑮ since it is installed with special jig.
2. For further disassembly, refer to Fig. 49.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. Make sure that ⑤ has no scratch and rotates smoothly.
3. Slightly turn ⑥, and fix by tightening ⑦ at position where the S/N ratio is minimum, then apply the screw lock.
4. Measurement of spring tension of ⑧
   Method: — Measure at 'a' point by using the dial tension gauge (C062), with the knob main set to FWD ◀.
   Permissible range: — 15 – 25 g
   Adjusting method: — Replace or adjust ⑧.

II – 2 – 12 Holder flywheel

Reassembly: Magnet head

1. Adjust with ⑨, so that the extension allowance of ⑩ is 0.2 mm to the ⑤ side from the imaginary feeding line obtained by connecting the assy shaft flywheel (P. 71) ⑥ to ③ with a straight line.
2. Adjust with ⑭, so that the center (gap) of ⑩ falls on the center line of ⑤. (Refer to Fig. 51)
3. Adjust with ⑫ x 3 pcs., so that the space between ⑩ and ⑪ is approximately 2.5 mm.
4. Measurement of spring tension of ⑬
   Method: — Refer to Fig. 51, and measure by using the rod spring beam (C043).
   Permissible range: — 60 – 100 g
   Adjusting method: — Adjust by bending ⑬
5. After adjustments of 2 – 5 are made, set the magnetic azimuth alignment film (P040), and travel the film at the VR position where output waveform shows no distortion, then make fine adjustment by means of ⑫ x 3 pcs., so that the reproduction output is maximum, and apply screw lock. (Max. output: Over 14 V)
6. After the adjustment of 5, carry out fine adjustment of ⑰ installation position to make the noise minimum.

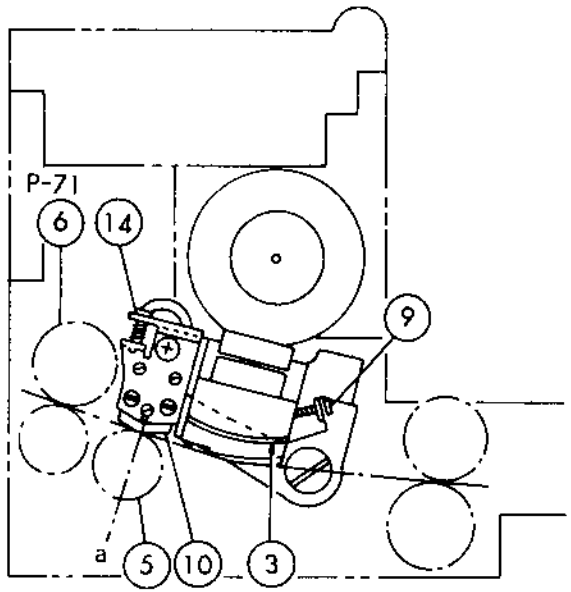


Fig. 50

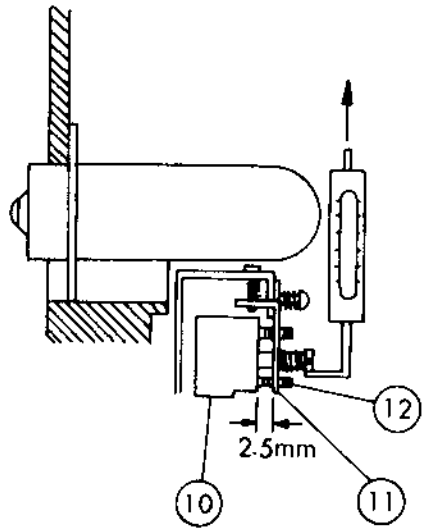


Fig. 51

II – 2 – 12 Holder flywheel

Reassembly: Sound lens assy

1. Make sure that the lens surface of ④ is not stained with dust, etc. (Replace if the internal lens of ④ is blurred or stained.)
2. Make sure that ㉓ activates without fail.
3. Extend ④ approx. 9 mm from ①, and carry out temporary tightening. (Refer to Fig. 52)
4. Set the sound focusing film (P035), and travel the film at the VR position where output waveform shows no distortion. Then carry out fine adjustment by moving ④ up-down and left-right before fixing when the reproduction output shows the maximum level. (Max. output: Over 14 V)
5. Set the optical buzz tracking film (P032), then adjust to a position where the double-band sound is not produced, with amplifier VR set to max. Refer to "Reassembly" on P. 72 for adjusting method.

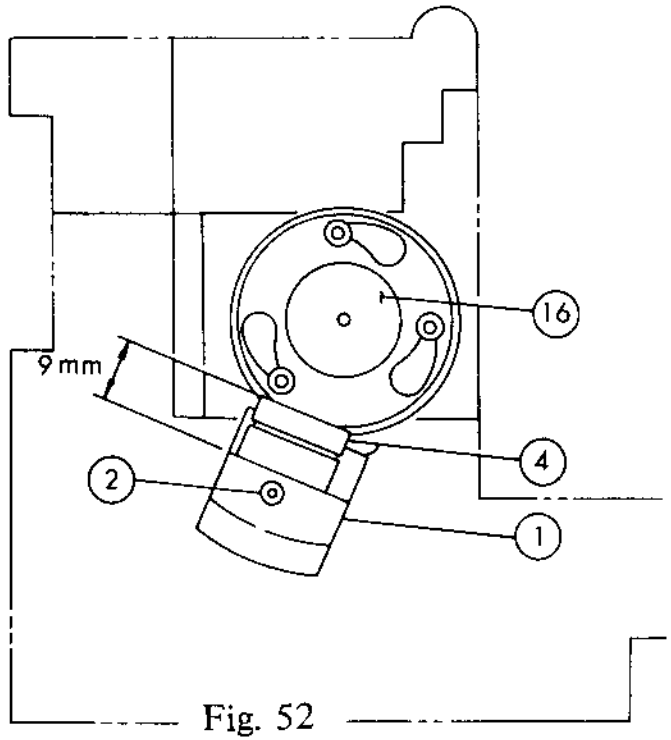


Fig. 52

II – 2 – 12

C Measurement of sound performance

1. Distortion factor: — Below 5%; both optical and magnetic films
   Film used: — Optical: 400 Hz signal level film (P033)
   Magnetic: 400 Hz signal level film (P037)
   Measuring instrument: — Distortion factor meter (P084)
   Measuring method: — Set the P033 and P037 films, and project with the tone control knob set to the center position, then turn the VR knob to obtain the output of the rated level (25 W-14 V), and read the distortion range in the distortion factor meter at this position.

2. S/N ratio: — Over 40 dB with the lamp lit up; both optical and magnetic films
   Film used: — Optical: 400 Hz signal level film (P033)
   Magnetic: 400 Hz signal level film (P037)
   Measuring instrument: — Distortion factor meter
   Measuring method: — Set the films P033 and P037, and project with the tone control knob set to the center position, then turn the VR knob to obtain the output of "rated output · 2dB," and stop the projector at this position. Take out the films, and set the film again to projection position, then read the distortion level in the distortion factor meter range.

3. Measurement of flutter: – Below 0.5%; both optical and magnetic films
   Film used: — Optical flutter film (P034)
   Magnetic flutter film (P038)
   Measuring instrument: — Wow/flutter meter (P083)
   Measuring method: — Set the films P034 and P038, carry out projection, then read the JIS WEIGHTED range in the wow/flutter meter.

4. Frequency performance
   Film used: — Optical multifrequency film (P036)
   Magnetic multifrequency film (P039)
   Measuring instrument: — Distortion factor meter (P084)
   Measuring method: — Set the films P036 and P039, carry out projection, and adjust by turning the VR knob, so that level range in the distortion factor meter shows 4 V (12 dB). At this position, read the signals that follow, and make sure that these signals fall within the range shown in Fig. 53.

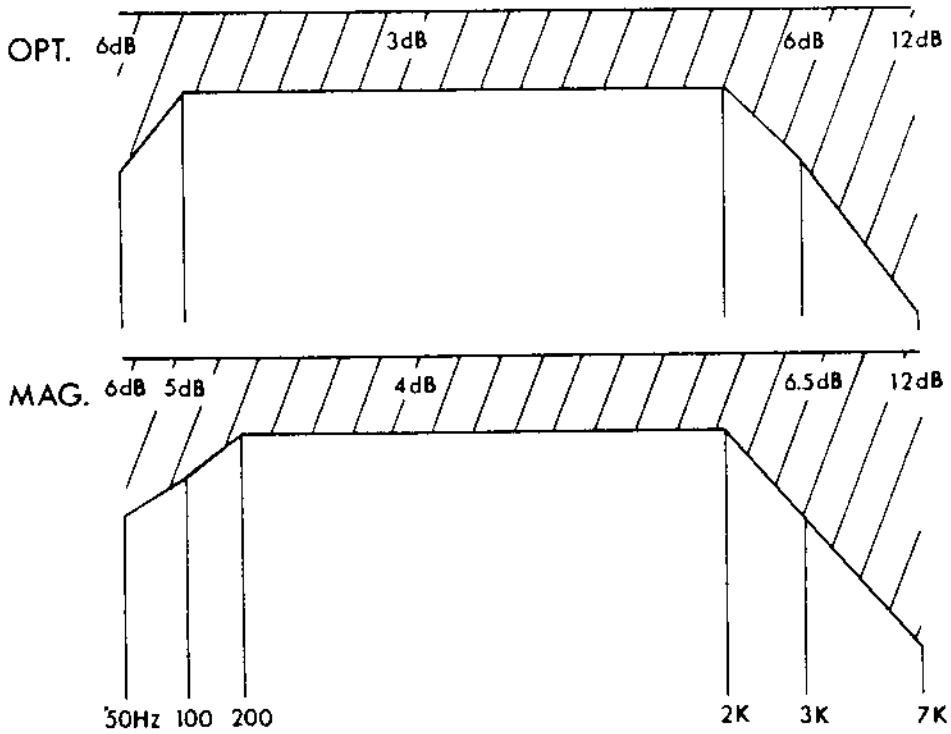

OPT.
6dB
3dB
6dB
12dB
MAG.
6dB
5dB
4dB
6.5dB
12dB
50Hz
100
200
2K
3K
7K

Fig. 53

II – 2 – 12 Holder flywheel

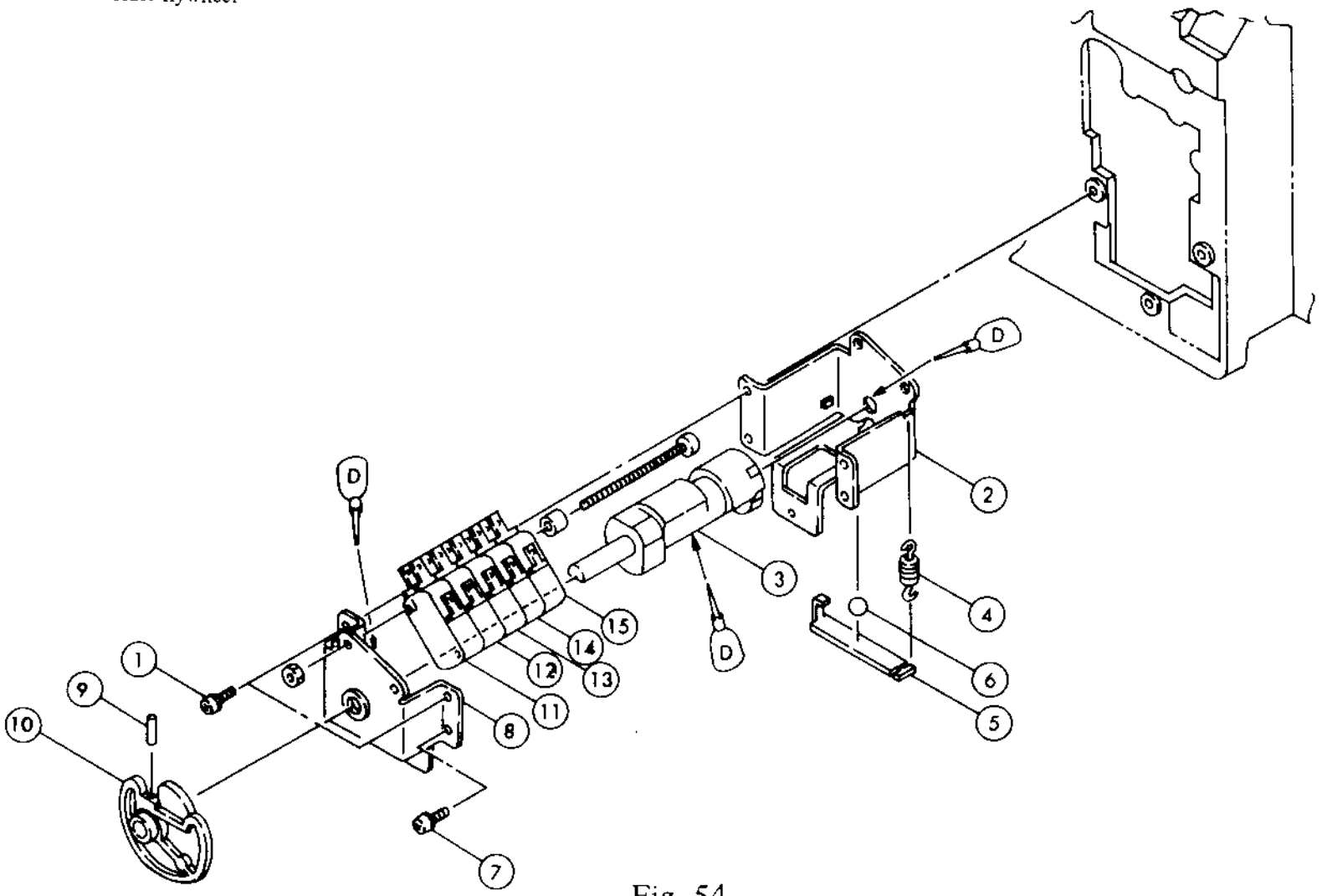


Fig. 54

II – 2 – 13 Switch mechanism

Troubleshooting hints:

Symptoms	Causes
Motor fails to operate.	Defective ⑪ or improper contact.
Motor fails to be set for FORWARD or or REVERSE projection.	Defective ⑫ and ⑬ or improper contact.
Douser fails to activate.	Defective ⑭ or improper contact.
Electromagentic (magnet) clutch fails to activate.	Defective ⑮ or improper contact.

Disassembly:

1. Remove ① × 3 pcs., and take out assy parts of ② while removing the connecting terminals.
2. Remove in the order of ④, ⑤ and ⑥, and take out ⑧ by removing ⑦ × 2 pcs.
3. The spiral pin of ⑨ is 2.5ϕ × 14 mm.
4. For further disassembly, refer to Fig. 54.

Reassembly:

1. Carry out reassembly in the reverse order of disassembly.
2. After reassembly, make sure, by turning ③, that all switches activate without fail.

Switch \ Knob main	RWD ▶▶	OFF ○	FWD ◀	DOUSER
11	P	—	P	P
12	—	P	P	P
13	—	P	P	P
14	—	—	—	P
15	—	P	P	P

P means "push."

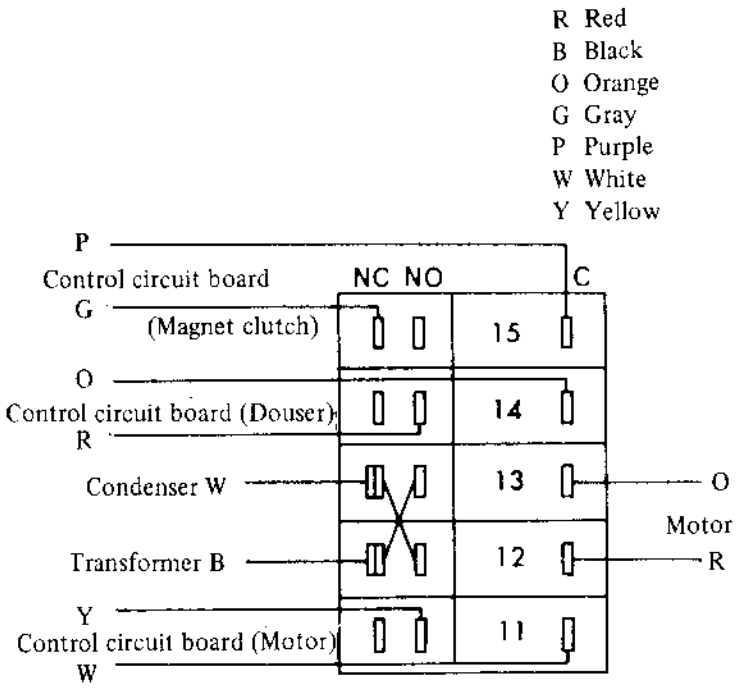


Fig. 55

III ELECTRIC CIRCUIT

III – 1 OUTLINE OF ELECTRIC CIRCUIT

III – 1 – 1 Electrical features

1. The lamp ON/OFF, START/STOP operations can be remote controlled.
2. Muting circuit interlocked with exciter adopted in amplifier circuit.
3. Amplifier of 30 W with extension speaker terminal short-circuit safely circuit adopted.
4. Lamp circuit:
   - Projection stand-by with half-lit lamp (lights at approx. 100 V).
   - Attached with rush-current safety circuit.
   - Timer (activating for approx. 5 seconds after lamp switch is turned to ON) attached to high tension generating circuit.
   - The same parts belonging to 100 V and 200 V lines of power unit assy are changed over by the fastening terminals.
   - Attached with a light counter for integrating the lamp lit-up time (max.: 100 hrs.)
   - Reduction in power consumption and weigh due to adoption of switching power source.

III – 1 – 2 Arrangement plan of external electric parts

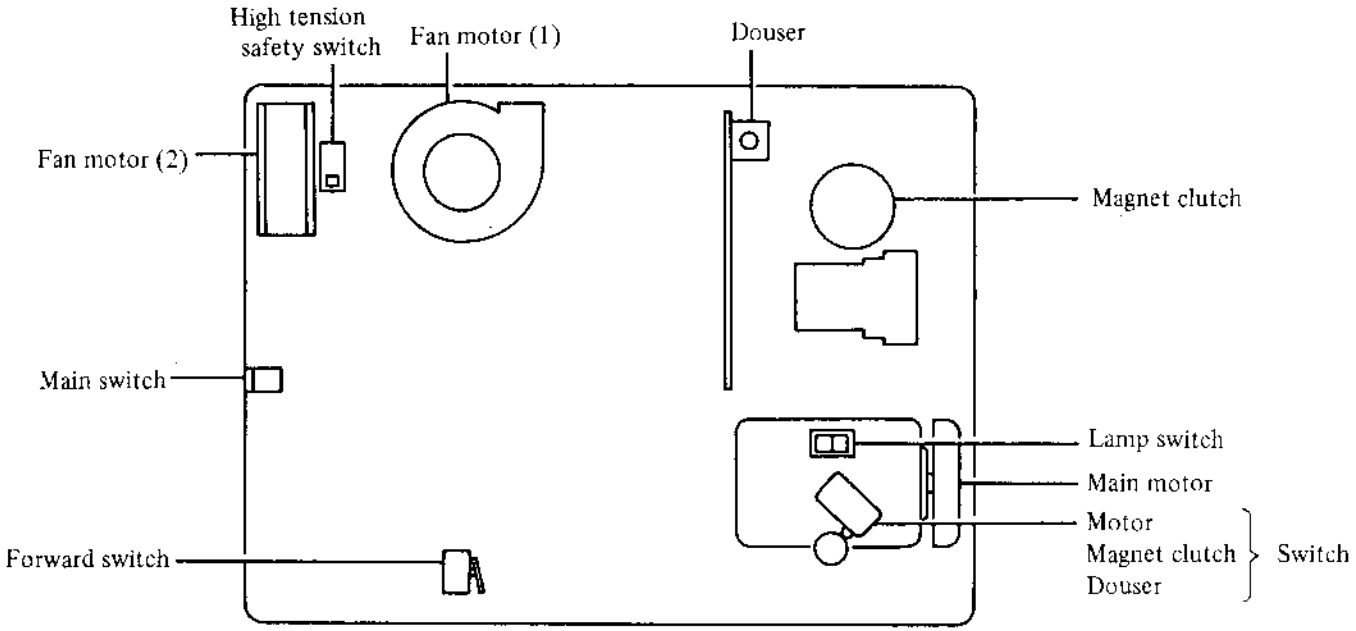
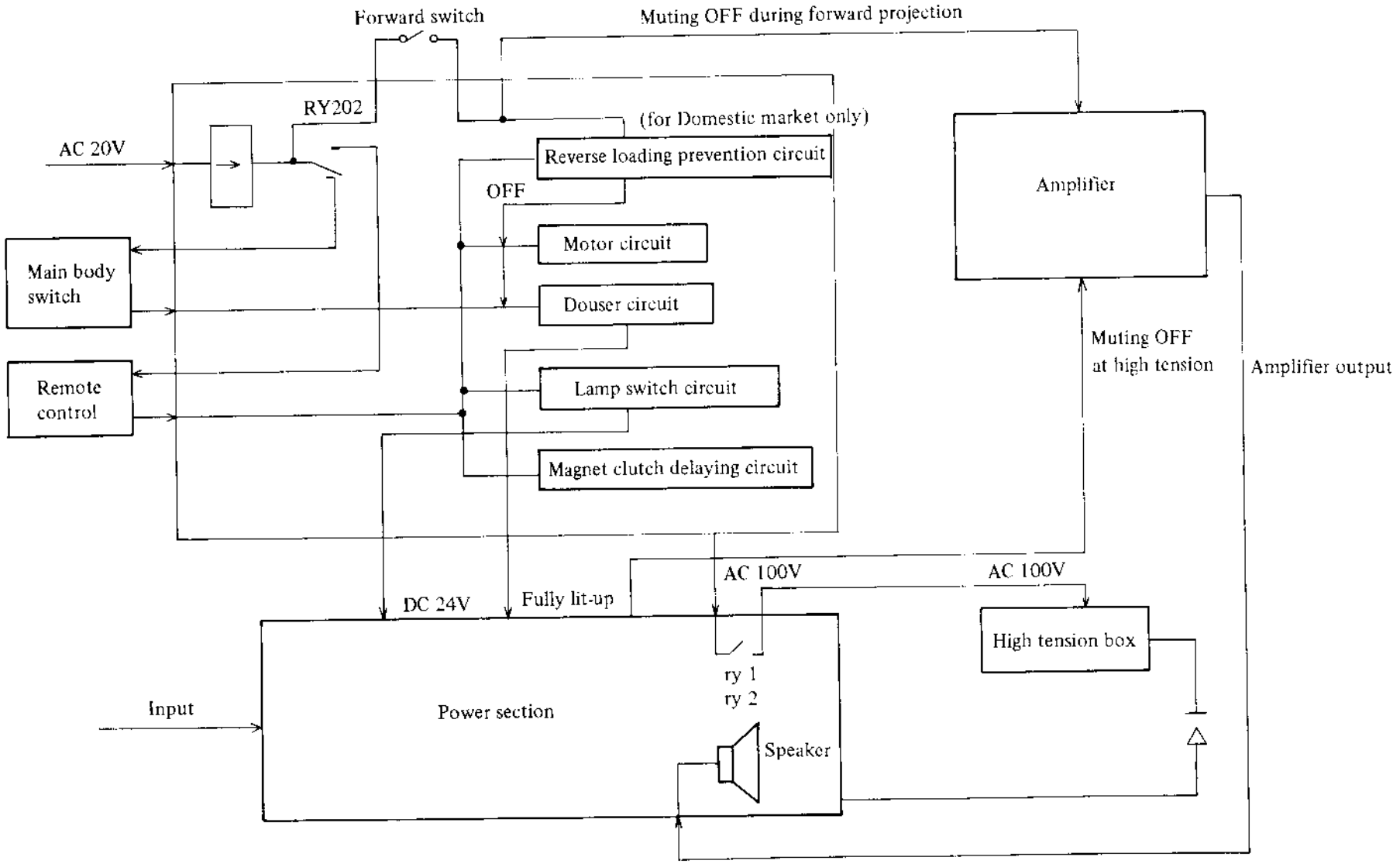
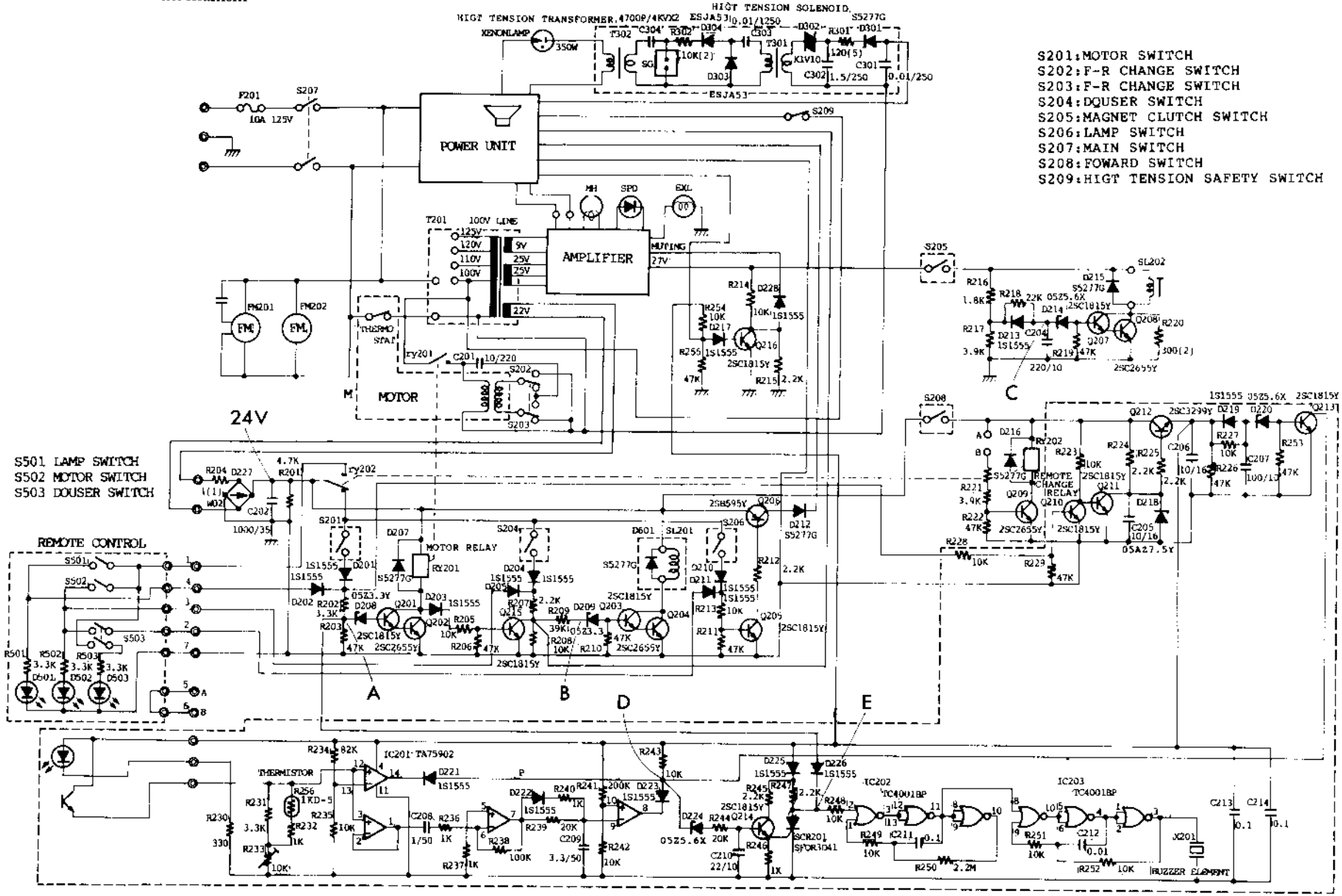


Fig. 56

III – 1 – 3 Electric circuit block diagram



II – 2 – 13 Switch mechanism



III – 2 CONTROL CIRCUIT MECHANISM

III – 2 – 1 Control circuit

A: Main body

Turn the main switch S207 to ON. → Fan motors FM 201 and FM 202 start operation

Turn the main switch S207 to ON. → Power transformer T 201 → Amplifier stands by for activation

Turn the lamp switch S 206 to ON. → Transistor Q 206 turns to ON. → DC 24V flows into power section control circuit to activate the power section.

Turn the knob main to FWD ◀. → Switch S 201 turns to ON. → Relay RY turns to ON. → Main motor M starts operation. (A point: 4V)

Turn the knob main to FWD ◀. → Switch S 208 turns to ON due to link lever ①. → Amplifier turns to ON.

(When microphone is connected, the amplifier activates even at OFF position; muting gets released when switch S 208 turns to ON; muting activates and amplifier turns to OFF before the lit-up Xenon lamp surface (i.e. during generation of high tension).)

Turn the knob main to DOUSER ⊡↑. → Switch S 204 turns to ON. → Solenoid SL 201 → Douser activates (B point: 4V).

Turn the knob main to RWD ▶▶. → Switches S 202 and S 203 change over; S 201 turns to ON. → Main motor M starts reverse rotation.

Turn the knob main to RWD ▶▶. → Switch S 205 turns to ON. → Transistor Q 208 turns to ON after 3 secs.

Magnet clutch voltage changes from initial 12V to 28V after 3 secs. (C point: 6V) (For detail, see P. 42)

B: Remote control unit

Insert the Remote Control Unit 8P. → Connect the 8P connectors ① ~ ⑧. → Relay RY 202 activates to change over to "Remote Control."

(Since the "Remote Control" activates only with switch S 208 at ON position, set the knob main to FWD ◀ or DOUSER when using Remote Control.)

Note: Film rewinding or/and quick review cannot be carried out by means of the Remote Control Unit; use the main switch (in main body) for such operations. The Remote Control Unit does not activate when the knob main is set to OFF ○ or RWD ▶▶.

C. Reverse loading prevention circuit (for Domestic market only)

When the knob main is set to FWD ◀ or DOUSER ▢≡ ↑, with the film loaded mistakenly or when the film has not entered the gate completely, a warning sound (pi-pi-) is produced, and the projector comes to an immediate stop. In such case, set the knob main once to OFF ○, load the film in proper way, and start projection.

Turn the knob main to FWD ◀ or DOUSER ▢≡ ↑ — Switch S 208 turns to ON. — The emitter of transistor Q 212 receives 7V. — The voltage is impressed in the luminescent diode of sensor, with the phototransistor receiving the reflected light thereof.

- Suppose that the film is reversely loaded. Then the light from the luminescent diode of sensor is reflected by the film and falls into the phototransistor, causing high voltage to be applied on pin No. 14 of IC201, so that the point D receives 6 ~ 7V. This turns the transistor Q 214, to ON, and SCR 201 to ON as well, so that the point A receives approximately 1V, setting the transistors Q 201 and Q 202 to OFF and the relay RY201 to OFF as well. When the voltage level at the point E becomes low, the oscillators IC 202 and IC 203 activate, activating the buzzer x 201.

- In the case of normal loading, on the other hand, the reflected light falls intermittently into the phototransistor due to perforation holes, the pin No. 8 of IC 201 receives 0 ~ 1V due to IC 201 circuit, causing the voltage level at the point D to become low. This keeps the transistor Q 214 turned to OFF, and hence the reverse loading prevention circuit does not activated.

III –2 – 2 High tension circuit

Xenon lamp lighting circuit (power section PC board)

1. Turn the main switch to ON, then voltage is impressed between the connectors CN1 4 – 6, with voltage ranging from 130V to 180V applied to C5 and C6, and C7 and C8. (The power section PC boards are the same for domestic use and export use, and are separately used for 100V line and 200V line by changing the insert terminals. Take utmost care at the time of replacement.
2. Turn the lamp switch to ON, then DC 24V is impressed between connectors CN2 4 – 6, and DC 15V is applied to the condenser C28 through the IC 2. The IC 1 pin also receive 15V, and the output waveforms shown in Fig. 58 appear in IC 2 pin and IC 3 pin.

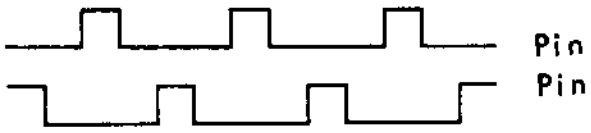


Fig. 58

Approx. 20 kHz is generated.

FET Q5 and Q6 turn to ON, alternately turning transistors Q1 and Q2 to ON through transformers T2 and T3.

As in the case of I1 and I2, the current flows alternately into T1 to be transmitted to the secondary winding. The current is then commuted to charge the condenser C15. The secondary winding is added to the main winding, causing the voltage level at C15 (the voltage applied to the lamp) to become high (over DC 100V before the lamp lights up). The high voltage then turns the relay RY1 to ON, causing the current to flow between the connectors CN 1 1-2 and activating the high tension generating circuit in projector main body. High tension pulse is then applied to both ends of Xenon lamp, causing the lamp to light up. After the lamp lights up, the voltage at both ends comes to 20V level. Accordingly the voltage at both ends of C15 also becomes 20V, turning the relay RY1 to OFF and bringing the high tension generating circuit to a stop.

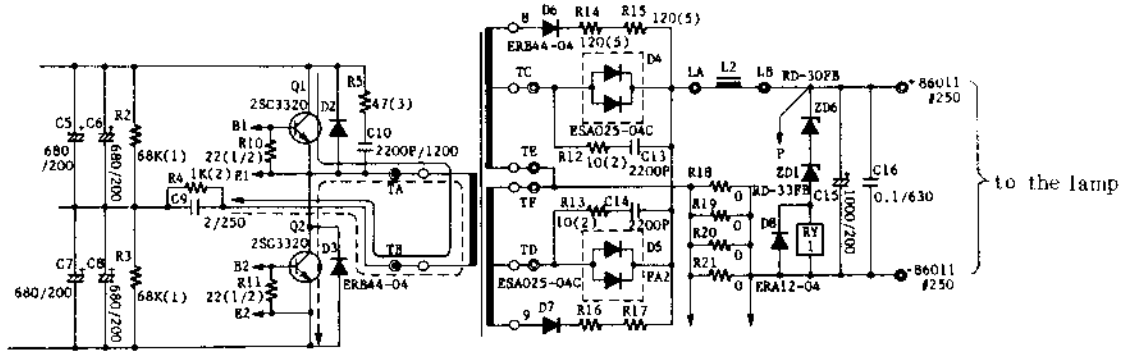


Fig. 59

3. High tension timing circuit:
On turning the lamp switch to ON, the relay RY2 turns to ON after approx. 3 5 seconds depending on the time constants of R25 and C20. When the relay RY2 activates, the connection between the connectors CN1 1-2 turns to OFF, stopping the generation of high tension. In other words, when the lamp does not light up due to some reason after turning the lamp switch to ON, the high tension generating circuit keeps on generating high tension. Hence, this switch is employed so that the high tension be generated only for 3 ~ 5 seconds after the lamp switch is turned to ON.

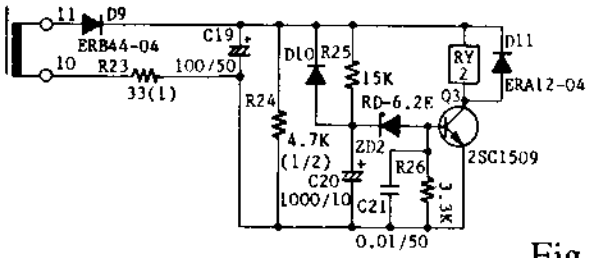


Fig. 60

4. Constant current control:
With the lamp lit up, the current from lamp flows into the shunt resistances R18 R21, generating voltage of micro level. This microvoltage is made to flow into the control circuit in order to change the output pulse width of IC1 2 pin and 3 pin.

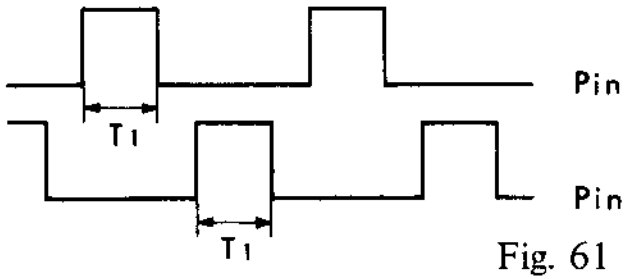


Fig. 61

* Shunt resistance = Current detecting resistance

For instance, when the lamp current becomes small, the voltage at both ends of R18 R21 becomes small as well. In order to compensate for this, the control circuit activates, causing the pulse width T1 of IC1 2 pin and 3 pin to become larger, the time of Q1 and Q2 being turned to ON to get longer, the time of current flowing through I1 and I2 to get longer, and the output of secondary winding to become larger in order to make the lamp current larger.
The control circuit also activates for reverse operation when the lamp current becomes high to supply constant current to the lamp.

5. Amplifier muting circuit:
With the lamp switch turned to ON, and over DC 100V applied to both ends of the condenser C15, turning the transistor Q4 to ON, the connector CN2 1-4 get shortcircuited, activating the amplifier muting circuit, resulting in the amplifier to get turned to OFF. After the lamp is lit up and the voltage at both ends of the condenser C15 goes down, the transistor Q4 turns to OFF, causing the amplifier to activate. This is a circuit for preventing the noise, during high tension generation, to enter the amplifier.

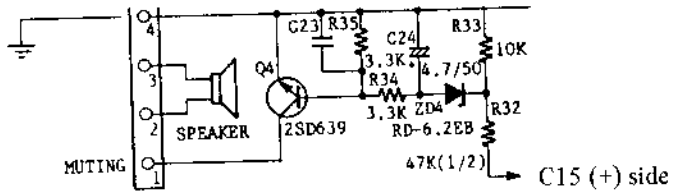


Fig. 62

6. Full/Half lighting:
On turning the lamp switch to ON, the lamp fully lights up, and after approximately 3 seconds, it changes to half lit position. For improving the lighting property, the lamp is fully lit up for approximately 3 seconds till the relay RY2 activates, after which the lamp changes to half lit position. The lamp is set for half lit position (approx. 7A, 100W) except when the knob main is turned to DOUSER.

With the knob main turned to DOUSER, approximately 10V is applied across the connectors CN2 4-5, activating the photocoupler PHC 1 and shortcircuiting both ends of VR2. The lamp then lights up fully (approx. 17.5A, 350W).

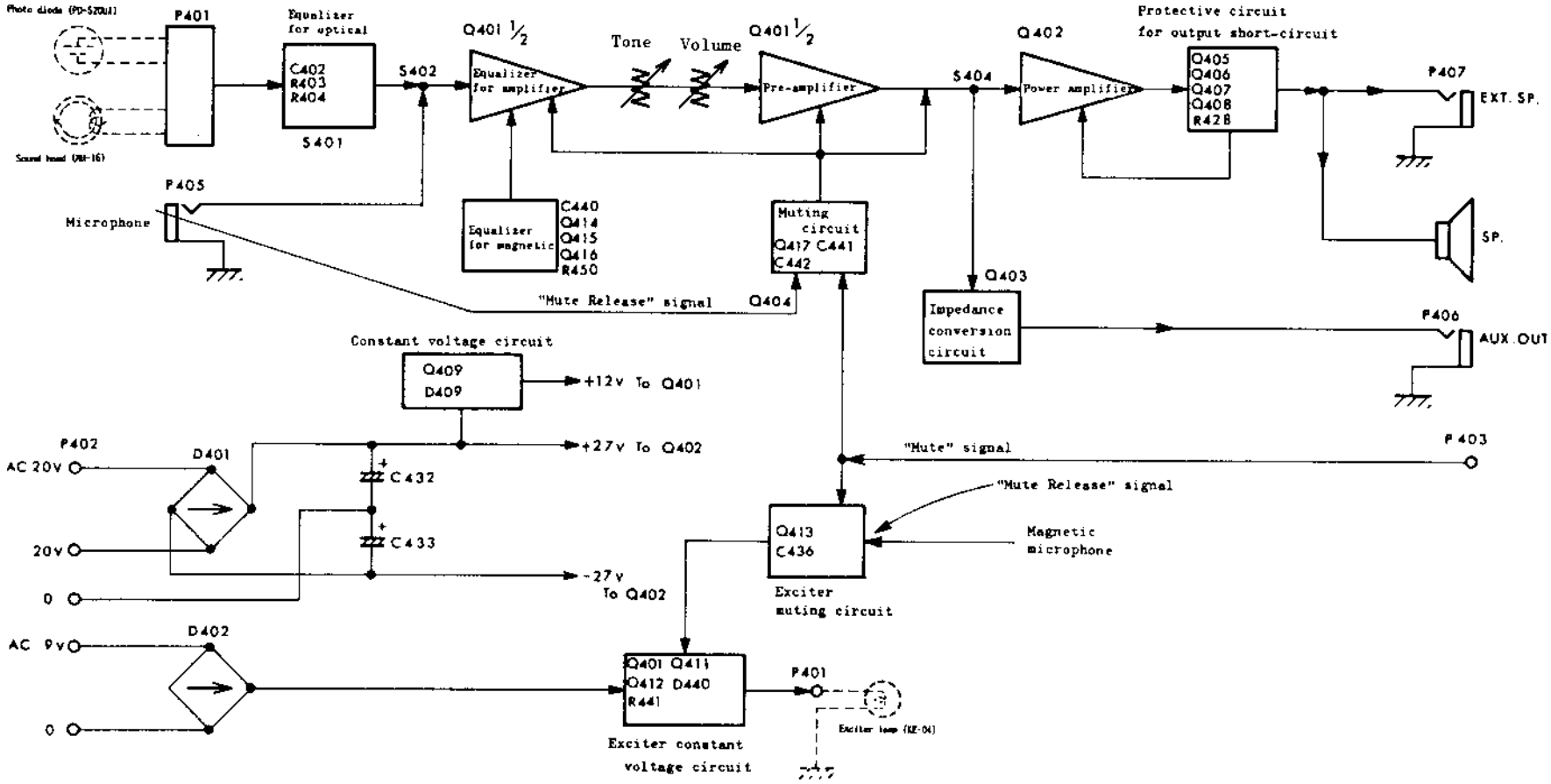
7. Timer circuit:
The timer is provided for checking the lamp lit-up time. With the full scale of 1000 hrs., the timer activates when the lamp is at half-lit position as well as when the lamp switch is turned to ON.

8. High tension generating circuit:
As described in item 2, current passes through CN 1 1-2, with AC 100V impressed at the PC high tension input section of projector high tension generating circuit assy. The voltage through D301 and R301 is charged into the condenser C302, undergoes pulse conversion in the sidac D302, causing approx. 5000V to be applied on

III – 3 AMPLIFIER CIRCUIT

This is an all IC amplifier with the rated output 25 W and the maximum output 30 W. The power IC (STK080) in the amplifier is driven by two power sourses (+ and –). The + power source with 12 V constant voltage is used as the power source for pre-IC.
The equalizer amplifier and preamplifier are of 1-chip composition using 2 ch IC (TA7325P), having the gain of 40 dB respectively.

III – 3 – 1 Block Diagram for Amplifier Circuit



III – 3 – 2 Signal Transfer for Optical Reproduction

The signal from solar battery (with load resistance: 22 kΩ) has its high zone uplifted (approx. 10 kHz + 4 dB) by the equalizer circuit composed of C402, R403 and R404, and amplified further (approx. + 40 dB) by the equalizer amplifier before entering into tone control circuit. The tone control circuit is a C-R type tone circuit and is used in numerous 16 mm amplifiers. The circuit is a TREBLE variable circuit, and has the property (response) of max. + 5 dB, min. −10 dB at 10 kHz.
The signal, after passing through the tone circuit, gets into preamplifier to undergo flat amplification approx. + 40 dB before entering into power amplifier. The signal, amplified by the power amplifier, then passes through R 428 (0.47Ω) before reaching the speaker. The R 428 is a resistance to detect the excess current of the output line when the output (speaker) is shorted.
Refer to P. 93 for short circuit protective circuit.

III – 3 – 3 Signal Transfer for Magnetic Reproduction

The signal from magnet head (with load resistance: 100 kΩ) undergoes LC resonance in C439 (1000 PF) to uplift 9 kHz. The semi-fixed resistance R458 (50k-B) located in series with C439 is a damping resistance, and adjusts the uplifting quantity (rate) of 9 kHz. The euqalizer for magnetic reproduction from the equalizer curve with time constant of 70 μs by using the NFB (negative feed back) circuit of the equalizer amplifier. This circuit is composed of C440, R450 and R408, and increases the gain at 400 Hz signal reproduction by 15 dB higher than at optical reproduction by shorting R443.
The change-over from equalizer circuit for optical reproduction to equalizer circuit for magnetic reproduction and vice versa is carried out by means of the transistors Q414, Q415 and Q416. The signal transfer after the signal passes through the equalizer amplifier is the same as in the case of signal transfer for optical reproduction.

Ⅲ – 3 – 4 Microphone Circuit

When the microphone is inserted into the microphone jack (P405), the switch of S402 changes the circuits then cuts off the signal for optical and magnetic reproductions and connects the microphone circuit. It also breaks off the power source to the transistor (Q414) for magnetic equalizer circuit change-over, and composes the equalizer circuit special to the microphone. Furthermore, since Q401 is turned to OFF due to the muting function in cases other than forward projection, the S402 "-1" also turns Q404 to ON and grounds the muting signal in order to cut off the muting circuit.
When the exciter lamp is lit up, the base of Q411 is grounded to extinguish the lamp by turning Q413 in the exciter circuit to ON.

Ⅲ – 3 – 5 Auxiliary Output Circuit

The auxiliary output terminal (P406) transmits signal by means of the jack with size ϕ3.5 mm. The signal then carries out impedance conversion of the preamplifier output by means of 1-step emitter follower circuit, corresponding to the load of 600 Ω. The output level can by varied by the VOLUME, with max. 0 dBm obtainable at the load of 600 Ω.
When the auxiliary output terminal is used, the S404 changes over and the power IC is cut off so that no sound comes from the built-in or/and external speaker.

Ⅲ – 3 – 6 Exciter Lamp Circuit

This circuit forms 4 V power source for exciter by means of the constant voltage circuit (Q410, Q411, Q412 and D410. The 4 V emitter output of Q410 can be adjusted (regulated) by means of the semi-fixed resistance R441 (1k-B). The circuit, getting interlocked with sound muting circuit, also turns the exciter lamp on or off. This is done by turning the output of Q410 to ON or OFF by controlling the base voltage of Q411 in constant voltage circuit by means of Q413. The exciter lamp is made to extinguish instantaneously and to light up gradually with the time constants of C436 and R437, thus carrying out muting by means of exciting lamp as well as the other muting circuits for preventing unfavorable sound from the speaker.
The exciter lamp is lit up only during forward projection.

Ⅲ – 3 – 7 Muting Circuit

Muting signal is transmitted from the collector of Q216 in control circuit. This signal is "L" (low) only for FORWARD mode; for other modes it is "H" (high). The signal is "H" while the lamp lights up.

The signal transmitted from the collector of Q216 passes into amplifier and exciter circuits through P207. In amplifier circuit, the signal transfers into the pin (9) of Q401 (TA7325P). This circuit is used because when a voltage over 0.9 V is applied in the pin (9) of Q401, it turns the power (output) to OFF by cutting off the bias circuit in the IC. However, since this circuit alone can not prevent the unfavorable sound from the speaker, muting is carried out by turning Q417 to ON. The above circuits are set not to operate when microphone is used at modes other than FORWARD. Refer to "Microphone Circuit" on preceding page.

The signal in the exciter circuit transfers to the base of Q413, grounding the base of Q411 by turning Q413 to ON and then turning Q410 to OFF. It also mutes the exciter, when microphone is used, by turning Q413 to ON. Fig. 63 shows the timing chart for mute signal (upper curve), exciter voltage (center curve) and sound output (lower curve). The points of measurement are (4) of P207 for mute signal, emitter of Q401 for exciter voltage and SP. OUT for sound output.

When muting circuit is turned to ON (left-hand-side in Fig. 63), the voltage of mute signal rises up, muting the exciter first and then (shortly later) the sound output. This delay of approximately 0.1 second is due to C441 and C442 for the countermeasure against unfavorable sound.

When muting circuit is turned to OFF (i.e. when muting is released) as shown on the right-hand-side of Fig. 63, the sound and exciter rise up approximately 2 seconds after the voltage of mute signal drops to "L." This delay is for eliminating the sound irregularity at the time of rise of flywheel.

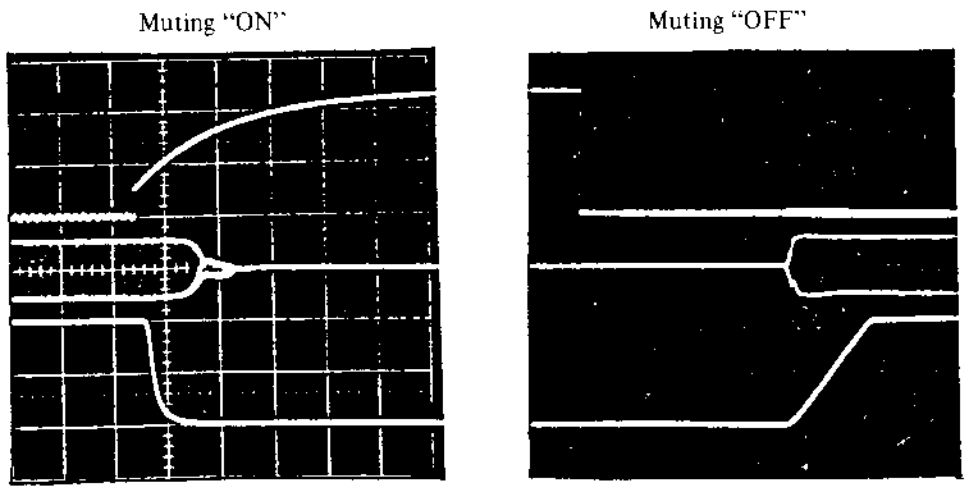


Fig. 63

Ⅲ – 3 – 8 Speaker Safety Circuit

Most of the conventional projector amplifiers, with output less than 20 W, could be safely protected from power short circuit simply by means of the fuse because of the large internal endurance of the IC. However, since the 30 W output of this projector makes the internal endurance of power IC inadequate, the projector is provided with a current control type electronic safety circuit, the function of which is described below.

Since this circuit is vertically symmetrical with the pin (7) power IC (STK 080) and carries out same function, only half cycle of the circuit will be described here.

When the speaker output is grounded (earthed), the short-circuit current flows through R428 (0.47 Ω). Supposing this current to be 2.6 A, a voltage of 1.2 V RMS (0.47 Ω x 2.6 A = 1.2 V) generates at both terminals of R428, and since Q406 is not turned to ON, this voltage gets divided in R427 and R456, causing the current to flow to the base of Q405 and turning Q405 to ON. This grounds the pin (9) of Q402 and distributes the base current of IC driver, and thus the output current of IC is controlled (limited) to 2.6 A. Fig. 64 shows the power source and signal curves when output is shorted. The points of measurement are the pin (8) of Q402 at positive side of the power source (0.5 V/DIV) in the case of upper curve, the pin (7) of Q402 at 400 Hz signal (VOL-MAX) in the case of center curve and the pin (6) of Q402 at negative side of the power source (0.5 V/DIV) in the case of lower curve.

The power current at one side, with the input 40 dB VOL-MAX (22 V RMS-8Ω), is 1.2 A AC (and is 0.8 A AC at the rated value of 14 V RMS-8Ω). Here, if both terminals of the load (8 Ω) are shorted, the sound output (actually of 1.2 V RMS) gets virtually reduced to zero, as shown in the right-hand-side of Fig. 64, with the power current at one side in this case being 1.3 A. Furthermore, there is no change in the power ripple. In other words, the power current is controlled to 1.3 A by means of the safety circuit, which activates and controls the output current of the pin (7) of Q402. Hence, the IC is safe from getting heated up and the power source fuse does not break off even when both terminals (ends) of speaker are shorted by mistake.

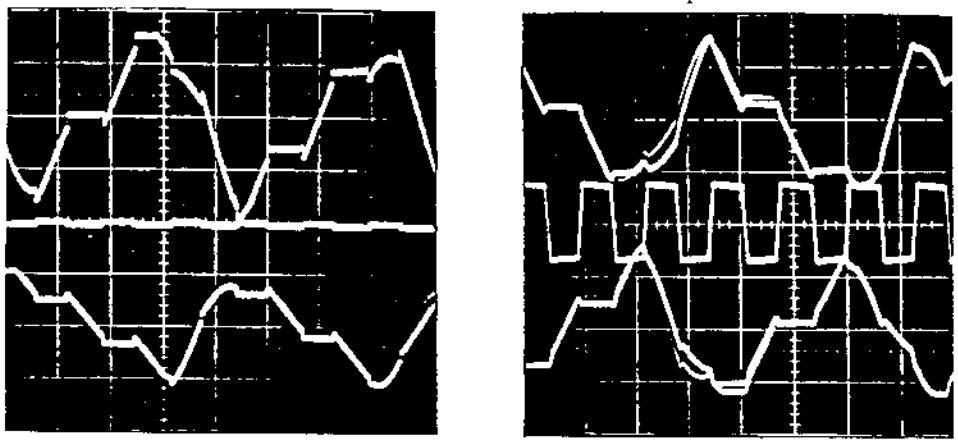


Fig. 64 2 m Sec/DIV

III – 4 ELECTRICAL CIRCUIT TROUBLESHOOTING HINTS

III – 4 – 1 Electric circuit:

Xenon lamp fails to light up — The lamp switch turned to ON.

Check if discharging takes place inside the lamp
- Yes → Check if the power voltage is proper.
  - Check to see that lamp life is no exhausted (confirm through timer). → Yes → Replace.
  - Check the high tension generating power for weakness. → Replace high tension generating circuit assy. / Leakage of generated high tension to the base.
- No ↓

Check if over DC 100 V is applied across the lamp.
- Yes → Check RY1 to see if it is normal or defective. / Check S209 to see if it is normal or defective, and confirm the installation position / Replace the high tension generating circuit assy.
- No ↓

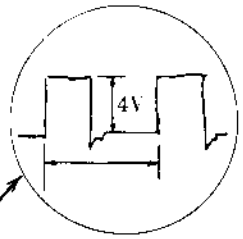
Check if DC 40V is applied across the lamp.
- Yes → Check D6, D7, R14, R15, R16 and R17 in voltage and weight circuits.
- No ↓

Turn the lamp switch to ON, and check if the voltage at C5, C6, C7 and C8 is 130 180V.
- Yes → Check to see if Tr, Q1 and Q2 are OK.
  - OK → Check D4 and D5, and see if the voltage across CN2 4 – 6 is 24 V
    - Yes → Check C28, and see if the voltage in IC 1 – 1 pin is 15 V.
      - Yes → Confirm the waveforms at both ends of D14 and D15 by disconnecting CN1.
        - OK → Confirm Tr, Q1, Q2, D4, D5, R1, TRIAC and D1 again.
          - No good → Replace.
        - No good → Check the output of IC 1 – 2 and 3 pins.
          - OK → Check FET, Q5 and Q6 and the peripheral circuits.
          - No good → Check and replace IC1.
      - No → Replace IC1 or IC2.
    - No → Replace.
  - No → Replace Tr, Q1 and check R1, D14, D15, D4 and D5.
    - No good → Replace.
- No ↓

Check R1 for disconnection.
- No good → Replace.
- OK ↓

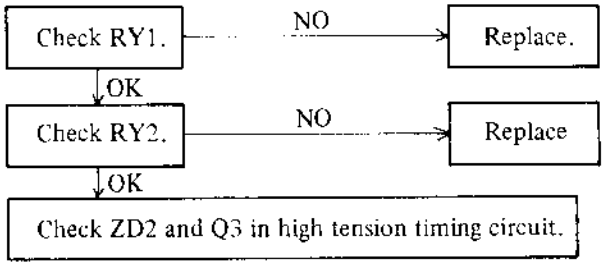
Check if 24V is applied bttween the collector of Q206, connecting the control circuit and CN2, and the earth.
- Yes → Connect CN2
- No ↓

Check S206, Q205, Q206 and CN2 to see if they are normal or defective.

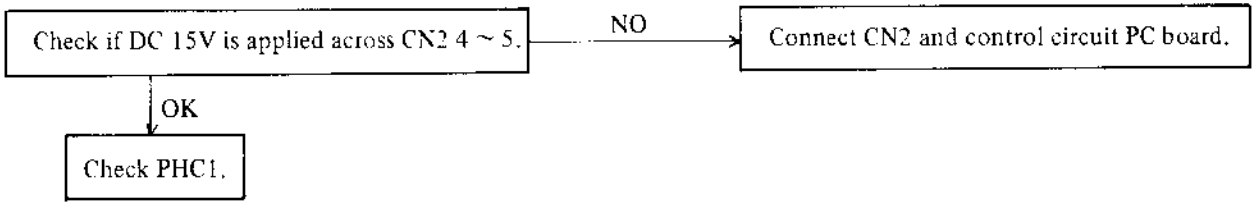


to see if they are normal or defective.

Discharge of high tension does not stop, with the lamp lit up.



The lamp does not turn to full lit-up position, with the knob main set to DOUSER.



○ Main troubles in power section and countermeasures

1. Blow-out of main fuse: ———— Defective Q1, Q2, D1, D14, D15, R1 and TRIAC

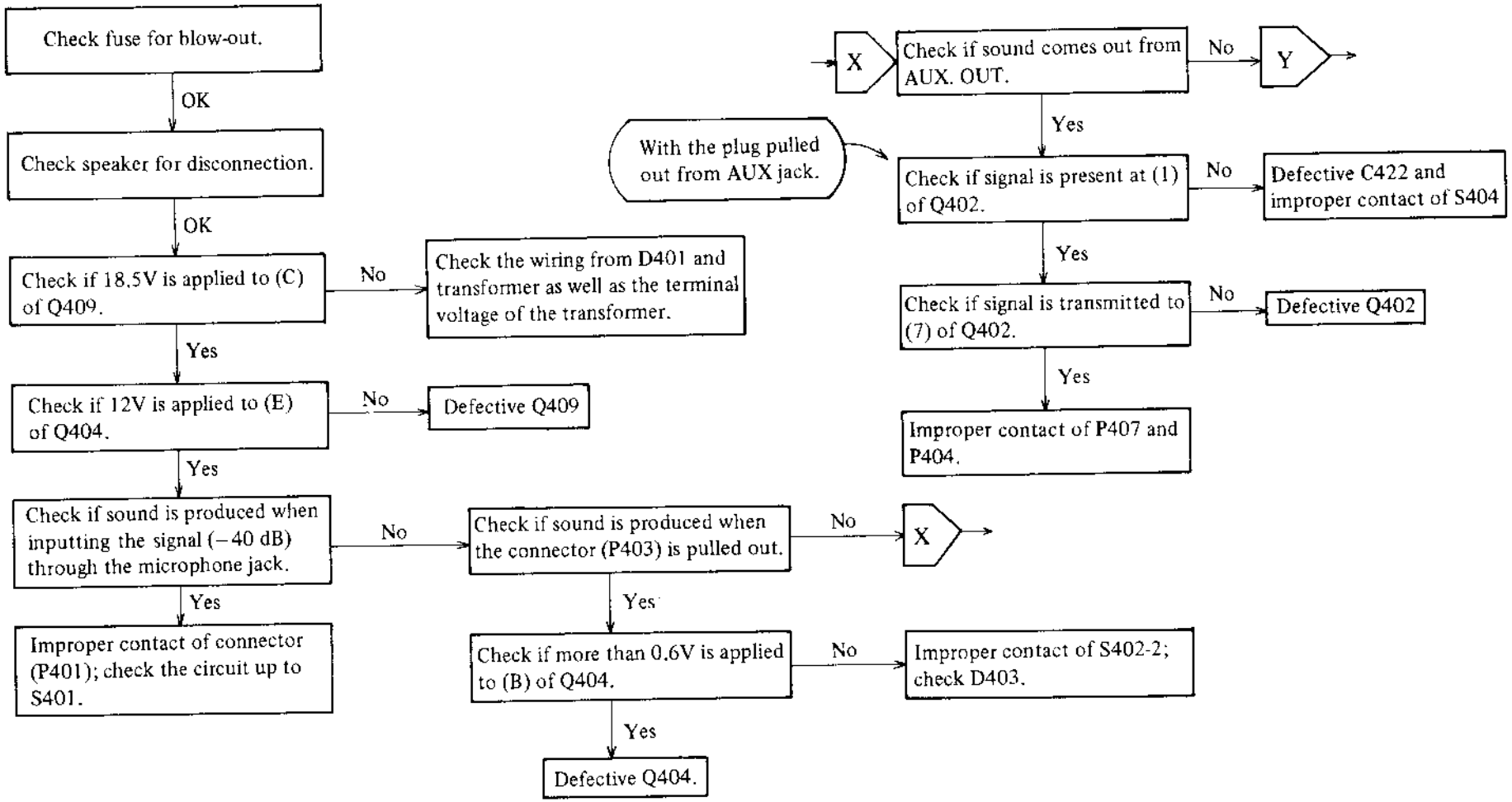
2. Failure in generation of high tension (no-load voltage is not applied across the lamp): ———— Defective Q1, Q2, D4, D5, D14, D15, R1 and RY. Check the signals of IC1 2 and 3 pins,

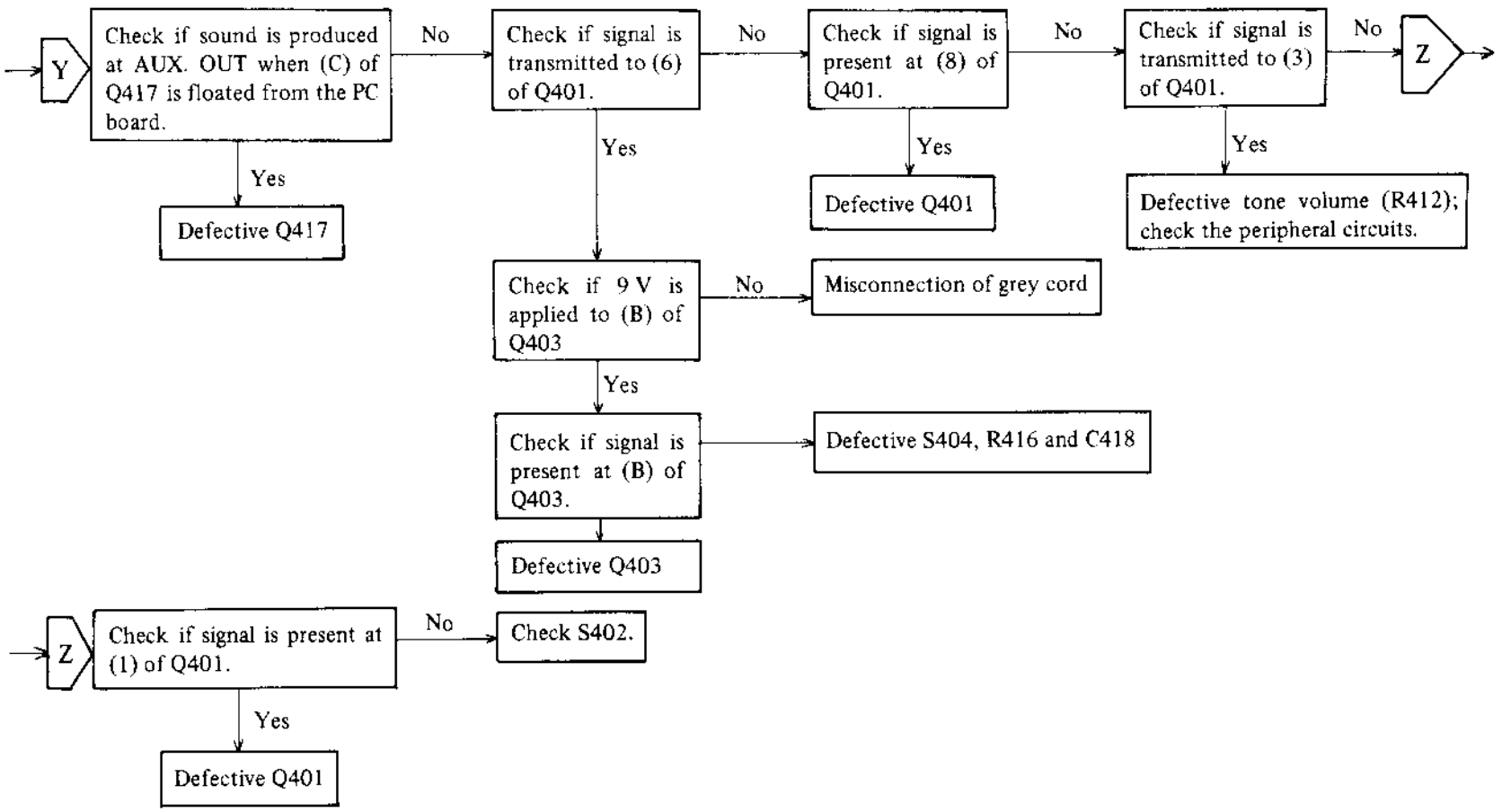
Note: BE SURE to disconnect the high tension generating circuit when repairing the power section, since it is very dangerous.

Ⅲ — 4 — 2

Applifier circuit

- Failure in replay (optical/magnetic)

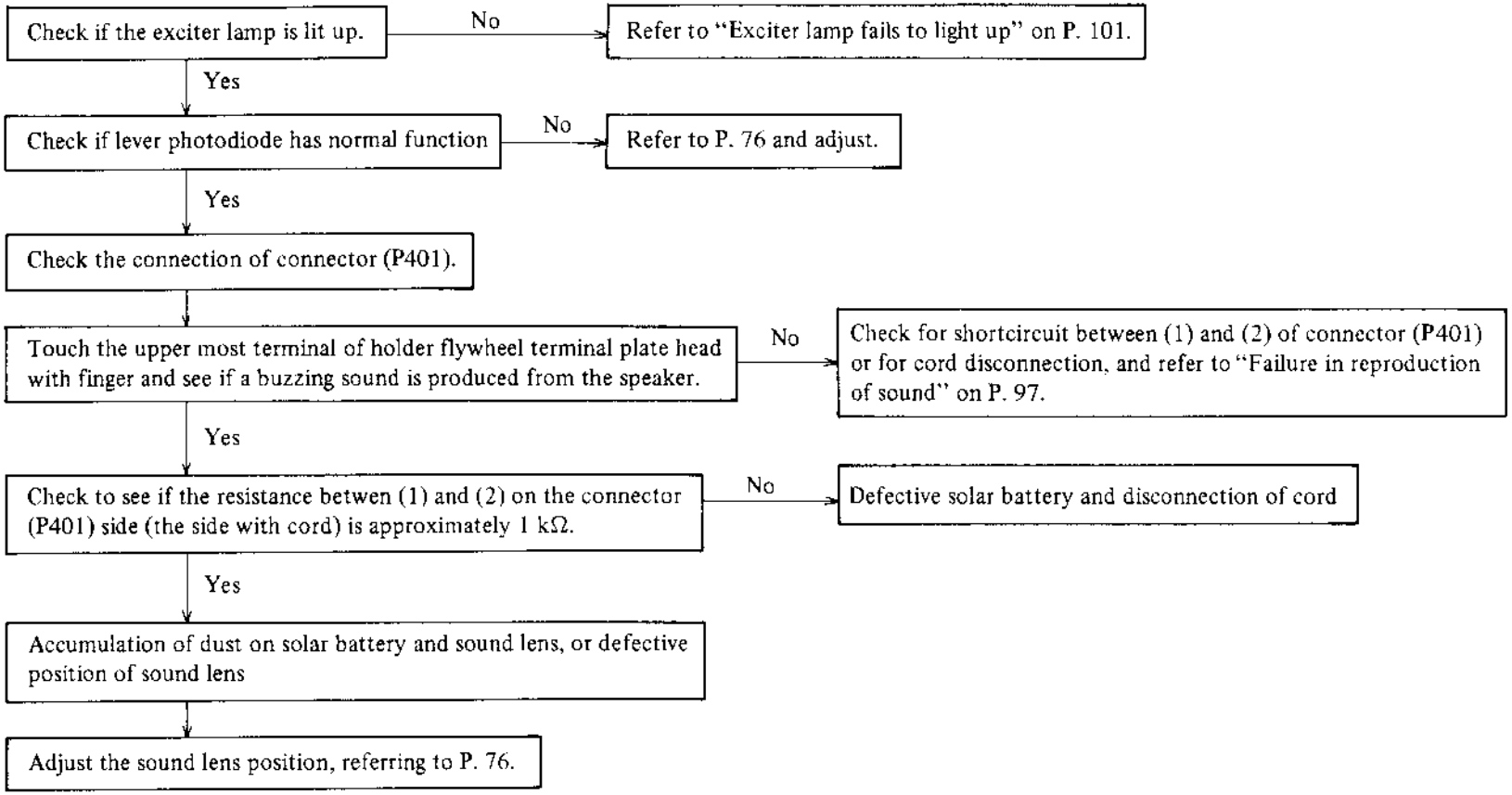




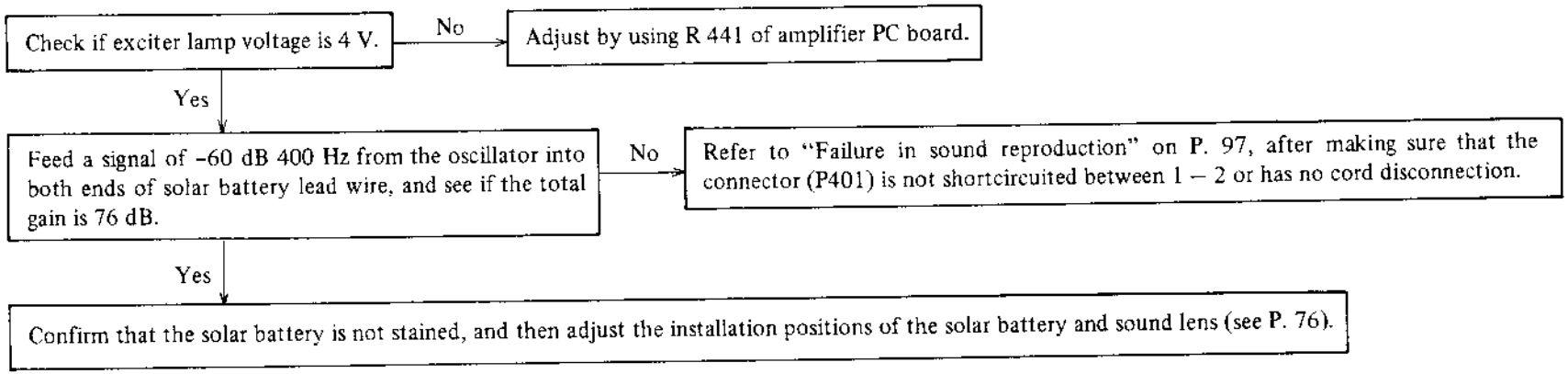
- Inner speaker fails to produce sound (sound is normal when extension speaker is connected).

Check the speaker voice coil for disconnection.
↓
Check for defective cord connection to the speaker terminal.
↓
Check the connector (P404) for misconnection.
↓
Check the switch circuit of extension speaker jack (P407) for defective contact.

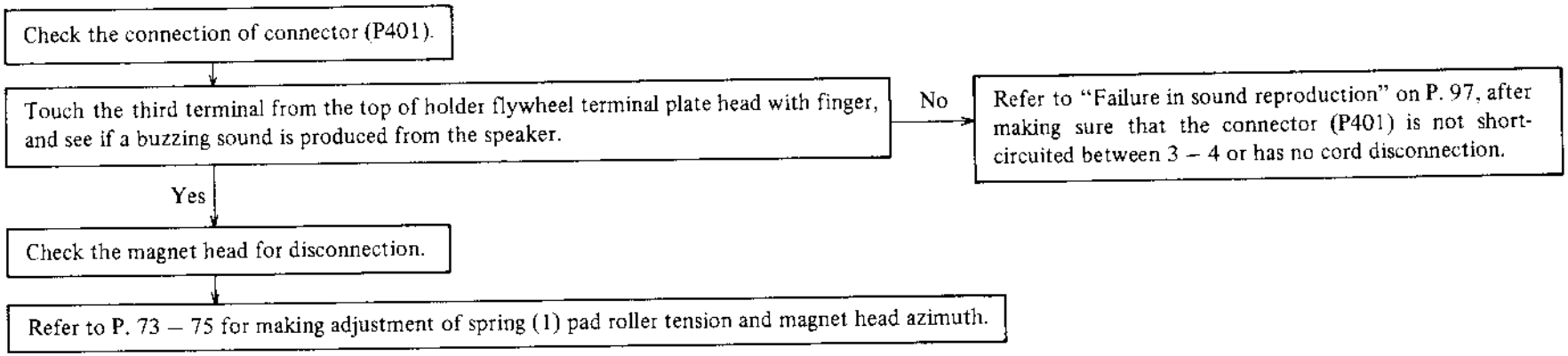
- Optical sound is not produced (with normal microphone and magnetic sound).



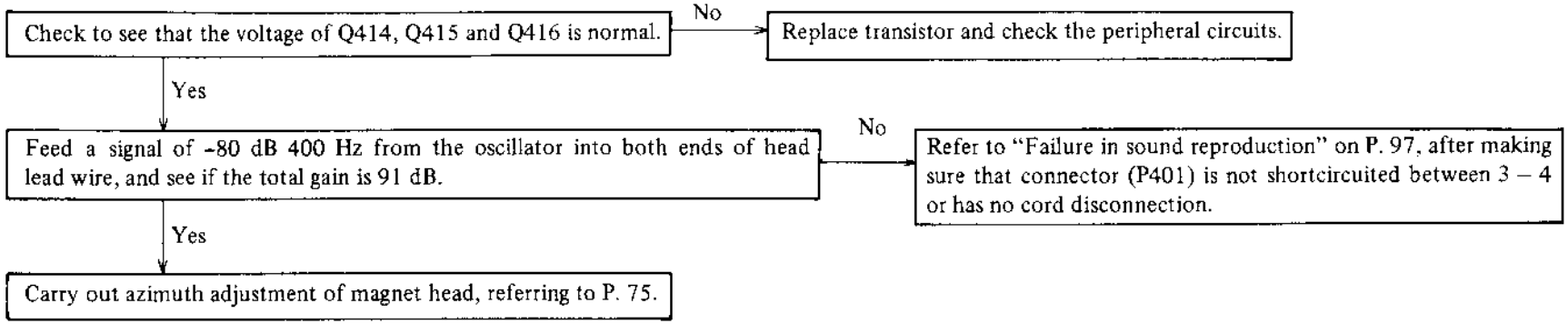
- Optical sound is small (with normal microphone and magnetic sound)



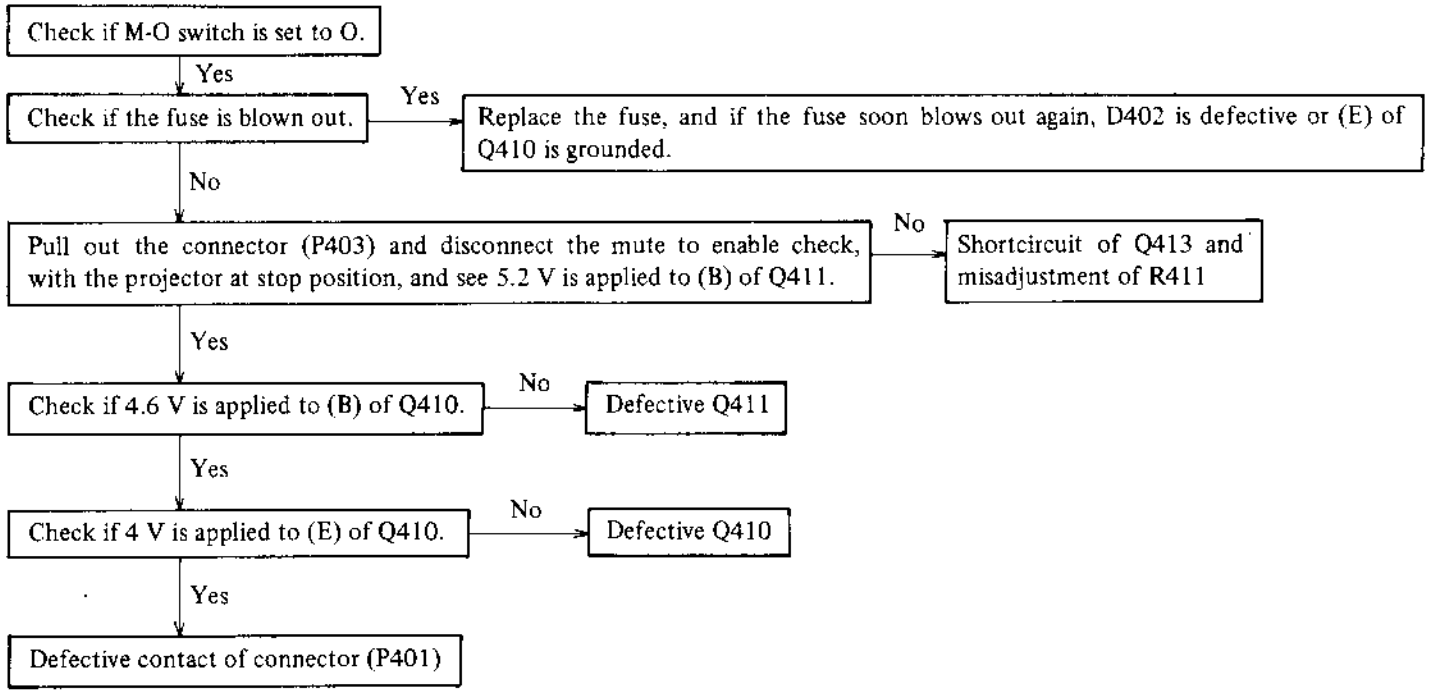
- Magnetic sound is not produced.



- Magnetic sound is small



- Exciter lamp fails to light up (muting activates, except for forward projection, causing the exciter lamp to fail lighting).



Defective contact of connector (P401)

- Amplifier fuses (F401 and F402) blow out.

Shortcircuit of bridge rectifier (D401)
↓
Shortcircuit inside the power IC (Q402)

- Exciter fuse (F403) blows out.

Check if the fuse blows out, with the switch interlocked with volume (S403)turned to OFF. —Yes→ Shortcircuit of bridge rectifier (D402)

↓ No

Check if the fuse blows out when connector (P401) is pulled out, in case it blows out, with the switch S403 turned to ON. —Yes→ Check if the pin section of P401 is grounded.

↓ No

In case the fuse blows out when P401 is inserted, check to see if the holder exciter lamp touches the terminal holding exciter lamp.

- Sound does not come out when microphone is used (with normal optical and magnetic sound).

Either the microphone itself is defective or the microphone jack (P405), S402-1 and S402-2 are defective.

- Noise during optical sound production

Check if the earth (black cord) of solar battery is not slackened and is not about to get disconnected.

↓

Check if the shield wire of connector (P401) is not about to get disconnected on the shield side.

↓

Check if the shield side of terminal plate head shield wire has no contact with the holder flywheel (i.e. there is no 2-point grounding).

↓

Check if the PC board amplifier and chassis fixing screws are not slackened.

↓

Check Q410 and Q411 when the exciter power source has excessive ripples.

- Noise during magnetic sound production

Check if the cancel coil fixing position is normal. ⇢ Adjust, referring to P. 75.

↓

Check if the shield side of the connector (P401) shield wire is not about to get disconnected.

↓

Check if the shield side of terminal plate head shield wire has no contact with the holder flywheel (i.e. there is no 2-point grounding).

↓

Check if the PC board amplifier and chassis fixing screws are not slackened.

IV TABLE FOR TROUBLES

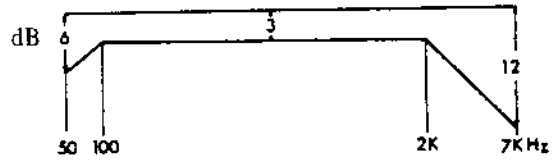
	Troubles	Pages to refer
Film feeding	Defective film feeding	48, 62
	Flickering of image (in transversal direction)	48, 52
	Flickering of image (in longitudinal direction)	52
	Flowing of image	48
	Excessive large feeding sound	48
	Film cannot be set.	52
	Scratch of film	40, 44, 52, 62, 66, 68, 72
	Failure in focusing	19, 60
	Upper loop disappears.	62
	Lower loop disappears.	68
	Continuous activation of loop restorer	19, 70
	Loop restorer fails to activate.	40, 70
	Film gets cut off during initial projection.	66
	Defective quick review	66
	Reverse loading prevention deveice fails to activate.	54, 58, 68, 74
	Reverse loading prevention device does activate, but buzzer does not ring.	58 58, 80 80
Take-up and rewinding	Take-up arm does not fix.	44
	Failure in film take-up	44
	Uneven film take-up	66
	Excessively large sound during film take-up	40
	Failure in rewinding	38, 40
	Rewinding arm does not fix.	38
	Film slackens down.	38, 44
	Magnet clutch fails to activate (defective high-speed rewinding).	58, 80

	Troubles	Pages to refer
Sound	Amplifier fails to activate.	54, 58, 68, 97
	Sound does not come out.	19, 34, 97, 100
	Optical sound does not come out.	74, 100
	Defective optical sound	74, 100
	Noise during optical sound reproduction	103
	Magnetic sound does not come out.	74
	Defective magnetic sound	74, 100, 101
	Noise during magnetic sound reproduction	103
	Failure in M-O change-over	58
	Sound does not come out when microphone is used.	102
	Excessively large wow/flutter	44, 46, 56, 66, 68, 72, 74
	Inappropriate S/N ratio	74
Motor, lamp, etc.	Abnormal noise	46, 56
	Motor fails to rotate.	19, 54, 56, 58, 80
	Failure in change-over of Forward/Reverse rotation of motor	80
	Fan motor fails to rotate.	36, 54
	Unstable projection speed (excessively large wow/flutter)	46, 48, 56
	Lamp fails to light up.	19, 36, 54, 60, 95
	Lamp is lit up, but the image does not appear.	48
	Lamp fails to light up fully.	96
	Uneven brightness	60
	Exciter lamp fails to light up.	54, 58, 74, 101
	Remote control fails to function.	58, 68
	Power cannot be supplied.	54, 58

V. TOLERANCE

Item		Tolerance	Remarks
Pressure of side presser spring		45 – 55 g	Refer to page 52.
Protrudent length of claw tip		0.9 - 1.0 mm	Refer to page 48.
Framing adjustable amount		3 : 7	Refer to page 52.
Unsteady picture in forwarding	upward/downward	less than 3 mm	Project a registration film (P086) at 24 fps. The picture size is 1 meter width.
	rightward/leftward	less than 2 mm	
Projector speed in forwarding		23 – 25 fps	
Tension at take-up side		100 – 200 g	Refer to page 44.
Tension at rewinding side		150 – 300 g 600 – 800 g	Refer to page 40
Pressure of head lever spring		60 - 100 g	Refer to page 75.
Pressure of middle tension lever spring		30 – 70 g	Refer to page 66.
Pressure of pressure roller lever spring		200 – 300 g	Refer to page 68.
Pressure of guide roller (3) lever spring		20 – 30 g	Refer to page 70.
Pressure of pad roller spring		15 – 25 g	Refer to page 74.
Film scratch		After projecting the film 10 times, there shouldn't be scratch affecting the picture.	
		50 – 80 g	Refer to page 64.
		300 - 450 g	Refer to page 72.

V. TOLERANCE

Item			Tolerance	Remarks
Amplifier output	Maximum	Optical	over 30W	
		Magnetic	over 30W	
	Rating	Optical	over 25W	
		Magnetic	over 25W	
Distortion factor		Optical	less than 5%	Refer to page 77.
		Magnetic		
S/N ratio		Optical	over 40dB	Refer to page 77.
		Magnetic		
Wow/Flutter		Optical	less than 0.5%	Refer to page 77.
		Magnetic		
Frequency response		Optical		Refer to page 78.
		Magnetic