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Bell & Howell

**Instruction Manual
for the Model**

640

16mm Sound Projector

Bell & Howell

Model 640 16mm Sound Projector

This instruction manual gives a comprehensive description of every basic operating function of the projector. Throughout the text, reference is made to explanatory diagrams contained on a convenient "fold-out" sheet affixed to the inside of the rear cover.

It is most important that either the ACTUAL USER of the machine, or the dealer from whom it is obtained completes and returns the post paid Guarantee Registration Card affixed opposite this page. If, for any reason, the card has been detached when you receive the machine, please write to the address on the back cover of this manual quoting the serial number of the machine.

The model 640 offers scope for the most advanced professional recording of 16mm magnetic sound: in order that the user may obtain maximum performance a booklet on recording techniques will shortly be made available, and will be forwarded on request.

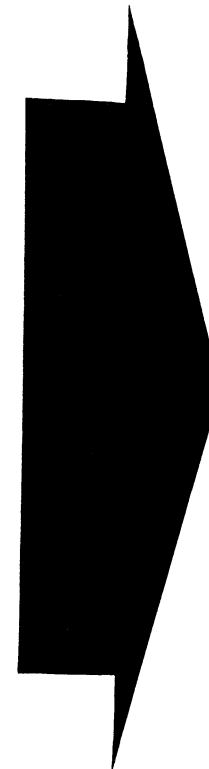
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- Enables you to obtain the full benefits of our guarantee.
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Address

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Purchased from.....

..... Date purchased.....

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GUARANTEE

This product of Rank Precision Industries Limited is guaranteed to be free from defects in materials and workmanship for one year from date of original purchase. This guarantee also applies to Taylor-Hobson lenses.

Should, in our opinion, any part of this equipment be defective in materials or workmanship it will be replaced or repaired free of charge (except for carriage), provided the equipment has been operated according to the instructions accompanying it.

This guarantee and undertaking does not extend to projection lamps or valves or other proprietary articles, which normally will be guaranteed by the manufacturer concerned.

No liability is assumed for damage to film, filmstrips, or slides, and no liability is assumed for loss damages or expenses resulting from interruptions in the operation of equipment.

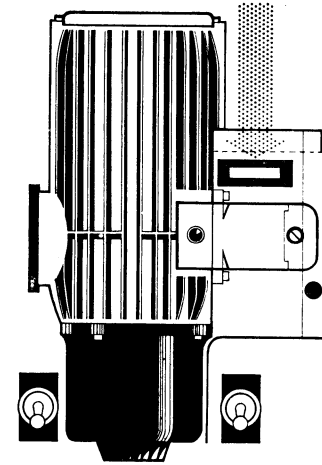
This guarantee and undertaking is only in favour of the initial retail purchaser. It is void :—

- (a) If the equipment has not been registered by completing the accompanying registration card and returning it, in the case of a purchase in the United Kingdom to Rank Precision Industries Limited or in the case of a purchase abroad, either to Rank Precision Industries Limited or their accredited overseas agents within 21 days of the date of original purchase.
- (b) If in our opinion the equipment has been damaged by accident, misuse or negligent handling or operation.
- (c) If the equipment has been altered repaired or serviced by other than approved Service Agents appointed by Rank Precision Industries Limited.
- (d) If adaptations or accessories other than those manufactured or recommended by Rank Precision Industries Limited have been made or attached.

Rank Precision Industries Limited

The Type and Serial Number of your Equipment must always be quoted in all Correspondence, Claims, etc.

The serial number of your projector will be found to the right of the lamp house.



Service facilities for Bell & Howell equipment are available throughout the world.

If you need advice or assistance with cine problems please contact your nearest accredited Bell & Howell agent, the address of whom may be obtained by writing to:

**Rank Precision Industries Ltd.,
Cine and Photographic Division,
Service Department,
High Street, Mitcheldean, Glos.
Telephone : Drybrook 421.**

IMPORTANT Fold out illustrations inside back cover for reference while reading manual.

CHECK LIST

Before commencing to set up the projector, ensure that you have all the appropriate items listed here :

There are two versions of the Model 640 projector : the 640S (Standard model) with separate 12-in. speaker in matching wooden case, and the 640C (Compact model) with portable 6-in. speaker and lead housed in a door on

1 25 ft. main Lead *
1 50 ft. Speech Lead
1 6 ft. "Y" cable *
1 1,600 ft. spool
1 projection lamp
1 practice film
1 microphone
1 400 ft. spool

In the Standard model these items of equipment will be found in the speaker case.

In the Compact model they will be found packed with the projector.

the projector blimp case. Both versions are intended for operation on 110 volts A.C. mains supply; for operation on 200-250 volts on A.C. mains, a transformer is required. The list below shows items of equipment normally supplied with each model :

1 4 volt .75 amp. exciter lamp
1 rear spring take-up belt
1 2 amp. amplifier fuse
1 cleaning brush
1 oil can
1 Edge stripe magnetic head
1 Full stripe magnetic head
1 take-up spool arm

These items are attached on the inside of the top front door of the projector, in both Standard and Compact models.

1 feed spool arm

Inside the projector to the left of the lamp and projector switches.

* For use with transformer : When operating directly from 110v A.C. mains a single 25 ft. "Y" cable is supplied.

SETTING UP

IMPORTANT: Throughout the following instructions, figures shown thus "(12)" refer to items shown on the illustration of the complete projector on the fold-out sheet at the rear of the manual. References to "Fig. 1a," etc. refer to complementary diagrams also shown in the fold-out sheet. For easy reference, have the sheet folded out at all times while using the manual.

Place the projector on a table or projection stand where it is easily accessible and conveniently located in relation to power supply and screen position.

Open the doors on the operating side of the projection case. First, the lower door which bears the plaque "Bell & Howell," next the upper door marked "Filmosound."

Check that the correct spares and accessories as listed on page 2 are attached to the inside of the open door.

Speaker Unit

Model 640S (Standard) is supplied with a separate 12-in. speaker in a wooden case, the Model 640C (Compact) has a 6-in. speaker housed in a door at the rear of the projector case. The following instructions apply only when the Standard speaker has been supplied. Instructions for the Compact model will be found on a later page.

Open the back of the speaker using the clip (see Fig. 1). Take out all the leads, and spares, and check them against the list on page 2.

Electrical Connections

Before attempting to make any electrical connections:

- (a) Find out the voltage of your electricity supply and whether it is A.C. or D.C. Your Electricity Authority or local dealer will supply the information.
- (b) Make sure that the projector switch (1), lamp switch (2) and amplifier switch (3) are in the "off" position.

All 640 projector models are designed to work from A.C. (Alternating current) at 110 volts, therefore, if your mains supply is in the range 200-250 volts A.C. a transformer must be used to supply the correct voltage to your projector.

Operating on 200-250 volts, 50-60 cycles A.C.

First set your transformer to correspond with the voltage of your electricity supply. The transformer is fitted with a voltage selector panel (Fig. 2a) carrying two setting screws. The panel is marked 0 and +10 (top holes), and 200/220/240 volts (bottom holes). The screws must be set to correspond with the voltage of the mains supply in use. This is quite simply effected, as in the following example:

With the top screw in the 0 position and the bottom screw in the 220 position the transformer is set for a mains voltage of 220 volts. If the top screw was now put into the +10 position, the 220 volts (selected by the bottom screw) would be increased by 10 volts, and the transformer would now be set for 230 volts.

You will see from this example that it is possible to set your transformer to correspond with any mains voltage between 200 and 250 volts. The transformer is now ready to be connected to the projector.

Take the 6 foot "Y" lead and plug the single end (Fig. 3b) into its matching transformer connector at (Fig. 2c). The two connectors at the "Y" end should be plugged into the projector as shown in Fig. 4—large connector to position shown at Fig. 4d, small connector as at Fig. 4e. All connectors can only be matched together into their sockets when they are in the correct position.

The transformer is connected to the mains supply with the single lead shown in Fig. 5. The rubber covered three hole connector is plugged into the transformer as at Fig. 2f, and the free end of the lead should be connected to a suitable 3-pin plug as instructed below.

Where the projector is being operated from a mains supply of 110 volts A.C. no transformer is required, and a 25 foot "Y" lead is supplied. The twin connectors are plugged into the projector exactly as already described, and the free end of the lead is then connected to a 3-pin plug as instructed below.

The free end of the mains lead terminates in 3 insulated wires. Connect the red and black wires to the smaller pair of pins in the mains plug, and the green wire to the larger earth pin. If your power supply is from 2-pin sockets only, then the green wire must be connected to a suitable earth point. If in doubt, consult a qualified electrician.

WARNING

DO NOT CONNECT THE PROJECTOR TO THE ELECTRICAL SUPPLY UNTIL YOU HAVE READ THE FOLLOWING PAGES.

Operating on Direct Current

For supplies of 200/250 volts a special resistance is required for passing current to the projector lamp and motor, and a converter unit must be used to provide 100-v. A.C. current to the amplifier. Both of these units must be adjusted to match the mains supply voltage. The standard resistance unit supplied is only suitable for the 750 watt projector lamp. If a 1,000 watt lamp is to be used, a special resistance unit will be required.

When operating on 110 volts Direct Current, it is only necessary to provide the converter to supply the amplifier with 110-v. A.C., the projector lamp and motor may be connected directly to the mains supply. Under no circumstances should the amplifier be connected to a D.C. supply.

Inserting the Lamp

Unscrew the bakelite cap (4) below the lamp housing and insert the projector lamp with its vertical tongue at its base towards the front of the projector (Fig. 6g). Rotate the lamp slightly so that the tongue passes through the prealignment slot in the lamp house, when the lamp can be pushed home out of sight. With the lamp in position, replace the lamphouse cap.

WARNING

A 1,000 watt lamp may be used where it is desired to show Sound films to a large audience. **Do not use the 1,000 watt lamp** when projecting Silent film at normal Silent speed (16 f.p.s.), since the reduction in speed effects the cooling efficiency of the fan, and this would give rise to overheating and subsequent premature failure of the lamp.

Connecting the Speaker

The speaker should preferably be placed near to the screen and above the heads of the audience, although the best speaker position will always be determined by experiment. As a general rule, it is usually satisfactory if most of your audience can actually see the speaker. Never place the speaker behind the screen however, and also avoid leaving the cable where your audience may trip over it.

Where a compact speaker has been supplied, it will be found fixed to the door (Fig. 7h) on the opposite side of the control panel. Open the door from the inside by passing your hand in front of the projection lens and pushing on the roller clip. The speaker is attached to the top of the door by two press studs, and can be easily removed.

Coiled round the rear of the Compact speaker is a 25-ft. cable, one end of which is permanently connected to the speaker, the other terminating in a 2-pin plug. This plug should be connected to the projector "8 ohm" output position, as shown in Fig. 4i.

For the Standard "12" speaker, two connections are necessary. Take the lead shown in Fig. 8 and connect the socket end to the speaker as at Fig. 9j and the other end is plugged into the "16 ohm" position as at Fig. 4k. The back of the speaker can now be closed, after leading the cable through the special cut-away channel at the lower right hand side.

Focussing the Projector

The motor, lamp and amplifier switches should be still in the "off" position and the clutch knob (5) turned to its fully clockwise position. Connect the mains plug and switch on the supply—the pilot lamp will immediately light. This illuminates the inside of the projector for film threading and automatically switches off when the top door is closed. It is controlled by the red push button (6).

Open the projection gate by raising the lever (7) on the right hand side of the projection lens. Loosen the lens locking screw (8) by giving a full anti-clockwise turn, and remove the lens by pulling it forward out of its mounting. With the lens removed and film gate lever raised, withdraw the gate shoe (Fig. 10) by grasping the metal frame which protrudes at the rear of the lens mount. Clean the gate shoe with

a soft cloth, moistening it if necessary, to remove obstinate dirt. The inside frame edges of the shoe are cleaned with the brush supplied with the accessories on the upper projector door.

Replace the gate shoe in its guides, taking care that the shoe is pushed fully home, where it will click into position. The lens should also be replaced but the lens locking screw remains loosened.

Now, switch on the projector and lamp switches (the lamp will not light until the projector is switched on).

Operate the tilt knob (9) to adjust the projector elevation so that the beam of light falls on the centre of the screen. The tilt knob on the front of the projector case, raises or lowers the projector height, and holds it firmly in any set position.

Place your index finger on the variable aperture plate control (23) and move it backwards and forward. This adjustment either fully opens or partially closes the aperture—its full operation is explained in detail on a later page. At this stage it should be adjusted so that a full frame is projected on to the screen.

Revolve the lens in its mount until the outlines of the frame are sharply defined. If any dirt is apparent on the projected outline, the aperture and film channel should be cleaned as described on page 14. When sharp focus is obtained relock the lens with the lens locking screw. To adjust the size of the picture area move the projector nearer to or further away from the screen as required. After all adjustments are made, disengage the clutch and switch off the projector and lamp switches.

Place the amplifier switch (3) in the “on” position and after allowing a minute for the valves to heat, turn the optical volume control (10) clockwise until a hiss is heard in the speaker.

Inserting the spool arms

Remove both spool arms from their mounting in the projector case and upper door. Insert the front spool arm (Fig. 11) into the socket on top of the projector case so that the belt drive pulley is facing away from the two main front doors.

Insert the rear spool arm into the hole at the rear of the projector so that the large and small cog wheels are facing in the same direction as the front belt drive pulley. Pull out both the rear and front spring belts. These will be found in the channels on the left hand side of the sockets into which the spool arms have been inserted.

Pull up the front belt from the channel and lead it up and over the drive wheel on the spool arm, ensuring that the belt is not twisted. The rear belt should be connected to the drive wheel situated on the top cog wheel of the rear spool arm. The projector is now ready for lacing the film.

Threading the Film

Place the spool of film to be projected (a practice film is supplied with your equipment) on the top spool arm spindle. The spool must click firmly over the spool spindle. The empty take up spool must then be fitted to the rear spindle in the same way. Unwind about 4-ft. of film from the top spool. The film should feed from the lower front of the spool, and when using sound film with only one row of sprocket holes, the sprocket holes should be on the operator's side.

The practice film supplied has both an optical and magnetic sound track. To reproduce the magnetic sound track (either simultaneously, or independently with the optical track) the full stripe magnetic head must be inserted (Fig. 13). When using film with only an optical track, or when a magnetic track is not required, it is not necessary to insert the head.

Both the full stripe and edge stripe heads are stored in the pouch (39) attached to the inside of the upper front door. Full stripe head with the blue end, edge stripe head with the red end. The head is inserted into the projector to the left of the sound drum. The flat end of the head should slide along the metal runner in the socket provided (Fig. 13). For full details about magnetic stripes, see the "Recording Magnetic Sound" section on a later page.

The following instructions should be read in conjunction with the film threading diagram on the projector door.

1. BRING FILM INTO CASE AND AROUND FEED SPROCKET

Slip the film into the slot in the case at the base of the spool arm and between the rollers. Lead the film below the feed sprocket (13), and slide the film as far inwards as it will go. Press on tab (Fig. 14) to open the guard, pull gently on the film until the perforations seat over the sprocket teeth and then release the tab, so locking the film onto the sprocket.

2. FORM UPPER LOOP

Open the film gate by using the gate lever (7) which is located to the right of the projection lens which partially conceals it from view. The lever should be pulled outwards and upwards, away from the projector body. Now form the first loop, following the loop position outlined on the projector body. Pass the film through the channel behind the lens, being certain that it is fully seated in this channel, and close the gate by pressing down the gate lever as far as it will go.

3. FORM LOWER LOOP

Form the second loop, conforming to the lower outline, and slip the film over the take-up sprocket (14). Again press the film under the guard, and, while maintaining correct loop size, lock the film in exactly the same way as for the feed sprocket Now check your lacing.

To save possible film damage due to faulty threading, move the film through the projector by using the hand setting knob. The hand setting knob is to the right of the projection lens and it should be turned for several clockwise revolutions.

The film will be moved slowly by the sprockets, and the shuttle teeth will move it intermittently through the gate. Should the lower loop be lost, continue to turn the setting knob until the shuttle teeth are withdrawn, when the film may be pulled down to re-set the loop to the outline on the gear case. It is not possible to move the film downward through the gate unless the shuttle teeth are withdrawn. After adjustment, test the lacing again with the hand setting knob.

LACE FILM AROUND THE SOUND HEAD AND SOUND SPROCKET

Lead the film from the take-up sprocket (14), under the top roller of the stabiliser (see diagram on projector door), over the magnetic sound head (25), round the sound drum (16), under the bottom stabilising

roller, and over the final drive socket (15). At this stage the film guard tab must NOT be pressed. Press the film under the guide as far as possible and pull the film down as it passes over the sprocket. When the lower stabiliser roller is moved to its extreme right position by the tension of the film, open the film guard by pressing on the tab. Then free the film just sufficiently to permit the stabiliser to pull it back to the first available set of perforations. Release tab, permitting the guard to lock the film in place on the final drive sprocket. For clear sound it is essential that the film is tensioned around the sound drum.

LEAD FILM TO TAKE UP SPOOL

Pass the film under the spring loaded guide roller (40), then below the lamp house to pass under the rear guide roller (41). The film must then be inserted in the slot in the case and positioned between the rollers on its path to the take-up spool. It should pass around the bottom of the take-up spool, and the end be securely located in the slot in the spool hub. Take up the film slack by gently revolving the take-up spool clockwise.

If the magnetic sound track is to be used, the track pressure rollers must be placed in contact with the film. First twist the peg (Fig. 12, 1) in an anti-clockwise direction to disengage it from the locking bar, then allow the roller mechanism to press on the film.

OPERATION

With the projector threaded, turn off the room lights and switch on the projector and lamp switches, first ensuring that the clutch is in the anti-clockwise position. For showing the practice film, the direction switch (17) should be at "forward"; the sound/silent switch (18) at "sound." Put the Record/play lever (31) to "play" position.

To start projecting turn the clutch knob clockwise. Adjust the tone quality with the treble (34) and Bass (33) controls and to increase the volume use the optical volume control.

If reproducing a magnetic sound track, the volume must be controlled with the Magnetic/microphone volume control. By using their respective volume controls, both optical and magnetic tracks can be reproduced either independently or simultaneously. Volume controls not in use should always be set at zero.

When the first picture appears on the screen, loosen the lens locking screw and obtain critical focus

by rotating the lens in its mount. When the picture is sharp and clear, tighten the lens locking screw once more. If the picture is cut off on top or bottom, turn the framing knob (19) until the full picture comes into view. If this adjustment moves the picture off the screen, bring it back by turning the tilt knob (9) on the front of the projector case. No further adjustments should be necessary during projection of the film.

At the end of the film turn down the volume with the optical volume control as soon as the narration or music ceases. Switch off the lamp, but run the remainder of the film through the machine before disengaging the clutch. Allow the projector to run for at least one minute in order to cool the lamp, before finally switching off.

The Variable Aperture Plate

Your 640 projector is fitted with a Variable Aperture Plate, and this enables the projected picture to be set at any ratio between 1.34 : 1 normal picture and 1.85 : 1 for Wide Screen and VistaVision.

The aperture plate can be employed in a number of ways to bring flexibility and smoothness to the presentation of film programmes. By varying the aperture it is possible to have complete control over picture height, and with the availability of a new wider range of Taylor Hobson projection lenses, the 640 offers absolute versatility. Using these lenses in conjunction with the variable aperture plate, the picture can easily be adjusted to fill any size of screen with the projector remaining in the most suitable position.

To show standard films in the wide screen ratio, the projector must either be fitted with a shorter focal length lens, or where possible, moved further back from the screen.

By using your right index finger, the control (Fig. 10m) can be partially rotated. This adjustment varies the height of the aperture, and can be made even while the projector is running. Wide Screen ratio pictures are obtained when the aperture is reduced. To show pictures in the standard ratio, the aperture is kept fully open and the projector used normally. The exact setting position of the aperture plate control is always dependent upon projection requirements, but the correct adjustment will easily be found by experiment.

Lenses are available to suit every ratio and every location in focal lengths of: 1", 1½", 1¾", 2", 2¼", 2½", 3", 3½", 4".

Rewinding

To rewind the film remove the take-up spool (now full of film) and the empty feed spool. Interchange them to place the full spool of film on the feed spindle and the empty spool on the take-up spindle.

Take the film from the top of the full spool, over the projector case and on to the empty spool, so that it can rewind in an anti-clockwise direction. Ensure that the film is firmly secured in the slot of the spool hub, and give one or two winds to take up slack. Press in the take-up lock lever (Fig. 15n) on the take-up arm and, while holding it in, raise the empty spool on the take-up spindle to engage the rewind gears. While holding the spool in the raised position release the lock lever and the gears will then stay engaged. Switch on the "Projector" and the motor will now rewind the film. When removing the re-wound film from the take-up spindle, do not neglect to press the take-up lock lever to drop the spindle back into its take-up position.

RECORDING MAGNETIC SOUND

Magnetic Sound Tracks

Before a film can be used for making magnetic recordings, it must first of all be "striped." The stripe consists of a special iron oxide compound and is applied to the base of the emulsion side of the film—it is very hard wearing and is not affected by normal cleaning fluids. This stripe can be applied in different widths, and when a recording has been made upon it, it can either be used instead of or to supplement the existing photographic sound track.

Recording and playback is a similar operation to the familiar tape recorder, and a faulty recording can be erased and re-made as often as required.

On 16mm. single perforated films without a photographic sound track, the Full stripe is applied.

The Half stripe is applied to 16mm. single perforated films with an existing photographic track. By this means the film can carry two sound tracks, one magnetic, the other photographic.

The Edge stripe is applied to 16mm. double perforated film. The sound quality here is dependent upon the age and condition of the film, but satisfactory recordings can be made.

On all 16mm. films a Balance stripe is added next to the sprocket holes so that the film will always wind evenly on the spool.

WARNING: Once a magnetic recording has been made the film should not be stored in the speaker case, near the transformer, or anywhere close to a magnetic field, as this will partially erase a recording.

To record magnetic sound, set up the projector and lace the film exactly as described in the previous pages, first fitting in the appropriate magnetic head. Switch on projector—with the clutch disengaged—and move the record/play lever (31) to the “record” position. If the projector is not running the lever will not stay in position and a warning buzzer sounds. Once in the record position the lever cannot be moved manually, but it will automatically return to the “Play” position when the projector is switched off—but not when the clutch is disengaged. With the lever in “record” position, a recording level neon indicator (37) is revealed on the left hand side of the amplifier panel.

Plug the microphone jack into the top microphone socket (32) on the amplifier panel, and make sure that the track pressure rollers (36) are in contact with the film. You are now ready to record. Start the projector mechanism with the clutch and speak into the microphone in normal talking volume.

Adjust the recording volume by using the magnetic/microphone volume control and watching the recording level lights. For a correct setting, the bottom light should be flashing continually, and the top light flashing occasionally on the loudest sounds. The optical track can be recorded directly on to the magnetic track by turning up the optical volume; during any other recording, the optical volume must be set at zero.

To check the recording results at any point in the film, first stop the projector by turning the clutch knob to its full anti-clockwise position. Switch off the projector (the record/play lever will automatically return to “Play” position) and move the direction switch to “reverse.” Switch on the projector again, and run the film backwards by turning the clutch knob clockwise to start the projector. Stop at the desired spot by using the clutch knob again. Switch off the projector and place the Direction switch to Forward again. Start the projector and turn the clutch clockwise to start the film. Adjust the playback volume with the Magnetic/Microphone Volume control.

Note: The Direction switch must never be used while the projector is running.

If you wish to alter the recording, simply record again on the same section of film, making the required changes or adjustments. On re-recording, all previously recorded sound is automatically erased from the film.

When projecting the film, and playing back or recording a magnetic sound track, the volume is controlled by the magnetic/microphone volume control, not the optical volume. The bass and treble controls are not operative when a magnetic recording is being made; only when it is being played back.

The "Disc" socket (38) in the amplifier panel may be used to make magnetic recordings direct from a disc. Provided a means is available of varying the level of the input through the socket, the microphone may be used simultaneously so that a musical or other recorded background can be given to the commentary.

PUBLIC ADDRESS SYSTEM

With the play/record lever in the P.A. position, announcements or Disc music can be played through the microphone or disc inputs and transmitted direct through the speaker. This can be done whether film is being projected or not, and the volume is controlled with the magnetic/microphone volume. The amplifier must be switched on.

CARE AND MAINTENANCE

At all times the glass surface of the optical system of the 640 projector must be kept scrupulously clean with lens cleaning tissue, which may be obtained from your dealer.

Avoid scratching or rubbing the glass surface of the projection lens—dust may be removed with a soft camel hair brush applied very lightly and carefully. The lens is removed as described under the section, "Focussing the Projector."

Both the Magnilite Condenser (29) and the Main Condenser (27) are removed from the projector by pulling on the holder knobs. They should be cleaned frequently with the same materials used for the lens.

Occasionally, it is desirable to polish the reflector (26) and this is removed by pulling it out of the holder with a twisting movement. Polish carefully and replace.

The aperture and film channel may be cleaned by opening the gate and inserting the small cleaning brush into the channel. Hold it in a vertical position and close the gate partially to push the brush against the channel; then move the brush up and down to clean the channel. Never attempt to do this with the machine operating.

WARNING. DURING ANY CLEANING OPERATION THE VARIABLE APERTURE PLATE CONTROL MUST ALWAYS BE SET AT MAXIMUM HEIGHT OF PICTURE SO THAT THE APERTURE MASKS ARE FULLY WITHDRAWN BEHIND THE APERTURE PLATE.

Projector Lubrication

The application of Projector Oil at the proper points is a simple but very important part of maintenance.

Correct lubrication will assure long, trouble-free life of the projector. Lack of oil could result in serious damage. Oil cups and holes are readily accessible without removing any part of the machine whatsoever, and oil cups (28), should be given careful attention according to the chart below.

The felt reservoirs within the sprocket shafts should also receive periodic lubrication. Disconnect the projector from the speaker and transformer etc. and lay it on its side. Insert the tip of the oil can in the holes of the feed sprocket (Fig. 14) the take-up sprocket, and the final drive sprocket, squeezing the bottom of the oil can three times.

The track pressure rollers (36) should periodically receive one spot of projector oil. The oil must be applied carefully and any surplus removed immediately.

Lubrication Chart

	Silent Speed	Sound Speed
The middle Oil Cup	One drop of Projector Oil after each 8 hours of operation.	One drop of Projector Oil after each 4 hours of operation.
The two remaining cups	One drop of Projector Oil after each 32 hours of operation.	One drop of Projector Oil after each 16 hours of operation.
Sprocket Oil Holes	Saturate felt reservoirs every 6 months.	Saturate felt reservoirs every 3 months.

Lubrication of Re-wind Gears and Guide Rollers

After every 100 hours of use add grease to the rewind gears. To do this remove the thumb screw cap on the top of the rewind gears on the take-up arm and add grease as necessary. Then replace the cap and tighten it securely.

Place one drop of oil on the shafts of both the rear (41) and spring loaded (40) guide rollers and also on the shafts of the rollers at the base of each spool arm. This should also be done after every 100 hours of operation.

Exciter Lamp Replacement

The exciter lamp is situated beneath the three-sided metal cover at the right hand corner of the projector base. Unscrew the thumb nut (42) on the front and remove the cover of the exciter lamp shield and press the lamp down turning it slightly counter-clockwise when it can be lifted out. After a new exciter lamp is installed, and before it is lighted, wipe it with lens cleaning tissue to remove all fingermarks.

Fuse Replacement

A 2-ampere fuse (Fig. 4p) is provided in the amplifier. It should be checked immediately if the exciter lamp fails to light.

Always disconnect the mains lead before removing the fuse. Unscrew the insert marked "FUSE" for inspection. Never replace with a fuse rated at more than 2-ampere. To remove the fuse, insert the edge of a coin into the slot of the fuse holder, and turn it counter-clockwise.

Projector Lamp Replacement

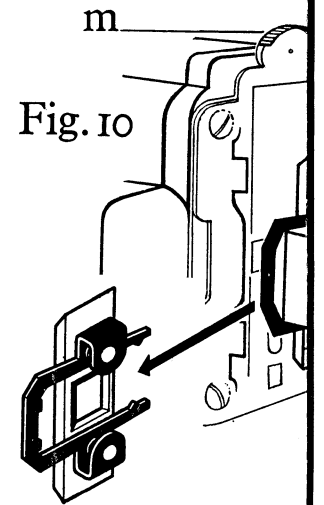
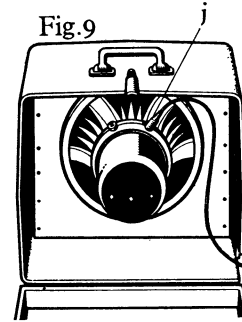
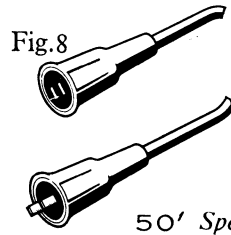
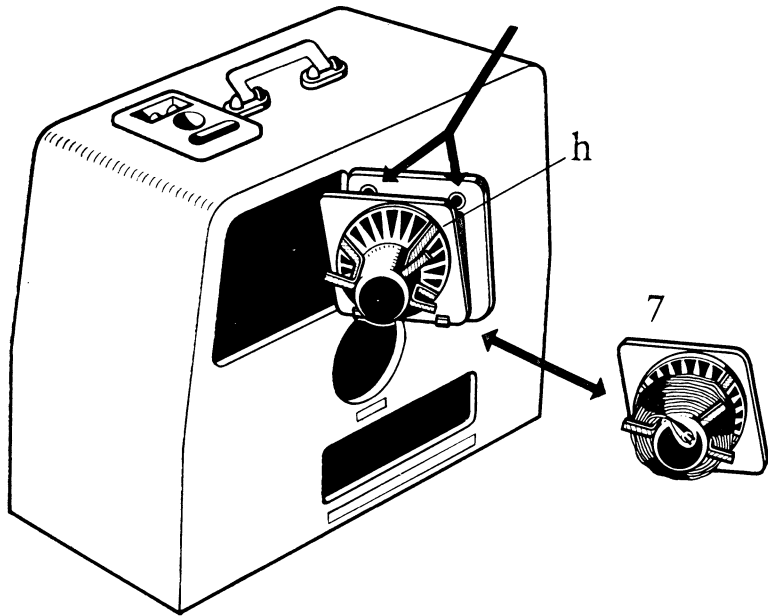
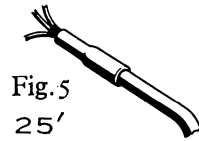
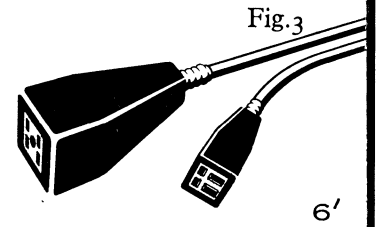
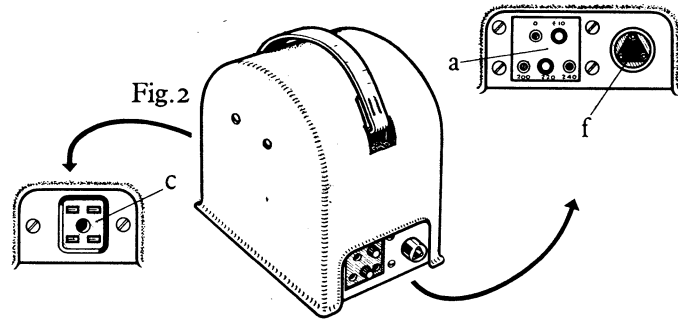
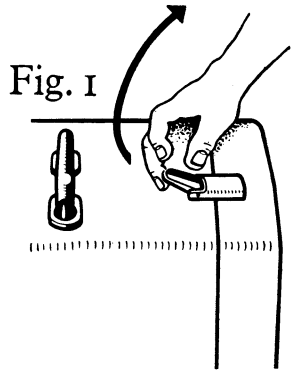
A replacement lamp is fitted in exactly the same manner as described previously under "Inserting the lamp."

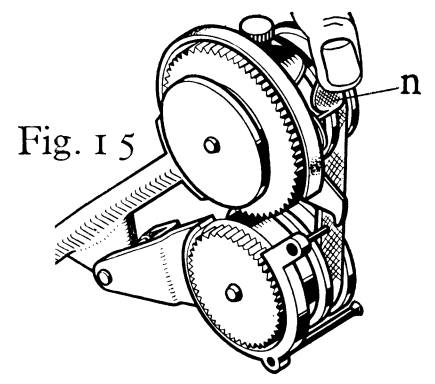
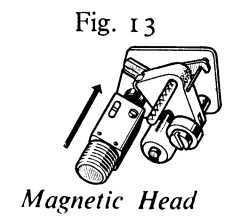
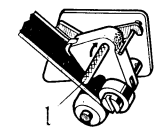
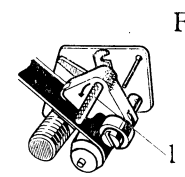
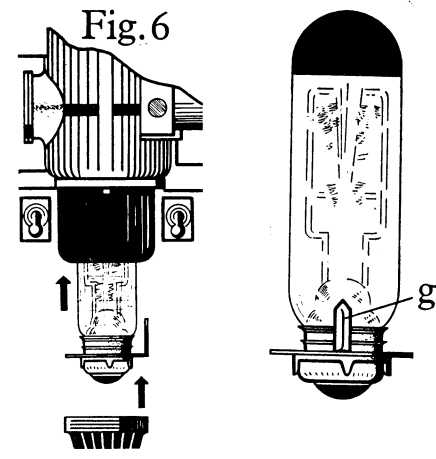
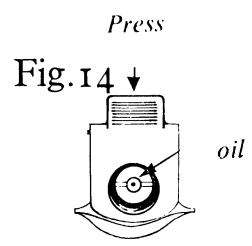
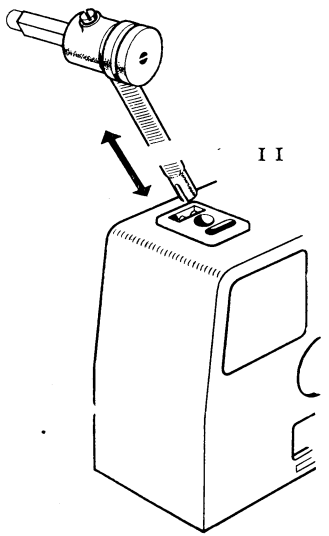
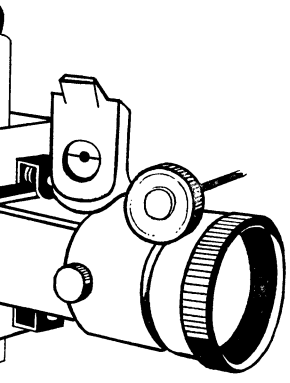
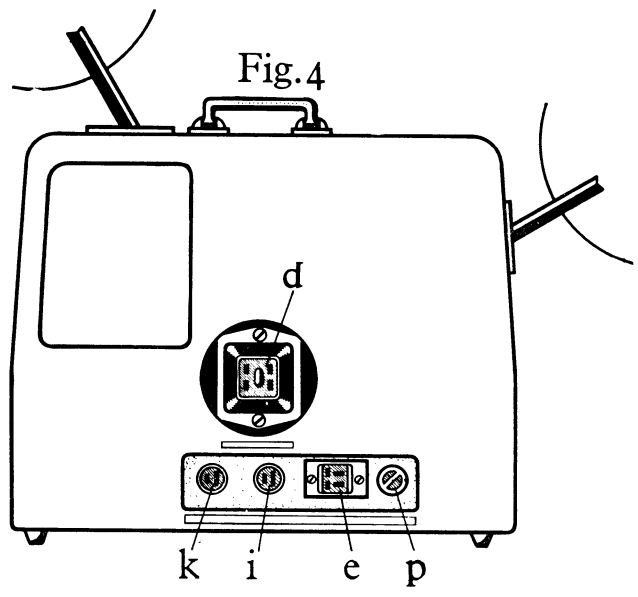
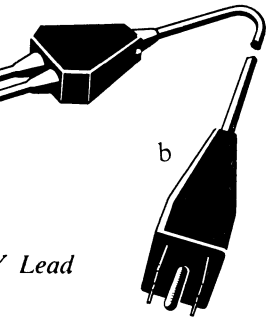
Before attempting to change a lamp, the projector **MUST BE ENTIRELY DISCONNECTED FROM THE MAINS SUPPLY.**

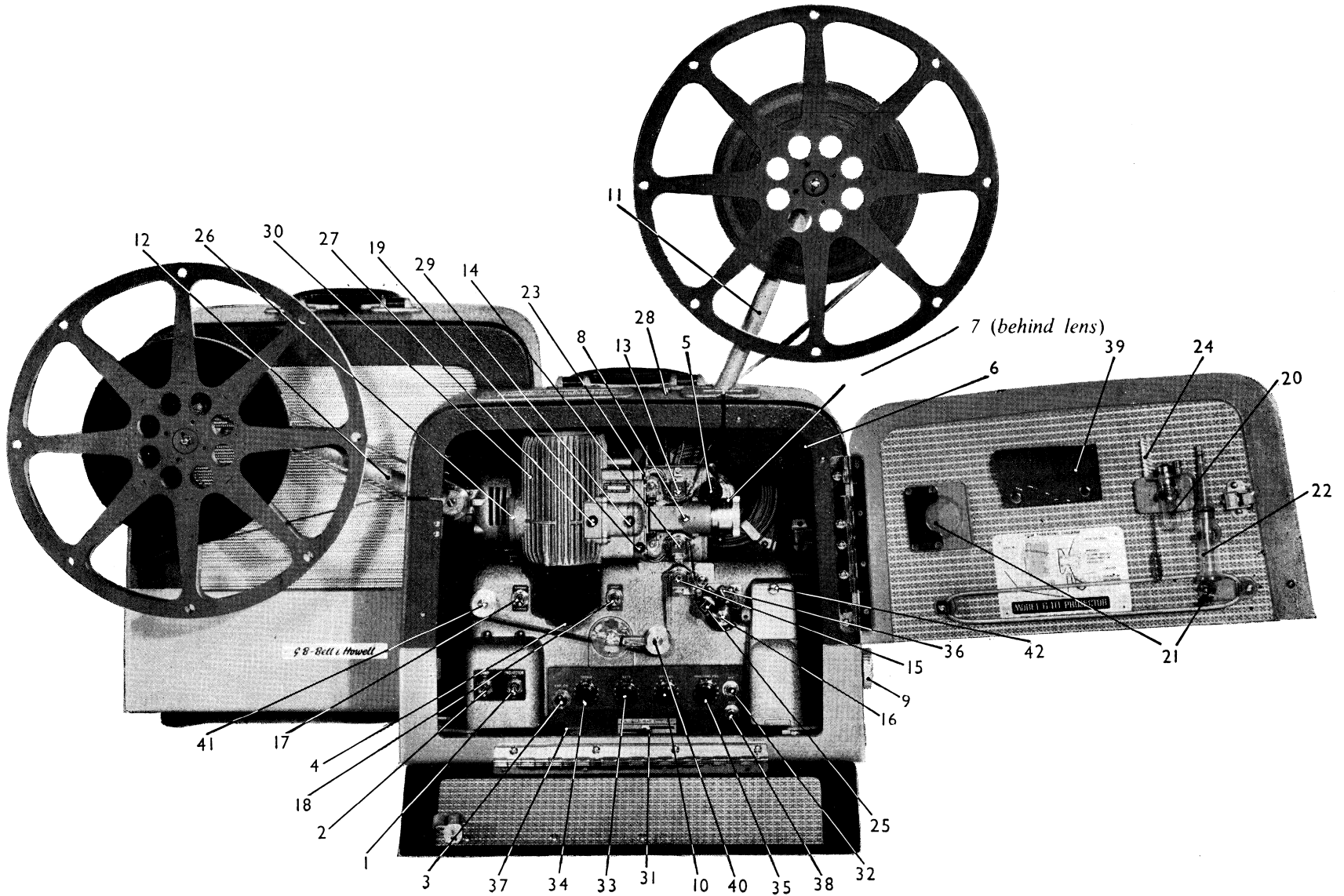
Replacing Spring Belts

The spring belts on the feed and take-up spool arms are straight belts with loops at each end which may be hooked together to form a continuous driving belt. To replace either of the belts unhook the loops where the ends of the belts join together, and withdraw the belt from the projector. To install a new rear belt, insert one end through the opening in the projector case, push it around the driving pulley and lead it back through the other hole in the case. Then hook the two ends together, squeezing them carefully together with a pair of pincers.

The driving pulley of the front belt is completely enclosed so that when the belt is pushed into one opening it will follow around and come out of the other. The driving pulley of the take-up spool belt is exposed and the new belt must be inserted in the pulley grove at the point where it comes closest to the projector. When the two ends of the straight belt have been hooked together to form a continuous belt, stretch them over the pulleys on the ends of the spool arms so that they will drive directly without a twist.







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