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RotoMatic

NO-REWIND SYSTEM

ST-200/ST-270

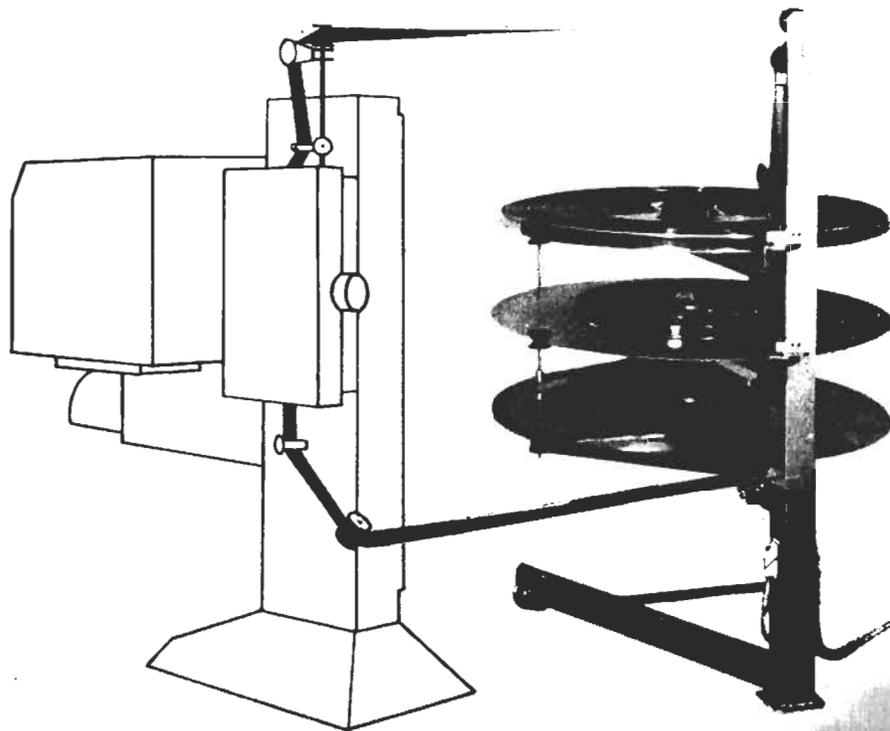


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## I.

### INTRODUCTION

- 1.1 The RotoMatic system is used in conjunction with professional film projectors and has the following advantages over normal film reels:

Very long programs may be projected without need for projector changeover. The longest program can be shown in one run (approximately four hours). For the standard version of this system the maximum film length is approximately 20,000 feet, and for the special version, the maximum film length is approximately 23,300 feet. The time consuming work of rewinding the film is eliminated so that there is no risk of film damage during rewinding. After the program has been shown, it is a simple matter to prepare for the next showing. During the operation, the film is not subjected to tensile forces; as a result, there is very little appreciable friction between the two subsequent layers of film and the splices are not heavily loaded. This means that, compared with large size reels, the film is less likely to be damaged.

- 1.2 Automation

All these features make the RotoMatic system extremely suitable for automation of projection booth activities. Fully automatic operation, for example, is possible when using the RotoMatic system in conjunction with a Norelco punched-card automation unit. Operation of hall lights, apertures, curtains and non-sync sound sources can also be controlled by this unit. In view of the various types of films such as CinemaScope, Wide Screen, etc., the projector must be suited for automatic lens and aperture changing. When the projector does not incorporate such facilities, two projectors are required. Each projector can then be used in combination with a separate RotoMatic system, but it is also possible to use the RotoMatic in conjunction with the projector on which the greatest length of film of the same type (e.g. CinemaScope) is to be run. The other projector can then be operated with normal film reels.

- 1.3 Versions

The standard version of the RotoMatic is supplied in two models, viz. a model suited for 35mm film only, and a model suited for 35mm as well as 70mm film.

A complete RotoMatic system includes:

- Control Unit
- Stand with three horizontal film discs
- Program make-up table
- A set of film guide roller arms for the projectors

The various units are designated by the following type numbers, and have the following weights (dimensions are given in Fig. 13):

|        |   |         |                       |          |
|--------|---|---------|-----------------------|----------|
| ST-200 | - | 35mm    | Stand                 | 301 lbs. |
| ST-201 | - | 35mm    | Control Unit          | 39 lbs.  |
| ST-202 | - | 35mm    | Program Make-Up Table | 97 lbs.  |
| ST-270 | - | 70/35mm | Stand                 | 331 lbs. |
| ST-271 | - | 70/35mm | Control Unit          | 39 lbs.  |
| ST-272 | - | 70/35mm | Program Make-Up Table | 99 lbs.  |

Electrically, control units ST-201 and ST-271 are identical. Only the alignment of SK7/SK8 differs for 35mm and 70/35mm operation.

Two sets each plug-in units and plug-in rings are supplied for the take-up and supply discs for the 35mm version.

For the combined 70/35mm version, one plug-in unit and plug-in ring (35mm) and one plug-in unit and plug-in ring (70mm) is supplied, making a total of two sets.

For feeding film in and out of the projectors special arms with guide rollers are available (See Chapter II - Installation).

The complete guide rollers for Norelco projectors may be ordered under the following part numbers (also see Figs. 15, 17, 19):

|              |                                     |                |
|--------------|-------------------------------------|----------------|
| <u>FP-20</u> | Top front                           | 4822 705 30977 |
|              | Top rear                            | 4822 705 30978 |
|              | Auxiliary guide roller              | 4822 705 30979 |
|              | Lower guide roller                  | 4822 705 30981 |
| <u>DP-70</u> | Upper guide rollers                 | 4822 705 30982 |
|              | Auxiliary guide rollers             | 4822 705 30983 |
|              | Lower guide roller                  | 4822 705 30984 |
| <u>DP-75</u> | Upper guide rollers                 | 4822 705 30985 |
|              | Lower guide rollers                 | 4822 705 30986 |
|              | Special adapter for DP-70 and DP-75 | 4822 705 30987 |

The height of the stand of the combined version is slightly greater than that of the 35mm version. This is because for 70mm film a greater length is required to twist the film between the upper guide rollers of the stand. This extension is obtained by means of a separate metal plate so that the actual stand remains the same for both versions. To insure proper film guidance, the guide rollers on the projector should be at the same height as those on the stand. The Program Make-Up Table supplied can also be employed for rewinding. This table is equipped with two discs for the 70/35mm version, thereby eliminating the use of normal film re-winder in the projection booth.

The RotoMatic system is suited for connection to 220V, 60 - cycle line voltage. For other line voltages an adaptor transformer must be used. When it is necessary to use an isolation transformer (in view of local safety regulations), it is advisable to order this transformer locally.

The RotoMatic equipment is packed in three cases. These cases have the following dimensions:

3'5" x 3'1" x 2'1½"  
3'10 7/8" x 6'8 3/8" x 1'11½"  
9½" x 4'8 3/4" x 4'8 3/4"

Total Gross Weight is 915 lbs.

#### 1.4 Working Principle

The three horizontal discs of the stand, having a diameter of 48" for the 35mm version and 52" for the combined 70/35mm version, may serve both as take-up and feed discs.

The feed disc is fitted with a plug-in unit which controls the speed of the disc. Via this plug-in unit, the film is fed to the guide rollers on top of the stand and then to the projector. The take-up disc is fitted with a ring onto which the film is wound. The speed of the take-up disc is controlled by means of a variable transformer driven by a large swivel arm. This swivel arm is pulled towards its extreme position by a spring, which is counteracted by the film which runs over a guide roller on the swivel arm. Thus, a balance condition is maintained which insures a constant tension on the film fed towards the take-up disc.

The system's functions are selected on the Control Unit. This unit has three rows of switches which, from Left to Right, determine the function of the upper, middle and lower disc. During projection the diameter of the roll of film on the disc will constantly change. Therefore, speed control is necessary.

For the feed disc, this is effected by the plug-in unit. The plug-in unit is provided with two microswitches which are actuated when the loop in the film to this unit is either too short or too long. As a result, the speed of the motor driving the disc is corrected to keep the film speed constant during the entire program. After a program has been shown, the RotoMatic can be prepared for the next showing by interchanging the plug-in unit and the plug-in ring and by re-programming the control unit correspondingly.

The program, which usually consists of several reels of film, is composed by means of the Program Make-Up Table. The program is also removed or broken down with the program make-up table. For this purpose, the center disc of the stand is used. The lower disc of the stand may also be used when 35mm film is to be transferred from the program make-up table to the RotoMatic. The program make-up table is controlled by the switches on its front panel. On this panel, a control has been provided with which the make-up and take-off speed may be controlled.

**NOTE:** Take-up speed control is possible only when SK10 is a double-pole switch. When mounting this switch in older type installation, allowance is to be made for the fact that points a5 and a6 of connector III may have been inter-changed (normally point a6 is phase - see Fig. 27).

In normal installation, the RotoMatic is placed between two projectors. The guide rollers on the stand are arranged so that the film may be fed either to the left or to the right, as required. A switch below the last guide roller on top of the stand provides electrical connection to one of the two projectors. The position of the switch knob also indicates the correct direction of threading the film, preventing misthreading over the last guide roller. Projectors which are to be used in conjunction with the RotoMatic system must be modified to obtain proper film feed-in and feed-out.

The number of guide rollers required depends on the type of projector and the available space.

For installation with Norelco projectors - types FP-20, DP-70 and DP-75 - one set of guide roller arms are supplied with each RotoMatic. For other types of projectors the arms supplied for Norelco projectors must be modified to fit the existing projector. If due to space restriction the stand of the RotoMatic cannot be placed between or directly alongside the two projectors, it will be necessary to determine the best way of feeding film into and out of the projectors. The guide rollers (consisting of two halves) are available separately and if necessary, supporting arms may be fabricated locally.

## II. INSTALLATION

2.1 The RotoMatic equipment is packed in three cases, as follows:

One case - 3'5" x 3'1" x 2'1½" - consisting of Program Make-Up table, Control Unit, plug-in unit, plug-in rings and the roller set for the projector.

One case - 3'10 7/8" x 6'8 3/8" x 1'11½" - consisting of Main frame.

One case - 9½" x 4'8 3/4" x 4'8 3/4" - consisting of three film discs and V-base.

✓ 2.2 After unpacking, the base should be secured to the frame with the four Allen bolts supplied. However, prior to mounting of the base, the electrical connections between the foot switch and the frame must be made. This can be done by means of the existing cable connectors.

✓ 2.3 Place the stand where desired and level the three support wheels on which the film discs are to be mounted. First check that the stand is in vertical position by a measure of both sides of the stand with a level. When the V-shaped base is level, this need not imply that the film discs are also leveled. Accurate levelling is essential to insure uniform loading of the bearings, freedom of movement of the swivel arm on the plug-in unit and to prevent a film roll from slipping from the disc when no plug-in ring is fitted.

✓ 2.4 The location of the stand depends on projection booth layout and available space. Normally, the stand is placed between two projectors or alongside two projectors. For such cases, complete sets of guide rollers for the projector for feeding the film in and out are available. When placing the RotoMatic between projectors, care must be taken that adequate space is available for operation of the projector itself.

✓ 2.5 Mount the three horizontal film discs on the support wheels of the stand by means of the screws supplied for this purpose.

2.6 Untie the large swivel arm and check that transformer T2 (Fig. 6) is driven when the arm moves. In the minimum position (arm pulled all the way back towards vertical column) the wiper of the transformer is practically at Zero. In the maximum position (arm all the way forward) the wiper is about half-way.

NOTE: ONCE FILM DISCS HAVE BEEN LEVELLED, DO NOT LEAN ON DISCS NOR PLACE ANY OBJECTS ON THEM.

- 2.7 With the earlier 35mm version of the RotoMatic system (prior to Serial Number 704) make sure that the marking dot on the gear wheel of the transformer is opposite the marking dot on the gear rack when the gear wheel and the segment are about to mesh. The swivel arm should then be almost in the minimum position.
- 2.8 Adjust the height of the film guide rollers on the vertical rod of the swivel arm. These three rollers must be in line with the film disc. In the 70/35mm version of the RotoMatic, rings 23 (Fig. 6) should also be adjusted in view of changeover from 35mm to 70mm operation.
- 2.9 Install the Control Unit and the Program Make-Up Table and connect the Control Unit and Program Make-Up table to the main column with the existing cable. The plugs and sockets are marked correspondingly. The length of the two cables between the Control Unit and the stand is 12 feet and the length of the cable between the Program Make-Up table and the stand is 9 feet (see Fig. 14).
- 2.10 If necessary, the Control Unit may be mounted to a wall; for example, by replacing the studs underneath the unit with fixing bolts.
- 2.11 The disc of the Program Make-Up table should be in line with the center disc of the stand. Alignment is properly effected by winding or rewinding a film between the Program Make-Up table and the stand.
- 2.12 The roller sets can be mounted on the projectors depending on the type of projector and available space. Figs. 15, 17 and 19 show the location of these additional guide rollers on projector types FP-20, DP-70 and DP-75, in the case of a standard installation. When due to lack of space, the RotoMatic system has to be installed in a different position relative to the projector; the best location of the additional guide rollers should be determined by the installing engineer. Additional mounting brackets for other than Norelco projectors must be fabricated locally.
- 2.13 Norelco FP-20 Projector:

The Upper and Lower magazines should be removed and the three brackets (Fig. 15) should be mounted on projector column. The location of the holes can best be determined after alignment with the aid of a length of film between the projector and the RotoMatic. The height of the upper guide rollers is approximately 73 inches; the lower guide roller is 26 inches. The frontmost guide rollers, which are provided with pad roller for holding the film in place, can be positioned differently in view of the film path to

the film path to the RotoMatic (i.e. - RotoMatic on the left or the right of the projector). When the projector is mounted on a high pedestal an additional auxiliary roller is required, otherwise the length between projector mechanism and lower guide roller is too great. This guide roller should be in line with the lower film guide.

#### 2.14 Norelco DP-70 Projector:

The Upper and Lower magazines should remain on projector. The film is then fed into and out of the projector mechanism via holes that must be cut in the magazines. For the Upper magazine this cut-out should be 1" x 3½". For the Lower magazine the cut-out should be 3½" x 3½". The edges should be de-burred and if necessary, provided with a plastic rim. The brackets for the guide rollers with which the film is fed into the projectors are mounted near the upper hinge. The height of the upper guide rollers is approximately 76 ¾" with respect to the floor. For the lower guide roller, this is approximately 25 inches.

The guide rollers are provided with a pad roller which retains the film. This roller differs for the 35mm and 70mm films. The rollers are adjustable after loosening the knob underneath the brackets.

The guide rollers on the bracket and the additional adjustable guide roller in the lower magazine can best be aligned with the aid of a length of film.

The adaptor pieces supplied should be mounted between the guide roller and the fixing bracket if the film is fed into the projector from the operating side (see Fig. 17).

#### 2.15 Norelco DP-75 Projector:

The Upper and Lower magazines should be removed and the two brackets with guide rollers should be mounted to the projector using the threaded holes provided (see Fig. 19).

The adapter pieces supplied should be mounted between the guide roller and the fixing bracket if the film is fed into the projector from the operating side (see Fig. 17).

When the projectors are tilted up or down, the guide rollers must be adjusted so that they are in a vertical position.

- 2.16 Mount the cabling between the Control Unit and the projectors in accordance with the connection diagram in Fig. 14. DO NOT FORGET to interconnect the ground terminal in the Control Unit to the ground terminal in one of the projectors.
- 2.17 Apply 220V line voltage phase from the projector to the terminal 61E of the Control Unit via a free "make-contact" of the projector motor relay. In the case of a two projector system, this should be effected for Projector X (terminal 61EX) as well as Projector Y (terminal 61EY) (see circuit diagram-Fig. 28).

When the projector motor relay is the 220V type, the voltage for the RotoMatic may be taken directly from the motor relay (61E or 61J).

- 2.18 Interrupt the circuit of the projector motor relay by removing the shunt between terminal 61C and 61D. These terminals must be connected to the corresponding terminals of the Control Unit to have automatic stopping of the projector in case of film rupture.
- 2.19 With the earlier 35mm version of the RotoMatic system (see circuit diagram - Fig. 27), an additional relay with break contact should be mounted in the projector. The break contact must be included in the circuit of the motor relay; for example, between terminals 61C and 61D. The relay itself is supplied via terminal 61H of the Control Unit.
- 2.20 The 220V supply voltage for the RotoMatic should be applied to points 60 and 20 of the Control Unit. Point 60 is phase (hot) and point 20 is null (return) - check with a voltage meter. The maximum power consumption of the complete RotoMatic system is approximately 400 watts.
- 2.21 The RotoMatic is only suitable for 220V line voltage. For other line voltages an adapter transformer is required. In the case of line without null conductor, i.e. phase on both wires, it is recommended to use an isolating transformer. However, this depends on local safety regulations.
- 2.22 After the electrical connections have been made, the voltage can be applied and after threading the film the RotoMatic can be tested. When the projector and RotoMatic are stopped, no loops should be formed in the film at the take-up disc. However, when there is a difference in run-out time, this can be eliminated by adjusting timing relay RE4 in the Control Unit. The time delay is adjustable by a disc on the relay.

2.23 Relays RE3 and RE10, resistors R1 and R2, and motor-end switches SK7 and SK8 are factory adjusted. Normally these components need not be re-adjusted after installation. Re-adjustment is only necessary:

RE3           When it appears that the film activates one of the two microswitches on the plug-in unit for too long. The time range of the relay is approximately 3-4 seconds.

RE10          If, during removal of the program with the Program Make-Up table, a loop is formed when stopping, although the brake on the feed disc functions correctly.

R1-R2         When the film does not unwind smoothly, so that the swivel arm of the plug-in unit moves from one microswitch to the other. When the resistance value is not correct it may also occur that the microswitch remains activated too long. The nominal resistance will be 200 to 220 ohms.

SK7-SK8       When the starting speed of the feed disc is too high or too low (SK7), or when with a minimum of film on the feed disc, the required speed cannot be attained (SK8).

The end switches are adjusted by turning the ring with cam on the motor shaft. Adjustment of these switches differs for the 35mm and for the combined 70/35mm version.

### III

### OPERATION

#### 3.1 Programming

**MAKING CERTAIN LEADER IS HEADS OUT**, place the first reel of film (commercial, cartoon, trailer, etc., or the first reel of the feature) on the disc of the Program Make-Up table. When the length of leader is insufficient due to the increased threading length between the RotoMatic and the projector, the leader must be removed and be replaced by a length of black film.

Fit the plug-in ring (35mm or 70mm) in the center of the take-up disc of the RotoMatic. (For 70mm, the middle disc must be used as it has the same height to the floor. For 35mm, the lower disc may also be used since the Program Make-Up table is provided with additional guide rollers.) Insert the leader into the plug-in ring and wind it onto the ring in a counter-clockwise direction. **DO NOT** use tape as this will cause problems when replacing plug-in ring with the plug-in unit when preparing for projection.

On the Control Unit, the power switch must be in the "On" position. The pilot lamp on the Control Unit indicates the presence of voltage.

The disc on which the plug-in ring is fitted is driven when button 4 of switch SKB (or SKC) on the Control Unit is pressed and switch SK10 on the control panel of the Program Make-Up table is operated (see Figs. 10, 12).

From Serial Numbers 704, the winding speed can be adjusted with the variable transformer on the control panel of the Program Make-Up table (T3 - Fig. 12).

After winding the first reel of film, the drive of the Program Make-Up table can be switched off by operating switch 10 again. The trailer may be removed if desired. Now place the second reel of film on the program table. If this is a continuation of the first reel of film the trailer of the first reel of film and the leader of the second reel must be removed. The beginning of the second reel can now be spliced to the end of the first reel by means of a guillotine splicer.

When the second reel is a separate film and there must be a pause between the first two films, the leader must be sufficient to allow the stopping and restarting of the projector. For the third and subsequent films proceed in the same way as for the preceding reels.

The trailer of the last reel should not be removed to allow stopping time for the projector. The trailing end of the film is fixed by inserting the supplied cornerpiece under the film reel and pressing it against the film.

After pressing button 5 of switch SKB on the Control Unit, the program is completed and the system can be prepared for projection.

### 3.2 Special Instructions for Film Handling When Using RotoMatic

When using the RotoMatic for make-up of the program, the following conditions must be observed:

1. For program make-up, a tape splicer for CinemaScope perforation must be used as well as the tape supplied by the manufacturer.
2. The leader of the first reel and the trailer of the last reel should remain on the film.
3. The above leaders should be lengthened by a piece of film long enough to span the distance between the RotoMatic and the projector.
4. Prior to program make-up, all other leaders and trailers should be cut off - always at the frame line between leader and first image frame; trailer and last image frame. All subsequent reels should be spliced together at the frame line.
5. Splices should be made with tape at both sides if Optical sound track. **MAGNETIC SOUND TRACKS MUST BE KEPT CLEAR.**
6. Leaders that have been cut off should be sorted out by reel number and safely stored for splicing when breaking down the program.
7. Splices should be marked with colored adhesive strips at the film edge opposite the Optical sound track in order to easily locate the splice when breaking down the program.
8. While making up the program from the Make-Up table, the speed control should be gradually accelerated until the appropriate speed is reached.

9. While transferring the film from the Make-Up table onto the center "B" disc of the RotoMatic, film should be inspected for torn or damaged perforations (repair), old contact strips (removed) or any other film damage.
10. When stopping the center disc of the RotoMatic for repair to film or upon reaching the end of the reel, the magnetic brake should be applied.
11. The end of the film, after make-up onto the large disc, should be held in place by the L-shaped angle bracket which is supplied with the system. NEVER FASTEN THE END WITH ADHESIVE TAPE.
12. The entire film path should be carefully checked after the film has been threaded.
13. When breaking down the program, begin with the last reel and end with the first one.
14. When breaking down into single reels, the tape on the splices should be removed from both sides of the film. DO NOT CUT OFF A PICTURE FRAME FROM THE FILM.
15. Leaders and trailers should then be re-spliced to the proper reels - AGAIN WITHOUT CUTTING - by applying strips of tape on both sides - utilizing the special splicer supplied by the manufacturer.

### 3.3 Preparing for Projection

It is assumed that the complete program is on the middle disc. Remove the plug-in ring from the middle disc and fit it on the take-up disc. This may be either the upper or lower disc. Should there already be film on another disc, which is not being used for the moment, the plug-in ring for 70mm may also be used for 35mm film.

The disc from which the plug-in ring has been removed is now used as a feed disc. For this, the plug-in unit should be plugged into the center of this disc.

After switching on the power, press buttons 1 and 2 of SKB on the Control Unit (see Fig. 10). Button B2 remains locked and button B1 is released. Button B2 can only be depressed after pressing button B1.

The leading end of the film, on the inside of the roll on the middle disc, must now be fed to the guide rollers at the top of the stand via the plug-in unit. For correct threading, follow the dotted line on the plug-in unit (see Figs. 2, 3 and 4).

After setting switch SK2 (Projector X - Projector Y) to the correct position, the film can be fed to the proper projector.

If the length of film is too short for further threading, the disc can be started by pulling at the film. When the loop in the film to the plug-in unit has the correct length, the disc automatically stops.

The additional guide rollers on the projector are equipped with a pad roller. When the projector is also suitable for 70mm, this roller should face the guide roller corresponding to the format to be used.

From the projector the film is fed to the lower vertical guide roller on the stand if the lower disc is used as take-up disc, or to the lower horizontal guide roller if one of the upper discs is to be used. If necessary, feed the film via the pivoting roller on the stand, and then via a guide roller on the vertical rod of swivel arm to the plug-in ring, where it is fixed.

The lower horizontal roller is adjustable thereby allowing the film to be fed in from left or right.

In the case of the 70/35mm version, the guide roller on the vertical rod must be placed in the correct position by moving the rod up or down as far as the stop ring (Item 23, Fig. 6).

Switch on the control section for the take-up disc by pressing button A3 or C3 of SKA or SKC on the Control Unit; SKA for the upper disc and SKC for the lower disc.

Any excess length of film causing a loop in the film to the take-up disc may be pulled taut by pressing the foot switch on the base of the stand.

To prevent mistakes it is recommended that the pushbuttons on the Control Unit be retained in the "On" position when not immediately projecting.

### 3.4 Projection

When the projector is started, the RotoMatic automatically starts. In case of film rupture both the projector and the RotoMatic stop automatically.

When starting the projector, check that the lamp on the stand is lit. This lamp indicates that the control section of the feed disc is ready for operation, i.e., the discs will be driven at full-speed immediately after starting.

When the film is to be stopped during projection, e.g., for Intermission, it is not necessary to press button 1 of SKA - SKC again, as the control section for the feed disc motor will be in the position suitable for the remaining film on the feed disc.

After completion of the show the RotoMatic is switched off by pressing button 5 of SKA - SKC and operating the power switch on the control panel of the Control Unit.

For subsequent shows it is advisable to use the upper and lower discs. The middle disc then remains available for adding or removing a second film, e.g., for a matinee or night performance.

When the above method is adopted, the operator should re-thread the film between performances. If this is not desirable for some reason (one operator for two theatres), the film can be re-threaded during Intermission. For this, the main feature should be at the beginning of the film roll and the supporting program at the end. Between the two films a length of black film must be inserted as required for running-out and re-starting of the projector.

### 3.5 Removing a Program

For removal of a program, the film should always be on the middle disc.

On the control panel of the Program Make-Up table, switch SK9 (Fig. 12) should be operated, so that the drive motor is lifted away from the disc, permitting it to run freely.

Place an empty reel on the platter of the Program Make-Up table. The film on the middle disc can then be fed onto the film reel.

The rewinding speed can be adjusted with the control on the control panel. For stopping, the brake on the middle disc must be activated by pressing button SK11. The speed control must then be turned back slowly. After rewinding, switch SK9 must be reset, pilot lamp LA3 on the control panel will then extinguish.

**CAUTION:** Whenever controlling either a motor on the stand or the make-up table, motor must always be started with control transformer T3 in its "Zero" position. If in any other position, fuses and rectifiers will blow and control transformer and motor will be damaged.

### 3.6 Changeover Projector X-Projector Y

When the RotoMatic is electrically coupled with two projectors, the left or right projector must be selected with switch SK2 at the top of the stand (Fig. 11). The position of this switch also indicates the direction of threading over the last guide roller.

At the bottom of the stand there is a bracket with a vertical and a horizontal guide roller. The horizontal guide roller is adjustable and must be shifted towards the stand when the projector is on the left of the RotoMatic. The guide roller is mounted in a slot in the bracket, and can be secured with a knob at the rear of the bracket. In certain versions the guide roller is screwed into a threaded hole. For changeover, the guide roller must be screwed into an adjacent hole.

### 3.7 Projector Conversion - 70/35mm

Converting from 35mm to 70mm is only possible with the RotoMatic ST-270, 70/35mm system.

Proceed as follows:

Insert the corresponding plug-in unit (35mm or 70mm) on the feed disc. Fit the appropriate plug-in ring on the take-up disc. The plug-in ring for 70mm is also suitable for 35mm film. The guide rollers on the vertical rod of the swivel arm must be in line with the horizontal film disc.

After loosening the knurled screw, the rod should be moved up for 70mm film and down for 35mm film. The travel is limited by two stop rings.

The bracket with two guide rollers at the bottom of the stand is adjustable in height. The upper position is for 70mm film; the lower position is for 35mm film. The bracket is secured with a knob. The guide rollers on the projectors are provided with a pad roller to retain the film. After loosening the knob at the bottom of the bracket, the appropriate pad roller can be applied.

When changing film size, it is also necessary to mount a different flange on the program table. This flange is located on the side of the table (Fig. 9).

### 3.8 Malfunctions

#### Feed Discs

Should the drive system for the feed discs fail during operation,

check first whether the malfunction is located in the plug-in unit. If necessary, this unit can be replaced by the spare plug-in unit.

When the defect is not located in the plug-in unit but in the control system of the motor, the speed of the feed disc can be adjusted manually with the variable transformer on the Program Make-Up table (T3, Fig. 12).

After pressing button 4 instead of button 2 of the proper switch on the Control Unit (SKA, SKB, SKC), switch SK10 on the control panel of the Program Make-up table should then be in the "On" position. This is possible only with versions where SK10 is a two-pole switch, i.e., from Serial Number 704 for ST-202 and ST-272. When SK10 is a single-pole switch or when the motor is defective, the motor can be released from the disc by removing the motor pressure spring, or by inserting an object (e.g. a nut) between the motor bracket and the support arm. The drive wheel is then no longer positioned against the support wheel of the disc, and the disc can then be turned by hand.

Projection can now be continued by turning the feed disc in the correct direction while starting the projector. At regular intervals the disc should then be accelerated, keeping in mind that the film loop to the plug-in unit should not become too taut.

#### Take-Up Disc

In case of failure of the drive system of the take-up disc, check first whether the malfunction is located in the switch by pressing button 3 again. Other malfunction sources are the motor or the variable transformer. When the motor is defective, the film disc can be driven manually after uncoupling the motor. The disc must be driven continuously as the tension spring of the swivel arm will pull the arm towards its maximum position. This will result in the projector being switched off (film rupture).

Another method is to wind the film directly onto a 3000-foot reel on the projector. As soon as the reel is full, the film is cut and the full reel is replaced by an empty reel - repeat process for rest of performance.

Should transformer in versions with Serial Numbers above 704 become defective, the speed of the take-up disc can also be controlled with the variable transformer on the control panel of the Program Make-Up table. For this, button 4 instead of button 3 on the control unit must be depressed and switch SK10 on the Program Make-Up table must be in the "On" position.

### 3.9 Maintenance

Maintenance of the RotoMatic system is restricted to regular cleaning of the film discs, guide rollers and switches to remove film dust.

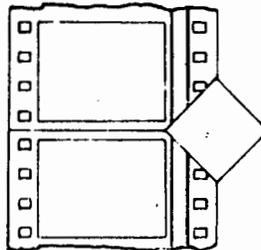
Lubrication of the rotary parts is not necessary. All the plain bearings are of the self-lubricating type. The ball-bearings contain sufficient grease for their entire service life.

The ball-bearing of the swivel arm of the plug-in unit must never be lubricated. To do so, will affect the proper operation of the apparatus.

To avoid failure during operation, it is advisable to check the carbon brushes of the DC motors once a year, and to replace them when necessary.

### 3.10 General Information

1. It is recommended splices be marked between different parts, to facilitate stopping at the correct point. Marking can be done by affixing a piece of colored tape - 10mm x 10mm - across the Optical sound track and the perforation, folding it over and sticking it to the back of the film (see illustration below).



The perforation which is covered can be cleared again by punching it with the splicer. By interrupting the sound track obliquely, the crackling noise is avoided.

2. After threading, the head of the film must be inserted in the plug-in ring of the take-up disc. By giving the disc a few turns, the film can be wound tightly onto the ring. The film should not be attached to the ring with adhesive tape as it will be difficult to change the ring for the plug-in unit when the film is to be shown again.

3. For the end of the film on the take-up disc, NEVER use adhesive tape, but use the L-shaped angle bracket supplied.

This bracket is placed underneath the film roll and pressed firmly against the film. If adhesive-backed tape is used, the last portion of the film will be pulled abruptly into the plug-in unit, thus causing breakage and damage to the perforations.

4. Certain operations such as renewing splices or contact foil are possible without rewinding. For example, in the event of film rupture, the two ends can be attached provisionally with adhesive tape. The projector can then be re-started and a strip of foam rubber, about 3/4" thick and 3-5 feet long, is inserted and wound together with the film. After the performance, this strip is taken out and the damaged portion can be picked up and repaired. The clearance in the roll of film will have no consequences for the next performance.
5. Small lengths of film can be removed in a similar manner as described under #4 above. For this operation, the beginning and end should be marked with a strip of foam rubber which is wound together with the film during projection. After the show the strips are removed and the spots to be spliced are cut.

The appropriate scene can now be removed and when it is very short, it can be manually wound onto a reel. When the film is too long for this, it can be fed onto the middle disc and re-wound via the Program Make-Up table. When the part removed need not be replaced by a new film, the two ends can be simply spliced together.

6. Fast rewinding may be desirable when a damaged spot somewhere inside the film roll is to be repaired and when no foam rubber has been inserted as described in #4-#5 above.

Via suitable guide rollers on the stand, the film can then be fed directly to the take-up disc, i.e. NOT via the projector. The film can be rewound at top speed by manually operating the control arm. However, the projector will then also run without film.

#### IV. DESCRIPTION

##### 4.1 Functional

The stand has three horizontal film discs, each of which is driven by a DC motor. The field winding of each motor is connected to a constant voltage and the rotor receives a variable voltage. Coupling between the motor and the disc is effected by a reduction gearbox and a friction wheel.

When a disc functions as feed disc, a plug-in unit is fitted in the center of the disc; this unit controls the speed of the disc. On the take-up disc, a plug-in ring is fitted. The film is now fed from the feed disc via the plug-in unit to the guide rollers at the top of the stand. The plug-in unit has a swivel arm through which the film is fed (Figs. 2-3). Coupled to this swivel arm are two microswitches. When the film loop is too taut or too slack, the swivel arm is pressed to one side, operating the appropriate microswitch. As a result, the speed of the feed disc is electronically corrected.

From the projector, the film is fed via the large swivel arm to the plug-in ring on the take-up disc. Depending on the loop in the film, the swivel arm will assume a certain position, which directly affects the speed of the take-up disc.

When the entire film has run through the projector, the system can be prepared for a new performance by interchanging the plug-in unit and the plug-in ring.

The third disc, normally "B", functions as a spare and may be used (even during a performance) for making up or removing a second program.

To make up a program from various films, or to remove a completed program, it is advisable to use the center disc as it is at the same level as the Program Make-Up table. Furthermore, solenoids are fitted underneath the center disc by means of which the disc is released from the drive and braked when a program is removed by use of the Program Make-Up table.

The control unit is connected to the stand via two cables. This control unit has three rows of switches with which the functions of the film discs can be selected. From left to right, this is A for the upper disc, B for the middle disc and C for the lower disc. For example: Using "B" disc as feed disc, depress button 1 of SKB which unlocks button 2 of SKB. Then depress button 2 of SKB and release button 1 (Fig. 10).

When disc A is used as take-up disc, button 3 of switch SKA must be pressed. For insertion and removal of a complete program, button 4 of SKB should be pressed. The fifth button of each of the three switches serves as an unlocking button for buttons 2, 3 or 4.

In the circuit diagram (Fig. 28) the relays are marked with a number inside the relay symbol. This figure indicates the number of contact that are used in the relay. The indication "t" denotes that it is a time-delay relay.

#### 4.2 Program Make-Up

When making up a program, switch SK10 on the Program Make-Up table must be closed. On the control unit, button 4 of switch SKB must be pressed. Normally, disc B is used for this purpose since it has the same height to the floor as the Program Make-Up table.

The 220V line voltage is fed to rectifier GR3 so that motor M3 is driven at full speed, thus winding the film from the table onto the plug-in ring of disc B. In later versions of the RotoMatic (see Figs. 27, 28) switch SK10 is a double-pole switch. This makes it possible to control the speed of disc B with variable transformer T3. This facility becomes useful when the disc contains a large amount of film. The winding speed may then become too high. During winding the film is constantly given a slight tension to prevent looping. This is achieved by means of drive motor M5, which remains coupled to the disc of the program table.

**CAUTION:** Whenever controlling a motor by use of variable transformer T3, prior to activating switch SK9, variable transformer T3 MUST BE IN ITS "ZERO" POSITION. Activating SK9 with T3 in any position other than "Zero" WILL RESULT IN BLOWN FUSES, RECTIFIERS BRIDGES AND WILL CAUSE DAMAGE TO VARIABLE TRANSFORMER T3 AND MOTOR.

#### 4.3 Program Breakdown

To remove a film it is recommended using disc B. This is due to the fact that solenoids are employed to release the drive motor from the disc, allowing the disc to run freely. Moreover, it is necessary for braking the disc at the end of the film. By closing switch SK9, solenoid RE12 is energized, so that the motor is released from the disc.

Motor M5 of the program table is driven via variable transformer T3. When rewinding is to be discontinued, button SK11 should be pressed. Relay RE9 now becomes energized so that the brake on disc B is applied via solenoid RE11. The brake remains activated because RE9 remains energized by its hold contact.

Relay RE10 is de-energized with a certain delay so that motor M5 can no longer be controlled by variable transformer T3. This delay is necessary to avoid looping. On completion of rewinding, SK9 is switched Off and Pilot Lamp LA3 is extinguished.

#### 4.4 Threading

When threading, the film is fed from the feed disc to the plug-in unit, through the guide rollers on the stand, to the upper guide rollers on the projector, through the projector, and via the lower guide roller on the projector and stand, back to the swivel arm and onto the plug-in ring of the take-up disc.

During the threading operation the projector is not running; therefore, relay RE1 in the control unit is not energized.

On the Control Unit, button 2 is pressed for the feed disc and button 3 for the take-up disc. When the film is to be fed through the projector, it is necessary to pull at the film. This causes the loop at the plug-in unit to become taut, operating microswitch SK5. Relay RE5 is now energized - 220VAC is applied to the bridge rectifier of the feed-disc motor via the closed contacts of RE7 and contact 3 of RE5.

Enough film should be unwound from the feed disc so that a slight loop is formed between projector and RotoMatic enabling film to be affixed to take-up ring. This loop can then be eliminated by operating footswitch SK4.

From transformer T2 via footswitch SK4 and button 3 on the Control Unit, the rectifier of the take-up disc motor receives supply voltage. When the loop is slack, the swivel arm is in its maximum position so that transformer T2 supplies the maximum voltage. The disc is automatically stopped when the swivel arm and transformer T2 are in the minimum position.

#### 4.5 Starting and Stopping

When starting a program, the feed disc should be at full speed. Due to the amount of film on the disc, the rectifier for the drive motor should receive full voltage. This is achieved by mechanically interlocking button 2 on the Control Unit.

Button 1 must be pressed first so that RE7 is energized and remains energized via its hold contact 1re7. Motor M1 which is coupled to control transformer T1, is driven via contact 2re7, until T1 has reached its maximum position. Transformer T1 supplies the rectifier for the feed disc via various contacts. When transformer T1 has reached its maximum position, the voltage is fed to lamp LA1 via motor end-switch SK7 which indicates system is at proper voltage and feed disc will start at full speed.

For Feed/Take-Up, see Paragraph 4.7, a and b.

During stopping (e.g. during Intermission) there should be no difference between the run-out times of the projector and the RotoMatic, otherwise looping can occur which could be dangerous when re-starting. To avoid this, the Control Unit incorporates an adjustable timing relay RE4 which insures that the motor of the take-up disc remains energized so that no looping occurs. In that case, there is a connection from T2 via 1re4, 3re7 and button 3 to the rectifier. Relay RE4 is connected in parallel with RE1 via contact 2rel. Therefore, as soon as the projector is switched off RE4 is de-energized with a time delay.

#### 4.6 Film Rupture

When film ruptures, the film will not reach the take-up disc. The swivel arm which is coupled with transformer T2 then goes to its maximum position. Microswitch SK3 is then operated and via selector switch SK3, either relay RE8 or RE13 is energized. These relays interrupt the circuit of the motor relay in Projector X or Projector Y. The projector and the RotoMatic are then automatically switched off.

In the earlier versions of the RotoMatic (Fig. 27) film rupture fail-safe was accomplished by an additional relay mounted in the projector. Relay RE8 then functioned as a selector switch between Projector X and Projector Y.

#### 4.7 Disc Speed Control

During operation, the diameter of the roll of film on the disc varies between 16 and 43 inches. To insure proper film winding, the speed of the disc must be continuously compensated.

##### a. Feed Disc

In the center of this disc a plug-in unit is inserted. This unit is provided with various guide rollers, a swivel arm

through which the film is fed and two microswitches.

When the loop in the film fed into the plug-in unit is too slack or too taut, the swivel arm operates microswitch SK6 or SK5. As a result, relay RE6 or RE5 is energized. Via contact 2re5 or 2re6, pulse relay RE2 is energized. Motor M1 is then briefly supplied with 220VAC. When microswitch SK5 is closed, motor M1 rotates clockwise via contact 1re5, and when SK6 is operated the motor runs in reverse.

Motor M1 is coupled with transformer T1 which, in turn, controls the feed disc motor speed. Because the contact of relay RE2 is briefly energized, the speed variation of the disc may not yet be sufficient to obtain the correct loop length, so that neither the two microswitches SK5 or SK6 are released.

If after three seconds, one of the two microswitches remains closed, relay RE3 is energized. As a result, motor M1 is continuously driven, thus rapidly restoring the proper loop length. This speed control system has a certain response time as it is dependent upon the transformer reaching its final position.

Because of this response time, a second control system has been incorporated. The voltage of transformer T1 does not go directly to the rectifier of the feed disc motor, but is fed by a resistor so that voltage division occurs. In the "Rest" position, one resistor is switched in, namely - R1.

When the loop becomes too small, SK5 is operated. Contact 3re5 short-circuits resistor R1 and the voltage from transformer T1 is fed directly to the rectifier. The speed of the feed disc motor then increases. When SK6 is operated, resistors R1 and R2 are connected in series between T1 and the rectifier.

#### b. Take-up Disc

In the center of this disc a plug-in ring is inserted. The film from the projector reaches this ring via a roller on the large swivel arm. This swivel arm is coupled to transformer T2.

The take-up disc is now controlled by the voltage from transformer T2 via contact 3rel and button 3 of SKA, SKB, or SKC. When the speed of the disc is too high, the loop in the film will become too small, moving the swivel arm to its minimum position. As a result, the output voltage of transformer T2 is reduced.

When speed of disc is too low, film loop becomes too large. As a result, the swivel arm is drawn forward by tension spring (Item 3-Fig.8) causing output voltage of T2 to increase.

As a result of these voltage changes of T2, take-up disc is driven at proper speed for good film winding.

#### 4.8 Projector Selection

With switch SK2, at top of the stand, a selection can be made between electrical coupling of the RotoMatic with Projector X or Projector Y. The earlier versions of the RotoMatic differ from the present version as compared in Figs. 27 and 28.

#### 4.9 Reliability of Operation

In the present version of the RotoMatic the circuit associated with SK10 on the winding table has been modified.

Variable transformer T3 is now used to control both the wind and rewind speed. This manually operated variable transformer can be used to control the feed and take-up disc in the event a malfunction in the control system of these discs. For the feed disc, button 4 instead of button 2 on the Control Unit should be pressed. For the take-up disc, button 4 instead of button 3 on the Control Unit should be pressed.

Speed variations that may be required during operation can be obtained by manually controlling T3 on the Program Make-Up table.

V. TROUBLE SHOOTING

MALFUNCTION

CAUSE

REMEDY

Motors for discs A, B & C will not run in both take-up and feed-off position

220 volt failure; blown fuse; motors have no field voltage; field rectifier defective

Replace fuse.  
Test GR1 for short circuit; replace GR1.

RE 1 not actuated

Check SK2 - for 61E connected to correct switch position.

SK 1 defective

Check SK1 for proper connections - replace switch.

Motors for disc A, B & C will not run in feed-off mode.

Control transformer T1 defective

Replace T1

Micro switch SK6 on speed control stuck causing M 1 to over-shoot end switch and transformer end position. Shear pin breaks off drive shaft.

Check transformer and drive system for mechanical damage and replace/repair if necessary. Replace shear pin.

Film feed-off motor too fast and cannot be slowed down

SK 6 does not actuate; RE 6 does not energize; and control motor receives no voltage.

Replace SK 6

SK 5 stuck/defective causing control motor M1 to overshoot end positions of switch and transformer. Shear pin breaks off drive shaft.

Check transformer and drive system for mechanical damage and replace/repair if necessary. Replace shear pin.

Check SK 5 for jammed/shorted contact Replace if necessary.

RE 6 defective

Replace RE 6

Film feed motor runs too slow and cannot be accelerated.

SK 5 defective  
RE 5 defective

Replace SK 5  
Replace RE 5

MALFUNCTION

CAUSE

REMEDY

Film feed motor has jerky movement, ie. only after SK5 is actuated

Resistor R1 defective causing phase of T1 to be applied only when RE5 is energized.

Replace R1. Set wiper to approximately 200 ohms.

Film feed disc starting speed too slow.

Friction wheel has insufficient pressure on disc drum. Disc slips. Basic speed too slow.

Check motor pressure spring - increase spring pressure. Adjust switching cam of SK7 to left.

Friction wheel dirty.

Clean friction wheel.

Film feed disc starting speed too high.

Basic speed too high.

Adjust switching cam on SK7 to the right.

Film on feed disc actuates switch SK 6 too long

Resistance of R 2 too low.

Adjust wiper of R 2.

Pilot lamp for transformer reset (T 1) does not light up

R2 defective - control motor receives no voltage.

Check R2 - replace if necessary.

LA 1 defective

Replace LA 1.

Microswitch locking button (A.-B.-C.) defective. RE7 not energized.

Press other locking button - RE7 must energize.

Microswitch SK5 or SK6 or SK7 defective.

Check transformer and drive system for mechanical damage.

Defective shear pin on drive shaft.

Replace shear pin. Replace SK5, SK6 or SK7.

With projector in stop position, transformer (T1) goes to maximum position and pilot light glows.

Locking button microswitch lever stuck (Mechanically).

Readjust mechanical lever switches SKA - SKB or SKC.

Motors for discs A, B & C will not run in take-up mode.

Transformer T2 defective.

Replace T2. (Adjust basic speed with swivel arm pulled to rear most position. Disc should rotate slowly).

Transformer wiper arm does not make good contact with windings.

Readjust wiper spring tension.

MALFUNCTION

CAUSE

REMEDY

|  |  |   |
|--|--|---|
| Take-up disc starting speed too high.  | Gear of T2 out of alignment.   | Pull back swivel arm completely. Gear should no longer mesh with gear segment. Readjust gear wheel. |
| Drive motor of one disc does not run.  | T2 clamping screw loose.   | Adjust transformer. Tighten clamping screws   |
| Projector and Rotomatic are not switched off when film breaks.                             | Armature rectifier defective. Motor brushes worn or not properly seated. | Replace rectifier. Check brushes - replace if necessary.  |
| When projector stops during program take-up disc runout time is too short causing looping. | SK 3 (film rupture switch) defective or stuck.                           | Check SK 3 - replace if defective.  |
| Film is very slowly released from SK 5 or SK6. Setting of transformer T1 remains the same. | Delay relay RE 4 not adjusted properly.                                  | Increase time relay of RE4.   |
| Winding disc B blocked.  | Setting of RE 3 too long.  | Readjust RE 3 time approximately 3-4 seconds.   |
| Film take-off not possible.  | RE 3 defective   | Replace RE 3  |
| Pilot lamp "take-off" does not light up.   | Too much backlash in reduction gear.                                     | Replace Reduction Gear box of M 1.  |
| During takeoff (braking), loops are formed.  | Microswitch of button B3 "winding" defective.                            | Replace microswitch or switch assembly.   |
|  | Fuse VL 2 in make-up table defective. Delay relay RE 10 not energized.   | Replace VL 2. Adjust controls of RE9.   |
|  | LA 3 defective   | Replace LA 3.   |
|  | Time setting of delay relay RE 10 too short.                             | Readjust RE 10  |

VI COMPONENT PARTS and ILLUSTRATIONS

When ordering replacement parts, please specify Code  
Number of parts, type number and Serial Number of  
equipment.

| Item    | Code Number    | Description                           |
|---------|----------------|---------------------------------------|
| RE1     | 4822 705 30836 | Operating relay - 60 Hz               |
| RE2     | 4822 705 30837 | Pulse relay                           |
| RE3     | 4822 705 30838 | Timing relay                          |
| RE4     | 4822 705 30841 | Timing relay - 60 Hz                  |
| RE5-RE8 | 4822 705 30842 | Relay                                 |
| RE13    |                |                                       |
| GR1-GR4 | 4822 705 30852 | Rectifier (above S/N 704)             |
| GR1-GR4 | 4822 705 30853 | Rectifier (below S/N 704)             |
| T1      | 4822 705 30854 | Control transformer (above S/N 704) ✓ |
| T1      | 4822 705 30855 | Control transformer (below S/N 704)   |
| SK1     | 4822 705 30872 | Main Switch                           |
| SKA-SKC | 4822 705 30873 | Pushbutton Switch                     |
|         | 4822 705 30874 | Microswitch of SKA-SKC                |
|         | 4822 705 30875 | Pushbutton for SKA-SKC                |
| SK7-SK8 | 4822 705 30884 | Microswitch                           |
| M1      | 4822 361 60022 | Control Motor                         |
| LA2     | 4822 705 30866 | Lamp - 220V                           |
| VL-1    | 4822 705 30868 | Fuse - 3.15 amps                      |
| C1      | 4822 120 50167 | Motor Capacitor                       |
| R1-R2   | 4822 705 30864 | Resistor                              |
| 1       | 4822 705 30844 | Clamping spring for RE5-RE8           |
| 2       | 4822 705 30843 | Relay socket for RE5-RE8              |
| 3       | 4822 705 30891 | Terminal block - 12-pole              |
| 4       | 4822 705 30892 | Cable - 18-core                       |
| 5       | 4822 705 30867 | Lampholder                            |
| 6       | 4822 705 30871 | Fuseholder                            |
| 7       | 4822 705 30857 | Reduction Gearbox                     |
| 8       | 4822 705 30886 | Switching ring with cam for SK8       |
| 9       | 4822 705 30885 | Switching ring with cam for SK7       |
|         | 4822 267 60004 | Socket connector - 30-pole            |
|         | 4822 268 40003 | Shell for socket connector            |

Above Components are for ST-201 and ST-271 Control Unit

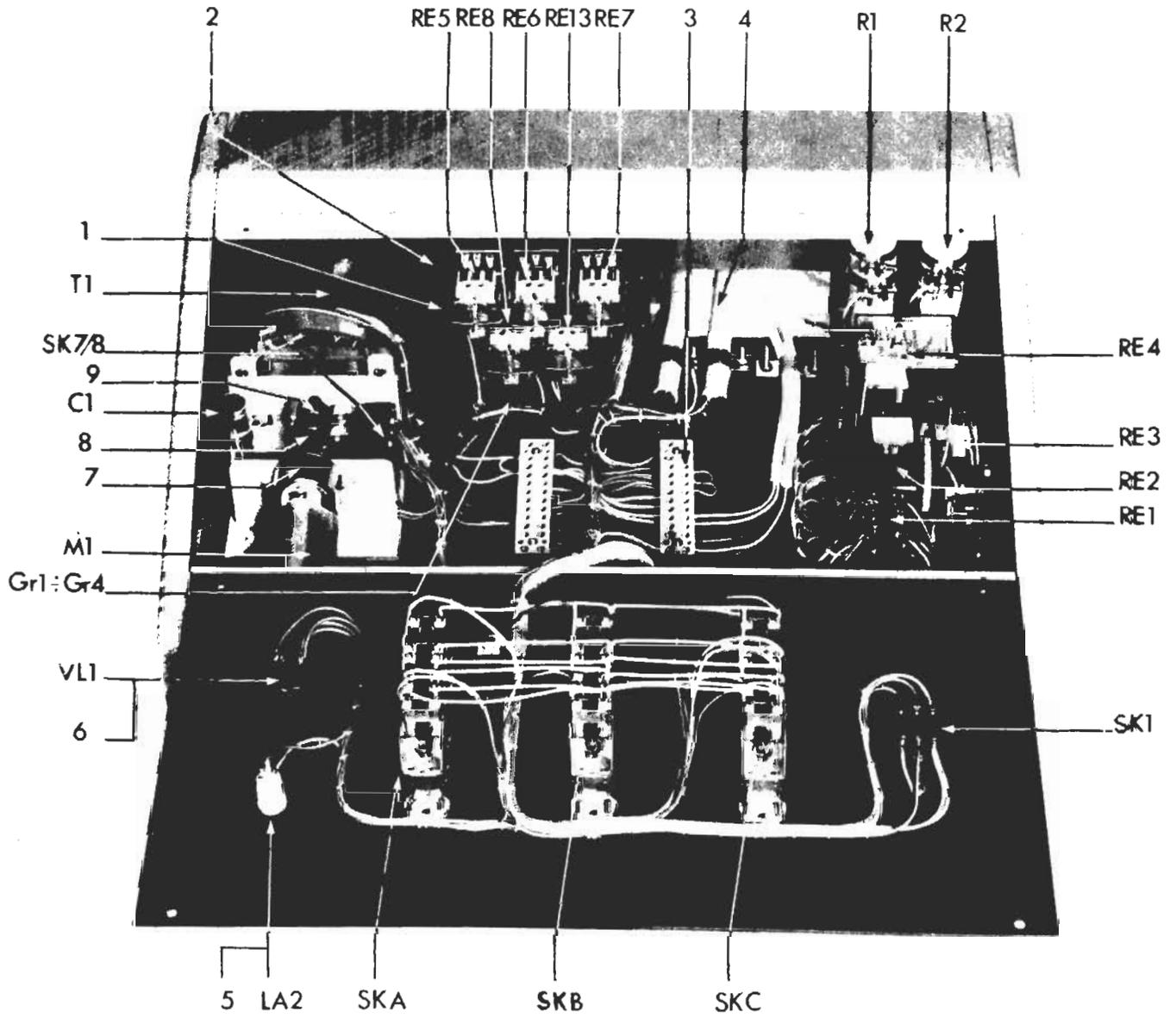


FIG. 1

| Item    | Code Number    | Description                     |
|---------|----------------|---------------------------------|
| SK5-SK6 | 4822 705 30883 | Microswitch                     |
| 1       | 4822 705 30907 | Plug-in Unit - complete         |
| 2       | 4822 705 30908 | Guide roller - without guide    |
| 3       | 4822 705 30909 | Half guide roller - Large       |
| 4       | 4822 705 30911 | Shaft for guide roller          |
| 5       | 4822 705 30912 | Switching disc                  |
| 6       | 4822 705 30913 | Switching arm with ball-bearing |
| 7       | 4822 705 30914 | Microswitch Cover               |
| 8       | 4822 705 30915 | Bracket                         |
| 9       | 4822 705 30916 | Stop ring                       |
| 10      | 4822 705 30917 | Guide roller - with guide       |
|         | 4822 265 40013 | Pin Connector                   |

Above Components are for 35mm Plug-In Unit

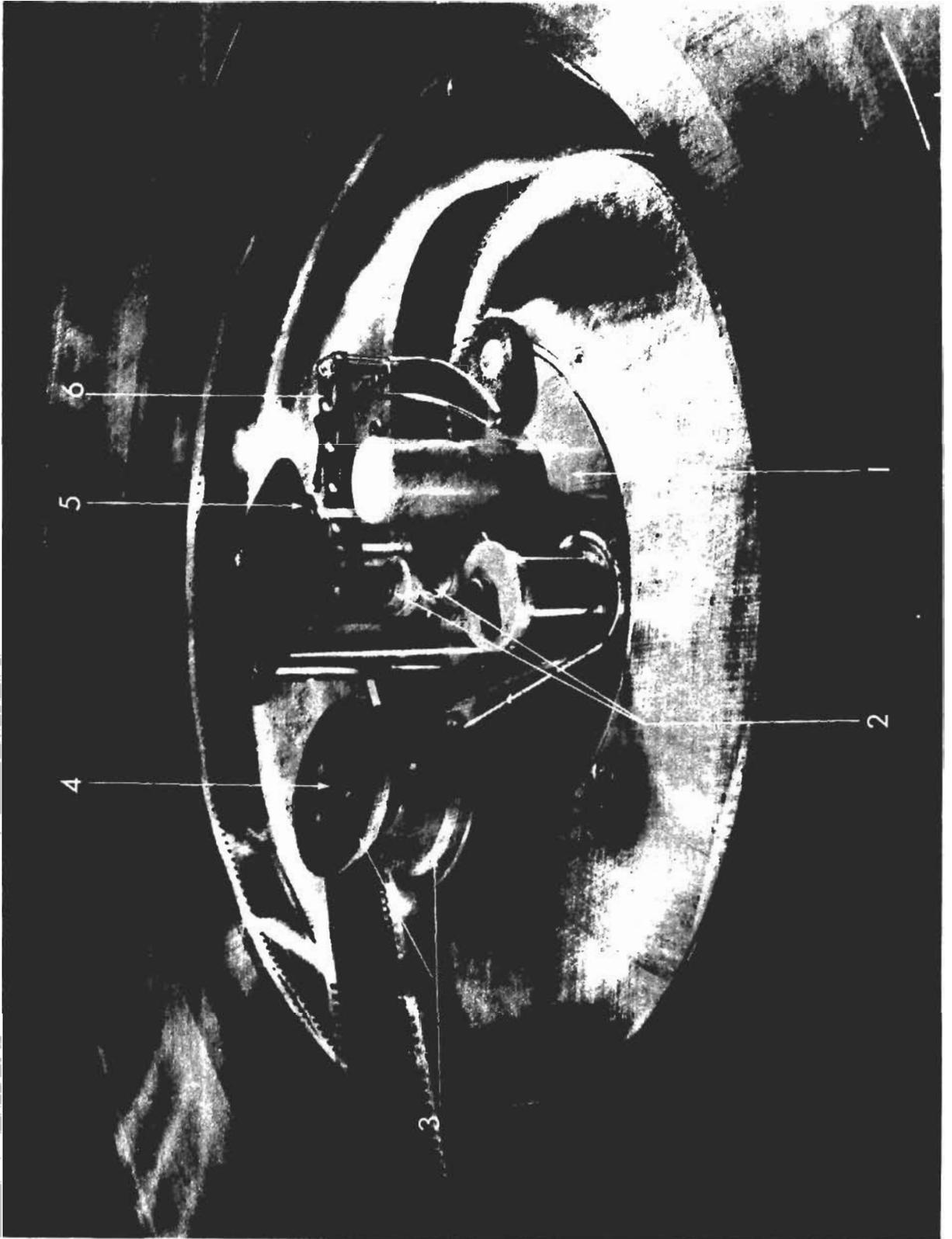


FIG. 2

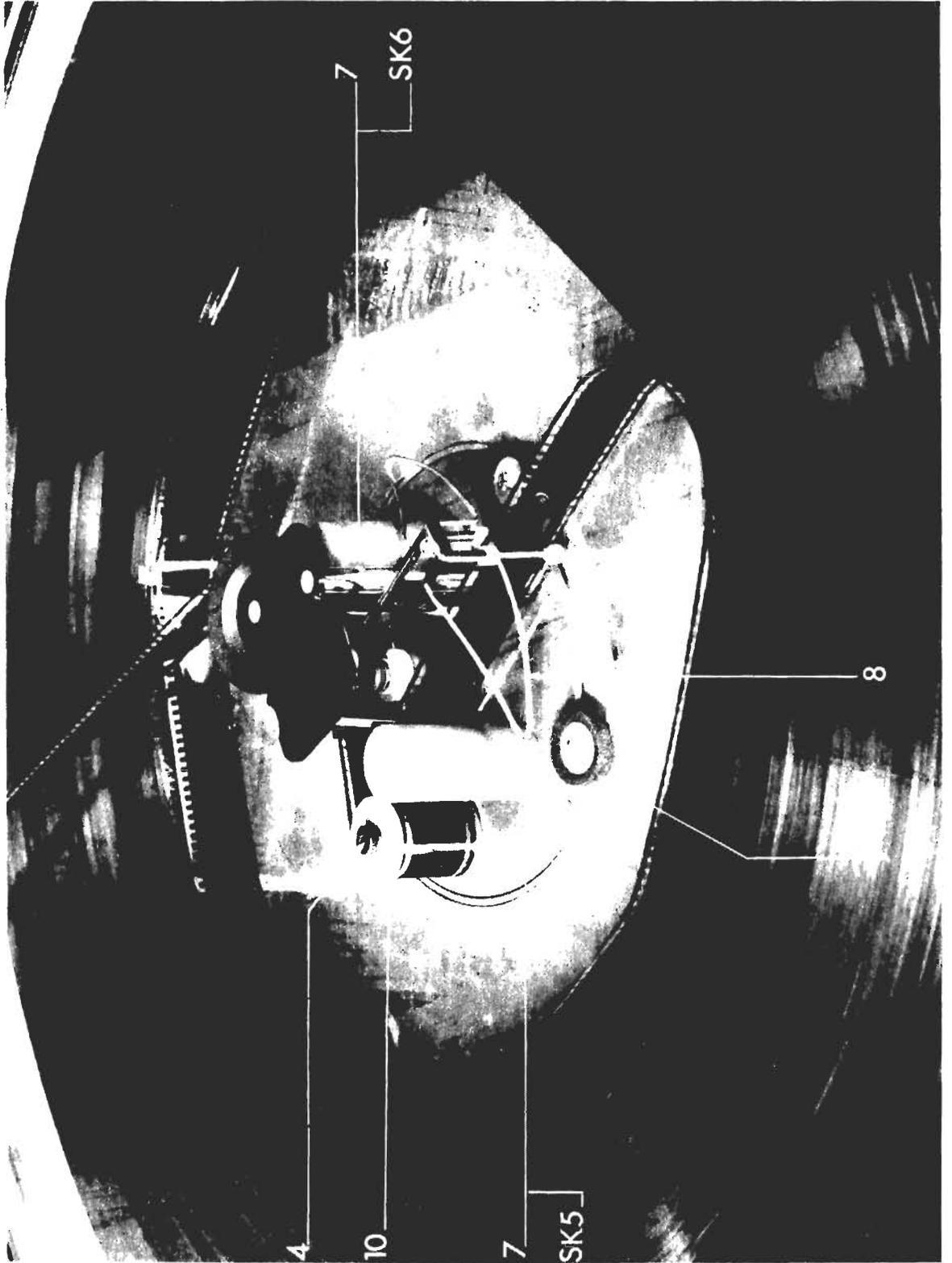


FIG. 3

| Item    | Code Number    | Description                         |
|---------|----------------|-------------------------------------|
|         | 4822 705 30918 | Plug-in Unit - Complete (70/35mm)   |
| SK5-SK6 | 4822 705 30883 | Microswitch                         |
| 1       | 4822 705 30919 | Ball-bearing                        |
| 2       | 4822 705 30921 | Axial bearing of combination roller |
| 3       | 4822 705 30922 | Shaft for combination roller        |
| 4       | 4822 705 30923 | Upper half-guide roller             |
| 5       | 4822 705 30924 | Lower half-guide roller             |
| 6       | 4822 705 30925 | Tapered guide roller                |
| 7       | 4822 705 30926 | Switching disc                      |
| 8       | 4822 705 30927 | Stop ring                           |
| 9/12    | 4822 705 30914 | Microswitch Cover                   |
| 10      | 4822 705 30928 | Switching arm with ball-bearing     |
| 11      | 4822 705 30939 | Guide roller - without guide        |
| 13      | 4822 705 30929 | Guide roller - without guide        |
| 14      | 4822 265 40013 | Pin Connector                       |
| 15      | 4822 705 30931 | Guide roller - with guide           |

Above Components are for 70mm Plug-in Unit

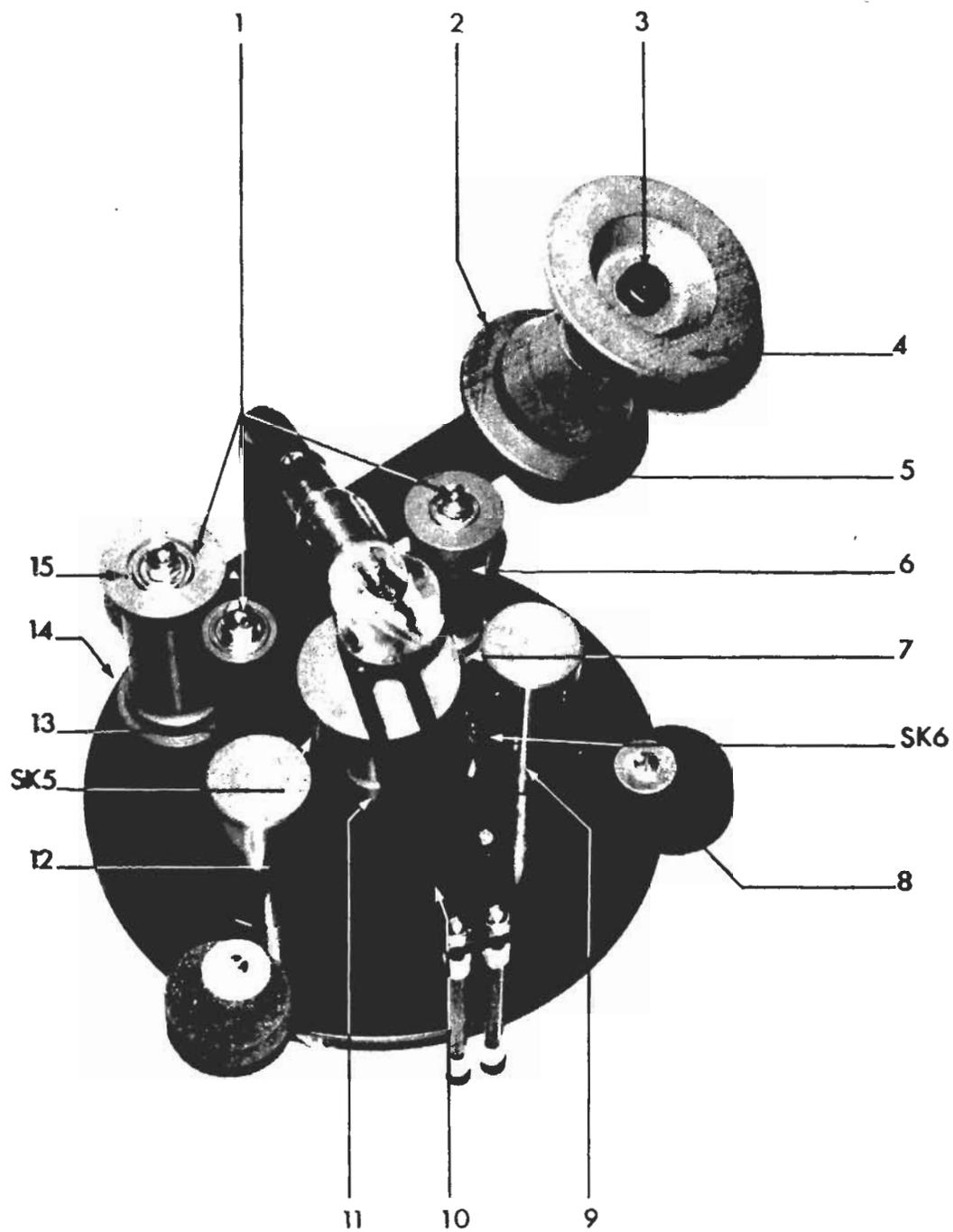


FIG. 4

| Item      | Code Number    | Description                   |
|-----------|----------------|-------------------------------|
| SK2       | 4822 705 30876 | Projector selection switch    |
| SK3       | 4822 705 30881 | Microswitch - film rupture    |
| SK4       | 4822 705 30882 | Foot switch                   |
| LA1       | 4822 705 30865 | Lamp                          |
| RE11-RE12 | 4822 705 30847 | Solenoid                      |
| T2        | 4822 705 30854 | Control transformer           |
| M2-M4     | 4822 705 30859 | Motor                         |
| 1         | 4822 705 30861 | Carbon Brush - M2-M4          |
| 2         | 4822 705 30934 | Leaf spring                   |
| 3         | 4822 705 30935 | Bolt                          |
| 4         | 4822 705 30933 | Ball Knob                     |
| 5         | 4822 705 30932 | Half insert ring - complete   |
| 6         | 4822 267 50015 | 12-pole Socket connector      |
| 7         | 4822 705 30898 | 12-pole Flange box            |
| 8         | 4822 265 50003 | 30-pole Pin Connector         |
| 9         | 4822 705 30901 | 30-pole Flange box            |
| 10        | 4822 705 30956 | Knob                          |
| 11        | 4822 705 30941 | Film disc - 52-inches         |
| 12        | 4822 705 30878 | Knob for SK2                  |
| 13        | 4822 705 30849 | Spring for RE11               |
| 14        | 4822 705 30946 | Brake shoe assembly           |
| 15        | 4822 705 30947 | Chain for control transformer |
| 16        | 4822 705 30948 | Chain Wheel                   |
| 17        | 4822 705 30922 | Shaft for combination roller  |
| 18        | 4822 705 30957 | Ball-bearing                  |
| 19        | 4822 705 30945 | Cover for Control transformer |
| 20        | 4822 705 30923 | Combination roller - Half     |
| 21        | 4822 705 30894 | Single pole plug              |
| 22        | 4822 705 30895 | Single pole plug - female     |
| 23        | 4822 705 30954 | Collar                        |
| 24        | 4822 705 30862 | Motor Reduction Gearbox       |
| 25        | 4822 705 30949 | Wire                          |
| 26        | 4822 705 30951 | Tension spring of control arm |
| 27        | 4822 705 30942 | Ball-bearing of Film Disc     |
| 28        | 4822 267 50017 | Connector of Plug-in Unit     |
| 29        | 4822 705 30943 | Drive Wheel for Film Disc     |
| 30        | 4822 705 30952 | Pressure spring for motors    |
|           | 4822 705 30959 | Screw assortment              |

Above Components are for 70/35mm Stand

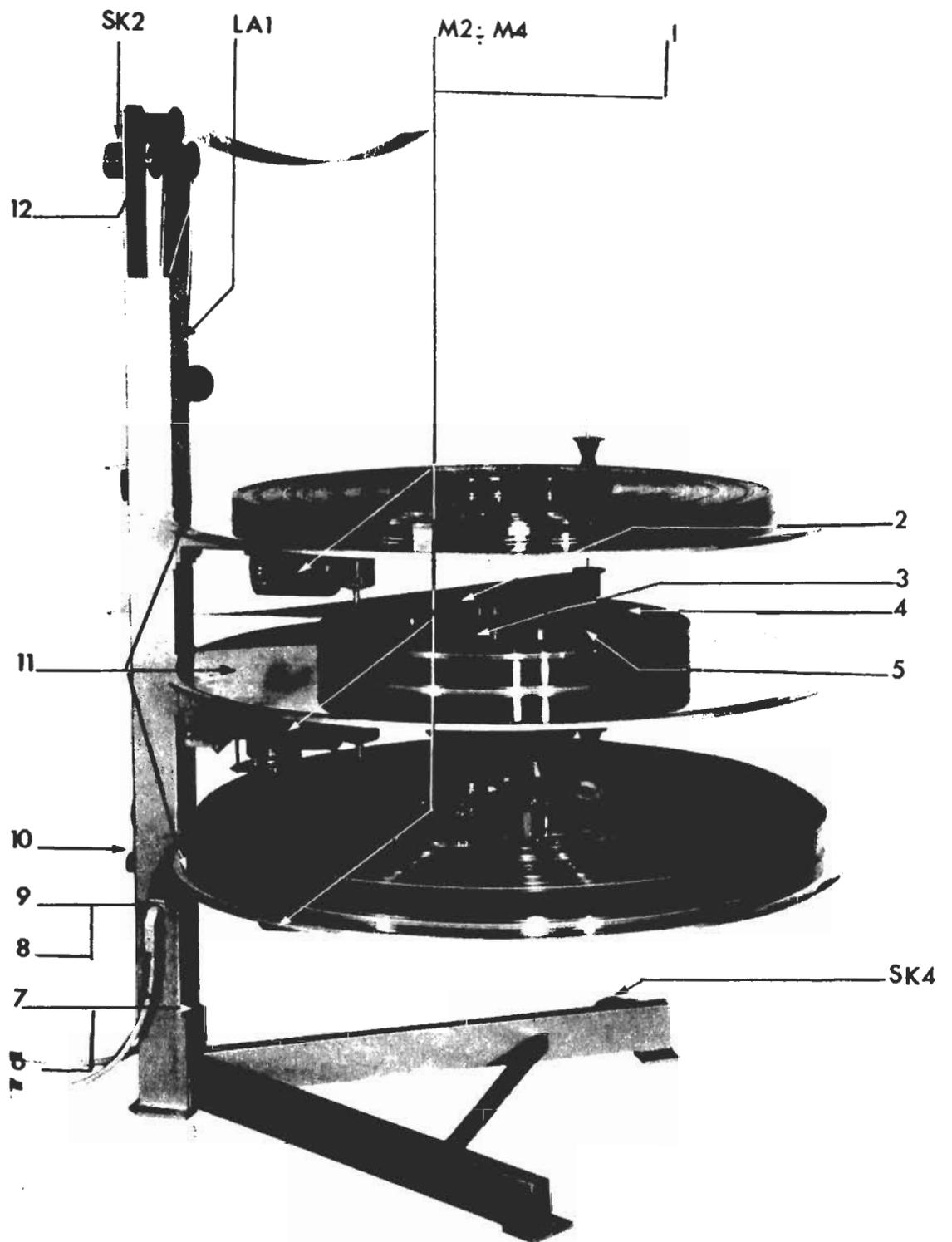
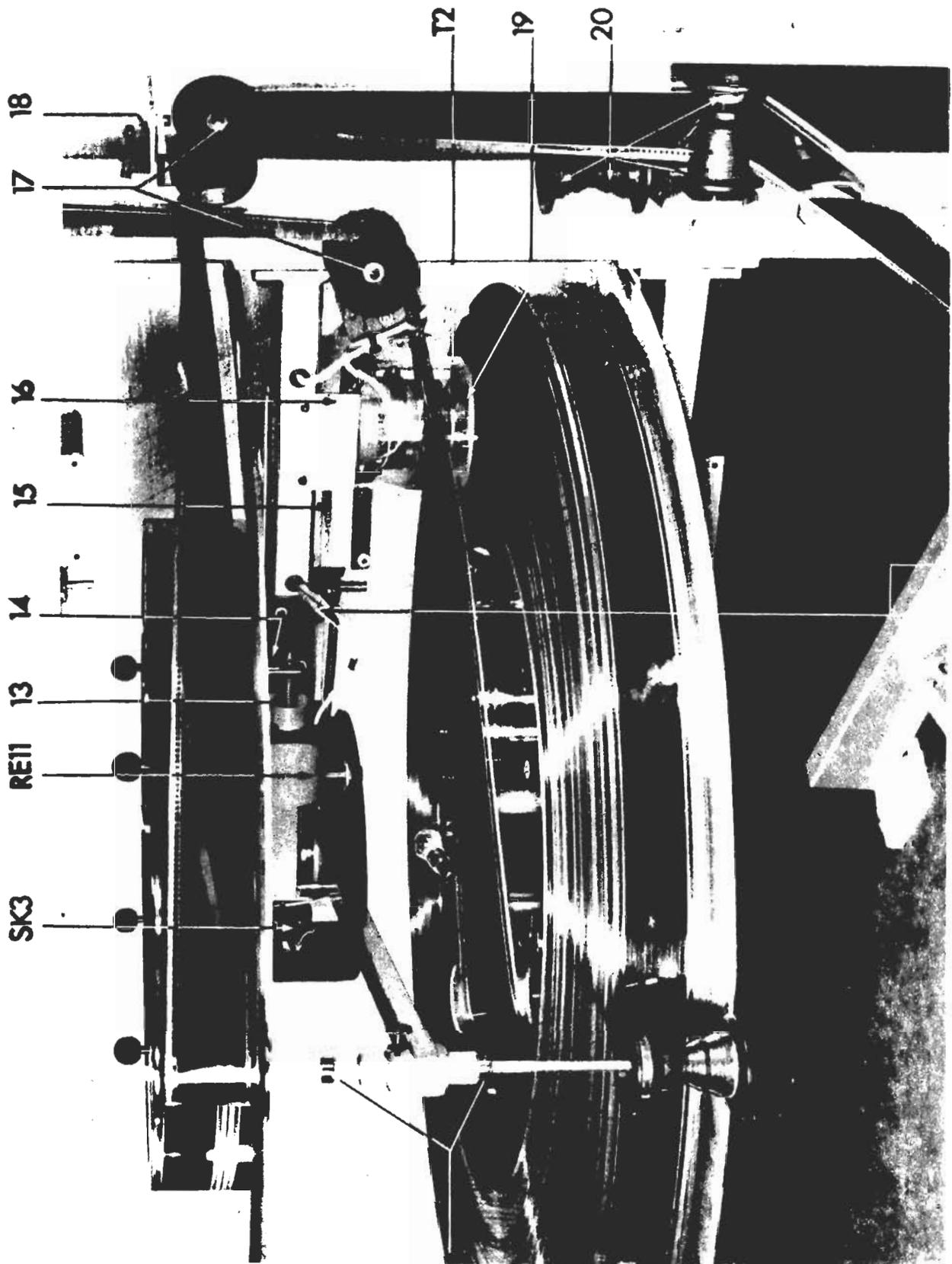


FIG. 5



22 21

FIG. 6

23

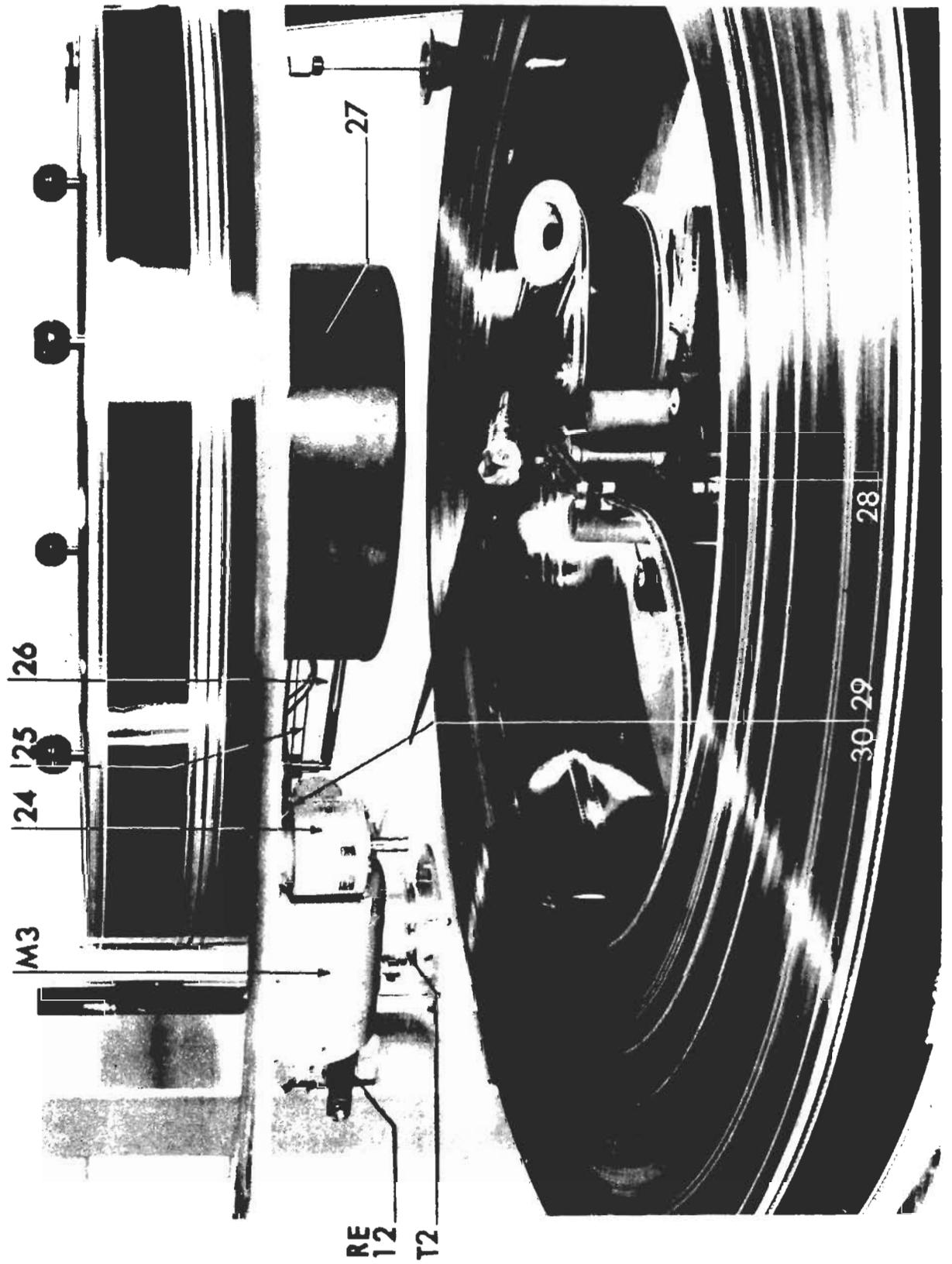


FIG. 7

| Item      | Code Number    | Description                                  |
|-----------|----------------|--|
| SK2       | 4822 705 30876 | Projector selector switch<br>(above S/N 704) |
| SK2       | 4822 705 30877 | Projector selector switch<br>(below S/N 704) |
| SK3       | 4822 705 30881 | Microswitch - Film Rupture                   |
| SK4       | 4822 705 30882 | Foot Switch                                  |
| LA1       | 4822 705 30865 | Lamp   |
| RE11-RE12 | 4822 705 30848 | Solenoid                                     |
| T1        | 4822 705 30854 | Control transformer (above S/N 704)          |
| T1        | 4822 705 30855 | Control transformer (below S/N 704)          |
| M2-M4     | 4822 705 30859 | Motor  |
| 1         | 4822 705 30861 | Carbon brush - M2-M5                         |
| 2         | 4822 705 30863 | Reduction gear box - M2-M5                   |
| 3         | 4822 705 30951 | Tension spring - control arm                 |
| 4         | 4822 705 30962 | Gear Wheel (below S/N 704)                   |
| 5         | 4822 705 30936 | Insert ring assembly                         |
| 6         | 4822 705 30937 | Knob on insert ring                          |
| 7         | 4822 705 30938 | Bolt   |
| 8         | 4822 705 30939 | Film disc - 48-inches                        |
| 9         | 4822 705 30941 | Film disc - 52-inches                        |
| 10        | 4822 705 30942 | Ball bearing of film disc                    |
| 11        | 4822 705 30961 | Gear segment w/plate (below S/N 704)         |
| 12        | 4822 705 30944 | Drive wheel for film disc                    |
| 13        | 4822 705 30894 | Single-pole plug - Male                      |
| 14        | 4822 705 30895 | Single-pole plug - Female                    |

Above Components are for 35mm Stand

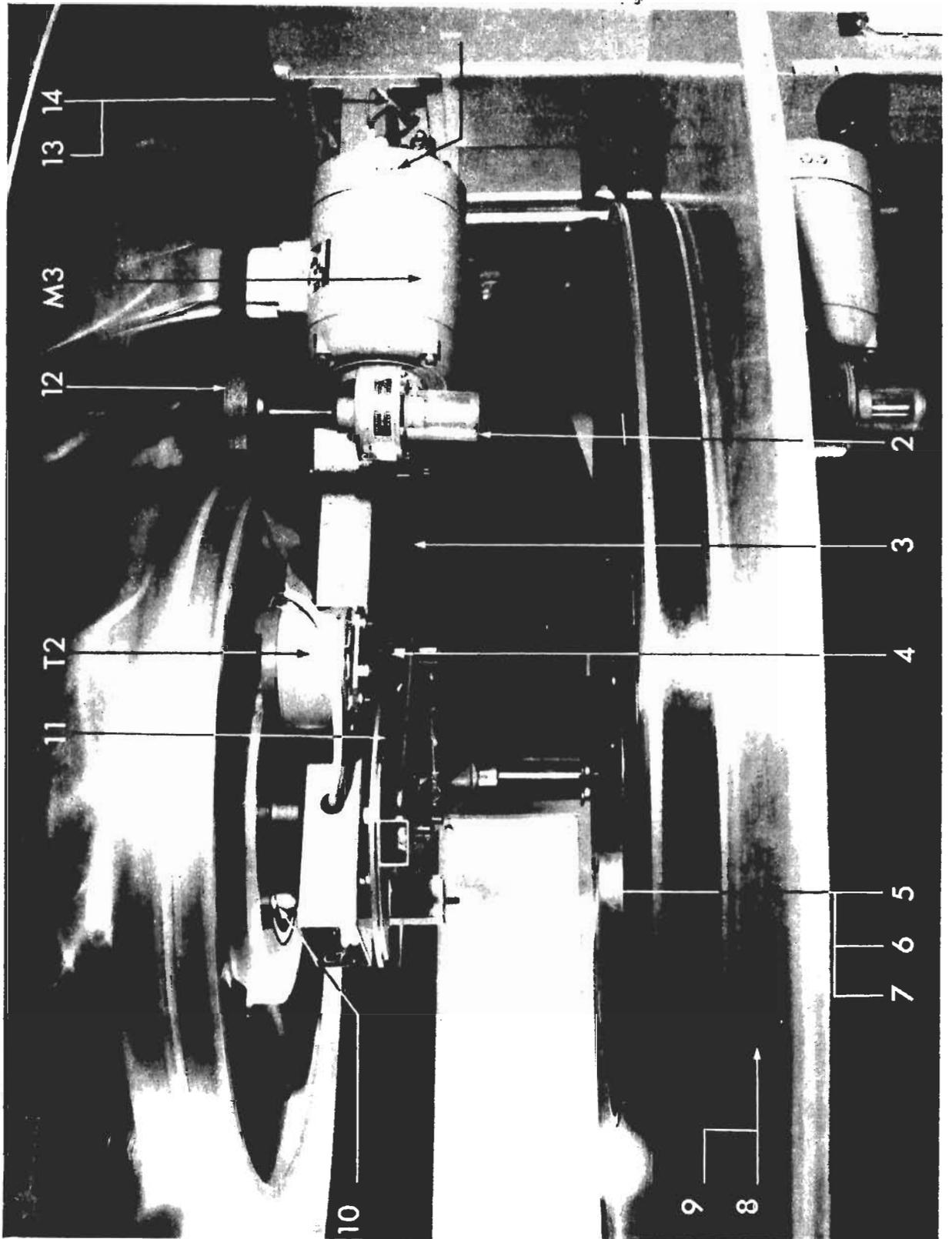


FIG. 8

| Item    | Code Number    | Description                     |
|---------|----------------|---------------------------------|
| SK9     | 4822 705 30887 | Switch - Film feed-out          |
| SK10    | 4822 705 30888 | Switch - Film feed-in           |
|         |                | (after S/N 704)                 |
| SK10    | 4822 705 30887 | Switch - Film feed-in           |
|         |                | (before S/N 704)                |
| SK11    | 4822 705 30889 | Pushbutton switch               |
| RE9     | 4822 705 30845 | Relay                           |
|         | 4822 705 30846 | Contact for RE9                 |
| RE10    | 4822 705 30841 | Relay                           |
| M5      | 4822 705 30859 | Motor                           |
|         | 4822 705 30861 | Carbon brush for Motor          |
| T3      | 4822 705 30854 | Control Transformer             |
| GR5-GR7 | 4822 705 30852 | Rectifier                       |
| LA3     | 4822 705 30866 | Lamp                            |
| VL2     | 4822 705 30869 | Fuse - 2A                       |
| 1       | 4822 705 30909 | Guide Roller - Half (35mm)      |
| 2       | 4822 705 30958 | Shaft for guide roller          |
| 3       | 4822 705 30972 | Flange for 70mm - with pins     |
| 4       | 4822 705 30867 | Lampholder                      |
| 5       | 4822 705 30971 | Flange for 35mm - with pins     |
| 6       | 4822 413 40223 | Knob for Control Transformer    |
| 7       | 4822 705 30871 | Fuseholder                      |
|         | 4822 705 30974 | Flange - with short shaft       |
|         | 4822 705 30973 | Flange with spline shaft - 35mm |
|         | 4822 705 30963 | V-Belt                          |
|         | 4822 705 30964 | V-Belt Pulley of motor          |
|         | 4822 705 30965 | V-Belt Pulley of disc           |
|         | 4822 705 30893 | Cable - 12-core                 |
|         | 4822 705 30899 | Connector shell - 12-pole       |
|         | 4822 265 40008 | Pin connector - 12-pole         |

Above Components are for 70/35mm ST-272 Program Table

| Item    | Code Number    | Description                               |
|---------|----------------|---|
| SK9     | 4822 705 30887 | Switch - film feed-out                    |
| SK10    | 4822 705 30888 | Switch - Film feed-in<br>(after S/N 704)  |
| SK10    | 4822 705 30887 | Switch - Film feed-in<br>(before S/N 704) |
| SK11    | 4822 705 30889 | Pushbutton switch                         |
| RE9     | 4822 705 30845 | Relay                                     |
|         | 4822 705 30846 | Contact for RE9                           |
| RE10    | 4822 705 30841 | Relay                                     |
| M5      | 4822 705 30859 | Motor                                     |
|         | 4822 705 30861 | Carbon brush for Motor                    |
| T3      | 4822 705 30854 | Transformer (after S/N 704)               |
| T3      | 4822 705 30855 | Transformer (before S/N 704)              |
| GR5-GR7 | 4822 705 30852 | Rectifier (after S/N 704)                 |
| GR5-GR7 | 4822 705 30853 | Rectifier (before S/N 704)                |
| LA3     | 4822 705 30866 | Lamp                                      |
| VL2     | 4822 705 30869 | Fuse - 2A                                 |
| 1       | 4822 705 30909 | Guide Roller - Half (35mm)                |
| 2       | 4822 705 30958 | Shaft for guide roller                    |
|         | 4822 705 30967 | Pad roller                                |
| 4       | 4822 705 30867 | Lampholder                                |
| 6       | 4822 413 40223 | Knob for Control Transformer              |
| 7       | 4822 705 30871 | Fuseholder                                |
|         | 4822 705 30976 | Spline shaft for take-up                  |
|         | 4822 705 30963 | V-Belt                                    |
|         | 4822 705 30964 | V-Belt pulley of motor                    |
|         | 4822 705 30965 | V-Belt pulley of disc                     |
|         | 4822 705 30893 | Cable - 12-core                           |
|         | 4822 705 30899 | Connector shell - 12-pole                 |
|         | 4822 265 40008 | Pin Connector - 12-pole                   |

Above Components are for 35mm ST-202 Program Table

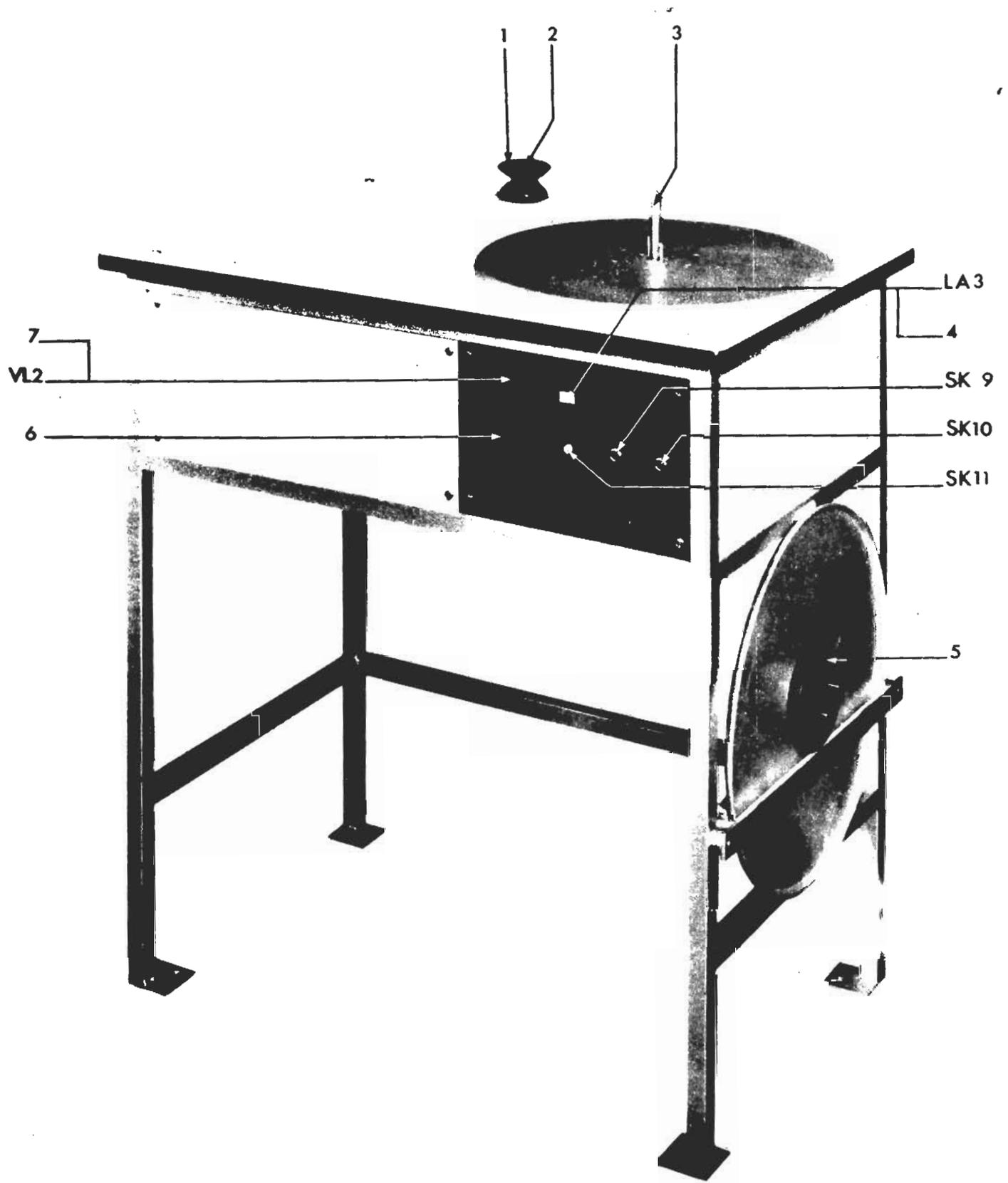
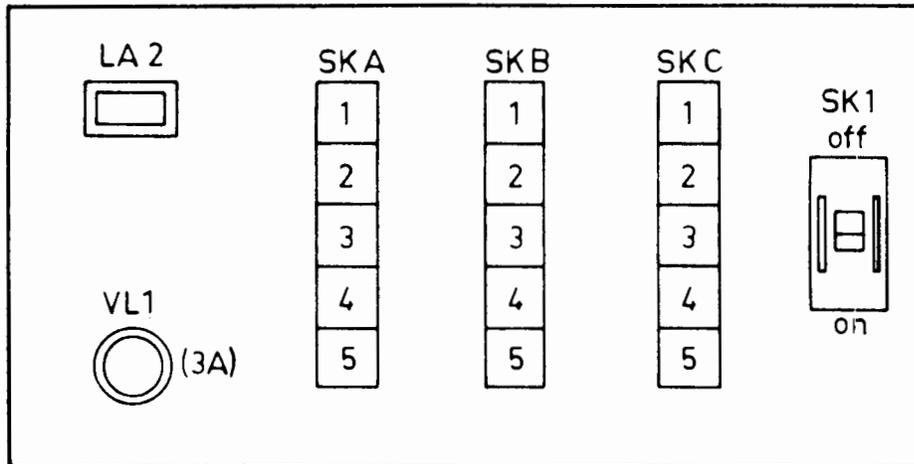
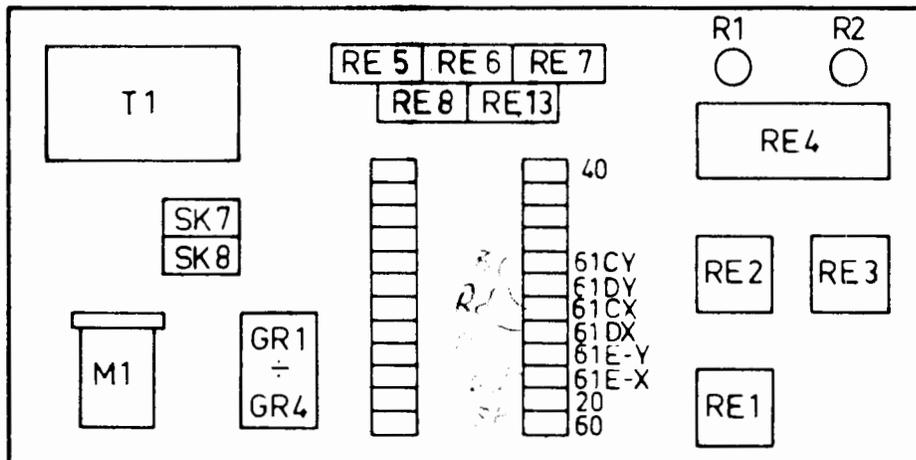


FIG. 9

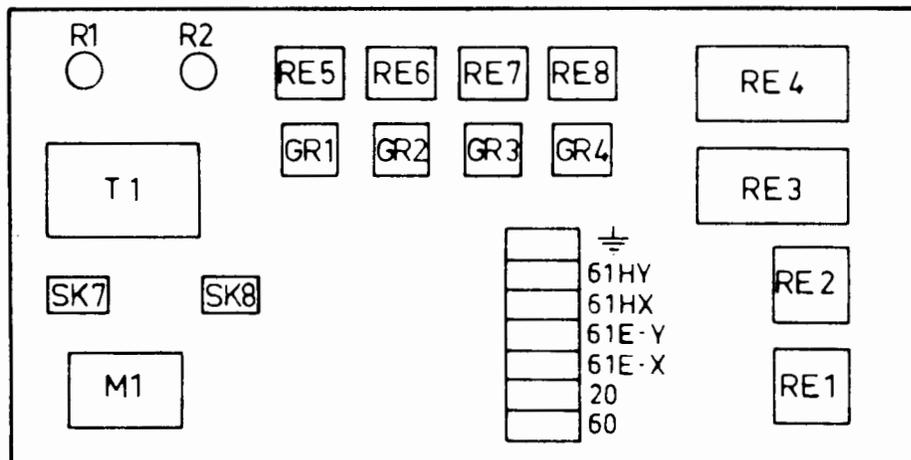
CONTROL UNIT



new version

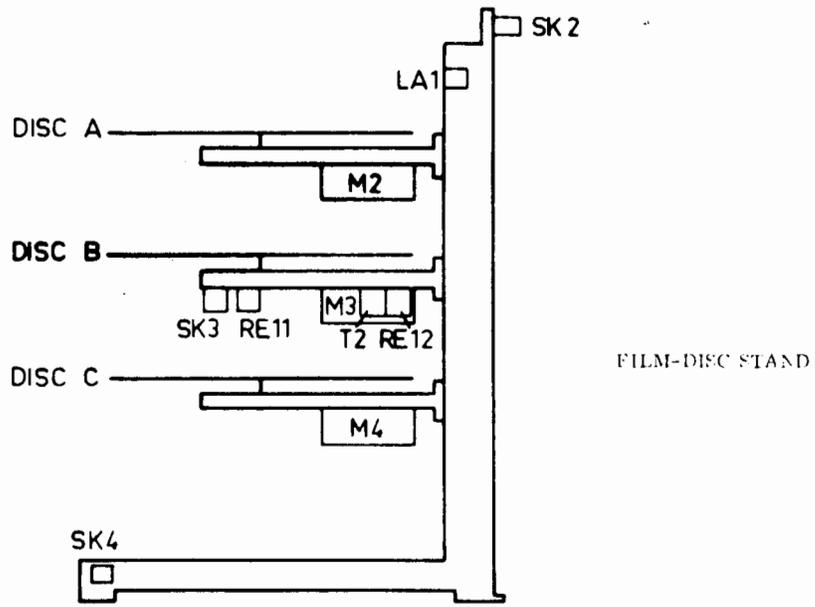


old version



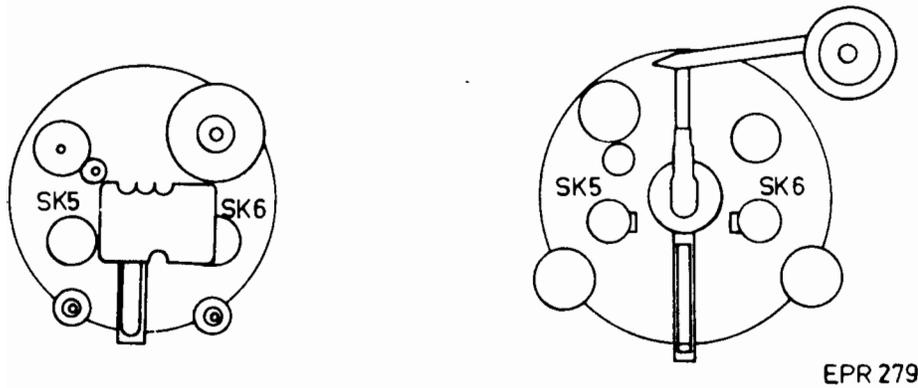
EPR 276

Fig. 10



Plug-in unit 35 mm

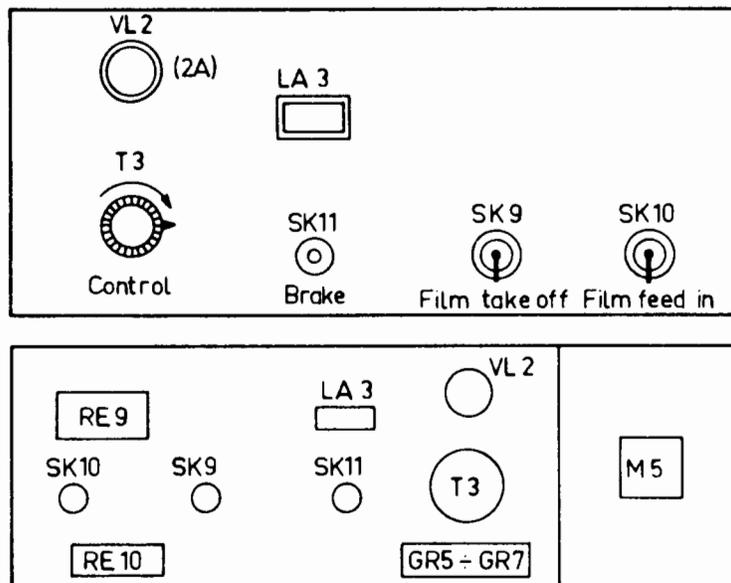
Plug-in unit 70 mm



EPR 279

Fig 11

PROGRAMME TABLE



EPR 277

Fig. 12



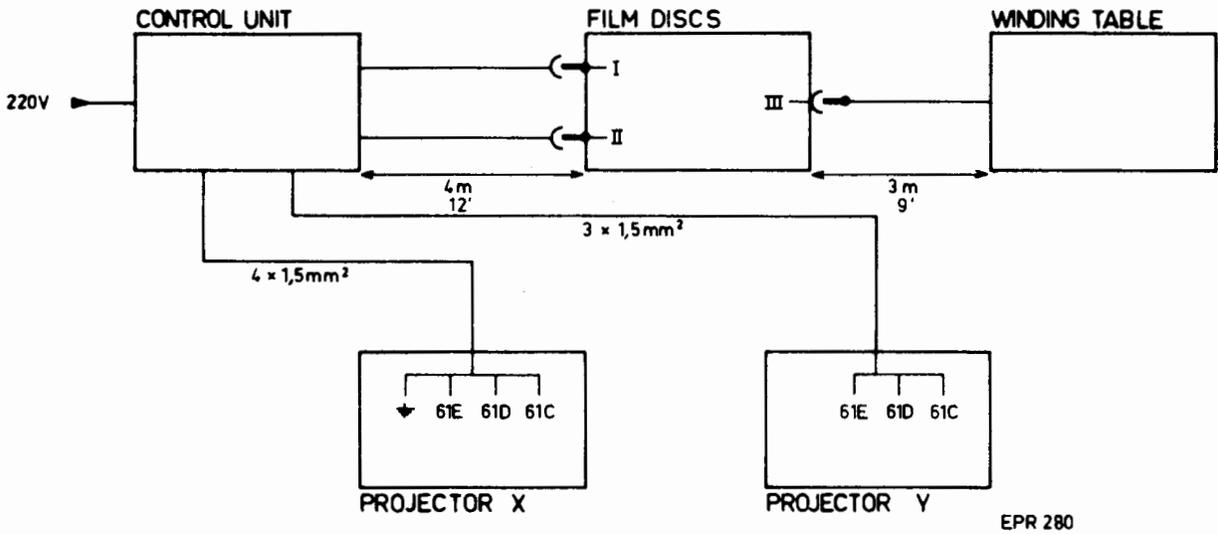
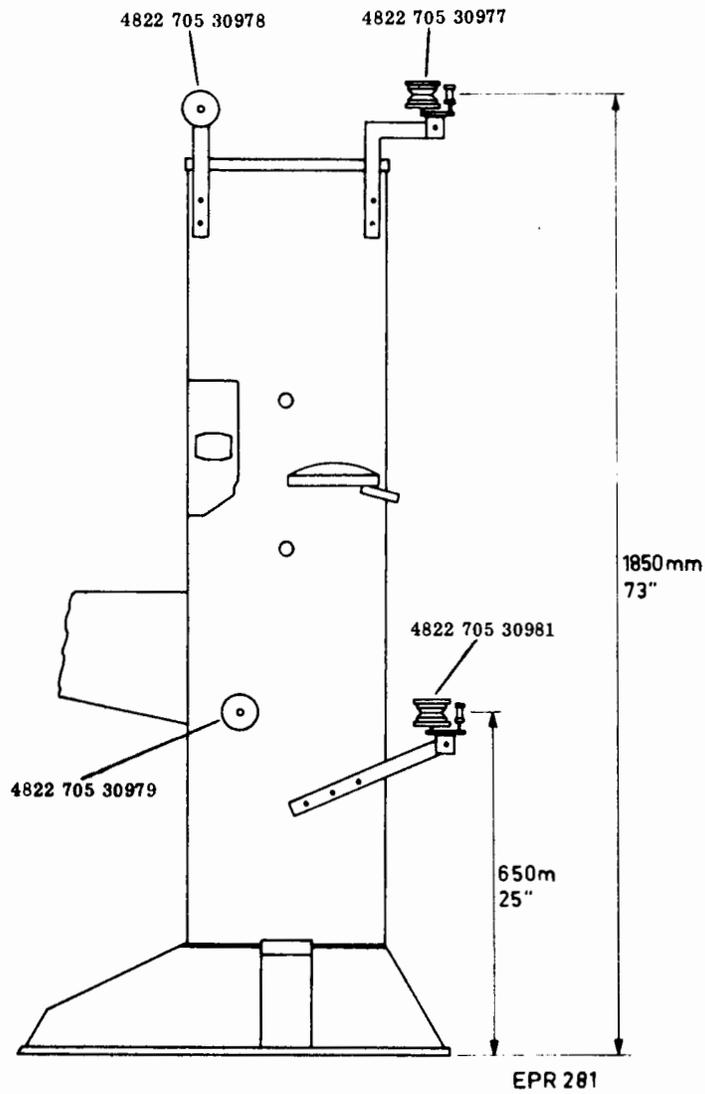
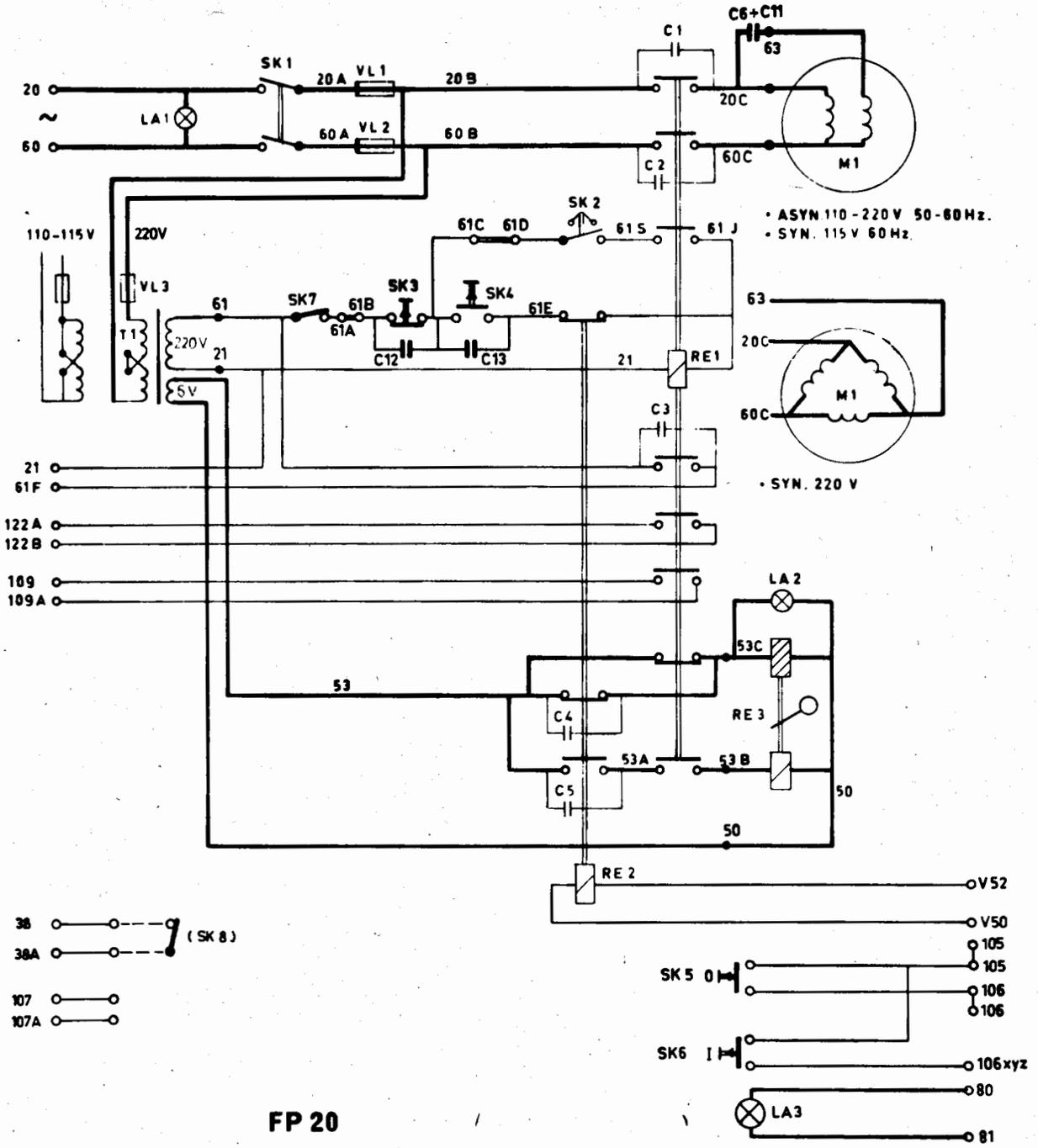


Fig. 14



FP 20

Fig. 15



FP 20

EPR174

Fig. 16

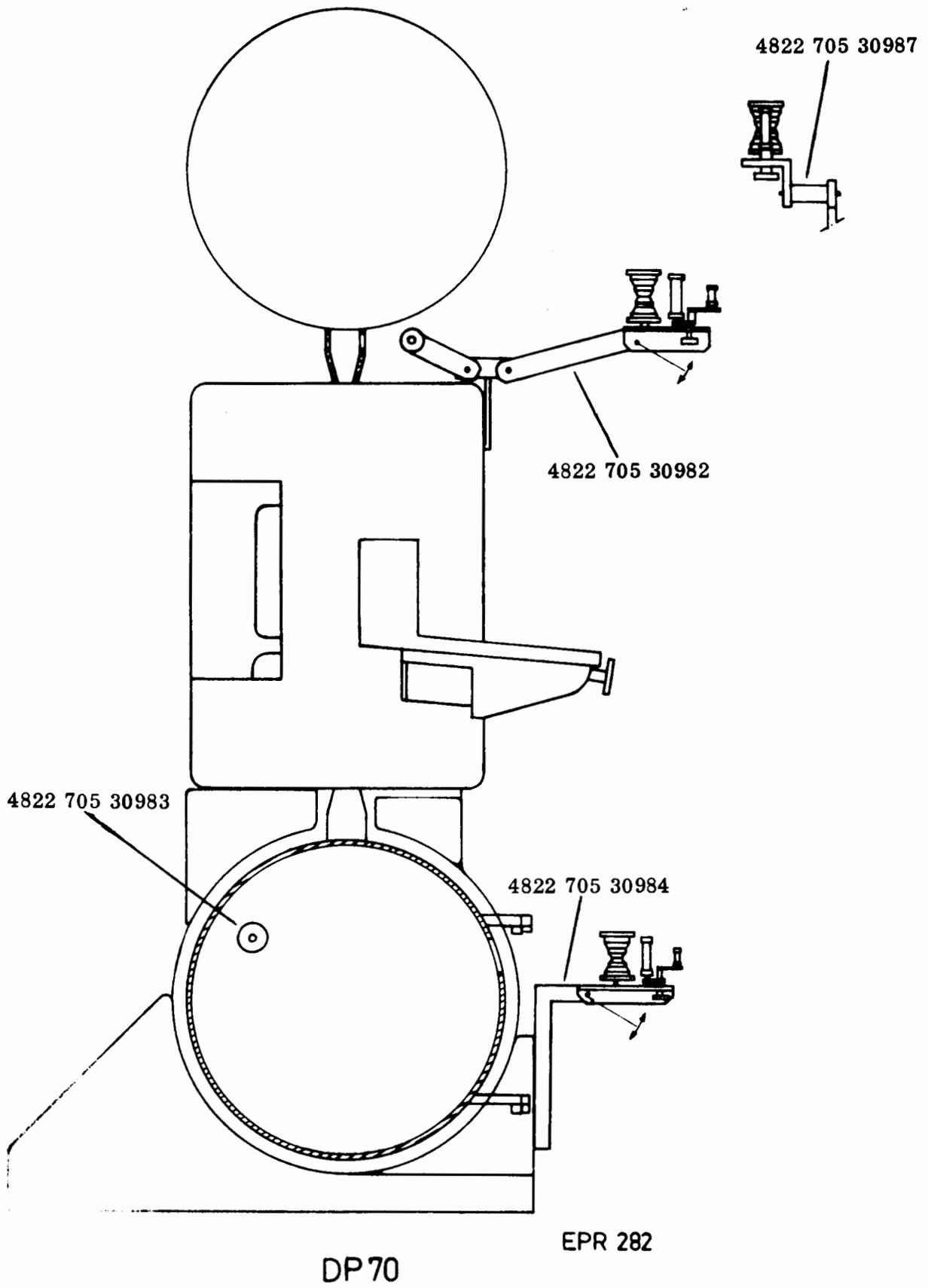


Fig. 17

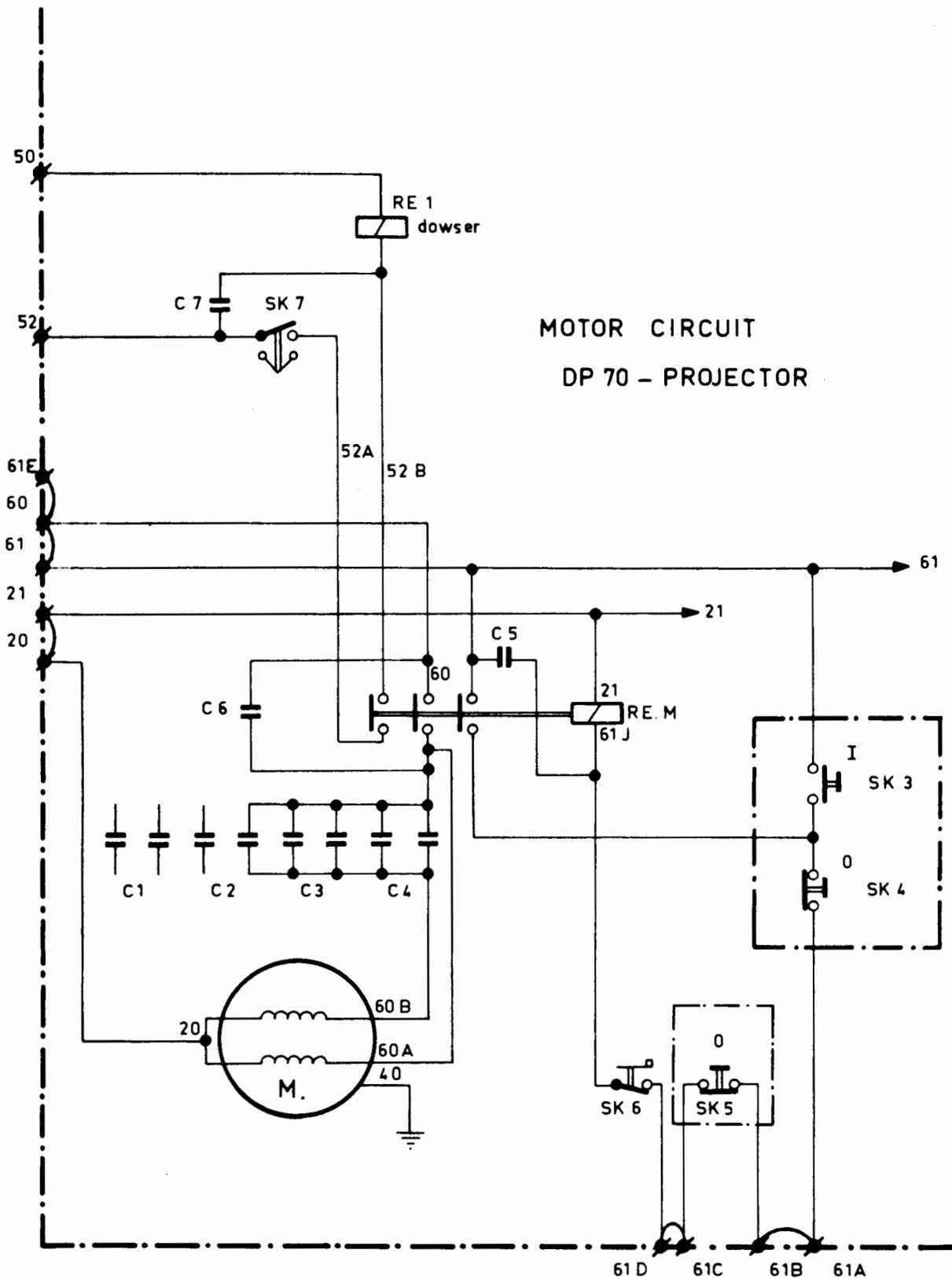


Fig. 18

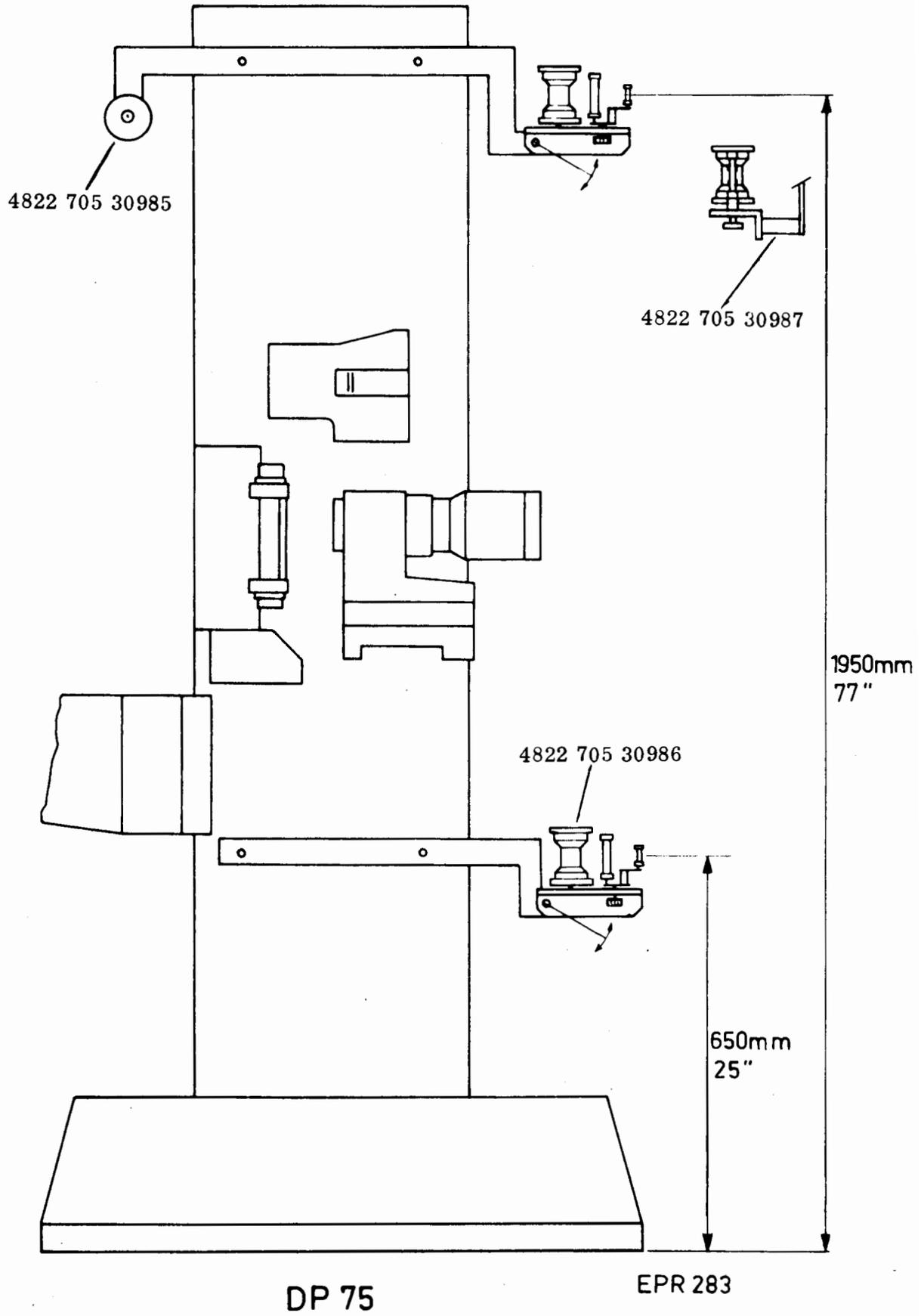
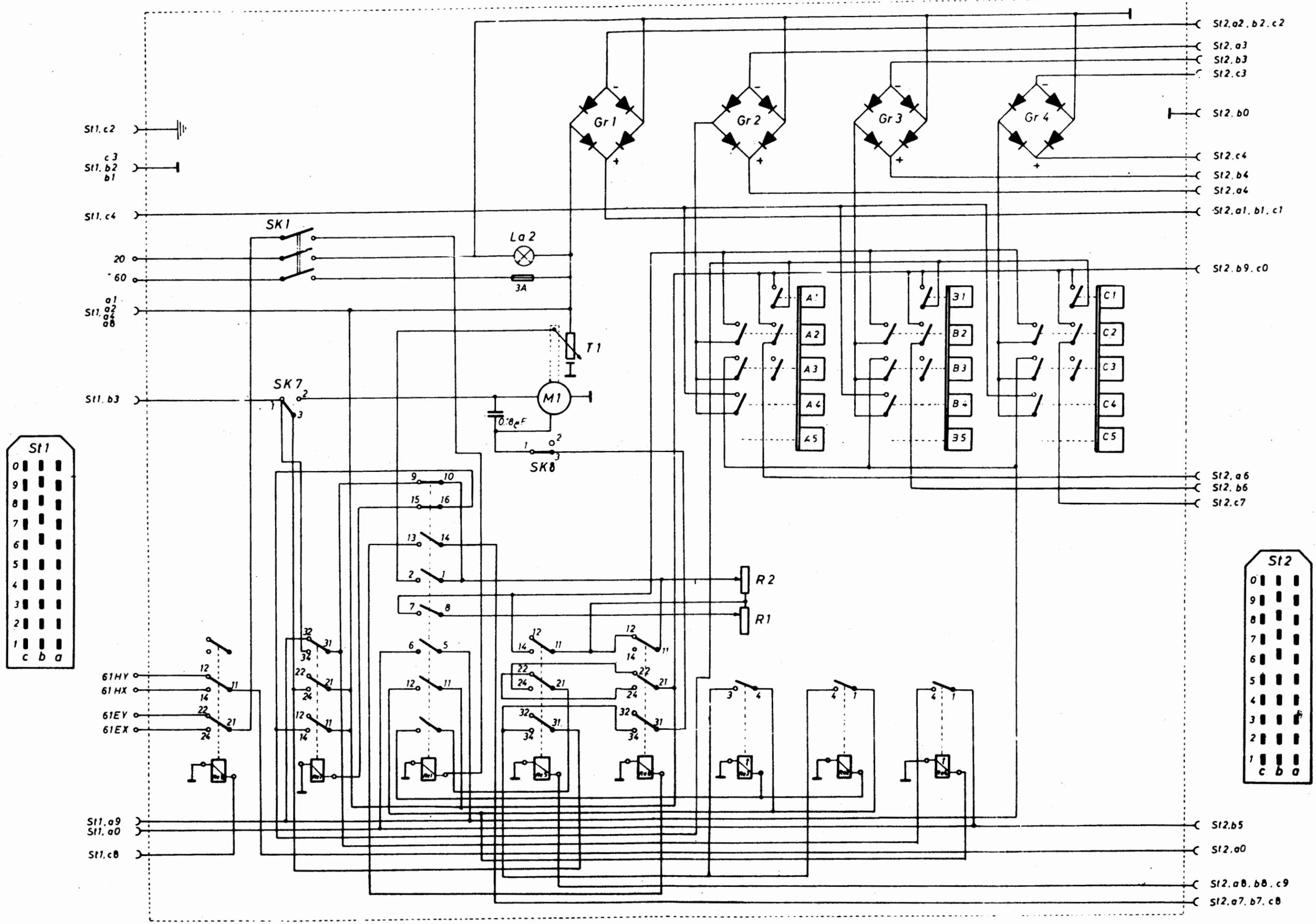


Fig. 19





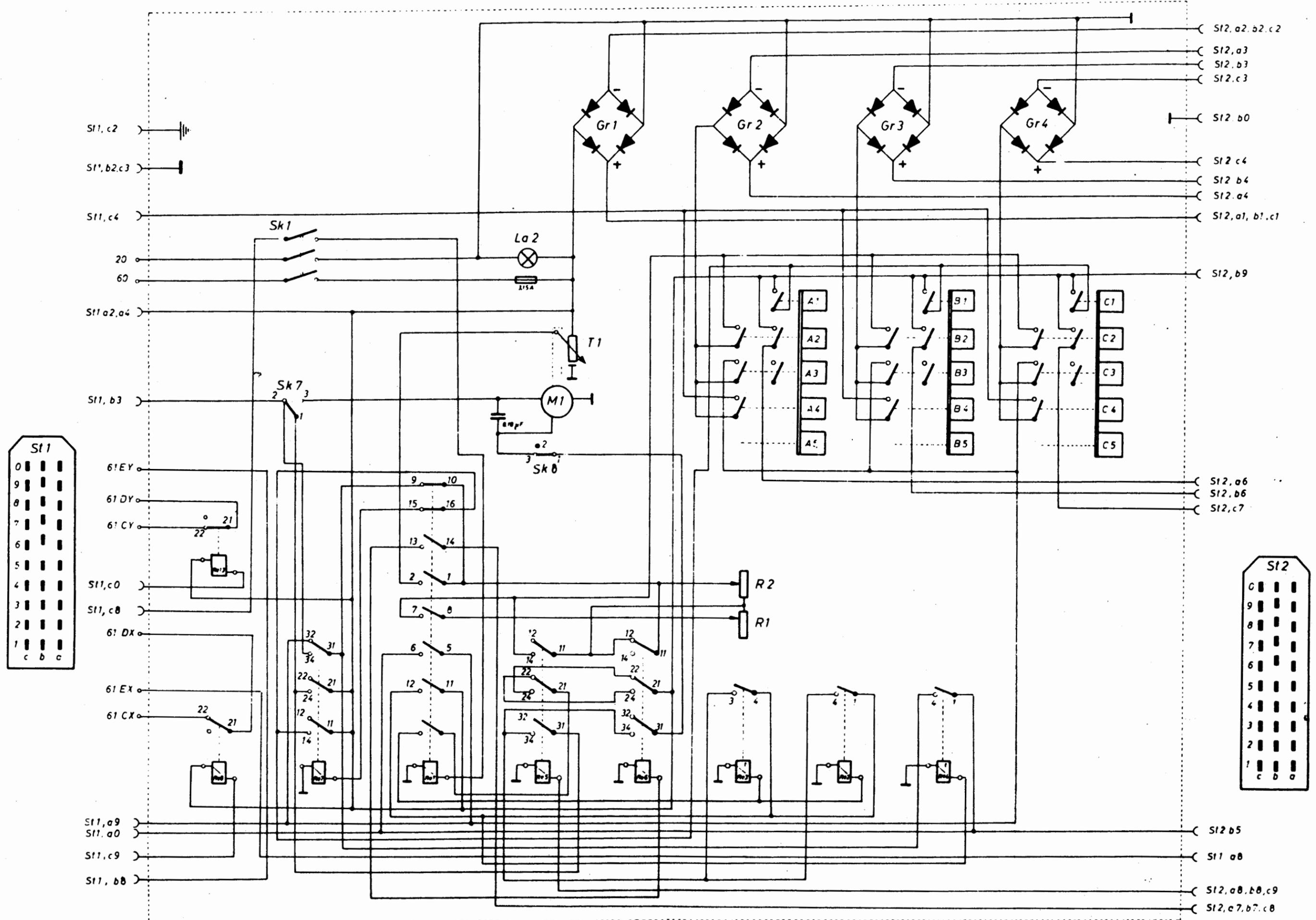


Fig. 22

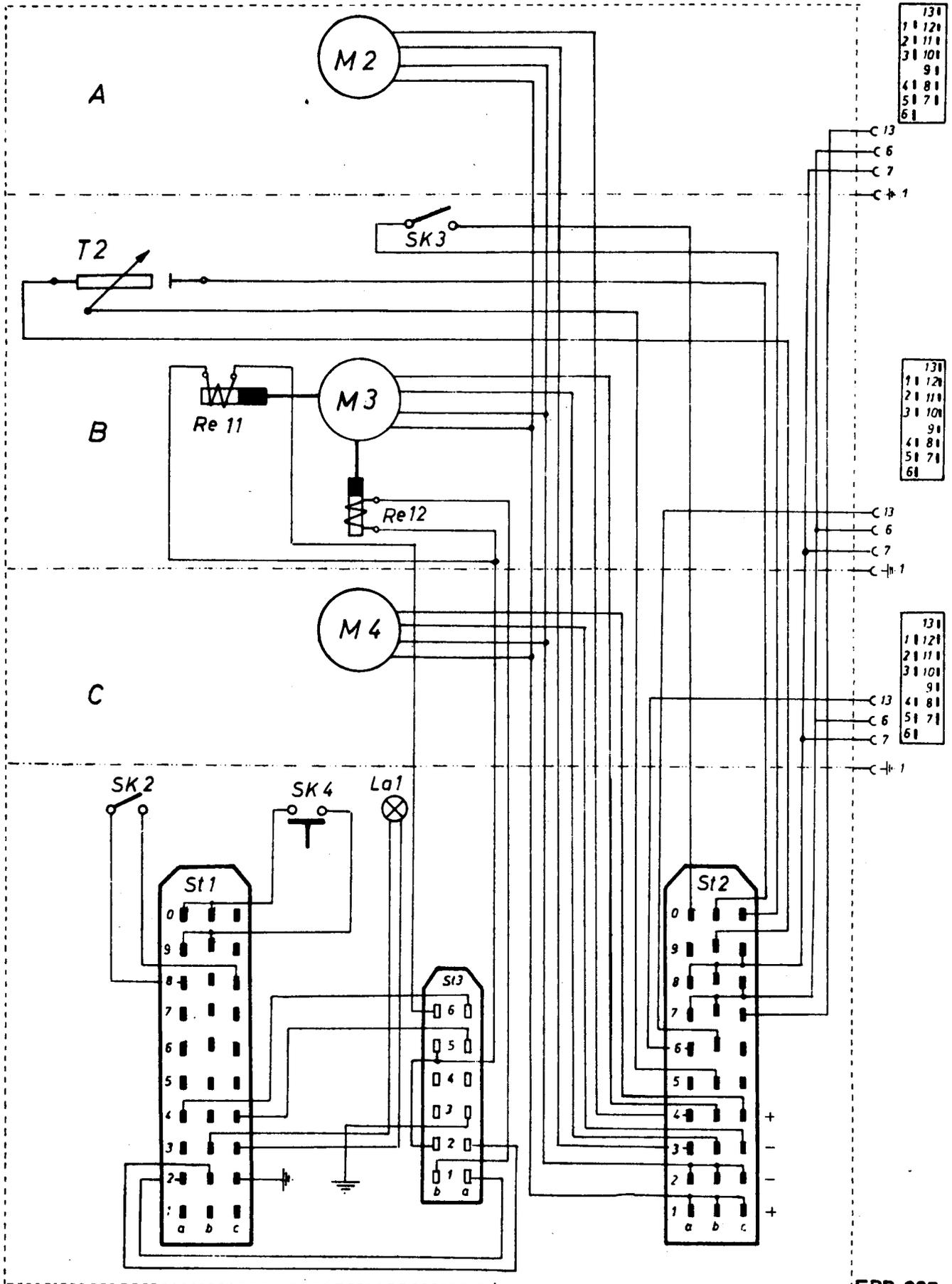


Fig. 23

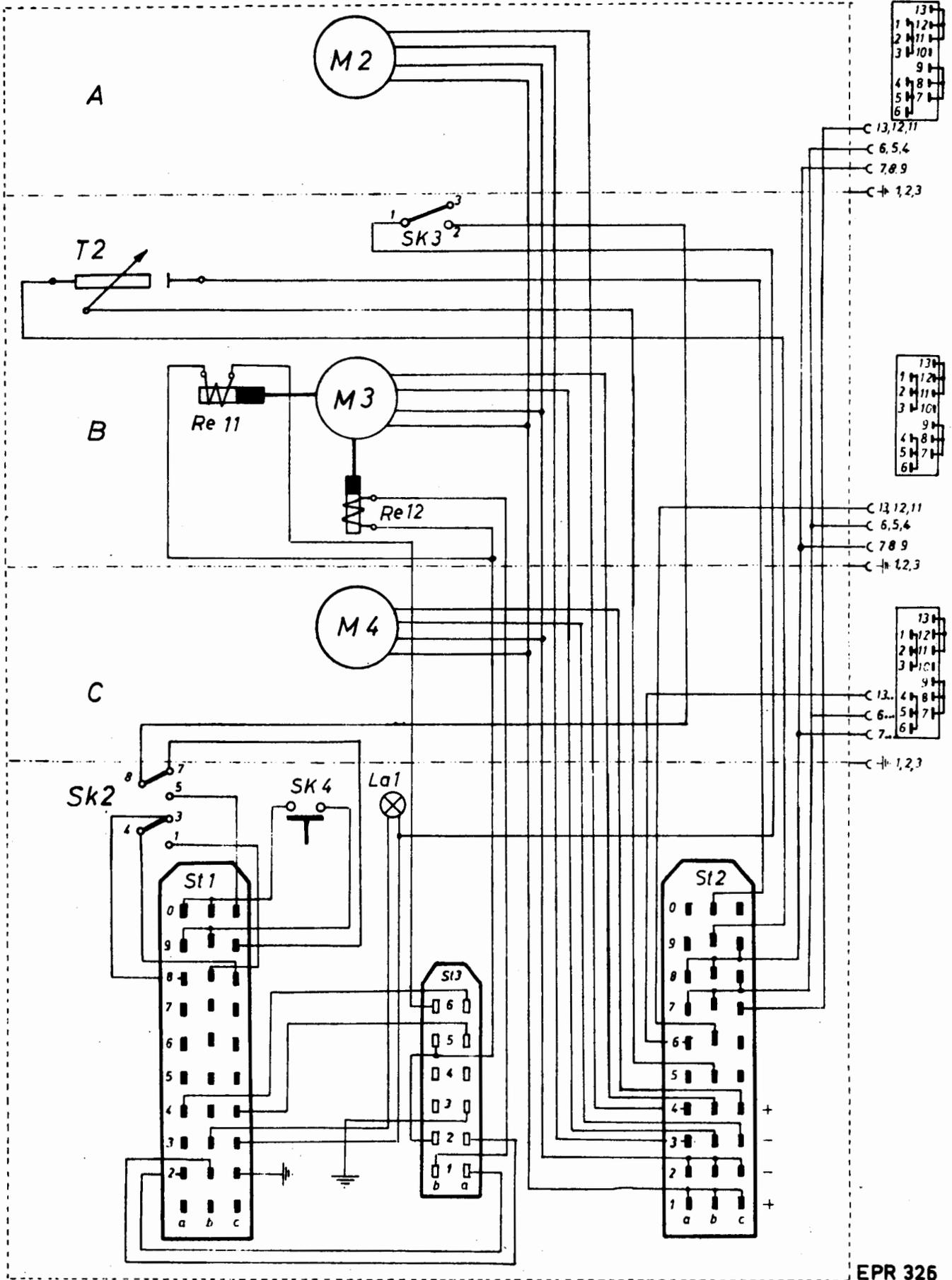
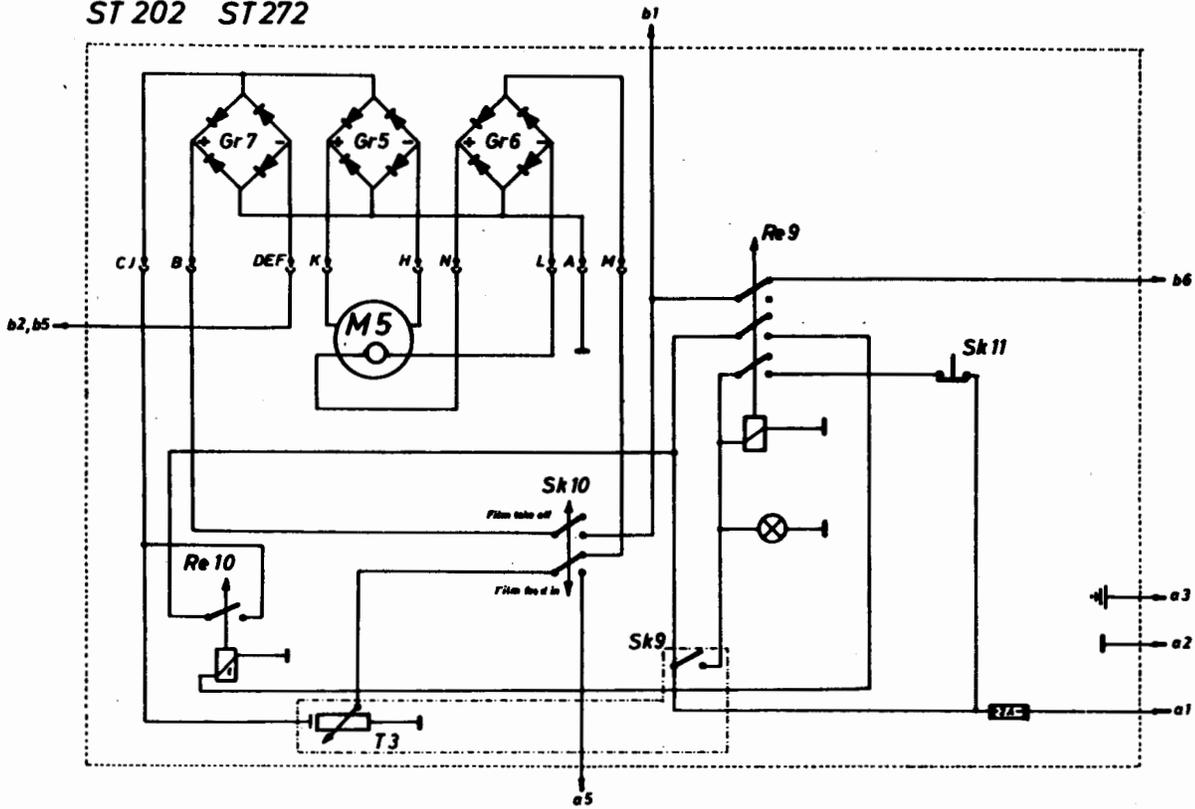


Fig. 24

ST 202 ST 272



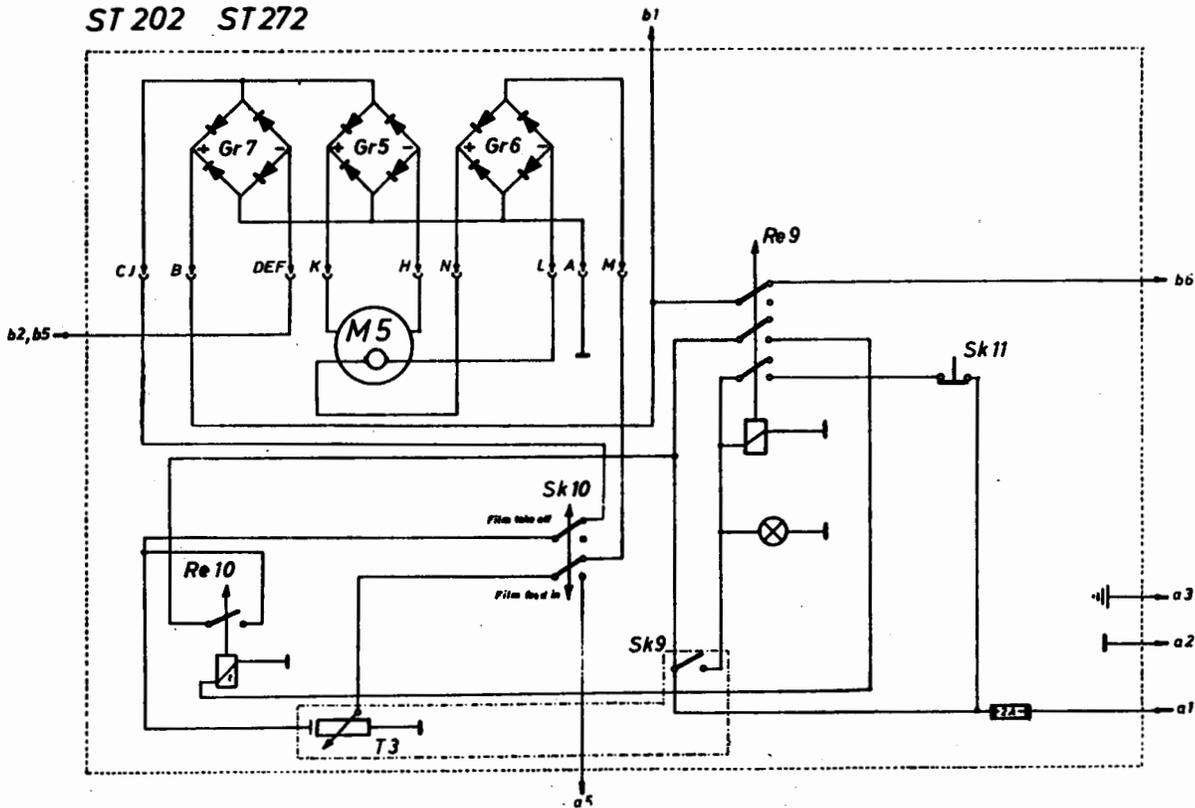
T 2008



K3-015-01-110

ST 202 ab SN 847  
ST 272 ab SN 569

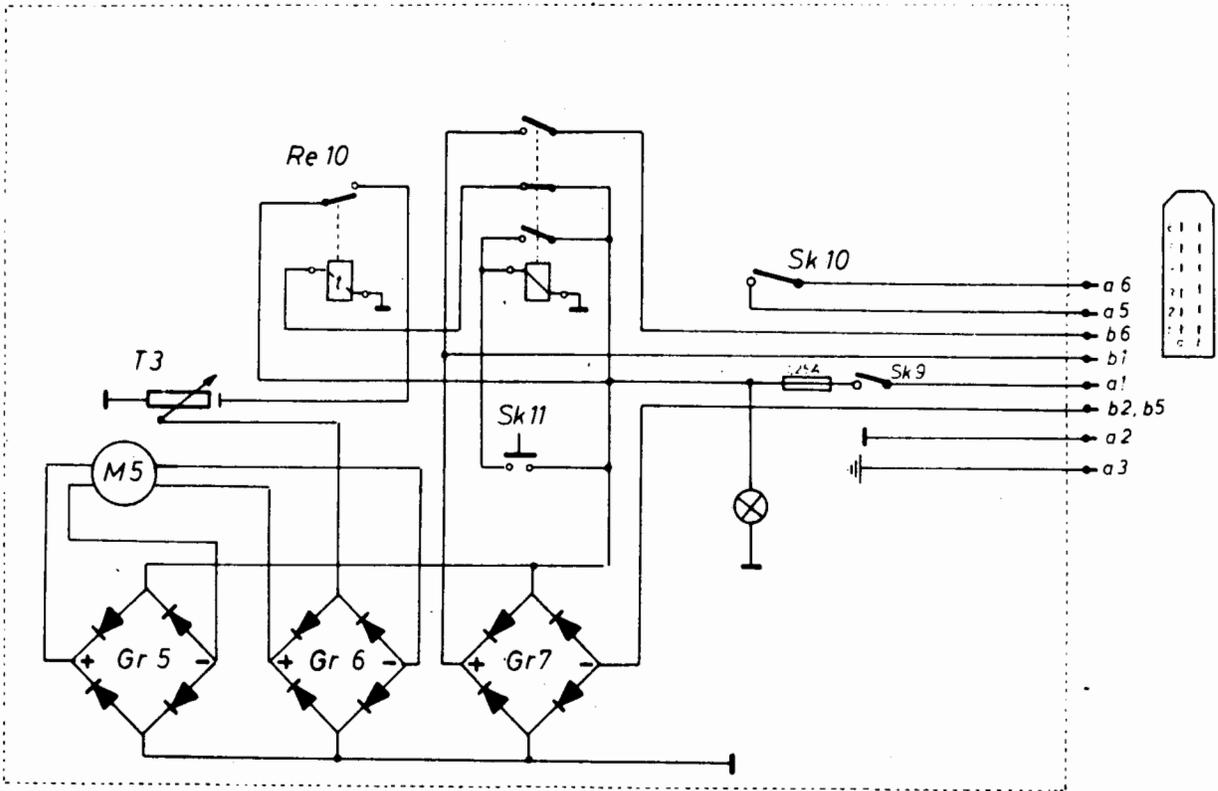
ST 202 ST 272



T 2008

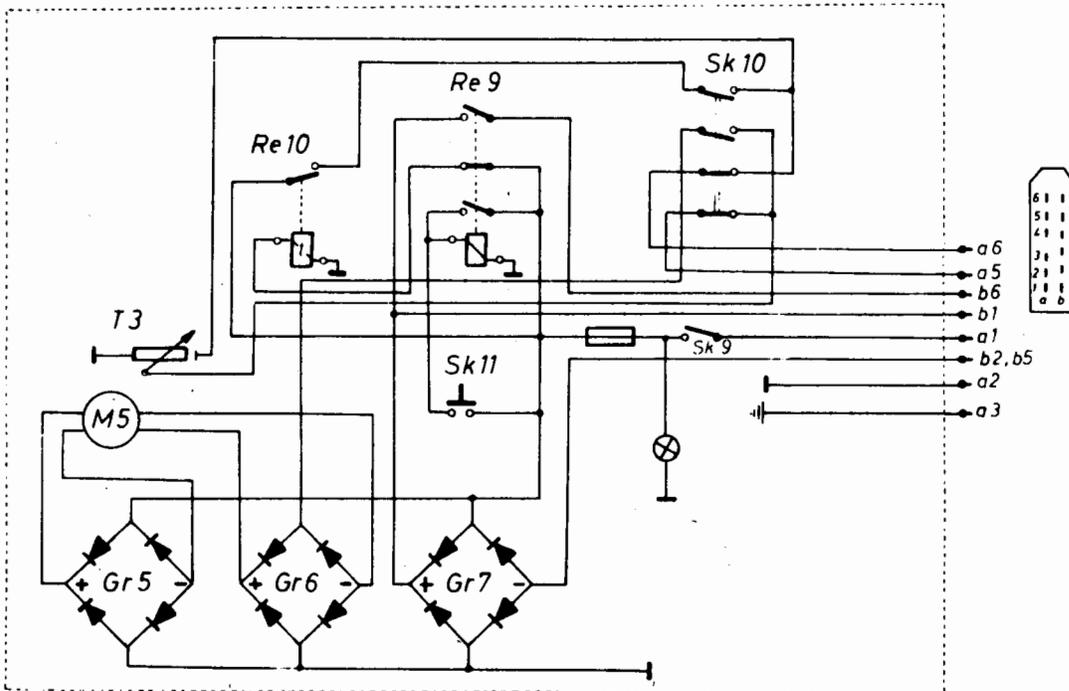


K3-015-01-110



EPR 327

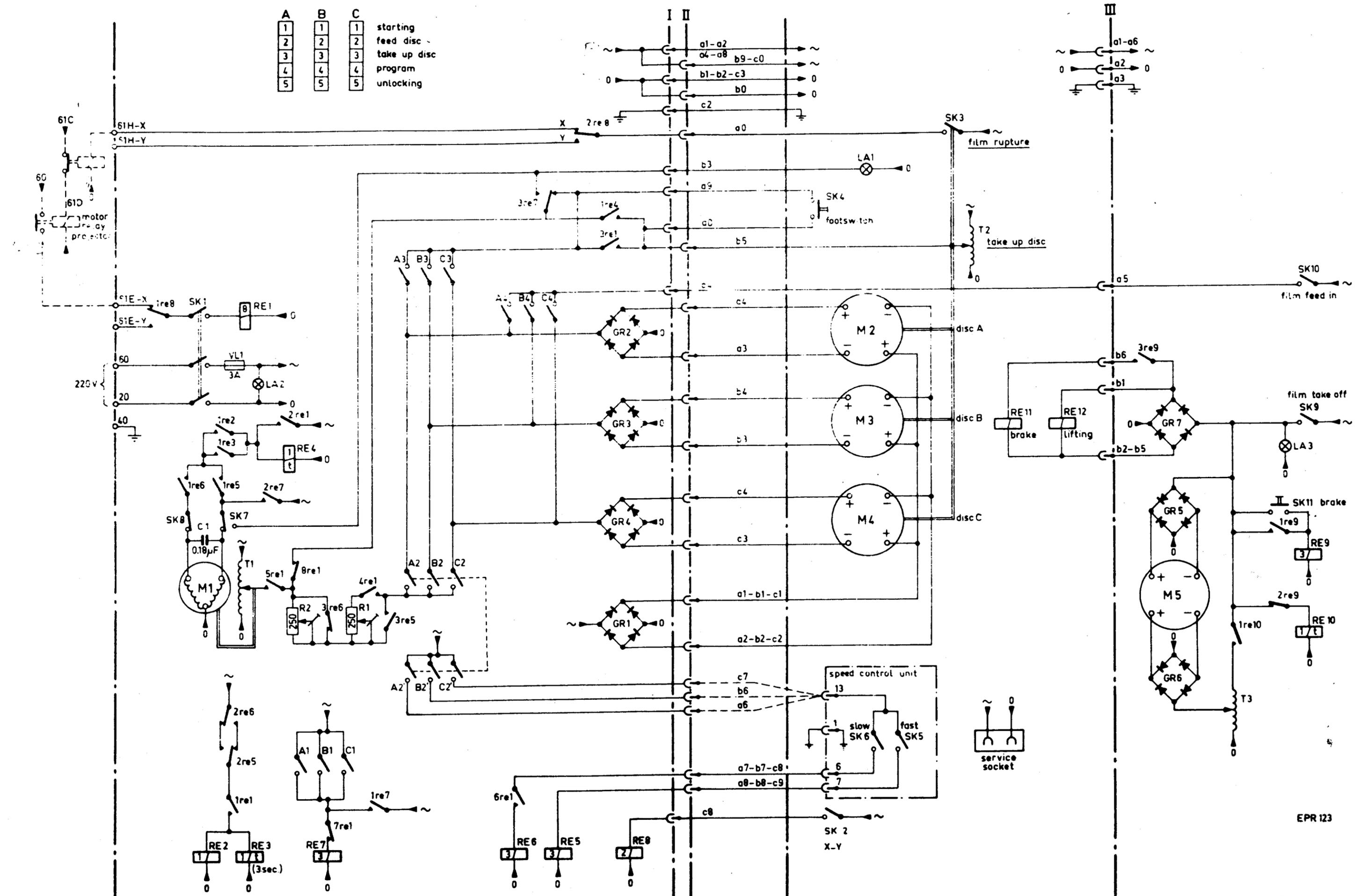
Fig. 25



EPR 328

Fig. 26

| A | B | C |              |
|---|---|---|--------------|
| 1 | 1 | 1 | starting     |
| 2 | 2 | 2 | feed disc    |
| 3 | 3 | 3 | take up disc |
| 4 | 4 | 4 | program      |
| 5 | 5 | 5 | unlocking    |

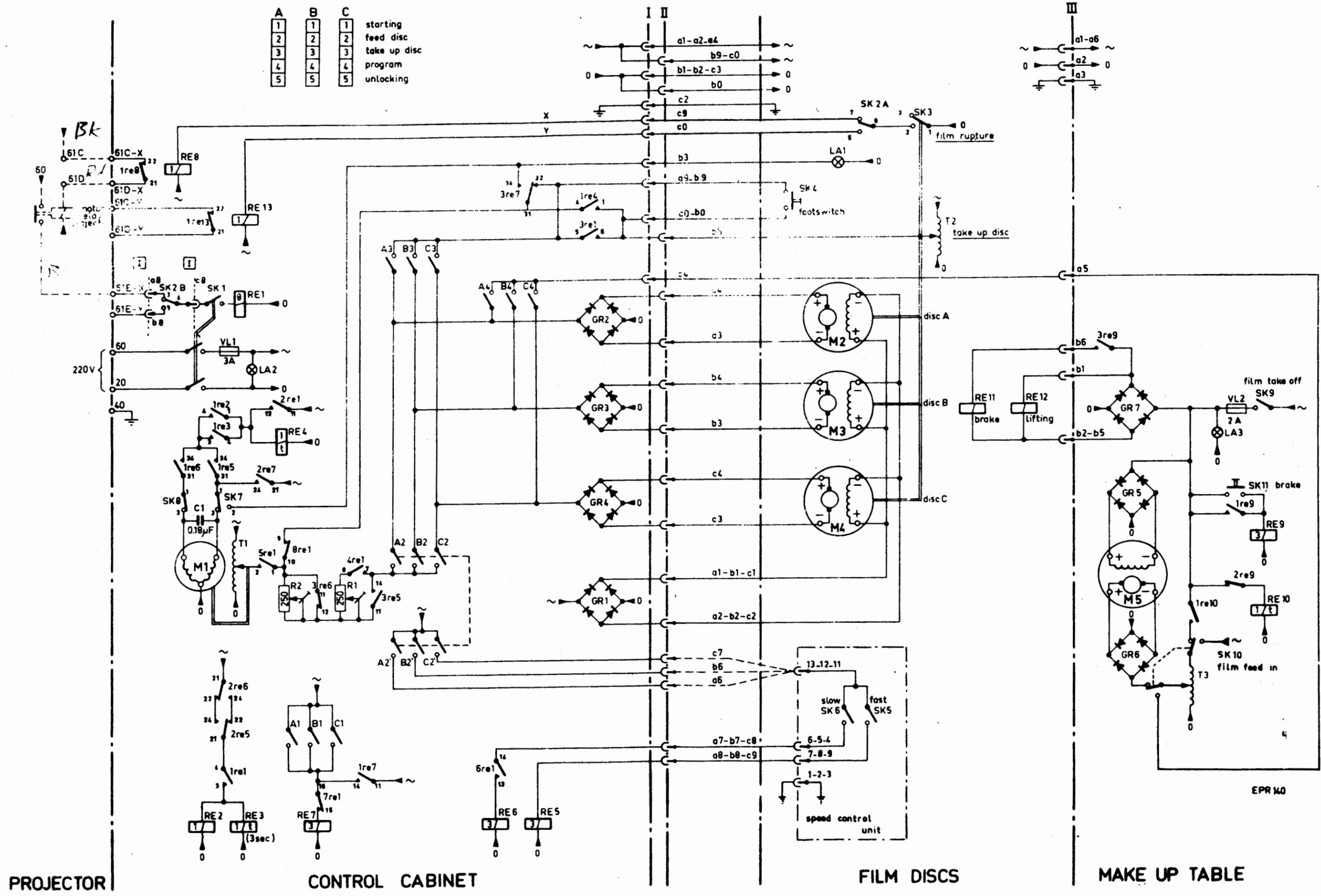


PROJECTOR

CONTROL CABINET

FILM DISCS

WINDING TABLE



PROJECTOR

CONTROL CABINET

FILM DISCS

MAKE UP TABLE

Fig 24

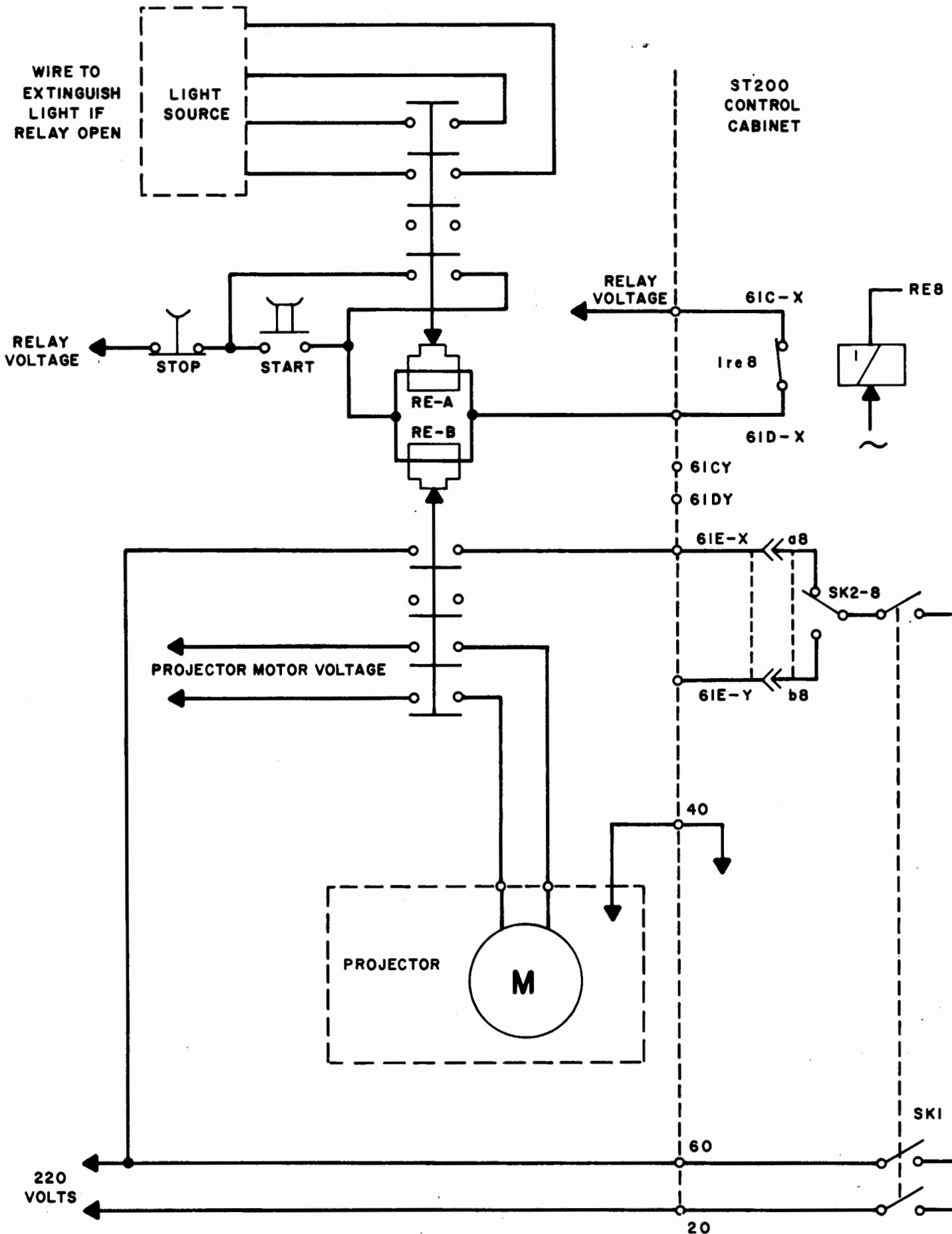
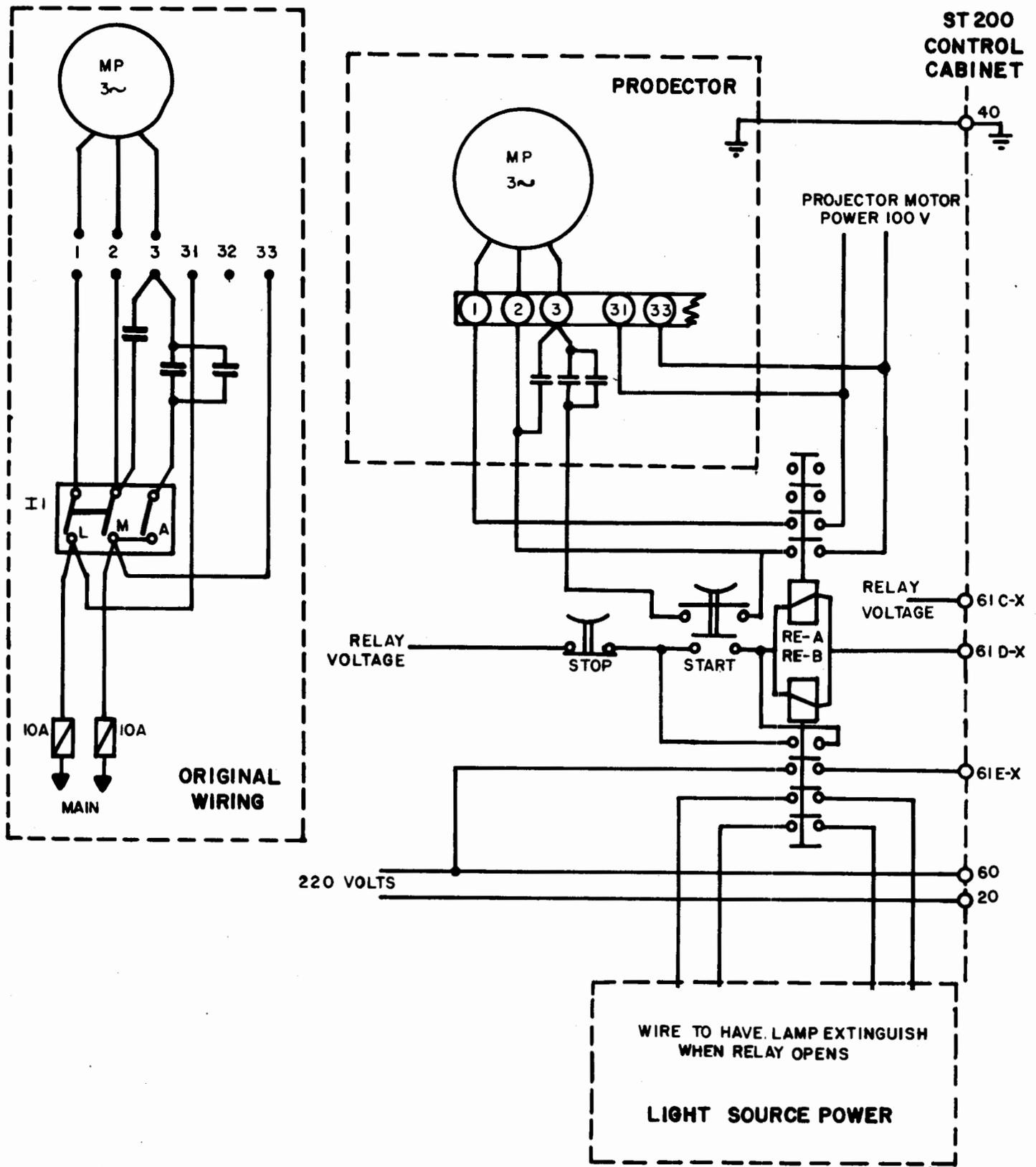


FIG. 29 RELAY INTERFACE FOR NON-NORELCO PROJECTORS W/O STARTING CAPACITOR



**FIG 30. RELAY INTERFACE FOR NON-NORELCO PROJECTORS USING MOMENTARY STARTING CAPACITOR**