

Threading the tape

The reel with tape is put on the left-hand turntable and the empty reel on the right-hand turntable. Care should be taken that the "dull" side of the tape comes into contact with the recording/playback and erasing heads, this "dull" side being the "sensitive" side of the tape. In order to pass the tape through the appropriate slit in the head, the central control knob must be set at either of the positions 1 or 2. In the other positions of knob E the pressure roller lever is right underneath the slit in the cover and consequently it is then impossible to thread the tape.

Indicator K.

When the central control knob E is set at position 6 (recording), the indicator K will light up. This also serves as a warning that the erasing oscillator is switched on. The signal applied to the recording amplifiers should be regulated with knobs A and/or B in such a way that the line and dot which light up, do not quite touch one another at the highest modulation peaks.

Recording a Radio/P.U. signal.

Join connections to plug sockets G.
Take care of the earth socket (see fig. 1).
Set central control knob E at position 6.
Adjust the signal strength by means of knob A (R19) in such a way that the indicator K indicates the correct modulation depth.

Recording a microphone signal.

Insert the plug of the microphone in socket J on the mounting plate (see fig. 1).
Set central control E at position 6.
Regulate the signal strength with knob B (R10) so that the indicator K indicates the correct modulation depth.

Mixing P.U. with microphone signal.

The signals are adjusted in the desired ratio by means of the knobs A and B.
The maximum modulation depth is again determined by the deflection of the indicator K.
It is advisable to turn knob C slightly back during recording.

Twin-track recording.

The height and adjustment of the recording/playback head are such that it is possible to record 2 programmes on this apparatus. When the tape with the first programme is full, it should not be rewound to the left-hand reel. The full reel and the empty one are interchanged in such a way that the dull side of the tape passes the heads again. The other side of the tape can then be modulated in a normal way.
To play back the two programmes consecutively, the reels must be interchanged again after playback of programme 1.

Erasing the tape

Usually any signal still present on the tape is erased automatically during recording. If it is desired, however, to erase the signal still present without making a new recording, then proceed as follows:
Turn knobs A and B fully to the left.
Put the central control knob E in position 6.
Switch on knob F.

Description of the mechanical part.The brake brackets 135 and 136 (see fig. 4)

The ends of the brake brackets 135 and 136 project from the elongated holes in the mounting plate 1 against the bottom of the switch ring 42.
The switch ring 42 is fixed to the central control knob so that when the latter is turned the switch ring 42 is moved whatever its position (see fig. 5).
In the positions 3 and 4 the control knob 43 can be depressed completely; in the positions 5 and 6 it must be depressed only partially.
The bottom of the switch ring 42 has a special toothed profile, so that on turning the control knob in the various positions, the brake levers 135 and 136 are depressed both at the same time or each separately.
In this way the brake discs 193 are released from one or both turntables, which are then allowed to run free.

Adjusting the brake brackets 135 and 136.

1. Slightly loosen the screws 140.
2. So adjust the brake brackets by means of a fitting screw-driver in the hole in the springs 137 and in the brackets 168(8) that the cam at the ends do not come into contact with the edges of the elongated holes.
3. Bend the upright tag of the brake brackets so that at position 5 of the control knob the distance between the brake disc 193 and the turntable 32 is approx. 0.5 mm. Make sure that the tags on the brake brackets can move freely in the holes in the mounting plate (see fig. 4 and 7). Then tighten the screws 140 firmly and secure them with locking paint.
4. Set the control knob at position 4.
The right-hand turntable is now stationary.
The force necessary to lift the tag, to which the brake disc is attached, from the turntable, causing the latter to start rotating, must lie between 450 and 550 g, measured just below the brake block (is adjustable by giving the elongated hole in the bracket 168(8) more or less pretension). (see fig. 8).
5. The same applies to the left-hand turntable.
In this case the control knob must be set between the positions 4 and 5, so that the left-hand turntable is operated, while the brake block is pressed against the turntable.
6. The extremities of the brake brackets should be able to move freely in the elongated holes of the coupling levers 133 and 134 without jamming or catching.

EL 3517		Lubricating grease X 013 58	Lubricating grease X 018 91	Lubricating oil X 007 12	Lubricating oil X 008 16
Lubrication plan	Number of item to be lubricated				
Switching ring	42		x		
Spindle + bearing in pressure-roller lever	69+71		x		
Spindle + bearing in pressure-roller	73+72		x		
Ball + pivot in flywheel spindle.	20+19		x		
Lower part of reel spindle + bearing disc.	25+139		x		
Fork head screw	68		x		
Spindle + bearing of "ready" lever.	144+151		x		
Spindle + bracket + spring. (playback mechanism)	88+89+		x		
Adjusting strip + bracket (in triangular hole)	90		x		
	224+89	x			
Bearing of friction disc + reel spindle.	32+25			x	
Bearing in cord pulley 92 + spindle (rewinding mechanism)	92/91			x	
Bearing in flywheel casing + tone spindle	17+19				x
Bearing bushes in flywheel casing + reel spindles.	18+25+				x
	29				
Bearing of intermediate wheel + spindle of intermediate wheel.	115+114			x	
Bearing in mounting plate + switch spindle	1+40	x			
Pin + forks on switches.	51+53	x			
Lifting lever + cam disc.	122+58	x			
Ends of brake levers + mounting plate.	135+136+1	x			
Ends of brake levers + bearing of these levers in the elongated holes in coupling lever.	133+134+	x			
	135+136	x			
Place of "ready" lever + pressure roller lever	150+71	x			
Spindle + bearing of lifting lever.	123+122	x			
Fork of lifting lever + bracket of intermediate wheel.	122+113	x			
Bearing of locking lever + spindle on mounting plate.	61+12	x			
Spindle on locking lever + roller	62+63	x			
Spindle + bearings of guide lever.	144+145	x			
Spindle on guide lever + roller.	146+147	x			
Bearing in switch plate + switch.	48+40	x			
Bearings in turntables + reel spindles	29+25			x	
Bearing bush in flywheel casing + tone spindle.	17+19				x
Rotor spindle + bearings of the motor.	303+310+			x	
	311				

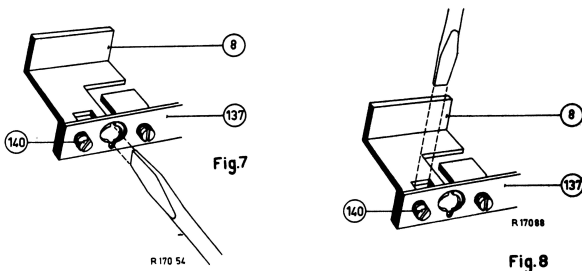
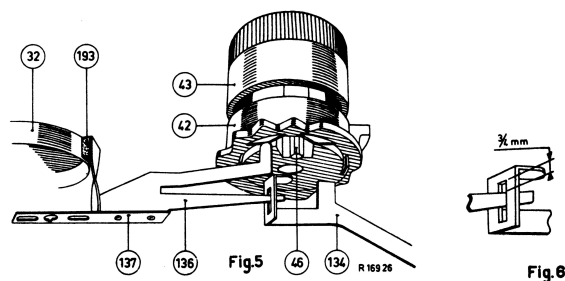
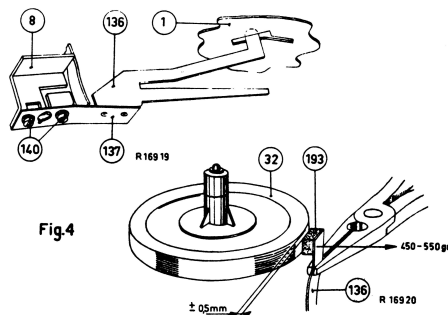


Fig. 8

PHILIPS

SERVICE NOTES

for the
MAGNETIC-TAPE RECORDER

EL3517

PHILIPS SERVICE NOTES MODEL EL 3517

Suitable for supply from A.C. mains.

Dimensions: 360 x 330 x 190 mm Weight : 10.5 kg.
Power consumption: about 50 W Loudspeaker : AD 3461

Tape velocity 9.5 cm (3 $\frac{3}{4}$ "/sec.
When using:

Normal tape
Tape length on 5" reels 180 m
Recording and playback time 2x30 min.
Fast forward winding approx. 80 sec.
Fast rewinding approx. 80 sec.

Long playing tape
Tape length on 5" reels 260 m.
Recording and playback time 2x45 min.
Fast forward winding approx. 120 sec.
Fast rewinding approx. 120 sec.

Amplifier:

Valves: ECC83 - ECL80 - ECL82 and DM71 (indicator)

Mains voltages: 110 - 127 - 220 and 240 V

Output impedance of additional loudspeaker connection 7

Some order numbers

Microphone	EL 6100/02
Empty 5" (12.7 cm) reel	EL 3912/03
5" reel with 180 m of tape	EL 3915
300 m leader tape (green) on reel	EL 3917
300 m leader tape (red) on reel	EL 3918
5" reel with 260 m of tape	EL 3915/50
Reel of adhesive tape	EL 3916
Headphone	EL 3992/10

Connections (see fig. 1)

The apparatus is supplied from A.C. mains ; by means of the voltage adapter it can be connected to 110 - 127 - 220 and 240 V. The adapter is accessible if the cover of the compartment for storage of the flexes is lifted and the plate in front of the adapter removed after loosening of the 2 screws.

Under the cover are also provided the connections for:

- a. An additional loudspeaker connection H.
When a plug is inserted in the socket 2 the internal loudspeaker is switched off by SK11. The circuit: internal loudspeaker and S8 of the output transformer is interrupted and the circuit S7 and the external loudspeaker closed.

- b. Mains flex and plug.
c. Gramophone/radio connection.

In the position "recording" an input signal can be applied to the plug sockets G, whilst in the position "playback" a signal can be tapped off.

The microphone connecting plug J is fitted on the mounting plate of the mechanical part of the apparatus.

Controls (see fig. 1)

Knob A. By means of the volume control R19 connected to it the Gram/radio input signal can be controlled. In certain series the push-pull switch SK5 is likewise connected to it, enabling the capacitor C23 to be switched on or off. Owing to this, the H.F. erasing and pre-magnetizing signal is shifted approx. 3 Kc/s.
For if the tape recorder is used in combination with a radio set, a whistling sound may become audible during recording. This is caused by interference between the harmonics of the oscillator frequency and the H.F. signals in the radio set.
In the apparatus where SK5 is absent, C23 is not found either.

Knob B. Connected to this knob is the volume control R10, with which the microphone-input signal can be regulated. The switch SK6 is also connected to this knob. When knob B is turned fully to the left, the microphone input signal is short-circuited by SK6.

Knob C. To this knob is connected the volume control R34 + R35, with which the output signal of the playback amplifier can be regulated.

Knob D. Connected to this knob is the potentiometer R13, with which the high note range of the playback amplifier can be regulated.

Knob E. Central Control knob (see fig. 2)
By means of this knob the apparatus can be set at the positions described below, both mechanically and electrically.
For convenience the various positions are indicated by the figures 1 to 6.

Position: In this position motor and amplifier part are
1 switched off. The intermediate wheel has been lifted off the motor pulley and the flywheel in order to prevent denting of the rubber intermediate wheel when the mechanism is not operating.

Position: SK9 is switched on, owing to which the amplifier
1 2 part receives a voltage.
In the following positions SK9 remains switched on.

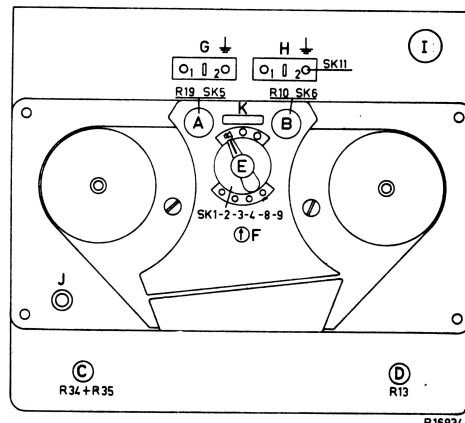


Fig.1

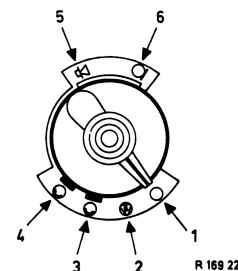


Fig.2

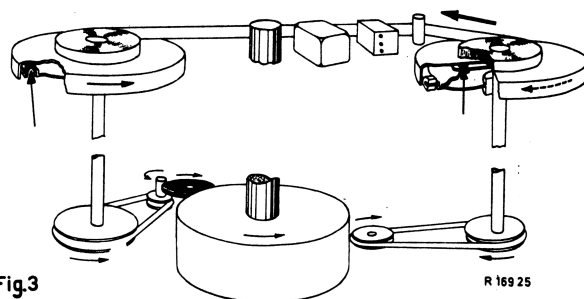


Fig.3

- Position 3a: The motor is switched on by SK8.
(knob E not depressed) The intermediate wheel is released and now presses against the motor pulley and the flywheel.
- Position 3b: Right-hand turntable turns anti-clockwise.
(knob E pressed) Left-hand turntable is stationary. When reels are put on and the tape is threaded, the latter winds rapidly forward.
- Position 4a: Like position 3a.
(knob E not depressed)
- Position 4b: Right-hand turntable turns anti-clockwise.
(knob E pressed) Left-hand turntable turns clockwise. When reels are fitted and the tape is threaded, the latter rapidly rewinds.
- Position 5: "Ready" position "reproduction".
The tape is pushed almost against the tone spindle by the pressure roller.
(See also under "Knob F").
The amplifier is then electrically connected as a play-back amplifier.

Position: "Ready" position "recording".
6 In this position, too, the tape is pushed almost against the tone spindle by the pressure roller.
(See also under "Knob F").
The amplifier is then electrically connected as a recording amplifier.

Knob F. When knob E is at position 5 or 6, the pressure-roller lever is released by pushing knob F in the direction of the arrow. The tape is then clamped between the tone spindle and the pressure-roller the tape speed is thus determined by the number of revolutions of the tone spindle.
When knob F is pulled in the opposite direction, the pressure roller is lifted from the tone spindle, as a result of which the tape is allowed to run free and stops.

7. Set the control knob at position 1.
The ends of the brake brackets projecting from the elongated hole in the coupling brackets must not touch the upper side of the said elongated holes.
There must be a clearance between them of approx. 3/4 mm.
(see fig. 6).

The oil seal 170

The purpose of this seal is to prevent the oil from seeping out of the bearing of the flywheel spindle 19 and contaminating the tone spindle, which may cause slip.
The ring 170 must be approx. 2 mm above the top bearing and the flywheel casing.

Stripping bracket 143

The purpose of this bracket is to prevent the tape from winding around the flywheel spindle.

Adjustment

The bracket must be so adjusted that it just keeps free from the flywheel spindle.

Plastic cover 181

By means of the screws 186 the cover must be so adjusted that the turntables 32 cannot come into contact with this cover.

Switch plate 48 (see fig. B)

This plate serves for bedding of the switch spindle 40 and for fixing the switches 52.

Adjustment

The switch plate must be so fixed with the screws 51 that the switch spindle 40 is perpendicular to the mounting plate.

The coupling levers 133 and 134 (see fig. 9)

The control knob 43 can be depressed approx. 8 mm in the positions 3 and 4. At the bottom of this knob is the switch pin 46, which projects from a recess in the switch ring 42.
Furthermore, the control knob is fitted with spring 44, by which it is kept up.

Plate 45 is provided to prevent the control knob from jumping out. When control 43 is depressed, the switch pin 46 moves through an elongated hole in the mounting plate 1 and presses down lever 133 or 134 underneath it: this depends on the position (3 or 4) of the central control knob.

The extreme ends of the coupling levers 133 and 134 have elongated holes, from which the ends of the brake levers 136 and 135, respectively, project (see fig. 6).

When, for example, at position 3 of the control the left-hand lever 133 is pressed down by the switch pin, the right-hand brake lever 135 is moved as well.

When depressing the operating knob in position 4, the reverse applies. In this case the left-hand brake lever is operated by the right-hand coupling bracket.

On the horizontal part of the coupling levers 133 and 134 a plate 139 is fitted supporting the pivot spindle 25 of the turntables 32 (see fig. 10).

When the coupling levers 133 or 134 are pressed down by the control knob, the reel spindle and the pulley 37 or 38 will also move in a downward direction.

This is a consequence of the weight of the spindle plus pulley, turntable and reel with or without tape (mechanism in operation). The spindle 25 previously mentioned is provided with a metal disc 26, which is covered with felt ring 30. In its turn the metal disc 26 is connected to the friction disc 28 by means of a piece of corrugated flexible cotton cloth 27 (see fig. 11).

The bearing of the friction disc 28 can be moved along the spindle 25 over a certain distance; it rests on the bearing 18, in which rotates the spindle 25. In the upper position of the reel spindle 25 the turntable 32 thus rests on the felt ring 30, i.e. at positions 5 and 6 and at positions 3 and 4 (when the control knob is not depressed).

In these positions, owing to the slight friction between the felt ring 30 and the turntable 32, the right-hand turntable is turned to the left.

The force k which is transmitted by the felt ring 30 to the turntable 32 is small, k being determined by $k = fN$ (f = the friction coefficient between the felt ring 30 and the turntable 32, whilst N is the normal pressure exercised by turntable 32 plus reel with tape on felt ring 30 (see fig. 12).

The moment (force \times arm) is therefore small and only serves:

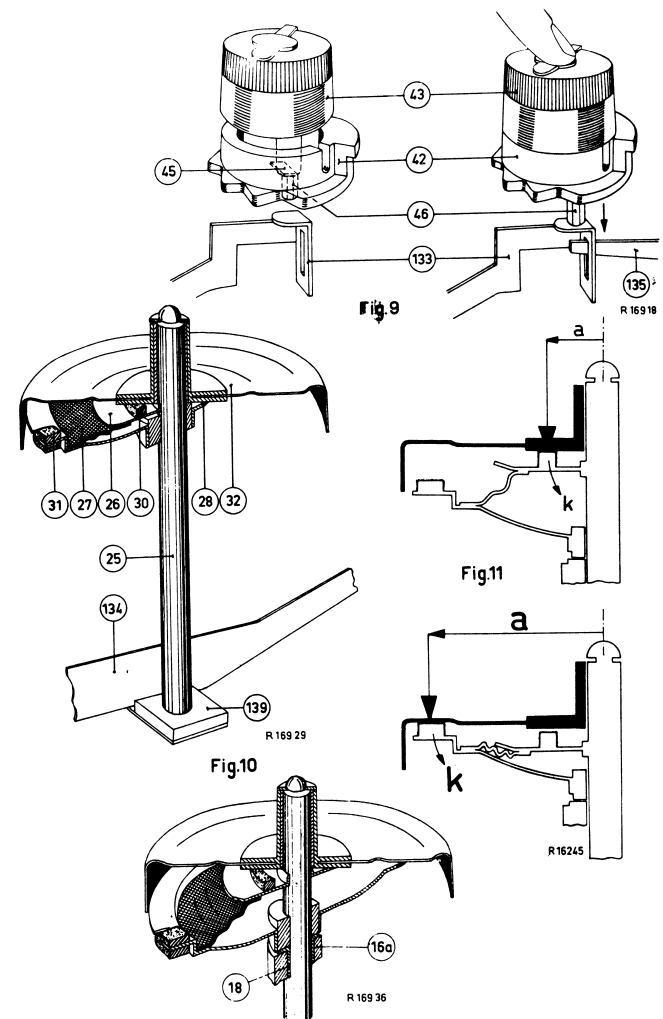
- To keep the tape taut, and
- To cause the tape to be wound tightly.

The right-hand turntable + spindle is stationary at the positions 5 and 6, since it is blocked in cord pulley 38 via spring 240 and cord 104. Owing to the friction between the felt ring 30 and the left-hand turntable 32, the latter will be slightly braked; as a result the tape is drawn tight during unwinding in the positions 5 or 6.

When the control knob is set at position 3 (fast forward winding) and then depressed, the coupling lever 133 will move downward. As a result, the combination: spindle 25, disc 26 and felt ring 30, moves down, owing to which the turntable 32 is lowered on to the friction blocks 31. The force with which the turntable is now driven, is a few times greater, since:

- The friction coefficient f between the turntable 32 and the friction blocks 31 is greater; consequently, K is greater.
- The distance A is a few times greater, consequently the moment $M = K \times A$, is greater too.

When the control knob is set at position 4 and depressed, the foregoing also applies, but in this case for fast rewinding.



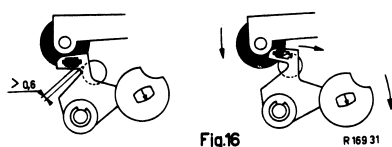
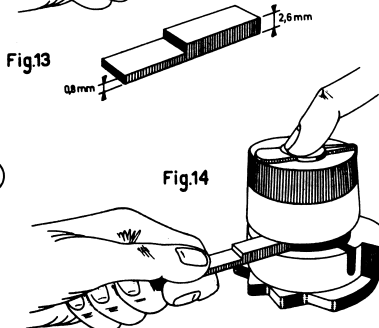
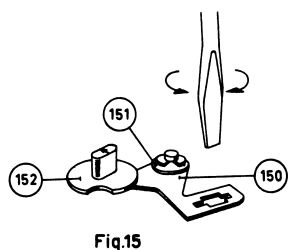
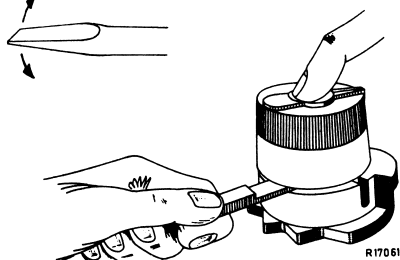
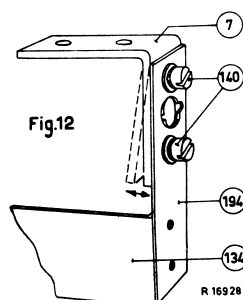
Adjust the coupling levers 133 and 134

- Bend and adjust the brackets 7, to which are fixed coupling levers 133 and 134, in such a way that:
 - the ends of the levers do not touch one another;
 - the flat horizontal ends of the levers are positioned right under the elongated holes in the mounting plate (under switch pin 46, see fig. 12).
- Remove the plastic cover 181.
- Put reels with tape in the apparatus in the usual manner. Both reels should have approximately the same quantity of tape on them.
- Set the control knob at position 3. Keep the thin end (0.8 mm) of the auxiliary tool (see fig. 13) between switch ring 42 and control 43. Depress control knob and keep it pressed.
- By inserting a screwdriver (held in the other hand) in the elongated hole in bracket 7, adjust the height of the right-hand coupling bracket 134 just enough to make the tape start winding forward.
Check:
Give the screwdriver a slight turn and stop the tape. Now adjust again so that the tape would just start moving forward, so as to make sure that the coupling bracket is not adjusted too high.
- If properly adjusted, release the control knob and turn up the screws 140 very tightly. Then secure the screws 140 with locking paint.
- Check:
Keep the thick end of the auxiliary tool 2.6 mm between the control knob and the switching ring 42 (see fig. 14). Depress the control knob. The tape must then not wind forward. If it does wind forward, the adjustment mentioned under 4 and 5 has not been effected correctly and has to be repeated.
- Set control knob at position 4. Tape in apparatus in the normal way. Give screws 140 of the left hand coupling lever 133 one complete turn to the left.
- Now adjust the left-hand coupling lever as indicated in the points 4, 5, 6 and 7. In this case, however, the tape must rewind with the control knob fully depressed.

"Ready" lever 152 (see figs. 15 and 16)

At the positions 5 and 6 of the control knob, the pressure-roller lever is turned inwards. Bracket 150 on lever 152 stops the pressure-roller lever just before the roller touches the tone spindle. When knob 152 is pulled back, the pressure-roller lever is further released, and accordingly the roller is pressed against the tone spindle and tape transport is effected. When the knob 152 is pushed forward again, the roller is again slightly removed from the tone spindle, so that the tape transport stops.

By means of the mechanism described above it is therefore possible to stop the tape transport during recording or playback without having to switch the central control knob back to position 4.



Adjustment

1. Put the tape in the apparatus.
2. Set the control knob to position 5.
The tape must then be stationary, the distance between the roller and the tone spindle being approx. 0.6 mm (see fig. 16). This can be adjusted by inserting a screwdriver in the hole in bracket 150 and bending the latter in the desired direction. When knob 152 is pushed back, the tape transport should take place.

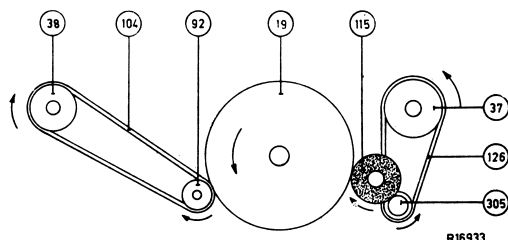


Fig.17

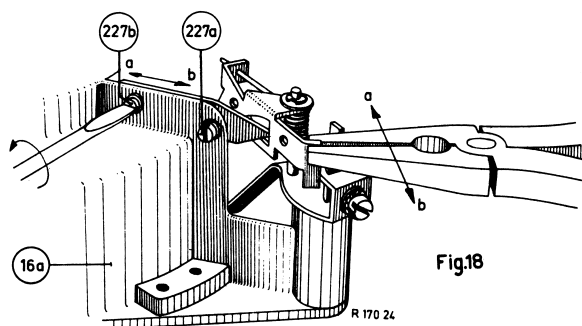


Fig.18

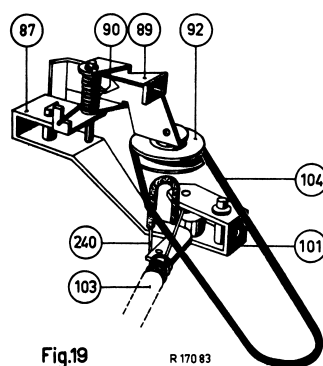


Fig.19

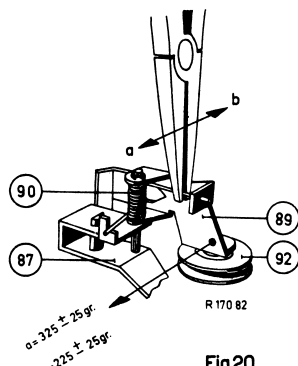


Fig.20

The driving mechanism of the turntables 32 and the rewinding mechanism 87 - 89 - 92 and 224 (see fig. 17).

When the control knob is at the positions 3 to 6 inclusive (anti-clockwise) the right-hand winding disc 28 is driven by the combination: motor pulley 305, cord 126, cord pulley 37 and reel spindle 25. At position 4 (fast rewinding), the left-hand winding disc, (clockwise) is driven by the flywheel 19, the cord pulley 92, cord 104 and cord pulley 38. The rewinding mechanism, i.e. the combination: bracket 89, cord pulley 92 and cord 104 is coupled to lever 87,

When the control knob is turned to positions 2 to 5, the lever 87 controlling the rewinding mechanism is moved as well. At the positions 1 - 2 - 3 - 5 and 6 the cord 104 is kept away from the flywheel 19 and is braked. At position 4 (rewinding) the combination: cord pulley 92 cord 104 is pressed against the flywheel 19, and the left-hand reel spindle 25 + winding disc 28 is driven in anti-clockwise direction (see fig. 19).

Adjustment of the rewinding mechanism

Note: There are 2 different constructions of the brake mechanism, viz.:

- a. one in which cord 104 is only braked by a spring on lever 87.
- b. another, in which cord 104 is braked by the cam on cord pulley 92, against spring 240 and by spring 242 on tilting bracket 101.

First adjustment a: (see fig. 18)

1. By means of pliers bend the tag on lever 89 so that when the control knob is at the positions 5 and 6, there is a play of 1 - 1.5 mm between cord 104 and the flywheel.
2. Set control knob at position 4 (switch over from position 5 to position 4, to eliminate tolerances).
3. Give the screws 227, with which plate 224 is fixed, one complete turn to the left. Push the points of the adjusting strip 224 into the triangular hole in bracket 89 (direction b). Make sure that the screws 227 can be easily moved in the holes in the flywheel casing 16a, by slightly moving adjusting strip 224, which is pressed into the triangular hole in lever 89.
4. Firmly tighten first screw 224a and then screw 224b. Then lacquer them.
5. Check:
Hold pulley 38 with one hand. The flywheel 19 must then stop (see also par. 6). Repeat this procedure, if necessary.
6. The pressure of lever 89 in the direction of the flywheel, measured in the hole in lever 89 close to spindle 91 should be approx. 325 ± 25 g. If required, adjust by bending the long end of spring 90 slightly into the desired direction (see fig. 20).
7. The brake spring 240 must be bent so that for the following settings of the control knob it assumes the position described (see figs. 21 and 22).

Position 3 : The spring must lie close against pulley 92, so that when cord 104 is moved either way, spring 240 moves too, but brakes effectively.

Position 4 : In this position the spring 240 must be clear of the pulley 92 and of the cord 104. The distance between spring 240 and pulley 92 and between spring 240 and cord 104 must then be 1 mm.

Position 5 : The spring 240 must lie close against cord 104 and brake it.

Position 6 : See position 5.

If required, adjust by bending spring 240 into the desired direction by means of pliers.

Check:

When the control knob is set at the positions 3, 5 and 6, the left-hand turntable must not move. (In position 3, depress knob and place reel with tape on the left-hand turntable).

Second adjustment b : (see figs. 23 and 24)

For points 1 to 5 inclusive see under "First adjustment a".

6. The pressure of lever 89 in the direction of the flywheel must be approx. 225 ± 25 g, measured in the hole in the lever 89 close to spindle 91 (see fig. 20).
7. Very slowly switch the central control knob from position 4 to position 3 and stop the knob at the moment cord 104 stops. (Apparatus under voltage). Hold the knob and move cord 104 with one hand so that pulley 92 is turning. The cam on the pulley 92 must then run just clear of the spring 240a on lever 87. If necessary, bend spring 240a so that the cam on the pulley 92 just keeps clear of the spring 240a. It is then assumed that the apparatus has already been adjusted according to point 3.

8. Slowly switch the control knob from position 4 to position 5.
The spring 242 then touches the inner side of cord 104.
The moment the cord stops, the outer side of the cord 104 must not touch the rib on the flywheel housing 16a.
Adjust if required, by bending spring 242 slightly (see fig. 23).

9. Check:

In the positions 3 - 5 and 6 of the control knob, cord 104 must not move. (Knob depressed in position 3).

Combination: lever 145, fork-head screw 68 and lever 67.

The circumference of the switching ring 42 has, in addition to a toothed profile, a spiral-shaped cam. (see fig. 25). Against this cam runs the roller 147, which rotates on the spindle 146. The spindle 146 is mounted again on the lever 145, the latter being swivel-mounted on spindle 12 on the mounting plate. The fork-head screw 68, which is fitted in a tapped hole in the bracket 67, grips around the spindle 146 near roller 147. The bracket 67 is again swivel-mounted on the pressure-roller lever 71.

The pressure roller lever 71 is always pulled in the direction of the tone spindle 19 by the action of spring 103. Owing to the presence of lever 67, fork-head screw 68, lever 145 and roller 147, the position of the pressure roller lever 71 is dependent on the position of the switching ring 42, i.e. of the control knob.

Adjustment: Fork-head screw 68 must be so turned that when the control knob is set at position 5 or 6, the space between roller 147 and the cam on the switching ring 42 is approx. 0.2 - 0.4 mm. (See fig. 27).

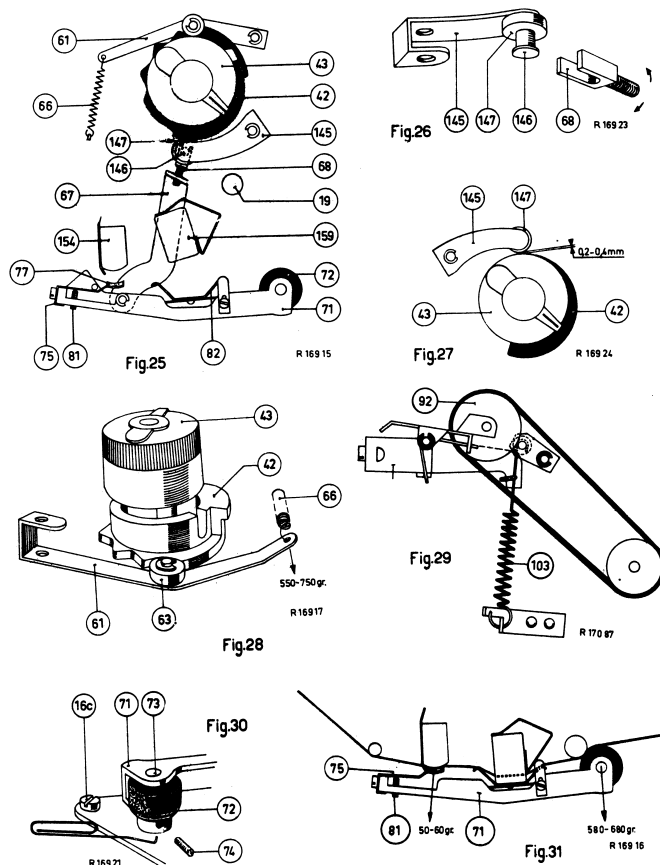
To turn fork-head screw 68, the pressure roller lever 71 must be turned away from the tone spindle by hand.

Note: After this adjustment, the adjustment of the rewinding mechanism lever 89 must be altered too.

Pressure roller lever 71 (see fig. 31)

This lever is pressed in the direction of the tone spindle 19 by the action of tension spring 103 (see fig. 31).

It is of a special design to reduce the force required to displace the pressure roller lever against the spring-action.



3517

If the strong spring 103 were fitted direct to the lever 87, a constantly increasing force would be required for hinging out pressure-roller lever 71. However, in the positions 1, 2 and 3, so when the spring 103 is extended to its limit, the tilting bracket 101 takes up a large part of the tensile force of spring 103. Consequently the spring delivers its full tensile force when the control knob is set between the positions 4 and 5. Another advantage of this construction is that when the control knob is released between the positions 4 and 5, the speed at which the pressure roller 72 touches the tone spindle 19 is not too high; the formation of loops in the tape is thus prevented.

Adjustment

The force by which the pressure roller 72 presses the tone spindle 19, measured on the spot where it comes into contact with the tone spindle, must range from 580 to 680 g. Adjustment can be effected by bending bracket 9 slightly in the required direction.

The pressure roller 72 can be taken out of the apparatus in the following way without it being necessary to dismantle the pressure roller lever 71.

1. Give screw 74 a few turns to the left.
2. By means of a piece of wire bent at one side push up spindle 73 so far that it can be withdrawn from the top of the pressure roller lever 71.

Switching ring 42, lever 61 and spring 66 (see fig. 28)

The circumference of the switching ring 42 has a special toothed profile.

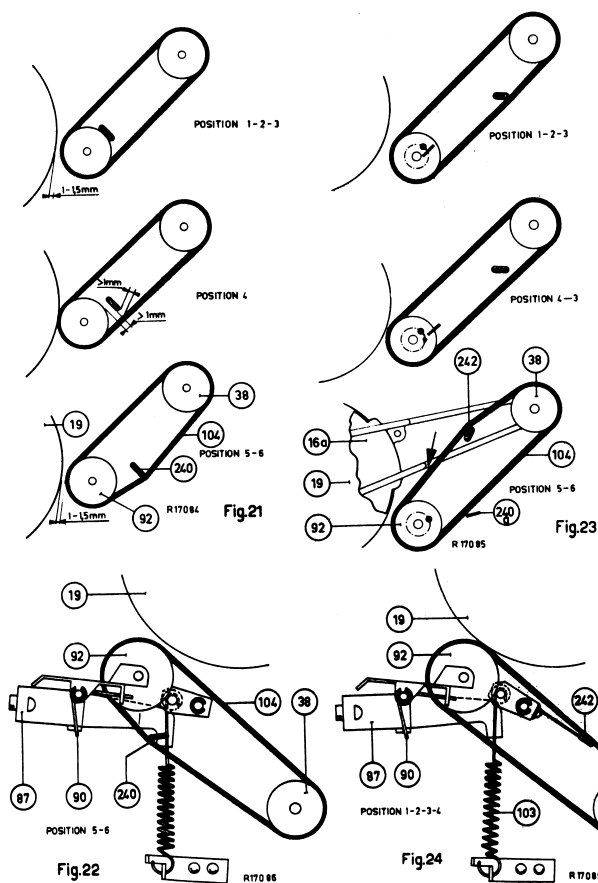
By means of spring 66, the roller 63 on lever 61 engages with the teeth of the switching ring; as a result the 6 positions of the control knob are fixed.

Adjusting spring 66

The tensile force of spring 66, measured at the point of application in lever 61 must range from 550 to 750 g.

"Anti-scream" switch 169 (see fig. 32)

What is called an "anti-scream" switch is fitted to prevent a "scream" becoming audible in the loudspeaker when the apparatus is switched over from the "playback" to the "winding" position or vice versa. Owing to the changing-over of the various contacts in the switches it is possible that some circuits are open at a given moment, which results in the phenomenon described above. Switch 169 is provided to eliminate this.



The teeth of the switch ring 42 presses lever 61 against the tag of switch 169 during the transition from one position to another. As a result, the signal of the second amplifier valve is short-circuited and the switching pulses are no longer audible.

Adjustment

By means of pliers bend the tag of switch 169 in such a way that in one of the positions of the control knob the distance between the tag and the lever 61 is approx. 1 mm (see fig. 32).

Silent-switching device, spring 164 and plate 166 (see fig. 33).

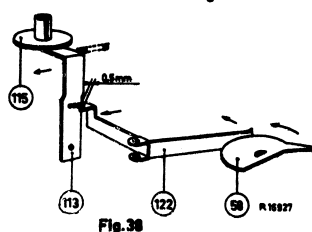
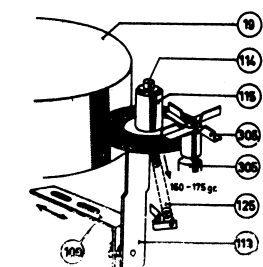
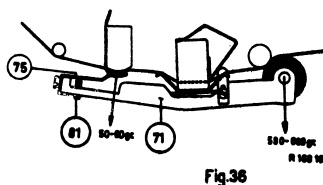
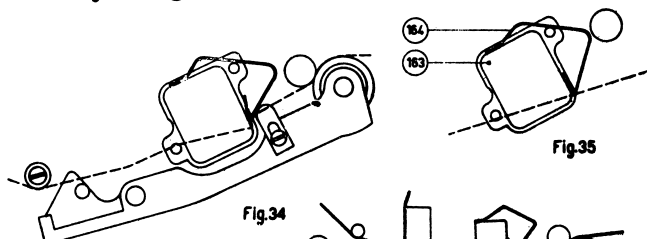
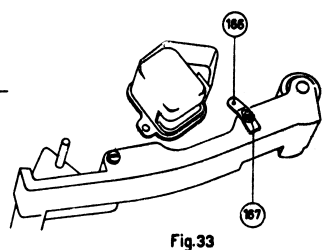
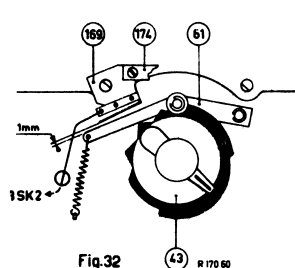
By setting the central control knob to its various positions, various electrical circuits are opened and closed, which may give rise to switching surges. These surges are recorded on the tape and are audible during playback. To avoid this, a silent-switching device is provided, consisting of spring 164 and plate 166.

At the position "playback" or "recording" the spring 16 is pressed inward by the plate 166. When the pressure-roller lever 71 is hinged out (to position 4), the plate 166 releases the spring 164 (see fig. 35). As a result the tape is pushed away from the recording/playback head before the various switches establish or break contact. The switching surges can no longer be recorded on the tape in this case.

Adjustment

1. Thread the tape in the normal way.
2. Set the control knob to position 5 (playback).
3. Adjust the plate 197 by means of screw 167 so that spring 164 just keeps clear of the tape.

Note: The bent end of the spring 164 must be in constant contact with the screening cover 163.



Damping bracket 82 and pressure pad 77 (see fig. 36).

Owing to its special shape the damping bracket 82 presses a larger surface of the tape against the recording/playback head. In this way a better contact between tape and head is ensured. Should there occasionally arise some play between the head and the tape (for example, if the tape is not tensed), this will be immediately noticed on account of the occurrence of voltage variations in the output signal. The tautness of the tape is produced firstly by the pressure pad 77 and secondly by the tone spindle 19 and the tension roller 72 pulling on the tape.

Adjusting the pressure pad 77 (see fig. 36).

This felt pad must be so adjusted by means of the set-screw 81 that the pressure measured on the spot where the pad 77 touches the erasing head, ranges from 50 to 60 g.

Driving mechanism (see fig. 37).

Intermediate wheel 115, bracket 113 of intermediate wheel and lever 122.

The intermediate wheel 115 rotates on the spindle 114 on bracket 113. The bracket 113 is again swivel-mounted on bracket 109. Spring 125 pulls the bracket 109 in such a direction that the intermediate wheel 113 is pressed with a certain force against motor pulley 305 and flywheel 19.

Owing to the special shape of disc 58 fitted on spindle 40 of the control knob, this disc presses against the rear end of lever 122 when the control is set to the positions 1 or 2. Consequently, in the positions 1 and 2 (so when the motor is not running) the intermediate wheel is lifted off the motor pulley and the flywheel. This is to prevent the rubber intermediate wheel from being dented by the motor when the mechanism is not in operation.

Adjustment

1. When the control knob is at the positions 3 to 6 inclusive the intermediate wheel must run perpendicularly to the motor pulley in the flywheel. This position can be adjusted, if required, by slightly turning bracket 109 (slightly loosen screws 110). (See fig. 37).
2. When the control knob is switched over from position 2 to position 3, the intermediate wheel 113 must first be released and press against the motor pulley in the flywheel, and then operate the motor switch. This can be adjusted by slightly changing the angle at which the lifting bracket 122 is bent (see fig. 38).
3. In the positions 3 to 6 inclusive of the control there must be a play of approx. 0.5 mm between the intermediate-wheel bracket 113 and the point at which the latter comes into contact with the fork of the lever 122 in its position of rest. This can likewise be adjusted by slightly bending lever 122.
4. The tensile force of spring 125 which pulls the intermediate wheel 115 against the motor pulley in the flywheel, must be 150-175 g measured in the working direction. If required, this can be adjusted by slightly bending the tag to which spring 125 is fixed.

Switches 52 (see fig. B)

The fixing screws 55, with which the switches 52 are attached, can be moved in the elongated holes in the switch plate 48, owing to which these switches can be adjusted as follows:

1. Set the central control knob at position 1. Both switches must then be off.
2. When the control knob is moved on to position 2, pin 59 on plate 58 must just engage with fork 53 on the motor switch and reverse this switch.
3. When the control knob is turned to position 3, pin 59 must just engage with the fork of the second switch (amplifier switch) and reverse this too.
4. Next, turn the control knob to the positions 2 and 1, on account of which the switches must switch back again in reverse order.

Caution: The pin 59 must not engage too deeply into the forks 52, as in this case they might be contorted.

Cord pulleys 37 and 38 (see fig. B)

The pulleys 37 and 38 are driven by the cords 126 and 104 respectively.

Adjustment

The pulley 37 must be fitted to the reel spindle 25 in such a way that the imaginary connecting line drawn through the grooves in the motor pulley 305 and the disc 37 runs parallel to the mounting plate.

The same applies to the cord pulleys 38 and 92, which are adjustable after the set screws 39 are loosened. The pulleys can then be moved on the spindle 25.

After this adjustment make sure that the brake discs 193 do not slide under the turntables 32 when the latter are pulled up.

If this should be the case, the pulley must be taken off the reel spindle 25 and one or more extra rings must be put between bearing 18 and pulley 37 or 38.

Then the above check must be carried out again.

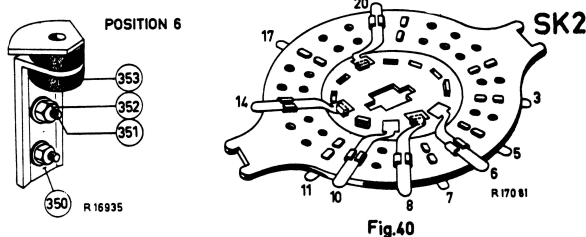
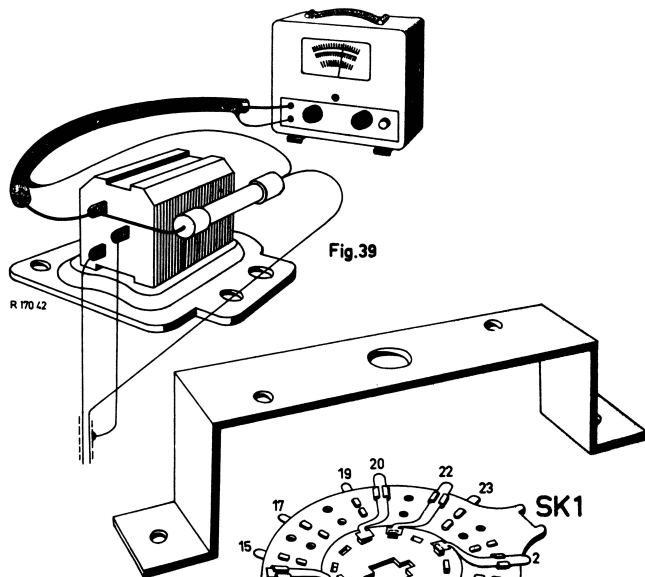
Adjustment of the switches

The switches SK1 and SK2 (see fig. 40).

1. Set the central control knob at position 1.
2. When the control knob is switched from position 1 to position 5, SK1 and SK2 must not move.
3. When the control knob is turned from position 5 to position 6 SK1 and SK2 must adopt their next position.
4. When the control knob is turned back from position 6 to position 1, the reverse must take place.
5. Adjustment (rotor with respect to stator) of SK1 and SK2. In the "recording" position (position 5) the rotors (i.e. the rotating part) of the switches SK1 and SK2 must be in the position as indicated in fig. 40. If required, loosen set-screws 228 and readjust switch spindle.
6. The disc 231 on the spindle of the control knob must be so adjusted by means of screws 227 that it moves lever 232 from the "playback" to the "recording" position.

Switch SK3

1. Set the central control knob at position 1.
2. The lever of the switch SK2 must be in its left-hand position (viewed from under the chassis).



- When the control knob is turned from position 1 to position 4, the switch SK3 must not operate.
- When the control knob is turned from position 4 to position 5 the switch lever 5 must be moved one step by the cam on disc 231. The lever is then at its central position.
- When the control knob is switched over from position 5 to position 6, the switch lever must be moved again one step. The lever is then in its right-hand position (viewed from under the chassis).
- When the control knob is turned back to position 5, the reverse should take place.

Switch SK4

- When the central control knob is turned from position 1 to 4, SK4 must not function. Contacts 2 and 3 connect. Contact 3 is open.
- When the control knob is turned from position 4 to position 5, SK4 must operate for a moment. First middle contact 2 open, then contacts 1 and 2 connected and contact 3 open.
- Before the control knob is stopped in position 5, SK4 must be switched back again, so contacts 2 and 3 connect and contact 1 is open.
- From position 5 to position 6, SK4 does not operate.
- On switching back from position 6 to position 1, the reverse will take place. SK4 should function between the positions 5 and 4.

Taking the apparatus out of the cabinet.

- Loosen the four fixing screws at the corners of the tape deck.
- Unsolder the connections to the loudspeaker, if required.

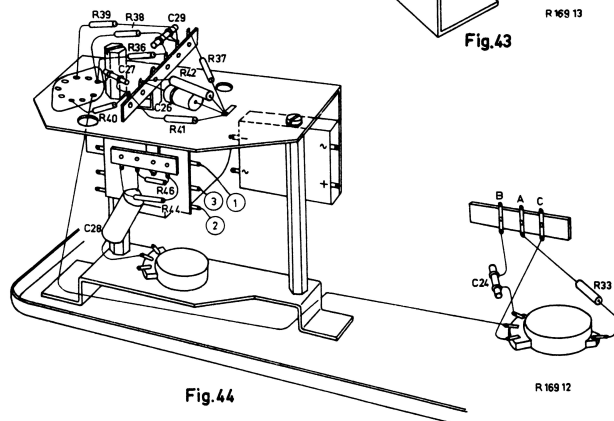
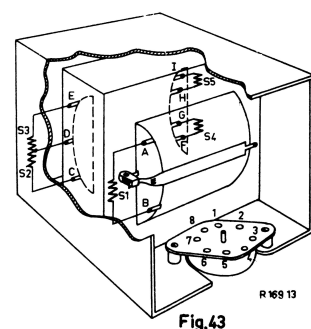
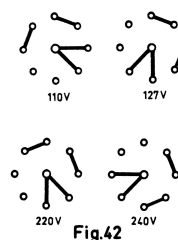
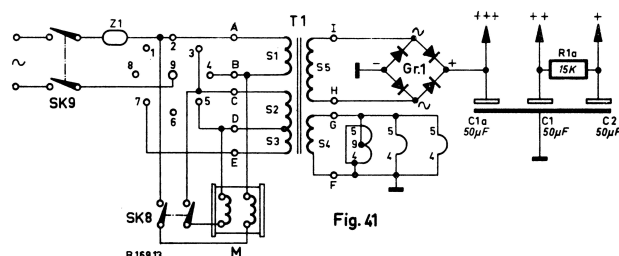
Detaching the electrical part from the mechanical part; the electrical part can be folded away and the mechanical part becomes accessible.

- Unsolder the following connections:
 - The three connections on the strip for leads to the potentiometer C (R34 + R35).
 - The three connections on the electrolytic capacitor for leads to the output stage.
 - The two connections on the microphone plug.
 - The connections coming from the pick-up head.
- Remove lever 232 from disc 231 on the spindle of the control knob.
- Unsolder set screw 228 on switch SK1 - SK2.
- Remove disc 231 from the spindle of the control knob by loosening screws 227.
- Remove adhesive tape round the hexagonal spindle near the relieve bracket of the mains flex.
- Remove the 4 potentiometer knobs.
- Dismantle plastic cover 181 by loosening screws 186.
- Unscrew big hexagonal leg under the chassis.

- Loosen the two fixing screws of the chassis:
 - near protective cover of the mains transformer.
 - near valve ECL80.
- Set the control knob at the "recording" position.
- Give the lifting lever 122 of the intermediate wheel a slight turn. The electrical part can then be folded away.

Complete removal of the electrical part

- Unsolder on the chassis the three connections coming from the erasing head.
- Unsolder the filaments of the valve ECL80.
- Unsolder the connections on sockets for second loudspeaker.
- Loosen the 2 fixing screws of the plug socket panel on the chassis.



Description of the electrical part

Position 2
pick-up amplifier

When the control knob is set at this position the apparatus can be used as a pick-up amplifier. SK9 is then closed. The signal applied to the pick-up input is amplified by B4a and B4b. The filter R36, C29 included in the anode circuit, gives an attenuation for frequencies upwards of 20.000 c/s. Negative feedback is applied to the cathode of B4a via the frequency-dependent network R44, R46, C28 and R43. The degree of frequency-dependence is adjustable by means of potentiometer R43. R43 serves to adjust the high notes. The high-note range is at its maximum with the runner on the earth side.

Positions 3 and 4
In this position the motor is switched on by means of SK8. The amplifier part, however, remains in circuit for pick-up reproduction. In position 3, fast winding forward of the tape is possible by depressing the control knob. Rewinding is effected by putting the knob in position 4.

Position 5
Play back
With the control knob in this position the signal generated by the tape in the recording/playback head K1 is amplified by B1a, B1b, B2a and B4. The filter R3, C4 fitted in the anode of B1a and the negative-feedback circuit R11, C14, R14, C10, R13 of B1b serve to correct the frequency characteristic during recording and playback. The filter in the anode of B1a corrects the low-frequency range, while correction of the high-frequency range is ensured by the negative-feedback circuit. On moving the control knob from position 4 to position 5, SK10 is switched over for a moment, and the head K1 is demagnetized.

Position 6
Recording

In this position two signals are applied to the recording/playback head, namely :

1. H.F. signal (± 45 kc/s) originating from the Collpits oscillator.
2. The amplified L.F. signal originating from the amplifier.

The erasing head K2 serves as an oscillator coil. The filament of the modulation indicator B3 is fed by the H.F. voltage of the oscillator. This has for result that the indicator only lights up during recording.

Across the filament of B3 is connected the resistor R25 in order to adjust the filament current to the correct value.

The H.F. signal is applied to the recording/playback head via the trimmer C17. The pre-magnetizing current of the tape can be adjusted with this trimmer.

The modulation depth can be adjusted by means of potentiometer R19. The pick-up signal to be taken up is likewise passed to g1B4a. As a result the signal can be monitored during recording.

The strength of the monitoring-signal is adjusted by means of potentiometer R34/35. For recording microphone signals the potentiometer R10 is opened. SK6 is then opened at the same time and the short-circuit of the microphone input is ended.

B1a serves as a microphone amplifier. By simultaneous adjustment of R10 and R19 the microphone signal can be mixed with the pick-up signal.

In position 5 and 6 the stand-by switch can, moreover, be used. The apparatus is then quite ready for operation, but the tape is not yet in motion. For reproduction it is thus possible to switch on or to stop rapidly at the proper moment.

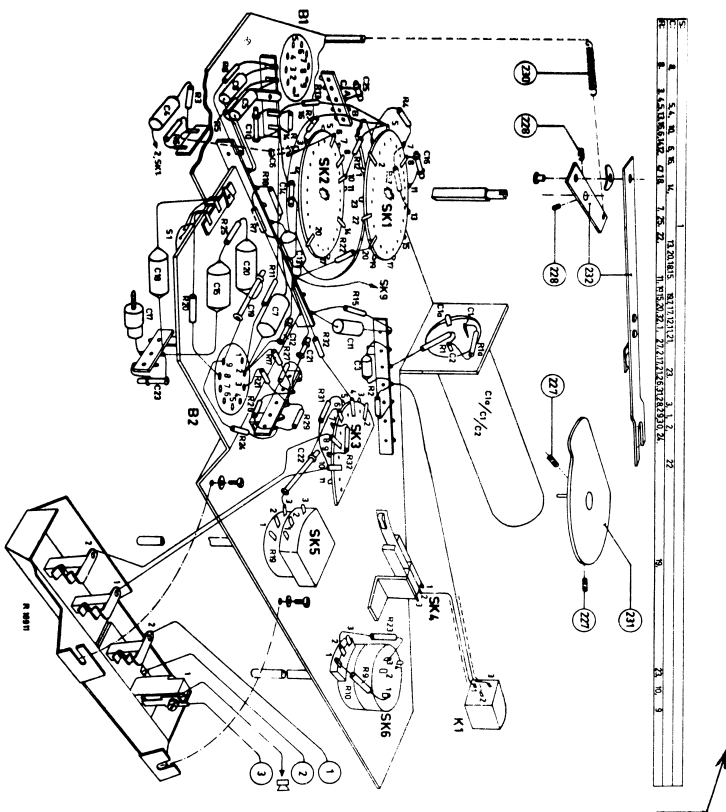
For recording it is possible to preset the modulation depth and to start or to stop the recording at the right moment.

General

In the flex storage compartment there are two sockets one for pick-up connection, the other for connection of second loudspeaker. The latter must have an impedance of 7 ohms. When the plug of the additional loudspeaker is inserted in the sockets, the built-in loudspeaker is automatically switched off.

The supply unit, Figs 41 - 42 - 43

This is fitted with a selenium rectifier. The pulsating D.C. voltage is smoothed by the three 50 uF electrolytic capacitors (C1 - C2 - C3). When it is desired to switch over to another mains voltage, the cover plate must be removed from the voltage adaptor. Before doing so, disconnect the apparatus from the mains.



Test measurements on the amplifier

The frequency characteristics described hereunder must not deviate more than approx. 20%. For recording the characteristics the apparatus must be taken out of its casing.

a. Frequency characteristic of the pick-up amplifier

1. Connect an A.F. generator to the pick-up input.
2. Set the control knob at position 2.
3. Set the volume control R34/35 at its maximum and the tone control R43 at maximum high-frequency.
4. Connect a 7-ohm resistor with plugs to the socket for a second loudspeaker, so as to disconnect the built-in loudspeaker.
5. Adjust a signal of 1000 c/s so that the tube voltmeter GM 6005 indicates a voltage of 0.5 V across the resistor. The input voltage on the pick-up connection is then 70 - 80 mV. This voltage must be kept at a constant value.
6. Measure the voltage as a function of the frequency. Hereunder a table is given of the values measured:

100 c/s	1000 c/s	4000 c/s	6000 c/s	10.000 c/s
0.5	0.5	0.5	0.5	0.5

b. Frequency characteristic of the recording amplifier

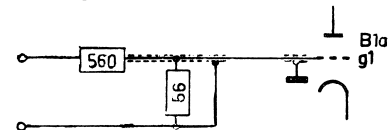
1. Connect an A.F. generator to the pick-up input.
2. Set the control knob at position 6 and volume control R19 to maximum.
3. Connect a 100-ohm resistor in series with the coil of the head K1 on the earthing side and connect to it tube voltmeter GM 6005. The measuring flex must be kept at the largest possible distance from the erasing head.
4. Unsolder the connection C17 - SK1.
5. Regulate a signal of 1000 c/s till the tube voltmeter indicates 5 mV. The input voltage must be kept at a constant value (180-280 mV).
6. Measure the voltage as a function of the frequency.

100 c/s	1000 c/s	4000 c/s	6000 c/s
6.8	5	6 - 8	8 - 12 mV

Restore the connection C17 - SK1 by soldering and remove the resistor near the head K1.

c. Frequency characteristic of the playback amplifier

1. Set the control knob at position 5 (playback).
2. The input signal of the A.F. generator is divided in a ratio of 1 : 11 and applied to g1B1a according to the following diagram.



The resistances of 560Ω and 56Ω must have a maximum tolerance of 2%.

3. Unsolder loudspeaker connection and connect a 7Ω resistor to the output of the second loudspeaker. Measure the output voltage across this resistor with tube voltmeter GM 6005.
4. Set volume control R34/35 at its maximum and tone control R43 at maximum high-frequency.
5. Adjust a signal of 1000 c/s so that the electronic valve meter indicates a voltage of 0.5 V. The output signal of the A.F. generator is then 1.4 - 2.4 mV. The input voltage must be kept at a constant value.
6. Measure the output voltage as a function of the frequency.

100 c/s	1000 c/s	4000 c/s	6000 c/s
1.8 - 2.4	0.5	0.45 - 0.55	0.55 - 0.65 mV

7. Remove the measuring flex and connect g1B1a again in the normal manner.

d. Stage amplification

1. Arrangement as under (c).
2. Volume control R34/35 at maximum position and tone control R43 at maximum high-frequency.
3. Adjust a signal of 1000 c/s until the tube voltmeter gives of deflection of 4V.

Output 7 Ω	g1B4a	g1B2	g1B1b	g1B1a
4V	0.6-0.7 V	0.14-0.17 V	2-2.5mV	1.1-2 mV

The direct voltages included in the table below have been measured with diode voltmeter GM 6004.

Measured on	Valve pin	Pick-up amplifier pos. 2	Playback Pos. 5	Recording Pos. 6
C1a		250-260 V	250-260 V	230-240 V
C1		220-230 V	220-230 V	200-210 V
C2		205-215 V	205-215 V	190-200 V
An. B4b	6	235-245 V	235-245 V	230-240 V
g2. B4b	7	220-230 V	220-230 V	200-210 V
An. B4a	9	105-115 V	105-115 V	95-105 V
An. B2b	6	-	-	210-220 V
An. B2a	1	85- 95 V	85- 95 V	85- 95 V
An. B1a	1	105-115 V	105-115 V	95-105 V
An. B1b	6	105-115 V	105-115 V	95-105 V

Adjustment of the recording/playback head K1

For this adjustment a test tape is indispensable.

This test tape is easily made when a good apparatus is available.

Connect an A. F. generator to the pick-up input of the apparatus and measure the output voltage of the A. F. generator by means of a tube voltmeter GM 6005.

Switch on the apparatus and set the control knob at position "pick-up recording".

Turn potentiometer R19 to its maximum and record for a few minutes a frequency of 5000 c/s at a constant voltage of 100 mV of the A. F. generator.

The adjustment of head K1 is effected as follows:

1. Remove the protective cover item 181.
2. Connect a 7 Ω resistance to the loudspeaker socket by means of a plug.
3. Connect tube voltmeter GM 6005 across this resistor.
4. Remove the protective cover from the recording/playback head K1.
5. Put on a test tape and set the apparatus at position 5 (playback).
6. By means of the three screws 162 adjust the head K1 so that the tape runs unhampered in the guiding brackets of the heads.
7. Now modulate a 5000 c/s signal on the test tape and set the volume control at its maximum; the control knob is then at playback position.
8. By means of the two rear screws (162) adjust the output voltage to maximum.
The head must then be exactly perpendicular to the tape.
9. Make sure that the tape still runs unhampered in the guiding brackets.
If not, a new adjustment must be made.
10. Lock the set screws with paint.

Characteristics and measurements

In the measurements mentioned below the following measuring instruments have been used:

A. F. generator	GM 2307
Tube voltmeter	GM 6005
Diode voltmeter	GM 6004

Adjustment of the pre-magnetizing current (see fig. 39)

1. Take the apparatus out of its case.
2. Remove protective cover item 181.
3. Take the protective cover off the recording/playback head K1.
4. Connect a 100 Ω resistor in series with the coil of head K1 on the earthing side and connect to it tube voltmeter GM 6005.
Keep the measuring flex as far as possible away from the erasing head.
5. Switch on the apparatus and set the control knob at the position "pick-up recording" (position 6).
6. Set volume controls at minimum.
7. With the aid of trimmer C17 the voltage across the resistor must be adjusted to 16 mV.

S1)	665 W		R5	2700 Ω	900/2K7
S2)	665 W		R6	220000 Ω	901/220K
S3)	103 W	A3 142 92	R7	220000 Ω	901/220K
S4)	43 W		R8	2700 Ω	900/2K7
S5)	1450 W		R9	22000 Ω	901/22K
S6)	2x1700 W		R10	1 M Ω	916/EE1M
S7)	160 W		R11	1,5 M Ω	901/1M5
S8)	16 W	918/03	R12	1 M Ω	901/1M
S9)	89 W		R13	3,3 M Ω	901/3M3
S10	3500 W	A3 719 40	R14	10 M Ω	901/10M
C1-C1a	50+50 μ F		R15	390 Ω	900/390E
C2	50 μ F	AC 5481/50+50+50	R16	470000 Ω	901/470K
C3	22000 pF		R17	1 M Ω	901/1M
C4	22000 pF		R18	120000 Ω	901/120K
C5	50 μ F		R19	1 M Ω	B1 638 17
C6	6800 pF		R20	22000 Ω	901/22K
C7	10000 pF		R21	3900 Ω	900/3K9
C8	50 μ F		R22	180000 Ω	901/180K
C10	330 pF		R23	1 M Ω	901/1M
C11	50 μ F		R24	33000 Ω	901/33K
C12	100 pF		R25	22 Ω	901/22E
C13	18000 pF		R26	150000 Ω	901/150K
C14	22 pF		R27	1 M Ω	901/1M
C15	2200 pF		R28	6,8 M Ω	901/6M8
C16	330 pF		R29	10000 Ω	900/10K
C17	60 pF		R30	68000 Ω	900/68K
C18	4700 pF		R31	100000 Ω	901/100K
C19	470 pF		R32	220000 Ω	901/220K
			R33	1,6 M Ω	916/GL400K+1M6
			R34	0,4 M Ω	
			R35		

C20	6800 pF	906/6K8	R36	1000 Ω	900/1K
C21	1500 pF	904/1K5	R37	1000 Ω	900/1K
C22	22000 pF	904/22K	R38	100000 Ω	901/100K
C24	10000 pF	904/10K	R39	2200 Ω	900/2K2
C25	1500 pF	904/1K5	R40	1000 Ω	900/1K
C26	25 μ F	910/D25	R41	680000 Ω	901/680K
C27	10000 pF	904/10K	R42	470 Ω	900/470E
C28	39000 pF	906/39K	R43	20000 Ω	916/GE20K
C29	220 pF	904/220E	R44	8200 Ω	901/8K2
			R46	390 Ω	900/390E
R1	1800 Ω	900/1K8			
R1a	15000 Ω	900/15K			
R2	10 M Ω	901/10M			
R3	8200 Ω	900/8K2			
R4	1 M Ω	901/1M			
SK4		A3 186 78,0			

List of Mechanical Component Parts

When ordering please always state:

1. Code number
2. Description
3. Type number of the apparatus.

Pos.	Fig.	Description	Code number
16	B	Case assembly	49 914 78
19	B	Flywheel	AE 500 75
20	B	Ball $\frac{1}{4}$ "	89 205 06
24	B	Cyl. screw 4 x 8	999/4x8
25-31	B	Left-hand turntable+spindle x)	AE 605 35
	B	Right-hand turntable+spindle x)	AE 605 36
31	A	Friction block	P5 515 82/35
32	A	Turntable	AE 570 37
33	A	Clamping ring 4 \emptyset	985/4
37	B	Cord disc	49 898 94
38	B	Cord disc	AE 500 38
39	B	Set screw 4 x 4	997/4x5
41	A	Locking ring 7 \emptyset	985/6
42	A	Switching ring	P4 519 02/01
43	A	Switching knob	AE 570 21
44	A	Pressure spring	49 897 74
46	A	Switching pin	49 897 76
47	A	Set screw 3 x 8	997/3x10
49	B	Washer 3 \emptyset	988/3
50	B	Spring-loaded tooth ring 3 \emptyset	987/3
51	B	Cyl. screw 3 x 6	999/3x10
52	B	Switch	08 529 10
55	B	Cyl. screw 2.6 x 6	999/2.6x15
56	B	Spring-loaded tooth ring 2.6 \emptyset	987/3
57	B	Washer 2.6 \emptyset	988/3
60	B	Set screw 4 x 8	997/4x10
63	A	Roller	P5 515 37/34
65	A	Locking ring 4 \emptyset	985/4
66	A	Tension spring	49 897 81
68	A	Forked screw	49 897 85
70	A	Locking ring 5 \emptyset	985/5
72	A	Pressure roller	49 914 79
73	A	Spindle	49 898 17
74	A	Set screw 2.6 x 6	998/2.6 x8
75-77	A	Damping block	A3 754 63
78	A	Washer 3 \emptyset	988/3
79	A	Spring-loaded tooth ring 3 \emptyset	987/3
80	A	Cyl. screw 2.6 x 6	999/2.6x15
81	A	Set screw 2.6 x 10	999/2.6x15
82-83	A	Damping bracket	49 915 41
87-97	B	Bracket + cord disc	AE 605 10
92	B	Cord disc	AE 605 11
94	B	Ring	P5 515 93/16
95	B	Locking ring 3 \emptyset	985/3
96	B	Washer 2.6 \emptyset	988/3
97	B	Locking ring 2.6 \emptyset	985/2.5
98	B	Washer 4 \emptyset	988/4

- x) Left-hand turntable : with big feltring.
Right-hand turntable : with small feltring.

Bc 81

Drive.

It appeared that after a long use cracks can occur in the material of the driving cord. To avoid this in future the material as well as the profile has been altered.

The profile is now rectangular, for which purpose the guide-pulley and the motor-pulley have been modified.

This improvement has been introduced from serial number 717 50.

The parts for both versions can be furnished as follows:

Old:	item 126	Driving cord	AE 500 44
	item 37	Guid-pulley	49 898 94
	item 305	Motor pulley 50 c/s	49 893 72.0
	item 305	Motor pulley 60 c/s	49 893 73.0
	it	Motor 50 c/s	49 916 15
		Motor 60 c/s	49 916 16
New:		Driving belt	P7 520 23/319
		Belt disc	AE 502 79
		Motor pulley 50 c/s	49 893 90
		Motor pulley 60 c/s	49 893 91
		Motor 50 c/s	49 917 11
		Motor 60 c/s	49 917 12

Pos.	Fig.	Description	Code number
99	B	Cyl. screw 3 x 12	999/3x15
100	B	Washer 3 Ø	988/3
101	B	Tilting bracket	AE 600 10
102	B	Locking ring 4 Ø	985/4
103	B	Tension spring	49 899 04
104	B	Driving cord	P7 520 01
106	A	Washer 3 Ø	988/3
108	A	Cyl. screw 3 x 30	999/3x30
110	B	Cyl. screw 3 x 6	999/3x10
111	B	Washer 3 Ø	988/3
112	B	Spring-loaded tooth ring 3 Ø	987/3
113			
115	B	Intermediate wheel + bracket	AE 605 12
117	B	Locking ring 4 Ø	985/4
120	B	Washer 3 Ø	988/3
121	B	Cyl. screw 3 x 8	999/3x10
122	B	Lifting-lever	49 897 39
124	B	Locking ring 3 Ø	988/3
125	B	Tension spring	49 897 40
126	B	Driving cord	AE 500 44
128	B	Cyl. screw 3 x 40\	999/3x50
129	B	Spring-loaded washer 3 Ø	989/3
131	B	Cyl. screw 3 x 4	999/3x10
132	B	Spring-loaded tooth-ring 3 Ø	987/3
133	B	Coupling lever	49 915 49.0
134	B	Coupling lever	49 915 50.1
135	B	Braking lever	49 915 51.1
136	B	Braking lever	49 915 52.1
140	B	Cyl. screw 3 x 6	999/3 x 10
141	B	Washer 3 Ø	988/3
142	B	Spring-loaded tooth-ring 3 Ø	987/3
143	A	Stripping bracket	49 898 76
145+			
146	A	Guiding lever + spindle	49 915 53
148	A	Locking ring 5 Ø	985/5
150+			
151	A	Stand-by knob	AE 605 13
153	A	Spring	AE 500 51
154	A	Erasing head	49 918 15
158	A	Cyl. screw 2.6 x 6	999/2.6x15
159	A	Recording/playback head	49 918 14
162	A	Cyl. screw 2.6 x 15	999/2.6x15
163+			
164	A	Protective cover	A9 868 30
167	A	Cyl. screw 2.6 x 4	999/2.6x15
169	A	Anti-singing switch	AE 570 14
175	A	Washer 3 Ø	988/3

Pos.	Fig.	Description	Code number
176	A	Spring-loaded tooth-ring 3 Ø	987/3
177	A	Cyl. screw 3 x 6	999/3x10
178	B	Spring-loaded outer tooth-ring 3 Ø	987/3
181	A	Cover	AE 605 14
185	A	Plug	49 898 12
186	A	Ornamental screw	49 898 13
190	A	Knob	AE 570 24
	1	Knob (C and D)	AE 570 26
191	A	Leaf spring	28 753 01
	1	Leaf spring for knob C and D	A3 522 08.3
201		Hydraulic oil	X 018 16
202		Watch oil	X 007 12
203		Graphite grease	X 013 58
204		Lubricating grease	X 020 92
229	B	Microphone plug	V3 737 15
		Microphone flex	R 367 KA/01AA10
		Female plug	AE 605 15
233	B	Cyl. screw 3 x 8	999/3x10
302-			
317	B	Motor 50 c/s	49 916 15
		Motor 60 c/s	49 916 16
		Pulley 50 c/s	49 893 72
		Pulley 60 c/s	49 893 73
304	B	Ball 1/8"	971/67
307	B	Set screw	49 937 15
308	B	Cyl. screw 3 x 5	999/3x10
310	B	Bearing (open end)	49 927 04
311	B	Bearing(closed end)	49 927 05
312	B	Cyl. screw 3 x 35	999/3x50
313	B	Washer 3 Ø	988/3
314	B	Cyl. screw 2.6 x 6	999/2.6x15
321		Tension spring	A3 646 57
323		Set screw 4 x 5	997/4 x 5
325		Socket plate	979/2x19
326		Socket plate(with switch)	979/S2x19
		Knob (of cover)	P4 525 13/17
		Case (grey-finished)	AE 501 12.0
		Case (brown-finished)	AE 500 29.0
		Tension spring (of cover)	49 899 04.0
350-			
353		Suspension assembly	AE 570 29
		Ventilation grill	P4 519 00/19
		Loudspeaker grill	AE 605 34
		Locking	AE 500 31
Gr1	41	Rectifier	SR 250 B100

PHILIPS SERVICE NOTES EL 3517-19-20-30-47-60

Specification

EL 3517-19 Suitable for 110-127-220 and 240 V, 50 c/s.
(Special version for Sweden).

EL 3517-20 Suitable for 110-127-220 and 240 V, 50 c/s.
EL 3517-30 Suitable for 110- 127-220 and 240 V, 50 c/s.
(Special version for New Zealand).

EL 3517-47 Suitable for 115 V, 60 c/s.
(Special version for Canada).

EL 3517-60 Suitable for 110-127-220 and 240 V, 60 c/s.

For repairs or replacement of parts, see the Service Notes of the EL 3517.

Bc 76

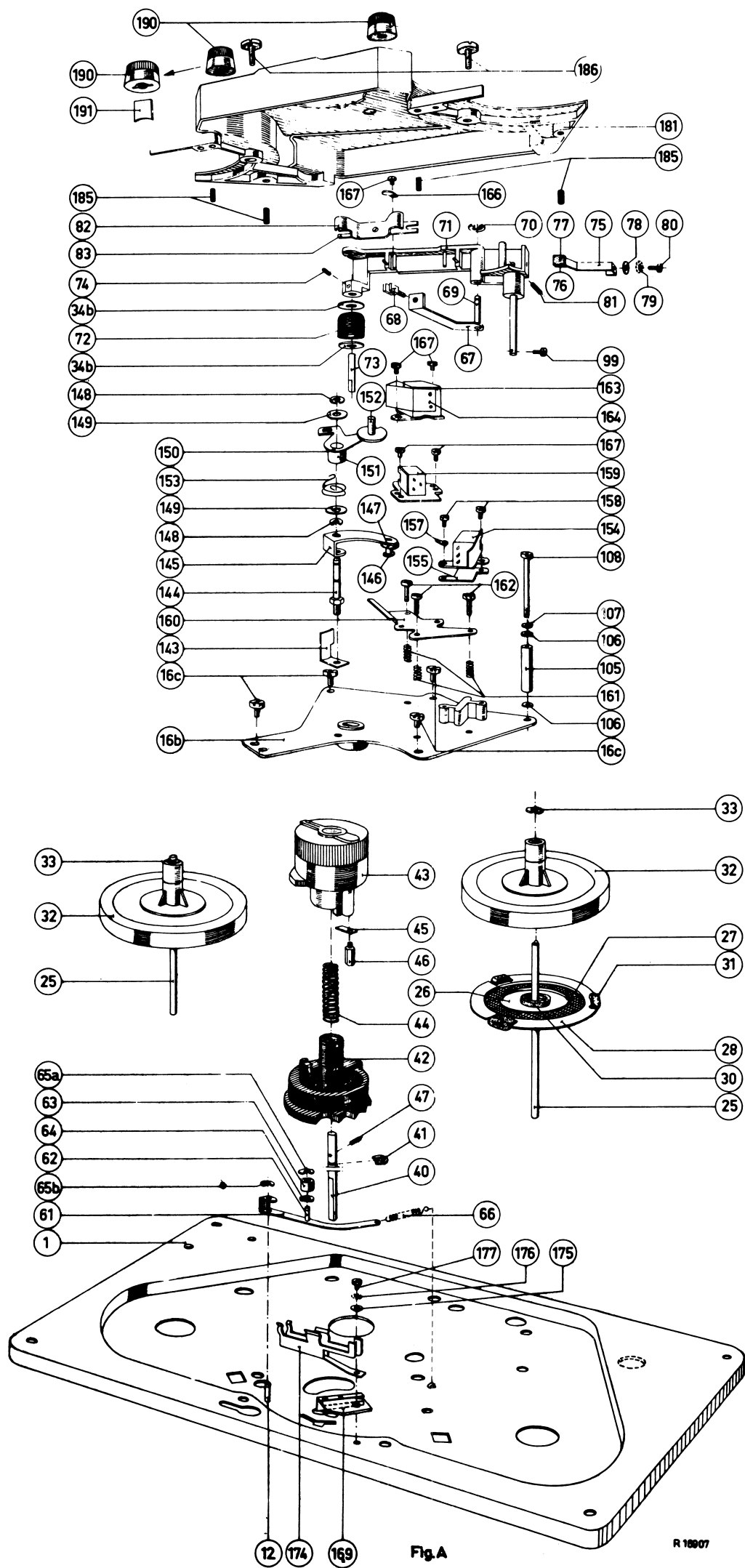
Kindly modify the Service Notes on the EL 3517 according to the instructions given below:

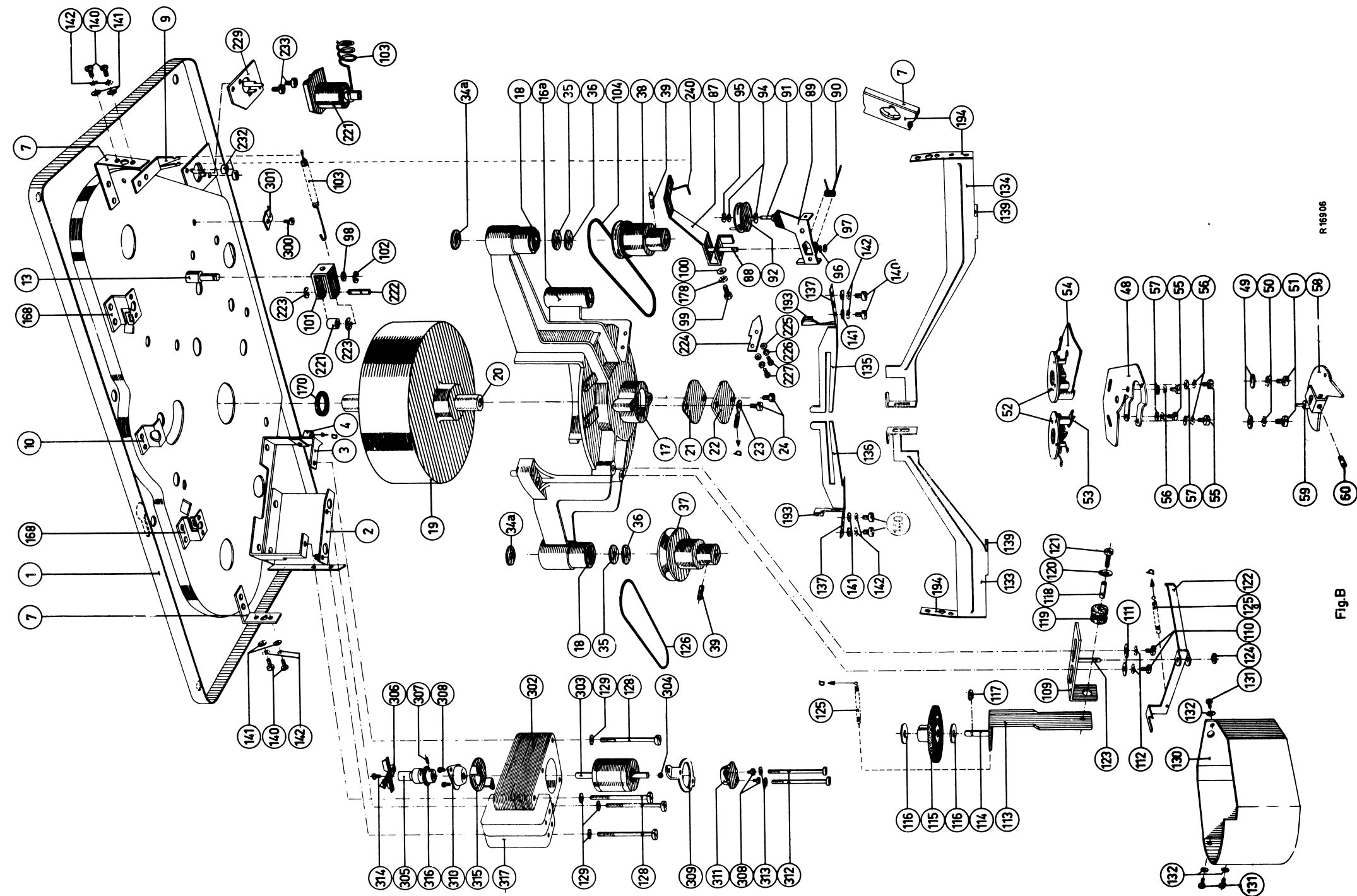
Pos. 34a	These steel rings are replaced by nylon rings : <u>code number</u>
Pos. 34b	P5 510 81/332. With a view to the mechanical noise. When these nylon rings are used, the turntables and pressure roller are running almost noiselessly.
Pos. 73	Spindle of pressure roller (49 898 17) <u>new code number</u> 49 898 17.4 In some cases it could happen that this spindle jammed. The new spindle has been more intensely polished, so that any friction is reduced to a minimum. For the same reason the spindles of the turntables, AE 605 35 and AE 605 36, are finished in the same way, but in this case the code numbers have not been changed. Our stocks have been adapted, so that in case of orders on these parts, turntables and pressure-roller spindles of the new versions will be supplied. The modifications mentioned below have been introduced from the marking <u>HO7</u> :
Pos. 16	Housing (assembly) <u>code number</u> 49 914 78 (code number unchanged) The two bearing bushings for each reel spindle have been shortened. The larger space, which now exists between the two bearing bushes has been filled up with Calypsol grease.
Pos. 72.	Pressure roller 49 914 79 (5mm) <u>new code number</u> AE 570 59 (4 mm)
Pos. 73	Spindle of the pressure roller 49 898 17.4 (5 mm) <u>new code number</u> AE 501 99 (4 mm) The diameter of this new spindle is 4 mm. This modification has been introduced with a view to a new lubrication method. The space between the two bearings in the bearing housing of the pressure roller is filled with Calypsol grease. Moreover, the nylon ring pos. 34b is adapted to the new diameter of the spindle :
Pos. 34 b	Nylon ring P5 510 81/332 (5 mm) <u>new code number</u> P5 510 76/332 (4 mm)
Pos. 133	Coupling lever (left) 49 915 49.0 <u>new code number</u> AE 605 49
Pos. 134	Coupling lever (right) 49 915 50.1 <u>new code number</u> AE 605 50 The fiber thrust plate (pos. 139) has been replaced by a nylon thrust plate, so that the mechanical noise is reduced, as well as possible wear.
Pos. 135	Braking lever (right) 49 915 51.1 <u>new code number</u> AE 605 54
Pos. 136	Braking lever (left) 49 915 52.1 <u>new code number</u> AE 605 52 The felt on the brackets has been replaced by chamois-leather, which is fastened by clamping instead of gluing. In this way the loosening of the felt is avoided, and, during repairs, it is no longer necessary to wait a long time till the glue has dried.
Pos. 144	Spindle of stand-by knob <u>code number</u> AE 500 48 Considering the many requests received, this spindle still be supplied as well.
Pos. 21	Thrust plate <u>code number</u> P5 510 77/332 The material used is nylon instead of fiber. Consequently the ball, supporting the flywheel-spindle, has less friction.

Parts that now are greased with Calypsol grease:

Under and upper bearing of flywheel	Pos. no. 17 + 170
Thrust plate	Pos. no. 21
Bearing of pressure roller	Pos. no. 72
Bearings of reel spindles	Pos. no. 18
Nylon ring	Pos. no. 34a

Calypsol grease can be ordered under code number X 027 86.

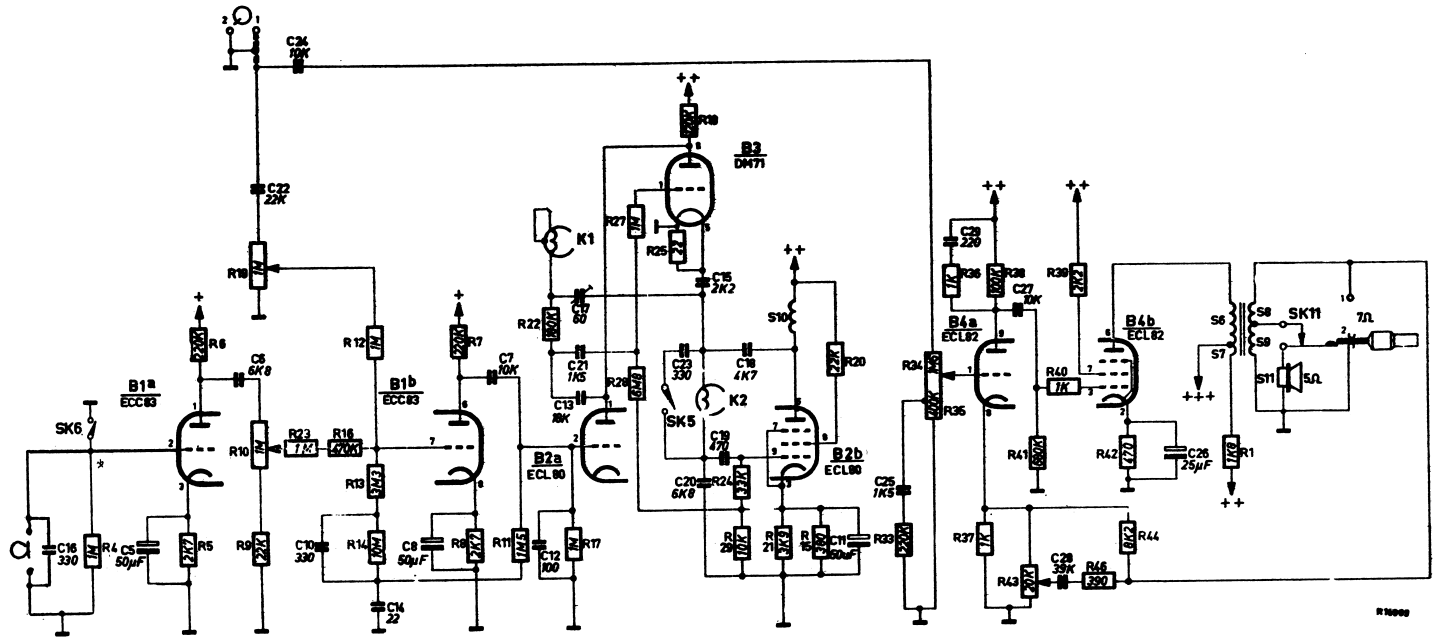




R 169 06

Fig.B

POSITION RECORDING



P. U. Amp. Playback.

