

# PHILIPS *Service*

RECORDERS

EL 3302/00/12D/20D/22D/29D



TGR 1179



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This Service Notes consist of the sheets ME 362 - ME 369

ME 362 E

SERVICE INFORMATION										
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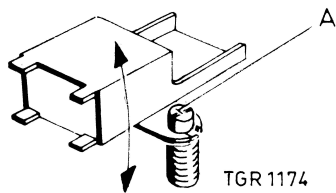


Fig. 4

#### Speed check 2

Since it is not possible in this way to check the speed with the standard test tape, the following method should be applied.

One of the sides of a cassette is removed.

This can be done easily with the aid of a knife and a file.

All burrs should be removed from the opening.

The tape can be pulled outside through this opening.

Completely remove the apparatus from the cabinet and insert the cassette.

Position a stroboscope disc (code number A9 407 30/50 for 50 c/s and A9 407 30/60 for 60 c/s next to the apparatus and lead the tape past this disc, see Fig. 5. The speed can then be adjusted by turning R54 with the aid of a small screwdriver.

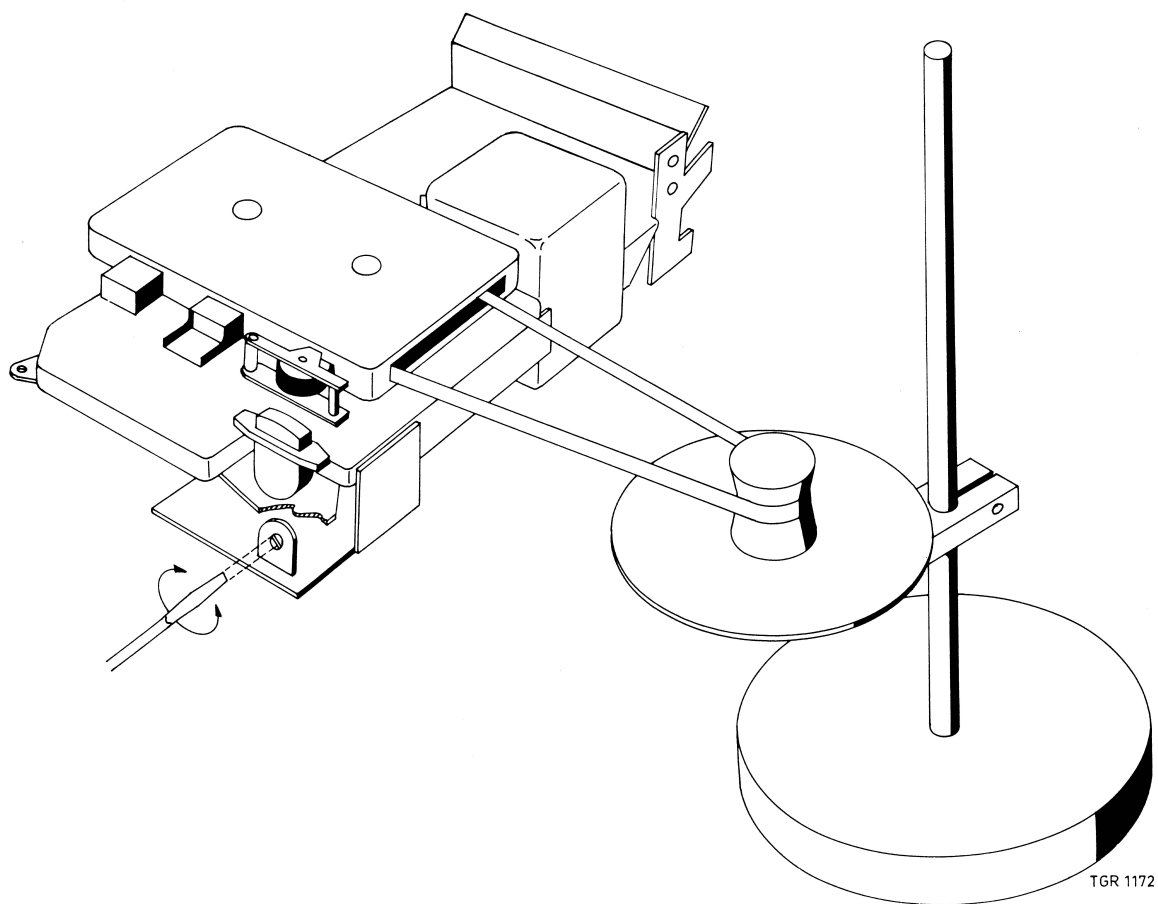


Fig. 5

List of electrical parts

TS1, TS2, TS3, TS7	AC125	C2, C7, C13, C19	C 420 AN/A40
TS4, TS5	AC126	C22, C23, C26	4822 069 00578
TS6a/TS6b	AC128/AC127	C16	4822 069 01101
TS8	AC127	C11	4822 069 01104
TS9	AC128	C20, C27, C28, C29	4822 069 01105
GR1, GR2, GR3	BA114	C14	4822 069 01096
Loudspeaker	4822 240 30033	C25	4822 124 20196
C1, C3, C5, C6, C12, C17, C21	909/W2, 5	R51, R52	4822 071 00677
C4, C8, C18	909/A25	R53	4822 071 00837
C10	909/Z0, 64	R40	4822 071 00587
C15	909/U200	R54	4822 071 00954
C24	909/U400	Switch SK4	4822 277 30307
C9	904/P330E	S3	4822 157 50013
C31	904/P220E	S1, S2	4822 107 00322

Electrical measurements

New batteries should be used to power the apparatus

Playback sensitivity

- Replace the loudspeaker by a resistor of 8  $\Omega$ .
- Set the volume control to maximum.
- Supply a signal of 1000 c/s to the measuring point (point 6 of BU2) via a resistor of 22 k $\Omega$ .
- Adjust the input voltage, so that a voltage of 630 mV is measured across the resistor of 8  $\Omega$ .
- The input voltage should then be 40 mV  $\pm$  2 dB.
- The voltage on the line (point 3 of BU1) should then be 50 mV  $\pm$  2 dB.

Recording sensitivity

- Supply a signal of 1000 c/s to point 1 of BU1 via a resistor of 1M5.
- Connect valve a voltmeter to the measuring point (point 6 of BU2).
- Set the volume control to maximum.
- Adjust the input voltage so that 4 mV is measured on the measuring point.
- The input voltage should then be 120 mV  $\pm$  2 dB.

Indication meter

- New batteries should be used to power the apparatus.
- Switch the apparatus into position "playback".
- The pointer of the indication meter must be deflect in the right-hand part of the green sector.

Premagnetizing current

This current must be adjusted so that the voltage at the measuring point (point 6 of BU2) amounts to 10-25 V. This can be adjusted with potentiometer R53.

STEP SENSITIVITIES

Playback

Supply a signal of 1000 c/s - 40 mV to point 1 of BU1 via a resistor of 1M5. The following voltages should then be measured on the various points:

	TS1	TS2	TS3	TS4	TS5
Collector	0.028 mV	2 mV	54 mV	-	800 mV
Emitter	-	-	-	30 mV	-

Recording

Supply a signal of 1000 c/s - 125 mV to point 1 of BU1 via a resistor of 1M5. The following voltages should then be measured on the various points:

	TS1	TS2	TS3	TS4
Collector	3.4 mV	14 mV	320 mV	-
Emitter	-	-	-	300 mV
Base	0.15 mV	-	-	-

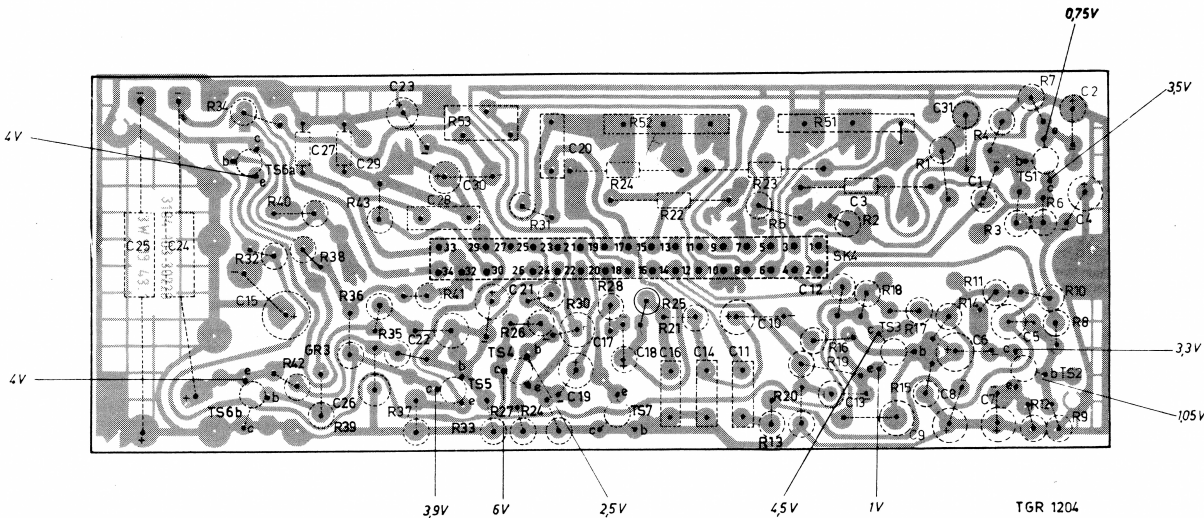


Fig. 6

## LIST OF MECHANICAL PARTS

Item	Code number	Description	Item	Code number	Description
1	999/2x5	Cheese head screw, 2x5 mm	57	4822 492 60926	Leaf spring for cassette
2	988/2	Washer, 2 mm		4822 175 00981	Set of battery springs
3	999/2x8	Cheese head screw, 2x8 mm	60	4822 175 00974	Wire spring
4	987/3	Spring washer, 2 mm	62	4822 175 01514	Switch SK1
5	999/2x12	Cheese head screw, 2x12 mm	63	4822 175 00951	Winding pulley assy
6	985/1,9	Locking ring, 3 mm	64	4822 175 01055	Ring
7	986/3	Spring washer, 3 mm	65	4822 358 30076	Drive belt
8	985/3	Locking ring	66	4822 175 00971	Flywheel assy
25	4822 249 40039	Erase head	67	4822 175 00972	Flywheel bearing bracket
26	4822 249 10032	Recording/playback head	68	4822 194 00239	Motor assy
28	4822 175 00955	Compression spring under recording/playback head		4822 194 00257	Motor print assy
29	4822 175 00956	Leaf spring under recording knob	69	4822 163 00919	Pressure plug
30	4822 175 00961	Stopping spring	70	4822 175 00977	Spindle
31	4822 175 00962	Stopping roller assy	73	4822 175 01203	Bracket
35	4822 520 40005	Ball	74	4822 175 01202	Spring
36	4822 163 00922	Switch lever	90	4822 267 20073	Terminal plate assy
37	4822 175 00965	Wire spring of control bracket	95	4822 268 20032	Contact spring of 5 - and 6-pole plugs
38	4822 175 00947	Leaf spring of meter		4822 492 60925	Battery spring interconnection
39	TD 300 49	Ring	93	4822 268 20033	Contact spring of SK2 and SK3
40	4822 528 90081	Roller	94	4822 268 20034	Contact spring of SK2 and SK3
41	4822 403 50412	Lever assy	91	4822 492 60927	Leaf spring under starting button
43	4822 492 60912	Wire spring under lever	<u>List of Cabinet parts</u>		
44	4822 175 01252	Winding roller lever assy	Item	Code number	Description
45	4822 175 00967	Pulley assy	75	4822 459 20094	Ornamental grille assy
46	4822 175 00968	Ring under pulley	76	4822 175 01359	Dust plate
47	4822 358 30077	Belt	77	4822 443 30101	Cabinet assy
48	4822 175 00944	Wire spring of brake bracket	78	4822 175 01361	Silver foil
49	4822 175 01251	Spring	79	4822 443 60195	Flap
50	4822 175 00945	Tension spring on brake bracket	80	4822 175 00935	Indicator
51	4822 163 00918	Cover over turn-table	81	4822 410 10012	Starting knob
52	4822 175 00943	Brake bracket assy	82	4822 410 10011	Recording knob
53	4822 175 00957	Pinch-roller lever assy	83	4822 443 60194	Battery cover
54	4822 175 00964	Turntable assy	84	4822 068 00668	Screw
55	4822 175 00958	Spring on pinch roller lever	85	4822 443 60193	Bottom plate
56	4822 175 00986	Ring for brake bracket	88	4822 412 20008	Knob assy
			89	4822 443 60192	Cover for heads
				4822 600 70014	Everready case
				4822 163 00921	Rubbering round motor

### Working of the transistor driven motor

For clarity, the circuit diagram is shown in a simplified form in Fig. 12. Assume that the voltages increase; as a result the base of TS8 becomes less positive with respect to the emitter since diode D keeps the potential of the emitter constant. Consequently, transistor TS8 becomes less conductive and, as a result, the collector current and the base current of TS9 decrease.

The result is that the motor current decreases. The motor current then decreases until the desired value is reached again. In case of a voltage decrease, the base of TS8 will become more positive with respect to the emitter and TS8 will become more conductive with the result that the base current of TS9 will increase and consequently the motor current increases. The circuit shown in Fig. 12, however, only controls the voltage variations and not the deviations produced by load variations of the motor.

When the motor load increases, the motor current also increases and as a result the voltage drop across the motor also.

When the voltage across the motor does not increase, the counter electromotive force will diminish, so that the r.p.m. will be less.

To counteract this, the voltage across the motor will have to increase depending on the load of the motor. This is obtained by adding a resistor, see Fig. 13.

When the motor load increases, the current through the resistor will increase and consequently the voltage drop also.

As a result the base of TS8 will become more positive with respect to the emitter. TS8 will therefore become more conductive and TS9 also as a consequence, as described above, with the result that the voltage across the motor increases.

The value of the resistor should be selected so that the voltage across the motor is about 0.5 V lower than the available battery voltage.

According to the specification, the whole should operate in the temperature range of -50°C to +50°C. This means that the circuit will have to be able to operate independent on temperature variations. To attain this, two silicon diodes have been connected in series. The properties of these diodes vary so that variations in the circuit due to temperature variations are compensated for.

A coil S3 has also been included in the circuit for temperature compensation.

### Lubrication instructions

Shell Alvania 2 (A9 881 22/P50)

Ball 35.

Grooves and extrusions in slide 300.

Shell Tellus 33 (4822 077 00104)

Shaft 305 of turntable 54

Shaft of roller 40

Shaft of flywheel 66

Hub and bearing of winding friction 63

Hub and shaft of pulley 45

The EL 3797/50 is an electro-dynamic microphone which consists of microphone EL 3795/50 and remote control unit 3922 236 0021. The complete remote control unit can be delivered under code number EL 3796/50.

Sensitivity: at 1000 c/s the sensitivity is 0.19 mV/ $\mu$ bar.

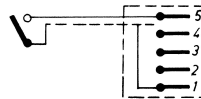
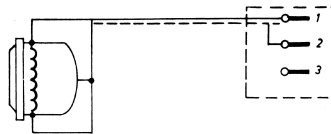
Impedance: at 1000 c/s the impedance is 500  $\Omega$ .

List of Parts for the microphone

<u>Item</u>	<u>Code number</u>	<u>Description</u>
1	4822 447 10099	Housing
2	4822 169 00519	Bracket
3a	4822 219 00131	Flex
3b	978/3x180	Plug, 3-pole
4	4822 169 00534	Clip
6	4822 169 00524	Spring-mounted cover
8	EL 6091/10	Capsule
9	4822 169 00536	Hose
11	4822 447 10101	Cover
12	4822 432 20007	Edge

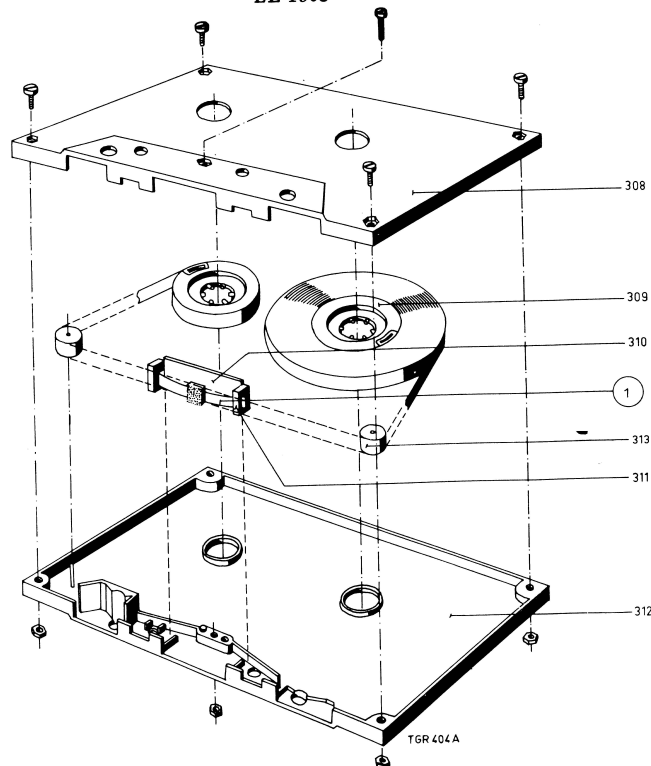
List of Parts for the microphone

<u>Item</u>	<u>Code number</u>	<u>Description</u>
13	4822 169 00531	Spring
14	4822 169 00532	Spring
15	4822 169 00526	Plate
16	4822 169 00529	Contact spring
17	4822 169 00525	Switching knob
18	4822 169 00528	Spring
19	4822 169 00527	Plate
20	4822 447 10097	Cover
21a	4822 219 00131	Flex
21b	978/5x270	Plug, 5-pole
22	4822 447 10098	Frame
	4822 462 10072	Stand for microphone



TGR 1181

EL 1903



TGR 404A

<u>Item</u>	<u>Code number</u>	<u>Description</u>
1	4822 175 01441	Pressure felt assembly



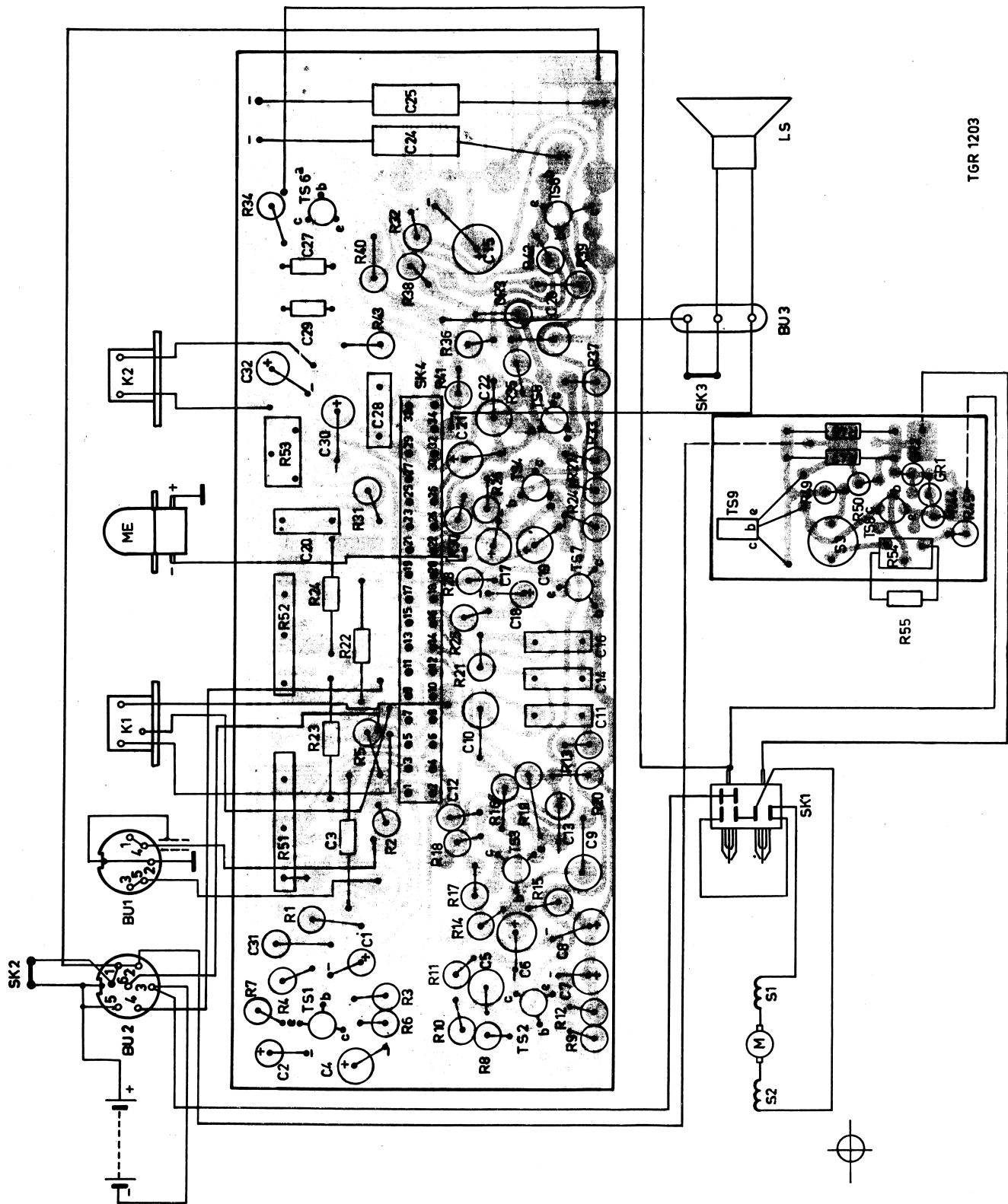
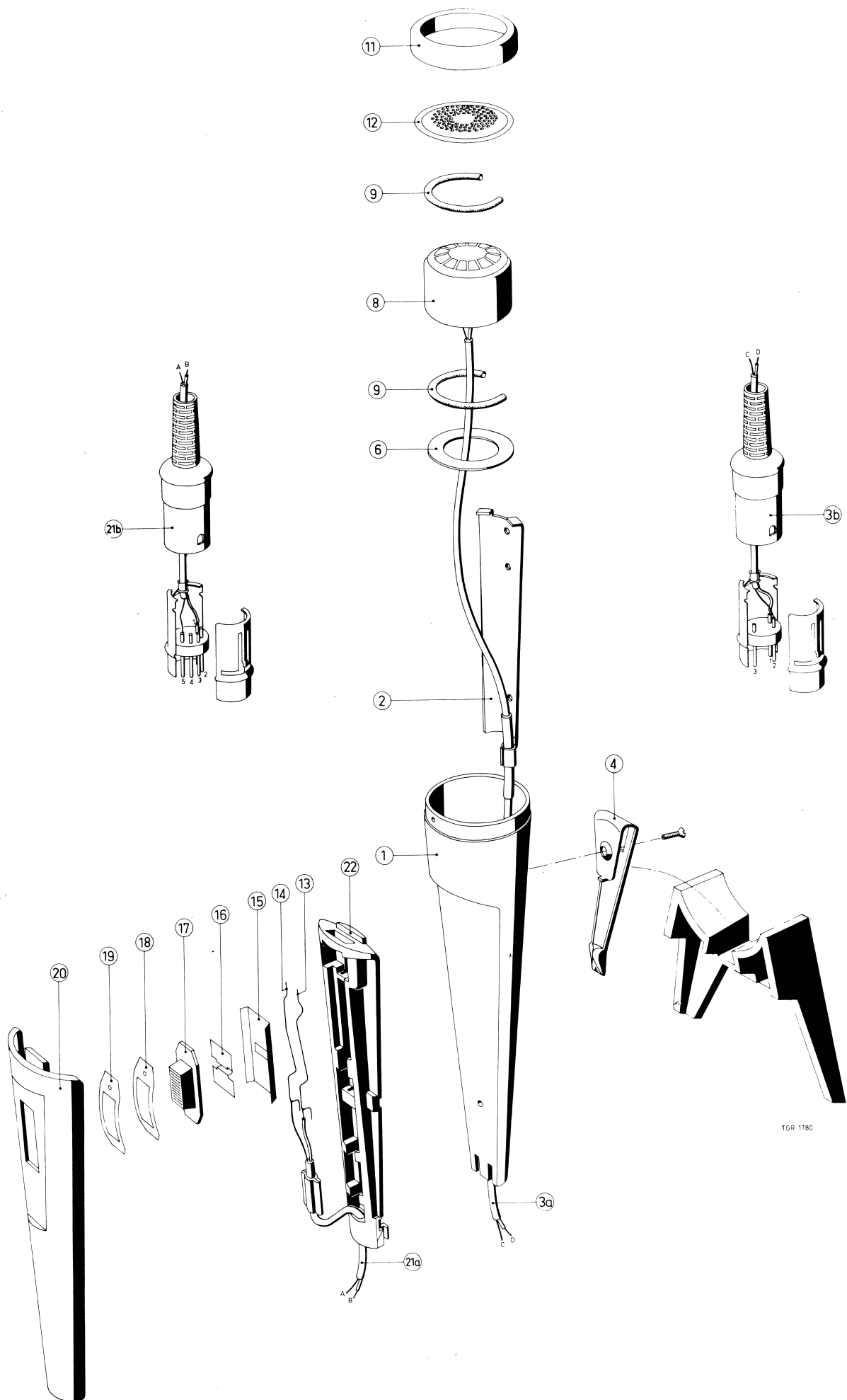


Fig. 8



TGR 1180

- a. The winding friction of the right-hand turntable being too small.
- b. Too much friction in the cartridge.

In order to ascertain which fault is causing this trouble, first of all the torque of the winding friction should be measured. This ought to be done as follows:

Open the side of the cartridge in such a way that the tape can come out free from the cartridge. Take care that on the tape reel, on the side of the opening, enough tape is wound so that the diameter of the tape reel is 2 cm. Make a knot in the tape, that is coming out of the side of the cartridge.

In this knot a spring-pressure gauge can be hooked. Put the cartridge onto the recorder, the opening being on the right.

Switch the set into the position "playback".

Move the spring-pressure gauge in the direction in which the tape is pulling and slowly decrease this movement until the tape comes to a stand-still.

Precisely at the moment the tape stops, a tensile force of 12-22 grs should be indicated.

It is stressed that pulling in the opposite direction must definitely be avoided as this will cause a considerable increase in the tensile force.

Should the force be within the mentioned value the fault is due to the cartridge.

A simpler method of checking the winding friction is to measure the current drain of the recorder.

This can be done in the following way:

Connect a milliammeter in series to the power supply. For this purpose use a plus, code number 978/6, with two wires soldered to pins 1 and 5. Put the plug in BU2 and connect the meter to the wires.

Instead of using the batteries of the apparatus, it is better to employ a stabilised external power supply, e.g. 800/BEX.

Then, an mA-meter should be connected in series with the negative lead.

Switch the set to position "playback" with the volume control turned right down.

Measure the total current drain.

Stop the right-hand turntable by hand and observe the increase in the current drain. This increase should be 7-14 mA.

With a value smaller than 7 mA the winding friction, item 63, is out of order and should be replaced.

With a correct value of 7-14 mA the winding friction is correct, but still the torque of the winding friction, on the right-hand turntable, may be too small due to too high a pressure force of the pulley of the winding friction against the turntable.

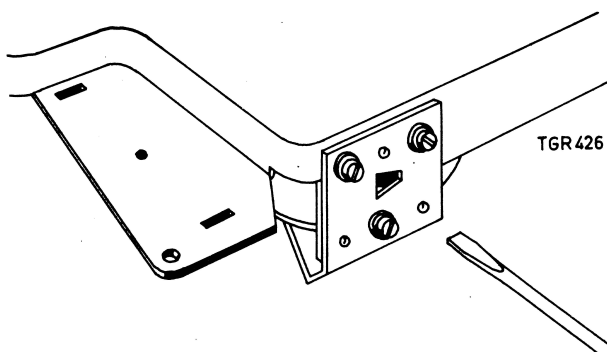


Fig. 1

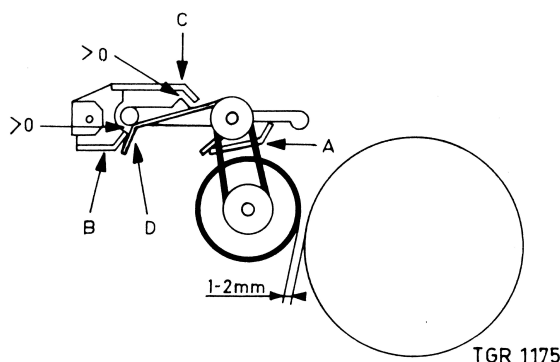


Fig. 2

#### Repair:

In the case of insufficient torque of the winding friction first, the pressure force of the pulley against the right-hand turntable should be measured, as indicated in Fig. 3. Too high a pressure force will considerably decrease the torque of the winding friction (120-150 gr.).

If after adjustment of the pressure force the torque of the winding friction still is not correct, the winding friction, item 63, should be replaced.

After replacement this friction should be checked again.

#### Winding friction

- Switch the apparatus into position "playback".
- The pressure of the pulley of the friction against the right-hand turntable must be  $85 \pm 159$  gr., see Fig. 3.
- This pressure can be adjusted by bending the wire spring under the winding friction lever.

Adjusting the winding roller lever, see Fig. 2.

Switch the apparatus to playback position. Tag C should then just clear the cam on the pulley lever. The capstan idler wheel should be at a distance of 1-2 mm from the fly-wheel. This can be adjusted by bending tag A. Spring D should just clear tag B. Adjust by bending tag B.

#### Brake bracket

In position "playback" or "recording" the brake bracket must be positioned against the two stop pins on the mounting plate and must moreover have a clearance of at least 0.3 mm with respect to the turntables.

#### Checking the tape speed 1

The tape speed is checked with the aid of testtape 4822 218 00199 onto which a 400-c/s signal has been modulated every 4.75 metres.

Insert the cassette with testtape into the apparatus.

Switch to position "playback".

The period of time between two 400-c/s signals should be between 95 and 103 seconds.

This can be adjusted with R54, Fig. 7.

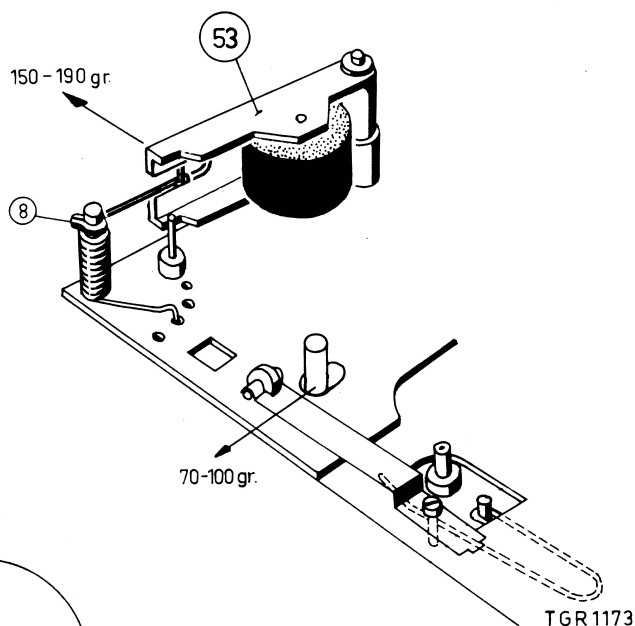


Fig. 3

## Technical Data

Tape speed	: 4.75 cm/sec. ( $1\frac{7}{8}$ "/sec)
Supply voltage	: 7.5 V (5 x 1.5 V)
Output power	: 400 mW
Loudspeaker	: 4822 240 30033
Microphone	: EL 3797/50
Headphone	: EL 3775/85
Dimensions	: 200 x 115 x 55 mm
Weight	: 1.1 kg
Input sensitivity	: 0.2 mV across 2 k $\Omega$
Maximum current, unloaded	: approx. 110 mA
Maximum current at 400 mW	: approx. 200 mA
Frequency range	: 80...10,000 c/s $\pm$ 6 dB
Cassette with tape	: EL 1903
Number of tracks	: 2
Track width	: 1.5 mm
Transistors	TS1 : AC125
	TS2 : AC125
	TS3 : AC125
	TS4 : AC126
	TS5 : AC126
	TS6a.
	TS6b : AC128..AC127
	TS7 : AC125
	TS8 : AC127
	TS9 : AC128

## HINTS FOR REPAIR

### Taking the apparatus out of the case

- . Remove the tape cassette.
- . Remove the control knob 81 from the apparatus
- . Loosen the battery cover 83.
- . Remove the batteries.
- . Loosen screw 86 of the bottom plate 85.
- . Remove the bottom plate 85.
- . Loosen the three screws 84 by means of which the mounting plate is fitted.
- . Loosen the screw between the two turntables.
- . Take the apparatus out of the case.
- . Encasing the done in the reverse order.

### Replacement of the drive belt 65

- . Loosen the three screws by means of which the lower bearing bracket of the flywheel is fitted to the mounting plate, see Fig. 1.
- . Remove this bearing bracket 67.
- . Loosen the screw by means of which the bottom plate 304 of the motor is fitted to the screening bush.
- . Remove the bottom plate.
- . The drive belt can now be removed.
- . Mounting is done in the reverse order.

Note : When fitting the lower bearing bracket 67 of the flywheel, make sure that the cord groove of the flywheel 66 and that of the winding friction 63 are aligned. The height of the flywheel can be adjusted as shown in Fig. 1, by means of a screwdriver via the triangular opening in bearing bracket 67.

### Replacement of flywheel and winding friction 63

- . Loosen the three screws by means of which the lower bearing bracket of the flywheel is fitted to the mounting plate. See Fig. 1.
- . Remove this bearing bracket.
- . Remove the motor print.
- . Release the drive belt at the side of the flywheel.
- . Remove the nylon clamping ring from the bracket of the winding friction 63.
- . The flywheel and the winding friction must now be simultaneously removed.
- . Mounting is done in the reverse order.

Note : When mounting make sure that the lip of the winding friction bracket engages the hook of the wire spring 60.

After the flywheel bearing has been fitted, the cord groove of the flywheel and that of the winding friction must be aligned.

The height of the flywheel can be adjusted as shown in Fig. 1 by means of a screwdriver via the triangular opening in bearing bracket 67.

### Replacement of the motor

- . Loosen the screw by means of which the bottom plate of the motor is fitted to the screening bush.
- . Remove the bottom plate.
- . The motor can now be taken out of the screening bush.
- . Unsolder the connection wires of the motor from the anti-interference coils S1 and S2.
- . Mounting is done in the reverse order.

### Replacement of the winding roller lever 44

- . Remove the nylon clamping ring 64 from the winding roller lever 44.
- . The lever can be removed from the shaft when the idler wheel is pushed slightly backwards.

### Replacement of turntables 54

- . Loosen the cap 51 of the turntable.
- . After this the turntable can be directly removed.

## MECHANICAL ADJUSTMENTS

### Recording/playback head

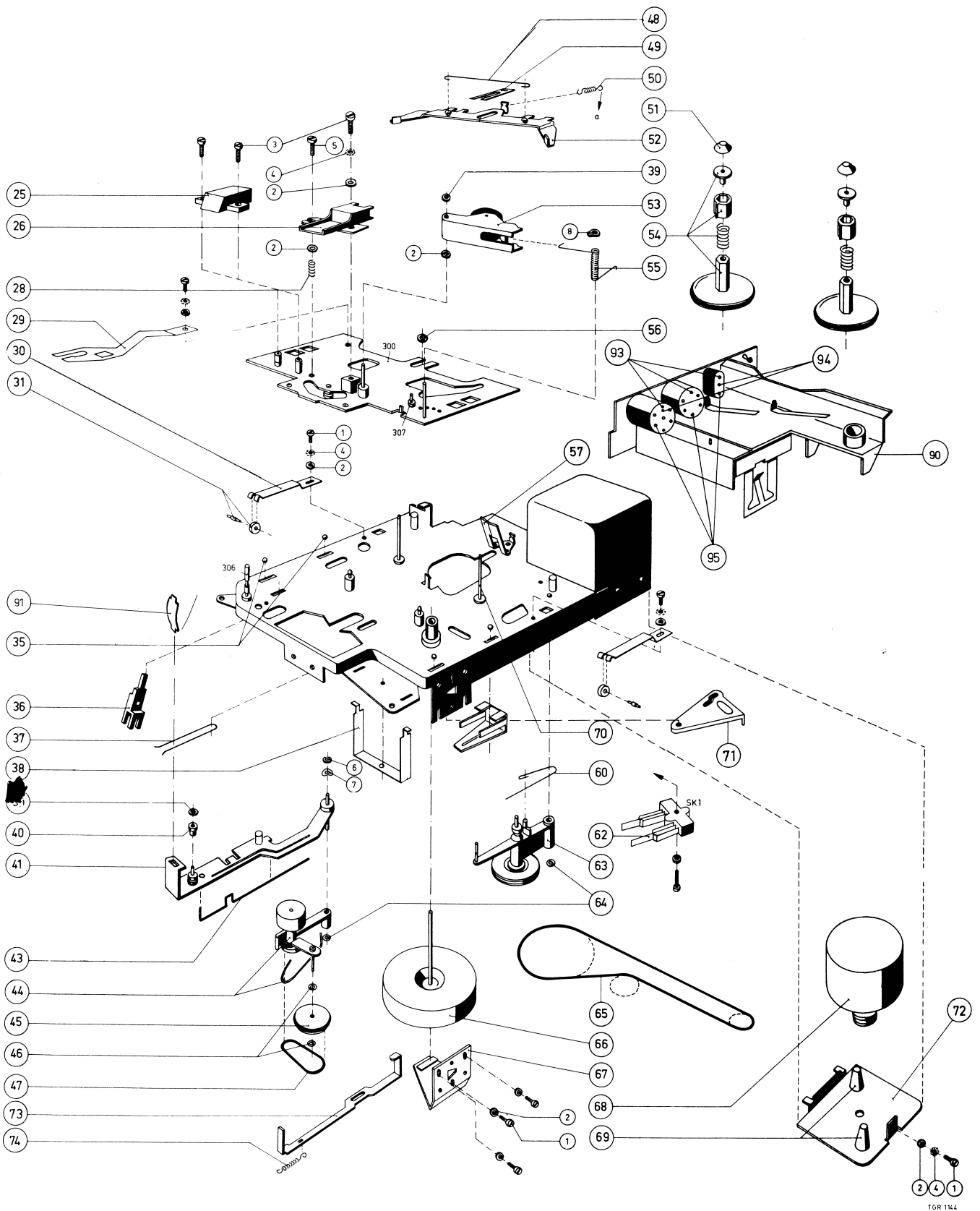
The air gap of the recording/playback head can be adjusted as follows :

- . Remove the cover over the heads (item 89)  
This cover can be removed by pressing it to the left.
- . Place a cassette with a test tape of 5000 c/s (code number 4822 218 00199) into the apparatus.
- . Switch the apparatus to position "playback".
- . Connect a valve voltmeter to the points 2 and 3 of BU1.
- . Adjust for maximum output voltage with screw A (Fig. 4).
- . After the adjustment, seal the screw with cellulose lacquer.

### Pressure roller lever

- . Switch the apparatus into position "playback".
- . The force needed for pulling the pressure roller clear of the capstan, must be between  $170 \pm 20$  gr. see Fig. 3.
- . This force can be adjusted by slightly repositioning the torsion spring.

It may occur that the tape in the cartridge is not wound up or in a jerky way.  
The tape, being transported by the capstan, will be damaged or the drive will become blocked.  
This fault may be caused by.



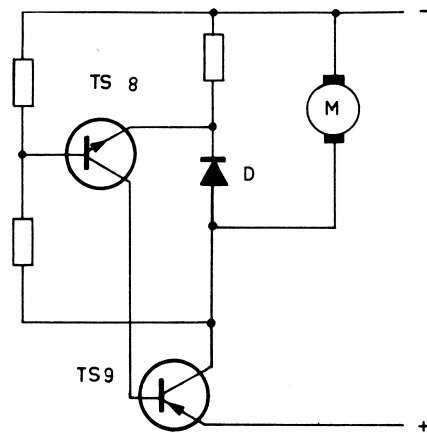
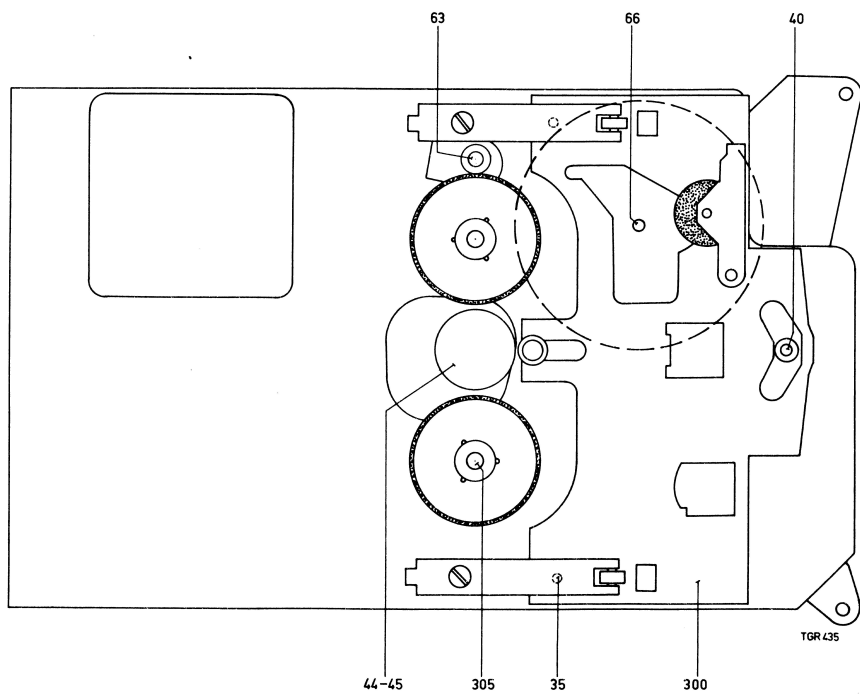
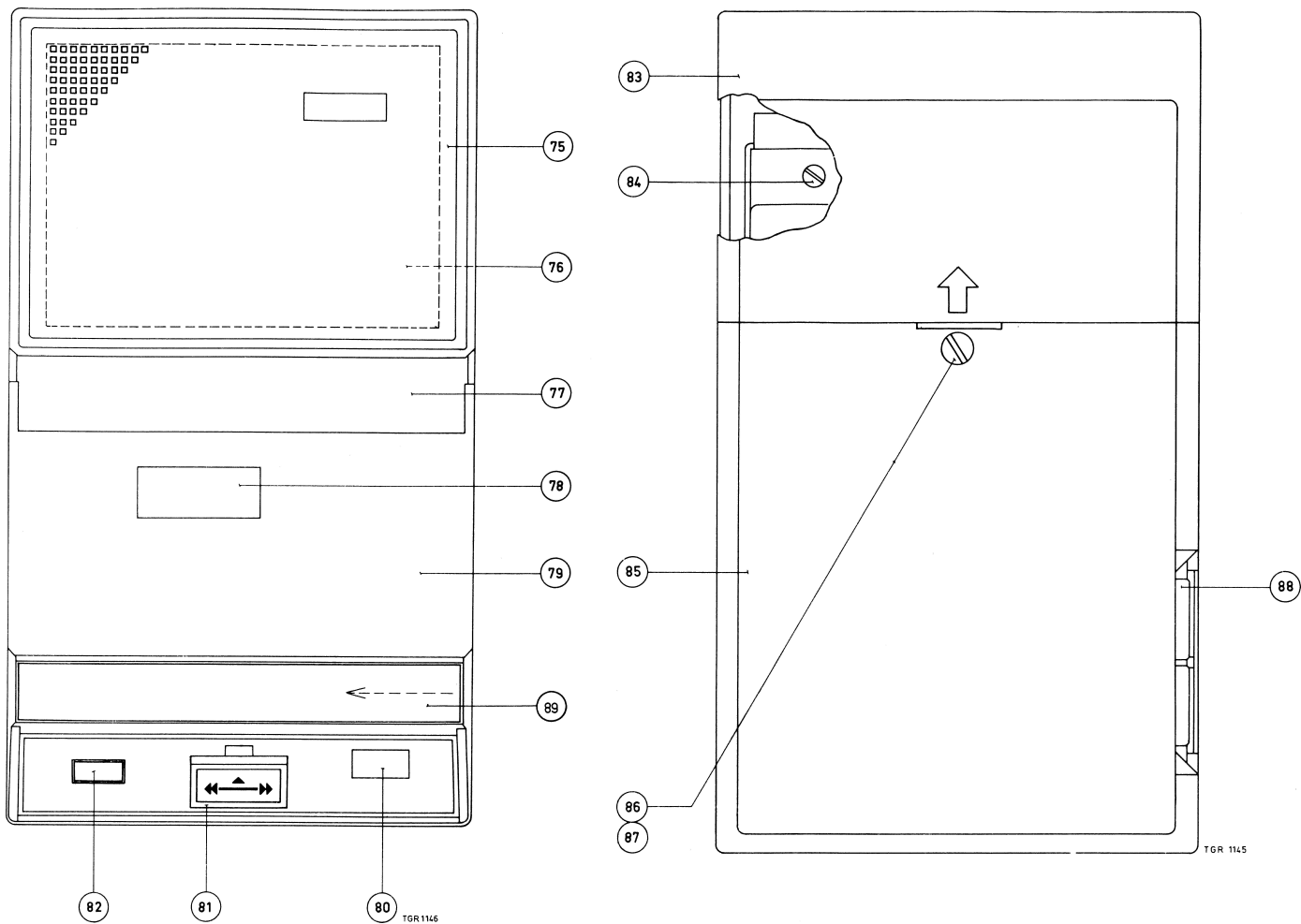


Fig. 12

TGR 871

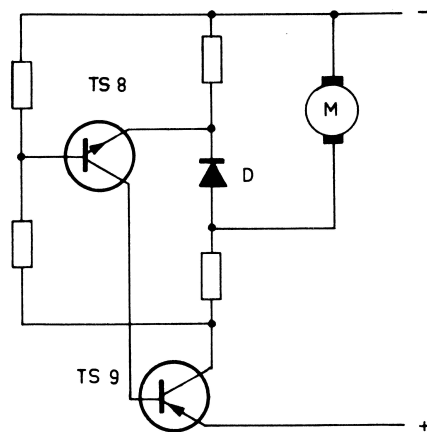


Fig. 13

TGR 870