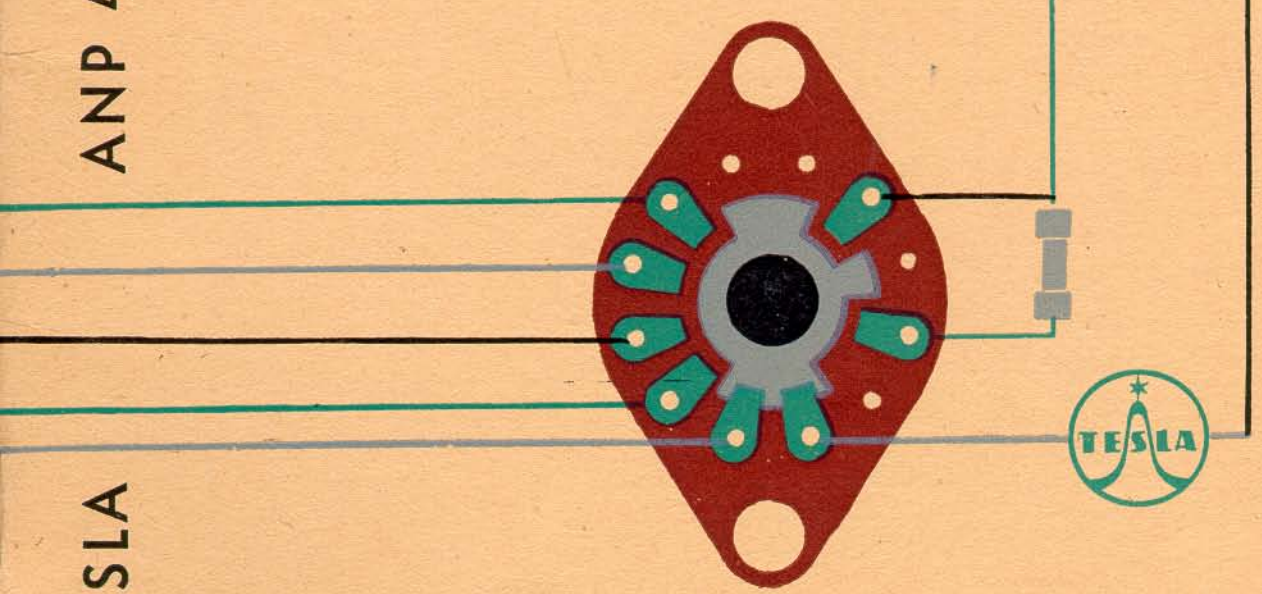
start

TESLA ANP 402



BATTERY MAGNETIC TAPE RECORDER

Instructions for Maintenance and Repair

TECHNICAL DESCRIPTION, INSTRUCTIONS FOR MAINTENANCE AND REPAIR OF THE BATTERY TAPE RECORDER TESLA ANP 402

START

KOVO

PRAHA – CZECHOSLOVAKIA

1962

BATTERY TAPE RECORDER TESLA ANP 402

Fig. 1. Instrument with basic accessories

Microphone AMD 902	AN 618 00
Two spools with tape in cassette	6 AF 800 22/Z
Empty spool	6 AF 800 20
Cable for connection to a receiver	6 AK 762 11
Six-pin connector	6 AF 895 53

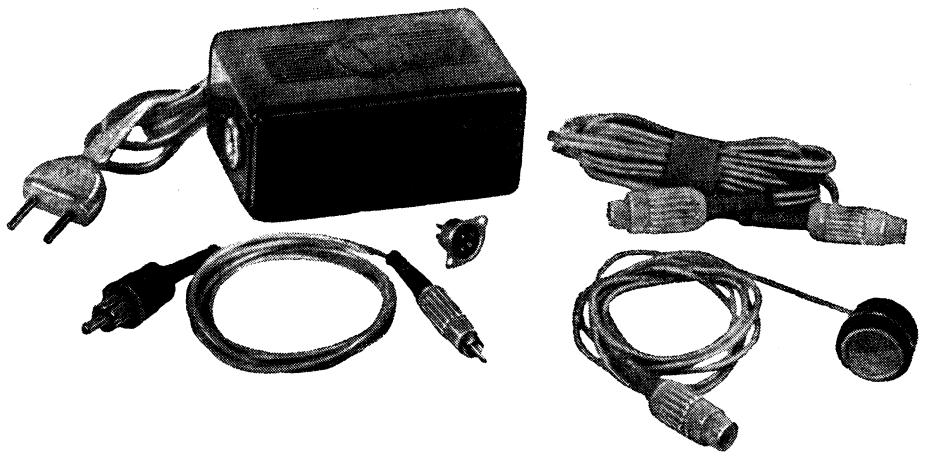


Fig. 2. Special accessories (without eraser choke)

Mains power source	AYN 400a (for 120 V)
	AYN 400b (for 220 V)
Cable for connection to a receiver with diode output	6 AK 762 12
Cable for connection to a 12 V battery	6 AK 050 09a (+ on chassis)
	6 AK 050 09b (— on chassis)
Three-pole connector (plug)	6 AF 895 10
Three-pole connector (socket)	6 AF 282 03
Plug for the 12 V source	6 AF 895 41
Telephone pick-up	6 AK 050 04
Eraser choke	AYN 107

1.0 TECHNICAL DATA

1.1 Mechanical properties

Tape speed	4.76 cm/sec
Recording	Double track
Recording time	2 × 22 minutes
Rewinding time	40 seconds approx.
Length of tape on spool	65 m
Suitable tape	AGFA CH long-playing
Dimensions	250 × 160 × 100 mm
Weight	3.4 kg (including batteries)

1.2 Electrical properties

Frequency range	150 to 6000 c/s within 5 dB
Sensitivity for microphone	100 μV for full modulation
for radio receiver	100 mV for full modulation
Sound-to-noise ratio	Min. 32 dB
Erasion	By a permanent magnet
Output power	Max. 200 mW
Powering	9 V (i. e. 6 × 1.5 V), 12 V storage battery, mains 120 V or 220 V, 50 c/s
Power consumption	Max. 140 mA (forward run)
Transistors	105NU70, 2 × 107NU70, 2 × 104NU71 matched, 104NU71 (motor control)

2.0 ATTENDANCE OF THE TAPE RECORDER

2.1 Insertion of the batteries

The tape recorder is powered by six battery cells which are situated in two spaces inside the tape recorder. These spaces for the cells are closed by the bottom cover of the case which is secured with a screw (Fig. 3). The space for two of the cells is

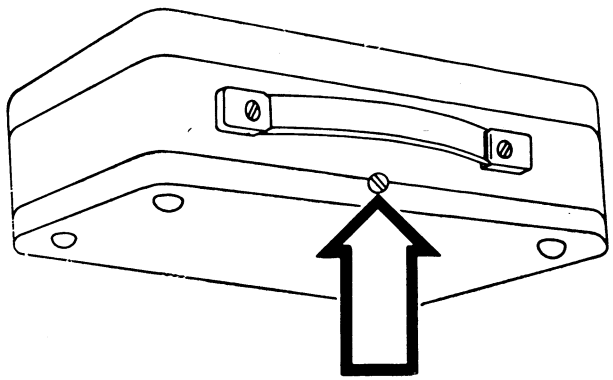


Fig. 3.

directly accessible, whereas that for the other four cells becomes accessible only after the removal of an insulating plate which is secured with three flat springs. The plate can be released by pressing it against the springs, using the semicircular cutting so as to free it from the two notches and then it can be tilted upwards. It is essential to position the cells **correctly,** otherwise they could damage the transistors.

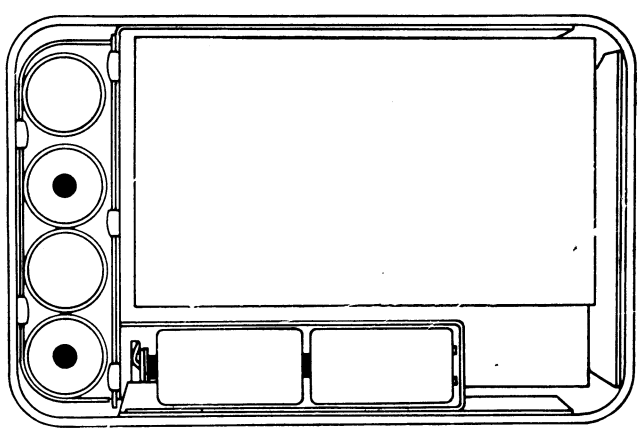


Fig. 4. Positions of the batteries

2.2 Powering from a motor-car battery

The START tape recorder can be powered also from a 12 V motor-car battery, e. g. directly in the vehicle. The tape recorder is connected with the cable 6 AK 050 09a in vehicles with the + pole on the chassis, or with the cable 6 AK 050 09b in vehicles with the — pole on the chassis to the socket on the dashboard of the vehicle or directly to the terminals of the battery. **It is essential to maintain correct polarity!** The minus pole of the battery has to be connected to the framework of the tape recorder, i. e. to the internal contact of the connector.
Care must be taken with types of cars where the plus pole of the battery is connected to the chassis of the car! The inserted cells are partially regenerated during operation from a car battery.

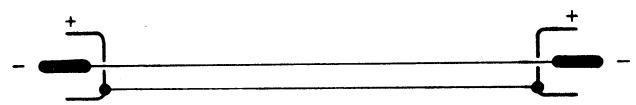


Fig. 5 Cable 6 AK 050 09a

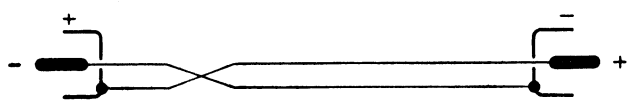


Fig. 6. Cable 6 AK 050 09b

The cable is connected to the tape recorder via the coaxial socket on the back of the case (Fig. 7).

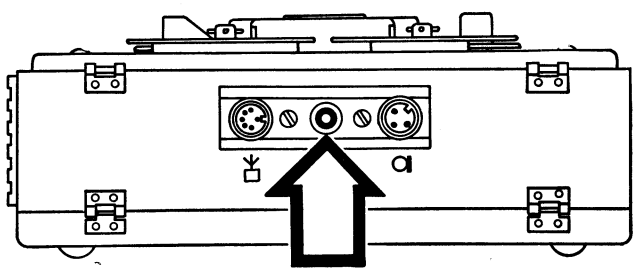


Fig. 7. Connection to an external power source

2.3 Powering from the mains

The mains power source TESLA AYN 400 is intended for powering the tape recorder from the mains, and is connected to the tape recorder with the cable 6 AK 050 09a (the same as is used for connecting to a car battery). The mains power source AYN 400a is only for 120 V and the AYN 400b for 220 V, 50 c/s. For other voltages, it is necessary to use a transformer. When mains powering is applied, the inserted cells are partially regenerated.

2.4 Insertion of the tape

For the START tape recorder only long-playing tapes must be used. Other tapes are unsuitable.
During recording or playback, the tape unwinds from the left-hand spool onto the right-hand one. Therefore, a full spool is placed on the left-hand shaft and an empty one on the right-hand shaft. The tape is placed vertically into the slot in the front cover. The shafts of the spools have rotary caps with three wings, the turning of which prevents the spools from falling off.

2.5 Control elements

The left-hand control selects the following operations:

- ◁ Rewinding
- O Instrument switched off
- Playback
- Recording

Right-hand control: Volume control during playback and setting of the recording level (under normal circumstances set to approximately 5 — to be tested previously).

In the centre of the cover is the "Stop" push-button.

2.6 Connection of the microphone

The microphone is dynamic and is connected to the socket marked which is on the back of the case (Fig. 8).

2.7 Connection to a radio receiver

The receiver is connected either by the diode output or by the low-impedance output to the socket marked which is on the back of the case.
A receiver with high-impedance output must be adapted.

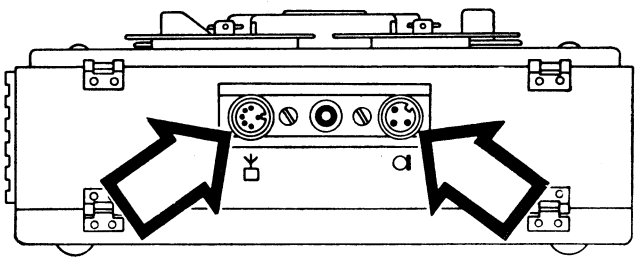


Fig. 8. Connection of the microphone and to a receiver

2.8 Tape recorder as a source of modulation

The output of the tape recorder is connected asymmetrically in the connector to the terminals 3 ("live") and 2 (framework). Approximate impedance: 50,000 ohms; voltage 0.5 V.

2.9 Soldering of the cable connectors

The plastic material from which the connectors are made softens from heat. Therefore, before soldering on the conductors, the plug has to be inserted into the socket. Thus deformation is prevented. The soldering has to be carried out quickly with a hot soldering iron of larger type.

3.0 REPAIR OF THE MECHANICAL PARTS

3.1 Removal of the instrument from the case

a) Loosen the screw which secures the bottom cover.
b) Unscrew the two screws which secure the decorative plate of the connectors.
c) Unscrew the case handle.
d) Carefully remove the instrument from the case.

When the panel is too tight in the case, it is recommended to remove the instrument from below after loosening the screws as mentioned in items 3.2 a) and c), taking off the controls according to item 3.2 b) and leaving the panel in the case.

3.2 Dismounting of the panel

a) After unscrewing the two countersunk screws, remove the small cover.
b) Take off the two controls.
c) Unscrew the four decorative screws with lenticular heads.
d) Carefully remove the panel.

3.3 Drive mechanism

The mechanical parts of the drive mechanism of the tape recorder require the application of suitable tools and instruments during repair, and the maintaining of the basic rules which apply to tape recorders in general.
Further it is essential to ensure cleanliness of the workplace, so that the individual parts do not become soiled with grease, nor mechanically damaged.

3.31 Description of the drive mechanism

a) The motor of the tape recorder is a DC motor with permanent stator and wound armature. When powered with a voltage of 9 V, it has 2220 revolutions per minute at normal run of the tape recorder. The motor revolutions are adjusted by the transistor 104NU71. The motor is connected to the pertaining battery via a resistor R 24 to which a transistor is connected in parallel. The contact of the centrifugal governor interconnects the base and the collector of the transistor, causing a sudden lowering of the internal resistance of the transistor. At this moment the current of the motor is maximum. After the motor has reached the rated revolutions, the centrifugal force and the force of the spring in the centrifugal governor gain equilibrium, however the contact is not interrupted yet. When the rated revolutions are exceeded, the contact is interrupted, the internal resistance of T 6 increases and the current flows into the motor through the resistor R 24 only; thus the current is reduced and the revolutions of the motor are lowered.
In order to ensure quiet running of the tape recorder, the motor is suspended in foam rubber.

b) The drive of the flywheel, the shaft of which is simultaneously the tone capstan, is carried out by a round rubber belt of ⌀ 2 mm, 270 mm long (i. e. the diameter of the ring is 86 mm). The belt is in a groove around the flywheel and is driven by the pulley of the motor. The belt is kept taut by a tautening pulley part 6 AF 816 23.
The driving force is brought onto the shafts of the two spools by the friction of the rubber lining of these shafts. The unwinding spool (left) engages the flywheel and the winding-on spool (right) engages the spring belt. Whereas the winding-on spool is in continuous contact, the unwinding spool is pressed against the flywheel only during fast rewinding of the tape. During normal forward run, the unwinding spool is braked by a pad.

c) Normal forward run

By switching the left-hand control from the position marked ○ to the position marked ⏏, the rubber pressure pulley is pressed against the tone capstan, thus causing the tape to move and the eraser head to turn so that the extrusion without the magnet keeps the tape in the same position as for erasion. This is important for the correct strapping of the combined head by the tape. The rubber pressure pulley is pressed by a helical spring.
At the same time the winding-on spool is driven by the slipping belt of the flywheel and the unwinding spool is braked by a pad. By further turning of the control to the position marked ⏏, the performance selector switch is moved further by a sprocket from the position for playback to that for recording. Simultaneously the eraser head turns further, so that its magnet reaches the tape and erases the old recording. The eraser head is controlled via a fabric cord by the cam fitted on the shaft of the performance selector switch.

d) Fast rewinding

On the lower end of the performance selector switch is a link which controls the pressure of engagement between the unwinding spool and the flywheel. The rubber-lined gear wheel is pressed against the flywheel by a spring. After engaging the flywheel, the braking action of the pad is discontinued simultaneously.

3.32 Tape guiding

The tape of the recorder is guided by grooves in two guide pins, and also by a brass inset in the space between the heads. The position of the tape guiding is stable and cannot be altered. In the case of necessity, the positioning of the combined head has to be altered. The felt pad is pressed against the combined head by a spring of 3 g pressure (Fig. 10).

3.4 Testing and adjustment of the mechanical parts

For obtaining good recording and playback, the most important factor is the perfect mechanical state of the tape recorder.

3.41 The tape must be correctly carried by the pressure pulley and must not "wander". Looping of the tape in front of and behind the pressure pulley and at the heads must not take place. The tape has to be adjusted first without the guiding angle plate, by sliding the pressure pulley along the lever and if this is insufficient, then it is necessary to adjust the pressure by bending the lever with flat nose pliers. The front of the combined head must be perpendicular to the base plate. Only then is the guiding angle plate set and the belting adjusted.

3.42 The flywheel must rotate freely without knocking and vibrations. From normal forward run the coasting must be minimum two seconds including the belts. The axial play can be maximum 0.3 mm.

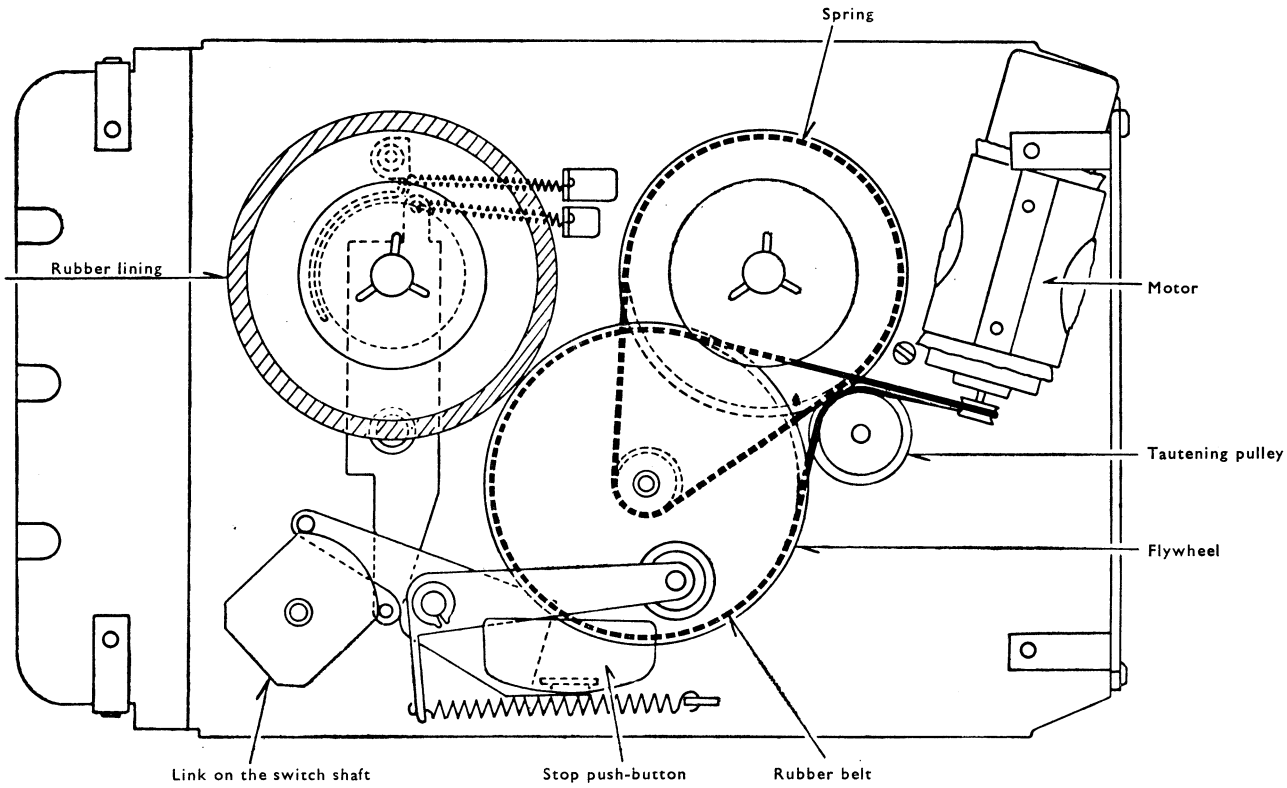


Fig. 9. Diagram of the drive

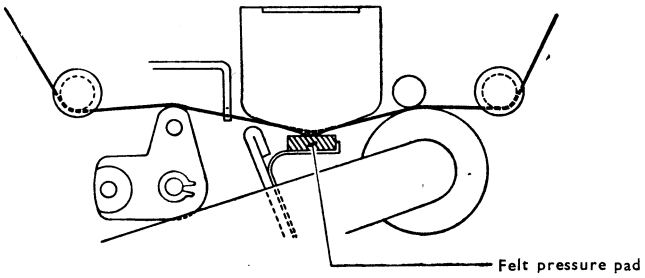


Fig. 10. Tape guiding

3.43 The height of the two drive pins must correspond to the data given in Fig. 11.

3.44 The spring belt must run from the flywheel to the right-hand drive pin parallel to the chassis. During normal run of the instrument, the torque of the right-hand drive pin must be 14 to 17 gcm. The torque can be adjusted by shortening or exchanging the spring belt.

3.45 The brake of the left-hand drive pin has to be adjusted so that the torque for overcoming the braking action is 22 to 25 gcm. Fine adjustment is carried out by bending the fastening lug on the chassis. During rewinding, the left-hand drive wheel

must be disengaged from the brake and pressed against the flywheel circumference. During rotation, "screw motion" of the wheel must not occur in the axial direction.

3.46 The stop push-button separates the pressure pulley from the tone capstan (the resulting gap must be at least 1 mm) and simultaneously disconnects the contact blades of the switch. Disconnection must be reliable and the gap between the contacts in the disconnected state must be minimum 0.6 mm. In the idling position of the push-button, a gap of minimum 0.2 mm must remain between the push-button and the control lever. If necessary, the gap can be adjusted by bending the lug of the push-button.

3.47 The motor must be mounted so that the rubber belt of the motor pulley runs onto the flywheel at a tangent. Exact adjustment of the belt can be carried out by bending the pivot of the intermediate pulley.
The motor must be turned in the suspension so that the opening for adjustment of the governor is accessible for a screwdriver.

3.48 The lever with the pressure pulley can have an axial play of maximum 0.2 mm. In the switched off position, after the lever has been disengaged, a gap of at least 6 mm must be between the pressure pulley and the tone capstan. During normal forward run of the tape, the pressure of the pressure pulley has to be within the range 280 to 300 g. The pressure pulley must rotate very easily in order to prevent fluctuations of the recording.

3.49 The position of the eraser head is checked after setting the performance selector switch to the position "Recording". The head must be turned so that the slot in the magnet is exactly perpendicular to the tape. Permissible tolerance: $\pm 2^0$. When the adjustment is correct, the spring inside the head causes a pressure of 50 to 70 g at the spot furthest from the axis of rotation. The correct tension of the spring is achieved by turning the head counter-clockwise, and only then is the control cord fixed. The axial play of the head on the pivot can reach maximum 0.1 mm, whilst the head must turn quite easily.

d) Remove the springy retainer of the shaft of the pressure lever and withdraw the lever together with all the attached components.
e) Carefully slide the triangular plate upwards — take care of the connections to the combined head, if necessary disconnect them.
f) Exchange the rubber belt.

When reassembling, an opposite procedure has to be carried out and care must be taken that the flywheel always rotates freely and is not jammed in the bearings. Check according to items 3.41, 3.42, 3.46, 3.47, 3.48 and if necessary also 3.44.

Note:
The spring belt can be exchanged without removing the triangular plate. It is sufficient to unhook the belt and to pull it out. The new belt is inserted taking care that it sits properly in the groove of the flywheel. The belt is hooked together and is inserted into the groove of the drive wheel.

3.53 Exchange of the combined head

a) Remove the instrument from the case according to item 3.1 and dismount the panel according to item 3.2.
b) Unsolder the connections from the head.
c) Unscrew the three set screws which hold the supporting plate of the head.
d) After releasing the two screws, exchange the head.

Reassembly is carried out following an opposite procedure; the connections have to be resoldered. Adjust the slot perpendicular to a standard tape. Simultaneously check the height of the slot in relation to the tape (see item 5.4).

3.54 Exchange of the flywheel

a) Proceed according to items 3.52 a) to e).
b) Slip out the rubber belt (do not stretch it unnecessarily).
c) Raise the flywheel from the lower bearing and at the same time carefully take off the spring belt.

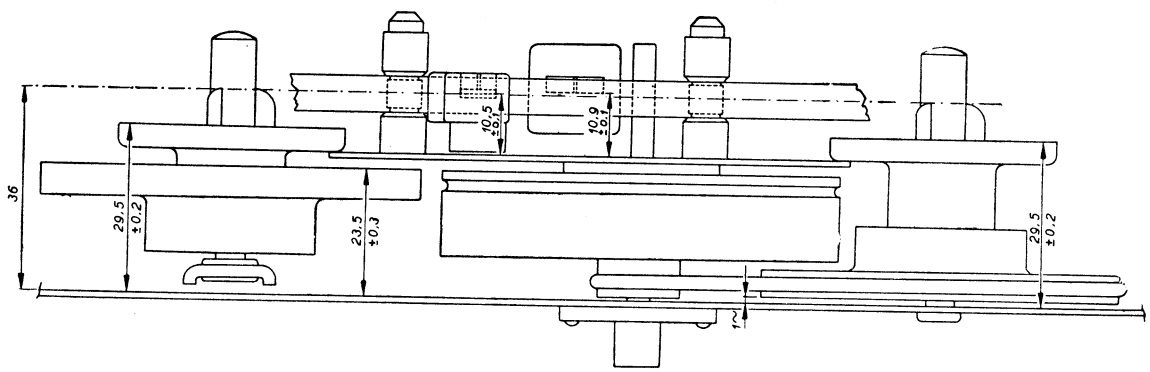


Fig. 11. Guiding

3.5 Exchange of some parts

3.51 Exchange of the motor

a) Remove the instrument from the case according to item 3.1.
b) Dismount the panel according to item 3.2.
c) Disconnect the four connections of the motor from the plate under the metal framework of the instrument.
d) Slide the retaining strip off backwards.
e) Carefully withdraw the motor.

When remounting, an opposite procedure has to be carried out and simultaneously the conditions in item 3.47 and 5.61 must be observed.

3.52 Exchange of the drive belts

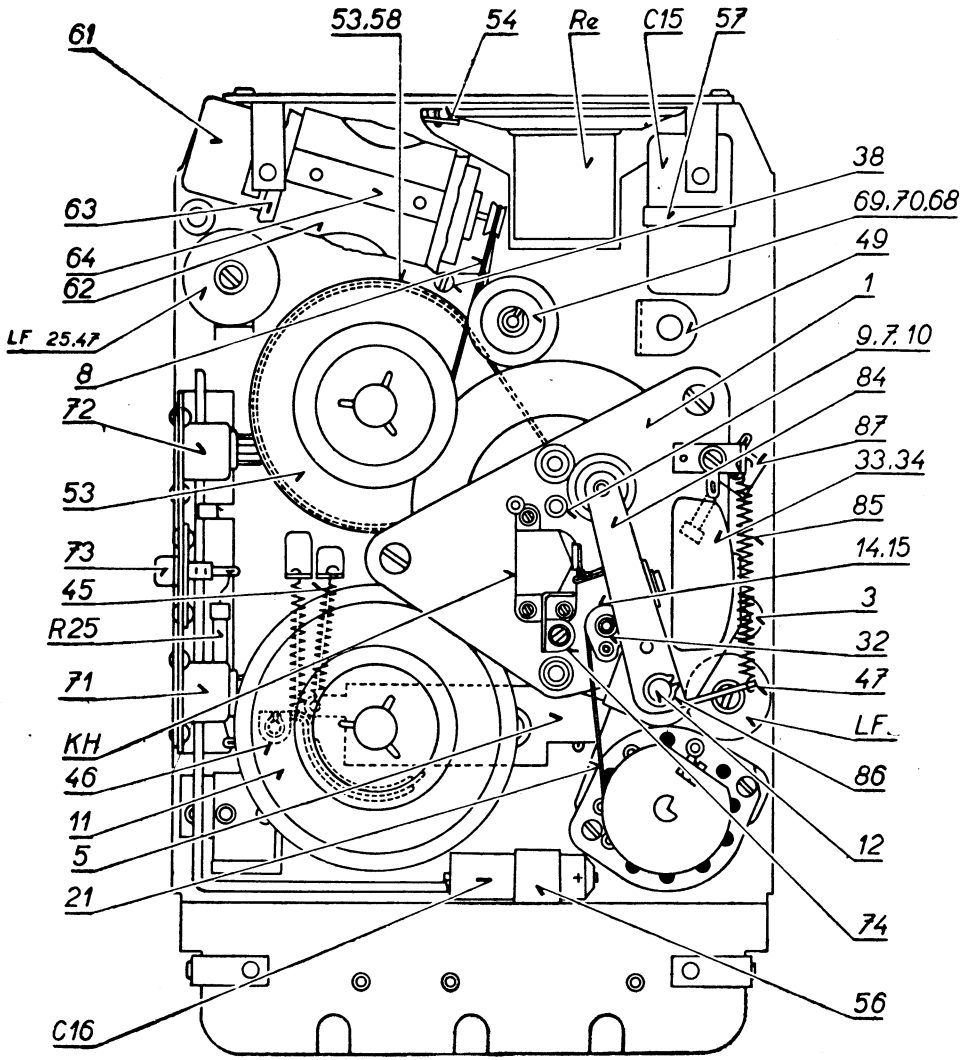
a) Remove the instrument from the case according to item 3.1.
b) Dismount the panel according to item 3.2.
c) Release and unscrew the two screws which fasten the triangular plate.

d) Lubricate the lower part of the shaft of the new flywheel with grease 230 and insert the flywheel into the lower bearing, at the same time fitting on the spring belt. Lubricate also the square hole of the upper bearing (the tone capstan must remain dry!).

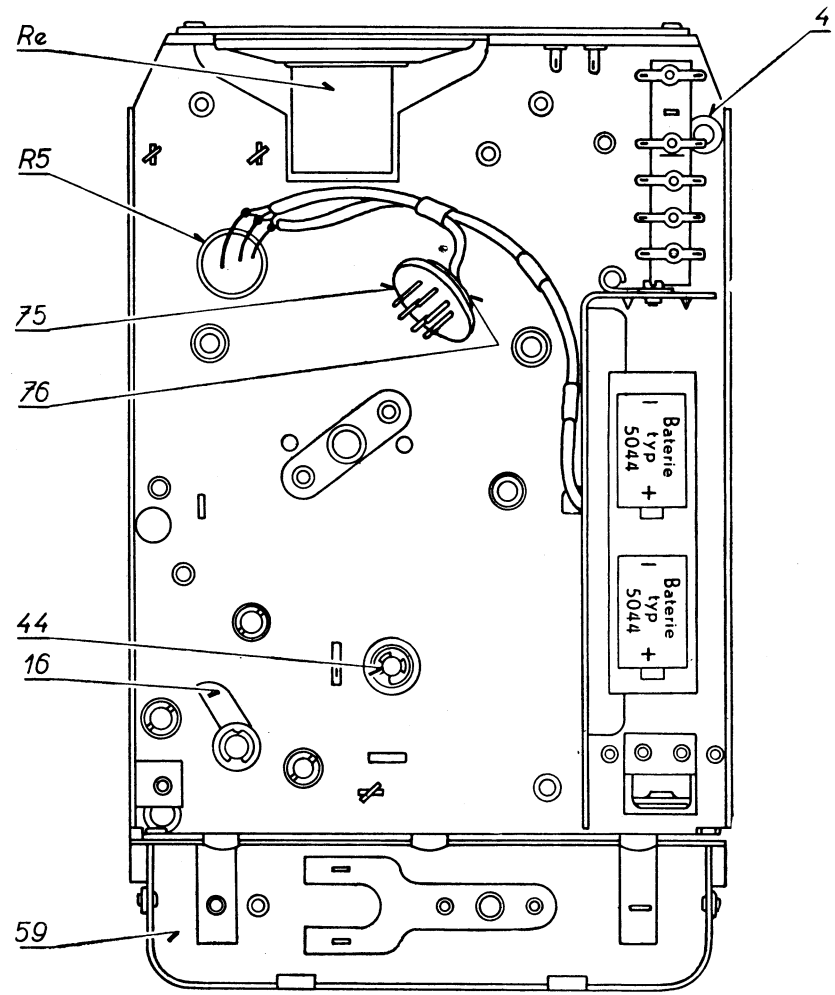
The further procedure is opposite to that for removing (i. e. items 3.52 e) to a) have to be followed). Then check according to items 3.41, 3.42, 3.46, 3.47, 3.48 and if necessary also 3.44.
After the flywheel has been exchanged it is essential to ensure that the belt runs smoothly — when leaving the slot it must not jerk. This can be achieved by suitably adjusting the tautening pulley (part 69).

3.55 Exchange ot the drive pins

a) Remove the instrument from its case according to item 3.1.
b) Loosen the grub screws of the wheels.
c) Slide out the centre parts upwards. Mind the pads inserted under the ball (part 55) — see Fig. 13.



a)



b)

The rotary pivots to be lubricated with mineral grease except the columns item 11 and 69.
When fitting the retaining rings, the axial play must remain 0.1 to 0.2 mm
After checking, the soldered places have to be coated with rhodamine

Fig. 12 Mechanical assembly of the chassis.

When the drive pins are being replaced, it is essential to observe the note below Fig. 13 and to lift the brake of the left-hand pin in order to avoid damage to it.

3.56 Exchange of the loudspeaker

a) Remove the instrument from the case according to item 3.1.

b) Dismount the panel according to item 3.2.

c) Unsolder the connections from the moving coil of the loudspeaker.

d) Release the three mounting screws (completely unscrew the upper one).

e) Withdraw the loudspeaker.

f) Remounting is carried out by an opposite procedure, taking care not to squash the conductors of the stop push-button and of the capacitor C 15.

3.57 Exchange of the electrolytic capacitor C 15

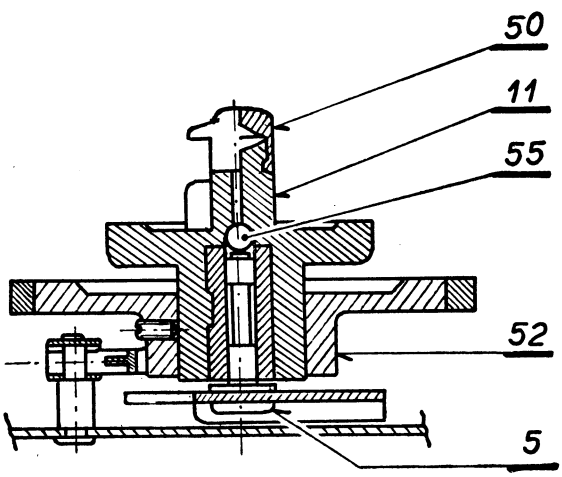
a) Remove the instrument from the case according to item 3.1.

b) Dismount the panel according to item 3.2.

c) Unsolder the earth conductor of the capacitor.

d) Release the plate with the printed circuits (four screws) and disconnect it from the cable bank by taking out the plug.

e) With flat nose pliers, straighten the torsion of the lug holding the electrolytic capacitor and withdraw the lug.



Under the ball (part 55) is usually a pad made of spring bronze for adjusting the height of the drive pin. The thickness of this pad is 0.1 mm (6 AA 063 04) or 0.3 mm (6 AA 063 03); its diameter is 4 mm.

Fig. 13. Section of the drive pin

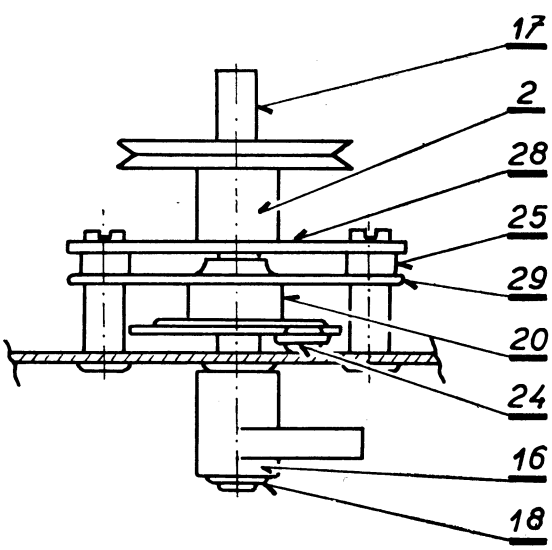


Fig. 14. Assembled performance selector switch

f) Unsolder the positive conductor of the electrolytic capacitor.

g) Mount a new electrolytic capacitor C 15 by an opposite procedure.

h) Check the operation of the sliding switch and replace the instrument in the case.

3.58 Exchange of the potentiometer R 5 (volume control)

a) Proceed according to items 3.1 and 3.2.

b) Release the plate with printed circuits (according to item 3.57 d).

c) Unsolder the potentiometer connections.

d) With a 12 mm spanner release the fixing nut of the potentiometer.

e) Mount a new potentiometer by an opposite procedure.

f) Before replacing the instrument in the case, check the operation of the sliding switch.

3.59 Exchange of other parts

When exchanging the other parts of the tape recorder, it is essential always to proceed very carefully, even when their exchange is obvious from their positions.
Before replacing the instrument in the case, it is always necessary to check the operation of the individual parts of the tape recorder and if necessary to lubricate the friction surfaces — however they must not be lubricated excessively!

3.6 Motor governor

Remove the instrument from the case and after releasing the belt, slide the motor backwards; release the two screws on the governor cover, remove the cover; release the set screw of the governor, withdraw the governor.

When mounting the governor, first of all carefully fit the brushes of the motor on the slip rings. After being secured, the governor must not rub against the cover of the bearing, not even when the shaft of the motor is slid to the extreme position.
Permissible gap: approximately 0.2 mm.

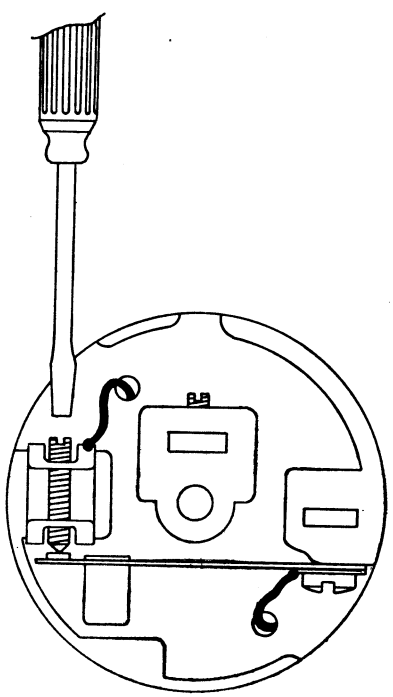


Fig. 15. Motor governor

3.7 Lubrication of the moving parts

For the lubrication of the bearings in the tape recorder, only fine oil as used for sewing machines and bicycles must be applied. The use of any other oil is not permissible.

There are five lubrication points in the instrument. The two drive pins are lubricated with two or three drops of oil applied to the holes in the shafts — these holes are accessible after removal (by turning) of the securing caps with wings.

The upper bearing of the flywheel is lubricated with two drops of oil applied directly to the bearing of the tone capstan. The lower bearing has not to be lubricated — it has a sufficient supply for several years. However, when it has to be lubricated, the flywheel must be withdrawn (see item 3.54).

The pressure pulley of the rubber belt is lubricated by wetting the felt pad with oil.

The rubber pressure pulley can be lubricated directly between the friction surfaces after unscrewing the securing nut from above. The motor has not to be lubricated — it has self-lubricating bearings.

Excessive oil must always be wiped off with a rag dipped in acetone. Petrol or any other solvent must not be used. Especially the tone capstan and the rubber pressure pulley must remain absolutely without oil.

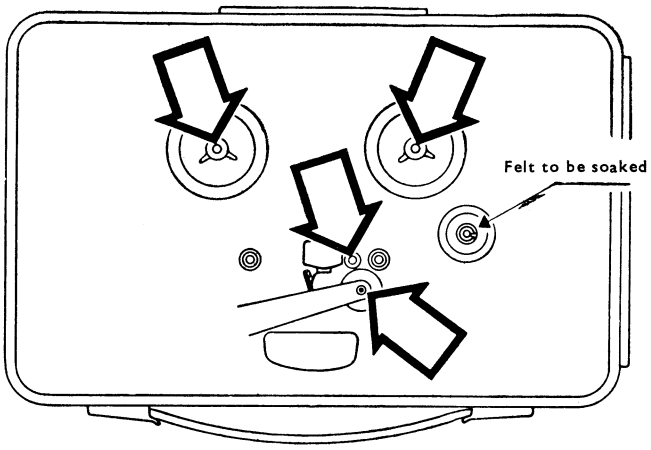


Fig. 16. Lubrication plan

4.0 RUNNING IN OF THE MECHANICAL PARTS

After the exchange of any part on which the movement of the tape is dependent, i. e. flywheel, pressure pulley, drive pins, motor, tautening pulley, etc., it is necessary to run in the mechanism anew. The running in is best carried out for 30 minutes of fast rewinding and then 60 minutes of forward run - playback. After the end of the running in, all operations of the instrument have to be tested and the overall noise of the mechanism checked It is necessary to pay special attention to the setting of the tautening pulley, which must rotate quite easily, however with the smallest possible play and without eccentricity and noise. Slight knocking and noise of the motor governor is not a fault. During fast rewinding, increased noise is permissible.

5.0 REPAIR OF THE ELECTRICAL PARTS

5.1 Description of the circuitry

a) Powering — The tape recorder is powered by six battery cells, i. e. by a voltage of 9 V. It is possible also to apply for powering a 12 V storage battery or a TESLA AYN 400 mains power source. In the latter two cases the cells remain inside the instrument, are partially regenerated and continuously maintain the powering voltage. During mains operation, the batteries operate as an output filter capacitor. The external sources are connected via the resistor R 25.

b) The playback amplifier employs five npn transistors which form a four-stage amplifier with symmetrical power stage. During playback the voltage created in the winding of the combined head is applied to the base of the first transistor T 1 — 105NU70 This transistor is thermally stabilized by the resistors R 1 and R 2. and operates in emitter connection. The amplified voltage is taken from the collector and is applied via the capacitor C 4 to the volume control R 5, from the slider of which it reaches via the capacitor C 5 the base of the second transistor T 2 — 107NU70 which also operates in connection with common emitter. This transistor is thermally stabilized by the resistors R 6 and R 7 and in its collector circuit is connected a correction element C 6, LK which emphasizes the high tones. The resistor R 10 serves for the adjustment of the frequency peak at 200 c/s. For this reason in some instruments a further resistor R 50 is connected in parallel with it (see adjustment of the amplifier frequency response). The third amplifier stage operates as a driver for the symmetrical output stage. It employs the transistor 107NU70 which operates in emitter connection with thermal stabilization. The signal from its collector is connected via the coupling transformer TR 1 to the bases of the transistors of the final stage, and also via C 14 to the resistive divider R 16, R 17, from where the voltage is derived for the connection of a receiver or of a further amplifier. The power stage employs two transistors 104NU71 in symmetrical (push-pull) connection. These transistors are thermally stabilized. The collectors of the two transistors are connected to the output transformer, to the secondary winding of which is connected the built-in loudspeaker. To the tap of the secondary winding can be connected an external loudspeaker of 5 ohms impedance. By connecting the external loudspeaker to the connector K 1, the built-in loudspeaker is automatically disconnected.

c) Recording amplifier — The first three stages of this amplifier are the same as those of the playback amplifier. Only in the recording amplifier the base of the first transistor T 1 is connected to the connector K 2. The amplified signal is obtained from the collector of the third transistor via C 11 and is connected to the combined head via the winding L03, to which is applied the premagnetizing frequency. During recording the two transistors of the final stage are connected as an oscillator which provides premagnetization. The bases of the transistors T 4 and T 5 are connected to the winding L02 and the collectors to the winding L01.

d) The automatic control of the motor revolutions is described in item 3.31. The stop push-button controls simultaneously the disconnecting contact T, thus inserting the resistor R 26 in series with the motor. Thus the motor takes less current and rotates further without load at the rated revolutions. After releasing the push-button, the motor obtains the normal operating current.

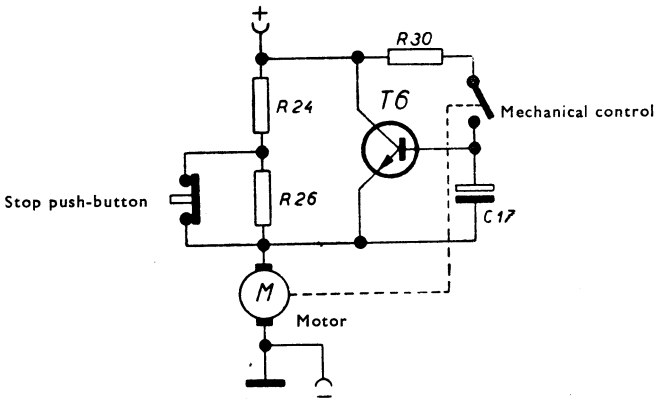


Fig. 17. Electrical control of the motor

e) Erasion — Clearing of old recordings is carried out automatically during recording by the permanent magnet in the eraser head.

5.2 Equipment of the repair workshop

For the correct adjustment and testing of the tape recorder, the repair workshop must be equipped not only with routine measuring instruments (e. g. voltmeter ohmmeter), but also with other measuring instruments, and repairs must be carried out by a technical expert who is well acquainted with the measuring instruments. If the repair workshop is not equipped with the necessary tools and measuring instruments, then the tape recorder must be handed over to a specialized workshop.

a) Measuring instruments:

DC VT voltmeter up to 30 V (e. g. TESLA BM 289)
AF generator with a range of 50 to 10,000 c/s and minimum output voltage of 1 mV (e. g. TESLA BM 344 or BM 218a)
AF millivoltmeter 0.01 to 100 V, input impedance minimum 0.1 Mohm (e. g. TESLA BM 210 or BM 310)
Oscilloscope (e. g. TESLA TM 694 or KŘIŽÍK T 565)
Distortion meter from 0.1 to 100 % (e. g. TESLA BM 224).

b) Test components:

Loading resistor 10 ohms/2 W ± 2 %
Capacitor 200 μF/15 V
Equivalent circuit instead of the combined head
2 resistors 100 ohms ± 2 %
Connection cable approx. 0.5 m long
Standard tape with 5 kc/s recording for a tape speed of 4.76 cm/sec
Demagnetizing coil for demagnetizing the head and the guide pins
Set of battery cells
Loudspeaker ⌀ approx. 20 cm in case

c) Tools:

Non-magnetic screwdriver (brass) for adjusting the head
Set of screwdrivers
Spanner 12 mm

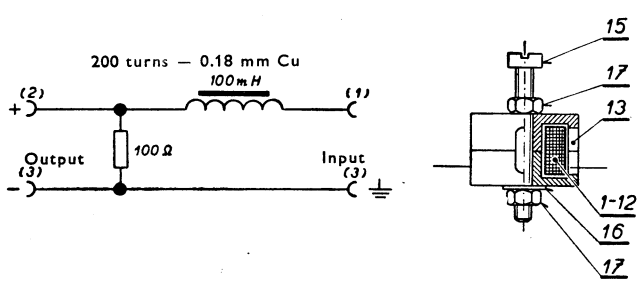


Fig. 18. Connection of the equiv alent circui instead of the combined head

5.3 Measurement and adjustment

5.31 Static test

Connect the amplifier to a DC voltage of 9 V. Before switching on, turn the trimmer potentiometer R 19 to maximum resistance. The voltage of the amplifier is measured against earth with a DC VT voltmeter (TESLA BM 289). The data listed in the following table are for information only, and deviations from them by ± 20 % do not indicate faults. During measurement with a voltmeter of another input resistance, the voltage values can be quite different.

Transistor	Electrode	V	Measured with an instrument of 1000 ohms/V
T 1	B	1.7	0.7
	K	3.5	1.7
	E	1.6	1.6
T 2	B	2.3	0.8
	K	5.1	3.2
	E	2.2	2.6
T 3	B	1.2*)	0.7*)
	K	7.8	7.8
	E	1.1	1.1
T 4, T 5	B	0.13	0.13
	K	8.8	8.8
	E	—	—
T 6	B	—	—
	K	8.9	8.9
	E	2.8	2.8

*) At point A, according to the wiring diagram

5.32 Testing and adjustment of the final stage

Load the amplifier output with a resistor of 10 ohms (instead of the built-in loudspeaker) and connect the AF generator to point A via a capacitor of 200 μF (see the diagram, connect the positive terminal of the capacitor to point A). Adjust the output voltage at point B to 0.5 V at 1 kc/s. With the trimmer potentiometer R 19, adjust minimum distortion according to a distortion meter connected to point B — this value can be maximum 3 %. Check the distortion across the resistor of 10 ohms at an output voltage of 1.23 V — this value can be maximum 8 %. At the same time the input voltage must not exceed 15 mV.
The frequency response of the final stage must be 5 dB within the frequency range of 150 to 6000 c/s, i. e. the output must be between 0.25 and 0.5 V. As a basis, a voltage of 0.5 V at 1 kc/s is set across the amplifier output. It is essential to maintain the input voltage constant at point A.

5.33 Testing of the playback amplifier

Load the amplifier output with a resistor of 10 ohms and replace the combined head by the equivalent circuit (Fig. 18).

Connect the AF generator to the amplifier input via a divider 1 : 1000 and a VT voltmeter to the output. The volume control is at maximum. At an output voltage of 1.23 V, the input voltage must not exceed 100 μV.
The interfering voltage (without signal) can be maximum 35 mV at point B. At the same time point B is loaded with a resistor of 0.5 Mohm ± 10 % including the internal resistance of the voltmeter.

The distortion is checked at point B with a distortion meter. For this purpose a voltage of 0.2 mV is connected to the amplifier input and at point B a voltage of 0.5 V is set with the volume control. The distortion at 1 kc/s can reach maximum 3 %.

5.34 Testing of the recording amplifier

Instead of the combined head, connect the equivalent circuit LSK 006 01, containing a series resistor of 100 ohms (± 2 %) in the earth connection. The performance selector switch is in the position for recording and the oscillator is made inoperative by interconnecting the bases of the transistors T 4 and T 5. Connect to the amplifier input a resistor of 100 ohms ± 2 % and the voltage from the AF generator via the divider 1 : 1000. The volume control is at maximum. With an input voltage less than 100 μV, a voltage of at least 20 mV must be across the measuring resistor of 100 ohms (built into the LSK 006 01). The measurement is carried out at 1 kc/s.
The interfering voltage at point B (without signal) must not exceed 25 mV.

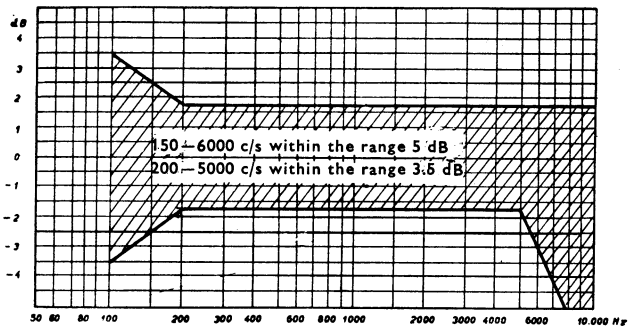


Fig. 19. Tolerance of the frequency response

5.35 Adjustment of the frequency response

The frequency response is related to 1 kc/s and is expressed by deviations in dB during recording and playback of frequencies from 200 c/s to 6.5 kc/s. The deviation is ascertained during recording and playback whilst the total has to be 6.5 to 7 dB at 200 c/s and 16 to 23 dB at 6.5 kc/s.
To the amplifier output is connected a frequency of 1 kc/s of 0.2 mV from the AF generator. The instrument is set for playback and with the volume control first a voltage of 200 mV is set across the output of the amplifier at point B, and then a voltage of 2 mV is set across the resistor of 100 ohms (in series with the head). In both cases the deviation in dB is ascertained at a frequency of 200 c/s and if the total deviation is not within the range of 6.5 to 7 dB, then the value of the resistor R 10 has to be adjusted. If the overall deviation is smaller, then the resistor has to be reduced and vice versa. If the resistor has been exchanged, it is necessary to check the deviation once more.
At high frequencies the resonance of the recording amplifier is adjusted to 6.5 to 6.7 kc/s by altering the air gap between the cups LK (by inserting paper).

5.36 Testing of the oscillator

Set the performance selector switch to the recording position and instead of the head, connect the equivalent circuit LSK 006 01 containing the measuring resistor 100 ohms ± 2 % in series with the earth connection. With the trimmer potentiometer R 23 a voltage of 0.13 V is set across the measuring resistor.
At the same time the sinusoidal waveform of this voltage is checked with an oscilloscope. The oscillator frequency is approximately 35 to 40 kc/s. Simultaneously the magnitude of the voltage across the 100 ohms resistor is checked and must not drop below 0.06 V when the powering voltage is reduced to 5 V.

5.4 Adjustment of the combined head

Connect a millivoltmeter of a range of up to 1 V to the measuring point B and insert the measuring tape LSK 006 03. At a frequency of 5 kc/s adjust the head so that the output signal is maximum, however the volume control has to be set so that the output does not exceed 0.5 V. The screws must be adjusted only with a non-magnetic screwdriver.

At the same time it is necessary to check the correct height of the head. The position is correct when the lowest stamping of the head is 10.9 mm above the subpanel (Fig. 11). The perpendicular position of the face with regard to the base plate must be maintained.
The screws must be secured with lacquer against inadvertent loosening.

5.41 Frequency response of a recording

Connect a 100 ohms ± 2 % resistor into the earth connection of the combined head and apply to the amplifier input marked ⋈ a constant voltage of 100 mV which is obtained from the AF generator.
Set the volume control so that when the oscillator is disconnected (the bases of T 4 and T 5 short-circuited) a voltage drop of 2 mV is across the measuring resistor. Under this condition make a recording of the frequencies 100 c/s, 160 c/s, 200 c/s, 300 c/s, 500 c/s, 800 c/s, 1 kc/s, 2 kc/s, 3 kc/s, 5 kc/s and 6 kc/s. During playback set the volume control so that the output voltage at point B does not exceed 0.2 V. Then the output voltage must be within 5 dB in the frequency range of 150 c/s to 6 kc/s, i. e. the ratio between the maximum and minimum output voltages must not exceed 1.78; within the range of 200 c/s to 5 kc/s it must remain within 3.5 dB (Fig. 19).

5.42 Output power and distortion

Connect a signal of 100 mV of a frequency of 1 kc/s to the input ⋈ and with the volume control adjust a current of 180 μA in the head, i. e. 18 mV across the 100 ohms resistor. Make a recording and during the playback the output voltage across the loudspeaker must be at least 1.23 V. The voltage waveform displayed on the oscilloscope screen must not be distorted by the limiting action of the amplifier. At the same time the distortion tested at the measuring point B with an oscilloscope must not exceed 6 % (at a voltage of 0.5 V set with the volume control).

5.43 Sound-to-noise ratio

Make a recording at 1 kc/s of an input voltage of 100 mV. With the volume control set the maximum recording level (i. e. 18 mV across the 100 ohms resistor). With the same adjustment of the volume control, make a recording without a signal.
During the playback of the 1 kc/s recording, set the volume control to a voltage of 0.5 V at the measuring point B. With the same adjustment of the volume control, measure the output voltage of the recording without a signal. The ratio between these two voltages must be better than 32 dB.

5.44 Erasion of the recording

A recording made, for example, according to item 5.42 or 5.43 must be absolutely erased by the eraser head. During erasion, the volume control is at minimum.
During playback of an erased recording (1 kc/s) when the volume control is turned to maximum the frequency must not be audible in the loudspeaker.

5.5 Power consumption of the instrument

At a powering voltage of 9 V ± 2 %, the DC power consumption of the whole instrument must not exceed 130 mA. It is measured at forward run and at full modulation of the final stage (1.23 V across the loudspeaker).

5.51 Power consumption of the motor

The performance selector switch is in the position for playback. The current drawn by the motor must not be more than 80 mA at 9 V without the tape fitted. If the current is greater, then it is necessary to check the ease of rotation of all the parts, and if necessary exchange the motor. A voltage of approximately 2.9 V must be across the motor brushes. A higher voltage is not detrimental. The measurement is carried out with a voltmeter and the checking is made also at a powering voltage of 6 V only.

When switched to fast rewind, the current of the motor must not exceed 150 mA without the tape fitted even at a 6 V powering voltage.

5.6 Tape speed and flutter

When the powering voltage drops from 9 V to 6 V, the tape speed must not alter by more than 3 %. With the rated voltage of 9 V used for powering, a recording is made at 1 kc/s (e. g. according to item 5.42 or 5.43) and when the voltage drops to 6 V, the frequency of the 1 kc/s recording is checked. This frequency can alter by maximum 30 c/s, i. e. the reproduced frequency can be minimum 970 c/s. If the change is larger, then it is necessary to check the resistor R 24 in the circuit of the volume control.

Fluctuations of the tape speed must not exceed 1 %. The measurement is carried out with a fluctuation meter according to the Standard DIN 455 07.

5.61 The correct speed of the tape, i. e. 4.76 cm/sec, is checked with a measuring tape 1428 mm long, on which the frequency 1 kc/s is recorded and the playback time of which is 30 seconds. The tape speed is correct if this playback time is within the range of 29.8 to 30.2 seconds in the middle of the tape and within 29.4 to 30.6 seconds at the beginning and at the end of the tape. If the measured playback time is longer or shorter, then the motor revolutions can be adjusted by setting the contact screw in the governor and the measurement is repeated.

6.0 COILING INSTRUCTIONS AND TESTING OF THE WINDINGS

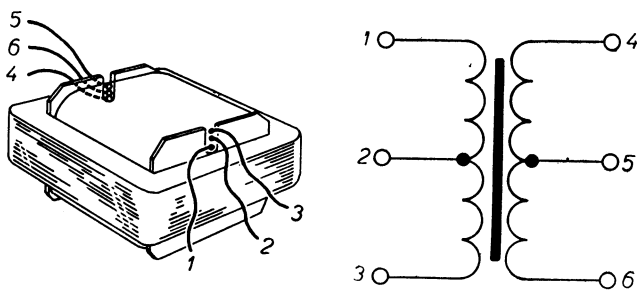


Fig. 20.

6.1 Output transformer 6 AN 673 02

Winding	Number of turns	Wire diameter mm	Winding resistance	Ratio	
1—2	78	0.355	0.88 Ω		
2—3	22	0.355			
4—5	300	0.224	9 Ω	1 : 3	Bif.
5—6	300	0.224	9 Ω		

Terminals 1 and 5 marked with colour.

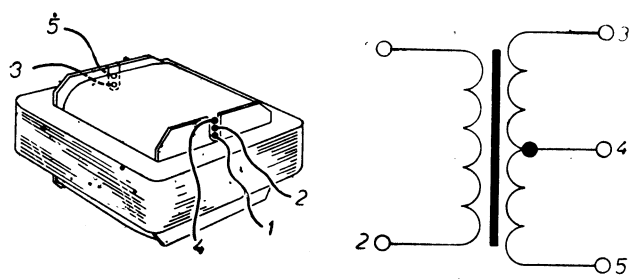


Fig. 21.

6.2 Modulator transformer 6 AN 666 00

Winding	Number of turns	Wire diameter mm	Winding resistance	Ratio	
1—2	3000	0.08	555 Ω		
3—4	1000	0.09	155 Ω	3 : 1	Bif.
4—5	1000	0.09	155 Ω		

Terminal 4 marked with colour.

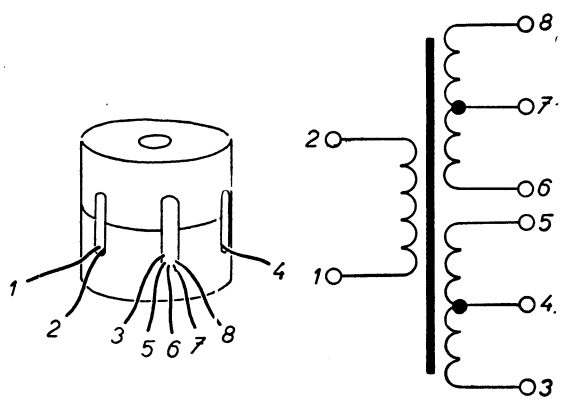


Fig. 22.

6.3 Oscillator coil 6 AK 605 00

Winding	Number of turns	Wire diameter mm	
1—2	150	0.15	
3—4	19	0.15	Bif.
4—5	19	0.15	
6—7	33	0.2	Bif.
7—8	33	0.2	

Terminals 5 and 9 marked with colour.

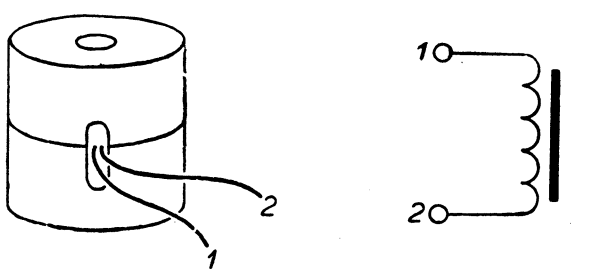


Fig. 23.

6.4 Correction choke 6 AK 605 01

Number of turns	Wire diameter mm	Winding resistance
250	0.2	5 Ω

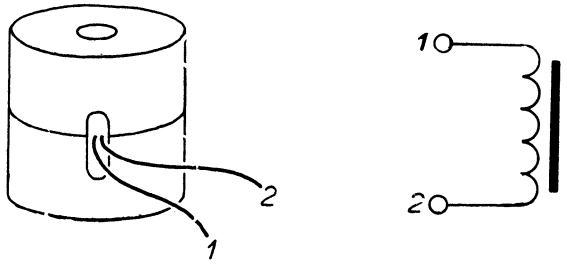


Fig. 24.

6.5 Filter choke 6 AN 682 01

Number of turns	Wire diameter mm	Winding resistance
400	0.236	7.5 Ω

7.0 LIST OF SPARE PARTS

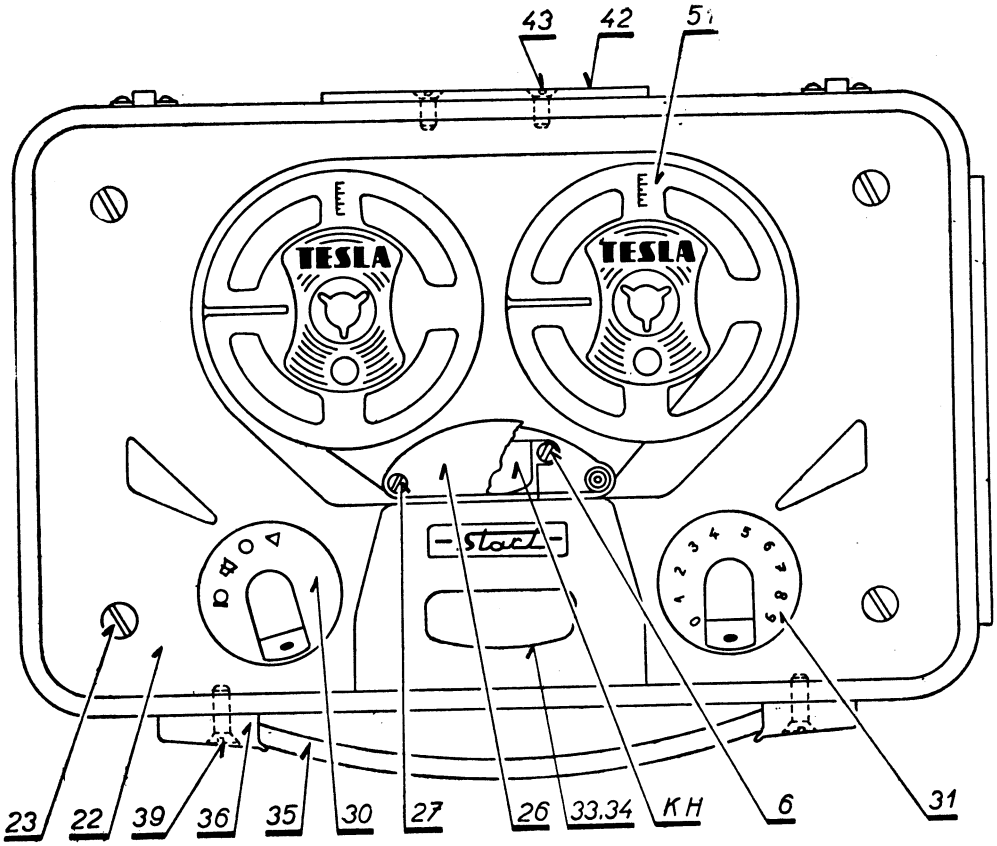
Part	Figure	Description		
R1		Resistor 15,000 Ω/0.25 W		
R2		Resistor 47,000 Ω/0.25 W		
R3		Resistor 15,000 Ω/0.25 W		
R4		Resistor 5,600 Ω/0.05 W		
R5		Miniature potentiometer 10,000 Ω		
R6		Resistor 27,000 Ω/0.05 W		
R7		Resistor 56,000 Ω/0.05 W		
R8		Resistor 5,600 Ω/0.05 W		
R9		Resistor 5,600 Ω/0.05 W		
R10		Resistor 470 Ω/0.05 W		
R11		Resistor 8,200 Ω/0.05 W		
R12		Resistor 39,000 Ω/0.05 W		
R13		Resistor 470 Ω/0.05 W		
R14		Resistor 1,000 Ω/0.1 W		
R15		Resistor 820 Ω/0.05 W		
R16		Resistor 56,000 Ω/0.05 W		
R17		Resistor 27,000 Ω/0.05 W		
R18		Resistor 3,900 Ω/0.1 W		
R19		Trimmer potentiometer 10,000 Ω		
R20		Resistor 56 Ω/0.05 W		
R21		Resistor 5,600 Ω/0.05 W		
R22		Resistor 10 Ω/0.05 W		
R23		Trimmer potentiometer 1,000 Ω		
R24**)		Resistor 120 Ω/0.5 W		
R25		Resistor 39 Ω/0.5 W		
R26		Resistor 100 Ω/0.1 W		
R27		Resistor 0.15 M Ω/0.25 W		
R28		Resistor 1,000 Ω/0.05 W		
R29		Resistor 10 Ω/0.5 W		
R30		Resistor 470 Ω/0.05 W		
R31***)		Resistor 10Ω/0.5 W		
R50*)		Resistor 390 Ω/0.05 W		
C1		Miniature electrolytic capacitor	12/15 V	200 μF
C2		Miniature electrolytic capacitor	12/15 V	5 μF
C3		Miniature electrolytic capacitor	12/15 V	20 μF
C4		Miniature electrolytic capacitor	12/15 V	5 μF
C5		Miniature electrolytic capacitor	12/15 V	5 μF
C6		Sealed paper capacitor	160 V	22,000 pF
C7****)		Miniature electrolytic capacitor	350/385 V	0.5 μF
C8		Miniature electrolytic capacitor	6/8 V	100 μF
C9		Miniature electrolytic capacitor	12/15 V	5 μF
C10		Miniature electrolytic capacitor	6/8 V	100 μF
C11		Miniature electrolytic capacitor	12/15 V	5 μF
C12		Sealed paper capacitor	400 V	2,200 pF
C13		Mica capacitor	500 V	1,300 pF
C14		Sealed metallized paper capacitor	160 V	47,000 pF
C15		Electrolytic capacitor	12/15 V	1,000 μF

*) Connected only if required (see item 5.35)
**) 80 to 150 Ω as required
***) Replaces the choke LF between C 16 and the collector of T 6.
****) Replaced by a sealed metallized paper capacitor of 1 μF/160 V, from approximately Production No. 4500.

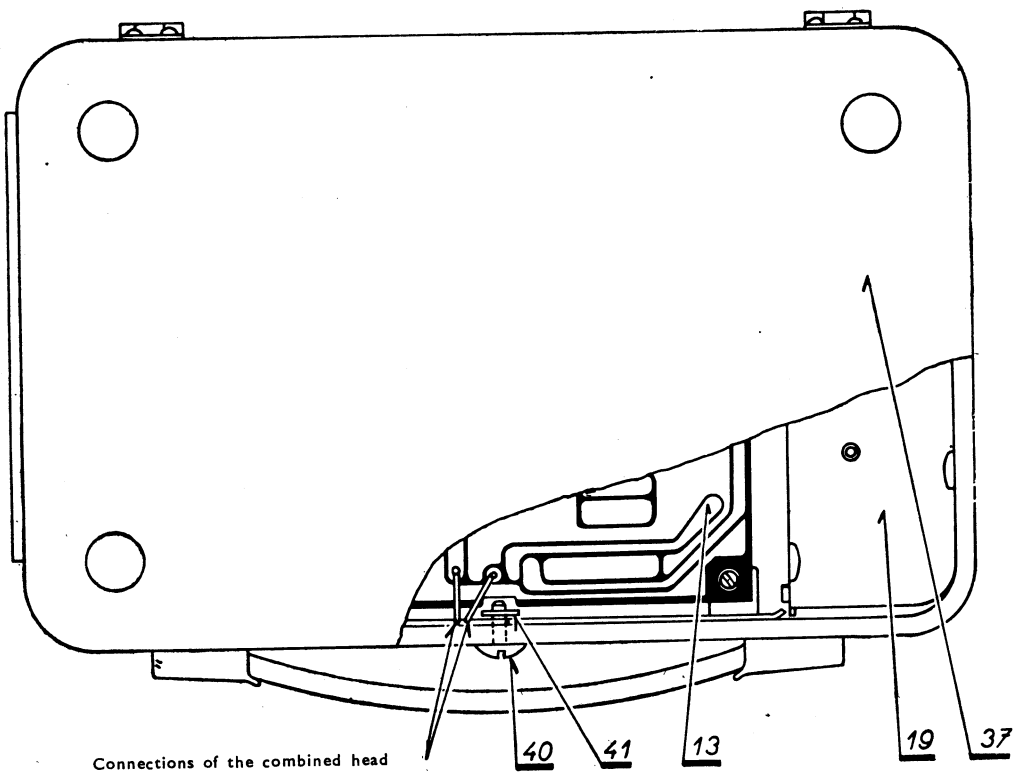
Part	Figure	Description		
C16		Miniature electrolytic capacitor	12/15 V	200 μF
C17		Electrolytic capacitor	6/8 V	50 μF
C18		Subminiature electrolytic capacitor	12 V	2 μF
T1		Transistor 105NU70		
T2		Transistor 107NU70		
T3		Transistor 107NU70		
T4		Transistor 104NU71 } matched		
T5		Transistor 104NU71 } matched		
T6		Transistor 104NU71		

Part	Figure	Description	Order No.
Re	12b	Loudspeaker ARO 031 (With connection plate on the rack)	2 AN 635 02
		Loudspeaker ARO 032	2 AN 635 13
TR1	27	Modulator transformer	6 AN 666 00
TR2	27	Output transformer	6 AN 673 02
LK	27	Correction choke	6 AK 605 01
LO	27	Oscillator coil	6 AK 605 00
LF	12a, 29	Filter choke	6 AN 682 01
KH	12a, 25a	Combined head with bracket	6 AF 846 15
		Combined head	ANP 910
6	25a	Spacer tube	6 AA 214 04
13	25b	Amplifier, complete	6 AN 050 04
37	25b	Case, assembled	6 AK 127 00
35	25a	Handle	6 AA 178 00
36	25a	Metal cap for handle	6 AA 898 00
39	25a	Screw, nickel-plated M 4 × 15	—
40	25b	Screw, decorative	6 AA 071 21
41	25b	Retaining ring 3.2 mm	—
42	25a	Cover of the connectors	6 AA 687 04
43	25a	Screw, nickel-plated M 3 × 10	—
22	25a	Panel, assembled	6 AF 115 00
23	25a	Screw, decorative	6 AA 076 01
26	25a	Head cover	6 AA 687 03
27	25a	Screw, nickel-plated M 2 × 4	—
30	25a	Knob (performance selector switch)	6 AF 243 02
31	25a	Knob (volume control)	6 AF 243 03
51	25a	Spool (without tape)	6 AF 800 20
19	25b	Cover for the battery, assembled	6 AF 169 01
3	12a	Rubber bushing	4.5 × 1-M
4	12b	Rubber bushing	5.5 × 1-M
1	12a	Plate, assembled	6 AF 050 19
7	12a	Flywheel, assembled	6 AF 881 02
8	12a	Rubber belt (Circular cross section)	6 AA 408 05
		Rubber belt (square cross section)	6 AA 408 09
9	12a	Steel ball II. 4	—
10	12a	Washer	6 AA 292 02
12	12a	Pivot	6 AA 013 23
17	14	Switch shaft (Original design)	6 AA 708 00
		Shaft of the switch (new design)	6 AF 725 00
18	14	Ring	No. 54 773-B
16	12b, 14	Cam	6 AA 797 01
20	14	Cam, assembled	6 AF 806 43
24	14	Steel ball II. 6	—
29	14	Stirrup	6 AA 668 24
28	14	Contact plate of the switch	6 AF 516 04
25	14	Spacer	6 AA 020 04
2	14	Gear wheel	6 AA 180 02
5	12a, 13	Lever (backwards)	6 AF 185 03

Part	Figure	Description	Order No.
44	12b	Spring washer 4 mm	—
45	12a	Spring	6 AA 786 03
46	12a	Brake, assembled	6 AF 882 00
50	13	Retaining cap	6 AA 318 02
11	12a, 13	Disc	6 AF 423 01
52	13	Drive wheel I (with rubber lining)	6 AF 180 00
53	12a	Drive wheel II (with groove)	6 AF 180 01
55	13	Steel ball II. 4.763	—
58	12a	Spring belt	6 AA 786 28
61	12a	Motor with pulley	6 AN 880 01
62	12a	Screening	6 AA 509 02
63	12a	Packing	6 AA 391 03
		Motor	6 AN 880 00
		Pulley	6 AA 670 03
64	12a	Clasp	6 AA 748 05
68	12a	Felt pad	6 AA 303 05
69	12a	Pulley	6 AF 816 23
70	12a	Retaining ring	AA 024 03
59	12b	Partition, assembled	6 AF 806 38
14	12a	Eraser head	6 AF 800 19
15	12a	Spring	6 AA 786 17
21	12a	Fabric cord 17 cm long	43 706
32	12a	Retaining ring 3 mm	AA 024 03
84	12a	Pressure lever, assembled	6 AF 806 44
85	12a	Spring	6 AA 786 19
86	12a	Retaining ring 4 mm	AA 024 04
87	12a	Blade contact set	6 AF 050 02
33	13a	Push-button, assembled	6 AF 800 23
34	12a	Spring	6 AA 791 04
38	12a	Support	6 AA 668 33
54	12a	Loudspeaker bracket	6 AA 635 16
47	12a	Cup (ferrite), large	6 AA 762 03
48	27	Cup (ferrite), small	6 AA 762 04
49	12a	Stirrup	6 AA 643 07
56	12a	Clamp (for C16)	6 AA 668 32
57	12a	Clamp (for C15)	6 AA 808 14
76	12b	Plug with cable	6 AK 050 03
75	12b	Plug	6 AF 895 56
60	27	Switch plate	6 AK 516 00
65	27	Spring	6 AA 786 20
66	27	Tube socket, NOVAL	6 AK 497 10
67	27	Spacing washer	6 AA 260 15
74	12a	Guide	6 AA 668 34
71	12a	Three-pole connector — socket	6 AF 282 03
72	12b	Six-pin connector — socket	6 AF 282 02
73	12a	Two-pole connector — socket	6 AF 280 00
		Three-pole connector — plug	6 AF 895 10
		Six-pin connector — plug	6 AF 895 53
		Two-pole connector — plug	6 AF 895 41
		Mineral grease	230
		Fine lubricating oil	L
		Clear lacquer + 10 % rhodamine	



a)



Connections of the combined head

b)

Fig. 25 Assembly of the instrument

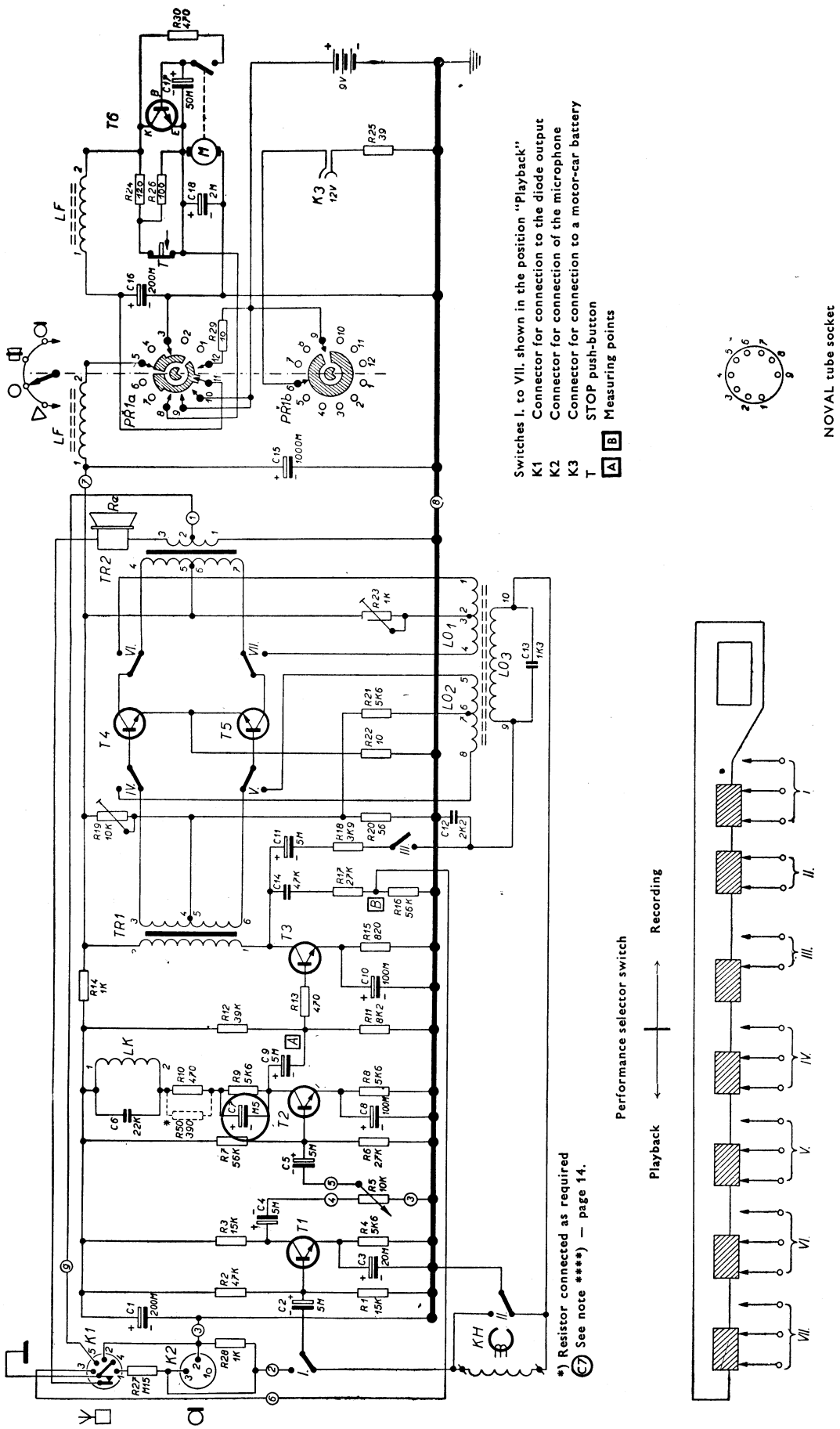


Fig. 26. Wiring diagram

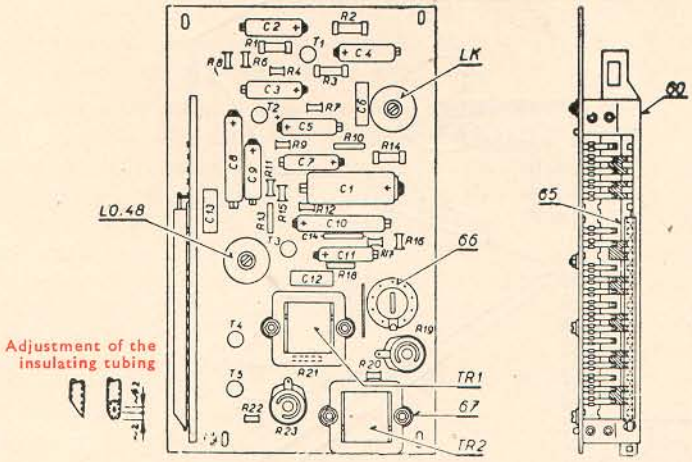
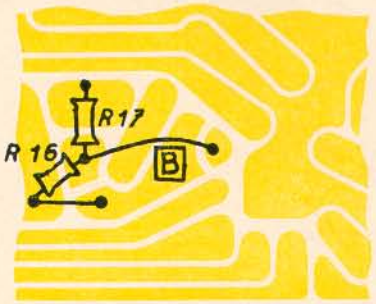
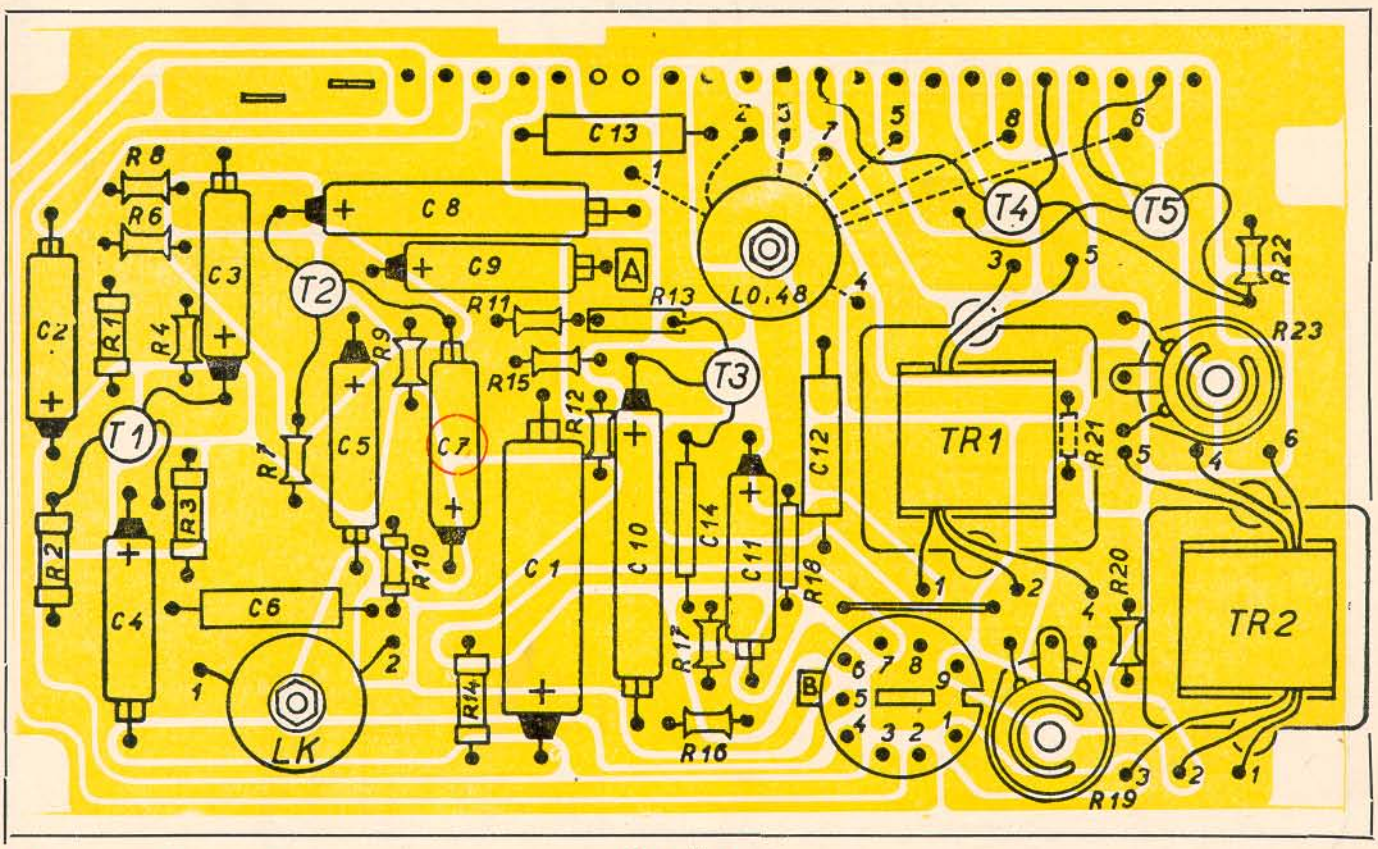


Fig. 27. Components on the plate



Older design

Fig. 28 b



(C7) See note ****) — page 14.

New wiring

Fig. 28 a). Printed circuits

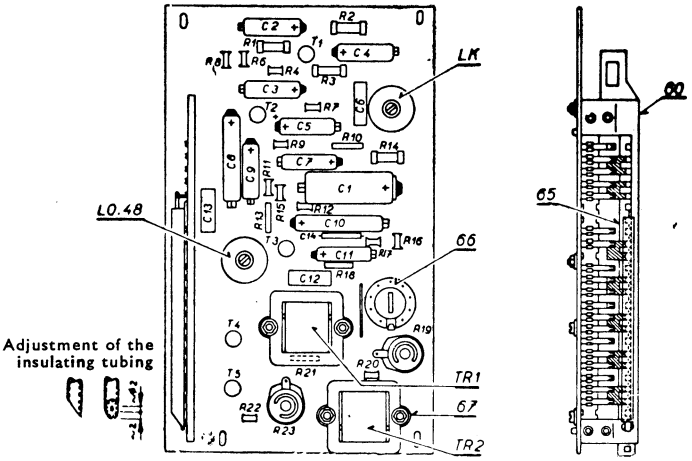
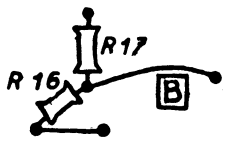
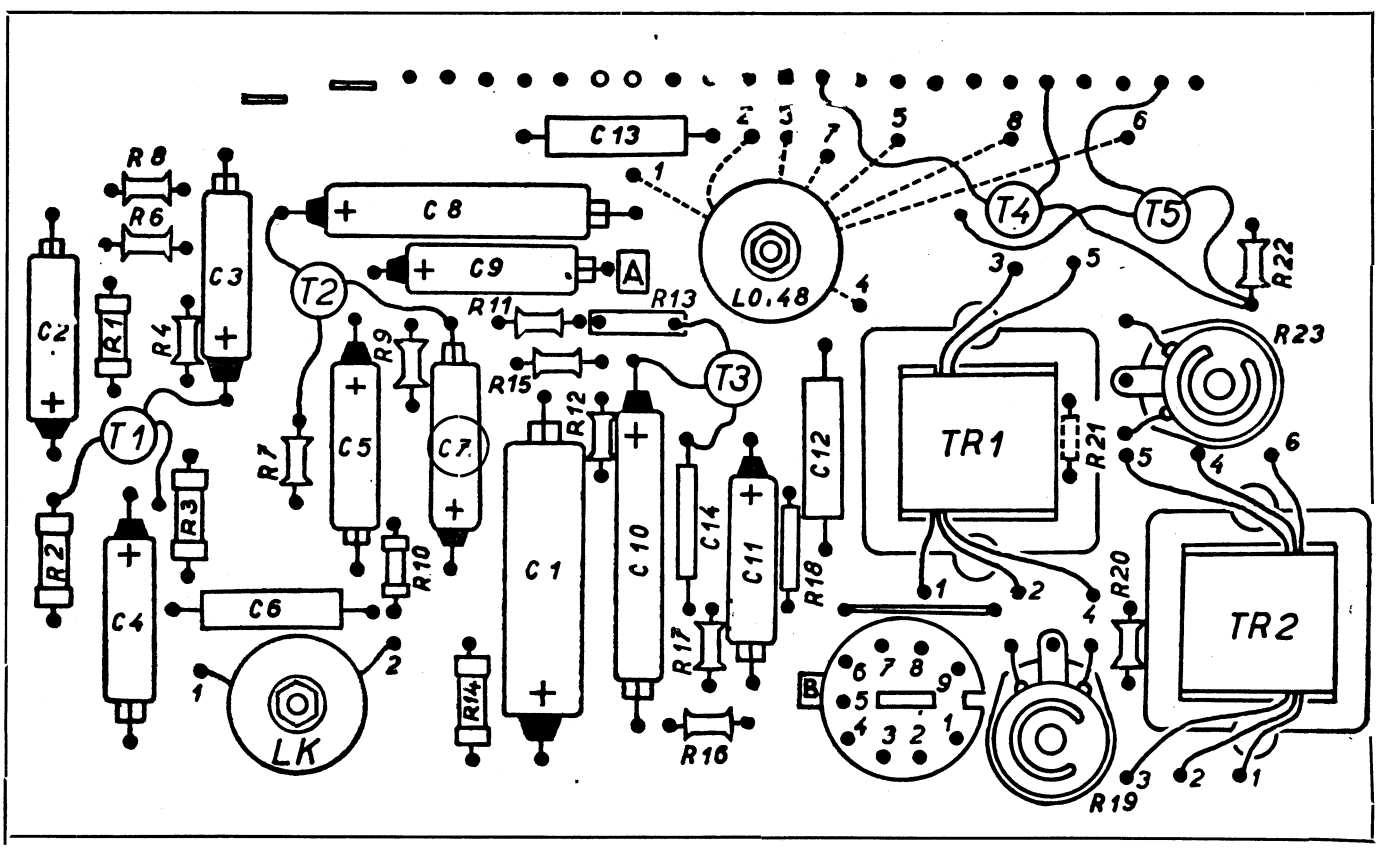


Fig. 27. Components on the plate



Older design

Fig. 28 b



New wiring

(67) See note ****) — page 14.

Fig. 28 a). Printed circuits

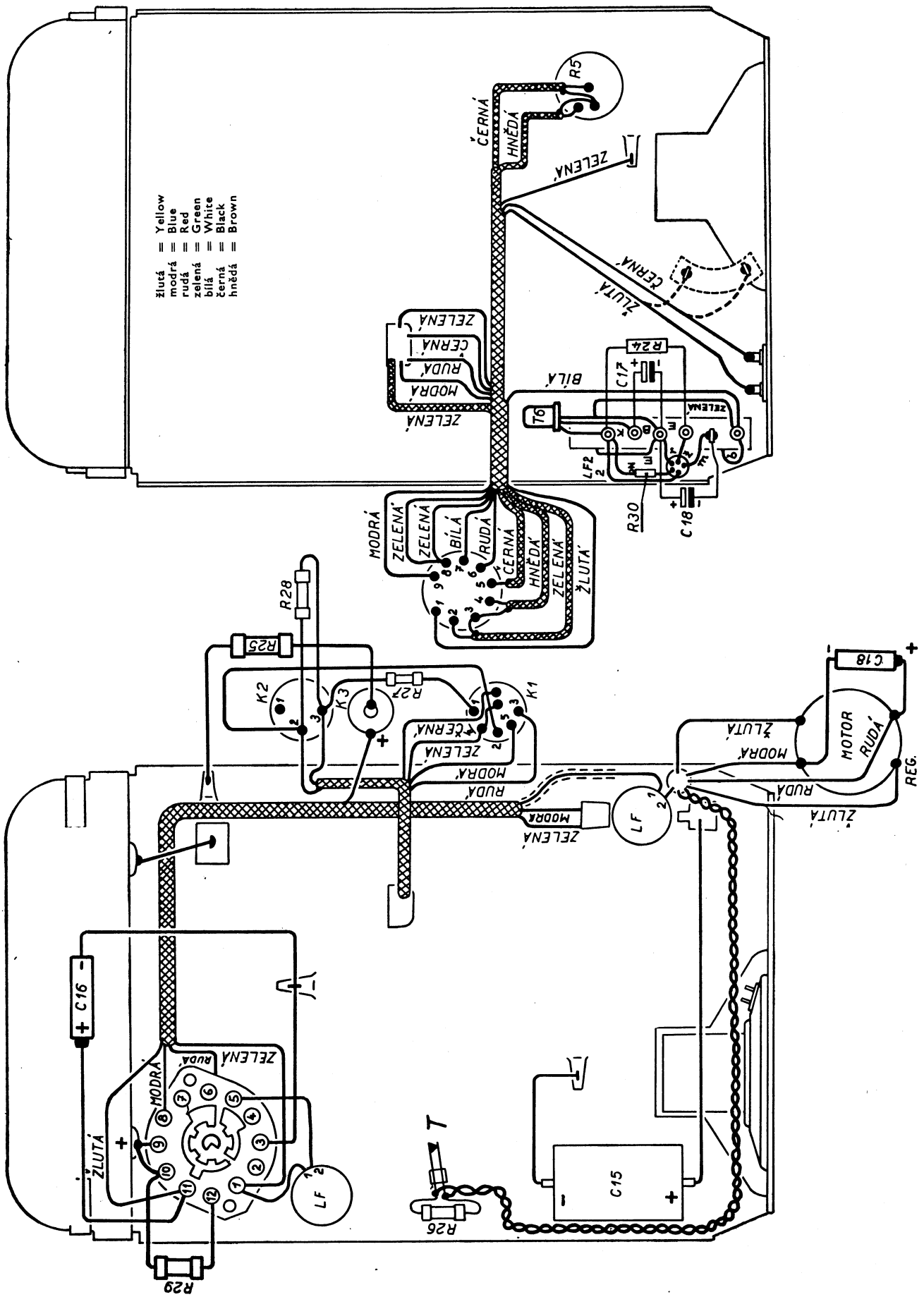


Fig. 29 Mounting diagram

8.0 MODIFICATIONS

a) **Approximately from Production No. 000501** the printed circuitry will be carried out according to Fig. 28a. Up to the given number, plates are used according to Fig. 28b.

b) **Approximately from Production No. 001001,** instead. of the loudspeaker ARO 031 will be applied the type ARO 032. This necessitates a modified connection of the moving coil. The loudspeaker type ARO 031 has a connection plate on the rack of the loudspeaker. The new loudspeaker has none. Therefore, the connections of the moving coil are soldered to double soldering tags situated on the insulating holder of the loudspeaker in the circular hole in the chassis. This alteration is not indicated in the illustrations.

c) The instrument employs the following transistors in the individual stages:

First and third stages (T 1 and T 3):
Either 105NU71 + 107NU71
or 106NU71 + 106NU71

Second stage (T 2):
Always only 107NU71

Final stage (T 4 and T 5):
2 × 104NU71
or 2 × 101NU71

Motor control (T 6):
or sometimes 104NU71 or 102NU71
also 101NU71

d) The rubber belt of square cross section has proved to be more advantageous and is used instead of the circular one in instruments starting from approximately Production No. 6000 onwards. Consequently, also the grooves on the flywheel, on the tautening pulley and on the motor pulley have been, changed. The Order Nos. of the modified parts remain unchanged. Both types of belts are applicable with the parts provided with the new grooves.

e) As can be seen in the list of spare parts, the choke LF connected between C 16 and the collector of the T 6 transistor, has been replaced by a resistor of 10 ohms/0.5 W. This change has been carried out starting approximately from Production No. 2000.

f) Starting with Production No. 4500, the electrolytic capacitor C 7 has been replaced by a sealed metallized paper capacitor of 1 μF/160 V. The reason is the improved adjustment possibility of the frequency response — deviation of low tones.

g) Starting approximately with Production No. 3000, the permalloy screening of the motor has been deleted, as it has proved to be superfluous.

h) The cam (part 16) which controls the performance selector switch is replaced by a pin in the extended shaft of the switch starting with approximately Production No. 10,000. The Order No. of the new shaft including the pin (part 17) is 6 AF 725 00. Owing to this modification, parts 16 and 18 are deleted.

i) From Production No. 17,001 onwards, the performance selector is supplemented with a lock against inadvertent changing over to recording. This lock is released with the push-button to the left of the switch control.

j) The retaining ring 3.2 mm — part 41 — has ben from No. 4500 deleted.

9.0 MAINS POWER SOURCE AYN 400b OR AYN 400a

For powering the battery tape recorder START ANP 402 from the mains, the mains power source AYN 400b is suitable for 220 V only, whereas the source AYN 400a is for 120 V.

9.1 Technical data

Powering from the mains	220 V, 50 c/s, or 120 V, 50 c/s
DC voltage for the tape recorder	12 V (with the tape recorder connected)
Polarity of the DC voltage	Minus pole connected to the output pin
Permissible drain	160 mA
Dimensions	Height 60 mm width 133 mm depth 80 mm
Weight	0.65 kg

9.2 Description of the circuitry

The mains voltage stepped down by a transformer is rectified by a full-wave selenium rectifier. Filtering is carried out by an electrolytic capacitor of 500 μF. The main capacitive filter is formed by the battery cells inserted in the tape recorder case. These cells simultaneously maintain a constant output DC voltage. The rectifier is protected by a 0.16 A fuse.

9.3 Testing of the mains power source

For checking the correctness of the connection, the instrument is connected to mains of 220 V, 50 c/s. A voltage of 22.5 V $\pm$ 10 % must be across the output (without the tape recorder being connected). The minus pole must be on the centre pin and the plus pole on the sleeve. The voltage is measured with an AVOMET or similar voltmeter of 1000 ohms/1 V resistance.

9.4 Exchange of the components

After removing the covering plate (the bottom of the case), the individual components can be exchanged easily. They are attached with clamps to lugs inside the case. Care must be taken not to damage the threads.
The fuse plate is only slid into a groove.

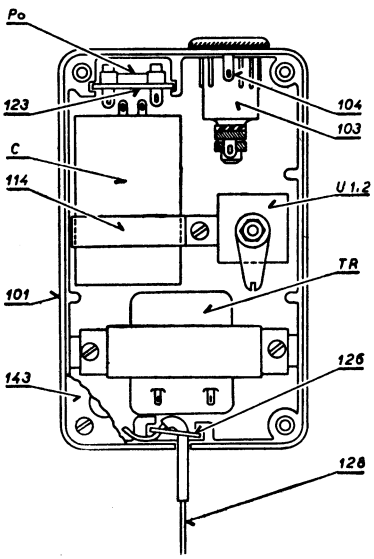


Fig. 30. Power source

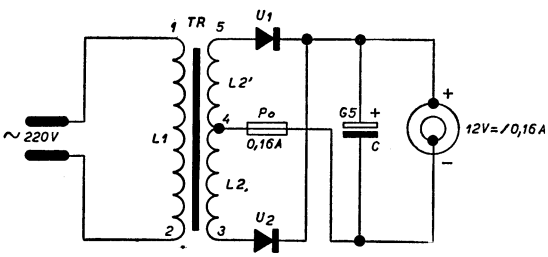


Fig. 31. Wiring of the power source

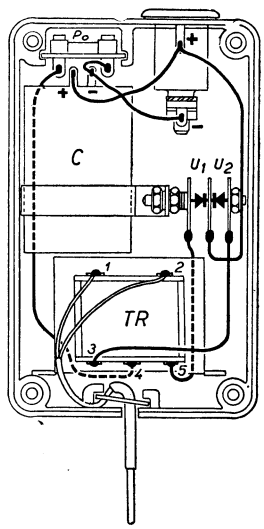


Fig. 32. Mounting diagram of the power source

9.5 Spare parts of the mains power source

Part	Figure	Description	Order No.
101	30	Case	6 AF 249 00
103	30	Socket	9452.02
104	30	Soldering tag	6 AA 060 03
114	30	Capacitor clamp	6 AA 662 05
123	30	Fuse holder	6 AF 806 57
126	30	Mains cord clamp	6 AA 633 04
128	30	Mains cord	6 AF 615 00
143	30	Case bottom, assembled	6 AF 196 07
TR	30, 31	Transformer (for 220 V)	6 AN 661 01
		Transformer (for 120 V)	6 AN 661 02
U1, 2	30, 31	Rectifier	20/23-II 1/2
C	30, 31	Electrolytic capacitor 500 μF/50V	—
Po	30, 31	Fuse 0.16 A	—

CONTENTS

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