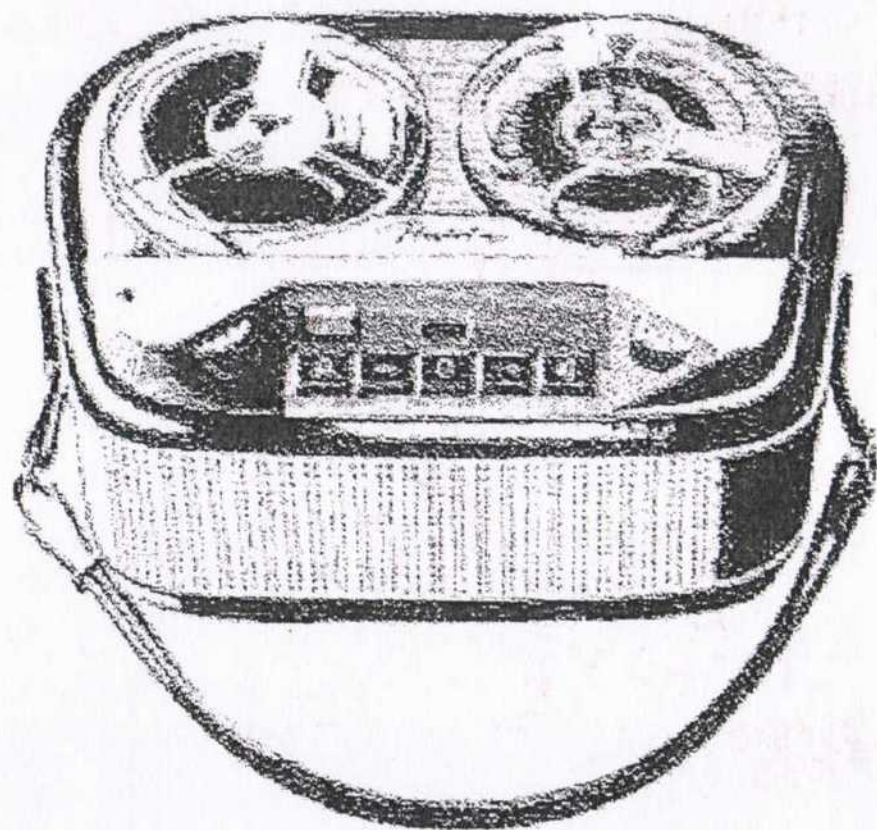




Butoba MT5

Butoba

Repair Instructions for BUTOBA MT 5

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Fig. 1-10

A. GENERAL INFORMATION

All parts - with exception of the loudspeaker - are mounted on the chassis plate

I. Disassembly Instructions

1. Remove the battery case 90 06 49 or the mains converter.
2. Take off plastic lid 80 62 00, cover plate for push-buttons 90 05 39 and cover for magnetic heads 87 08 00.
3. Unscrew threaded pin 91 17 00 on speed change knob 90 06 46, remove plastic knob.
4. Lift cover plate 80 02 00.
5. Remove the 4 woodscrews 91 04 06, lift up chassis (one hand into the battery compartment).

II. Push-Button Control

1. Depressed push-button "O" places tape recorder in "switched off" position.
2. Tape transport starts when start stop slide 87 62 00 is shifted to the left. As long as this slide is completely at left end, transport stops for this time (short interruptions).
3. Depressed playback button "⏮" places tape recorder in operating position, the brakes are released and the amplifier is connected for playback.
4. Depressed recording button "⏭" places tape recorder in operating position, the brakes are re-

leased and the amplifier is connected for recording, magic line is on.

5. Simultaneously depressed recording "⏭" and playback "⏮" button place tape recorder in operating position, (public-address-system).
6. Depressed fast forward button "→" swivels rewind motor to the right (motor running clockwise), drives take-up reel counter-clockwise.
7. Depressed rewind button "←" swivels rewind motor to the left (motor running counter-clockwise), drives rewind reel clockwise.
8. All buttons released place tape recorder in operating position, playback with speaker switched off.

III. Drive

1. General

The drive unit 90 06 31 is a self contained assembly. The tape operating motor 90 05 06 transmits its power via the flywheel 90 06 36 to the capstan shaft.

2. Motor

6 V d.c. motor, speed stabilized by centrifugal contact governor and transistor OC 76 between 6.7 V and 4.8 V, independent of load. The speed

can be adjusted within certain limits by turning screw at the centrifugal governor.

The motor case 900633 screens off the recorder from noise and magnetic and electric interference fields generated by the motor.

3. Speed selection

The two tape speeds are obtained by driving the rubber lining of the flywheel 900636 either with the small (1-7/8 ips) or with the large diameter (3-3/4 ips) of the stepped roller. During changing speed the motor is momentarily lifted, shifted in its vertical position and then pressed home by the two springs.

When the tape recorder is not used, move speed change knob to 1-7/8 ips thus to avoid bruises on rubber lining. In this position the motor is kept off from the rubber lining. (Bottom "O" depressed).

4. Capstan shaft and flywheel

The hardened capstan shaft 900638 runs in lifetime bearings. Operating the recorder in horizontal position the axial thrust is taken up by a ball bearing 900639 between two steel discs 913572; a rubber disc 922918 absorbs the running noise. The aluminium pulley that is pressed on the capstan shaft drives by friction the take-up turntable 900624 via spring belt 875600. The balanced flywheel is fitted with the capstan shaft in a close sliding fit and should not be matched with any other shaft.

IV. Tape Motion

1. General

The tape motion is in accordance to the international norm, half-track technique. Turnover tape reel to utilize second tape track.

2. Tape Guidance

The tape runs from the left hand rewind reel 900623 via the guide pillar 837700 along the heads 925100 and 900535, and via the right hand guide pillar 837701 to the take-up reel 900624. By operating the quick start slide 876200 (s. also under note A II, 2) the pressure plate 900607 is released, pulled forward by tension spring 913915. The capstan shaft and the small pillars 838200 to ensure tape being held in positive contact with the heads.

The pressure lever 900610 with its felt flush holds tape in positive contact with record/play head 900535.

3. Brakes

A proper tape tension is obtained by an adjustable felt brake 900627 pressing slightly against the shaft of the rewind turntable.

By depressing button "O" the rail 851800 releases the levers 900601 and 900602 to brake.

The spool on which tape is wound-up is not braked so much as the spool from which tape is wound-off thus to avoid tape loops and kinks.

I. Fast Forward and Rewind

The rewind motor 90063 is mounted below the chassis plate and can be swivelled sidewise. Pressing either button „→“ or „←“ the levers 915203 and 915204 press the motor via the tension spring 913919 and the reversing lever 900603 either to the left or right against the rubber lining of the turntables. The motor rotates automatically in the required direction.

I. Tape Counting Clock

The tape counting clock 900615 is driven by the rewind turntable, connected with a rubber belt 875700 via a pulley 900621.

II. Amplifier

The amplifier is a highly sensitive transistor type amplifier which is mounted on two printed circuit plates. It can be connected for recording as well as for playback amplification.

1. Printed circuit (large)

On the printed circuit (large) 900550 a four-stage amplifier is built up. Its first stage is fitted with a low noise transistor OC 603; the second stage with the transistor OC 75 serves for frequency response equalization and is changed over for either recording or playback. In the third stage the transistor OC 71 operates as impedance converter; the fourth stage with the transistor OC 76

is used either as voice frequency recording stage for recording or as driving stage for playback.

With the potentiometer R 15 the treble equalization is adjusted; with the potentiometer R 29 the bass equalization and sensitivity are controlled. The potentiometer R 26 serves for adjusting the correct basis voltage of the transistor OC 76. All earth wires of the amplifier are critical. Any changes of the earth connections may lead to negative or positive feedback, motor-boating, humming, birdies, etc.

2. Bunch of cables

In order to facilitate the laying of cables to transformers, switch-plates and the printed circuit, all cables are bound together to a bunch of cables.

3. Printed circuit (small)

The printed circuit (small) 900551 is attached to the battery holder, and also to the output stage transistor 2×OC 74. When these are connected for "recording or playback" they are used as final stage (output 1.2 W) or as erasing oscillator.

Potentiometer R 32: For adjustment of static current of matched pair OC 74 transistor on playback.

Potentiometer R 40: For adjustment of oscillator current on recording.

Potentiometer R 35: For improving the frequency response characteristics (inverse feedback) of the output stage on playback. During recording the

anode current for magic line is obtained by transforming and rectifying the h. f. of the erasing oscillator. The filament voltage for the magic line is obtained from the stabilizing resistor (R 39, 4,6 Ω) of the erasing oscillator. L. f. voltage is obtained from the driver transformer L 2 900530 (special winding), rectified and fed to the grid of the magic line.

VIII. Power Supply

2×4 monocells each 1.5 V (u2 cells).

Mains converter 110-260 V, 50-60 cycles.

Any 6 V d. c. supply (6 V car battery through socket of mains converter)

Voltage for motor or amplifier should not exceed 6,7 V and not drop below 4,8 V.

B. REPAIR INSTRUCTIONS

Trouble Chart

Symptom

Cause and Remedy

I. Push-Button Control

1. Push-buttons will not stay in when depressed or jump out at the slightest movement

Notches at the button assembly worn, replace assembly. Spring of blocking slide sluggish, replace assembly. When soldering on new assembly make sure that the inner contacts are not bent up so high that shorts with the pressure plate can occur.

2. Faulty contacts at buttons or broken off contacts

Clean the contacts with Cramolin and/or bend contacts into correct position or replace button assembly.

II. Drive

1. Tape operating motor does not run

Check contacts of batteries or mains converter. Across red-white and blue terminals of the drive unit 6 V must be measured. Blue = negative. If this voltage exists bridge the transistor OC 76 for a moment or replace. If there is no 6 V at the two terminals, trace the wire through the push-button assembly and repair any interruptions found. If voltage is found to exist and transistor in working order check whether motor terminals are interrupted. White to green-yellow = regulator, red and green-yellow = motor.

When the connecting wires are unsoldered there must be no earth connection. If still unsuccessful, the entire drive unit must be replaced.

Symptom

Cause and Remedy

Dismantling of drive-unit.

Unsolder terminals white-red (yellow-red) and blue. Remove screws 91 04 06 and 91 04 07 and the holding tongue of the condenser 1300 μ F - 92 09 12 - so that screws 91 04 01 can be taken off. Do not damage wire bunch when pulling out the motor.

Dismantling of motor.

To repair or replace the motor with case, dismantle drive unit (s. above), remove flywheel and lift up drive roller. Pull off top cover of motor case (bayonet lock), pull up motor. Do not forget the balance weight (lead) on re-assembly.

Remove the regulator (governor) cap, check regulator and the sliding contacts. If in order, replace motor as further repairs on the motor are hardly possible.

The speed of the new motor must be set. The speed regulator screw is accessible through the cut-out section in the motor case and the opening of the regulator cap. The flywheel must run at 365 r. p. m. (the speed can be increased by turning the regulator screw clockwise).

2. Motor running, but flywheel is not driven or does not rotate properly

Speed selector lever is not set in its end position; motor press-on springs are unhooked or have insufficient tension. When unit is running the motor must be pressed on with a force of about 120-150 grammes. Motor dislocated: Adjust in such a way that the centre of the relevant stepped roller diameter has contact with the centre of the rubber-lined flywheel edge. Reversing lever bent or distorted: This causes insufficient pressure of the stepped roller against the flywheel.

Stoprail 851800 jams: Motor cannot be pressed on. Restore working order of stop-rail. Place clearing lever on the outside of the motor case to avoid motor jams.

- 3 a) Motor loaded, current input too high (max. 135 mA)

Capstan shaft has excessive friction: Bearing surfaces dirty, insufficient axial play of the shaft. Capstan roller does not rotate smoothly. Too much pressure applied by the capstan roller (max. 400-450 grammes). Pressure of felt-flush-lever to rec./play head too strong (max. 25 grammes). Check angle of tape contact at the heads.

Rewind turntable is braked excessively (max. 25 grammes, checked with only a few windings on reel). Belt 87 56 00 of the take-up turntable too tight (s. also under IV, 3).

- b) Motor unloaded, current input too high (max. 50 mA)

Bearing of motor shaft dislodged: Try to restore easy running by tapping slightly against the case of running motor.

Symptom

Cause and Remedy

4. Speed variation or "Wow" Capstan shaft running out of true: Max. vertical deviation of shaft 5μ Rubber-lined edge of the flywheel damaged (vertical deviation), max. vertical deviation 10μ
If rubber rings are fouled by dirt or oil, clean with warm water. Replace flywheel if the rubber ring is badly fouled. Keep off any dissolvents (lubricants, petrol etc.) of caoutchouc lining.
5. Motor regulation Uneven running of motor results in speed variations (several seconds, frequently in irregular intervals).
Replace motor as a re-adjustment mostly fails. Do not use contact oil!
Replace transistor OC76 if drive unit operates abnormally slow or if motor does not start at all.

III. Tape Motion

1. Poor quality playback of tapes not recorded with this Butoba Slot of record/play head is not vertical; readjust. Simplest method: Thread standard alignment tape DIN 45513 (or equivalent) at $3\frac{3}{4}$ ips. Turn screw at each side of the record/play head until max. volume is obtained at the 6 Kc tone of the said tape. Adjust for the highest maximum on the tape.
Attention: The tape has several somewhat lower maxima! Check angle of tape contact at the heads; if necessary shunt small guide pillars 838200. Take care that tape fits head tightly. Slightly tilt head carrying plate by adjusting the 3 in reverse located screws 910202.
2. Second track audible Remove pressure lever at the record/play head. Release pressure plate, operate tape transport, turn setting screws 910202 to adjust position of heads in height. This should occur with between 0.1-0.5 mm the record/play head and ferrit part of the erase head visible. Check vertical position of head.
3. Wow and flutter Capstan roller out of true or not parallel to capstan shaft. Replace capstan roller and adjust. Bearing of capstan roller dirty or worn out. Clean or replace capstan roller. Rewind turntable braked excessively. Tension on reel core should not exceed 25 grammes (incl. running tape clock). Tape counting clock jerks when in operating mode. Symptom: Flutter of tape between reel and guide pillar. Replace tape counting clock; remove rewind turntable.

Symptom

Cause and Remedy

Check spring belt 875600, proper tension 15-20 grammes. (Measured at reel core with drive unit operating on 3- $\frac{3}{4}$ ips.) Guide pillars and heads must be altered and paralleled to avoid sinuous tape motion causing wow and flutter.

4. Splines broken off on turntable

Replace turntable (when ordering indicate left or right piece).

5. Tape fails to wind on take-up reel

Tape operating motor shifted upwards or motorcover loose, scrapes on turntable. Relocate. Spring belt overstretched. Replace.

IV. Fast Forward/Rewind

1. Fast forward/rewind motor does not run

Check contacts at battery holder, battery compartment and mains converter. Check voltage (6 V) on joints of fast forward/rewind motor at the small printed circuit, if voltage is in order unsolder motor. If no voltage exists, trace lines through push button assembly to the terminals at battery compartment.

2. Fast forward/rewind motor runs but fails to drive

Unsufficient swivel of levers 915203 and 915204. Adjust spring (bend or replace) 913919. When newly adjusting fast-forward rewind the brake of the rewind turntable and the spring belt of the take-up turntable have to be properly adjusted (s. B III, 3).

3. Tape loops when unit is stopped after winding or rewinding

Adjust screws on brake lever that stoprail by depressed button "O" released brake levers completely. If felts on the brake levers are worn, replace brake levers. Tension springs must be positioned properly.

4. Fast forward/rewind operates slow

Check brakes of take-up/rewind turntable (s. B III, 3). Fast forward/rewind motor weak. Bend collector springs very carefully. Apply a thin coat of CRAMOLIN oil to collector. If no satisfactory results are achieved, replace motor.

V. Amplifier

1. Fails to play back

Check power supply. With a meter trace signal of record/play head via transistor OC 603, OC 71, OC 75 and OC 76 to the output stage. Voltage supply of record/play head at 1 Kc by full level adjustment should be between 0,15. 0,25 mV.

Symptom

Cause and Remedy

2. Fails to record but line lights magic

Feed a. f. voltage to inputs and trace through amplifier. Replace defective components. For full level (3 V) of the OC76 transistor in recording mode, signal voltage of 0,15-0,25 (1000 c), is required at the base of the OC 603 transistor. Disconnect erasing oscillator when tracing signal. (unsolder the two blue terminals of the erasing coil on the small printed circuit) as otherwise the low frequency signal cannot be traced properly to the head.

3. Magic line fails to light up

Check oscillation of erasing oscillator at the terminals of the erase head. If this voltage does not exist check the short circuit switch (contacts 49 and 50) secured below the recording button. Make sure that it opens by depressed recording "O" button. Bend holding angle to obtain a contact separation of appr. 1 mm by depressed record "O" button. Check the erasing coil for passage of current: Current must pass through terminals: Red to blue, yellow to brown, white and green to black.

If function of erasing oscillator is in order check anode voltage of magic line at the socket (appr. 80 V). Check filament voltage (appr. 0,8-1,1 V) eventually replace DM71 valve. Check d. c. voltage at the transistor OC74. Collector appr. 6 V; base when oscillator does not oscillate appr. 0,1-0,2 V must be adjustable by potentiometer R 40 and must be equal at both transistors.

4. Unit fails to erase properly

Check whether tape is threaded properly. Tape must be held in positive contact with the erase head. Clean head. Check function of erasing oscillator (s. V, 3).

5. Playback response distorted

Clean record/play head. Check static current of output stage. The entire amplifier (except drive) must have 50 mA without modulation at 6 V working voltage. If insufficient, adjust potentiometer R 32, check passage of current through the two secondary winding halves of the driver transformer. Across the base terminals of the transistor OC74 about the same a. c. voltages and the same basis voltage must exist. Check current passage through the output transformer. Abnormal distortion in the 4 stages of the preamplifier are rare. If above hints fail, apply 1 Kc 0,1-0,2 mV to the input and check with oscillograph where distortion occurs.

6. Recording distorted

Clean record/play head. If recording is heavily distorted it may be assumed that the biasing current is insufficient or non-existent. Across the voice-frequency input of the magnetic head about 14-16 V, 29-33 Kc must exist. The biasing current can be

Symptom

Cause and Remedy

altered by potentiometer R 42. On potentiometer R 36 current of OC76 can be adjusted (max. 12 mA at 6,4 V). Adjust a. f. that no distortion occurs below 3,5 a. c.

7. Motor-boating effect during playback

Check filter condensers 1300 μ F, 6 V - C 18; 100 μ F, 15 V - C 6; 100 μ F, 15 V - C 3 and 100 μ F, 15 V, 250 μ F, 6 V - C 13. A dry joint at C 13 may cause heavy motor-boating. Check contact springs and contacts of mains converter and batteries; clean if necessary.

8. Amplifier fuse blows after brief period of playback

Operating voltage exceeds 6,8 V; potentiometer R 23 adjusted too high. Adjust that amplifier has a total current consumption of about 50 mA on 6 V battery voltage. Adjust on 7 V if the unit is continuously operated on excessive working voltage (e. g. fully charged car battery). Note that the speed deviation of record/play motor might exceed 10% at 3-3/4 ips.

9. Loud amplifier noise on playback

Check in which stage noise occurs. Usually a defective capacitor and sometimes a defective transistor is the cause. The same results by a defective resistor e. g. R 4,100 K Ω in first stage.

10. Abnormal erase noise

Badly dirtied record/play head. Clean. Erase noise should not exceed amplifier noise by 3-4 dB. Parts near the heads or tape transport may become magnetic and increase considerably erase noise.

11. Worn heads, frequency response deviates, inadequate volume

Replace head if pole piece is grooved in (more than 0,2 mm). Take-off the two set screws at the cradle. Unscrew cradle from mu-metal screen and take off head. Fit new head and adjust (B III, 1 and 2).
Important: All measurements should be carried out with a valve-voltmeter, that has an input resistance of at least 1 M Ω .

C. LUBRICATION CHART

APPLICATION	Lubricate after appr. working hours	Recommended lubricants	Order No.
Bearings of turntables	1.000 hours	MOBIL DTE Heavy medium	1
Capstanshaft	500 hours	MOBIL DTE Heavy medium	1
Rubber roller bearing	100 hours	HH. Watchoil	2
Felt on brake spring	500 hours	Normal Watcho	3
Slip plane of speed change knob	500 hours	Molybdändisulfid ÄRONIX TYP 30 S	4
Slip plane of stoprail	500 hours	Molybdändisulfid ÄRONIX TYP 30 S	4
Three rocking levers and pressure plate	500 hours	Normal Watchoil	3

MAINTENANCE

Apply grease sparingly to push-button assembly mechanism after appr. 1000 hrs. of operation. From time to time remove dust and tape abrasions from magnetic heads, rubber roller (capstan), guide pillars and pressure felt at the magnetic heads. Particular care should be taken that no rubber parts come in contact with any lubricants.

D. SPARE-PARTS LIST

Part No. Description

1. Parts on Chassisplate

847800	Lifetime Bearings for Tape Turntable
812200	Caps for Lifetime Bearings
900621	Assembly Shaft with Pulley
900622	Assembly Bridge
851800	Stoprail
860100	Guide Screw
900601	Assembly Brake Lever, left
900602	Assembly Brake Lever, right
900603	Assembly Reversing Lever
837701	Guide Pillar M 3
837700	Guide Pillar M 4 with Surface
920704	Potentiometer 10 K Ω log.
900613	Assembly Holding Angle for socket
924701	Socket
900627	Assembly Brake Spring
913911	Tension Spring for Brake Lever 0,2x3,5x35 windings
913912	Tension Spring for Stoprail 0,45x4,5x27 windings
913919	Tension Spring for Reversing Lever 0,55x4,5x32 windings
913914	Tension Spring for Start-Stop Lever 0,45x4,5x8 windings
923010	Cable Clamp
915214	Engaging Lever

Part No. Description

2. Push-Button Assembly

900605	Assembly Push-Button-Rail with Angle and Bank of Contacts
921519	Insulating Lamination 1x7x12 mm
921522	Insulating Lamination 0,7x7x12 mm
921520	Metal Lamination 0,8x7x12 mm
913937	Contact Spring
921521	Contact Stripe
900607	Assembly Pressure Plate
838200	Guide Pillar, small
839600	Connecting Wire 1,5 dia. x 125 mm
915203	Lever for Forward
915204	Lever for Rewind
900611	Assembly Stoplever
913915	Tension Spring for pressure plate 0,63x4x51 windings
900612	Assembly Start-Stop Lever
900577	Assembly Push-Button Set
922920	Rubber Spacer 16x5x6 mm
923501	Valve Socket for DM 71 Valve
923500	Valve DM 71
900609	Assembly Rubber Roller (Capstan)
844400	Spacer
900610	Assembly Pressure Lever
913910	Tension Spring 0,3x4x20 mm
856900	Bow for Pressure Plate
913941	Holding Spring for DM 71 Valve

Part No. Description

3. Fast Forward Rewind Motor

90 06 36	Assembly Fast Forward Rewind Motor
92 36 01	Fast Forward Rewind Motor, without Case
92 29 04	Rubber Sleeve D 6
90 06 25	Assembly Case for Motor
92 29 26	Foamed Rubber 4x195x55 mm
92 29 14	Foamed Rubber Disc 30x15x5 mm
92 29 21	Rubber Disc 29x10x1 mm
91 39 34	Truncated Cone Spring
90 06 26	Assembly Cover
91 51 02	Holding Angle for Fast Forward Rewind Motor
85 25 00	Holding Plates
81 26 00	Cover
92 45 26	Choke

4. Head Carrier Plate

90 06 14	Assembly Head Carrier Plate
81 37 00	Head Carrier Plate
90 05 34	Assembly Erase Head
92 51 00	Erase Head
92 51 06	Bolt for Erase Head
90 05 35	Assembly Record/Play Head
92 51 08	Record/Play Head
92 51 02	Screening for Record/Play Head
92 51 03	Cradle for Record/Play Head
91 39 00	Pressure Spring for Record/Play Head 0,8x5,5x131x6 windings

Part No. Description

5. Printed Circuit, Large

90 05 50	Assembly Printed Circuit, Large
91 47 23	Contact Pins
92 09 08	Electrolytic Condenser 5 μ F
92 09 15	Electrolytic Condenser 50 μ F
92 09 16	Electrolytic Condenser 25 μ F
92 09 07	Electrolytic Condenser 100 μ F
92 09 00	Electrolytic Condenser 2,0 μ F
92 09 13	Electrolytic Condenser 250 μ F
92 03 00	Condenser 0,1 μ F
92 03 04	Condenser 4700 pF, 90 V
92 03 08	Condenser 2000 pF
92 03 11	Condenser 0,047 μ F
92 01 11	Resistor 100 K Ω
92 01 07	Resistor 15 K Ω
92 01 09	Resistor 50 K Ω
92 01 01	Resistor 1,8 K Ω
92 01 13	Resistor 200 Ω
92 01 22	Resistor 100 Ω
92 01 15	Resistor 500 Ω
92 01 04	Resistor 5,6 K Ω
92 01 00	Resistor 1 K Ω
92 01 28	Resistor 600 Ω
92 01 05	Resistor 8 K Ω
92 01 24	NTC-Resistor 1,3 K Ω blue
92 07 05	Potentiometer 10 K Ω
90 05 90	Assembly Coil 100 windings
92 05 03	Transistor OC 603
92 05 11	Transistor OC 75
92 05 09	Transistor OC 71

Part No.	Description
920507	Transistor OC 76
900530	Driver Transformer EJ 42

6. Battery- and Mains Converter Compartment

900629	Assembly case for Battery- and Mains Converter Compartment
900537	Assembly Fuse Holder
927004	Fuse 0,5 Amp.
927003	Fuse 0,8 Amp. medium
921515	Insulating Lamination
914709	Tubular Rivet
923015	Heat Sink
914726	Semicircular Rivet 3x4 mm
900630	Assembly Baseplate
921526	Insulating Plate 0,5x145x76 mm
830300	Threaded Bolt
921531	Insulating Plate 0,5x145x79 mm

7. Printed Circuit, Small

900551	Assembly Printed Circuit, Small
914723	Contact Pins
920301	Condenser 0,22 μ F
920311	Condenser 0,047 μ F
920314	Condenser 0,022 μ F
920305	Condenser 0,01 μ F
920313	Condenser 500 pF
920900	Condenser 2 μ F
920512	Germanium Diode OA 81
920705	Potentiometer 10 K Ω
920707	Potentiometer 2,5 K Ω

Part No.	Description
920104	Resistor 5,6 K Ω
920109	Resistor 50 K Ω
920106	Resistor 12 K Ω
920108	Resistor 25 K Ω
920101	Resistor 1,8 K Ω
920116	Resistor 50 Ω
920120	Resistor 4,6 Ω
920110	NTC-Resistor 130 Ω
900591	Assembly Erasing Coil
920513	Transistors OC 74 (Pair)
900531	Output Transformer EJ 48

8. Drive Unit

900631	Assembly Drive Unit (s. Fig. 7)
923015	Heat Sink
920907	Electrolyt Condenser 100 μ F
920115	Resistor 500 Ω
920116	Resistor 50 Ω
920507	Transistor OC 76
900632	Assembly Guide Tube
900644	Assembly Shaft for Reversing Device
900645	Assembly Bush for Reversing Device
915205	Change Lever
914318	Steel Pin
900538	Assembly Holding Bow for Motor, left
900585	Assembly Holding Bow for Motor, right
900633	Assembly Case for Motor
900634	Case for Motor
924715	Reduction Sleeve
900506	Assembly Tape Operating Motor

Part No.	Description
92 29 25	Foamed Rubber 4x55x250 mm
92 29 35	Rubber Ring 2x30x18 mm
81 29 00	Cover with Hole
87 19 00	Lead Plate
92 29 27	Foamed Rubber 4x55x30 mm
92 29 36	Rubber Ring 1x30x12 mm
92 29 04	Rubber Sleeve
92 29 06	Rubber Sleeve
81 28 00	Cover without Hole
91 39 16	Tension Spring 0,3x4x8 mm
90 06 36	Assembly Fly Wheel
91 17 00	Threaded Pin M 3x4 mm
90 06 38	Assembly Capstan Shaft
90 06 39	Assembly Ballbearing
92 29 18	Rubber Ring 1,3x11x5,4 mm
84 43 00	Spacer
91 35 72	Pressure Disc Hardened
85 74 00	Stiffening Lath
92 29 11	Rubber Spacer
92 09 12	Electrolytic Condenser 1300 μ F
92 30 06	Strap for Electrolytic Condenser

9. Tape Counting Clock

90 06 15	Assembly Tape Counting Clock
83 16 00	Adjusting Lever
87 57 00	Rubber Drive Belt

10. Turntables

90 06 23	Assembly Rewind Turntable
91 39 40	Reel Retaining Clip
90 06 24	Assembly Take-up Turntable
87 56 00	Spring Belt

Part No.	Description
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11. Parts for Cabinet

80 70 00	Assembly Wooden Cabinet
90 06 47	Assembly Polystyrol Border
87 84 00	Polystyrol Stud
91 47 31	Rivets two pointed
87 72 00	Hook in Hinges
92 57 02	Speaker
80 80 00	Assembly Grill for Speaker
92 29 12	Rubber Spacer
84 87 00	Bush M 3
90 06 49	Assembly Battery Holder
87 85 00	Carrying Strap

12. Covering Parts

80 02 00	Assembly Cover Plate
87 53 00	Protection Glass for Tape Counting Clock
87 08 00	Cover for Magnetic Heads
90 05 39	Assembly Push-Button Cover
87 15 00	Plastic Cover
92 29 19	Rubber Spacer
80 62 00	Assembly Plastic Lid

13. Operating Knobs and Buttons

87 06 00	Tone and Volume Control Knobs
87 62 00	Start Slide
91 35 75	Washer
91 47 30	Pointed Nail
90 06 46	Assembly Speed Change Knob
a - e	Push-Buttons, loose for Part No.

Part No.	Description
90 0577	a) Recording Button
	b) Rewind Button
	c) Stop Button
	d) Wind Button
	e) Playback Button

14. Spring Rings

91 41 25	Spring Rings 3,3 DIN 127
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15. Crescent Retaining Rings

91 41 00	d 1 = 3,2 DIN 6799
91 41 01	d 1 = 2,3 DIN 6799
91 41 02	d 1 = 4 DIN 6799
91 41 05	d 1 = 7 DIN 6799
91 41 07	d 1 = 1,5

16. Hexagon Nuts

91 30 01	MA 3 DIN 439
91 30 02	MA 4 DIN 439
86 03 00	1,2x5x12,9 mm

17. Screws

86 05 00	Grub Screw M 2,6x4
86 04 00	Ring Screw M 3x5,5
91 04 00	Semicircular Screw AM 3x4 DIN 86
91 04 06	Semicircular Screw AM 3x10 DIN 86
91 04 01	Semicircular Screw AM 3x5 DIN 86
91 04 08	Semicircular Screw AM 3x12 DIN 86
91 04 07	Semicircular Screw AM 3x7 DIN 86
91 22 03	Semicircular Wood Screw 1,3x7 lacquered
91 09 02	Shank Screw 3x6 DIN 427
91 02 02	Countersunk Screw AM 3x20 DIN 87

Part No.	Description
91 02 22	Countersunk Screw AM 3x5
91 02 03	Countersunk Screw AM 1,4x2
91 11 06	Countersunk Screw AM 3x18
91 11 07	Countersunk Screw AM 3x8 lacquered
91 11 05	Countersunk Screw AM 3x10 lacquered
91 06 31	Cylindrical Screw AM 2x6 DIN 84
91 06 34	Cylindrical Screw AM 2x5 DIN 84
91 06 05	Cylindrical Screw AM 3x3 DIN 84
91 06 23	Cylindrical Screw AM 2x2,5
91 06 01	Cylindrical Screw AM 2x8 DIN 84
91 06 13	Cylindrical Screw AM 3x22
91 06 14	Cylindrical Screw AM 3x25
91 06 04	Cylindrical Screw AM 2x2,5

18. Washers

91 35 78	0,4x7x3,1 mm
91 35 14	0,3x8x3,1 mm
91 35 67	1,0x7x3,5 mm
91 35 84	1,0x15x3,1 mm
91 35 10	0,3x4,5x2,1 mm
91 35 69	1,5x12x3,1 mm
91 35 54	0,3x7x3,1 Pertinax
91 35 43	1,0x10x4,2 mm
91 35 68	0,5x10x3,1 mm
91 35 76	1,0x7,2x3,6 mm
91 35 57	0,3x5,5x3,3 mm
91 35 15	0,3x6x4,1 mm
91 35 86	0,5x6,5x3,3 mm
91 35 62	0,5x8x3,1 mm
91 35 42	1,0x10x3,1 mm
91 35 85	0,3x9x6,1 mm
91 35 71	0,5x10x5,2 mm

Parts and Numbers as per circuit diagram

Part No.	Description
Spare Part List for Mains Converter	
92 65 02	Silicon Diode OY 5065
90 05 40	Assembly Fuse Holder
92 47 08	Socket T 3267, 6 V
91 47 16	Tube Rivet ER 2014/a3
92 49 15	Voltage Selector (Philberth)
91 47 17	Tube Rivet ER 2517/a 4 Ms
91 35 78	Washer 0,4x7x3,1 mm
90 05 45	Assembly Lug Lamination
92 15 33	Insulating Lamination 0,3x33x40 mm
91 47 04	Tube Rivet ER 2317/b4
83 31 00	Contact Stud
84 21 00	Insulating Bush
84 20 00	Insulating Bush
91 30 01	Hexagon Nut A 3
92 14 01	Lug
90 05 22	Assembly Transformer
91 02 11	Counter Sunk Screw AM 4x28 mm
91 30 02	Hexagon Nut A 4
91 35 43	Washer 1x10x4,1 mm
84 32 00	Spacer 5,5x4x4 mm
90 05 88	Assembly Choke EJ 48
92 70 02	Fuse 0,2 Amps, medium
90 05 83	Assembly Cover Plate
92 42 04	Cable with Plug
92 29 03	Hellermann-Protection Sleeve D 6/20
92 09 12	Electrolytic Condenser 1300 μ F 12,5 V
86 02 00	Screw
91 41 02	Crescent Retaining Ring d 1 = 4
91 02 22	Counter Sunk Screw AM 3x5
87 98 00	6 Volt Lable

Ref. No. Circuit Diagram	Description	Part No.
Resistors		
R 1	200 Ω	92 01 13
R 2	1,8 K Ω	92 01 01
R 3	100 K Ω	92 01 11
R 4	100 K Ω	92 01 11
R 5	15 K Ω	92 01 07
R 6	1,8 K Ω	92 01 01
R 7	8 K Ω	92 01 05
R 8	1,8 K Ω	92 01 01
R 11	100 K Ω	92 01 11
R 12	50 K Ω	92 01 09
R 13	1 K Ω	92 01 00
R 14	100 Ω	92 01 22
R 16	1,8 K Ω	92 01 01
R 17	1 K Ω	92 01 00
R 18	500 Ω	92 01 15
R 19	100 K Ω	92 01 11
R 20	50 K Ω	92 01 09
R 21	200 Ω	92 01 13
R 22	200 Ω	92 01 13
R 23	5,6 K Ω	92 01 04
R 24	5,6 K Ω	92 01 04
R 25	8 K Ω	92 01 05
R 27	600 Ω	92 01 28
R 28	NTC 1,3 K Ω	92 01 24
R 30	50 K Ω	92 01 09
R 31	25 K Ω	92 01 08
R 33	50 Ω	92 01 16
R 34	NTC 130 Ω	92 01 10
R 36	1,8 K Ω	92 01 01

Parts and Numbers as per circuit diagram

Ref. No. in Circuit Diagram	Description	Part No.	Ref. No. in Circuit Diagram	Description	Part No.
R 37	1,8 K Ω	92 01 01	C 13	250 μ F 12 V	92 09 13
R 38	12 K Ω	92 01 06	C 14	100 μ F	92 09 07
R 39	4,6 Ω	92 01 20	C 15	50 μ F	92 09 15
R 41	5,6 K Ω	92 01 04	C 16	2200 pF	92 03 08
R 42	10 K Ω	92 07 05	C 17	0,047 μ F	92 03 11
R 43	5,6 K Ω	92 01 04	C 18	1300 μ F	92 09 12
R 44	500 Ω	92 01 15	C 19	5 μ F 15 V	92 09 08
			C 20	500 pF	92 03 13
			C 21	0,047 μ F	92 03 11
	Potentiometers		C 22	2 μ F 25 V	92 09 00
R 9	10 K Ω log.	92 07 04	C 23	2 μ F 25 V	92 09 00
R 10	10 K Ω log.	92 07 04	C 24	0,047 μ F	92 03 11
R 15	10 K Ω	92 07 05	C 25	0,22 μ F	92 03 01
R 26	10 K Ω	92 07 05	C 26	0,01 μ F	92 03 05
R 29	10 K Ω	92 07 05	C 27	0,022 μ F	92 03 14
R 32	2,5 K Ω	92 07 07	C 28	4700 pF	92 03 04
R 35	10 K Ω	92 07 05	C 29	2200 pF	92 03 08
R 40	2,5 K Ω	92 07 07	C 30	100 μ F 15 V	92 09 07
			C 31	100 μ F 15 V	92 09 07
	Condensers			Coils	
C 1	5 μ F	92 09 03	L 1	Treble equalization coil	90 05 90
C 2	100 μ F	92 09 07	L 2	Driver Transformer EJ 42	90 05 30
C 3	100 μ F 15 V	92 09 07	L 3	Output Transformer EJ 43	90 05 31
C 4	50 μ F	92 09 15	L 4	Rejector Circuit Coil	90 05 90
C 5	50 μ F	92 09 15	L 5	Erase Coil	90 05 91
C 6	100 μ F 15 V	92 09 07	L 6	Choke	92 45 26
C 7	0,1 μ F	92 03 00	L 7	Choke	92 45 26
C 8	100 μ F	92 09 07			
C 9	4700 pF 90 V	92 03 04			
C 10	2 μ F 25 V	92 09 00			
C 11	25 μ F	92 09 16			
C 12	50 μ F	92 09 15			

1 = Rundfunk-Eingang
1 = Radio input
1 = Entrée diode

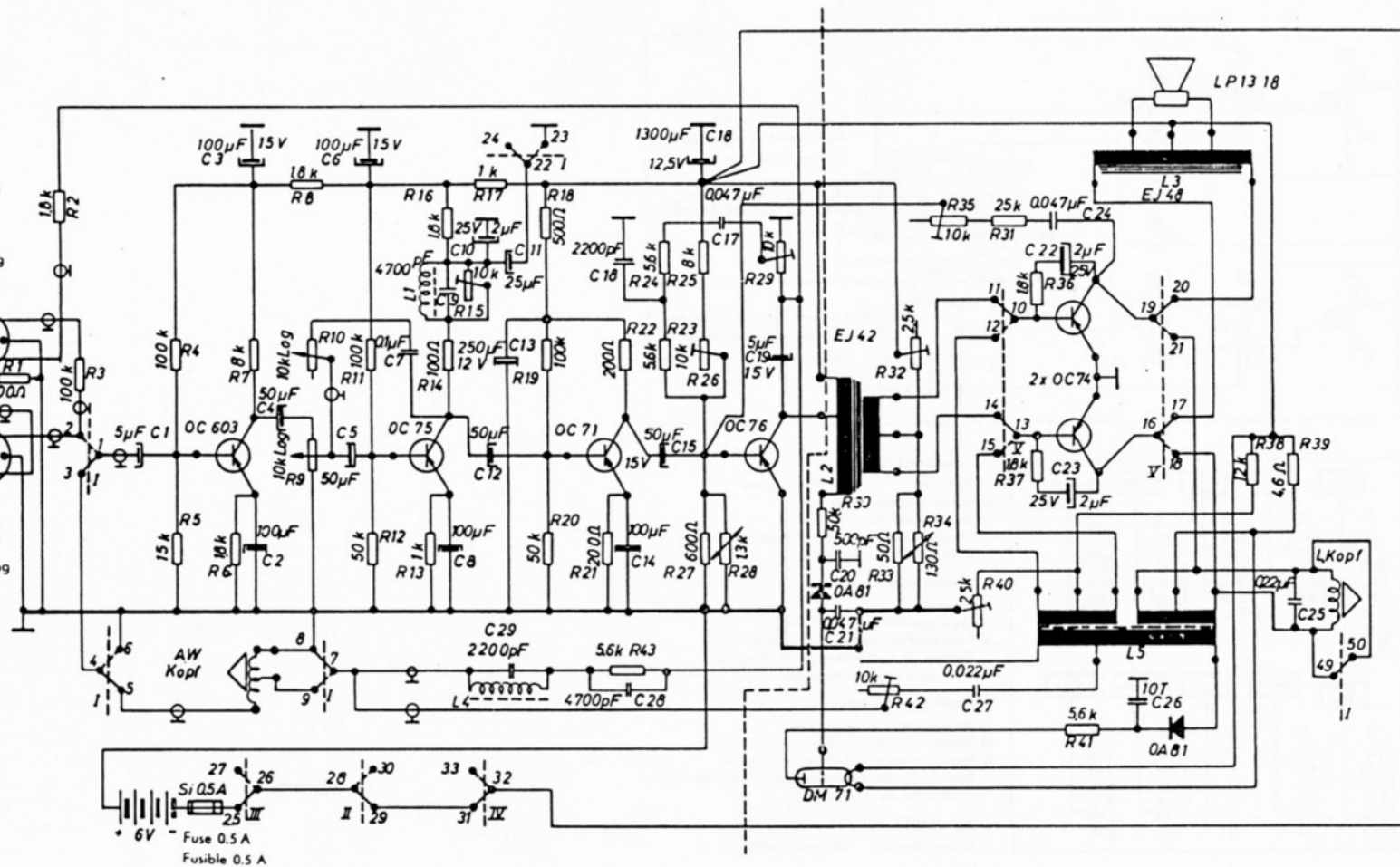
3 = Rundfunk-Ausgang
3 = Radio output
3 = Sortie B. F.

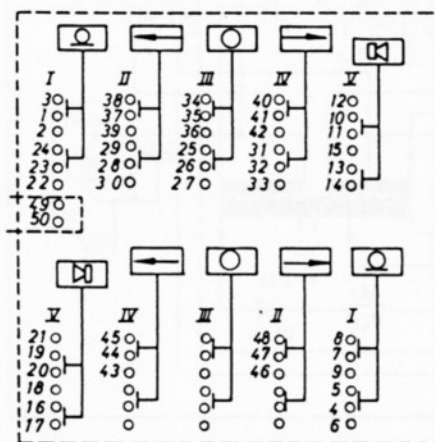
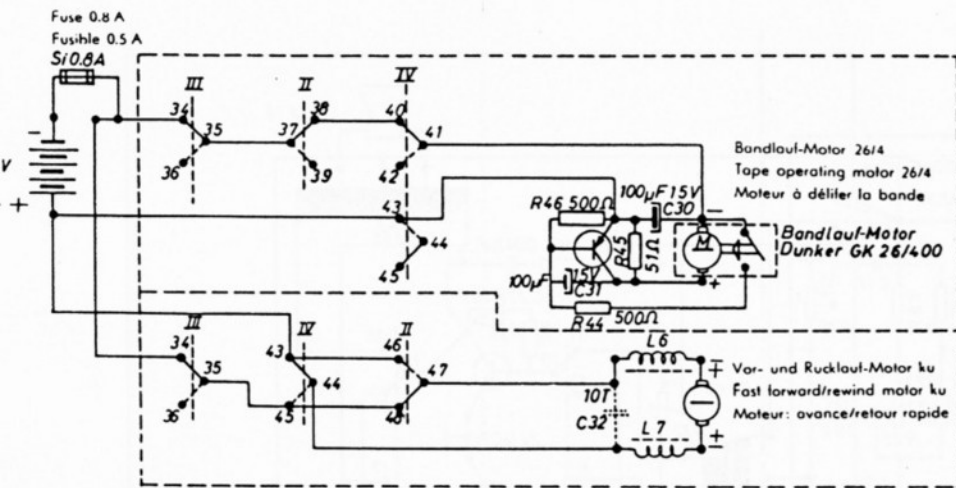
Normbuchse
Normal Socket
Prise normale

Normbuchse
Normal Socket
Prise normale

1 = Mikro-Eingang
1 = Micro input
1 = Entrée micro B. i.

3 = Rundfunk Ausgang
3 = Radio output
3 = Sortie B. F.





Schalterstellungen:

- 1) Verstärker = Wiedergabe
 - 2) Bandlauf-Motor = Ein
 - 3) Var-Rücklauf-Motor = Varlauf
- Drucktastensatzstellung = Wiedergabe
C 32 entfällt ab Nr. 55500

Switch positions:

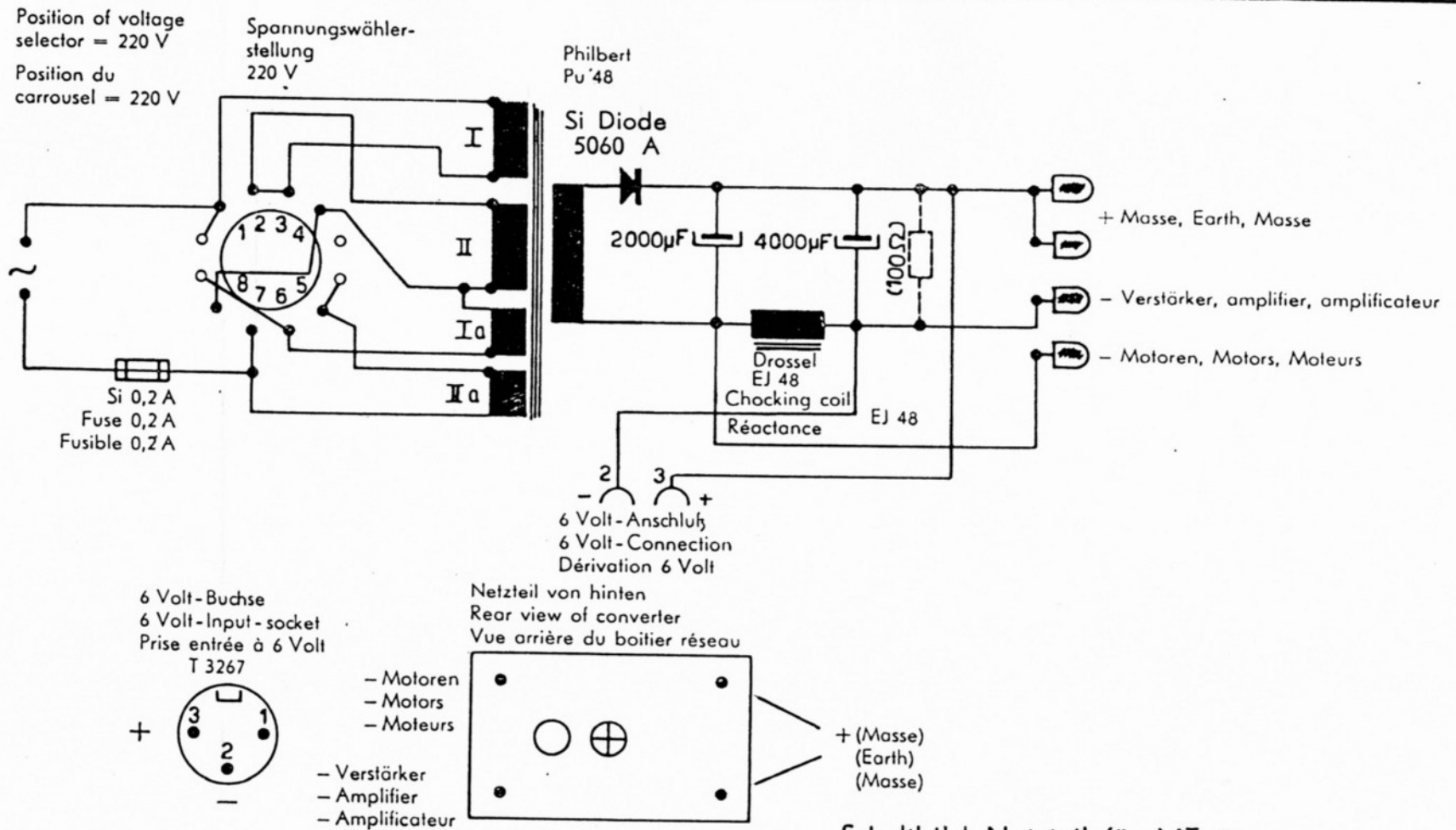
- 1) Amplifier = Playback
 - 2) Tape operating motor = On
 - 3) Forward/Rew. Motor = Forward
- Position of Push-button-set = Playback
C 32 deleted from Nr. 55500

Positions du circuit:

- 1) Amplificateur = Reproduction
 - 2) Moteur à défilet la bande = en marche
 - 3) Moteur avance/retour rap. = Avance
- Pos. du clavier de commande = Reproduction
C 32 biffer de No. 55500

Schaltbild für MT 5

Circuit diagram Schéma modèle MT 5



Schaltbild Netzteil für MT 5
Circuit diagram (Converter for MT 5)
Schéma (appareil réseau pour MT 5)

Fig. 1

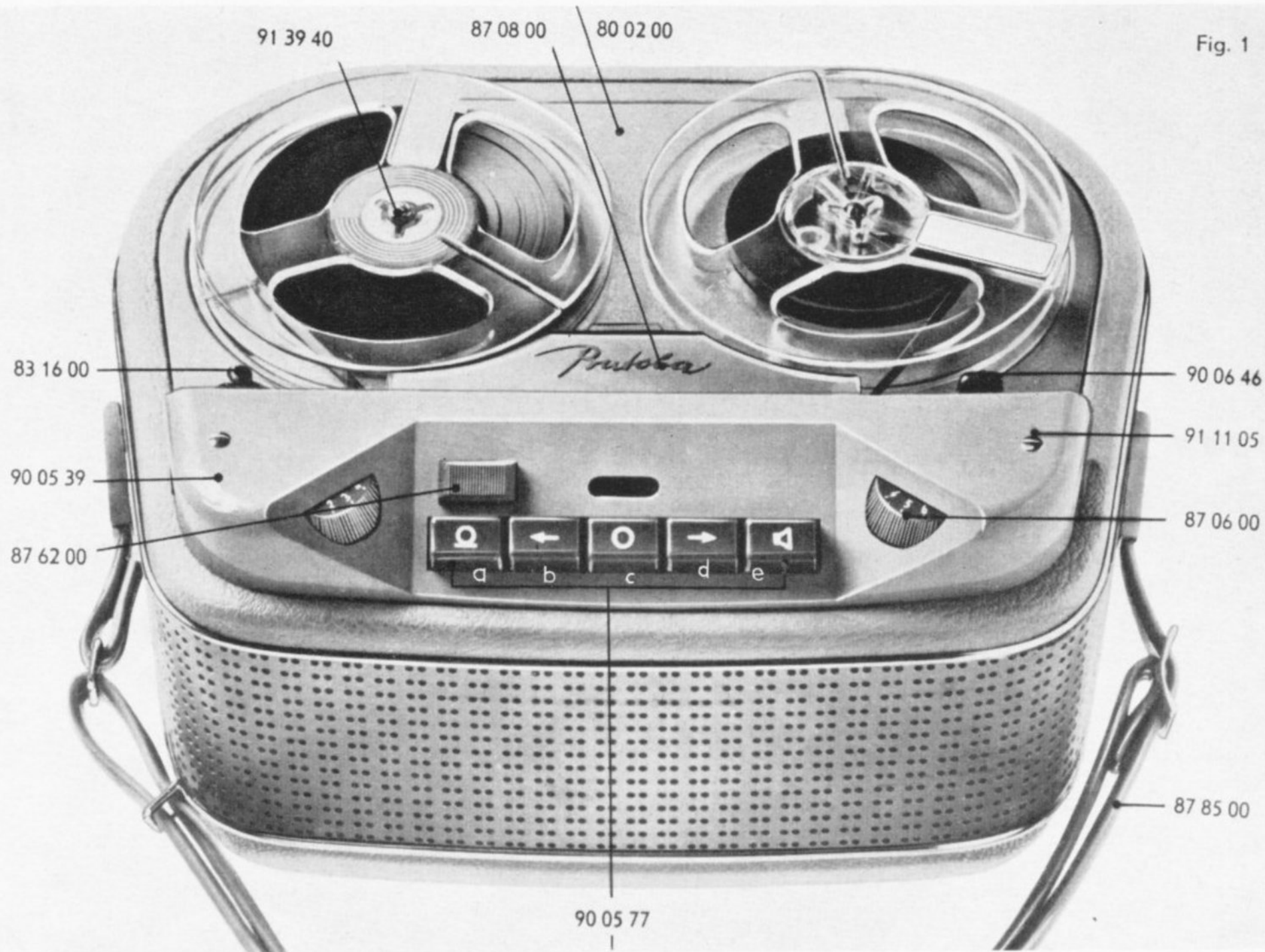


Fig. 2

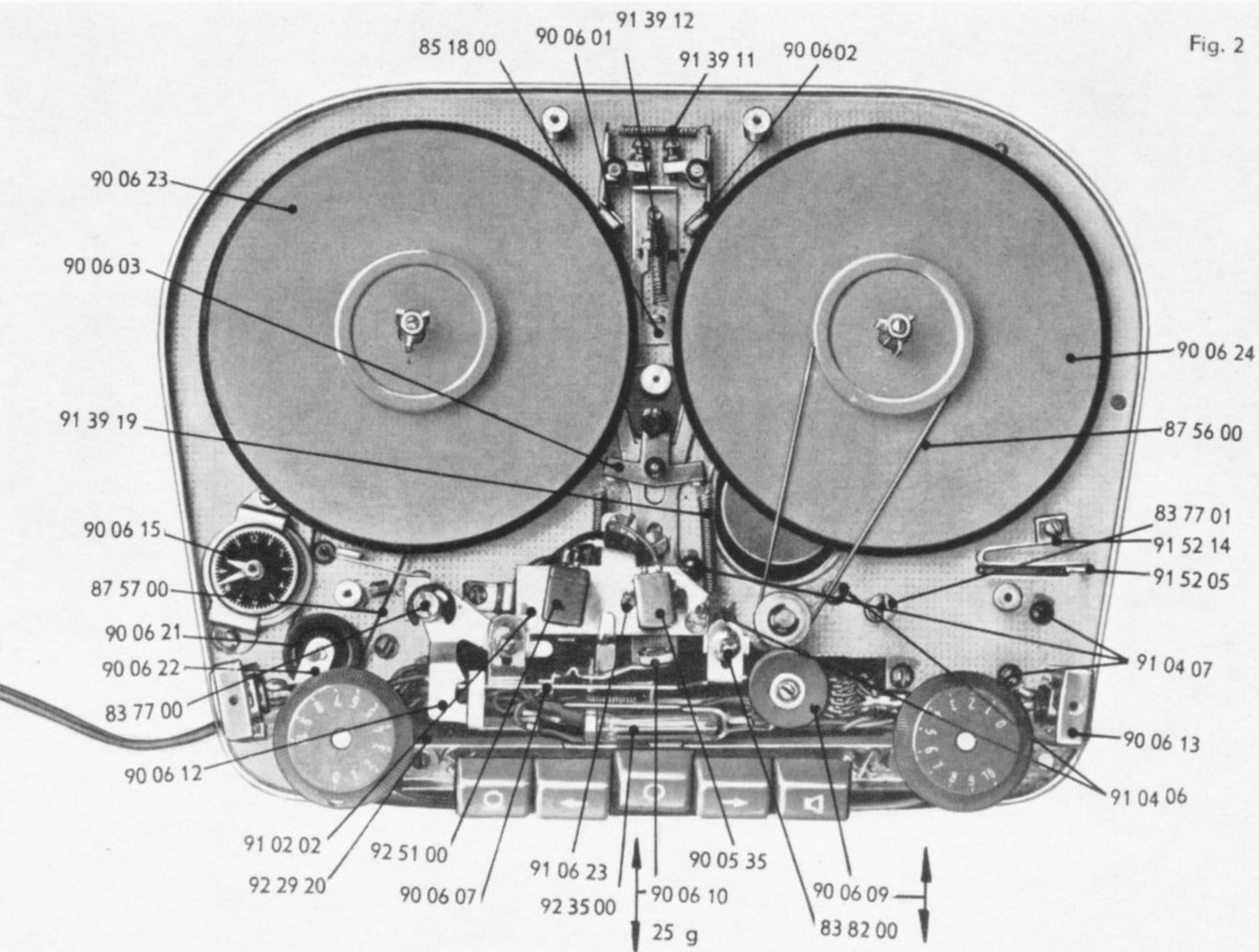


Fig. 3

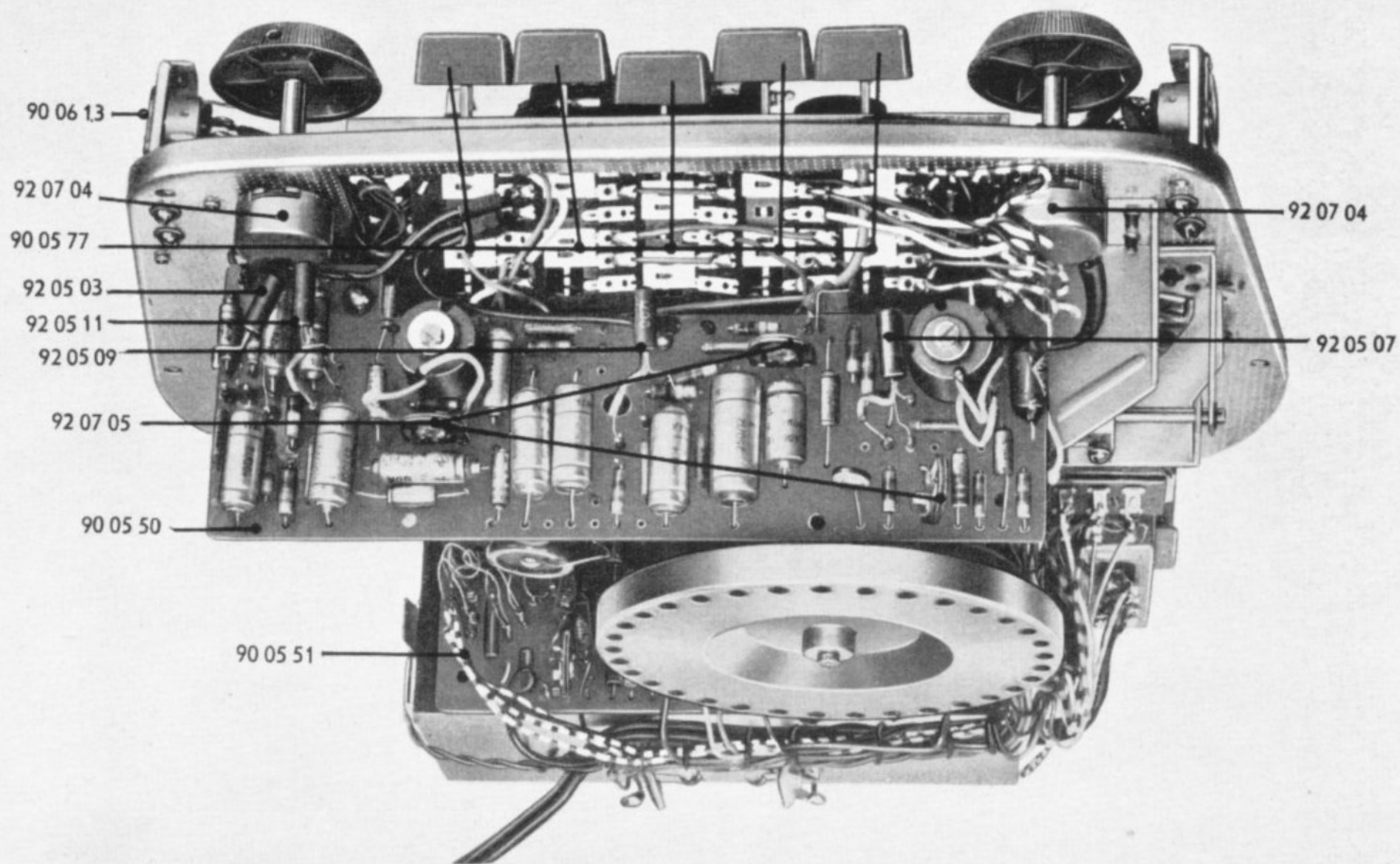


Fig. 4

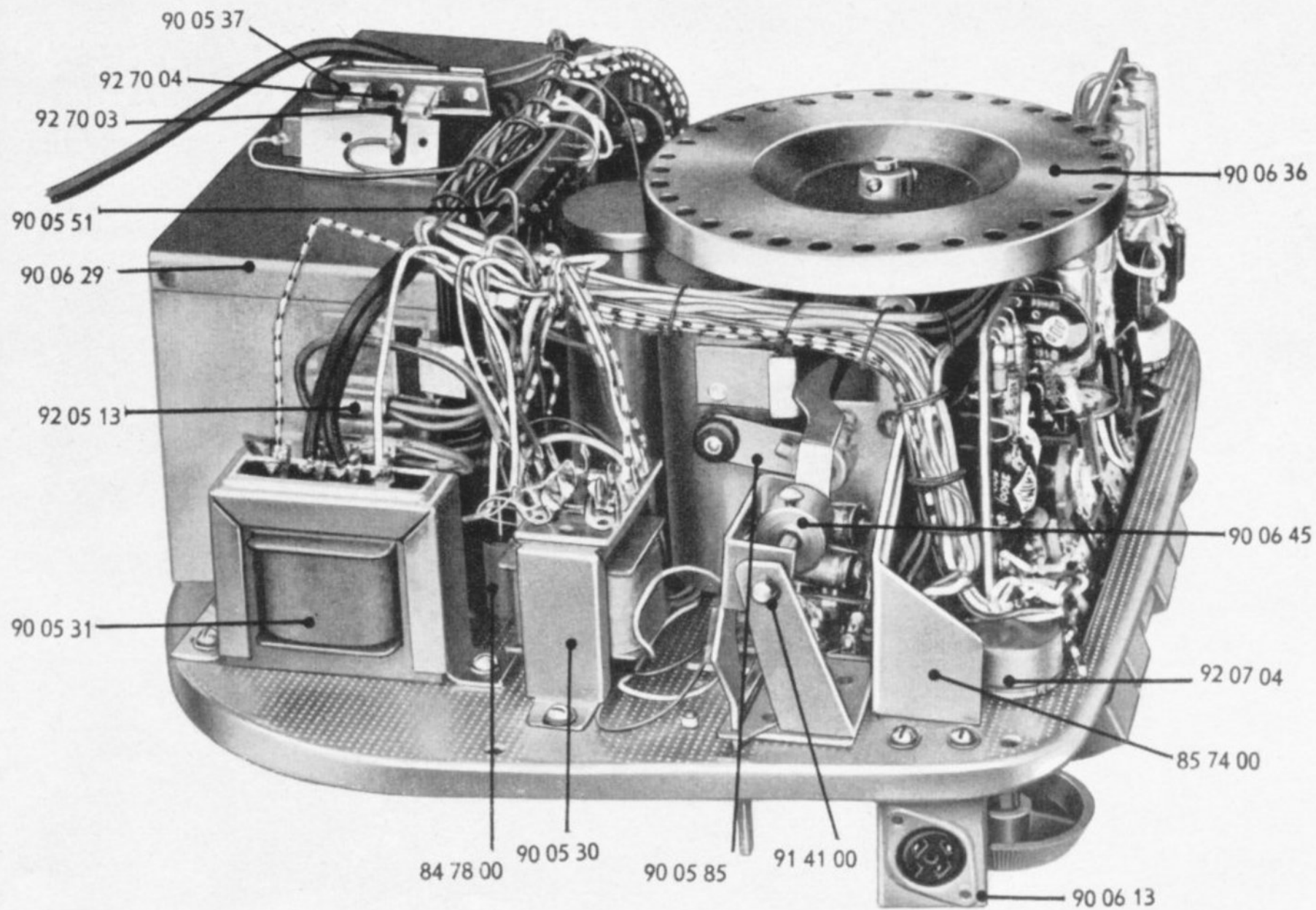


Fig. 5

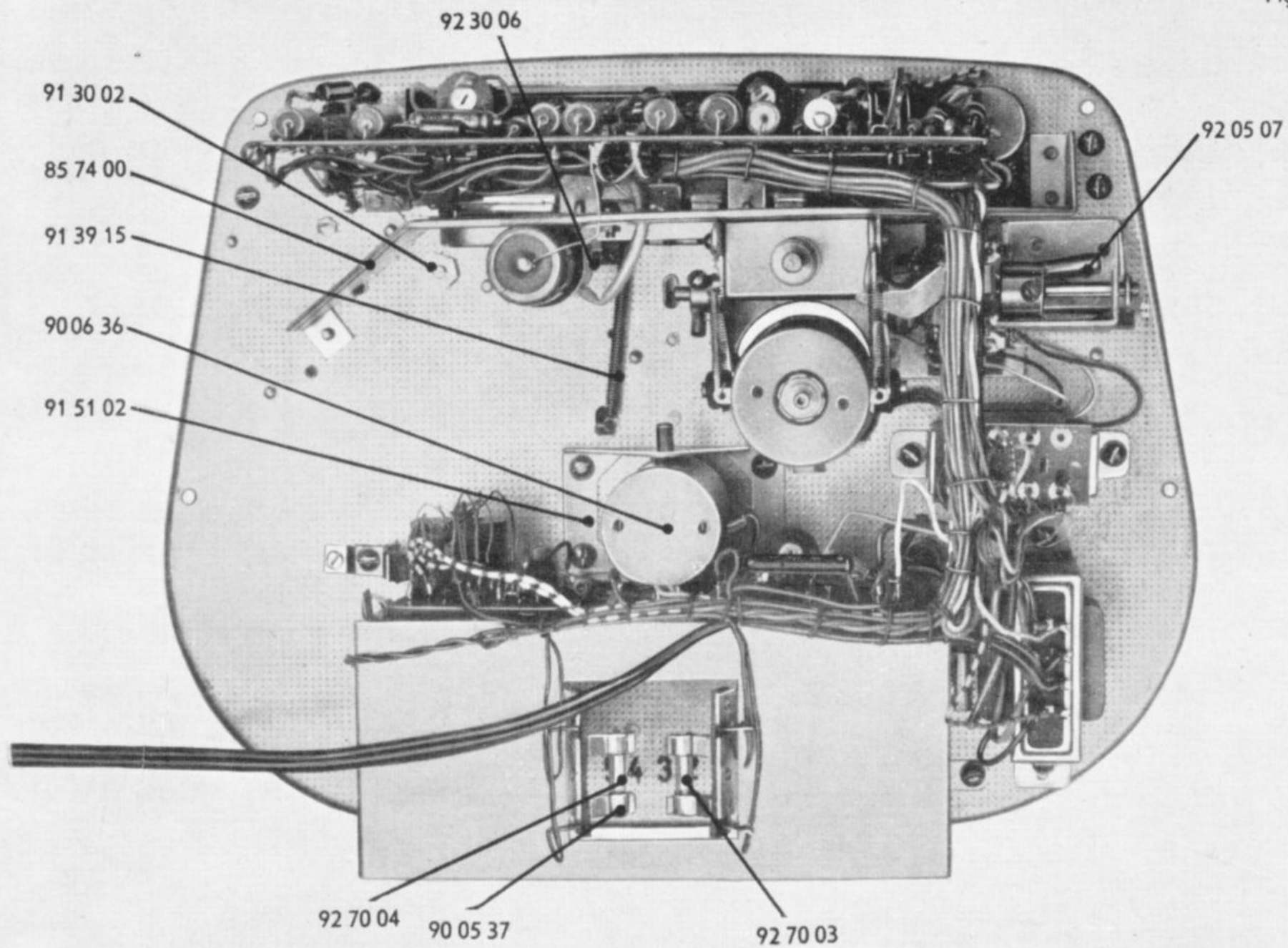


Fig. 6

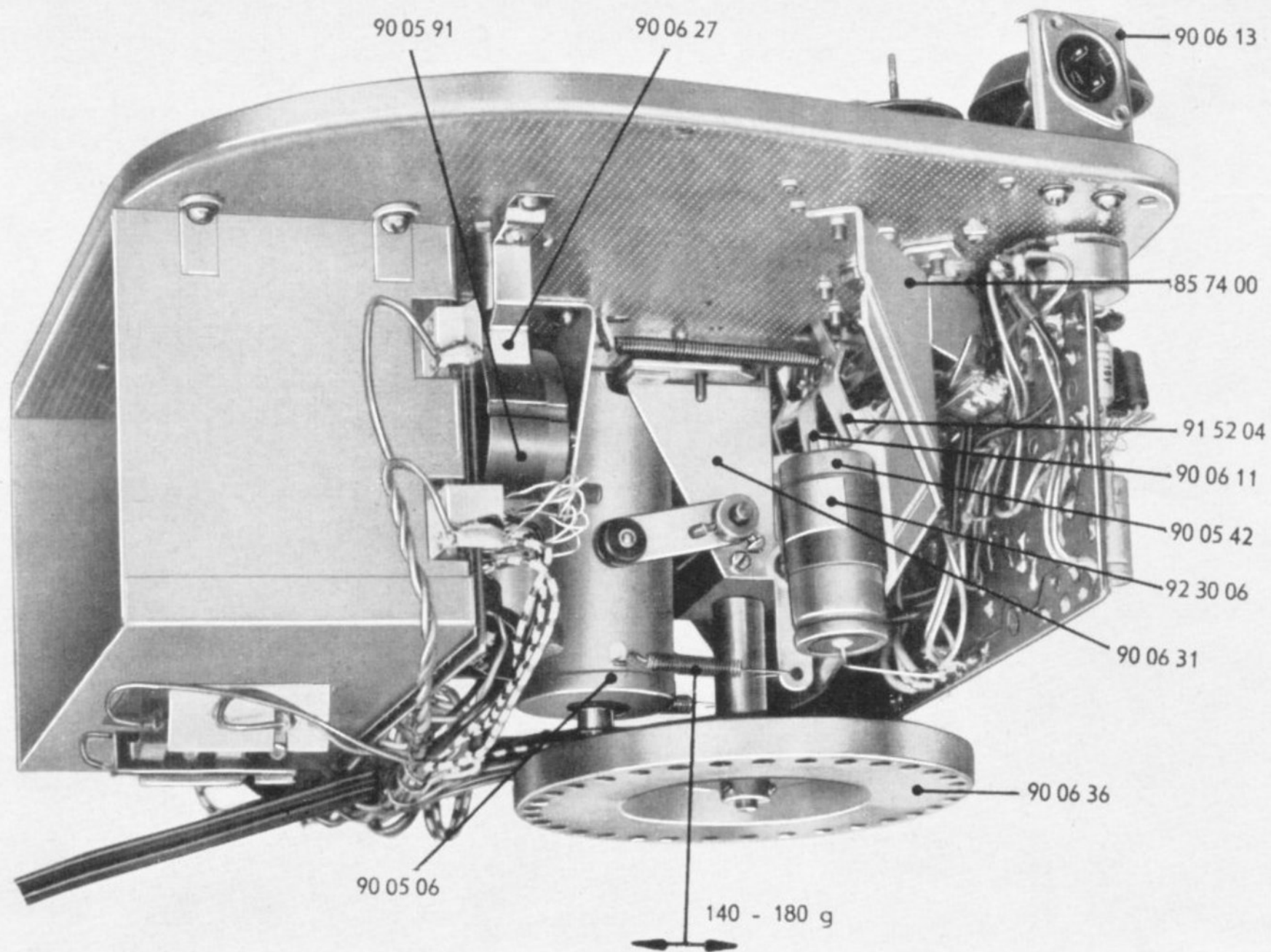


Fig. 7

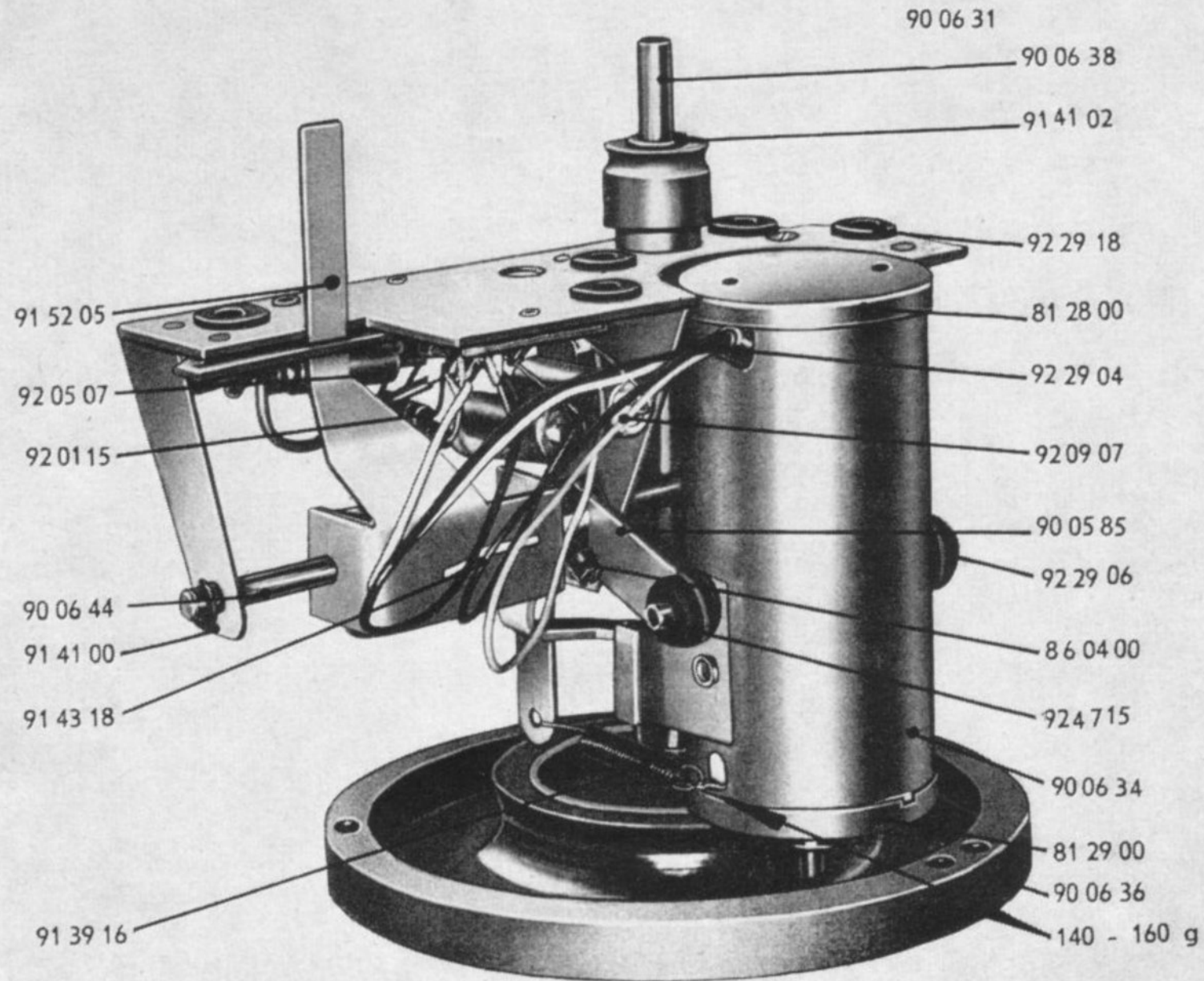


Fig. 8

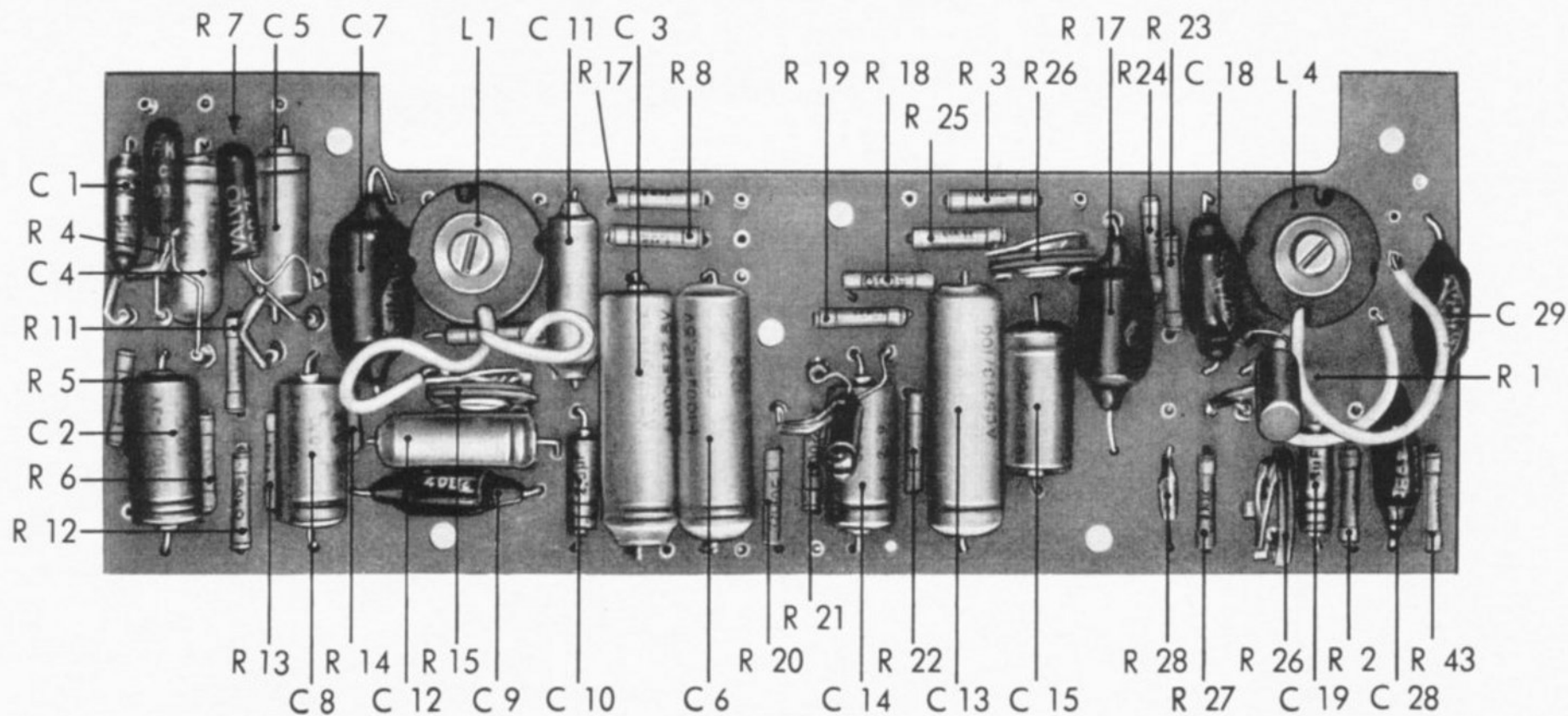


Fig. 9

90 05 51

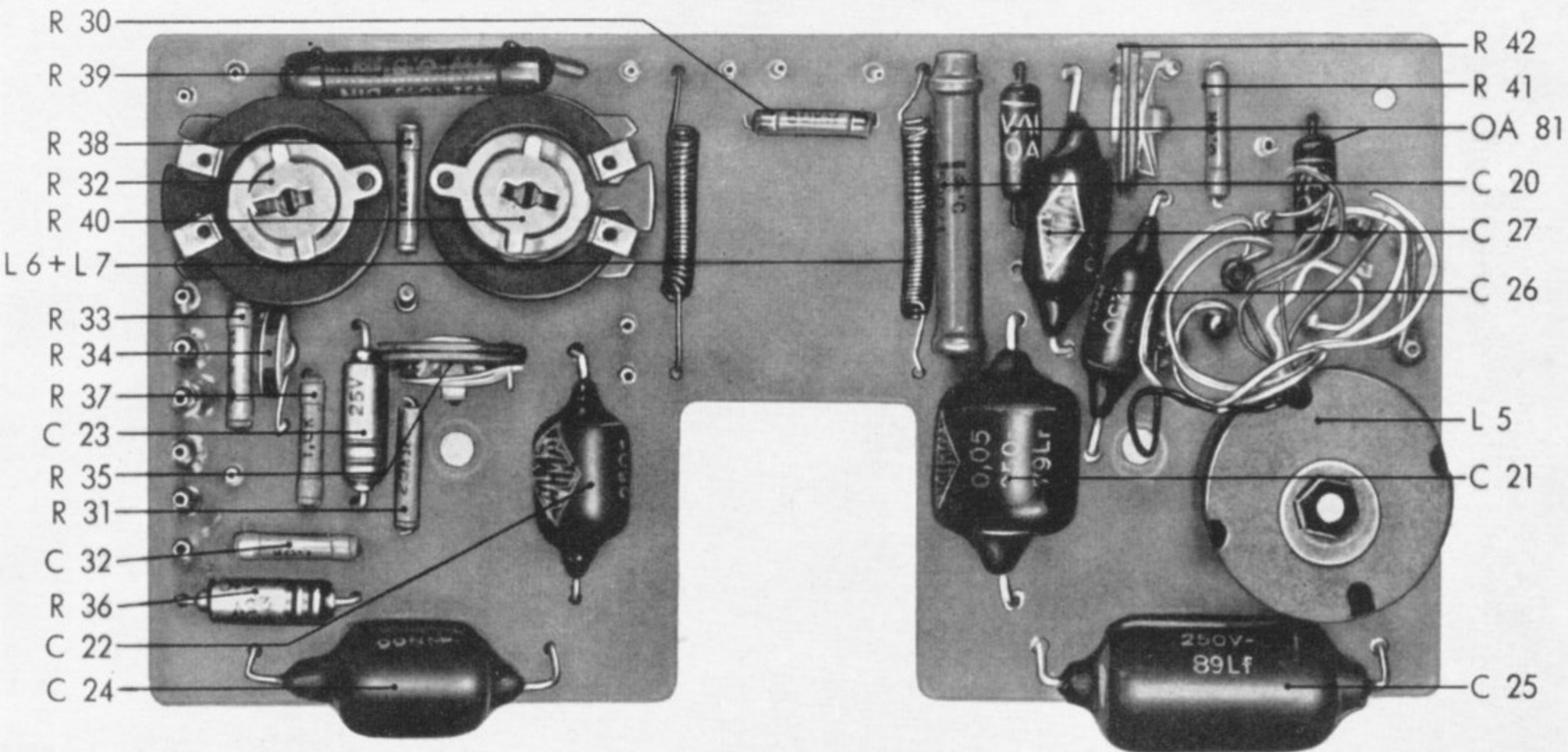
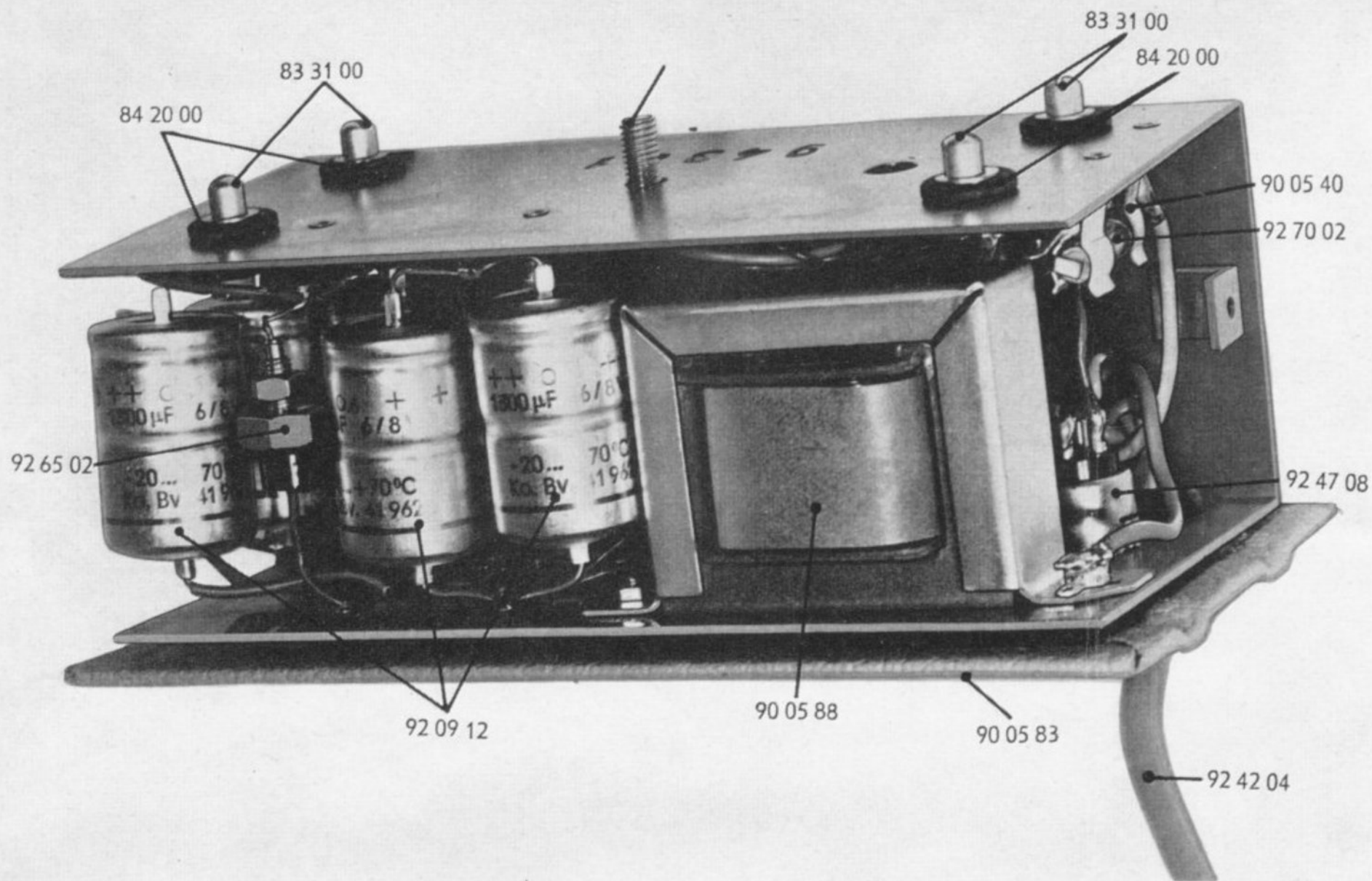


Fig. 10



1. Teile an Chassisplatte - Parts on Chassisplate - Pièces sur Platine



84 78 00



81 22 00



90 06 01



91 39 11



90 06 02



90 06 03



90 06 21



90 06 22



90 06 13



91 39 12



86 01 00



91 39 19



92 47 01



92 07 04



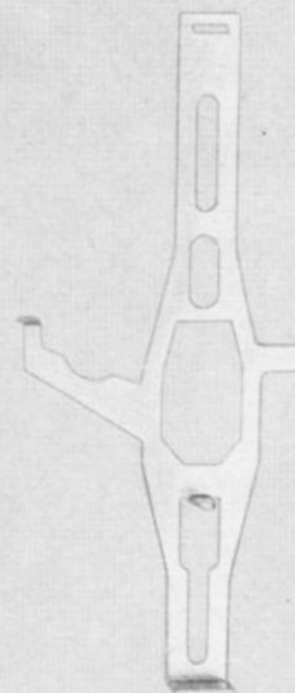
92 30 10



91 39 14



83 77 01



85 18 00



83 77 00

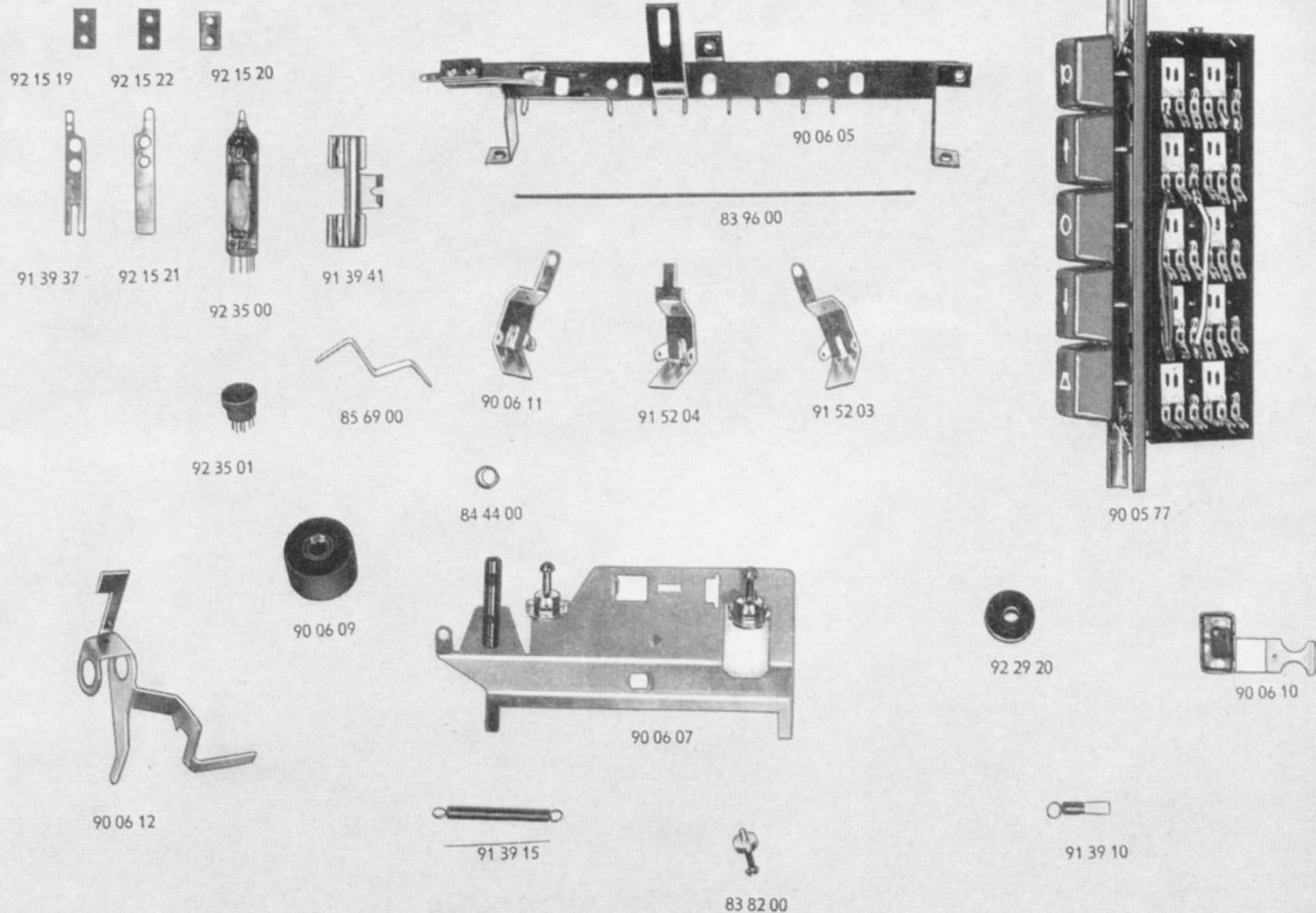


90 06 27

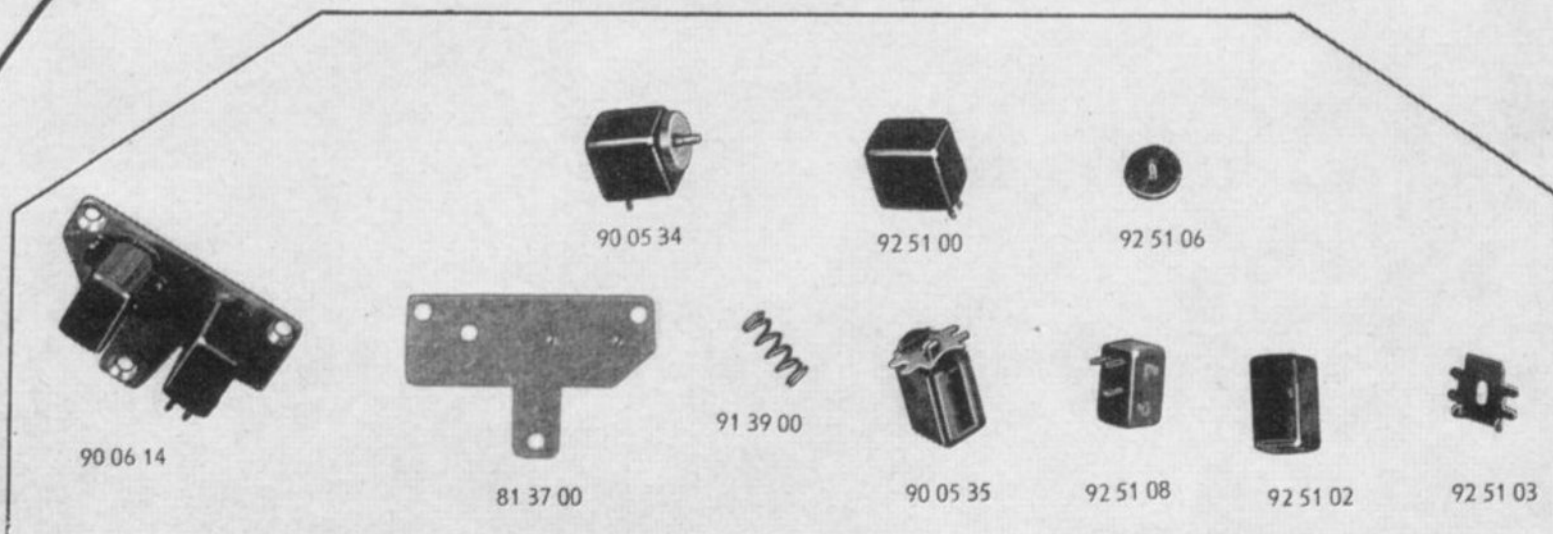
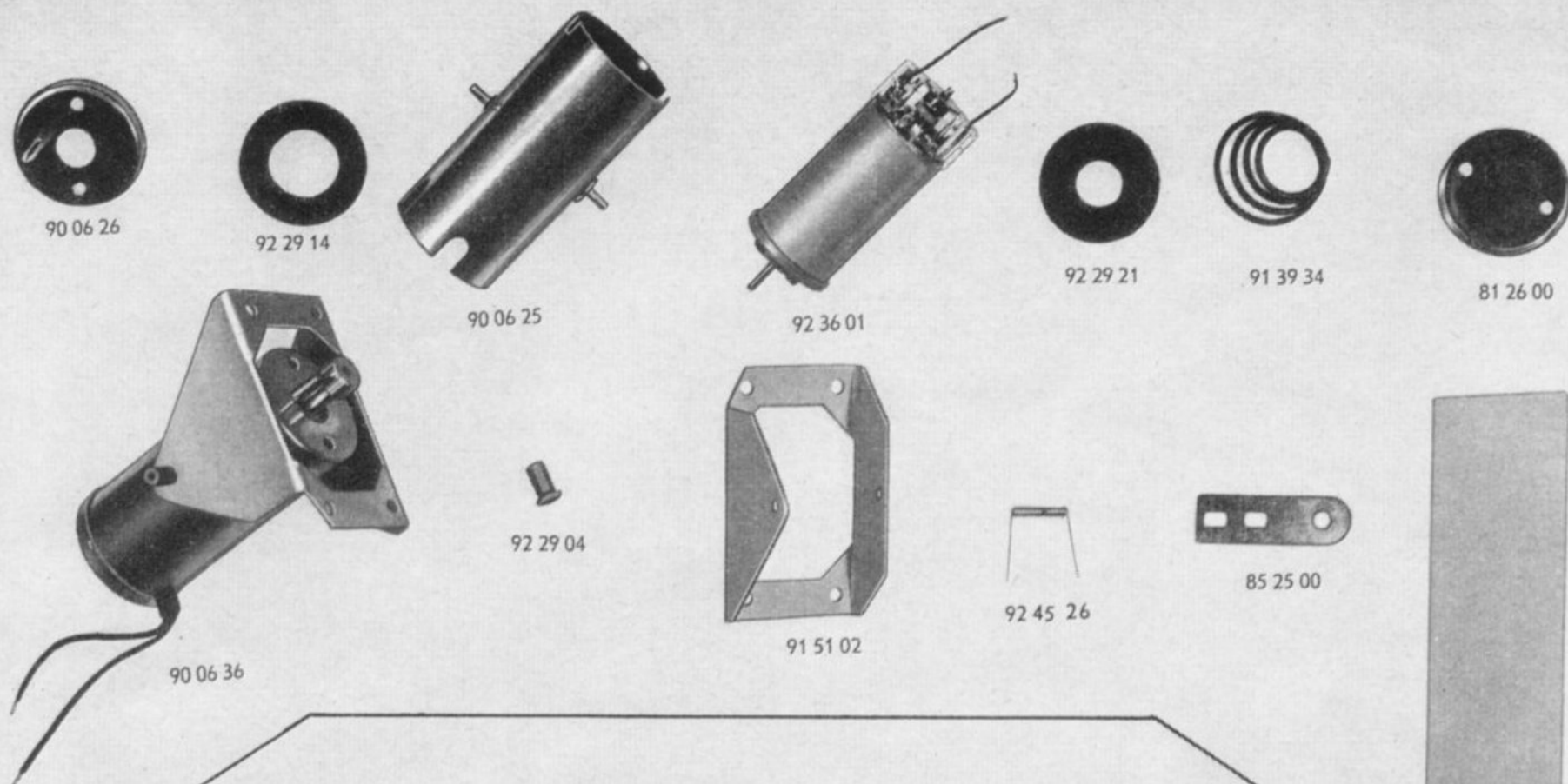


91 52 14

2. Druckastenaggregat - Push-Button Assembly - Contacteur à Touches



3. Vor-Rückspulmotor - Forward-Rewind Motor - Moteur Rebobinage



4. Kopfträgerplatte - Head Carrier Plate - Support Têtes

5. Gedruckte Schaltung (groß) - Printed Circuit (large) - Platine Circuit Imprimé Préamplificateur



92 09 13



92 09 07



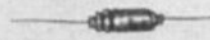
92 09 15



92 09 16



92 09 00



92 09 08



92 03 04



92 05 03



92 05 11



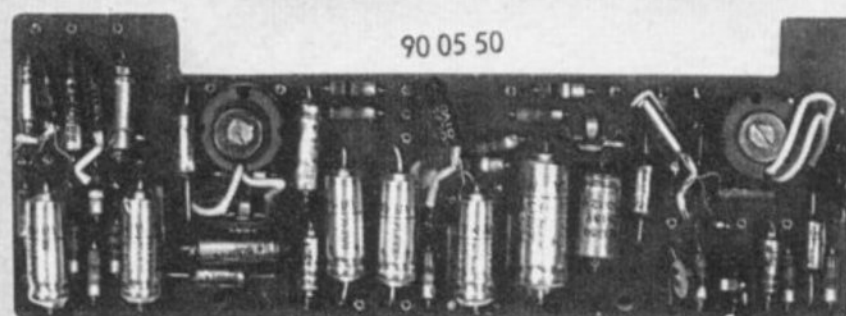
92 05 09



92 05 07



91 47 23



90 05 50



92 01 11



92 01 07



92 01 13



92 01 04



92 01 22



92 01 15



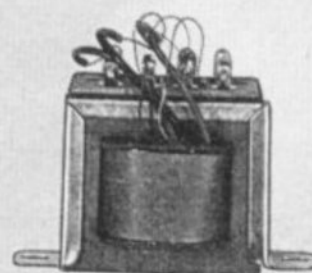
92 01 00



92 01 01



92 01 09



90 05 30



92 07 05



90 05 90



92 01 24



92 01 05



92 01 28



92 03 00

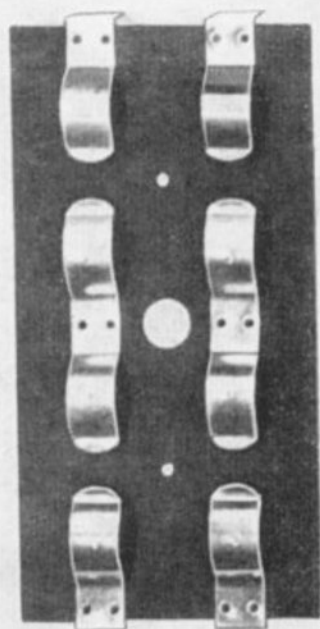


92 03 08

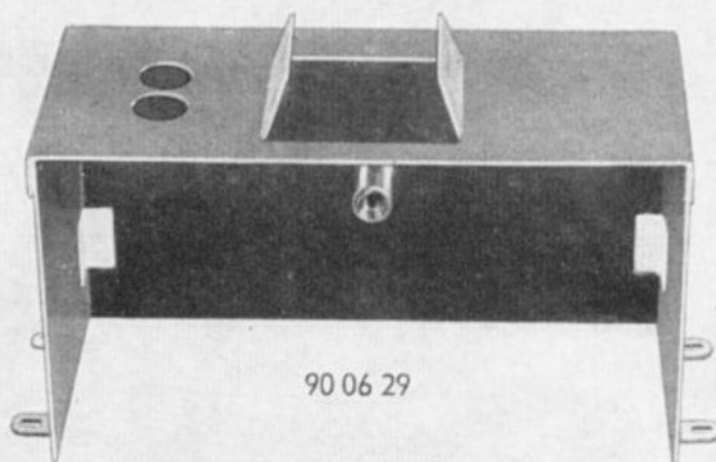


92 03 11

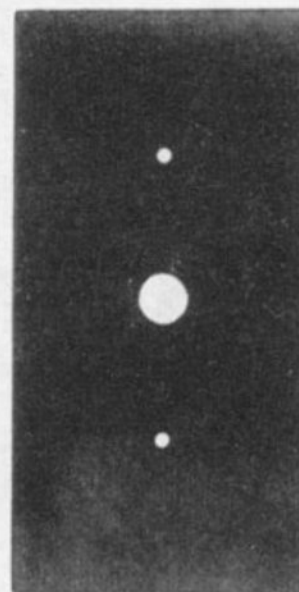
6. Gehäuse für Batterie-Netzteileinschub - Battery- and Mains Converter Compartment Boitier Récepteur Alimentation



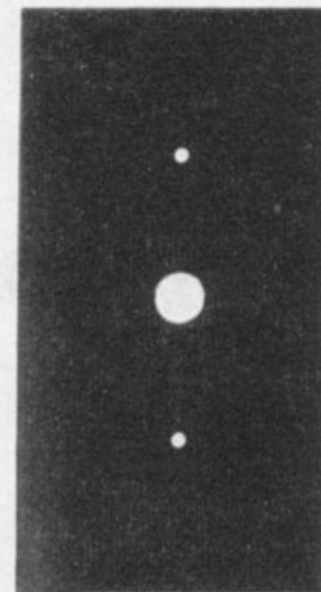
90 06 30



90 06 29



92 15 26



92 15 31



83 03 00



91 47 09

92 15 15



90 05 37



92 30 15



91 47 26

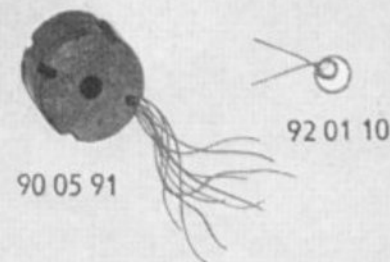
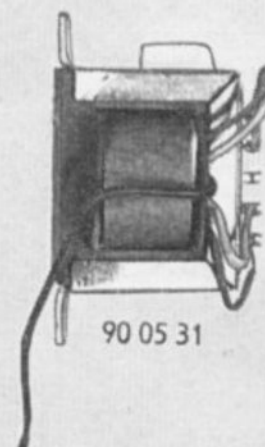
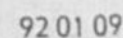
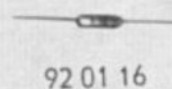
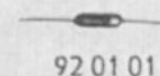
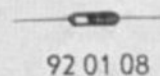
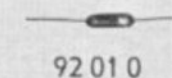
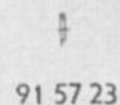
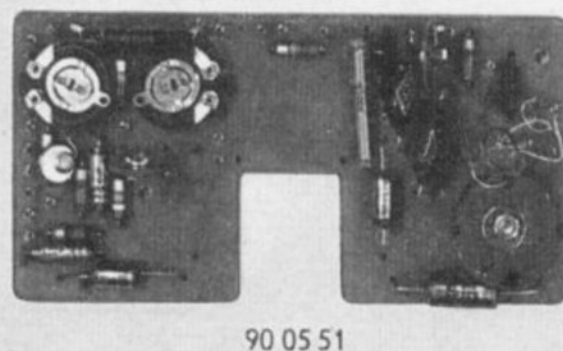
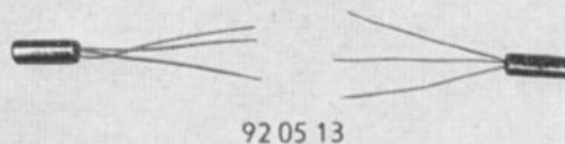
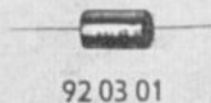
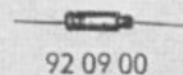


92 70 04

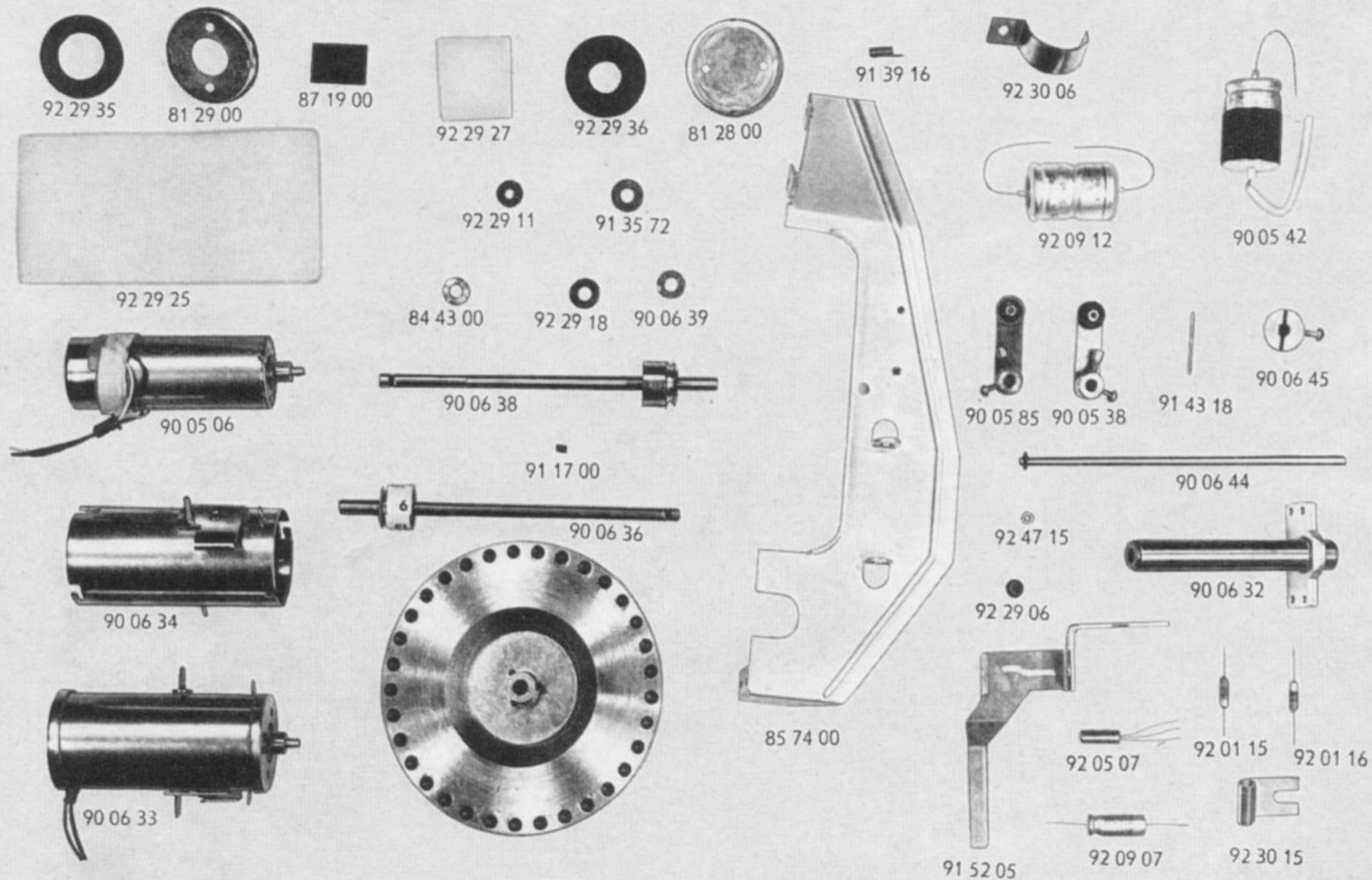


92 70 03

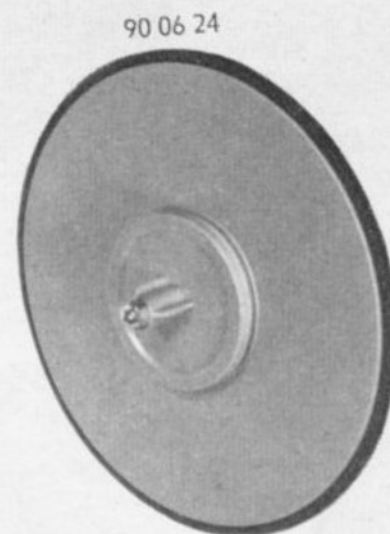
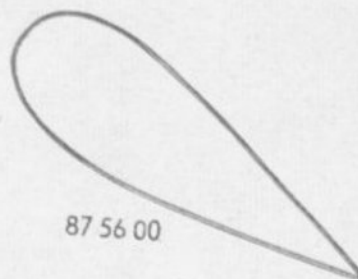
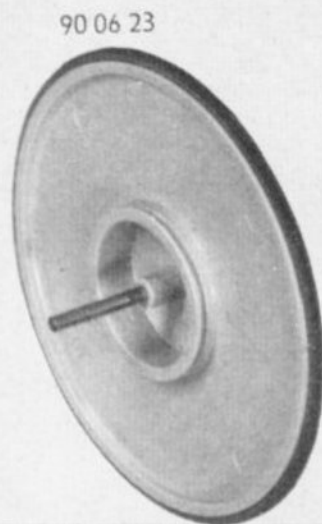
7. Gedruckte Schaltung (klein) - Printed Circuit (small) - Circuit Imprimé HF & BF



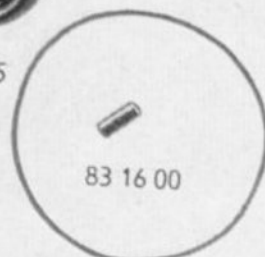
8. Antriebsaggregat - Drive Unit - Groupe du Moteur Défilement



10. Spulenteller - Turntables - Porte Bobine



90 06 15



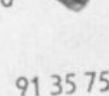
87 57 00



87 06 00



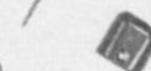
87 62 00



91 35 75



91 47 30

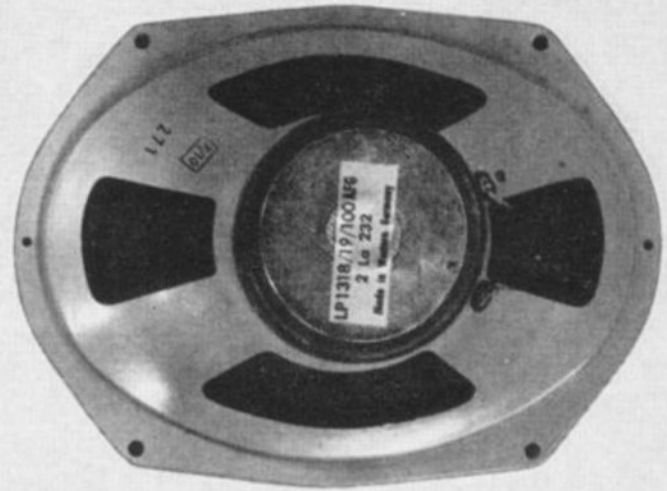


90 06 46

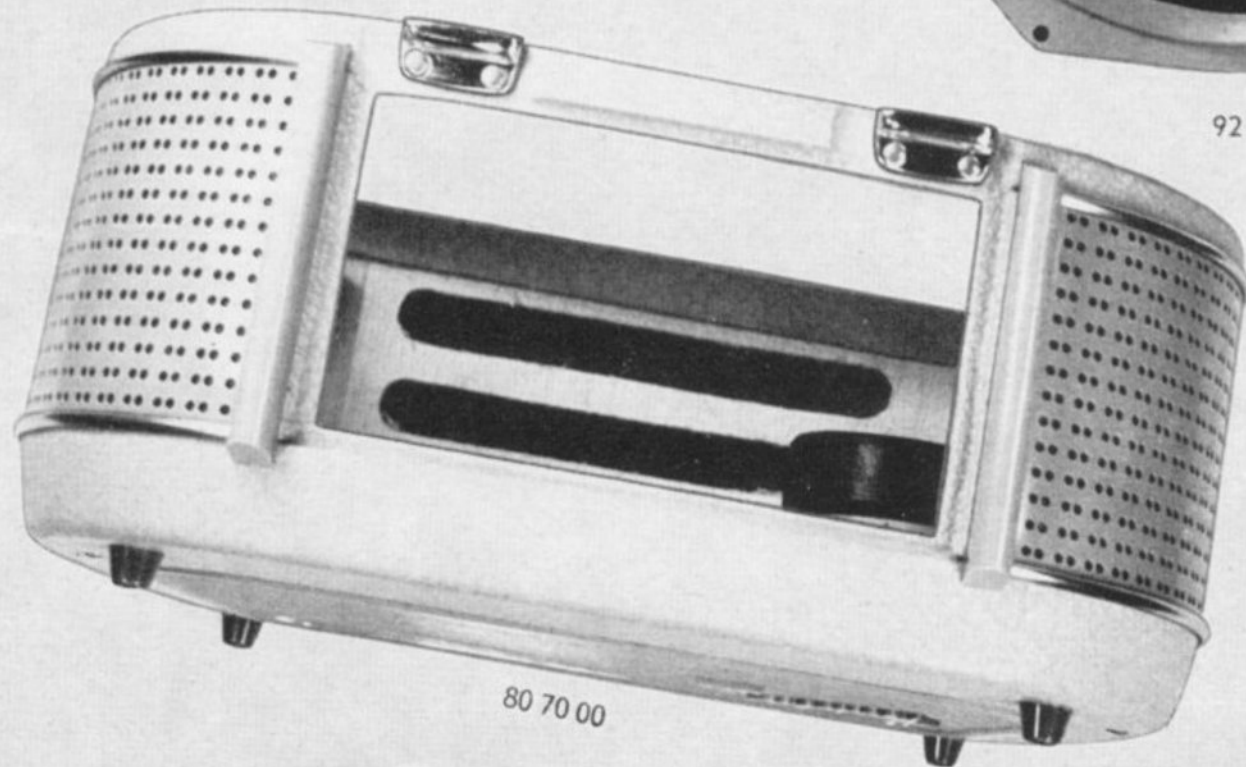
9. Bandzählwerk - Tape Counting Clock
Compteur Horaire

13. Bedienungsknöpfe - Drucktasten — Control Knobs - Buttons
Touches et Boutons

11. Koffergehäuse - Cabinet - Mallette

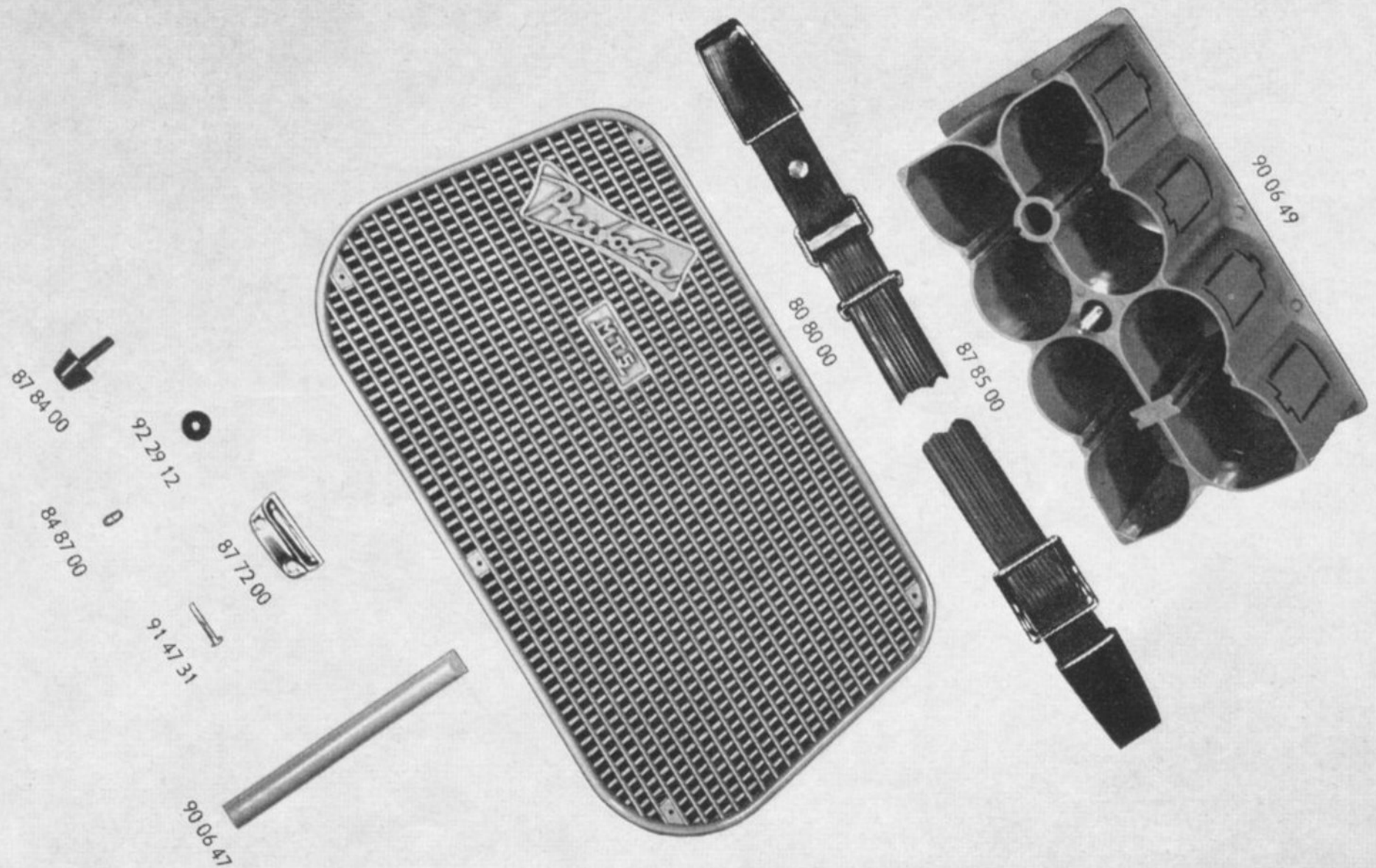


92 57 02



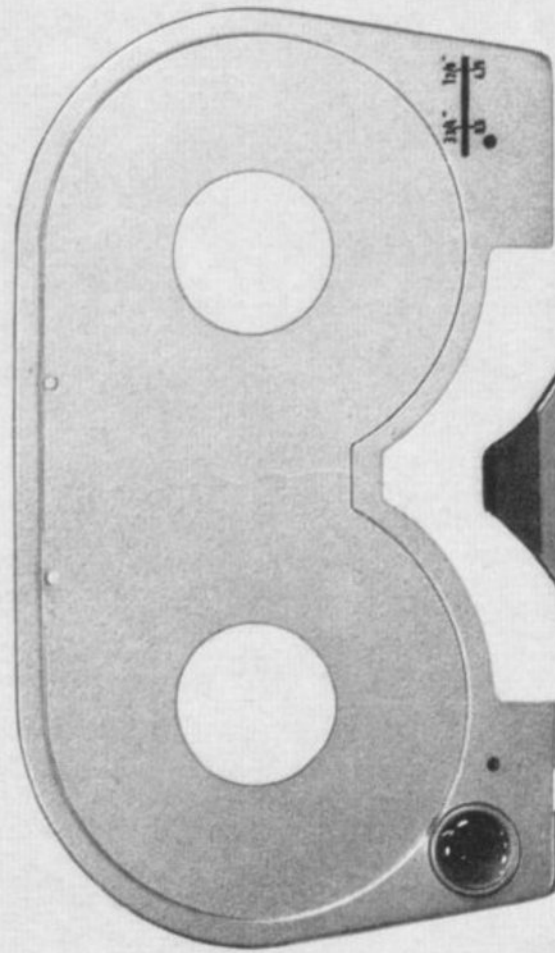
80 70 00

11. Teile zum Koffergehäuse - Parts for Cabinet - Pièces de la Mallette



12. Verkleidungsteile - Covering Parts - Caches

80 02 00



87 53 00



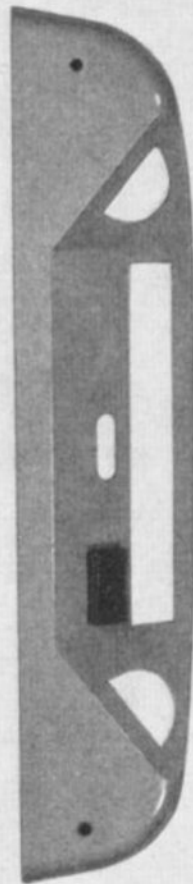
87 08 00



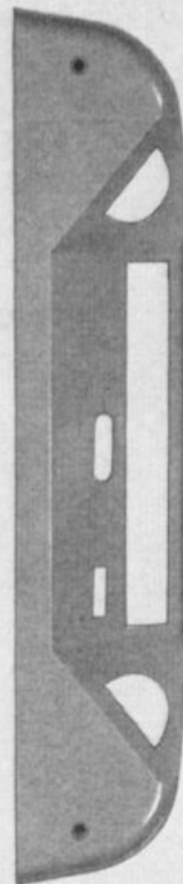
92 29 19



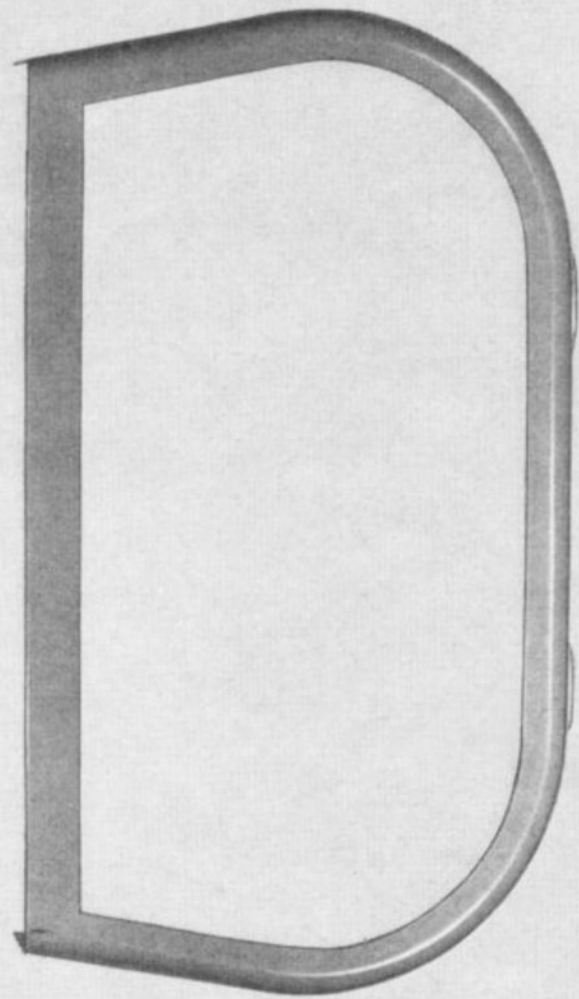
90 05 39



87 15 00



80 62 00



14.-18. Normteile-Übersicht - View of Standardised Parts - Vue des Pièces Standardisés

Unterlagscheibe



washer
rondelle

Halbrundschrabe



semicircular screw
vis à tête ronde

Zylinderschrabe



screw fillister head
vis à tête
cylindrique

Sechskantmutter



hexagon nut
écrou hexagonal

Federring



lock washer
ring à ressort

Sicherungsscheibe



crescent retaining ring
rondelle de sûreté

Linsensenkschrabe



countersunk screw
vis à tête cylindrique bombé

Halbrundholzschrabe



semicircular wood screw
vis en bois tête ronde

Schaftschrabe



shank screw
vis à tige

Körnerschrabe



grub screw
vis pointeau

Ringschneideschrabe



ring screw
piton

Senkschrabe



countersunk screw
vis à tête fraisée

Maße laut Liste

Dimensions as per list

Dimensions selon spécification

19. Netzteil - Mains Converter - Alimentation Réseau

