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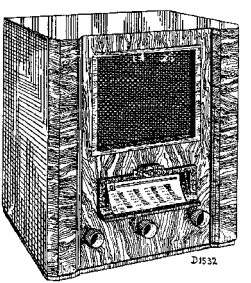
PHILIPS

SERVICE MANUAL

SUPER-INDUCTANCE RECEIVER

For A.C. and D.C. Mains.

Type 213 U



GENERAL REMARKS.

This receiver can be connected either to a D.C. or A.C. mains supply within a voltage range of 200—250 volts, and within a frequency range of 25—100 cycles. Three control knobs are provided. The volume control as well as the on/off switch are operated with the left knob, while the centre one is used for tuning. The right-hand knob is marked with a white spot; when this spot points to the left, the set is connected for a wave range from 180—560 metres, while with the spot upright the receiver is connected for a wave range from 760—1,900 metres. With the spot pointing to the right a filter for a wavelength of 1,500 metres is switched in. A mains socket on the back panel (safety switch) is provided which automatically renders the receiver electrically dead when the back is removed.

IMPORTANT.

When adjusting, testing or repairing the receiver it is desirable to use an A.C. supply which should have a double wound transformer between the supply and the receiver with the secondary winding not earthed.

CIRCUIT.

The receiver Type 213U has two tuned circuits, one between the aerial and the H.F. valve and one between the H.F. valve and the detector valve.

The aerial 1 is connected via C17 (1,000 $\mu\mu$F) and the coil unit S1, S2, S3 and S4 inductively coupled to the grid circuit of the H.F. valve L1 (VP13C). The anode circuit of L1 is inductively coupled by the coil unit S5, S6, S7 and S8 with the grid circuit of the detector valve L2 (SP13C).

Resistance capacity coupling is used for L.F. amplification. Automatic volume control has been incorporated. The resistance R9, which is connected in the grid circuit of L2, will cause a drop in the grid bias of L1 via R14, R15 when a strong signal causes an increase of the grid current of L2.

The heater circuits of L1, L2, L3 and L4 (CY1C) are connected in series, while the pilot lamps L6 and L7 (Types 8070) and the barretter L5 (C1 or C1C) are incorporated in the same circuit. L4 acts as a rectifier when the set is connected to A.C. mains, and for D.C. mains L4 is a simple series resistance. An extra loudspeaker of high impedance can be connected to the special secondary winding of the output transformer.

A resistance, R17, is incorporated in the grid circuit of L3 and is connected close to the valve socket. The connection from the valve socket to the resistance as well as the resistance itself are screened. R17 serves to prevent self-oscillating of L3.

The wave trap S14, S15, C28 is tuned for a wave length of 1,500 metres, and attenuates signals on that wavelength.

VERY IMPORTANT NOTES.

As previously mentioned, if the chassis is being handled under a voltage such as when trimming, testing for faults, measuring, etc., there is a possibility of a shock being experienced. It is, therefore, necessary to use a transformer which is double wound and has reasonably good insulation between the windings. On no account should the secondary winding be earthed. If such a transformer is not used it is possible for the chassis to have a voltage to earth and, therefore, touching it then would be dangerous.

If, therefore, a double wound transformer having no connection to earth is used the chassis may be earthed direct, and the handling of the chassis is quite safe and is exactly the same as operating an ordinary A.C. set. The earth via the clip is not sufficient as the chassis is then earthed via the earth condenser C14. If two or more chassis are connected to the same double wound transformer it is essential to connect the same points of the chassis together, otherwise there is a possibility of voltage occurring on the chassis of one of the receivers. Providing, however, both chassis are correctly earthed the secondary side of the transformer will become short-circuited if a faulty connection is made. If dealers require a transformer suitable for testing the universal type of receivers a special type of transformer can be supplied for this purpose. These transformers are supplied in two types, one with an automatic cut-out, Code No. 28.522.470, and one without a cut-out, Code No. 28.522.460. Particulars can be had upon application.

BALANCING THE RECEIVER.

The following instruments and tools will be required :—

1. A Service Oscillator similar to Philips Type GM.2880 which has a wave range of 21 M.C.—100 K.C.
2. An output indicator. For this purpose a unit (GM.2295) containing an adapted impedance with a selenium rectifier can be used, so that a reading can be obtained directly on a sensitive D.C. instrument.
3. A trimming tool. It is not desirable to change the variable condenser, screened coil or trimming condensers unless a Service Oscillator is available.

TRIMMING AND ADJUSTING.

1. The artificial aerial of 200 $\mu\mu$F is connected to the aerial socket and output meter to the loud-speaker sockets. The chassis is to be connected to earth. Trimming condensers C12 and C25 are opened as far as possible and the set is switched for the short waveband.
2. The negative grid bias of L1 is adjusted to negative three volts with the aid of the volume control. (To be measured between the chassis and cathode L1 by means of a moving coil D.C. voltmeter).
3. Move the sliding electrodes of trimmer condensers C12 and C25 to approximately 5·3 and 3·9 mm. respectively from the top of the isolantite insulation, thus giving them approximately the correct capacity.
4. Tune to 500 metres for maximum deflection on the output meter and adjust the pointer to coincide with the 500 metre mark.
5. Next, tune receiver to 200 metres and note the position of the pointer with respect to the 200 metre mark. If there is no difference between the position of the pointer and the 200 metre mark leave the tuning condenser in the same position and adjust C12 and C25 for maximum output. If there is a difference, to one side of the 200 metre mark, re-adjust tuning condenser to place the pointer approximately half way to the other side of the 200 metre mark, leaving condenser setting unchanged, again obtain maximum output by adjusting trimmers C12 and C25. When this has been done, the correct distance, 75 mm., will be found to exist between the tuning positions for 500 metres and 200 metres.
6. Adjust the pointer to the 200 metre mark by means of the driving band adjusting screw. Trimming on medium waveband is now complete. The receiver will then be found to tune correctly to 180 metres or below. Then tune to 225 metres. Switch over to long waves and leaving condenser setting unchanged, adjust long wave trimmers C26 and C13 for maximum output on 900 metres. Check sensitivity and calibration at 200 metres, 500 metres, 900 metres and 1,500 metres.
7. For maximum adjustment to be available on the driving band adjusting screw, the latter should be set at its mean position before balancing and the major adjustments of the pointer should be carried out by rotating the driving drum on the variable condenser spindle.

F 1

TRACING FAULTS WITH THE PHILIPS UNIVERSAL MEASURING APPARATUS.

When a Philips Universal Measuring Apparatus Type 4256 is available, tracing faults can be considerably simplified by applying the so-called " point to point " system.

With this system, circuit values between marked points and chassis or between the valve contacts themselves (11/12) can be measured. The latter are always allotted the same number as follows :—

1 and 2 = the filament.
3 = the control grid.
4 = the contact, if any, for the metallisation.
5 = the cathode.
6 = some extra grid or other point.
7 = the screen grid.
8 = the anode.
9 = an extra grid (as for instance in the case of the octode frequency changer).

Therefore 13, 23, 33, etc., always indicate the control grid circuits of different valves.

When a receiving set requires testing the procedure is as follows :—

A. A set of valves of a known good receiver is placed in the set and if necessary another loudspeaker should be tried, as well as gramophone reproduction. If there are no results, apply **B.**

B. The receiver is taken off from the mains. The valves are removed from the set. Switch the 4256 for measuring resistances on position 12. The + pin of the test flex must be sufficiently insulated and long enough so that it is possible to touch the different contacts of the valve holders, whilst the other pin must be connected to the chassis.

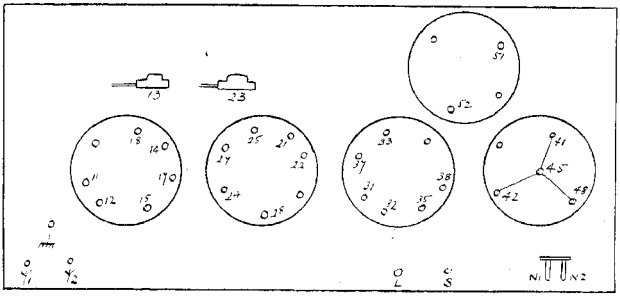
D. The mains contact pins (item 19, Fig. 5, page 15), have to be shorted and a valve socket, the contacts of which have been interconnected, is placed in the valve holder of L4, this safeguards the meter at the same time, as otherwise the electrolytic condensers could be charged up when measuring. The meter would then be in danger of being burnt out. When measuring at the contacts of the valve holder L4 the socket is temporarily removed.

E. The deflection of the meter is compared with the values given in the measuring table.

F. The measuring apparatus is switched in succession to positions 11, 10 and 9 and the readings compared.

The readings on the measuring instrument can be compared with the values for resistances and capacities given in the measuring table. If one of the readings differs considerably from the value given in the measuring table, check up with the aid of the diagram, which resistance or capacity might be shorted or open circuited. As there is an allowance of 10 per cent. for component parts, readings also can differ 10 per cent. without necessarily indicating a fault in the circuit.

When measuring electrolytic condensers (resistance measurements), the deflection will fall back to a certain value, as the leak current is reducing. It may happen that the value found is much too high on account of the condenser in question being defective ; this may also be due to the receiver not having been used for a long time. One should therefore be careful when judging the quality of electrolytic condensers.



RESISTANCES.

12	11 / 12	21 / 22	31 / 32	51 / 52	15	25											
	500	500	500	320	475	5											
11	N1 / N2	35															
	500	260															
10	18	17	37	45													
	470	200	480	470													
9	13	23	33	Aerial 1 /Earth	Aerial 2 /Earth	28	27										
	65	85	205	405	290	275	165										

CAPACITY.

12	Aerial 1 /Earth	Aerial 2 /Earth	13	23	28	33											
	325	195	55	45	255	195											
11	S	L / S	27														
	290	455	285														
10					48	38	18	17									
	500	360	390	255													
9	N1 / N2	45															
	310	310															

Pilot lamps in holders. Mains switch on.

G 1

REPAIR AND DISMANTLING.

1. Care must be taken that after repair the run of the wiring and the position of washers, screening plates, etc., must be the same. No insulating material should be placed on the bare wiring of the H.F. circuits.

2. Do not alter in any way the run of the wiring. The earth connections should be refixed in the same positions to which they were originally fitted.

3. Rivets may be replaced by screws and nuts. Moving parts may be greased with a little pure vaseline.

4. Always solder quickly so that the parts become heated up as little as possible. Soldering joints on condensers and resistances must be made about 1 cm. from the components. These condensers must be suspended free from the other wiring.

Electrolytic Condensers C1 and C2.

For removing use a box spanner as shown in Fig. 1.

Fig. 1.

Electrolytic Condenser C3.

This condenser is polarised, therefore the side which has a red band is the positive pole.

Resistances.

As some of the resistances are likely to get warm during operation, they should always be mounted so that contact is not made with any other part.

Driving Mechanism.

The driving band can be adjusted by the screw at the right hand side at the back. Any slight roughness on the scale pointer can be removed by adjusting the pointer or slightly greasing the guide rod which carries the cursor.

Should it be necessary to remove the drive band it can easily be reassembled by placing the pin fixed on the band in the hole in the condenser drum and resecuring the spring where necessary.

The drum disc is secured by two set screws and these must be effectively locked if they are removed at any time.

Volume Control and Mains Switch.

This part is coupled in one assembly. It is secured to the chassis by two screws and the spindle is pinned. No difficulty should be experienced in removing it for repairs or replacement.

Wavechange Switch.

Any necessary adjustments should, as far as possible, be made while the switch is in position. If it is required to remove the spindle the back unpainted grub screw should be released and also the catch plate which is secured by the two screws on the chassis front.

Reassembling Chassis in Receiver.

When the chassis is replaced in the cabinet turn the variable condenser and cursor to minimum. The small fluted engaging pin can then be slipped into the metal fork quite easily.

REPAIRING AND DISMANTLING OF LOUDSPEAKER.

Code No. 28.999.050. Type 4283.

Defects.

1. Open or short circuit in the coil of the transformer; no sound.

2. Coil jammed in the air gap; sound weak or distorted.

3. Rustling; dirt in the air gap; distorted coil, damaged cone, slack connections touching cone.

Important Points to be remembered during repair.

1. Repair must be effected on an entirely dust free table (not an iron table) with good tools.

2. The front or rear plate may, under no circumstances, be removed from the magnet, as this would cause the latter to weaken.

3. Immediately after repair the cloth cover must be replaced round the loudspeaker.
When the cone is moved carefully up and down (see fig. 2), no noise should be heard; a sound might be produced by the coil touching the sides of the air gap or by dirt in the air gap. A dirty air gap is cleaned by means of some stiff material enveloped in wadding soaked in alcohol. Iron particles can be removed by means of a flat steel spring.

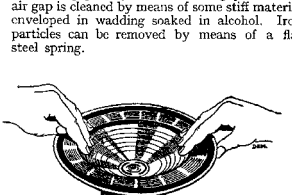


Fig. 2.

Centring the Cone.

This is effected by means of four feelers, 0·2 mm. thick (Code No. 09.990.840) which are placed in the air gap between the coil and the plate through the perforations of the centring disc. A new cone is

centred by means of the four feelers and fixed by means of a special service ring (Code No. 28.445.821). Commence by turning down the tags at 4 points 90° from each other. After all the tags have been bent down the feelers should be removed from the air gap. The wires to the transformer must be fixed at their correct length, because if they are too tight they interfere with the movement of the cone, and when too slack they touch the cone.

For changing the cone carrier a jig is necessary, which has to be placed in the air-gap before the nuts are loosened. This jig may also be used for centring the cone in the air-gap (see Fig. 3).

Fig. 3.

LIST OF SPARE PARTS AND TOOLS.

When ordering any of these items please state :—

1. Code number.
2. Type and serial number of receiver.
3. Description.

Fig.	Item.	Description.	Code No.
4	1	Cabinet	28.242.360
4	2	Station dial	28.701.200
4	3	Escutcheon, colour 005	28.894.670
4	4	Philips emblem	25.988.610
4	5	Driving strip	28.884.740
5	6	Driving disc	28.477.080
4	7	Spring for driving strip	28.740.050
4	8	Pointer	28.944.181
4	9	Sliding support for needle	25.868.800
4	10	Knob for condenser	23.995.590
4	11	Knob for switch	23.995.590
4	12	Knob for volume control	23.995.590
7	14	Back	28.397.690
		Back plate assembly (complete)	28.870.580
7	13	Moulded socket for safety switch	25.742.000
		Mains plug	23.947.000
	16	Spring for fixing back	25.673.860
	15	Spring for fixing back (top)	28.750.040
7	23	Protecting cover for aerial and earth	23.994.680
5	17	Socket plate for aerial and earth connection	28.884.420
7	21	Protecting cover for loudspeaker	23.992.541
5	18	Socket plate for loudspeaker	28.884.440
7	19	2-pin plug plate for safety switch	28.864.270
6	38	Holder for dial lamp	28.837.390
6	39	Milled nut for dial lamp	07.749.160
	20	Earth contact plate	28.870.570
7	22	Valve cap	28.852.050
5	40	Valve holder, 4 pins	28.225.900
	42	Valve holder, 7 pins	28.225.420
	41	Valve holder, 5 pins	28.225.410
5	24	Spindle volume control, mains switch	23.645.000
5	25	Spindle wavelength switch	23.645.010
5	26	Friction drive	28.910.010
5	27	Spindle for variable condenser	23.645.020
5	28	Volume control complete	28.811.220
5	29	Mains switch	08.529.460
5	30	Stator; wavelength switch with 12 contacts	25.868.760
5	31	Rotor without contact	25.439.381
5	32	Contact piece	25.046.592
5	33	Tube with flange (hub)	25.104.180
5	34	Spring	25.668.710
5	35	Lever for "Star" click plate	25.866.520
	36	Bottom cover	28.867.792
5	37	Spring for bottom cover	28.750.490
		Celluloid envelope for scale	28.337.051
		LOUDSPEAKER.	
		Protecting cap	28.250.430
		Clamping ring	28.445.820
		Cardboard ring	28.445.390
		Cone and coil	25.152.420

LIST OF SPARE PARTS AND TOOLS—continued.

Fig.	Item.	Description.	Code No.
		TOOLS.	
		Trimming tool	09.990.900
		Universal measuring apparatus	09.991.030
		Universal support...	09.991.380
3		Centring gauge for air gap	09.991.022
1		Pertinax distance pieces for centring cone	09.990.840
		Box spanner for electrolytic condensers	09.990.760
		Service Oscillator Type GM.2880 (14—3,000 metres)	09.991.260
		Auxiliary dial	.....

VALVES.

	L1	L2	L3	L4	L5	L6, L7
Type	VP13C	SP13C	Pen36C	CY1C	C1 or C1C	8070

TABLE OF VOLTAGES AND CURRENTS.

	L1.	L2.	L3.	
Va	180—174	28.5	162	Volts
Vg'	85—88	24.5	84	Volts
—Vg	1.7—15.7	—	13.3	Volts
Ia	7.5	0.38	38	mA
Ig'	2.83	0.4	9	mA

(1) All measurements are obtained with a mains voltage of 200 volts.
(2) The voltages were measured with voltmeters having a resistance of 2,000 ohms per volt. The values given above are the mean of several measurements, therefore some readings obtained may differ appreciably, particularly as variations may arise due to the tolerances of the components as well as the valves. Before finally deciding that a valve is defective it is recommended that a replacement test with the same type of valve is made.

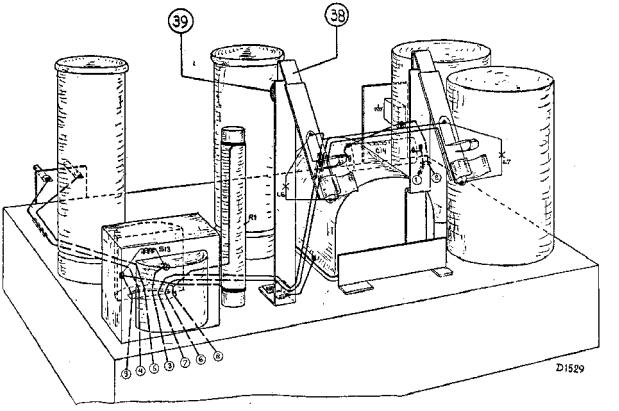

39
38
D1529

Fig. 6

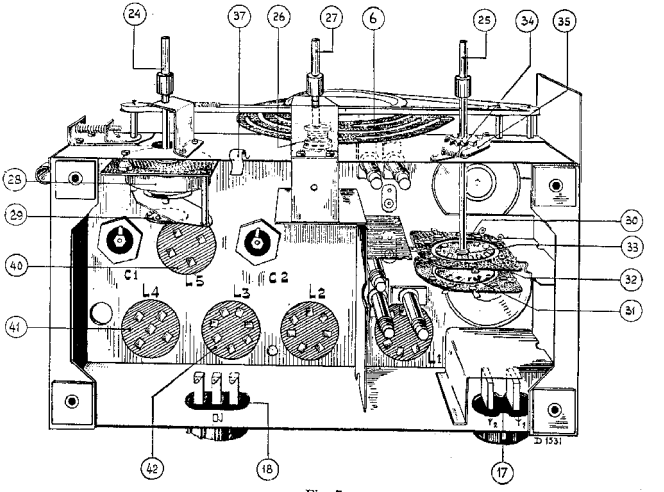

24
37
26
27
6
25
34
35
28
29
30
33
40
C1
L5
C2
L4
L3
L2
32
41
31
DJ
T2
T1
D 1531
42
18
17

Fig. 7

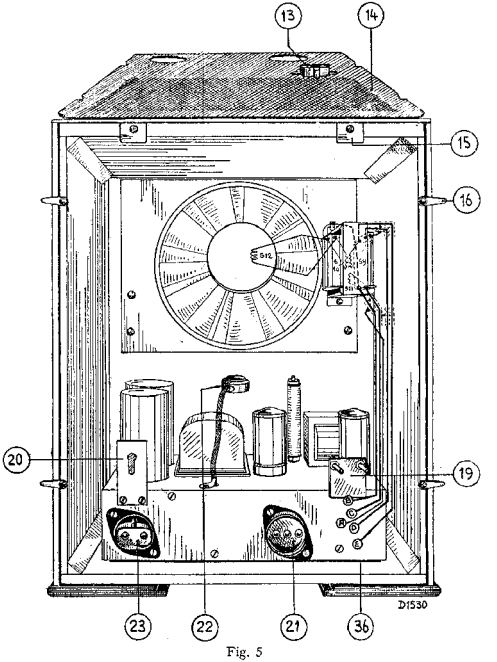
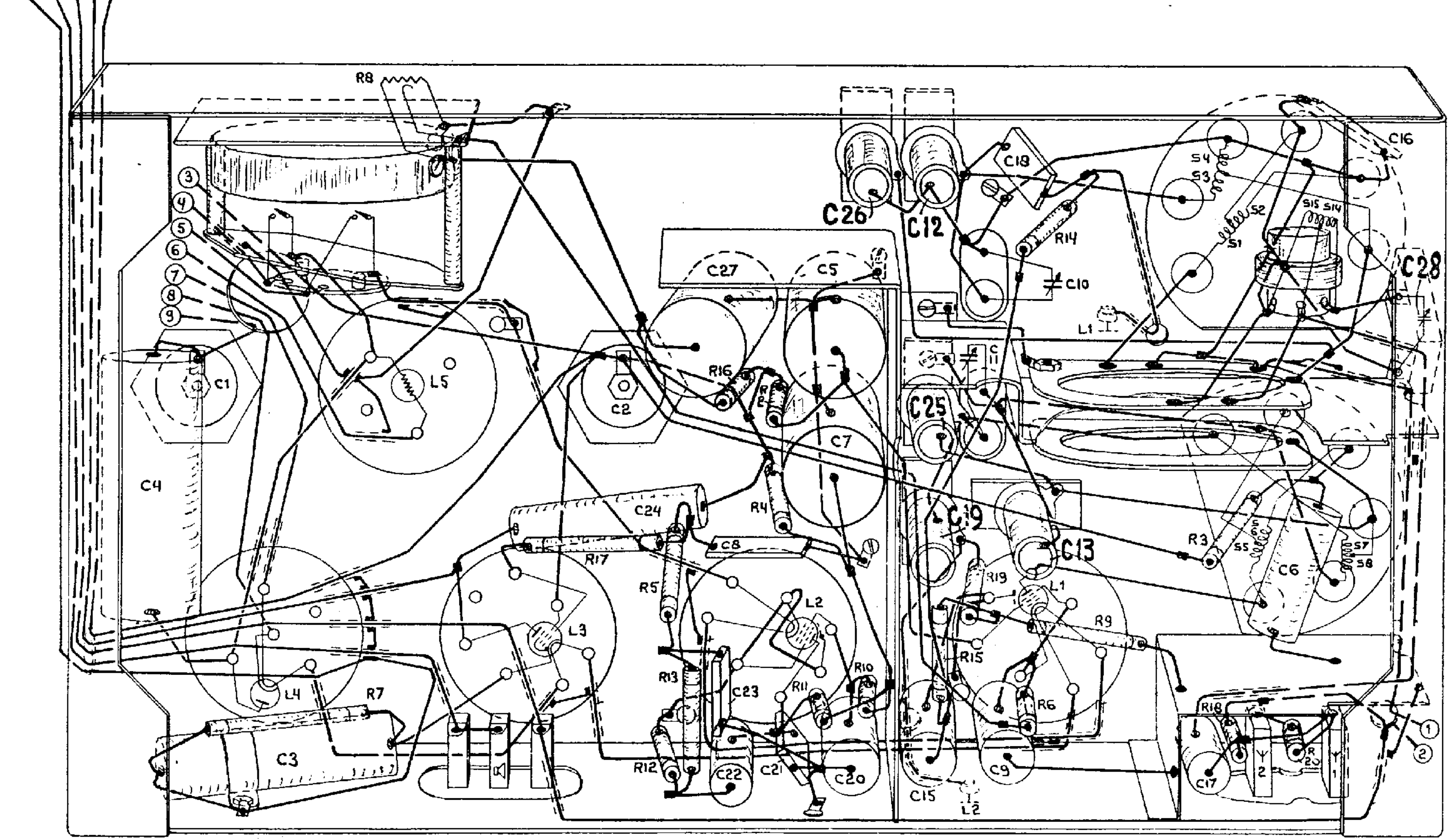


Fig. 5

S: 3.4, 1,2 ,5,6, 15,14, 7,8

C: 4, 1, 3, 2,24, 8,22,27,23,21, 5,7,20,26,15,12,25,19, 11,9,18,13,10, 17, 6, 16,28

R: 7, 8, 17, 5,12,13, 16,4,2, 11, 10, 15, 19, 6,14,9, 3,18 20



D1528

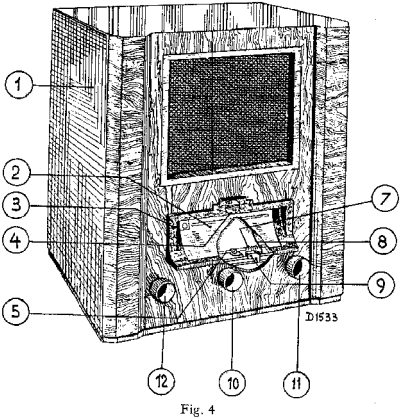


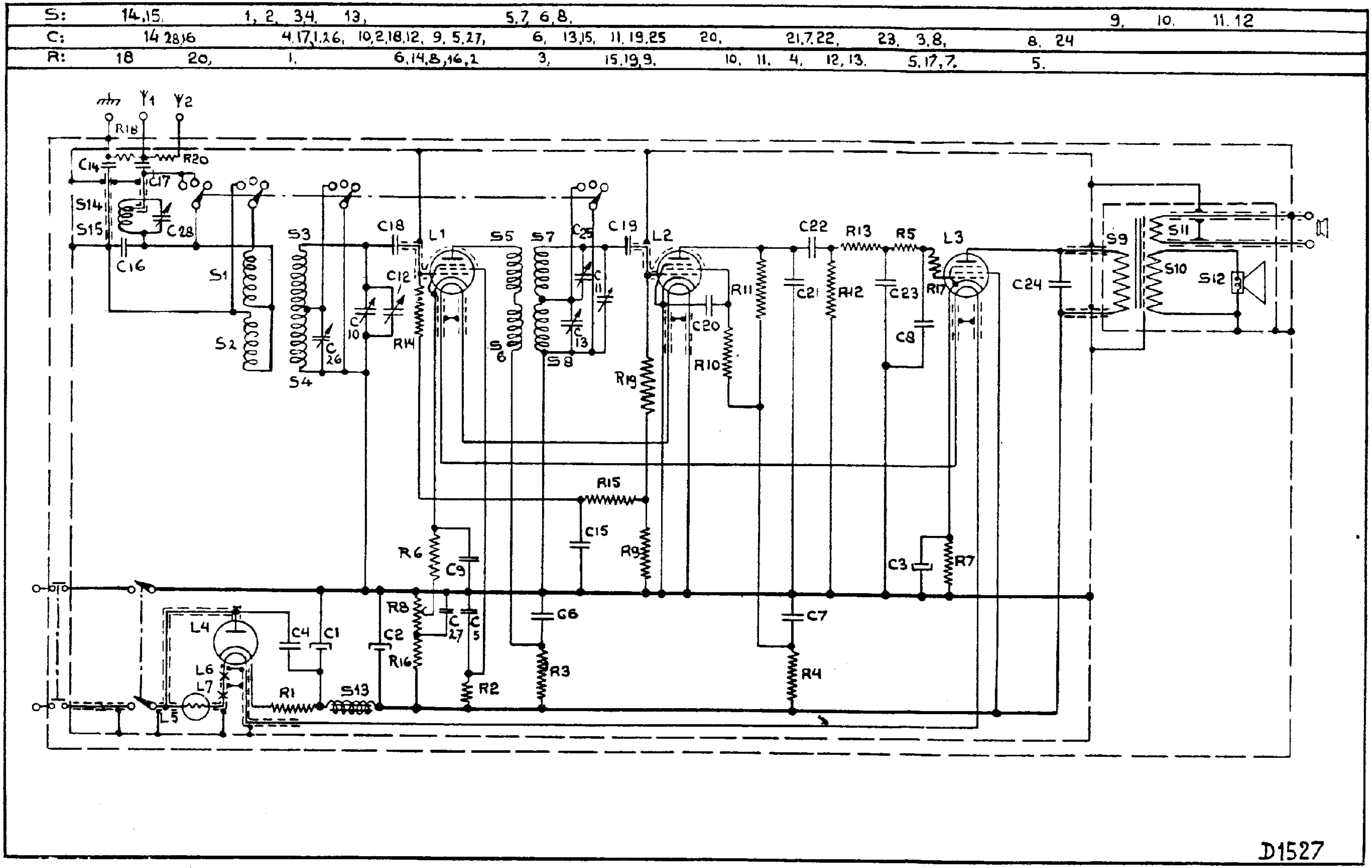
Fig. 4

RESISTANCES.

Designation	Resistances.	Code No.
R1	200 Ohm	28.799.420
R2	32000 Ohm	28.770.400
R3	1000 Ohm	28.770.250
R4	20000 Ohm	28.770.380
R5	50000 Ohm	28.770.420
R6	200 Ohm	28.770.180
R7	200 Ohm	28.770.830
R8	12500 Ohm	28.811.180
R9	0.64 M. Ohm	28.770.530
R10	0.8 M. Ohm	28.770.540
R11	0.32 M. Ohm	28.770.500
R12	0.5 M. Ohm	28.770.520
R13	50000 Ohm	28.770.420
R14	1.35 M. Ohm	28.770.560
R15	0.8 M. Ohm	28.770.540
R16	64000/2 Ohm	28.771.080
R17	1000 Ohm	28.770.250
R18	0.1 M. Ohm	28.770.450
R19	1.25 M. Ohm	28.770.560
R20	0.2 M. Ohm	28.770.480
R21	200 Ohm	28.720.180

CONDENSERS.

C1	32 μF	28.180.130
C2	32 μF	28.180.130
C3	25 μF	28.180.020
C4	0.1 μF	28.199.900
C5	0.5 μF	28.198.270
C6	0.1 μF	28.199.090
C7	0.5 μF	28.198.270
C8	100 $\mu\mu$F	28.190.130
C9	0.1 μF	28.199.090
C10	11—450 $\mu\mu$F	28.210.510
C11	11—450 $\mu\mu$F	
C12	0—27 $\mu\mu$F	25.115.410
C13	0—27 $\mu\mu$F	25.115.410
C14	0.1 μF	28.199.850
C15	0.1 μF	28.199.090
C16	80 $\mu\mu$F	28.190.120
C17	1000 $\mu\mu$F	28.199.650
C18	64 $\mu\mu$F	28.190.110
C19	25 $\mu\mu$F	28.210.040
C20	0.1 μF	28.199.090
C21	125 $\mu\mu$F	28.190.140
C22	20000 $\mu\mu$F	28.199.020
C23	100 $\mu\mu$F	28.190.130
C24	4000 $\mu\mu$F	28.199.710
C25	0—27 $\mu\mu$F	25.115.410
C26	0—27 $\mu\mu$F	25.115.410
C27	0.5 μF	28.198.270
C28	60—160 $\mu\mu$F	28.210.720



S: 14,15. 1, 2, 3,4, 13, 5,7, 6,8, 9, 10, 11, 12
C: 14 28,16 4,17,1,26, 10,2,18,12, 9, 5,27, 6, 13,15, 11, 19,25 20, 21,7,22, 23, 3,8, 8, 24
R: 18 20, 1, 6,14,8,16,2 3, 15,19,9, 10, 11, 4, 12,13, 5,17,7, 5.
L1
L2
L3
L4
L5
L6
L7
D1527

OHMIC RESISTANCE OF COILS.

Coil.	Resistance in Ohms.	Code No.
S1 ; S2 ; S3 ; S4	110 ; 110 ; 2 ; 30	28.564.780
S5 ; S6 ; S7 ; S8	10.5 ; 60 ; 2.4 ; 27	28.564.520
S9 ; S10 ; S11	250 ; 0.8 ; 1100	28.528.800
S12	5	25.152.420
S13	700	28.550.760
S14 ; S15	10.5 ; 30	28.565.060

Some receivers may have a resistance R21 of 200 Ohms fitted in series with the H.T. lead and the auxiliary screen socket of L3.