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A26RG
RECEIVER
TECHNICAL NOTES

Owing to production changes it may be found that individual receivers differ in minor details from the ensuing description.

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THE CIRCUIT

The Murphy A26RG may be described as a four valve set in so far as it contains four valve sockets—omitting the one for the mains rectifying valve. However, owing to the use of high efficiency valves and to the fact that some of the valve envelopes contain multi-electrode systems, the A26RG should be classified according to its performance rather than the apparent number of valves employed.

The accompanying schematic diagram (Fig. 3, page 10) shows the circuit.

In order to discriminate between two valve systems contained in the same envelope, distinguishing names will be given to them. Thus the two valves enclosed within the V1 envelope will be spoken of as V1Pen. and V1Triode respectively. Examination of the circuit diagram shows the position of the special valves employed in this receiver : these are V1, and V3. V1 combines an R.F. pentode and triode oscillator, whilst V3 is a double diode rectifier. The remaining valves V2 and V4 are both high slope pentodes, the former being specially designed for R.F. amplification and the latter being an extremely sensitive output valve. In addition, V2 acts as a gramophone amplifier as described below.

Referring again to the circuit diagram it is seen that the aerial is coupled to a band pass tuning arrangement (L3, L7, C1A, C1B, etc.) which incorporates an image frequency suppression circuit (Lo, Co). From the secondary of the aerial band pass tuning circuit signals are passed on to the grid of V1 Pen., where they are mixed with the local oscillations generated by V1 Triode and rectified, thus producing an I.F. signal at 117 k.c. This signal is fed through the I.F. transformer L15, L16 to the I.F. amplifier V2 and thence through the I.F. transformer L17, L18 to the detector V3 diode (A1).

At this point the signal encounters the A.V.C. system of which a brief description will be given here. The central idea behind this system is to arrange the circuits in such a way that the D.C. voltage produced by rectification of the I.F. carrier wave acts as a bias for V1 Pentode and V2. One of the diodes in V3 is used for this purpose, and it is fed from the primary of the second I.F. transformer. A delay voltage which prevents the operation of A.V.C. for weak inputs, is obtained from the voltage drop across R15, R16, in the cathode circuit of V4.

After rectification the signal is passed to the grid of V4 *via* the volume control R19, and the coupling condenser C25. C28 and R21 act as the tone control, R21 being adjustable. It should be noted that this control is shunted across the primary of the output transformer, instead of between V4 anode and chassis : this method of connection limits the voltage on C28 to that developed across T1.

The H.T. is supplied by a full wave rectifier, U12, the majority of the smoothing being carried out by the speaker field, in conjunction with C29, C30 and C20. The function of the hum bucking coil fitted to the speaker is to inject externally into the speech coil a certain percentage of any A.C. voltage which may be present in the speaker field. In this way the corresponding hum-voltage normally induced in the speech coil is neutralised.

In order to provide for the reproduction of gramophone records a four-pole switch, S7a, b, c, d, is used to make the necessary alterations to the circuit : in particular, V2 is arranged to act as a triode amplifier following the pick-up. Thus, when S7c opens, a resistance (R20) is inserted in series with the lead to the screening grid of V2, while S7d, which closes at the same time, connects the screening grid to the volume control *via* a coupling condenser, C32: in this way the screen is made to act as an anode, resistance coupled to V4. The

pick-up is permanently connected in V2 grid circuit, so that the voltages it develops may be amplified by the valve, and passed to V4 *via* R20 and C32 : the radio performance of the receiver is not, however, affected by this arrangement, since connection is made to the low potential or " earthy " side of L16, and furthermore the pick-up is shunted by a condenser, C31.

The function of contacts S7a and S7b is to prevent breakthrough of radio signals when records are being played : S7a short circuits the oscillator coils, while S7b disconnects V1 Pentode screening grid from the H.T. supply. Unless this latter precaution is taken, there is some danger of the local station being heard owing to the aperiodic amplification afforded by V1 and V2.

The actual controls of the set are five in number :

(1) Upper central knob : Ganged tuning condenser.
(2) Left-hand knob : Volume control and on-off switch.
(3) Central knob : Tone control.
(4) Right-hand knob : Wave-change switch.

The 5th control is mounted to the left-hand side at the rear of the motor board, and takes the form of a push-pull switch. Its function is to change from radio to gramophone when pulled to its upper position.

There are one or two special points in this receiver which call for attention.

Item (1) The position of the following components should be noticed ; the image frequency suppressor condenser Co, the band pass coupling L5, L6 and the output transformer T1. All these items are mounted underneath the chassis and may be seen in Figure 2.

Item (2) The potential of V3 cathode ; from the circuit diagram it is seen that the cathode of V3 is considerably positive with respect to chassis. This voltage is derived from a resistance in the cathode circuit of V4, and provides the delay for the A.V.C. system.

Item (3) The position of the R.G. switch. This is mounted on the earth panel : it is operated through a lever and link mechanism from a knob on the motor-board.

DISMANTLING

To remove the chassis from the cabinet first take off all control knobs, and unplug the loudspeaker leads from their sockets at the rear. Then remove the two top fixing screws from the metal back, and loosen the two lower ones—it is unnecessary to remove these latter altogether. Disengage the back from the screws, and move it sufficiently to allow the flexible leads and plugs which it carries to be disconnected from the chassis : the back can then be completely removed.

Take out the field plugs from the socket strip on the mains transformer and the pick-up plugs from the sockets on the right-hand side of the receiver, unclip the metal rod from the radio-gramophone switch dolly by pulling the former outwards, and disconnect the earth lead from the speaker chassis. With a quarter-inch Whitworth box spanner remove the three hex-headed holding-down screws ; these can be reached from the loudspeaker compartment, working from below. The chassis will now slide out.

Note that the number of the set is given on the name plate fixed to the cabinet back ; it is repeated on the chassis itself. If by any chance two sets are taken down at the same time make sure that each back and cabinet are kept together, so that when replacing the chassis they may be returned to their correct cabinets.

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PRACTICAL LAYOUT

The practical lay-out of the A26RG chassis differs from that of the A24RG in several respects. Amongst other points may be mentioned the absence of the heterodyne filter, and the new position of the electrolytic condensers and output transformer underneath instead of above the chassis ; the electrolytic condensers being included in the W2030 Bank, while the output transformer is situated behind the volume control.

The W2030 bank consists of large capacity electrolytic condensers only ; all other condensers and resistances are accommodated on the sub-panels and in the I.F. assemblies.

An important change has been made in the position of the on-off switch, this now being ganged to the volume control in order to minimise the pick-up of mains noise. On account of this alteration the wave-change switch has only two positions.

Fig. 1 is a plan of the chassis. It shows the components that are above the base, and also the fittings on the back edge. The sequence of the valves is similar to that obtaining in the circuit diagram. The actual valves used are :

Left hand	V1	Mazda AC/TP (met).
Second	V2	„ AC/VP1 (met).
Third	V3	„ V914 (clear).
Right hand	V4	„ AC/2Pen (clear).
Back right hand	V5	Marconi or Osram U12. or Mazda UU3.

In order that the details of the wiring of the components enclosed within the coil cans may be clearly seen, diagrammatic views of these assemblies are shown in Figures 5, 6, 7, 8 and 9 ; the views being obtained by looking at the coils from the top with the cans removed. In reading these diagrams care must be taken to see that the coloured tracers in the external connecting wires correspond exactly to the colours given in the illustrations. Otherwise confusion may arise owing to the diagram and the actual assembly being looked at from different angles.

On turning the chassis over, we get the " worm's eye " view shown in Fig. 2. Most of this is clear enough, but there are four component assemblies that call for special notice and we also give separate illustrations of these.

W2030. This is a block of four electrolytic condensers. Fig. 4 shows how it is arranged looking at the side where the tags show. The reference numbers on the condensers show where they are in circuit by referring to the schematic diagram, Fig. 1.

The arrow heads show where all the external connections go to, so that by the aid of the diagram one can change the assembly, and put in a spare without errors in re-wiring.

V2156. This lies behind V3 ; the internal and external connections can be seen in Fig. 10.

V2049. This is adjacent to the output transformer. Connections are given in Fig. 11.

V2053. This lies behind V1. Connections are given in Fig. 12.

W2332. This is situated below the pick-up socket panel, and is shown in Fig. 13.

As a large number of wires connect to the radio gramophone switch a diagram (Fig. 14) is given showing the point to which each lead goes.

VOLTAGES AND CURRENTS

The following table of voltages is given as a guide only—considerable variations may occur without seriously detracting from the efficiency of the receiver.

Owing to the particular circuit employed in the A26RG, the various voltages depend to some extent on the strength of the applied signal. For this reason certain readings were taken with and without a strong signal, in order to give an idea of the changes to be expected under working conditions. Similarly, in cases where voltages differ according to the position of the radio-gramophone switch, both readings are given.

Except where otherwise stated, voltages are to chassis ; they are those obtained with a " 1000 ohms per volt " meter, where possible using a 0—250 volts range.

VALVE OR COMPONENT	TESTING POINT		VOLTS	mAmps
V.1 PENTODE	A	Strong signal	240	1.0
		No signal	200	5.0
	S.G.	No signal	180	1.5
	C	Strong signal	2.5	
		No signal	7.0	
V.1 TRIODE	A	No signal	75	1.5
		Strong signal	255	3.5
V.2	A	No signal	240	7.0
		Gram.	255	6.0
	S.G.	Radio	220	1.5
		Gram.	160	1.2
	C	Strong signal	1	
		No signal	3	
V.3	D1A	Strong signal	—	—
		No signal	—	—
	D2A	Strong signal	— 25	—
		No signal	—	—
	C		15	
V.4	A	Strong signal	240	30.0
		No Signal	220	28.0
	S.G.	No Signal	240	7.0
	C	Strong signal	16	
		No signal	15	
L.S. FIELD	Tag F	Strong signal	—105	
		No signal	—115	
H.T. VOLTS across C.30	Tag B.	Strong signal	255	
		No signal	240	
RECT. H.T. VOLTS across C.29	Tags B. & F.	Strong signal	360	
		No signal	355	

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TRIMMING

A modulated oscillator is highly desirable for trimming the A26RG receiver : if this is not available only the radio frequency circuits can be adjusted and sets with faulty I.F. trimming must be returned to the Factory.

APPARATUS REQUIRED

(1) An insulated screwdriver. The blade should be either covered with sleeving or wrapped with insulating tape for about an inch from the tip, leaving only 1/16th-inch of the tip of the blade exposed.

(2) 0-1.5v. or 0-50v. A.C. voltmeter. Alternatively 0-10 milliammeter.

If an 0-1.5 voltmeter is used it must be connected directly across the speech coil of the loudspeaker : if, however, an 0-50 voltmeter is used this must be connected in series with a 1.0 mfd. condenser and the two together then connected across T1 primary. Alternatively they may be connected between V4 anode and chassis. The 0-10 milliammeter should be connected between Tag B on the W2030 bank and the pink lead from the 2nd I.F. can : *i.e.* in V2 anode lead.

GENERAL INSTRUCTIONS FOR TRIMMING

(*a*) When using a voltmeter indicator the input must be kept low enough to prevent the A.V.C. coming into operation, or alternatively, the latter must be cut out by disconnecting the green wire from the D2A socket. When a milliammeter is used, however, the A.V.C. must not be cut out, otherwise no deflection will be obtained.

(*b*) Set the manual volume control at its maximum position : this ensures that, provided the receiver is worked at a normal volume level, overloading will not take place in the H.F. stages when A.V.C. is removed.

(*c*) Make all trimming adjustments with the greatest possible care, bearing in mind that the operation is essentially critical and that faulty trimming can completely spoil the performance of a receiver.

TRIMMING BY MEANS OF A BROADCAST SIGNAL

NOTE—When trimming by means of a broadcast signal, a milliammeter must be used for the purpose and not an output meter.

(1) Tune in a fairly strong station between 200-220m. : identify it definitely and look up its wavelength. Compare with the reading on the set. If it is correct, go on at once to (2) below. If not correct, adjust the tuning control to exactly the right wavelength of the station, and then trim on C6 till you get the biggest meter deflection.

(2) Trim C2 to increase the deflection if possible.

(3) Do not touch the main tuning control. Trim C4 to best output ; go back to C2 and see if it needs further adjustment, then continue checking C2 and C4 alternatively until no improvement is obtained.

(4) Switch to long waves. Tune in Oslo or the nearest station to 1100m. available. Check its wavelength against the setting ; if correct go on to (5). If not, set the tuning control to the right wavelength, and trim on C7 to maximum meter deflection.

(5) Leave the tuning control set, and do as in (2) and (3) but working on C3 and C5 instead of C2 and C4.

TRIMMING BY MEANS OF A MODULATED OSCILLATOR

(1) Tune the oscillator to 200m. and switch to internal modulation. Connect the output of the oscillator to the aerial and earth of the receiver (*via* the dummy aerial if this is provided). Now tune the set to receive this 200m. signal at maximum strength and adjust the oscillator output to give about half scale reading on the meter. Check the reading on the set ; if it is exactly 200m. go on at once to (2) below. If it is not correct, adjust the receiver dial to 200m. and then trim C6 for maximum meter deflection.

(2) Trim C2 to increase the deflection, if possible.

(3) Do not touch the main tuning control. Trim C4 to best output : go back to C2 and see if it needs further adjustment, then continue checking C2 and C4 alternatively until no improvement is obtained.

(4) Switch to long waves. Tune the oscillator to 950m. and tune the set to receive this signal at maximum strength, again adjusting the oscillator output to give a reasonable reading on the meter. Check the reading on the set, if it is exactly 950m. go on at once to (5) below. If it is not correct, adjust the receiver dial to 950m. and trim C7 for maximum output.

(5) Leave the tuning control set and adjust as in (3) and (4) but working on C3 and C5 instead of C2 and C4.

I.F. TRIMMING

When I.F. trimming is necessary it should be carried out before the R.F. trimming ; as, however, the latter is somewhat simpler it will probably be done first whenever the general symptoms indicate faulty trimming. However, if R.F. trimming does not clear the trouble and I.F. trimming has to be resorted to, then, when this is complete the R.F. circuits must be re-trimmed.

First switch the receiver to medium waves and short circuit L9 or L11 to prevent V1 oscillating. Then tune the oscillator to 117 K.C. and feed its output (*via* the dummy aerial) to the input circuit of V2. That is, connect the A & E terminals on the oscillator to the grid of V2 and chassis, respectively. The output control is set to give a small reading on the indicator and trimmers C18, C17 are adjusted (in turn) until a maximum deflection is obtained. This is followed by the adjustment of C16 and C15, the oscillator output in this case being transferred to the grid of V1 Pen and chassis. When all four circuits have been trimmed for resonance the adjustment is complete and the R.F. circuits can be aligned.

N.B.—Sets bearing serial numbers upwards from A26 10,299, A26C 5735, A26RG 2567, have their I.F. circuits adjusted to 119Kc/s.

ADJUSTING THE IMAGE FREQUENCY SUPPRESSOR

This operation differs from normal R.F. and I.F. trimming in two important particulars ; in the first place the maximum possible output is required from the oscillator and in the second place the adjustment is for minimum and not maximum speaker response. The latter condition necessitates the use of the ear as an indicator, as in this special case an aural test is far more sensitive than the use of a meter. The actual adjustment is fairly simple, the oscillator is tuned to 333m. and the receiver to 450m. ; these being the conditions under which the set will receive a weak " image " signal from the oscillator. Hence, when this image signal is heard, it is necessary to adjust carefully the erinoid screw (situated on top of the band pass secondary coil) until the absolute minimum signal is heard in the speaker. Under these conditions the image frequency suppression system will be correctly adjusted.

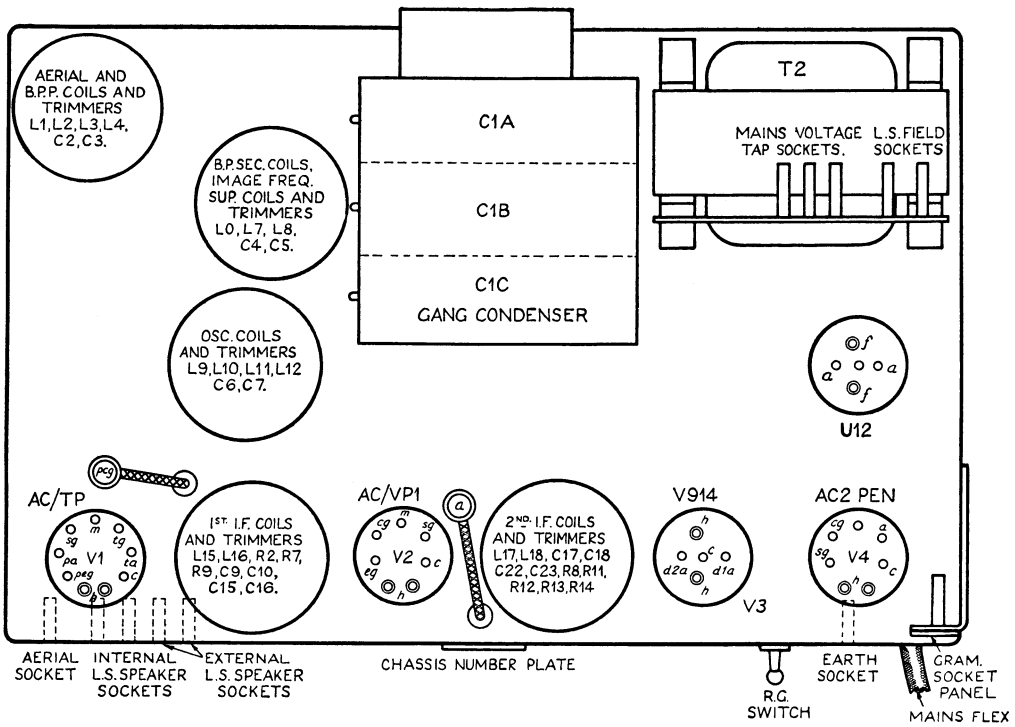

FIG. 1 PLAN OF CHASSIS

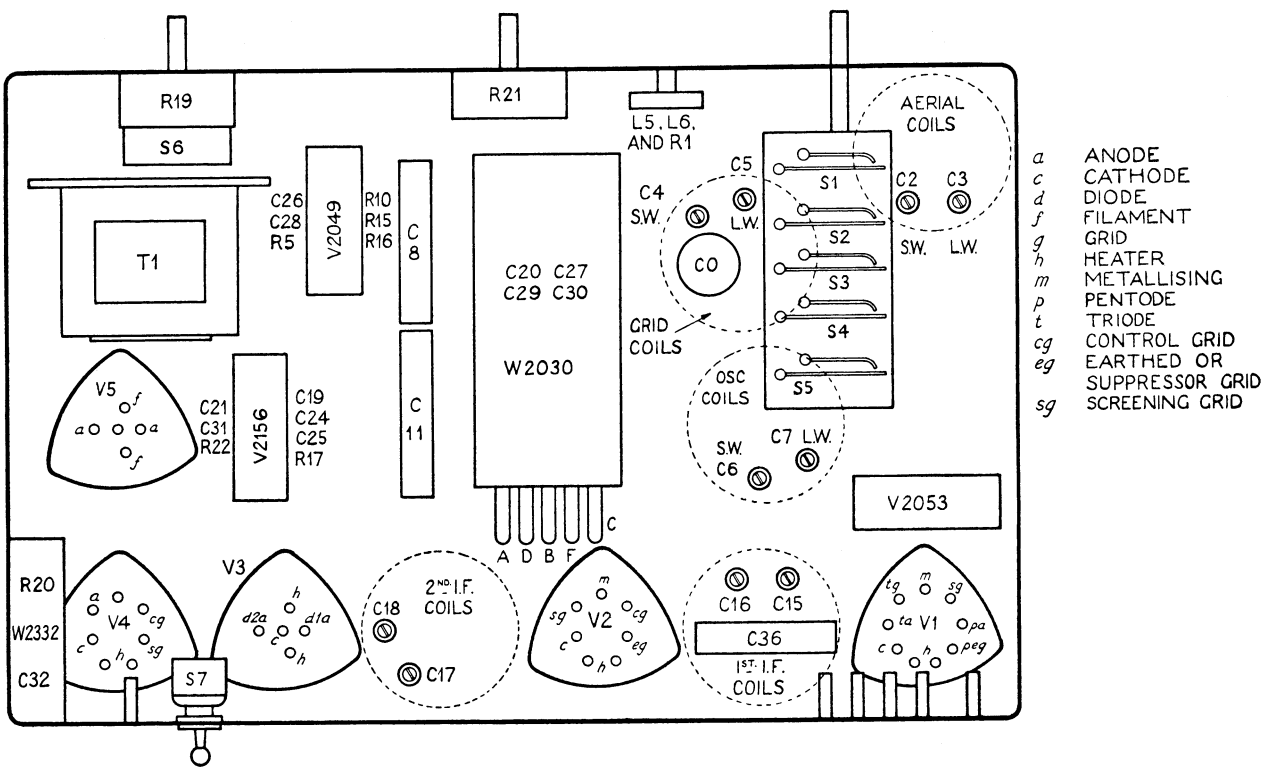

FIG. 2 UNDERSIDE OF CHASSIS

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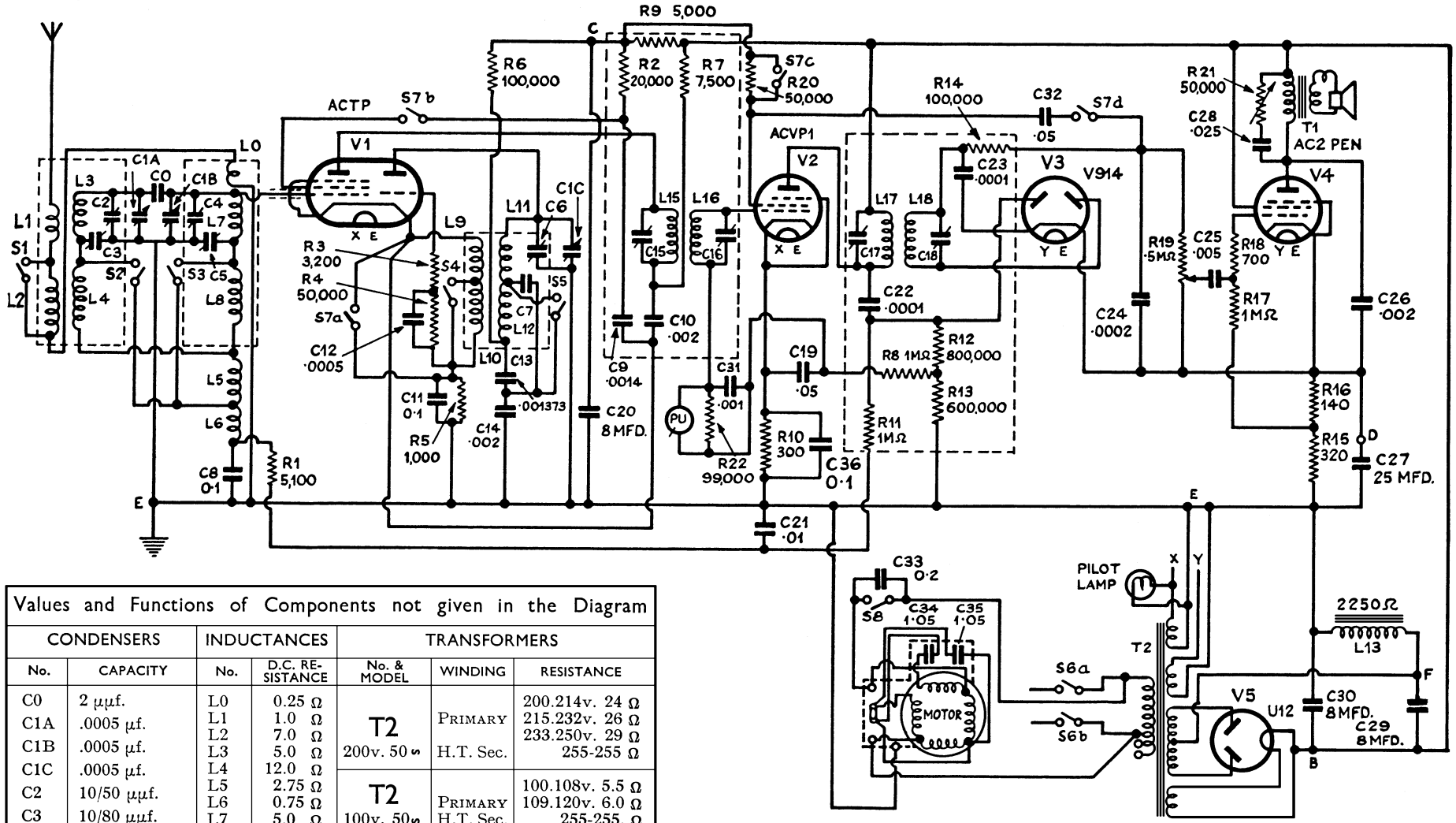
FIG. 3



Values and Functions of Components not given in the Diagram						
CONDENSERS		INDUCTANCES		TRANSFORMERS		
No.	CAPACITY	No.	D.C. RESISTANCE	No. & MODEL	WINDING	RESISTANCE
C0	2 μμf.	L0	0.25 Ω	T2 200v. 50 w	Primary	200.214v. 24 Ω
C1A	.0005 μf.	L1	1.0 Ω			215.232v. 26 Ω
C1B	.0005 μf.	L2	7.0 Ω			233.250v. 29 Ω
C1C	.0005 μf.	L3	5.0 Ω		H.T. Sec.	255-255 Ω
C2	10/50 μμf.	L4	12.0 Ω	T2 100v. 50w	Primary	100.108v. 5.5 Ω
C3	10/80 μμf.	L5	2.75 Ω			109.120v. 6.0 Ω
C4	10/50 μμf.	L6	0.75 Ω		H.T. Sec.	255-255. Ω
C5	10/80 μμf.	L7	5.0 Ω	T2 200v. 25 w	Primary	200.214v. 36 Ω
C6	10/50 μμf.	L8	12.0 Ω			215.232v. 39 Ω
C7	10/80 μμf.	L9	1.0 Ω			233.250v. 43 Ω
C15	70/140 μμf.	L10	2.5 Ω		H.T. Sec.	398-398 Ω
C16	70/140 μμf.	L11	4.0 Ω	T1	Primary	650 Ω
C17	70/140 μμf.	L12	8.0 Ω		Secondary	0.25 Ω
C18	70/140 μμf.	L13	2400 Ω	L.S.	Speech Coil	2 Ω
		L15	40 Ω			
		L16	40 Ω			
		L17	40 Ω			
		L18	40 Ω			

ALL RESISTANCE VALUES ARE IN OHMS AND CONDENSER VALUES ARE IN MICROFARADS UNLESS OTHERWISE STATED. BLOCK LETTERS, A.B.C., Etc., REFER TO THE POSITION OF SOLDER TAGS IN CONDENSER BLOCK W.2030.

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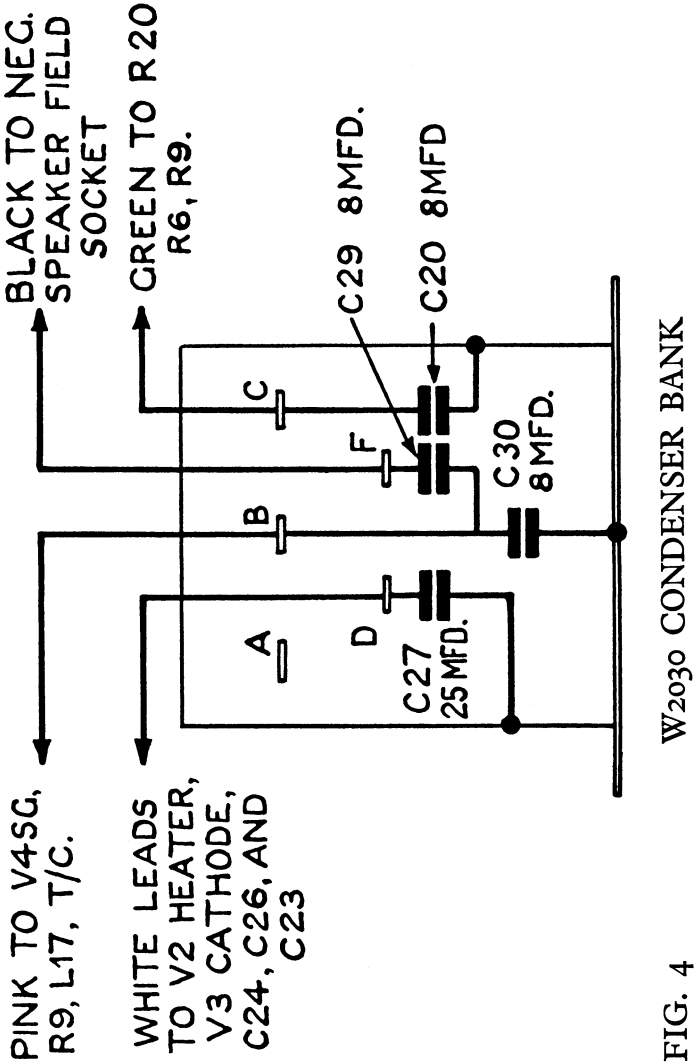
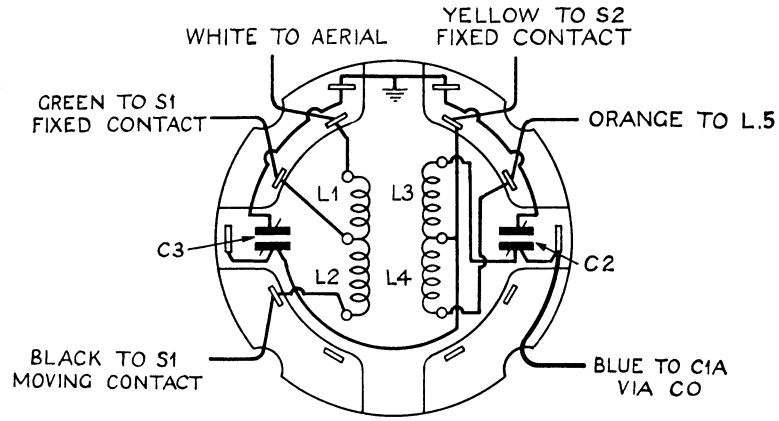


FIG. 4

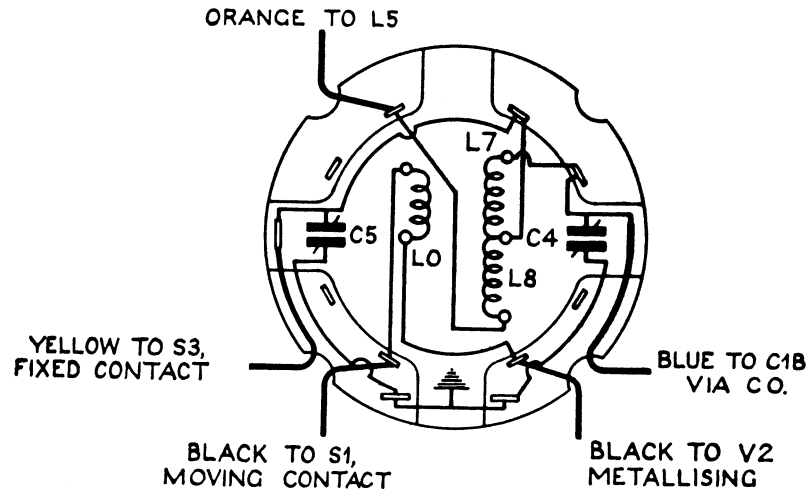
AERIAL COILS

FIG. 5



GRID COILS

FIG. 6



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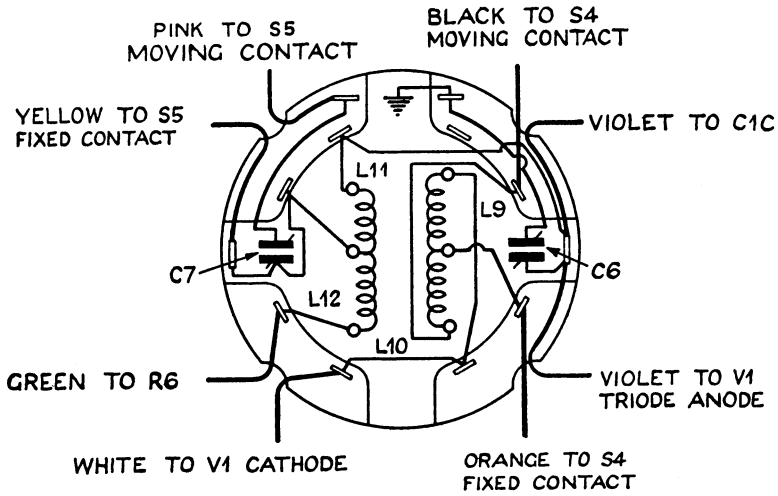
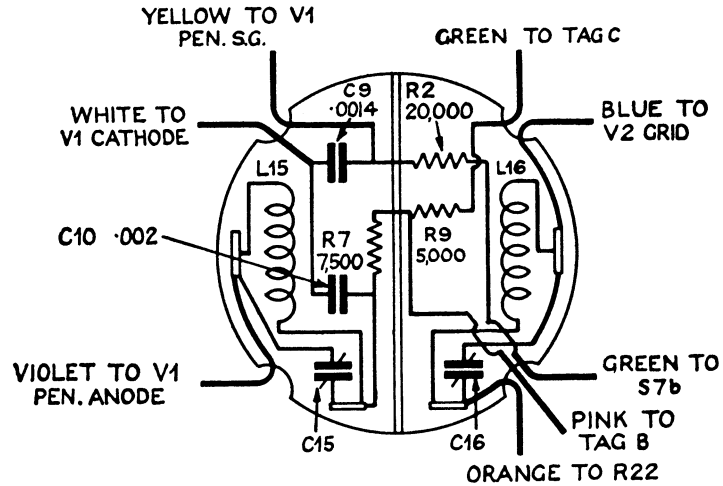
OSCILLATOR COILS

FIG. 7



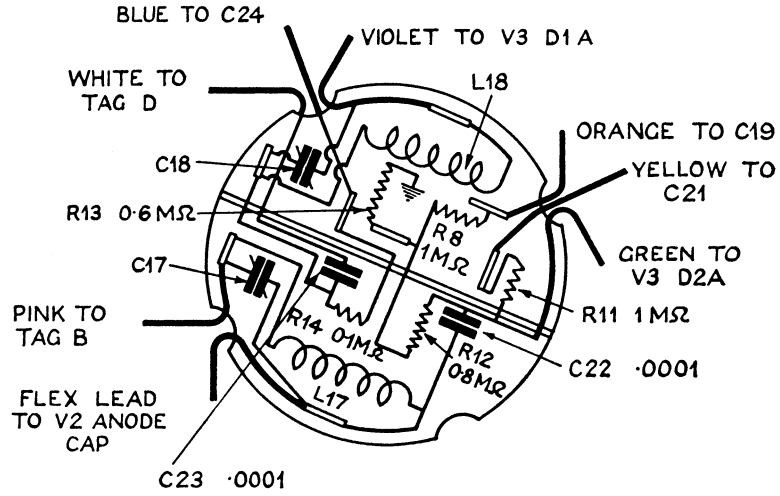
FIRST I.F. COILS

FIG. 8



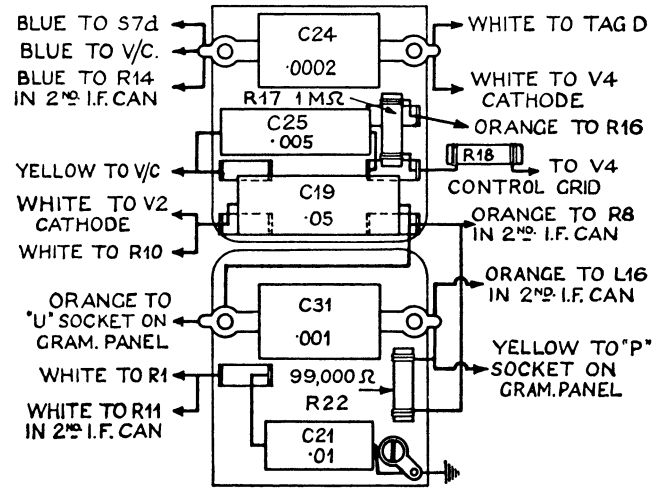
SECOND I.F. COILS

FIG. 9



V2156 ASSEMBLY

FIG. 10



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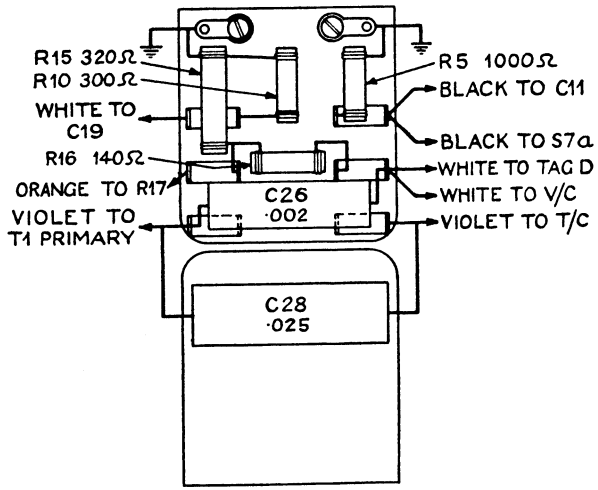
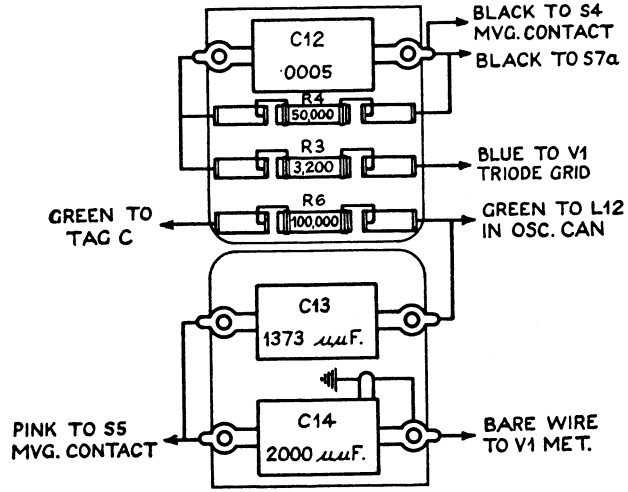
V2049 ASSEMBLY

FIG 11



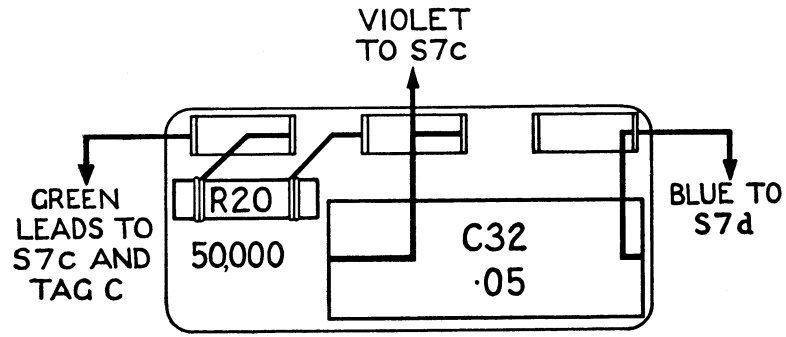
V2953 ASSEMBLY

FIG. 12



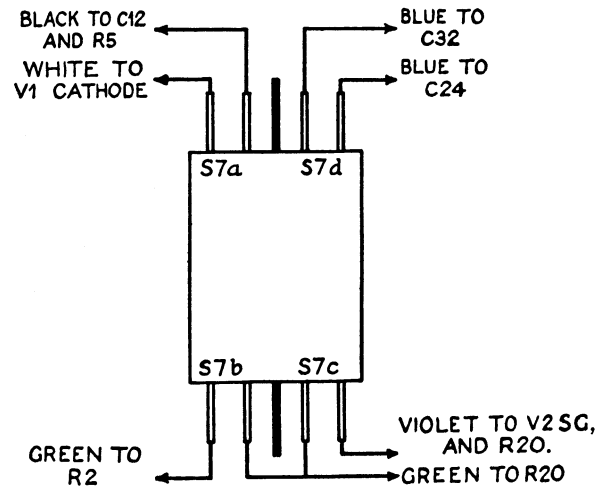
W2332 ASSEMBLY

FIG. 13



R.G. SWITCH

FIG. 14



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THE MOTOR BOARD

Fig. 15 shows the plan view of the 50 cycle motor-board. The turntable is omitted in order to disclose the details of the auto-stop mechanism, and the names of all the principal parts are shown. The design of the motor board is the same as that fitted to the A24RG, so that the following remarks may be taken as applying equally to the latter model.

The various parts are shown in the positions they occupy when a record has just been played and the pick-up returned to its rest. Thus the switch lever is in the " off " position and is in contact with the adjustable stop M. A brief description will be given of the action of the mechanism, in order to make clear the function of each part.

The motor is switched on by moving the pick-up to the right : this causes the pin H to engage with the switch lever, thus throwing the motor switch K to the " on " position. Simultaneously another pin O on the tracking link moves the tracking lever to the right, and this, acting through the friction device, causes the tracking arm to withdraw the switch lever away from the motor spindle to the fullest extent of its travel.

When the pick-up is moved to the left and the needle placed on the record, the tracking link is carried to the left also, and, due to the action of the radius arm, moves away from the pin L on the switch lever. During the playing of the record this action is continued, until a diameter of six and a half inches is reached, when a third pin R on the tracking link engages with the tracking lever, and acting through the friction device as before, but in the opposite direction, causes the tracking arm to slide the switch lever slowly towards the motor spindle.

With the needle at about six inches diameter the switch lever shoe has arrived at a position where its right-hand corner comes in the path of the striker mounted on the turntable, although its left-hand corner is still clear : the striker therefore pushes the lever back slightly. By the time the striker has completed a further revolution, the lever has again moved up, and is once more pushed back sufficiently to allow the striker to pass. This action also forces back the tracking arm ; as, however, the tracking lever is held by the pin R, the movement can occur only by virtue of the slip in the friction joint. This process continues until the final groove is reached, where the inward movement of the needle is greatly accelerated, the effect of which is to move the switch lever so far inwards that the left side of the shoe engages with the striker, and the lever is thrown over, thus switching off the motor.

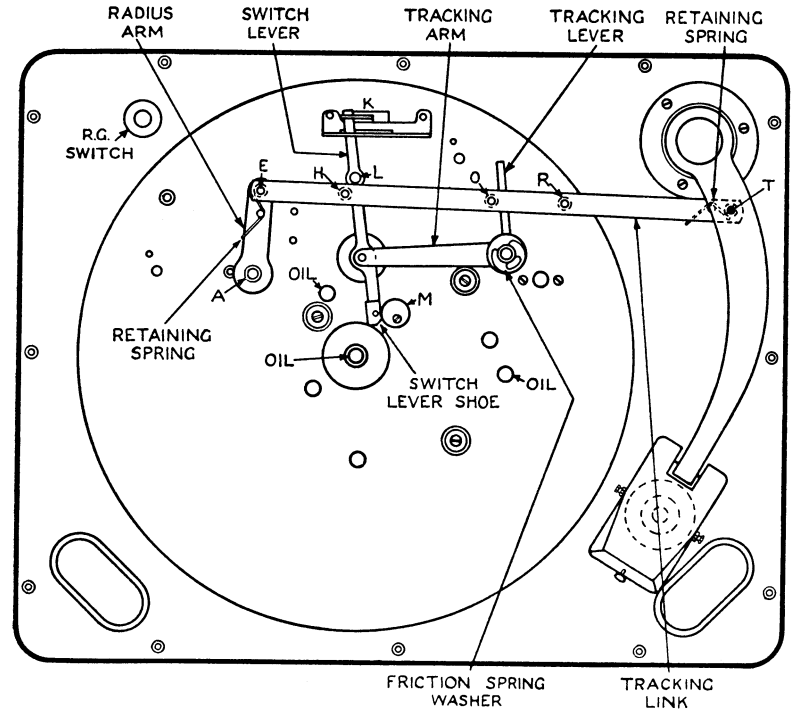
Although the striker is immediately brought to rest, the turntable is able to continue for a further half revolution owing to the fact that the two parts are frictionally connected, so that no sudden jar occurs at the moment of stopping. When the pick-up is returned to its rest the tracking link moves to the right, and, under the influence of the radius arm, bears upwards on the pin L, thus withdrawing the switching lever from engagement with the striker. The mechanism is now reset for playing another record.

Oiling. A small amount of oil should from time to time be applied at the points indicated in Fig. 15, but on no account should the friction joint be oiled. If the latter is found to be too slack or too tight, the spring washer should be removed, slightly bent to exert more or less pressure as required, and replaced.

A little lubricant should also be applied to points A, E and T, in order to keep these bearing surfaces quite free. Attention to this point will often correct faulty operation of the auto-stop mechanism, without adjustment of the spring friction washer. A good quality car engine oil is suitable for all lubrication purposes.

PLAN OF MOTOR BOARD

FIG. 15



BLOCK LETTERS REFER TO KEY POSITIONS MENTIONED IN THE TEXT