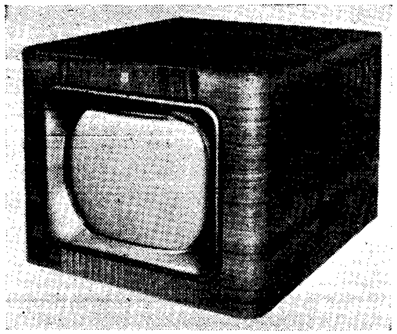
McCARTHY TSH312



Fourteen-valve five-channel television receiver with 12in. CRT. Walnut veneered table or console cabinet. Suitable for 200-250V AC and 230-250V DC. Manufactured by Felgate Radio Ltd., Felgate House, 6 Studland Street, Hammersmith, London, W6.

THE receiver is a superhet incorporating two RF stages designed to operate on lower side-band of vision carrier. RF and frequency-changer stages are common to both sound and vision channels. The receiver is made suitable for any of the five BBC channels by plugging in an appropriate set of aerial, RF and oscillator coils.

Vision interference suppression is fitted and EHT is obtained from rectified line flyback pulses.

Aerial input circuit is for use with 75-ohm coaxial feeder. The feeder is directly connected to primary L1 of aerial input transformer RFT1 the earthy side of which is coupled to receiver chassis through isolating capacitor C1.

RF amplifiers. Aerial signal is coupled by secondary L2 of RFT1 to grid of first RF amplifier V1. Amplified signal at its anode is developed across tuned coil L3 and capacitively fed by C5 to grid of second RF amplifier V2. Output of V2, developed across anode tuned coil L4, is fed by C7 to grid of triode mixer V3A.

Gain of V1 V2 is adjusted by **Contrast** control R8 in their common cathode circuit. R8 in effect varies the bias applied to suppressor and control grids and thus maintains reasonably constant the input response curve with variation of gain. On London models L2 is damped by R1 to increase bandwidth.

Oscillator is triode V3B connected in an earthed-node Hartley circuit in which oscillatory tuned coil L6, shunted by C12, is coupled between chassis and grid through C11. Automatic bias for grid is developed on C11 with R15 as leak. R14 is a decoupler. Output of oscillator is taken from cathode and fed by C10 to cathode of mixer V3A.

Mixer is triode V3A. RF signals fed to its grid through C7 and oscillator signal fed to its cathode by C10 are mixed to produce across L5 in the anode a vision IF of 6mc/s and a sound IF of 2.5mc/s.

Vision channel consists of IF amplifier V4, signal rectifier V5A, interference suppressor V5B and video amplifier V6.

Both vision and sound signals at anode of mixer V3A are fed by C46 to grid of vision IF amplifier V4. The sound signal is developed across primary L9 of IFT2 in the cathode circuit which, in addition to coupling sound signal to sound detector, functions as a sound-on-vision rejector.

Amplified vision signal at anode V4 is single-peak transformer coupled by IFT1 to signal rectifier V5A. Rectified video signal at cathode V5A is fed through corrector choke L11 and developed across R21 in grid of video amplifier V6, the amplified output of which is shunt and series corrected by L12 L13 respectively and passed to CRT cathode.

Interference suppressor is diode V5B shunted by R20 and connected with its cathode up to anode of video amplifier V6 and its anode down through C17 to chassis. C17 charges through R20 to a potential equal to peak white of signal. When a large amplitude high-frequency interference pulse appears with signal, cathode V5B is driven negative but, due to comparatively long time constant of R20 C17, its anode potential remains unchanged; the diode conducts momentarily to short circuit the pulse, through C17, to chassis.

Sound channel. Secondary L10 of IFT2 in cathode of vision IF amplifier V4 feeds sound signal of 2.5mc/s to grid of anode-bend detector V14. The audio signal at the anode is fed by C39 to **Volume control** R49 in grid of beam-tetrode output amplifier V15. Output is transformer coupled by OP1 to a 6½in. PM speaker L28.

Sync separator. Video signal at cathode of CRT is fed through C22 to grid of sync separator V8. Positive sync pulses drive V8 into grid current and the resultant bias across R29 is sufficient to place video portion of signal below cut-off, thus only sync pulses appear at anode and screen.

Frame sync pulses are taken from screen, where R30 and C25 have an integrating effect, and fed by C29 to cathode of frame scan oscillator V9. Line sync pulses are taken from anode and fed by C31 to screen of line scan oscillator and amplifier V11.

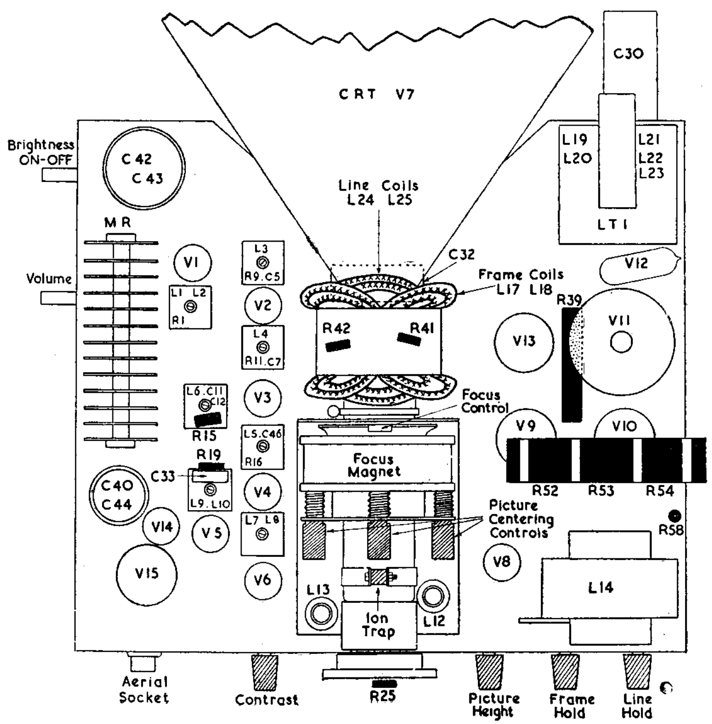
Frame scan oscillator is triode V9 operated as a grid blocking oscillator with grid-cathode feedback by transformer FT1. Scan voltage is developed on C26. Adjustment of grid voltage by R34 gives **Frame Hold** and variation of oscillator HT voltage by R32 gives **Picture Height** control. Frame scan waveform on C26 is applied through C23 to grid of CRT to give flyback suppression.

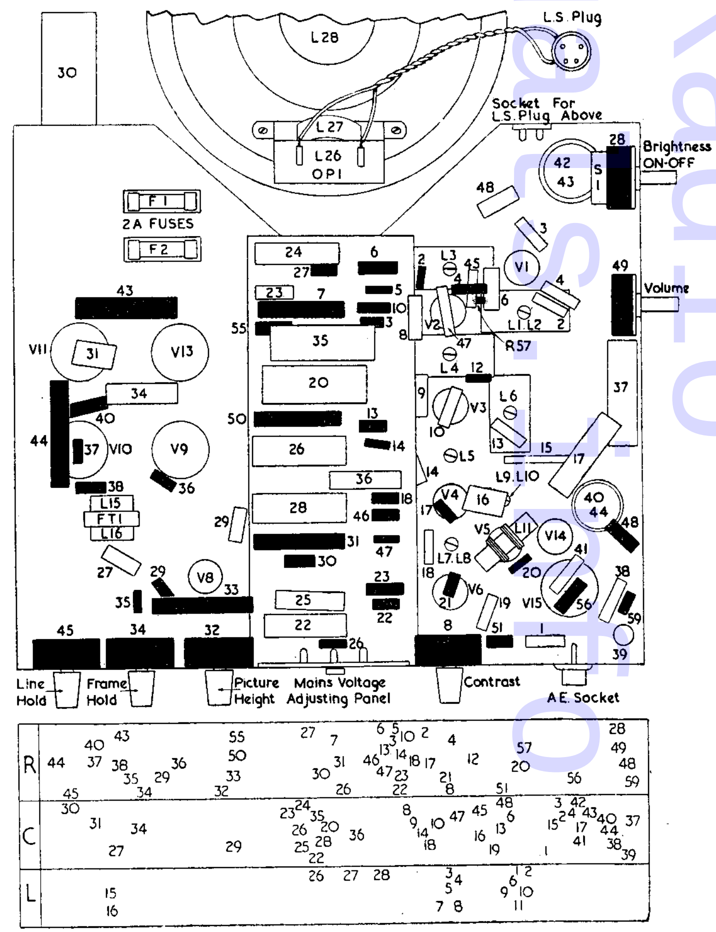
Frame amplifier. Scan voltage on C26 is fed by C28 R37 to grid of beam-tetrode amplifier V10. Output is directly coupled, through DC blocking condenser C30, to the high-impedance frame deflector coils L17 L18 damped by R41 R42.

Line scan waveform is generated by a self-oscillating tetrode output amplifier V11 which is driven into oscillation by anode-grid coupling provided by output transformer LT1. Variation of series grid resistance by R45 gives **Line Hold.** Output waveform is developed across secondary L21 of LT1 and applied through C32 to low-impedance line deflector coils L24 L25 on neck of CRT.

Economy diode. Additional HT for anode and screen of line amplifier V11 and second anode of CRT is provided by the charge built up on C35 by V13 when it rectifies and damps out the shock oscillation set up in LT1 at end of each line scan.

EHT of approximately 8.5kV for final anode of





RESISTORS

R	Ohms	Watts
1	22K (London only)	¼
2	1K	¼
3	220	¼
4	150	¼
5	1.5K	¼
6	47K	¼
7	56K	1
8	25K Linear WW Potr.	
9	47K	¼
10	150	¼
11	47K	¼
12	2.2K	¼
13	1K	¼
14	1K	¼
15	15K	¼
16	12K	¼
17	10K	¼
18	220	¼
19	150	¼
20	4.7M	¼
21	4.7K	½
22	4.7K	½
23	330	½
24	No component	
25	56K	½
26	220K	¼
27	22K	¼
28	500K Inverse - log Potr. with DP Switch	
29	2.2M	¼
30	15K	½
31	33K	1
32	25K Linr. WW Potr.	
33	56K	1
34	25K Linr. WW Potr.	
35	1M	¼
36	220K	¼
37	10K	¼
38	3.3M	¼
39	5K	WW10
40	150	½
41	47K	¼
42	47K	¼
43	10K	WW10
44	22K	2
45	25K Linr. WW Potr.	
46	220K	½
47	100K	½
48	10K	½
49	1M Log Potr.	
50	33K	1
51	220	½
52	34 WW 12	Tap'd dropper
53	34 WW 12	Tap'd dropper
54	137 WW 15	Tap'd dropper
55	3.3K	1
56	47K	¼
57	2.2K	½
58	CZ1 Thermistor	
59	220K	½

CAPACITORS

C	Capacity	Type
1	.005	Tubular 1kV
2	.002	Tubular 500V
3	.002	Tubular 500V
4	.002	Tubular 500V
5	50pF	Silver Mica
6	.01	Tubular 500V
7	50pF	Silver Mica
8	.01	Tubular 500V
9	.002	Tubular 500V
10	.002	Tubular 500V
11	20pF	Silver Mica
12	25pF	Silver Mica
13	.002	Tubular 500V
14	.002	Tubular 500V
15	1000pF	Silver Mica
16	10pF	Silver Mica
17	.1	Tubular 350V
18	.002	Tubular 500V
19	.002	Tubular 500V
20	200 or 250	Electrolytic 6V
21	No Component	
22	.1	Tubular 350V
23	.01	Tubular 500V
24	.1	Tubular 350V
25	.05	Tubular 350V
26	.2	Tubular 350V
27	.01	Tubular 500V
28	.25	Tubular 350V
29	.005	Tubular 500V
30	32	Electrolytic 350V
31	200pF	Silver Mica
32	25	Electrolytic 50V
33	.01	Tubular 200V
34	.05	Tubular 350V
35	8	Electrolytic 350V
36	.05	Tubular 350V
37	50	Electrolytic 12V
38	.002	Tubular 500V
39	.05	Tubular 350V
40	24	Electrolytic 350V
41	.002	Tubular 500V
42	100	Electrolytic 350V
43	100	Electrolytic 350V
44	24	Electrolytic 350V
45	.002	Tubular 500V
46	.002	Tubular 500V
47	.002	Tubular 500V
48	.01	Tubular 1,000V

INDUCTORS

L	Ohms
1-4, 6, 23	Very Low
5	1.5
7, 8	2
9	.75
10	2.5
11	16.5
12	3.5
13	10
14	56
15	450
16	200
17, 18	750
19	90
20	400
21	5
22	5
24, 25	7.5
26	450
27	.6
28	2.5

CRT is provided by V12 which rectifies high surge voltage on primary L19 and its overwind L20 when V11 is cut off. EHT is smoothed by capacity formed by inner and outer coatings of CRT.

HT is provided by half-wave metal rectifier MR fed direct from 200V input or through droppers R53 on 230V and R53 R52 on 250V inputs. Choke-capacity smoothing is given by L14 C42 C43 and further resistance-capacity smoothing by R55 C44. Reservoir smoothing capacitor C42 should be rated to handle 500mA.

Heaters V1-11, 13-15 are connected in series and obtain their current from the mains through R54 and thermal surge limiter R58. RF decoupling is by C45. Heater of EHT rectifier V12 is fed from an auxiliary secondary L23 on LT1. Mains input to receiver is fitted with a 2A fuse in each lead and filter capacitor C48.

S1, ganged to Brightness, control is the on/off switch.

CRT is a 12in. tetrode type 12XP4 or C12F employing permanent magnet focusing and fitted with ion trap. Video signal is fed to its cathode and R28 **Brightness** control.

ALIGNMENT INSTRUCTIONS

Connect valve voltmeter between cathode of CRT

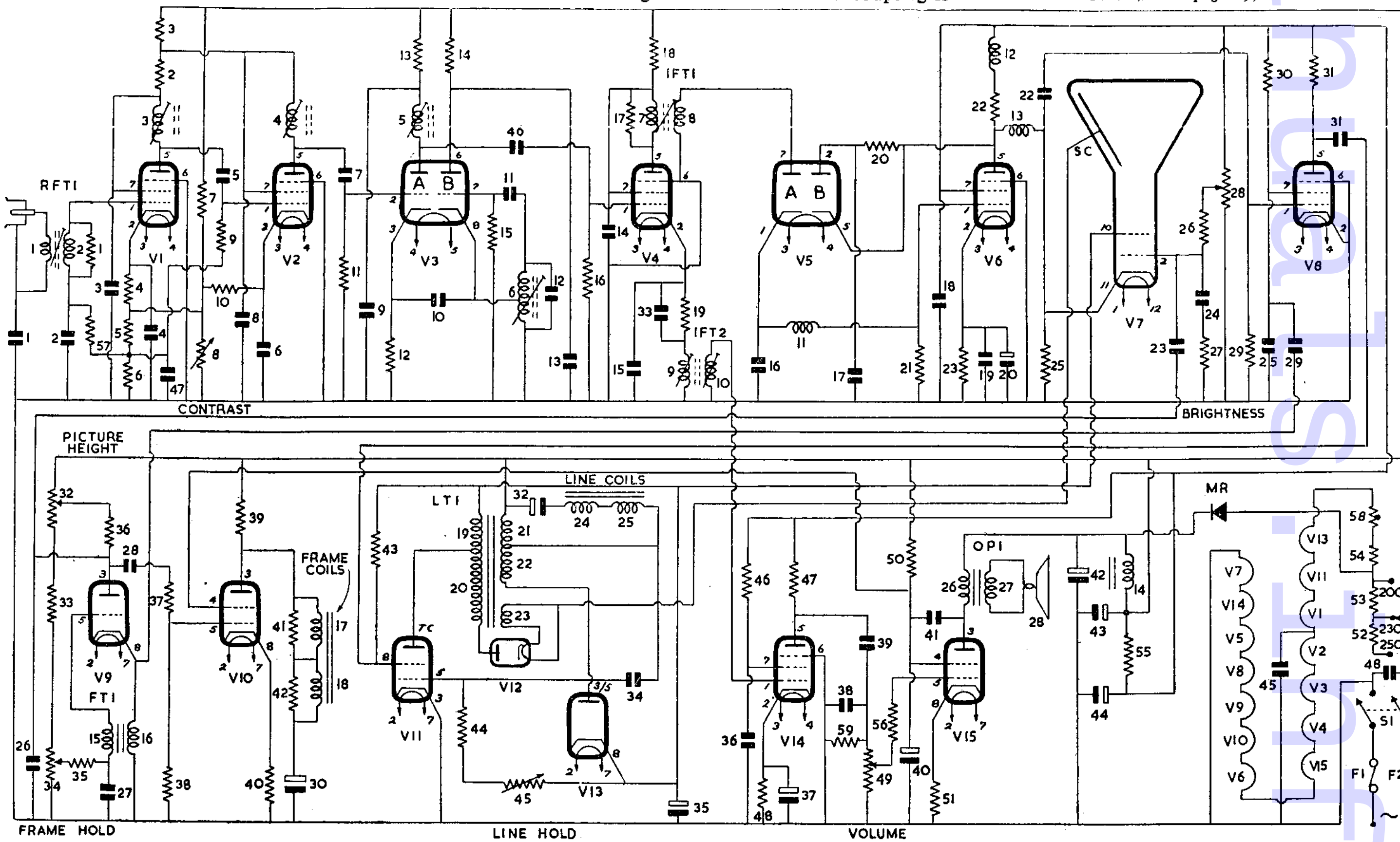
Continued on page 19, Col. 2

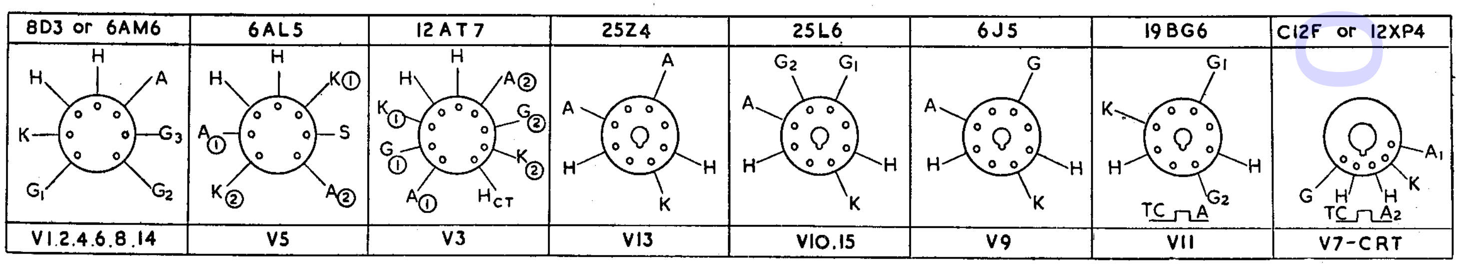
VOLTAGE READINGS

V	Type	A	G_2	K
1	8D3	200	200	2—65*
2	8D3	205	205	2—65*
3A	12AT7	200	—	4
3B	12AT7	200	—	0
4	8D3	205	205	1.5
5A	6AL5	—	—	—
5B	6AL5	—	—	135
6	8D3	135	170	2
7	12XP4	8.5kV	315	135**
8	8D3	115	150	0
9	6J5	60—70†	—	1
10	25L6	65	80	4.7
11	19BG6	—	155	0
12	R12	—	—	8.5kV
13	25Z4	—	—	315
14	8D3	115	70	2
15	25L6	205	80	5.6

* R8 min.-max. ** Grid 0-85. † R32 min.-max.

Unsmoothed HT voltage, 220V.
Smoothed HT junction L14, R55, 210V.
Voltage across heater chain, 150V AC or DC.
Total HT current through rectifier MR, 200mA.
Mains current with 230V AC input, 525mA.





PREIL "TWENTY"

Continued from opposite page

voltage is obtained from R2 decoupled by C1. Suppressor (g3) is earthed to chassis.

R4 is anode load and HT feed to anode and screen are voltage dropped and decoupled by R3 C2. Amplified signal at anode is fed by C3 to mic-volume control R6. When no plug is inserted into J1 then grid V1 and mic-volume control R6 are shorted to chassis, placing V1 inoperative.

Pickup input is designed for use with a high-resistance pickup which should be plugged into J2. Pickup signal is fed to pickup volume control R7.

Mixer is triode V2A. Signal from mic-volume control R6 or from PU volume control R7 or from both is applied through R8 R9 respectively to grid of V2A. Tone control giving top cut is provided by R32 with C5 connected between grid and chassis.

Cathode bias is provided by R11 and negative feedback from secondary L2 of output matching transformer OP1 is applied to cathode through R23 R12. Amplified signals are developed across anode load R10. C13 is an HF stabiliser. With no plug inserted in J2 then PU volume control R7 is short circuited to chassis.

Phase-splitter is triode V2B. Signal at anode V2A is fed by C6 to grid V2B of which R16 is grid load. Opposite-phased signals are developed across anode load R14 and cathode load R17. HT feed to anode V2B is decoupled by R13 C7.

Push-pull drivers are triodes V3A V3B, fed by C8 C9. R18 R22 are grid resistors and R21 common cathode bias resistor. Amplified, opposite-phase signals appear across R19 R20.

Push-pull output stage. C10, through stopper R26, feeds one push-pull output amplifier V4, and opposite-phase signal is coupled by C11, through R29, to second push-pull amplifier V5. R25 R28 are grid loads and R27 common cathode resistor.

Screens V4 V5 are strapped and obtain voltage direct from HT line, decoupling being by C14. Primary L1 of output matching transformer OP1 is in the anode circuits with HT applied to centre tap. R30 and R31 are anode stoppers.

Secondary L2 of OP1 is tapped for 8 and 15 ohm outputs. Voltages across L2 are applied through R23 R12 to cathode V2A as negative feed-back to reduce distortion, increase speaker damping and allow less-critical matching for various numbers of speakers.

HT is provided by a full-wave indirectly heated rectifier V6 fed from HT secondary L5 of mains input transformer MT1. Heater current is obtained from L4. Choke-capacity smoothing is by L3 C14 with further voltage dropping and resistance-capacity smoothing by R24 C12. Reservoir smoothing capacitor C15 should be rated to handle 400 mA ripple current.

Heaters V1 to V5 are parallel connected and fed from secondary L6. Primary L7 is tapped for inputs of 110, 200-250V 50 c/s. S1, which is ganged to tone control spindle, is ON/OFF switch.

Removal of chassis. First remove ventilation grille above amplifier control panel by unscrewing the four milled nuts, one at each corner. Next unscrew nut and bolt securing rear top of chassis to back of case. Finally remove the two Philips screws located on underside of front edge of case. Chassis can now be withdrawn by sliding forward and tilting backward to clear grille support strips.

McCARTHY TSH312

Continued from page 17

and chassis. Connect AC output meter across primary L26 of OP1.

IF stages. Inject 2.5mc/s to grid V3A through .01mF capacitor and adjust core L9 for minimum vision and core L10 for maximum sound output.

Inject 3.25mc/s and adjust core L5 for maximum vision.

Inject 5.5mc/s and adjust core L7-8 for maximum vision.

RF and oscillator stages. With London region models:—

1. Inject 41.5mc/s to aerial socket and adjust core L6 for maximum sound.

2. Inject 42mc/s to aerial socket and adjust L1/2 for maximum vision.

3. Inject 43.3mc/s to aerial socket and adjust L3 for maximum vision.

4. Inject 44.4mc/s to aerial socket and adjust L4 for maximum vision.

For other channels the procedure is identical using frequencies as listed below:—

Northern: (1) 48.25, (2) 48.8, (3) 50, (4) 51.2.
Scottish: (1) 53.25, (2) 53.8, (3) 55, (4) 56.2.
Midland: (1) 58.25, (2) 58.8, (3) 60, (4) 61.2.
Western: (1) 63.25, (2) 63.8, (3) 65, (4) 66.2.

The tuning should be checked on an actual transmission and if necessary slight adjustments made to improve picture quality. Cores of L9 L10 however, should not be disturbed.

Modification. R46 R47 are now fed from junction L14 R55.

FORFEX HAIRDRYER

Continued from page 14

heater former and end plate. A press-on chromium plated metal nozzle fits over outlet to give a concentrated air jet when desired.

The 7ft. heavy rubber covered two-core mains cable is fed into base of handle through a groove retained flexible rubber protector and is attached to internal connecting leads by two nut and bolt terminals which are in cavities in handle sections (Fig. 3). End of mains cable is fitted with a two pin 2A connector plug.

DISMANTLING

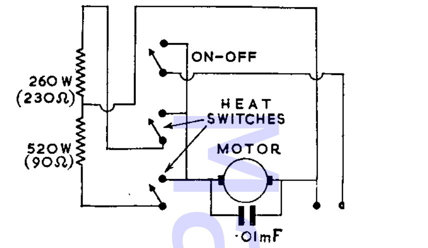
Access to motor and heater. Undo and remove the three nuts and bolts, positioned one on each side of nozzle and one at rear, and carefully lift off top section of body (Fig. 2). When doing this it is advisable to place nozzle in palm of cupped left hand to prevent heater retaining spring flying out.

To remove motor. Loosen screws in Bakelite connector block which secure either motor or switch and heater leads and then lift out motor with fan and baffle plate (Fig. 4). Fan can be removed from motor spindle by loosening grub screw in hub.

To remove heater. Remove end plate and asbestos gasket and disconnect the three leads from terminals at rear end of heater former by undoing and removing the three screws under which leads are fastened.

Access to handle switches. Undo recessed screw on each side of handle near body and undo and remove clamping nut and bolt towards bottom of handle. The two halves of handle can now be separated and removed from anchoring bush on bottom of body.

Fig. 5.—The two heat switches are not effective until the motor switch is closed



Switches are a press fit into support mouldings on inside of handle and can be removed by gripping switch cases and pulling. Paxolin insulation strips are inserted between the switches and when re-assembling see that these have been replaced in position.

MAINTENANCE

The motor is fitted with Sinterlite bearings with an oil-retaining washer. The bearings need no attention at any time by the user. The dryer is produced for hairdressers' use and continual running is catered for.

Motor brushes are a special type fitted with a retaining washer on spigot. This ensures no possibility of carbon springs fouling or damaging commutator when the life of the carbon has expired. Carbons can be obtained only from the manufacturers.

The element is a twin or double design and when damaged or burned out it is advisable to obtain a replacement part rather than to attempt repair.

Maintenance in the first year is covered by manufacturer's guarantee.

SERVICE CASEBOOK

FERGUSON 978T

SUFFERED from failure of frame hold control to take over except on extreme end of travel.

Time constants checked and fault found in R46 (680K, V13A grid leak) having gone high. Similar fault has been experienced in a number of these sets. —M.H.

SUPPRESS THIS ONE

OUR refrigeration engineer reports an unusual form of sparking which is believed to be responsible for radio interference.

The compressor of a refrigerator is driven by a rubber link belt with metal inserts. Friction causes this to work like a Whimshurst machine, emitting sparks nearly an inch long between the metal links and the driving pulley.

Both the motor drive pulley and the compressor flywheel are well earthed, yet the sparks occur only as the links approach the driving pulley and not as they approach the compressor pulley.—E. H. MEADOWS, Alton.

PYE AC

WE had an unusual and interesting fault the other day in a four-valve Pye AC superhet. Complaint was poor volume and at first we thought the EBL1 output pentode was defective. A new one brought no improvement; all other valves were up to standard and voltages everywhere were normal.

The fault appeared to be in the output stage so we concentrated there. After some little time we located the trouble.

One of the 120pF condensers in the diode detector circuit had developed a slight leak. As this condenser was connected from the earthy end of the second IFT secondary to chassis it biased the detector diode to the same extent as the pentode section of the EBL1.

Thus only strong signals could overcome the bias, and even they were attenuated by the amount of the bias. A new condenser completely cured the trouble.—G.R.W.

RADIOGRAM—WEAK OUTPUT

OUTPUT was almost inaudible. Checks of voltages, current and output transformer revealed no trouble.

Close examination of the speech coil circuit led to the cause of the bother. A panel—connected by flexible leads to the set—carried extension speaker sockets, aerial and earth sockets. One side of the speech coil ran direct to the secondary of the output transformer and to one speaker extension socket. The other side of the speech coil was wired to speaker frame and earthed chassis.

To complete the return circuit to the speech coil a lead from the extension speaker socket should have been connected to the earth socket. The lead was, in fact, there, but wired to the aerial socket! By changing over this connection results were brought to normal.

Although a simple fault—on paper—this took quite a time to find. The set was new and incorrect wiring was not anticipated.—J.R.

FERGUSON 288RG

A NEW receiver was suffering from strong modulation-hum on LW only when an external aerial was connected. With the built-in aerial there was no hum, though signals were naturally weaker.

As this receiver is of the AC/DC type, which is more prone to hum, an efficient earth was connected but without improvement. Various aerials were tried, the filter network tested, and a new set of valves substituted, but the hum persisted.

A study of the circuit diagram showed that on LW only, signals are fed to the grid of the FC by " bottom-end " coupling. This coupling is prone to mod-hum as there is no direct path to earth for any LF pick-up by the aerial.

A resistor was connected between coil and chassis but seemed to have little effect. A more conventional RF choke was fitted in place of this and a complete cure effected.—J. HALL, Peel, IoM.

INTERMITTENT HUM

A COMMON cause of intermittent hum, easily mistaken for faulty smoothing, is a temporary cathode-heater short in one of the valves. The usual culprit seems to be the double-diode triode in the 6-volt heater class.

Often the trouble occurs only at rare intervals and in many cases tapping the suspected valve will not produce the desired result. A change of valve is the only certain method of confirmation.—J. R.