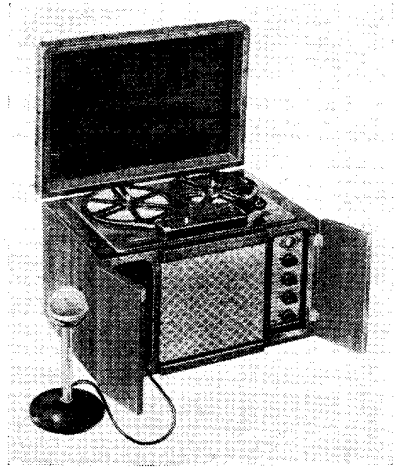
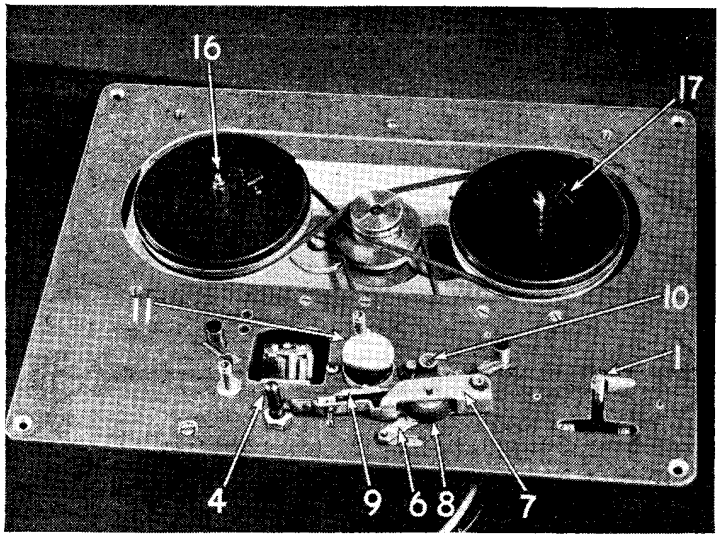
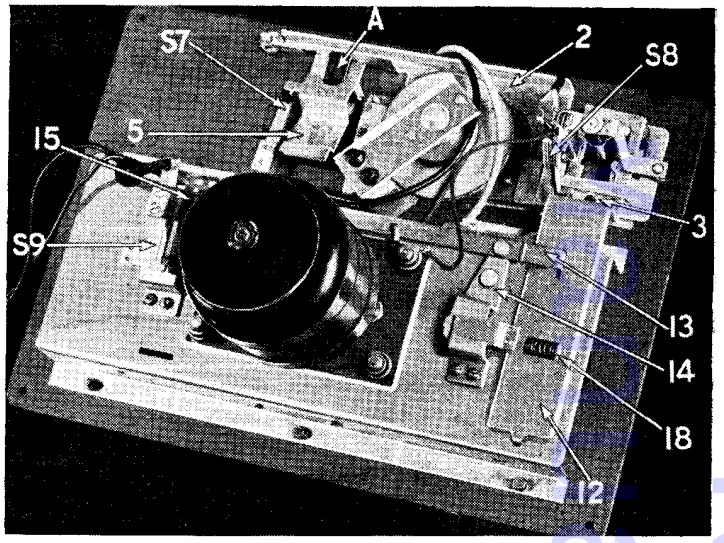
SOUNDMIRROR TAPE RECORDER



Self-contained magnetic tape recorder and reproducer. Sockets for high-impedance radio and crystal-type microphone inputs and terminals for connection of a low-impedance extension speaker. Housed in walnut table cabinet with hinged lid to tape-deck. Front control panel and microphone stowage compartment enclosed by snap fastening doors. Suitable for 200-250V 50c/s AC. Manufactured by Thermionic Products Ltd., Hythe, Southampton





THE apparatus consists of a mechanical tape deck incorporating drive motor, reeling and clutch assemblies, erase magnet, recording head and control gate.

Tape-deck utilises a brown crackle finished top plate with a sub-chassis carrying the mechanism. A $\frac{1}{50}$ hp 200-250V 50c/s induction motor, resiliently mounted on an adjustable bracket and fan ventilated, is fitted with a capstan providing two belt drives, one for the tape and one for the reels.

The first drive is to a spindle fitted with a self-balancing fly-wheel. When the tape is engaged with this spindle by a rubber-tyred pressure wheel, it is driven at a constant speed of $7\frac{1}{2}$ in. per second.

The second drive is transmitted by cross-over belt to the two tape reels through friction clutches. The clutch-drives rotate in opposite directions, one in the Record and Play direction (left to right through recording head), and the other in the Rewind direction.

The drives are controlled by a lever working in a gate. In the Fast Reverse and Fast Forward positions, the tape drive is disengaged, one reel drive engaged and the other reel drive disengaged. Winding takes place rapidly, tape speed increasing as the diameter of the tape on the driven reel increases. In these two positions, the lever must be held by the operator who therefore has instant control. An Auto-Rewind position is provided in the gate and this corresponds to Fast Rewind but permits the lever to be locked.

During Record or Play, when the tape is driven at constant speed by its independent drive, the take-up reel pulls gently on the tape but its clutch slips, permitting constant peripheral speed. The pay-off reel, although its clutch is disengaged, is subjected to slight drag by two subsidiary clutch pads to steady the pay-off. Rapid stopping, without over-run of tape, is secured by engagement of the pay-off reel clutch so that the two drives are opposed via the tape.

Each clutch consists of a lower drive pulley, with felt pads cemented to upper face and two "drag" pads on springy arms, working against an upper drum made of two interlocking cups and forming the reel turntable. The clutches are engaged by the weight of turntable and tape reel and are disengaged when the turntable spindles are raised from below by ganged levers coupled to main control lever.

When recording, the tape is held firmly in contact with its drive spindle by a spring-loaded rubber-tyre pressure wheel and with the recording head by a felt pad, both operated by a "head slide."

The erase head is a 4-pole Ticonal magnet assembly on a pivoted bracket. The bracket is fitted with setting pin which, when depressed while control lever is in Record position, raises the erase head into position so that it bears against the tape. It is locked in this position by a catch on head slide. On moving control to Rewind and Play positions, erase head is automatically dropped out of position. A switch S7, operated by a projection on erase head bracket, prevents a new recording being made without erasing an existing one. If control lever is moved to Record position without erase pin being depressed then recording head is shorted out.

Record-Play. With control lever 1 (see photographs) in this position, head slide 2 is moved to the right and locked in position by spring loaded catch 3. If erase pin 4 is depressed while control lever is in this position, erase magnet bracket 5 is locked in raised position by catch A on head slide.

Movement of head slide is transmitted through coupling lever 6 to pivoted arm 7, carrying spring-loaded pressure-wheel 8 and pressure pad 9, which are moved inward to hold tape firmly against drive spindle 10 and recording head 11. In addition, pivoted arm 12 moves lever 13 which operates clutch-raising toggles 14 and 15, the latter disengaging clutch on supply reel turntable 16 (take-up reel clutch remaining engaged) and closing S9, thus switching on power to drive motor.

Arm 12 is locked in this position by catch 3 which, when control lever 1 is released after being moved to Record-Play position, slips (under pull of its spring) behind stop lever attached to chassis under take-up reel turntable 17 pulley.

Rewind. If, during recording or playing, control lever 1 is moved into Rewind position, catch 3 is moved out of engagement with stop, head slide 2 returns to neutral position and pressure wheel and pad are moved away from tape and, if previously recording, erase head is released.

At the same time, pivot lever 12 through coupling 13 operates clutches so that take-up reel turntable 17 is disengaged and supply reel turntable 16 is engaged, thus rewinding tape on supply reel on 16. Switch S8, which is actuated by edge of catch 3 as head slide 2 and pivot arm 12 are pulled over, is closed thus short circuiting the recording head to prevent reproduction from the back-running tape.

Stop. After a rewind, control lever 1 must be pulled back into Stop position before it can move to Record or Play. On placing control lever 1 in Stop position catch 3 is moved out of engagement with head slide 2, and pivot arm 12 with catch 3 returns, under pull of spring 18, to its neutral position. In this position motor switch S9 is opened and both turntable clutches are engaged to stop the reels quickly.

Fast-Forward. When control lever 1 is in this position, supply turntable clutch is disengaged, motor switch S9 is closed and tape is wound rapidly on to take-up spool.

Fast-Reverse. With control lever 1 in this position, take-up turntable 17 clutch is disengaged, motor switch S9 is closed and tape is wound rapidly back on supply reel.

Amplifier. The front panel carries the following: (1) Magic Eye—this works only on Record and allows the operator to adjust the input to the amplifier to secure a satisfactory recording level; (2) Volume—this control is in action on both Record and play; (3) Record-radio/Record-microphone/Play switch—to record, the erase pin on tape deck must also be depressed; (4) Speaker Volume Recording only—operates only on radio input and controls internal speaker used as monitor, and (5) Tone control and Power Off switch—T/C operates only on play.

Amplifier. The amplifier consists of high-gain low-noise-level input stage V1 followed by a second AF amplifier V2 which, on Recording, is used in conjunction with bias osciliator V4 as output stage feeding into the recording head.

When used for Playback, output of V2 is fed to a double-triode self-balancing phase-inverter V5, the signals from which drive a double-triode push-pull output amplifier V6. Audio output of 1 watt is fed into an 8in. PM speaker. To give indication of recording signal level a magic-eye V3 is provided.

Power for amplifier is provided from a unit employing indirectly heated fullwave rectifier V5.

Input circuit is provided with two sockets, one for crystal type microphone and the other for high-impedance radio. Microphone signal is fed through S1 direct to g1 of V1 but radio input is attenuated by R1 R2 C2 before being switched by S1 to grid. When selector switch is placed in Play position then record-play head L1 is switched by S4 to R15 C15 and through S1 to g1 of V1 and R2 C2 are shorted to

chassis by S2. C15 with L1 form a parallel resonant circuit giving degree of treble lift.

R3 shunted by C3 forms grid load V1 and cathode bias is provided by R4 decoupled by C4 C5. Screen (g2) voltage is obtained from R6 decoupled by C6 C7. Suppressor is earthed to chassis and R5 is anode load. HT feed to anode and screen V1 is decoupled by R7 C1.

AF amplifier V2. Signal at anode V1 is fed by C8 through R8 to grid V2. When recording R8 functions as record-level control and on playback as a normal volume control.

On Record, V2 operates as an output amplifier, the audio signal developed across anode load R11 being fed together with 28kc/s bias current generated by V4, through C13 and S3 S4 to recording head L1. As bias current is approximately 20 times that of the audio recording current the signal to operate magic-eye is taken from screen (g2).

In addition, when recording from radio input, the signal on screen is fed through C10 R13 R14 S6 R24 to grid of phase inverter V5A, amplified by V6 and reproduced for monitoring purposes on internal speaker L5. Volume, when monitoring, is controlled by R14.

On Playback, V2 is employed as a normal voltage AF amplifier with cathode bias by R9, screen voltage from junction R10 R12 decoupled by C11, and with R11 as anode load. Bias oscillator V4 is placed inoperative, its tuning inductance L2 being used in conjunction with C16 C17 C19 R21, which are switched in by S3 S5, to provide frequency compensation.

Phase-inverter. Signal at anode V2 is fed by C13 through S3 S6 and tone control R24 to grid of V5A of which R22 is the grid load. Amplified signal developed across anode load R28 is fed by C24 to grid of one triode push-pull output valve V6A, and through potential divider R30, R27 to grid of V5B. Amplified and phase-reversed signal developed across anode load R29 is fed by C23 to grid of second triode push-pull output valve V6B. Cathodes V5A and V5B are strapped and biased by R26.

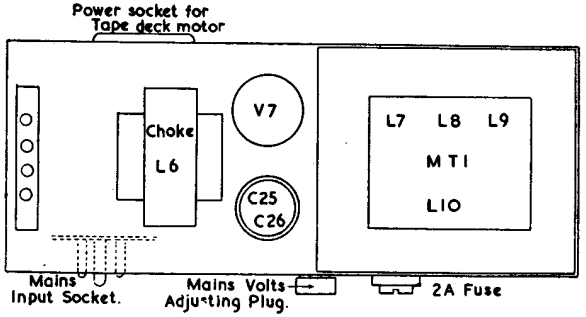
Output stage employs a double-triode V6 the two halves of which are connected in push-pull. Opposite-phase signals, generated by V5, are fed by C24 C23 to grids V6A and V6B. Cathodes are strapped and biased from R31. Output matching transformer OP1 in the anode circuit feeds signal to an 8in. PM loudspeaker L5. Terminals are fitted for connection of a low-impedance extension LS. Centre tap of heater secondary L9 of MT1 is returned to chassis through cathode load R31. This substantially cancels any heater-cathode leakage and reduces hum.

Bias oscillator is V4 connected in a Colpitts type circuit in which tuning inductance L2 in the anode circuit is effectively connected across C20 C21 by C9, which at 28kc/s is a virtual short circuit.

Magic-eye indicator V3 is provided to give visual indication of recording signal amplitude. When recording, signal developed on screen (g2) of V2 is fed through C14 R17 to grid of V3. S7 which is operated by Erase Pin when it is depressed removes paralysing cathode bias across R18.

In Play position of selector switch, V3 is placed inoperative by removal of its HT by S5.

HT is provided by an indirectly-heated fullwave rectifier V7 the anode voltages of which are obtained from HT secondary L8 of mains input transformer OP1. Choke-capacity smoothing by L6 C25 C26 is employed. Reservoir smoothing capacitor C26 should be rated to handle 100mA ripple current.



Heaters, V1 to V6, and indicator lamp are connected in series and obtain their current from LT secondary L9 of MT1. Centre tap L9 is returned to chassis through output valve V6 cathode Load R31.

Primary L10 of MT1 is tapped for inputs of 200, 220, 240V 50c/s. Live input lead to voltage tapping panel is fitted with 2A fuse. S10, which is ganged to tone control spindle, breaks mains supply to amplifier and tape deck motor.

MAINTENANCE

If control mechanism fails to lock or release properly, check for binding of moving parts caused by inadequate lubrication or burrs on contacting surfaces. When lubricating control mechanism use a light oil and apply sparingly.

Clutch adjustment. Clutches are adjusted and set at factory and should not require re-adjustment under normal conditions. However, if any part of clutch assembly necessitates replacement for some cause, then readjustment becomes necessary and proper procedure is as follows :—

1. Loosen locking nuts at top of each reel post. Clutch adjustment screws are now free for adjustment. An Allen key is required.
2. Place control lever in Fast-Forward position and adjust set screws so that rewind clutch 16 turns freely and the take-up clutch 17 is engaged.
3. Place control lever in Fast-Reverse position and adjust set screws so that the take-up clutch 17 turns freely and the re-wind clutch 16 is engaged.
4. Recheck to be sure condition 2 is satisfied.
5. Place lever in Record or Play position and be sure condition 2 is still satisfied.
6. Check adjustments to be sure retainer ring does not bind on adjacent washer and bearing housing when the clutch raises.
7. Both clutches should engage in the Stop position to produce braking action. When clutch adjustments are completed tighten locking nuts.

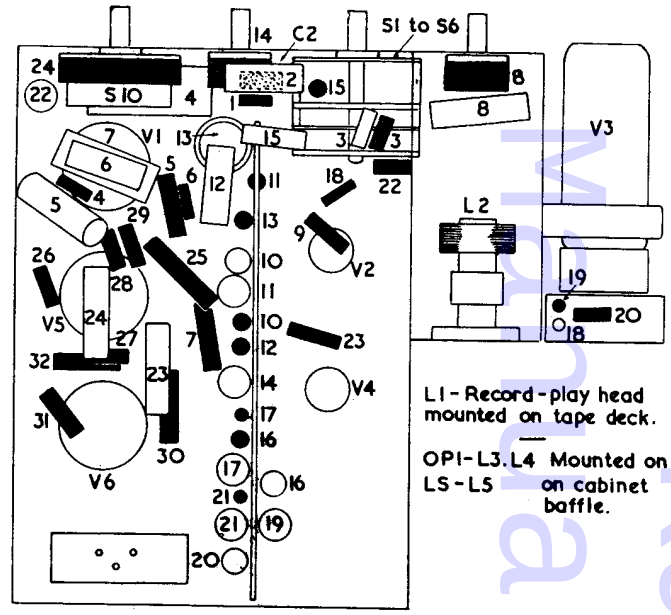
Tape tension adjustment. Pressure of tape against record head can be adjusted by turning a screw mounted on pressure wheel bracket assembly (be sure to loosen hex. nut). This pressure is measured in terms of tape tension by attaching a scale to the end of a piece of tape which is drawn through the tape guides, record head, pressure pad, and behind the capstan assembly at approximately 7½ inches per second to produce a scale reading of 1½ to 2½ ounces. Access to this adjust-

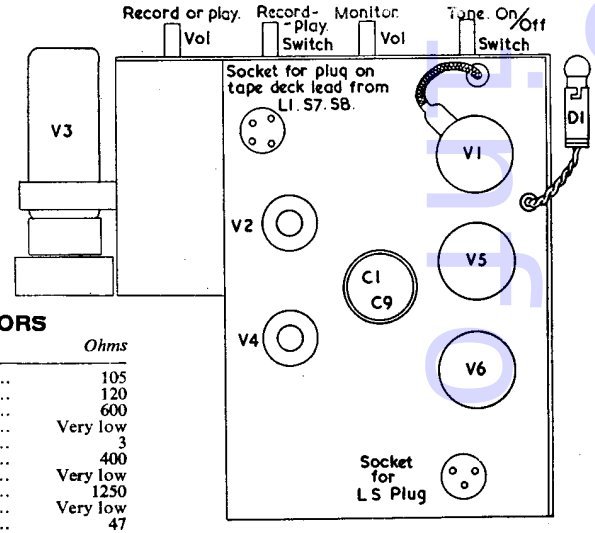
RESISTORS

R	*Ohms*	*Watts*
1	470K	¼
2	22K	¼
3	1M	¼
4	1.5K	¼
5	250K	¼
6	1M	¼
7	22K	1
8	1M	Potr.
9	390	½
10	47K	1
11	18K	1
12	47K	1
13	220K	¼
14	25K	Linear Potr.
15	22K	¼
16	2.2M	¼
17	150K	¼
18	10K	¼
19	1M	¼
20	1M	¼
21	2.2K	¼
22	470K	¼
23	3.3K	¼
24	100K Log Law Potr. with SPDT Switch	
25	2.2K	1
26	390	½
27	220K	½
28	220K	½
29	220K	½
30	470K	½
31	750	½
32	470K	½

CAPACITORS

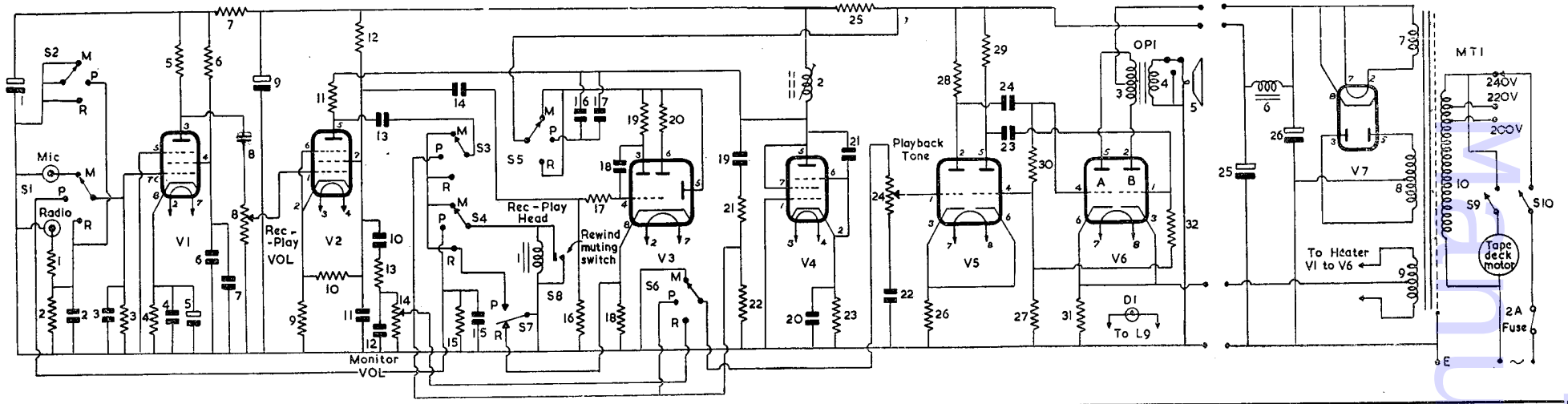
C	*Capacity*	*Type*
1	24 Electrolytic	450V
2	.001 Tubular	500V
3	50pF Ceramic	
4	25 Electrolytic	12V
5	.001 Tubular	500V
6	.001 Tubular	500V
7	.05 Tubular	500V
8	.005 Tubular	500V
9	24 Electrolytic	450V
10	.005 Tubular	500V
11	.001 Tubular	500V
12	.001 Tubular	500V
13	.25 Tubular	450V
14	.05 Tubular	500V
15	.005 Tubular	500V
16	.03 Tubular	500V
17	.005 Tubular	500V
18	50pF Ceramic	
19	.1 Tubular	500V
20	.01 Tubular	500V
21	.002 Tubular	500V
22	.005 Tubular	500V
23	.005 Tubular	500V
24	.005 Tubular	500V
25	24 Electrolytic	450V
26	24 Electrolytic	450V

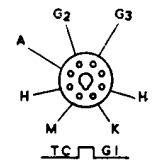
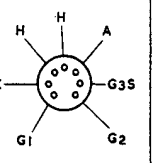
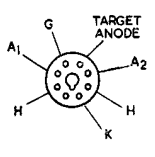
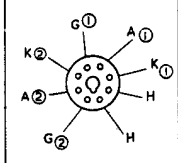
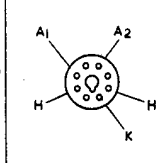
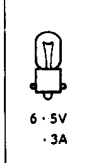




INDUCTORS

L	*Ohms*
1	105
2	120
3	600
4	Very low
5	3
6	400
7	Very low
8	1250
9	Very low
10	47



EF37A- 6J7	EF92-8D3-6AM6	EM34	6 SN7 GT	EZ 35	INDICATOR LAMP
					
V1	V2 V4	V3	V5 V6	V7	D1

VALVES AND VOLTAGES

V	Type	A	G_2	K	Remarks
1	EF37A or 6J7	60	20	.22	
2	EF92-8D3 or 6AM6	240	130	3	
3	EM34	150 A_1 A_2 360 Ia	—	20	Record only
4	EF92-8D3 or 6AM6	320 360	320 360	18 11	Record Play
5 A	6SN7GT	40	—	1.2	
5 B		40	—		
6 A	6SN7GT	370	—	14	
6 B		370	—		
7	EZ35	330 RMS A_1	—	370	Total cathode current =37mA
		330 RMS A_2			

Mains consumption at 230V=.2A

ment is by removing both the head cover and the pressure wheel cover.

Tape guide adjustment. Tape guides are located beneath head cover and are secured in position on panel by guide posts.

Adjustment of guides is made by slightly rotating guide clockwise or counter-clockwise around guide post to increase or decrease the friction of tape through the guides during "Fast-Reverse" or "Fast-Forward" process. Proper adjustment allows tape to wind tightly on reel within a reasonably short length of time, i.e., 1½ to 2 minutes. The guides should be in a vertical plane with respect to posts to facilitate ease of threading.

Belt replacement and adjustment. If machine fails to start with full reel of tape on take-up clutch, due to slipping of clutch belt, belt should be replaced. When replacing belt, be sure that it does not rub at cross-over point. This may be adjusted by raising or lowering drive pulley held by grub screw on motor shaft. In normal operation, rubber dust from clutch belt will accumulate and should be removed from time to time.

Roller pressure adjustment. Pressure of rubber wheel against tape and capstan spindle is adjusted at factory and it is not recommended that adjustment be made but rather that any defective component be replaced with a new part. If tape tends to crawl up or down on capstan spindle, it indicates that the spring may not be seating properly in grooves of wheel shaft. If this condition is satisfactory, then spring may have inadvertently been bent in a manner causing one arm to press more than the other. Since the adjustment is critical, it is recommended the spring be replaced rather than adjusted.

Another possible cause for this trouble is insufficient tape tension at record head.

Replacement of pressure wheel spring. Remove retaining spring clip which holds the assembly in place on post. Lift assembly off mounting post and slide spring out end of bracket and replace with new one.

CASEBOOK

Next time you pat yourself on the back for a difficult repair well done, remember that you may get a cash reward as well by dropping a line to "Casebook"

MURPHY V114

WE recently had in a Murphy V114: complaint—weak picture but sound OK. Sound was actually quite good, so vision IF and video stages were carefully checked but everything seemed normal.

According to the book, RF and oscillator should have been all right but, just in case, we checked, and found that the oscillator anode load, a 22K 1W, had gone high resistance. Changing this resistor restored normal performance.

We had also been having trouble with another V114. The customer kept reporting changes of contrast, sometimes as a slow fade, sometimes as a click—but never when we were there.

Soon after doing the above job, this customer came in with the good news that both picture and sound had gone except for an intermittent distorted breakthrough of sound. The set was collected and, going straight to the oscillator circuit, the 22K was found open circuit.

In neither case did the resistor show any sign of damage or react to gentle tapping.—E. LAYTON, Mitcham.

PILOT "BLUE PETER"

A NEW Pilot "Blue Peter" was returned after two weeks' operation with the complaint that signals were very weak. It appeared to be working normally so was left on "soak." After about an hour signals faded till only the local stations could be heard.

A new set of valves was tried without improvement, so the chassis was removed. When a meter was connected to the HT line to check the HT supply, the receiver suddenly burst into life, fading again after ten minutes. This happened every time the HT line was disturbed, so signal injection was adopted.

The output stage was not at fault and injection of IF signals revealed a loss in signal between the FC anode and the IF grid.

This brought IFT1 under suspicion and it was removed for examination. Coil windings were of correct resistance and the fixed parallel capacitors checked OK on the bridge. The connection of the primary winding however, did not look very clean and, knowing the trouble that can arise from a stray strand of Litz wire, the lead was unsoldered. The strands were cleaned with meth to remove any enamel, a good connection remade, and the transformer replaced.

The receiver was realigned and after three days of perfect operation was returned to the owner and has been operating perfectly since then.

The trouble mus thave been caused by an intermittent or HR connection in the IFT detuning the circuit. I can only think that the reason signals returned when the HT line was touched was due to "shock excitation."—J. C. H.

CASEBOOK INDEX

ALL Service Casebook items published in the September 1951-February 1952 supplements are reprinted and also fully indexed in Volume 6 of "Service Chart Manual."

Another feature of that volume is a reprint of the Sales-Service Review of Television Receivers that appeared in the January issue of "Electrical and Radio Trading." This review gives the valve line-up, tube type, intermediate frequencies, aerial input and speaker size for nearly every 1951-52 receiver.

18 TV, radio and electrical charts are given in the "Manual" which has durable manilla covers and an index on the front. Like its predecessors, "Service Chart Manual" is published specially and exclusively for regular subscribers and issued at the "presentation" price of 3s.

Send your order today, with cheque or PO, to The Publisher, "Electrical and Radio Trading," 6 Catherine Street, London, WC2.