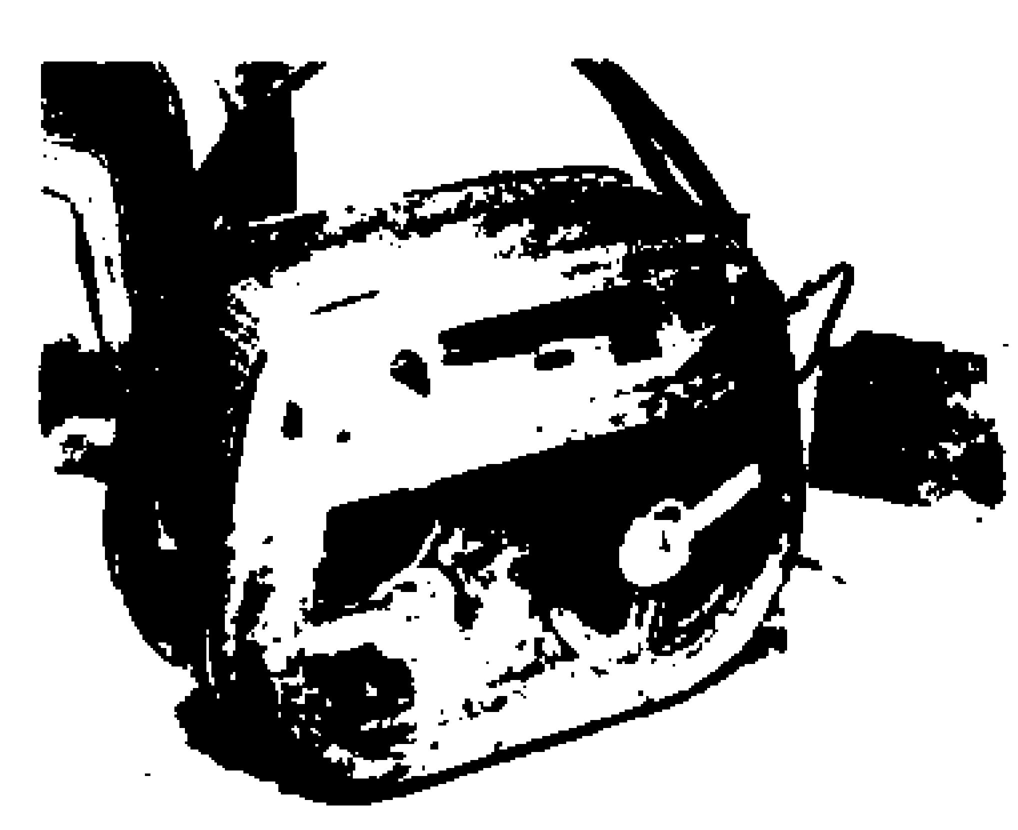
TAPE RECORDER SERVICE

By H. W. HELLYER



Butoba MT5

One of my correspondents asked me recently why I "wasted my time" writing about the older decks, when there were such fine new machines as the later *Grundigs*, the automatic *Telefunken*, the *Sony*, the *Planet*. . . . After having used this space for eighteen months the reason for my concentration on earlier models should have been clear. If it is not, I must have failed in my object! Nothing would be simpler than to follow in the footsteps of the reviewers, describing specifications of these later decks and adding comment on construction. But what owner of, say, the latest *Clarke and Smith*, the *Revox* E36, the *Akai* M6, to name but a covetable few, is going to be tempted to delve into its innards just for the fun of checking my ham-fisted working drawings.

Surely not the new—yet!

There are two reasons for our choice of machines to discuss: **first**, any new tape recorder is presumably going to be serviced under guarantee, and manufacturers take a dim view of technical hacks who advise readers to lay about them indiscriminately with soldering iron and pliers. **Second**, the number of requests for information that come to the *Tape Recorder* office give a pretty fair indication which machines need detailed description. And, incidentally, those faults that are most prevalent.

So that's why I concentrate again this month on a machine that has been superseded by an improved design—quite radically different—and has now gone out of production. The **Butoba** MT4 and MT5 must be familiar to us all. They have been widely advertised, and are still in plentiful supply at quite reasonable prices. For the purpose of this article we shall refer to the MT5—differences were mainly in production modifications. So, first a few facts.

There are two motors, one for capstan drive and the other for fast winding. The take-up torque is provided by a thin spring belt *B* from the capstan to the clutch drum of the righthand spool. This spring is tensioned by its grip on a "cord reel" of aluminium which is pressed on the capstan shaft *C*. I shall probably get shot for saying so, but the remedy for reluctant take-up is either an increase in belt tension by careful shortening (not a simple job if you want to avoid annoying knocks) or a judicious attack on the aluminium with a penknife. This is, providing the flywheel itself is not slipping. The flywheel *A* has a rubber rim which is engaged by the appropriate step on the motor pulley for 3¾ or 1⅞ i/s tape speeds. Note that this is not an outer rim, but a raised inner section *D*, and the motor lifts bodily to swing into place when the speed change is operated. As there is less pressure on the rubber at the lower speed, it is advisable, to prevent undue wear and resultant "wow", to leave the machine set on the 1⅞ i/s speed when it is switched off.

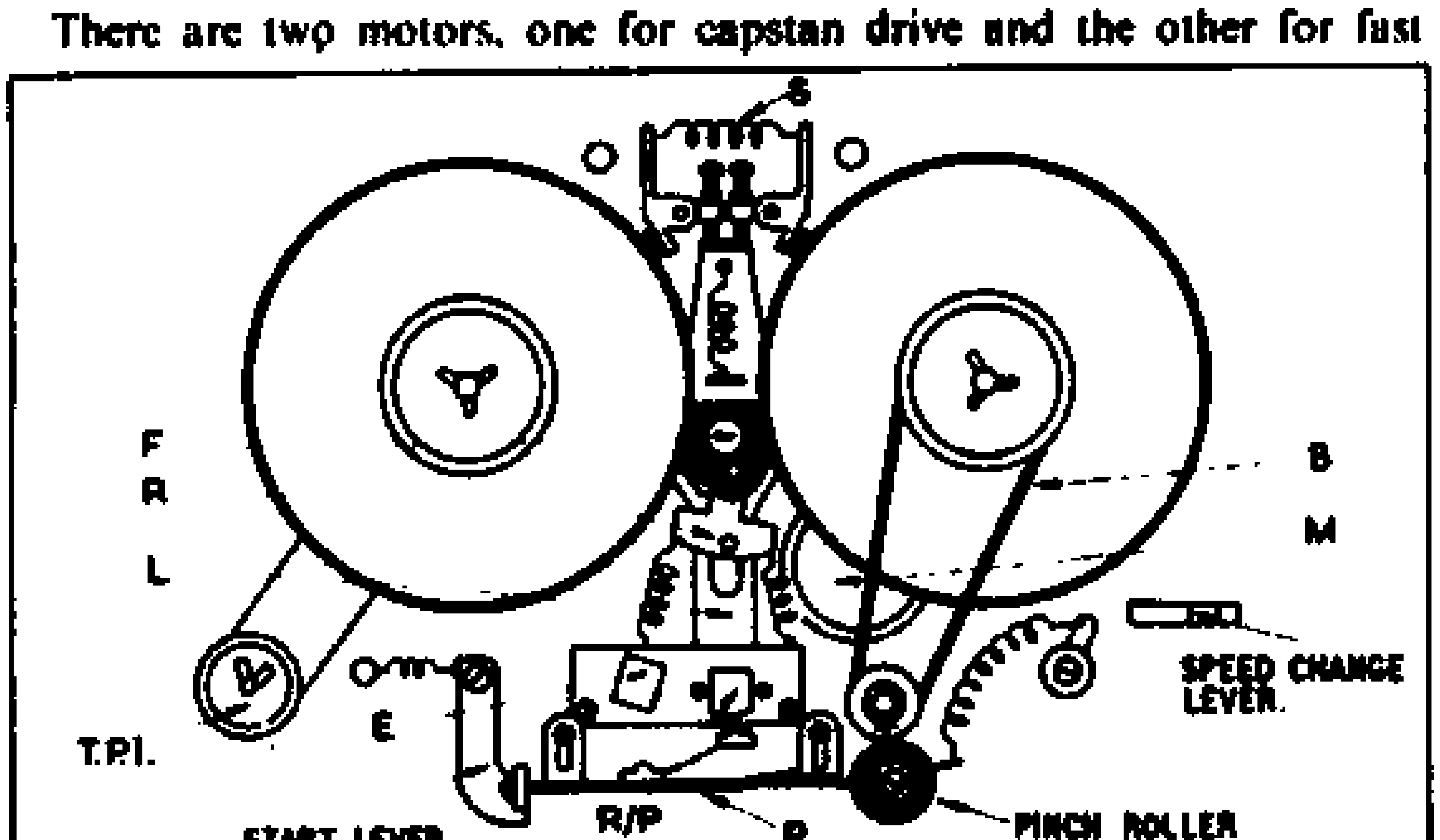


FIG. 1.

Two motors

Both motors are 6-volt, but the drive motor *M* has a regulator consisting of a centrifugal switch and OC76 transistor, which allows constant speed over the voltage range 6.7 V to 4.9 V. There is a contact screw for this switch which provides a small range of speed adjustment (clockwise to increase), but if it is at its limit for the correct speed of tape travel, the two 100 mfd electrolytics *G* should be checked. These are tucked away under the deck-plate, between the base of the motor (by which I mean the end remote from the pulley) and the speed change lever. Since the production of the MT5 a number of miniature electrolytics of similar capacity and rating (15 V DC) have come on the market, and replacing them is no trouble.

As a check on motor efficiency, it is convenient to measure current consumption, which should not exceed 125 mA, loaded. But even if it does, do not chase off in haste to order a new one—these motors are intended to operate on very light loading, and pinch pressure, head felt pressure and lefthand spool braking should be checked. When the motor is completely unloaded, the current should not exceed 50 mA. If it does, try tapping lightly against the motor case as it is running, with the blade of a screwdriver, to free the bearing. But go easy on the lubrication—oil will run down to the pulley and onto the rubber of the flywheel.

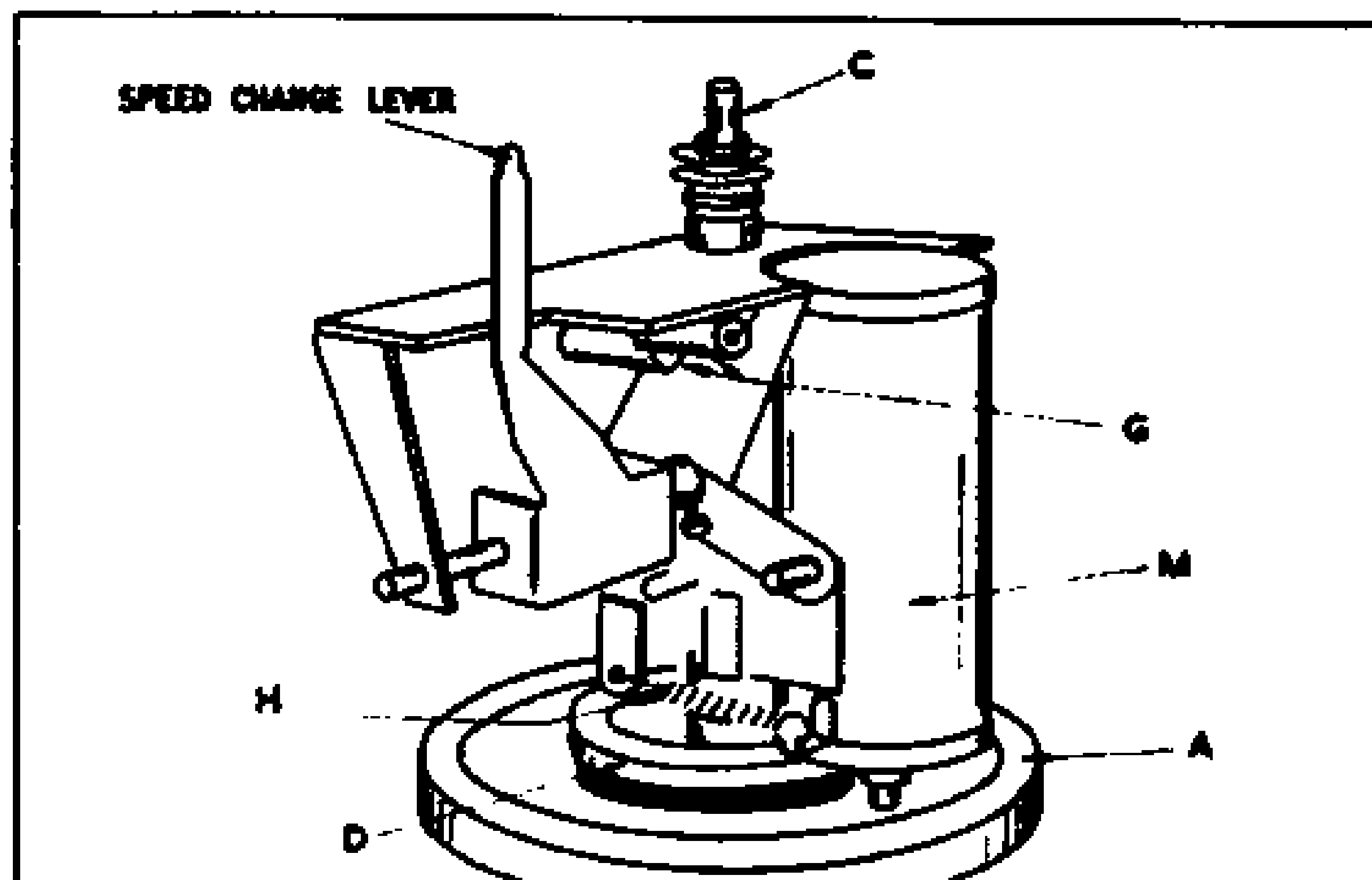


FIG. 2.

Remember that the motor is sprung into position *H*, and has an "elbow" movement, so that it can become dislodged, especially if the machine has a bump! Check that the springs have not become unhooked, the lever bent and fouling the edge of its slot, or the stop-rail jammed.

The *Fast Wind* function is effected in the same way, by physical engagement of the motor *F*—also a 6 V unit, but with no regulator—with the appropriate spool carrier. Each of these has a large lower drum with a rubber rim, also used for braking. There is a rocker arm *R* with a cutaway engaging a spigot on the motor casing. This arm is directly impelled by the appropriate key, and a switch also energises the motor by the same action. There are two important springs to each arm of the rocker.

Beneath this rocker is another, larger lever *L* which operates the brakes, sliding toward the operator when "*On*", allowing the swivel brackets with their common spring *S* to turn to the limit determined by the locknutted screws. Adjustment is straightforward, but do not overlook the auxiliary brake beneath the deck, consisting of an angle bracket and felt pad which supplies friction to the left-hand spool carrier during forward winding and play/record. This is adjustable by screw and small clamp, and care must be taken that too much friction is not applied—check with full and empty spool and during fast wind in both directions before locking the clamp.

The head assembly is fairly simple. Two-screw azimuth alignment is provided, and the pressure pads are mounted on the main roller bracket

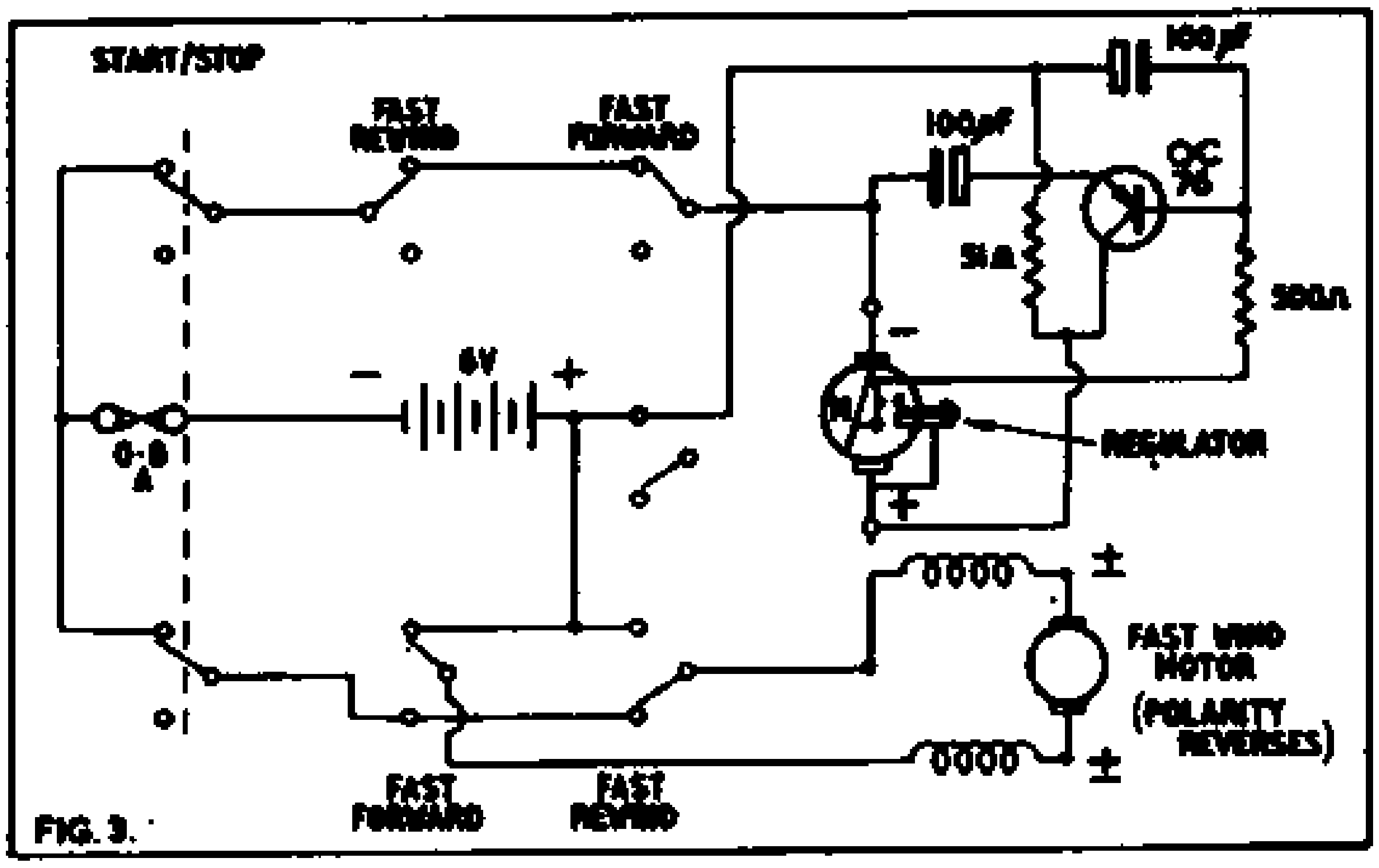


FIG. 3.

P via a separate sprung lever. It is easiest to take this last item off to adjust head height, then set the screws of the mounting plate so that the tape is flush with the upper edge of the erase head. Allow no more than a 1 mm. overlap of head to tape. Then set the R/P head height individually, replace the pad arm and play through a test tape for maximum output, making final adjustments.

Electrical tests are rather difficult without recourse to a valve voltmeter. And life is made easier with a signal tracer, which need not be a complicated instrument Mr. Bartlett Still could probably knock us up one between meals. For the benefit of those who have suitable facilities, here are some typical figures:

Oscillator check: measure 6 v a.c. across erase head, see that magic eye lights up, if not, check filaments, (0.8 1.1 V), and DC voltage at collectors of the two OC74 transistors. These should be equal, about 6 v. and a low reading may indicate a circuit fault, provided the playback is in order. If both record and playback are faulty and the magic eye does not light up, change the OC74s. These should be matched, but a 25 K variable resistor allows balancing, for correct oscillation during record, while another 25 K preset taps off the correct voltage to the centre-tap of the driver transformer secondary. An easy check of the amplifier is its overall current. At 6 V working, without input, during playback, there should be about 50 mA drawn. If this is in order, and the voltages of the two output transistors match, it will be necessary to check the transformer windings.

If our problem is distortion, there are one or two adjustments that can be made before taking an axe to the printed panel—"doing a Lizzie", in the trade parlance. Check the biasing voltage, which should be between 12 and 15 volts a.c. (incidentally, the bias and erase frequency is as low as 30 Kc/s). There is a 10 K preset to regulate this bias level, taken from a tap on the oscillator transformer via a 0.022 mfd capacitor. If the erase circuit is in order but recording is distorted, and this voltage low, replace the last item. These parts are situated on the small printed panel. The large panel contains the 4-stage amplifier.

If signal tracing is to be carried out, it is most likely necessary on *Record*. For *Playback* tracing, simple noise reproduction the old screwdriver approach is sufficient until the source of loss is established—from then on it is a matter of distortion tracing. The head should deliver between 150 and 250 microvolts at 1 Kc/s from a test tape (fully modulated). To revert to *Record*, take the amplifier on the larger panel as a complete unit and apply 150 250 microvolts at 1 Kc/s to the OC603 base. Disconnect the erase oscillator to avoid spurious responses, and to enable tracing all the way through to the head: unsolder the two blue terminals on the erase coil. It should then be possible to read a full 3 V at the OC76 output.

Noisy reproduction is another bugbear especially if a machine has been standing for a long while. I would emphasise that this is very rarely caused by transistors themselves. More often, it is a change in operating conditions beyond the limits stipulated by the manufacturers, or quite different component failure. If I seem vehement, it is because of the strong rubbish talked by many people about transistorised radios—when, quite often, the circuits which the transistor manufacturers designed so carefully have been pared by the receiver manufacturers to save costs or to speed production.

At the risk of a hollow laugh from some unfortunate owners, I would aver that this rarely happens with tape recorder design, so if there is noise, there must be a reason, and *ipso facto*, the transistors are the last parts we need to check.

On this machine, there is the possibility of a dried-out coupling capacitor—these components are happier with regular use. Hum or motor-boating may be the result of one or more of the 100 mfd electrolytics failing—but this is an obvious fault, common to all stages, more noticeable as one traces along the chain. The sort of noise that sounds like atmospheric hash is more likely to be caused by a current carrying resistor. As might be expected, this kind of fault is more noticeable in early stages, for the thermal noise produced is amplified along the chain. The higher the ohmic value, the more pronounced the effect. In the machine we are discussing, there is one resistor, a 100,000 ohm from the decoupled negative line to the base of the OC603, which is prime suspect, and should be replaced with a high stability component. It is usually situated at the left upper side of the board, right beneath the OC603.

Before closing a word of warning about component replacement. There is a temptation to be niggardly, to bend connecting wires and keep components for further use. Do not succumb: better to clip off the

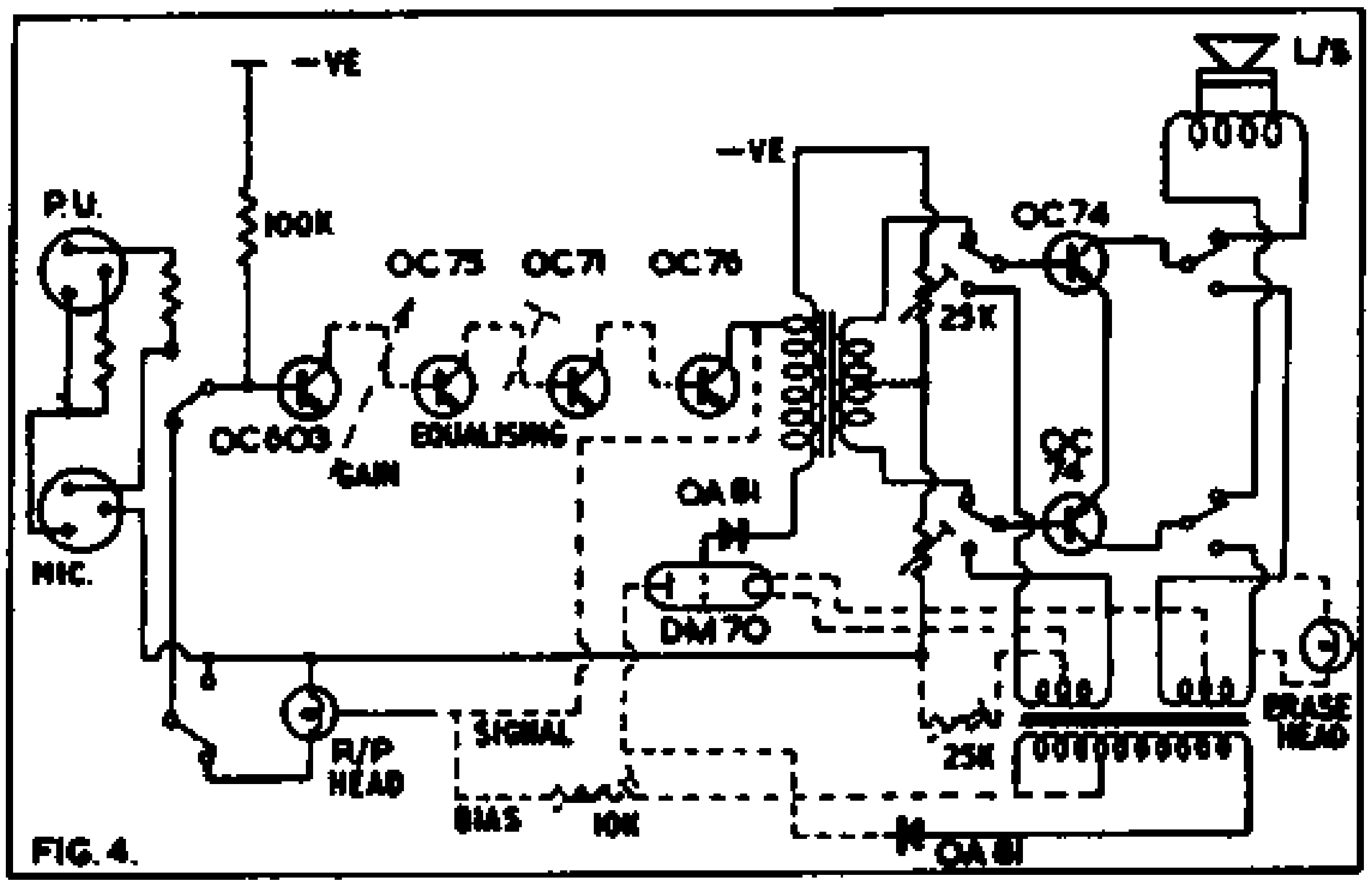


FIG. 4.

component and let the tail end of the connecting wire drop off with the minimum of applied heat, then to bend the wires of the new component exactly to length, avoiding too sharp an angle where a wire enters the body, clean the wires and the print, leaving insertion holes clear, fit the component to its flush position, solder with as brief an application of heat as is compatible with a good joint, finally cutting the excess tails from the print side.

Wasted words? I do not think so, for, like the advice to use a heat shunt, gripping the wire between iron and component with a pair of pliers, or even a crocodile clip, it is too often honoured in the breach. And if you change the resistor we have been talking about *without* providing a heat shunt for the transistor that shares its anchoring, you may well cure your noise trouble by getting no signal at all!