Voltage Regulating Devices

Methods of Preventing Fluctuation

By "Cathode."

THERE are two main types of voltage regulating devices. One is concerned with the a.c. input to a receiver and operates to maintain the voltage of this substantially constant notwithstanding line voltage variations. The other is applied across the output or part of the output of a B supply device, and is intended to maintain the B voltage approximately constant in spite of variations in the current drain from the unit.

The two types of device may also be distinguished by the receivers in which they are incorporated. The first type is usually found in a low-priced receiver in which the safety margin of transformer and condensers has been made so small as to render protection against line fluctuations essential. The second is seldom found in any commercial receivers, but is the more expensive and is intended to improve the results of the receiver rather than to protect any of its components against breakdown.

Line Voltage Regulator.

WE shall deal with the first type, the line voltage regulator first.

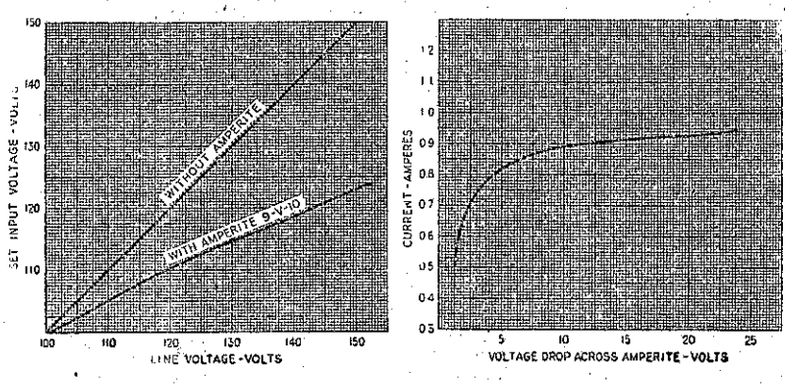
In essentials all these devices are the same. Whatever their outward appearance, they contain a resistance element, usually a wire winding, having an extremely high temperature coefficient.

Their operation is simple. Assume that we have such a device connected in series with the primary of a power transformer feeding a set. Under normal operating conditions, say, the set draws half an amp at 100 volts.

Under these circumstances the voltage regulator has a working resistance of 20 ohms, thus reducing the line voltage of 110 volts to the required 100 volts and running just slightly warm. Now, owing to a temporary reduction in the load on the supply line, the voltage rises to, say, 120 volts. The first and obvious result is that the set will draw more current through the regulating resistance. The second and less patent effect is that the increased current will heat the voltage regulator, the resistance of which will by reason of its high temperature coefficient, increase to, say, 30 ohms. The drop in voltage across a 30-ohm resistance will be 15 as compared with 10 volts across a 20-ohm resistance. Thus the voltage applied to the power transformers will rise from 100 to 105 as compared with the rise to 110 which might have been anticipated.

Fig. 1 shows a typical set of curves for a device of this kind.

Fig. 2 shows the simple manner in which it is connected.



Figs. 1 and 2 showing how voltage regulating devices maintain voltage at a constant figure.

It is unfortunate that the available types of regulators are designed for insertion in a 110-volt line and not for the 230-volt supply common in New Zealand. One particular regulator (i.e., Amperite 5A5) is suitable

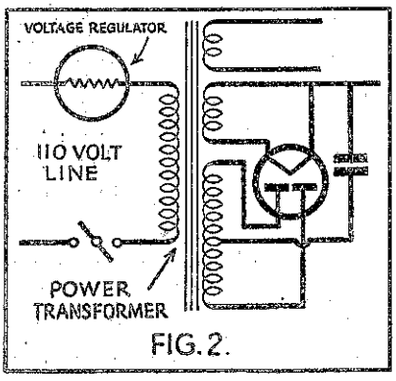


FIG. 2.

for sets drawing half an ampere, however, so that the larger receivers taking 100 watts or more from the supply line may have this unit incorporated in them. Where a receiver is wired for 110 volts and this is derived from a step-down transformer the appropriate unit may be wired

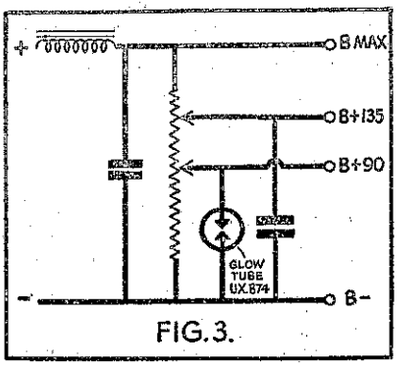


FIG. 3.

in series with the transformer in the receiver proper. The step-down transformer will not usually require any protection.

Perhaps the writer may be permitted to express his own private opinion that power apparatus should be designed on sufficiently generous lines to render line voltage regulators unnecessary.

Internal Voltage Regulator.

COMING now to the other type of voltage regulator, this is represented by the UX874 voltage regulator tube, which maintains a constant potential drop of 90 volts over a wide range of current values. It is normally connected in parallel with the lower portion of a potential divider across the output of a B supply unit as in fig. 3. The tap to which one terminal of the 874 is connected maintains the required voltage of 90 almost irrespective of the drain from this point. It will also be clear that other tappings on the potential divider will maintain a much more constant potential than would otherwise be the case. A voltage of 180 can be maintained absolutely constant if desired by connecting two of these tubes in series.

If the UX874 is examined it will be found to be simply a neon glow tube of unusually accurate characteristics. To start the characteristic blue glow a potential of 125 volts is necessary, but as soon as the tube flashes the increased current through the potential divider drops the voltage across the tube to 90, where it stays until the current through the tube falls to less than 5 milliamps, a condition not likely to arise if the tube is connected across suitable points. The maximum current which the 874 will pass is 50 milliamperes.

Apart from its value as a voltage regulator, the UX874 is extremely helpful in reducing back coupling, particularly in an audio amplifier. Considered from this viewpoint, it has been found equivalent to a condenser