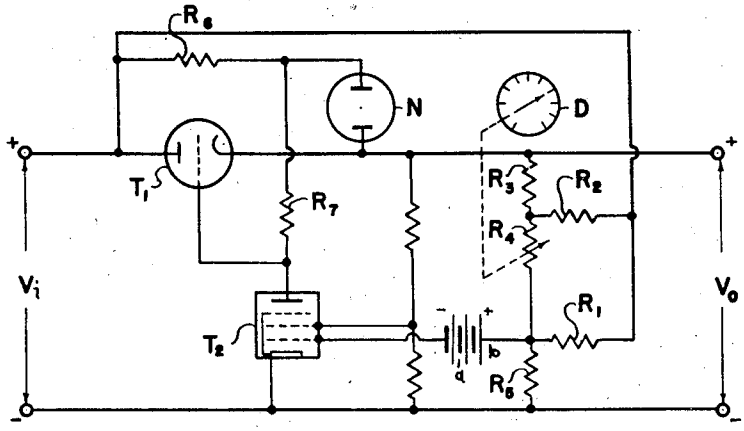
Dec. 28, 1948. A. J. H. VAN DER VEN 2,457,615

VOLTAGE STABILIZING CIRCUITS

Filed Dec. 1, 1944



PRIOR ART

FIG. 1

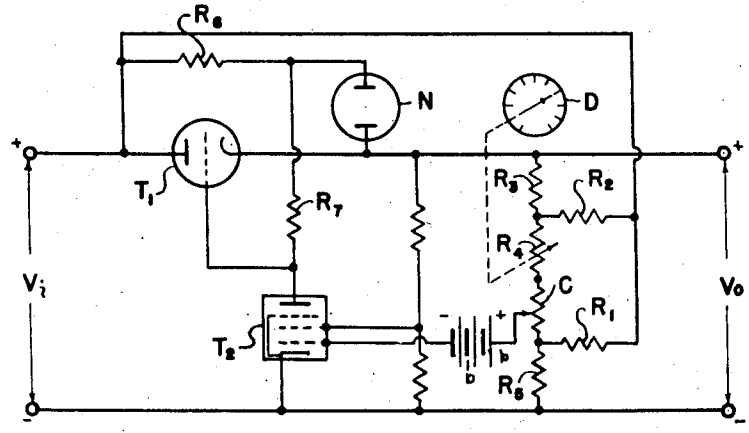


FIG. 2

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VOLTAGE STABILIZING CIRCUITS

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2 Claims. (Cl. 323—22)

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This invention relates to electric circuits embodying a thermionic valve, adapted to derive from a fluctuating or variable input voltage, a stabilised output voltage which is substantially independent of the load, and more especially to circuits of this kind provided with means for adjusting the value of the output voltage at will between prescribed limits.

In voltage stabilising circuits already disclosed (and shown in more detail below) the value of the output voltage can be adjusted at will, substantially without disturbing the effectiveness of the circuit to provide a steady output voltage under conditions of unsteady input voltage, and/or fluctuating load, and it is convenient in such a circuit to calibrate the said adjusting means directly in terms of output voltage. In such circuits a bias voltage, which may be derived from any constant voltage arrangement such as a battery, a neon discharge tube or a separate stabilising circuit, is applied to a thermionic valve in the controlling circuit. The bias voltage so derived, although described as constant, may be liable to a gradual change. The calibration of the adjusting means is however correct only for one value of the bias voltage, and consequently the calibrated scale becomes incorrect when any such change of that bias voltage occurs.

The main object of the present invention is to overcome this defect in voltage stabilising circuits by providing means whereby as soon as the said bias voltage is varied a simple correction may be introduced, whereafter all settings of the scale will be correct until the bias voltage is again changed.

With this end in view the invention consists in an electric circuit embodying a thermionic valve, adapted to provide a steady output voltage from an unsteady input voltage, and provided with means, including a variable resistance fitted with a scale calibrated in volts, for adjusting at will the value of the output voltage, wherein adjustable means are provided in the circuit for the introduction of a voltage correction for errors between the said scale indications and the true values of the output voltage arising from changes in other characteristics of the circuit, such as the bias applied to said thermionic valve.

The invention will be clearly understood from the following description of one form which it may assume, and the description will be more readily followed by reference to the accompanying drawings wherein

Fig. 1 represent a form of voltage stabilising circuit previously disclosed; and

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Fig. 2 shows the controlling elements of a voltage stabilising circuit incorporating one form of the improvement introduced by the present invention.

The form of voltage stabilising circuit shown in Fig. 1 has been substantially disclosed in British Patent Specification No. 552,822, from which full details of the circuit may be ascertained. For the purpose of the present description it is sufficient to note that a fluctuating input voltage V_I is controlled by the circuit including a grid-controlled control valve T_1 connected in series with a load connected across the output terminals to provide a steady output voltage V_o: that the value of the output voltage V_o may be altered at will by adjustment of the variable resistance R_4: and provided that the resistance values in the bridge circuit as shown are so chosen that

$$\frac{R_1}{R_5}=\frac{R_2}{R_3}$$

where R_1, R_2, R_3, R_5 represent the values in ohms of the resistances so symbolised, the stabilising effect is independent of the value of the resistance R_4:

In any voltage stabilising circuit in which the essential controlling elements comprise series resistances, such as shown in Fig. 1 as R_3, R_4, R_5 across the output leads, with the control grid of a thermionic valve T_2 connected through a bias battery a to the junction of R_4 and R_5, and the valve cathode connected to the negative output lead, or with the valve control grid connected directly to the junction R_4, R_5 and the valve cathode connected through a neon stabiliser to the negative output lead, the value of the output voltage V_o depends upon, and is in linear relationship with, the value of the resistance across the output leads. It is convenient to calibrate the adjusting knob of the variable resistance R_4 directly in terms of output volts as shown at the dial scale D, so that within the limits of adjustment of R_4, any desired value of output voltage can be obtained by the simple setting of the knob to the desired value. A stabilized anode voltage for valve T_2 is derived from the junction of a network consisting of a neon regulating tube N connected in series with a resistance R_6 across valve T_1, the anode voltage for valve T_2 being applied through a resistance R_7.

It will be noted, however, that such a calibration is only correct for one particular value of the bias voltage applied to the valve by battery a, and any change in the value of that bias voltage invalidates the calibration.

According to the invention, in order to meet this defect, a modification of the circuit is introduced, as shown in Fig. 2 herewith. Instead of connecting the positive terminal of the bias voltage supply to the junction of the resistances R_4, R_5, it is connected to the slider contact *b* of a potentiometer *c* which is connected in series between those resistances. Thus when any change occurs in the value of the bias voltage, the value of the output voltage V_0 can be measured with a D. C. voltmeter and adjusted by movement of the slider *b* until it agrees with the scale reading of the adjustable knob on resistance R_4. This need be done for only one setting of the knob, whereafter the calibration is correct for all knob settings unless and until the value of the bias voltage again varies.

The potentiometer *c* is preferably of small resistance, intended to provide correction only over a small range of bias voltage changes, and its adjustment has therefore only a small or negligible effect upon the voltage stabilization.

It should be understood that the form of the invention indicated above is described merely by way of example, and modifications thereof may be employed, as will be clear to persons versed in the art, without departing from the scope of the invention.

I claim:

1. An electrical circuit arrangement comprising, input means comprising a positive lead and a negative lead for connecting to a source of voltage subject to variations in value, output means comprising a positive lead and a negative lead for connecting to a load of fluctuating value, a discharge tube having an anode connected to the positive lead of the input means, a cathode connected to the positive lead of the output means and a control electrode, a first fixed value resistance element, a variable value resistance element and a second fixed value resistance element connected in series relationship in the order named with the free ends of the first and second fixed value resistance elements connected across the positive lead and the negative lead of the output means, a potentiometer interposed between the variable value resistance element and the second fixed value resistance element and being provided with a variable tapping, a third fixed value resistance element interposed between the positive lead of the input means and the junction of the first fixed value resistance element and the variable resistance element, a fourth fixed value resistance element interposed between the positive lead of the input means and the junction of the second fixed value resistance element and the potentiometer, the values of said first, second, third, and fourth fixed value resistance elements being such as to form a bridge circuit, a thermionic tube having a cathode connected to the negative lead of the output means, an anode connected to said control electrode and a control grid connected to said variable tapping, a resistance element interposed between the anode of the thermionic tube and a positive voltage point having a substantially constant value relative to the voltage of the positive lead of the output means, and means interposed between the control grid and the cathode of said thermionic tube for applying a biassing potential to said control grid, said variable value resistance element being calibrated in volts output and being adjustable to vary the voltage at said output means, and said potentiometer being adjustable for varying the calibration of said variable value resistance element.

2. An electrical circuit arrangement comprising input means having a positive lead and a negative lead for connecting to a source of voltage subject to variation in value, output means having a positive lead and a negative lead for connecting to a load of fluctuating value, a discharge tube having an anode connected to the positive lead of the input means, a cathode connected to the positive lead of the output means and a control electrode, a first fixed value resistance element, a variable value resistance element and a second fixed value resistance element serially connected in the order named with the free ends of the first and second fixed value resistance elements connected across the positive lead and negative lead of the output means, a potentiometer interposed between the variable value resistance element and the second fixed value resistance element and being provided with a variable tapping, a third fixed value resistance element interposed between the positive lead of the input means and the junction of the first fixed value resistance element and the variable resistance element, a fourth fixed value resistance element interposed between the positive lead of the input means and the junction of the second fixed value resistance element and the potentiometer, the values of said first, second, third and fourth fixed value resistance elements being such as to form a balanced bridge circuit, a glow tube, a fifth resistance element connected in series with said glow tube between the anode and the cathode of said discharge tube, a source of bias potential, a thermionic tube having a cathode connected to the negative lead of the output means, an anode connected to said control electrode and a control grid connected through said source of bias potential to said variable tapping, and a sixth resistance element connected between the anode of said thermionic tube and the junction of said fifth resistance element and said glow tube, said variable value resistance element being calibrated in volts output and being adjustable to vary the voltage of said output means, said potentiometer being adjustable for varying the calibration of said variable value resistance element.

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