March 15, 1927. 1,621,443

J. B. TREVOR, JR

VOLTAGE REGULATOR

Filed Feb. 24, 1926

Fig. 1,

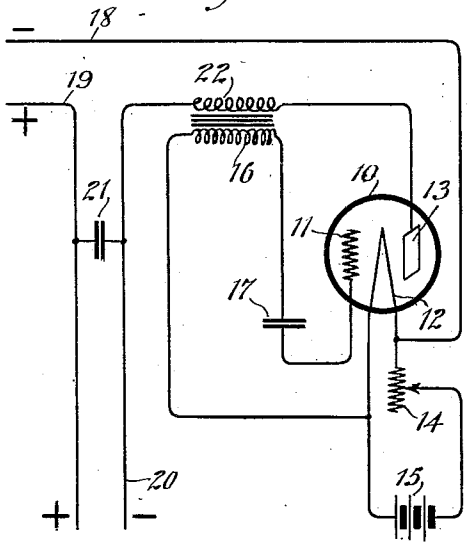


Fig. 2,

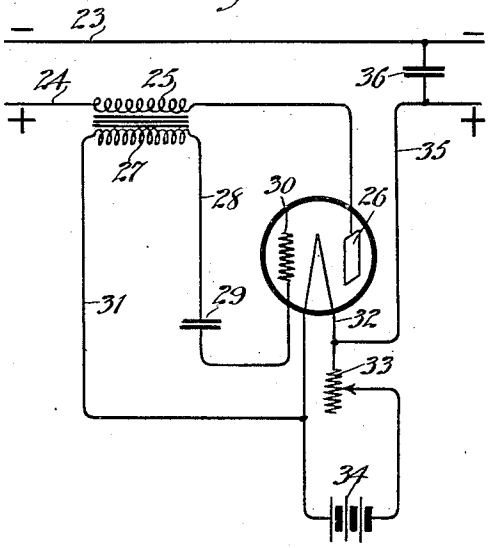


Fig. 3,

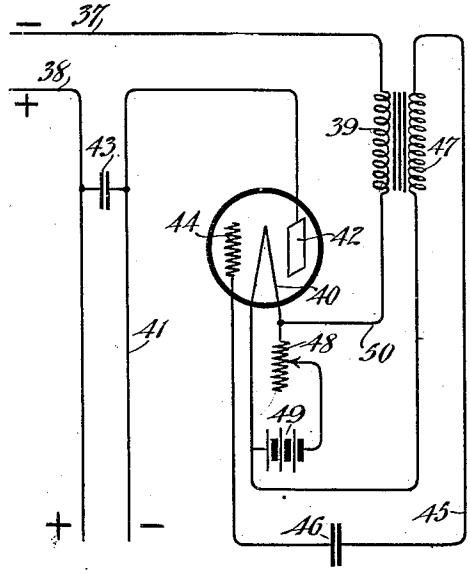
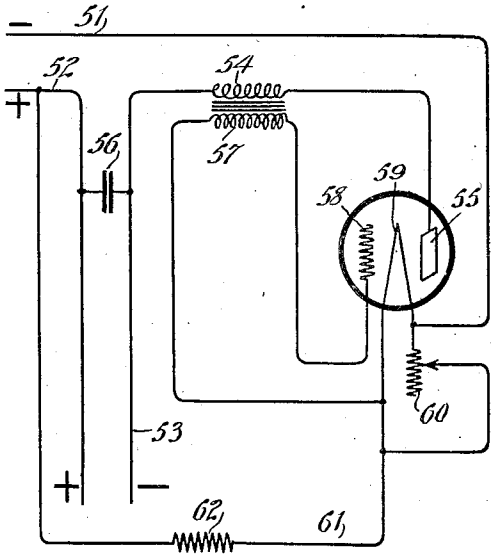


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

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VOLTAGE REGULATOR.

Application filed February 24, 1926. Serial No. 90,403.

This invention relates to a voltage regulator.

An object of the invention is to provide a simple and efficient device for regulating the voltage applied to radio sets where the set is hooked up with a house lighting system.

A further object is to provide a simple and efficient device which is especially adapted to replace the "B" batteries of a radio set with the commercial lighting current.

A further object is to provide a simple and efficient device which will be composed of a minimum number of durable parts which are economical to manufacture and capable of being readily repaired and replaced when desired.

The invention is illustrated in the drawings, of which—

Figure 1 is a circuit diagram of the preferred form of the invention;

Figures 2, 3 and 4 are modified circuit arrangements involving the same idea.

The form of the invention shown in the drawings is the preferred form, although it is understood that modifications in the construction and arrangement of the parts and in the character of the materials used may be adopted without departing from the spirit of the invention as set forth in the appended claims.

In its general aspect the invention comprises the use of a three-electrode thermionic discharge device having its output circuit in series with the voltage or current to be regulated, and its input circuit inductively associated with said voltage or current so that any variations in the voltage or current will create regulatory variations in the input circuit of the tube to permit the tube to act as a valve or check on these variations.

Preferably I connect the triode or thermionic discharge device in series with the line preferably between the radio set and the return wire of the power line with the plate of the tube connected nearest the radio set and the filament nearest the return wire. The filament may or may not be lighted by a separate "A" battery. It is possible to light the filament directly from the power line as shown in Figure 4.

The grid-filament circuit of the tube is connected to a transformer and preferably to the secondary winding thereof, the primary winding of which is disposed in the main power line between the radio set and the plate binding post. Across the power lines just prior to their connection to the radio set I prefer to insert a condenser of any desired predetermined capacity.

This device has been tested with an eight-tube super-heterodyne incorporating three stages of audio-frequency amplification. No hum could be heard when a loud-speaker was used with this set and when headphones were used in the loudspeaker jack, the hum was so slight as to be negligible. When the head phones are used with only a single stage of audio amplification absolutely no trace of a hum was discernible.

The filter operates by varying the voltage drop across the triode through which the current to be filtered is flowing from plate to filament. When the voltage rises an increased negative potential is inductively applied to the grid of the triode, thereby increasing the filament to plate resistance. When the voltage decreases, the grid becomes more positive with respect to the filament, thereby decreasing the resistance.

In the preferred form of the invention, shown in Figure 1 I illustrate a triode 10 having a grid 11, filament 12 and plate 13. A filament rheostat 14 is in circuit with an "A" battery 15. The filament and grid are in circuit with a winding 16 of a transformer which is preferably a standard audio-frequency transformer with a preferable ratio of five to one. A capacity 17 may be inserted in circuit with the grid as shown. The power lines 18 and 19 are shown. The wire 19 to the B+ of the radio set and a wire 20 connects to the B—. A condenser 21 is bridged across wires 19 and 20. The primary winding 22 of the transformer is in the wire 20 which extends to the plate 13. A wire 18 extends to the filament as shown.

In the form shown in Figure 2 the power wires 23 and 24 are illustrated. 23, the return wire leads directly to the B— binding post of a radio set and 24 extends through primary windings 25 of the transformer to the plate 26 of the triode. The secondary 27 of the transformer connects at one end by wire 28 through a condenser 29 to the grid 30. At the other end of the secondary 27 a wire 31 connects with the filament 32. A

filament rheostat 33 is in circuit with the "A" battery 34. A wire 35 extends from the filament to the B+ binding post of the radio set. A condenser 36 is bridged across the wires 23 and 35.

In the form shown in Figure 3, the power wires 37 and 38 are illustrated. 37 is the return wire leading from the primary 39 directly to the filament 40. The wire 38 leads directly to the B+ binding post of a radio set. Wire 41 extends from the B— binding post of a radio set to the plate 42. A condenser 43 bridges the wires 38 and 41. The grid 44 connects by wire 45 through condenser 46 with the secondary winding 47 of the transformer. A filament rheostat 48 is in circuit with the "A" battery 49. Wire 50 extends from the filament to one end of the primary winding 39.

In Figure 4 power wires 51 and 52 are illustrated. 52 leads to the B+ binding post of the radio set. Wire 53 leads from the B— binding post to the primary 54, the other end of which is connected to the plate 55. A condenser 56 bridges the wires 52 and 53. The secondary 57 connects at one end with the grid 58 and at the other end to the filament 59. The return wire 51 also connects to the filament 59. The rheostat 60 is shown in the filament circuit. A wire 61 leads from the filament through a resistance 62 to the wire 52 leading to the power line. This connection is for the purpose of lighting the filament directly from the power line instead of by means of a separate "A" battery.

The audio-frequency transformers used in these forms are standard types used for inter-stage coupling. The fluctuation in line voltage in the primary induces in the secondary an alternating current which is applicable to the grid of the triode. The end of the secondary winding farthest from the core is generally connected to the grid for the most complete elimination of variations in line voltage. The primary terminals should be so connected as to reduce the variation, as one connection will increase it. The grid condenser used as in Figures 1, 2 and 3 is very helpful, although not absolutely vital, and is generally in the neighborhood of 2000mmfd.

In the first three diagrams an "A" battery is used to supply the filament current. In the fourth figure, the resistance 62 is used to obtain the proper drop in voltage between the power lines and filament. In case the device should be used with a rectifier on alternating current mains a step down transformer could replace the "A" battery.

What I claim is:

1. A voltage regulator which comprises a power line, the voltage of which is to be regulated, a transformer having primary and secondary windings, a thermionic valve having its output circuit in series with one of the windings of the transformer and with said line and its input circuit in series with the other winding.

2. A voltage regulator which comprises in combination a transformer disposed in a power line and a thermionic valve, the output circuit of which is in series with the power line and one winding of the transformer and the input circuit of which is in series with the other winding of the transformer.

3. A voltage regulator which comprises in combination a transformer having windings, said transformer to be disposed in a power line the voltage of which is to be regulated, a three-electrode thermionic valve having a plate electrode connected to the power line through one of said windings, its filament electrode connected to one end of the other of said windings and the grid electrode connected to the other end of said second winding.

4. A voltage regulator which comprises a power line, a transformer disposed therein, one winding of the transformer being in series with the line, a three electrode thermionic valve having its plate connected in circuit with the end of the primary that is in series with the power line and its grid and filament electrodes connected to opposite ends of the secondary winding of the transformer.

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