April 19, 1927. 1,625,703

E. H. BOBO

RHEOSTAT

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Fig. 2.

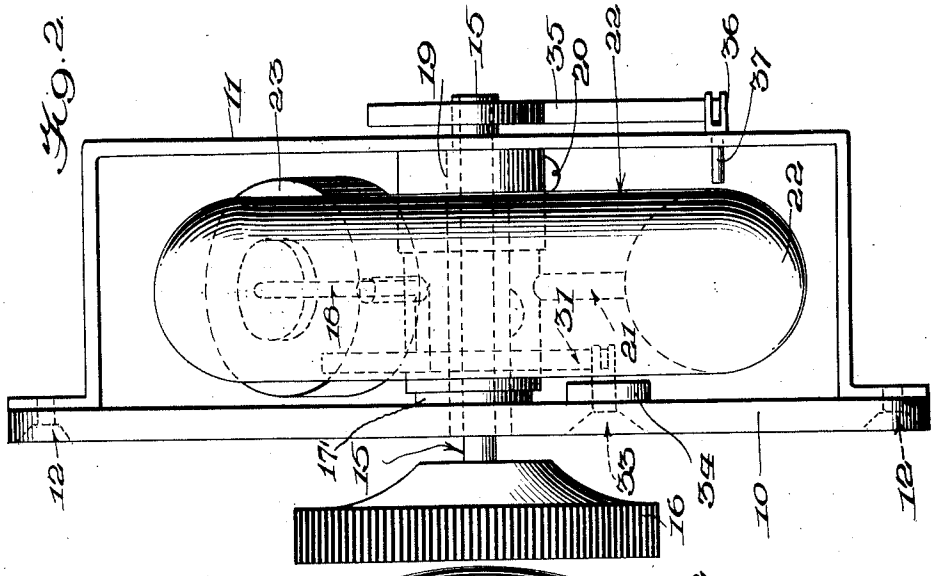
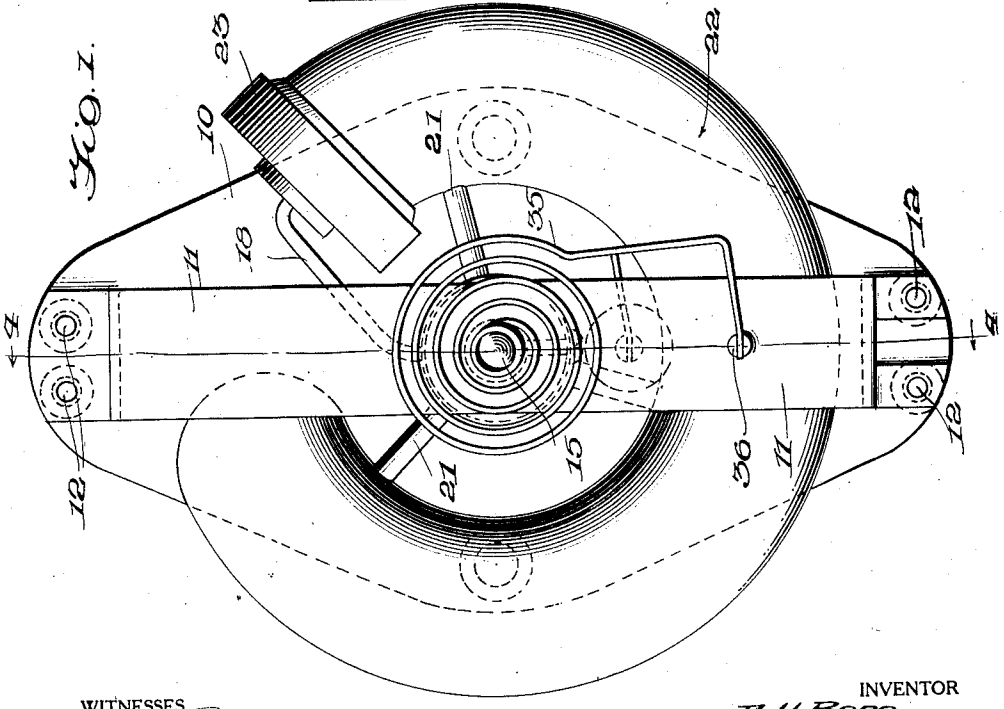


Fig. 1.



WITNESSES

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Fig. 4.

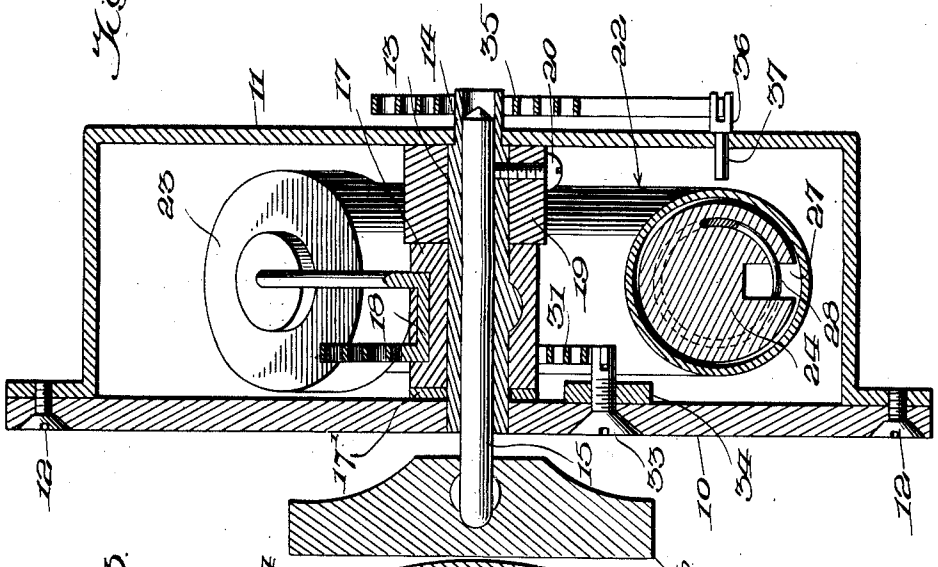
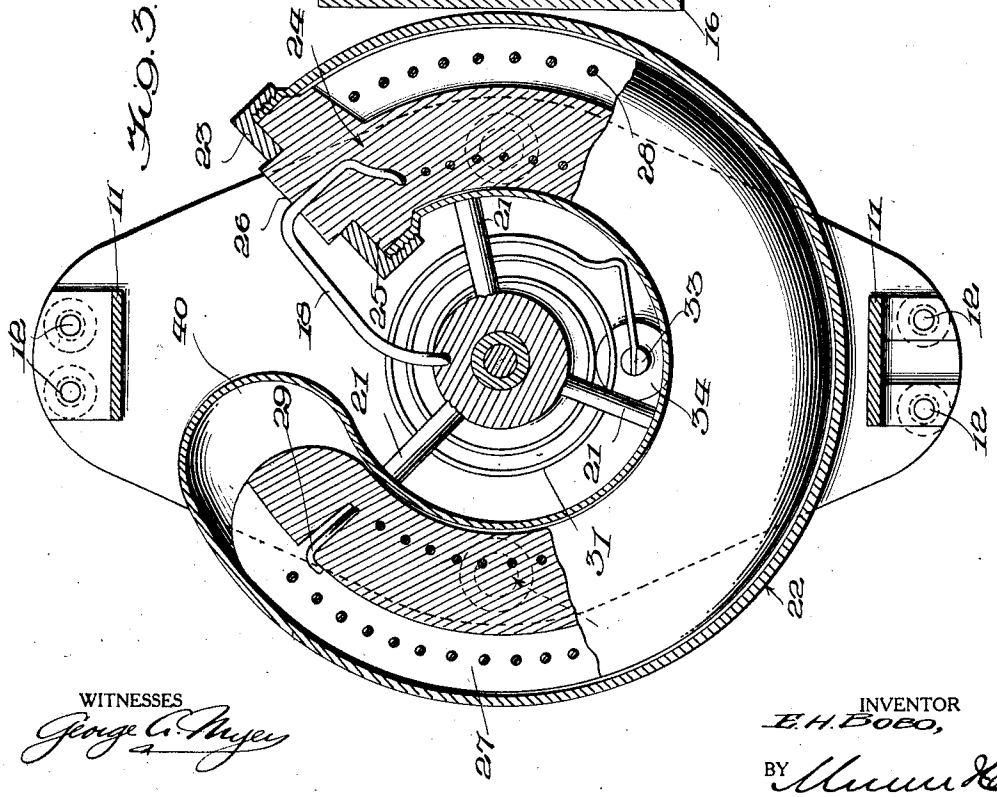


Fig. 3.



WITNESSES

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Patented Apr. 19, 1927. 1,625,703

UNITED STATES PATENT OFFICE.

EDWARD HALFORD BOBO, OF RANGER, TEXAS.

RHEOSTAT.

Application filed August 21, 1925. Serial No. 51,623.

This invention relates to improvements in rheostats.

The prime purpose of this invention is to provide a filament rheostat for electron tubes which will permit varying the current flow through a filament in an exceedingly even and uniform manner.

Other objects will hereinafter appear.

I accomplish my invention by the provision of a rheostat structure wherein mercury or other current conductive liquid serves as a current connecting medium between a resistance coil and a conductor. Means are provided whereby the mercury is caused to move and during said movement either increase or decrease the amount of the resistance coil connected in the circuit controlled thereby.

The present invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a rear elevation of a rheostat constructed in accordance with the present invention,

Figure 2 is a side elevation of the same,

Figure 3 is a view similar to Figure 1 with parts broken away and shown in section in order to more clearly illustrate the invention, and

Figure 4 is a vertical sectional view taken substantially on the line 4—4 of Figure 1.

Referring to the drawings in detail, 10 indicates a support plate and 11 a U-shaped frame member which may be secured to the plate 10 by screws 12. A hollow shaft 13 has its one end journaled in plate 10 and its other end reduced as at 14, and this reduced end journaled in the bridge portion of the U-shaped frame member 11. A bolt or rod 15 is tightly fitted into the hollow shaft 13, one end of said bolt extending from the shaft and carrying a knob 16. The shaft 13 has molded thereon a sleeve 17 which is of insulating material and which has embedded therein a current conductor bar 18. A spring washer 18′ is interposed between the sleeve 17 and plate 10. A collar 19 is arranged upon the shaft 13 and interposed between the sleeve 17 and frame member 11. A set screw 20 is employed to secure together the collar 19, shaft 13 and rod 15. The collar 19 is formed with arms 21 which support at their outer ends an arcuate shaped tube generally indicated by the reference numeral 22. The one end of the tube 22 is formed with an integral closure as shown while the other end thereof is provided with a screw cap 23. The tube 22 is preferably of copper and the interior surface thereof tinned.

Within the tube there is removably fitted a core 24, said core being preferably of hard rubber or other insulating material and of the same shape as the tube 22. One end of the core 24 is formed with a head 25 which has an extension 26. The end of tube 22 having a cap 23 is shaped to fit tightly about the head 25 of core 24. The cap 23 is provided with a central opening to accommodate the head extension 26.

The core 24 is formed with a longitudinally extending groove 27 which begins at the head 24 and terminates with the opposite end of the core. The core has embedded therein a resistance coil 28. The coil is preferably tinned and a portion of each convolution of said coil is disposed in the slot 27 as illustrated to advantage in Figures 3 and 4. The one end of the coil 28 is bent to engage the bottom of groove 27 as shown at 29, Fig. 3. The remaining end of coil is connected to one end of the conductor bar 18. The other end of conductor bar 18 is connected to the inner end of a spiral spring 31, said spiral spring encircling the sleeve 17 on shaft 13 and having its outer end suitably secured to a screw 33 carried by the plate 10. The screw 33 carries a nut 34 to permit a circuit terminal to be connected therewith. It should be noted that the plate 10 is of current insulating material while the frame member 11 is of current conducting material.

The reduced end 14 of shaft 13 has electrically connected thereto the inner end of a spiral spring 35, said spring having its outer end disposed in a slotted head 36 of a pin 37. The last named end of spring 35 should be soldered to pin 37. Also the inner end of said spring should be soldered to shaft 13. Soldered connections should also be made between the ends of spiral spring 31 and the bar 18 and screw 33. The pin 37 is suited to permit a circuit terminal to be connected therewith. Also it will be noted that pin 37 is disposed in the path of cap 23 and said pin serves as a stop to limit rotative movement of the tube 22.

Within the tube 22 there is placed a small quantity of mercury and the remaining space of the tube is filled with a non-oxidizing gas such as nitrogen. The capped end of tube 22 should be tightly sealed and this can be accomplished by shellacking the head 25 of core 24. It should be here pointed out that the quantity of mercury should be sufficient to serve as a connecting medium between the tube 22 and the resistance coil 28 as long as the tube 22 is not rotated to a position to bring the mercury into the end of tube extending from the free end of core 24. The space occurring between the free end of core 24 and the associated end of tube 22 provides a chamber 40 which is of sufficient capacity to hold the quantity of mercury necessary in tube 22 for the operation of the device.

In the use of the present device, the terminals 33 and 37 may be connected with a filament circuit of an electron tube in the usual manner, and if the tube is rotated to a position shown in the different figures of the drawings, the mercury therein will electrically connect the central portion of resistance coil 28 to the tube 22. The current will then flow through spiral 31, bar 18, resistance 28, and from thence through body of mercury to tube 22. The current is conducted from tube 22 through arms 21 and through spiral spring to terminal pin 37. In the instance above described, about one half of the resistance coil is included in the circuit being controlled. If the tube 22 is rotated to cause the mercury to move by gravity toward chamber 40, more resistance will be continually inserted into the filament circuit in an obvious manner; and if the tube 22 is rotated in the opposite direction the resistance in the filament circuit will be gradually decreased. When the tube 22 is being rotated to decrease the resistance of coil 28, said resistance will be entirely eliminated from the filament circuit when the cap 23 engages stop 37. The current now can flow from conductor bar 18 to terminal or stop 37, and thus not pass through any part of resistance 28. In case the tube 22 is rotated until the mercury is in chamber 40 then the filament circuit will be open. The tube 22 can be brought to the last named position when it is desired to disconnect the filament circuit being controlled from its source of supply.

While I have described my invention as being particularly applicable for controlling filament circuits of electron tube, it is to be understood I am aware of the fact that the same may be used for other purposes, and I am not to be limited to the use described.

I claim:

1. In a rheostat, an arcuate shaped metallic tube, means for rotating the tube about its axis, a core of insulating material arranged in said tube, a resistance coil molded within said core with a part of each convolution of said resistance exposed, and a body of current conducting liquid in the tube adapted to move with rotation of the tube and during said movement change the point of electrical connection between the tube and resistance coil in a continuous manner.

2. In a rheostat, an arcuate shaped metallic tube, means whereby the tube may be rotated about its axis, a core of insulating material in the tube said core having a longitudinal groove, a resistance coil embedded in the core longitudinally thereof, and each convolution of the coil having a portion disposed in said groove, and a body of current conducting liquid in the tube adapted to move with rotation of the tube and during said movement change the point of electrical contact between the tube and resistance in a continuous manner.

3. A rheostat comprising a rotatable metallic sealed tube, a resistance arranged longitudinally within the tube and insulated therefrom, a body of mercury within the tube adapted to establish a single point of contact between the tube and resistance and change the point of said contact with the rotation of said tube, and a non-oxidizing gas within the tube.

4. A rheostat comprising a metallic tube arcuate in shape and one end closed, means for rotating the tube about its axis, a core of insulating material tightly fitted within the tube and closing the open end of the tube, said core having an elongated groove with a resistance wire therein, and a body of current conducting liquid within the tube and adapted to move within the groove.

5. A rheostat comprising a metallic tube arcuate in shape and one end closed, means for rotating the tube about its axis, a core of insulating material tightly fitted within the tube and closing the open end of the tube, said core having a longitudinal groove and its end associated with the closed end of tube being spaced therefrom, a resistance wire disposed in the groove, and a body of current conducting liquid within the tube and adapted to move within the groove and also to flow or move into the space between the closed end of tube and associated end of core when the tube is rotated to bring the closed end thereof lowermost.

6. A rheostat comprising a metallic tube arcuate in shape and one end closed, means for rotating the tube about its axis, a core of insulating material tightly fitted within the tube and closing the open end of the tube, a resistance wire carried by the core and having its one end extending through the last named end of the core to serve as a terminal, and a body of current conducting

liquid within the tube adapted to establish points of connection between said tube and resistance wire.

7. A rheostat comprising a metallic tube arcuate in shape and one end closed, means for rotating the tube about its axis, a core of insulating material tightly fitted within the tube and closing the open end of the tube, said core having a longitudinal groove, a resistance wire molded within the core and sections thereof exposed in said groove, and a body of current conducting liquid within the tube and adapted to move within the groove.

EDWARD HALFORD BOBO.