C. WIRT.

RHEOSTAT AND PROCESS OF MAKING THE SAME.

APPLICATION FILED MAR. 23, 1918.

1,371,287. Patented Mar. 15, 1921.

Fig. 1

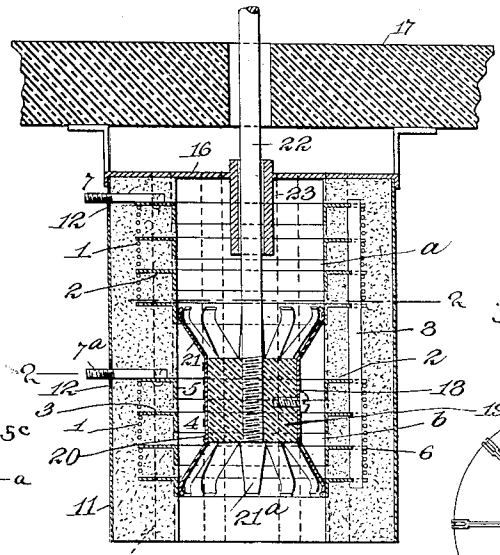


Fig. 8.

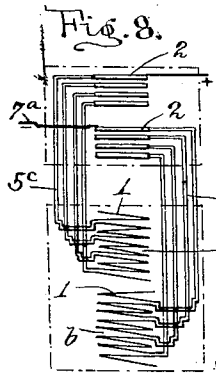


Fig. 7

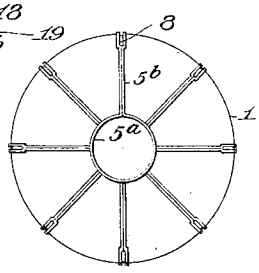


Fig. 9.

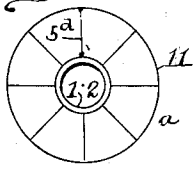


Fig. 2

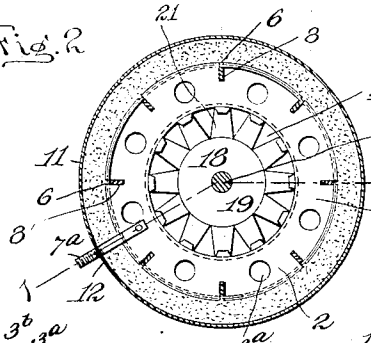


Fig. 5

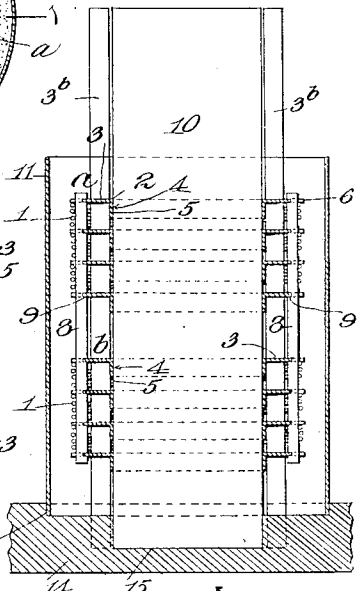


Fig. 4

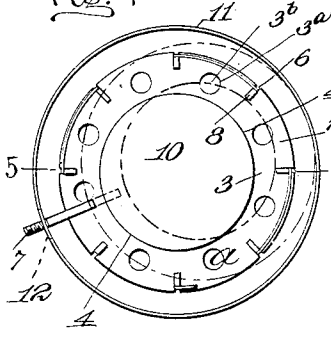


Fig. 3

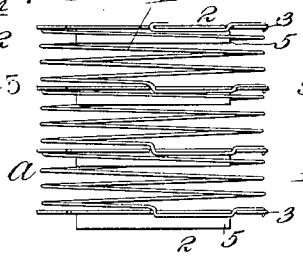
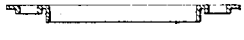


Fig. 6



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RHEOSTAT AND PROCESS OF MAKING THE SAME.

1,371,287. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed March 23, 1918. Serial No. 224,283.

To all whom it may concern:

Be it known that I, CHARLES WIRT, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Rheostats and Processes of Making the Same, of which the following is a specification.

The objects of my invention are to produce a simple, cheap and efficient rheostat and one which is extremely compact and of small size in proportion to its capacity.

These and further objects will more fully appear in the following specification and accompanying drawings considered together or separately.

I have illustrated one embodiment of my invention in the accompanying drawings in which like parts are designated by similar reference characters and in which,

Figure 1 is a longitudinal sectional view of my improved rheostat taken on the line 1—1 of Fig. 2.

Fig. 2 is a transverse section of the same taken on the line 2—2 of Fig. 1.

Fig. 3 is a side elevation of a resistance unit.

Fig. 4 is a diagrammatic view showing the method of inserting the resistance units in a shell.

Fig. 5 is a sectional view on the line 5—5 of Fig. 4, illustrating the method of making the apparatus.

Fig. 6 is a sectional view of a modified form of contact plate.

Fig. 7 is a detail plan view, on a reduced scale of the skeleton frame of a modification.

Fig. 8 is a diagrammatic view of a further modification, and

Fig. 9 is a diagrammatic view of another modification.

In carrying out my invention I provide a resistance member composed of a coil of wire of the required material and cross section. This coil I prefer to make in two separate units *a* and *b*. Each unit is composed of a coil 1 and a plurality of commutator rings or contact members 2. The contact members are of a suitable material which will offer the least possible resistance to the passage of an electric current. The contact members are preferably of sheet metal stamped to shape and each comprises a flat sheet 3 having a central, circular opening 4 and having an annular flange 5 surrounding the opening. The periphery of each contact member is provided with a plurality of radial notches 6. To the uppermost contact member of each unit *a* and *b* is secured a terminal 7 or 7^a respectively, to each of which a binding post may be attached.

The contact members are engaged with the coil of each unit at equi-distant points on the coil by looping the wire through the notches 6, the looped portions of the wire alternately engaging the upper and lower surfaces of the plates between the notches as shown in Fig. 3.

The units assembled as described are spaced apart, and the contact members 2 of each unit are held in proper relative positions by means of a skeleton framework composed of spacing strips 8 of insulating material which are carried in the alined notches 6 of all of the contact members.

Preferably the strips are placed in the notches before the wire is secured to the contact members and the coil is so wound that the wire engages the strips and is thereby retained in approximately circular coils. If desired the strips 8 may be provided at proper intervals with notches 9 which serve to secure the members of each unit in proper position and the units properly spaced apart. These notches may be dispensed with if desired.

The structure above described comprises a framework composed of longitudinal strips carrying two groups, each composed of a plurality of plates connected in series by a wire spiral, there being an equal number of turns of wire between each pair of plates, the groups having no metallic connection with each other, and each plate having a central perforation in axial alinement with the perforations in the rest of the plates. The groups are spaced apart the desired distance on the strips.

Each of the sheets 3 is preferably provided with a plurality of perforations 3^a the number and positions of the perforations being the same in each sheet so that when the plates are in place the holes in each sheet will be in alinement with the corresponding holes in each other sheet.

The cage-like structure is now placed upon a mandrel 10 which passes through the perforations in the plates and is of such a

size that it will engage the walls of the perforations, and hold the cage in position by frictional contact. The mandrel carrying the cage is now placed within a cylindrical casing 11. The casing is somewhat greater in diameter than that of the contact members combined with the length of the projecting portions of the terminals 7 in order that the cage may be placed within the casing while in a position eccentric thereto. When the mandrel is moved into axial alinement with the casing the terminals will project through openings 12—12 in the wall of the casing.

The casing is now seated in a socket 13 in a base 14, the mandrel being centered in the casing by the engagement of one end thereof with a counter bore 15 concentric with the socket.

A rod 3^b is passed through each set of alined perforations 3^a. The rods may or may not be seated in sockets in the base.

The casing is now filled with an insulating material composed of Portland cement, sand-lime or other artificial stone composition in semiliquid form. The base is rocked or otherwise jogged during the pouring of the plastic material to gently agitate the same and cause it to penetrate to every part of the shell and completely embed the wires and every part of each contact member except those portions in contact with the mandrel and the rods.

When the plastic material has become set the device is removed from the base and the mandrel and rods are removed by a longitudinal movement, thus leaving a central cylindrical opening and a series of ventilating openings encircling the central opening through the entire length of the device. The wall of the central bore being of the same size throughout, the diameter being that of the openings 4 in the commutator rings. The turns of the wire will be separated from each other by the insulating material and the commutator rings or contact members will be insulated from each other except through the wire.

A cap 16 having openings corresponding with the ventilating openings is placed over one end of the casing, said cap having means for attaching the device to a switchboard or other support 17.

The device above described comprises the stationary member of the rheostat, and in connection therewith I employ a movable member 18 consisting of a body 19 of insulating material and a metallic shell 20. The shell 20 has a plurality of spring fingers 21 and 21^a at each end thereof and the ends of each set of fingers normally form a circle of a diameter greater than the diameter of the bore of the stationary member so that they will always elastically engage the wall of the bore. An operating rod 22 is secured to the body 19 and extends through the cap 16 and the switch board 17. The cap is provided with a bearing 23 for the operating rod which bearing also acts as a stop for the moving member 18, and is so proportioned that the movement of the member 18 in one direction is arrested when the fingers 21 are in engagement with the uppermost contact member 2 of the group *a* and the fingers 21^a are in contact with the uppermost member of the group *b*.

By dividing the resistance member into two groups and so proportioning the movable member that it contacts with both groups a very compact rheostat is produced and both terminals of the device may be connected to the stationary element, and movable terminals eliminated.

The contact ends of the spring fingers 21 and 21^a are so proportioned that they will bridge the space between contiguous contact members 2 to avoid arcing and to prevent interruptions in the circuit as the member 18 is moved relatively to the contact members.

The flanges 5 of the contact members 2 may be omitted and the members may be placed in relatively close relation to each other thereby providing for a more gradual control of the circuit.

In the modification shown in Fig. 7 the commutator rings 5^a are shown as made of sheet metal bent to annular form. The material of the rings is extended radially to form arms 5^b. The spacing strips 8 are supported in the ends of the arms and the whole is embedded in the plastic insulating material as before described. This form of the device is desirable in rheostats of large size which may develop considerable heat.

If desired the arms 5^b may be dispensed with in which case the resistance wire may have inwardly projecting loops 5^c which will be soldered or otherwise secured to the rings 5^a. With the last named structure it will be possible to place the commutator and resistance coil in different casings at any desired distance apart, as shown in Fig. 8.

Instead of loops of the resistance coil being employed to connect the coil with the rings, wires 5^d of low resistance may be employed. By this means all of the heat developed will be in a structure removed from the commutator.

In accordance with the provisions of the patent statutes I have described the principle of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is merely illustrative, and that the invention may be carried out in other ways.

Having thus described my invention what I now claim as new and desire to secure by Letters Patent, is:

1. A rheostat having a resistance coil, contact members engaged by the coil, a skeleton frame of insulating material separating the contacts, and a body of molded, plastic insulating material in which the resistance coil is embedded.

2. A rheostat having a resistance coil, contact members engaged by the coil, a skeleton frame of insulating material separating the contacts, and a body of molded, plastic insulating material in which the resistance coil and frame are embedded.

3. A rheostat having a resistance coil, contact members engaged by the coil, a skeleton frame of insulating material separating the contacts, and a body of molded, plastic insulating material in which the resistance coil, contact members and frame are embedded.

4. A rheostat having a resistance coil, a plurality of contact members engaging the coil, means for spacing the contact members, and a body of molded plastic, insulating material in which the coil, spacing means and contact members are embedded, said contact member having a portion thereof free of the insulating material.

5. A rheostat having a resistance coil, a perforated contact member engaging the coil, and a body of molded plastic, insulating material in which the coil and contact member are embedded, said contact member having the perforation thereof free of the insulating material.

6. A rheostat having a resistance coil, a plurality of annular contact members engaging the coil, a skeleton frame of insulating material separating the members, and a body of molded plastic, insulating material in which the coil, contact members and frame are embedded, the bores of the contact members being free of the insulating material.

7. A rheostat having a plurality of resistance coils, a contact member engaging each coil, an insulating frame supporting and separating the coils, a body of molded plastic, insulating material in which the coils, frame and contacts are embedded, there being a portion of each contact member free of the insulating material, and movable means for electrically connecting the coils.

8. A rheostat comprising a commutator composed of superposed rings having internal contact surfaces, a resistance coil surrounding the commutator, connections between the coil and rings, and a body of plastic insulating material surrounding the rings and coil.

9. A rheostat, comprising a plurality of superposed rings forming a tube, said rings being insulated one from the other, a resistance coil connected at intervals with the rings, and a member movable longitudinally of the tube and adapted to contact with the rings, a body of plastic, insulating material surrounding the rings.

10. A rheostat having a resistance unit comprising superposed annular contact members, a resistance coil connecting the members in series, said members being electrically separated except for the coil, a second resistance unit comprising superposed annular contact members, a resistance coil connecting the members in series, said members being electrically separated except for the coil, said units being arranged in axial alinement, a lead connected to each unit, a body of plastic insulating material surrounding the members and coils and insulating the units from each other, there being a recess in the body in alinement with the bores of the members, and a movable member adapted to bridge the space between the units and contact with corresponding members in each unit.

11. A rheostat having a resistance unit comprising superposed annular contact members, a resistance coil connecting the members in series, said members being electrically separated except for the coil, a second resistance unit comprising superposed annular contact members, a resistance coil connecting the members in series, said members being electrically separated except for the coil, said units being arranged in axial alinement, a lead connected to each unit, a body of plastic insulating material surrounding the members and coils and insulating the units from each other, there being a recess in the body in alinement with the bores of the members, and a movable member adapted to bridge the space between the units and contact with corresponding members in each unit, there being a plurality of openings in each member, said openings in different members being in alinement, there being corresponding openings in the body in alinement with the alined openings in the members.

12. A rheostat having a resistance coil, a plurality of contact members engaging the coil, said contact members each having a central perforation, said perforations being in alinement, each contact member having a series of holes, said holes being in alinement, a body of molded, plastic, insulating material embedding the contact members and coil, said body having a chamber in axial alinement with the central perforation and chambers in alinement with the holes.

13. A rheostat comprising a plurality of superposed conducting members having exposed, internal contact surfaces, a movable member having spring fingers adapted to contact with the contact surfaces, said movable member being supported in engagement with the contact member by friction only, whereby all of the friction developed

will be effective for securing electrical connection between the movable member and conducting members, and a resistance coil connected at intervals to the conducting members.

14. A rheostat comprising a plurality of superposed conducting members having exposed, internal contact surfaces, a movable member having spring fingers adapted to contact with the contact surfaces, said movable member being supported in engagement with the contact member by friction only, whereby all of the friction developed will be effective for securing electrical connection between the movable member and conducting members, and a resistance coil connected at intervals to the conducting members.

15. The method of making rheostats which consists in supporting a plurality of plates of conducting material at intervals on strips of insulating material, winding a coil of resistance wire outside of the strips, and engaging the wire at intervals with the plates.

16. The method of making rheostats which consists in supporting a plurality of alined perforated plates of conducting material at intervals on strips of insulating material, placing a mandrel in the alined perforations, winding a coil of resistance wire outside of the strips, engaging the wire at intervals with the plates, and removing the mandrel from the perforations.

17. The method of making rheostats which consists in forming a skeleton framework of a plurality of annular plates of conducting material spaced apart by means of strips of insulating material, winding a coil of resistance wire around the framework, said wire engaging the plates, placing the framework on a mandrel, said mandrel closely engaging the bores of the plates, placing the framework and mandrel within a shell having a diameter greater than the diameter of the framework, filling the shell between its walls and the mandrel with a body of plastic insulating material, and removing the mandrel.

18. The method of making rheostats which consists in forming a skeleton framework of a plurality of annular plates of conducting material spaced apart by means of strips of insulating material, winding a coil of resistance wire around the framework, said wire engaging the plates, placing the framework on a mandrel, said mandrel closely engaging the bores of the plates, each plate having a series of holes therein, the holes in the plates being in alinement, placing a rod in each set of alined holes, placing the framework, rods and mandrel within a shell having a diameter greater than the diameter of the framework, filling the shell between its walls and the mandrel with a body of plastic insulating material, and removing the rods and mandrel.

This specification signed and witnessed this 20th day of March, 1918.

CHARLES WIRT.

Witnesses:
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A. E. RENTON.