K. A. SIMMON.

CONTROL APPARATUS.

APPLICATION FILED DEC. 13, 1919.

1,389,105. Patented Aug. 30, 1921.

Fig. 1.

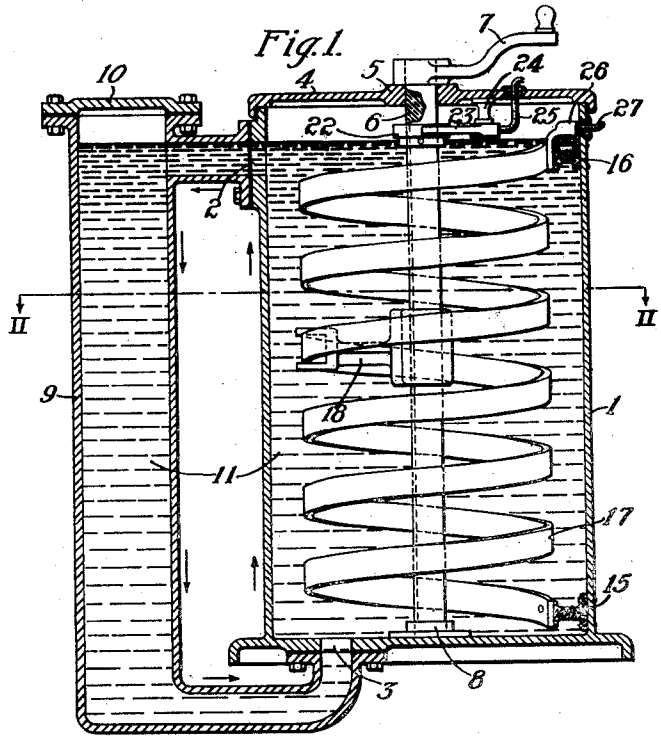
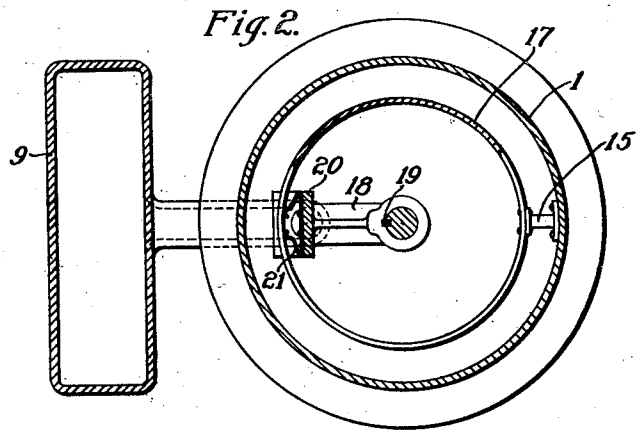


Fig. 2.



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CONTROL APPARATUS.

1,389,105. Specification of Letters Patent. Patented Aug. 30, 1921.

Application filed December 13, 1919. Serial No. 344,745.

To all whom it may concern:

Be it known that I, KARL A. SIMMON, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Control Apparatus, of which the following is a specification.

My invention relates to control apparatus and it has special relation to manually operated, rotative-type controllers.

The object of my invention is to provide a relatively simple and reliable controller of the type indicated which shall embody a spirally arranged resistor or conducting member together with a contact arm that is operated by the controller handle to vary the active portion of the resistor.

Another object of my invention is to render a controller of the class in question substantially explosion-proof by immersing the resistor and contact arm in non-inflammable liquid and providing a natural circulation thereof through the controller.

Other objects of my invention will become evident from the following detailed description taken in conjunction with the accompanying drawing, wherein—

Figure 1 is a view, in longitudinal section, of a control apparatus constructed in accordance with my present invention; and

Fig. 2 is a transverse sectional view taken along the line II—II of Fig. 1.

Referring to the drawing, the structure here shown comprises a tank or containing case 1, which is provided with a side opening 2 near its upper end and a bottom opening 3 and is inclosed on its top side by a cover or plate 4 that is provided with a centrally located apertured boss 5 through which an operating shaft 6, preferably of hard insulating material, extends. The outer end of the shaft 6 is rigidly secured to a suitable operating handle 7, while the lower end of the shaft is journaled at 8 upon the bottom wall of the tank or case 1.

A radiator or cooling member 9, which may be corrugated, if desired, is provided with a plurality of hollow arms that are bolted to the tank 1 to effect fluid-tight communication between the tank and the radiator. A top cover member 10 is bolted to the radiator 9 and may be employed for purposes of filling the radiator, etc.

The tank 1 and the radiator 9 are substantially filled with a non-inflammable cooling medium, such as carbon tetrachlorid, and, during operation of the controller, a natural circulation of liquid is maintained in the direction of the arrows, namely, upwardly through the controller case 1, outwardly through the side opening 2 to the radiator 9, downwardly through the radiator and thence through the bottom opening 3 to the tank 1.

Insulating brackets or supports 15 and 16 are secured to one side wall of the controller near the bottom and the top ends thereof, respectively, and a spirally arranged conducting member or resistor 17 surrounds the operating shaft 6 between the brackets 15 and 16, the entire resistor being immersed in the liquid 11.

The resistor or conducting member 17 may be made of any suitable material, such as the type of iron that is used in the familiar grid resistors for electric cars, or it may be made of a conducting and self-sustaining carbon compound or of any other material that will provide the desired qualities of self-support and electrical resistance. Furthermore, the resistor may be made of a wire wound around an insulated bar or pipe.

A contact arm 18 has a sliding fit with the operating shaft 6 and is secured, by a metallic key 19, to the shaft to insure rotative movement of the contact arm in accordance with the actuation of the controller handle 7. In this way, the contact arm 18 is free to slide longitudinally along the shaft 6 but is locked against rotative movement relative thereto.

The outer end 20 of the contact arm 19 is bifurcated, the horizontally-extending arms respectively passing over and under the spiral conducting strip or resistor 17. In this way, the contact arm is properly guided to maintain good electrical contact between the spiral resistor 17 and a spring clip or finger 21 that is electrically attached to the member 20.

For the purpose of leading current into or away from the contact arm 18, a collector or slip-ring 22 is secured to the operating shaft 6 to make electrical connection with the contact arm 18 through the key 19, or otherwise. A brush or control finger 23 bears upon the slip-ring 22, is insulatedly secured to the top cover 4 by a bracket 24 and is connected to the external electrical

circuit by means of an insulated conductor or cable 25 which extends through the cover plate 4.

The other terminal of the controller comprises a wire-receiving socket 26 which is electrically secured to the upper end of the spiral resistor 17 and is supported by the bracket 16. An insulated conductor or cable 27 extends from the socket 26 through the side wall of the tank 1 to the desired external circuit.

The operation of the illustrated apparatus may be set forth as follows. Initially, the contact arm 18 occupies its lowest possible position, wherein the contact clip 21 engages the lower end of the spiral resistor 17. It will be understood that the parts are properly insulated to prevent grounding on the controller case 1. Under such conditions, the electrical circuit of the controller is established from the conductor 25 through control finger 23, slip-ring 22, key 19, contact arm 18, spiral resistor 17 and socket 26 to the conductor 27. Consequently, the maximum resistance value is provided by the controller, since all of the spiral resistor 17 is included in circuit.

By rotating the operating handle 7 in a counter-clockwise direction, when viewed from above, the contact arm 18 rotates with the operating shaft 6 but gradually slides upwardly along the shaft by reason of the guiding effect of the bifurcated end 20 to the contact arm. In this way, the active portion of the spiral resistor 17 is gradually diminished, to correspondingly reduce the resistance value of the control device, until the upper end of the spiral resistor is reached, which limiting position is determined by the engagement of the contact arm 18 and the supporting bracket 16. Under such conditions, the resistance value of the control apparatus is substantially zero.

During the controller operation, the previously mentioned natural circulation of liquid through the controller occurs as the resistor and other conducting elements are heated by the current traversing them, and not only is a dangerous operating temperature prevented in this manner, but the non-inflammable properties of the carbon tetrachlorid or other suitable liquid 11 absolutely prevent the formation of sparks, thus precluding any possibility of controller explosions.

It will be appreciated that, if desired, the operating handle 7 may be geared to the operating shaft 6 to reduce the necessary movement of the handle 7 to effect the travel of the contact arm 18 from the one to the other end of the spiral resistor 17.

I do not wish to be restricted to the specific structural details or arrangement of parts herein set forth, as various modifications thereof may be made within the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed thereon as are indicated in the appended claims.

I claim as my invention:

1. Control apparatus comprising a spirally-arranged self-supporting resistor and means for varying the active portion thereof.

2. Control apparatus comprising a spirally-extending conducting member and means adapted to follow the contour of said member for varying the resistance thereof.

3. Control apparatus comprising a spirally-disposed conductor, means for varying the active portion thereof, and means for causing a cooling liquid to traverse said conductor.

4. Control apparatus comprising a spirally-arranged resistor, and a contact arm operating inside of said resistor and adapted to follow the contour thereof.

5. Control apparatus comprising a spirally-arranged resistor, an operating shaft extending therethrough, and a contact arm carried thereby to engage said resistor and adapted to slide longitudinally on said shaft.

6. Control apparatus comprising a spirally-arranged resistor, an operating shaft extending therethrough, a contact arm carried thereby to engage said resistor and adapted to slide along said shaft, and means for immersing said resistor.

7. Control apparatus comprising a spirally-arranged resistor, an operating shaft extending therethrough, a contact arm carried thereby to engage said resistor and adapted to slide along said shaft, and means for causing a circulation of cooling medium through said controller.

8. Control apparatus comprising a tank containing a spirally-arranged resistor and a contact arm for varying the active portion thereof, and a cooling member externally communicating with the bottom and the top of said tank.

9. Control apparatus comprising a spirally-arranged resistor, an operating shaft extending therethrough, a contact arm carried thereby to engage said resistor and adapted to slide along said shaft, a radiator externally communicating with said tank.

In testimony whereof I have hereunto subscribed my name this 8th day of December, 1919.

KARL A. SIMMON.