July 24, 1934. E. M. SORENG 1,967,519

RHEOSTAT

Filed March 11, 1931 2 Sheets-Sheet 1

Fig. 1.

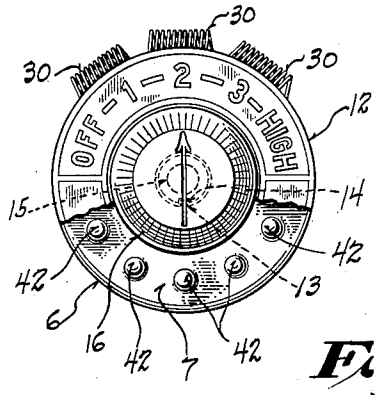


Fig. 2.

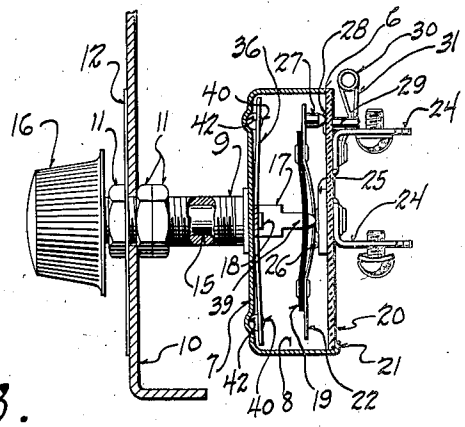


Fig. 3.

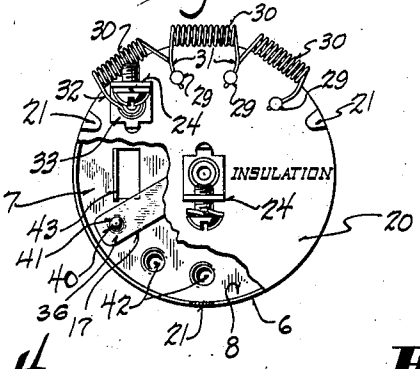


Fig. 4.

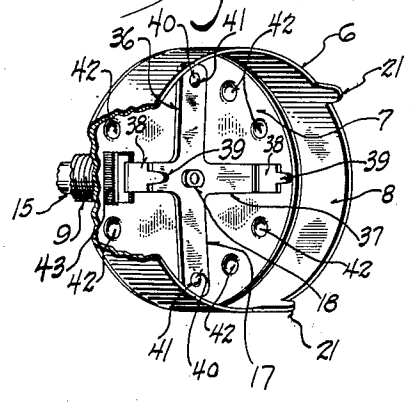
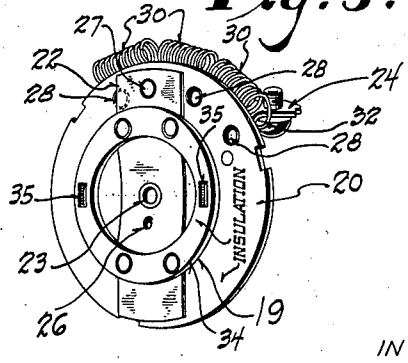


Fig. 5.



INVENTOR

Edgar M. Soreng

BY Ira Milton Jones

ATTORNEY

July 24, 1934. E. M. SORENG 1,967,519

RHEOSTAT

Filed March 11, 1931 2 Sheets-Sheet 2

FIG. 6.

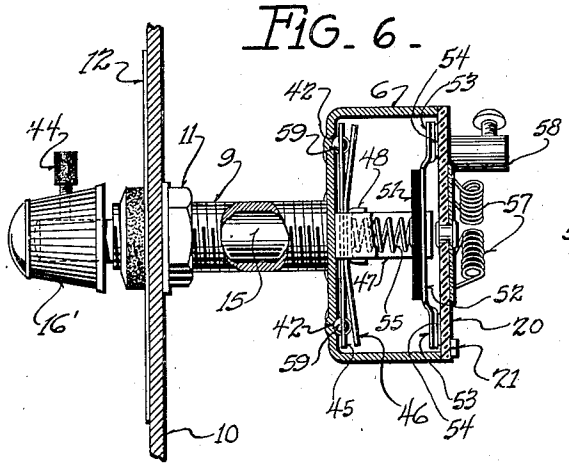


FIG. 7.

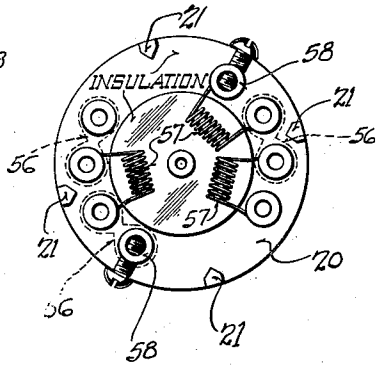


FIG. 8.

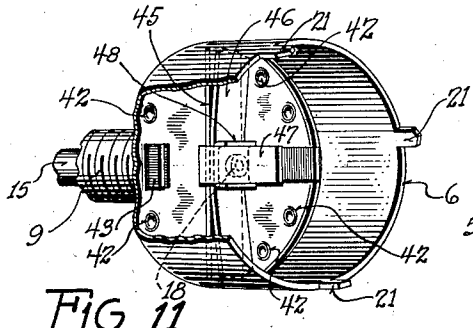


FIG. 9.

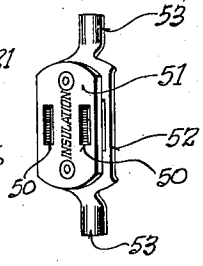


FIG. 10.

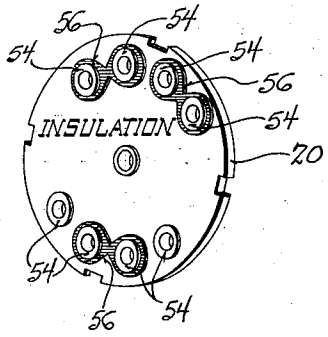
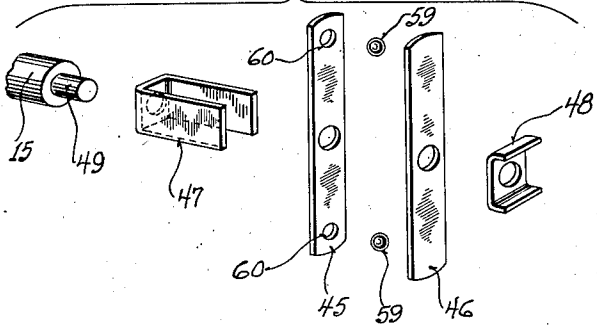


FIG. 11.



INVENTOR

Edgar M Soreng

BY Ira Milton Jones

ATTORNEY

Patented July 24, 1934 1,967,519

UNITED STATES PATENT OFFICE

1,967,519

RHEOSTAT

Edgar M. Soreng, Chicago, Ill., assignor to Soreng-Manegold Company, Chicago, Ill., a corporation of Illinois

Application March 11, 1931, Serial No. 521,681

6 Claims. (Cl. 200—11)

This invention relates to certain new and useful improvements in rheostats and has as an object to provide a small and compact rheostat having a switch incorporated therein and particularly adaptable to control the flow of current to, and the speed of, an electrical translating device such as the fan motor of a hot water automobile heater. It is, however, understood that the device may be used for other kindred purposes and is exceptionally well suited for use as a dimming switch.

A more specific object of this invention resides in the novel manner of imparting motion to the movable element of the rheostat and in the means for providing a detent action to positively indicate the various positions of the movable element.

And a further object of this invention is to provide a rheostat device of the character described which, due to its extremely simple construction and minimum number of parts, is inexpensive and lends itself particularly well to production methods of manufacture.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated one complete example of the physical embodiment of my invention constructed according to the best mode I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a front elevation of a rheostat embodying my invention with a portion of its dial broken away;

Figure 2 is a longitudinal sectional view through the rheostat illustrating the manner of mounting the same from a panel;

Figure 3 is a rear elevation with a portion of the mounting head broken away to illustrate structural details;

Figure 4 is a perspective view of the housing or casing; and

Figure 5 is a perspective view of the mounting head and the movable elements carried thereby shown detached from the casing;

Figure 6 is a view similar to Figure 2 of a slightly modified form of my invention;

Figure 7 is a rear view of the switch structure shown in Figure 6;

Figure 8 is a perspective view of the housing for the structure shown in Figure 6;

Figure 9 is a perspective view of the movable contactor;

Figure 10 is a perspective view of the mounting head; and

Figure 11 is a perspective view of the various elements of the driver shown separated and in their proper order of assembly.

Referring now more particularly to the accompanying drawings in which like numerals designate like parts throughout the several views, the numeral 6 represents a substantially cup shaped housing or casing drawn from stamping material and having a bottom wall 7 and an annular side wall 8.

Secured to the bottom wall 7 is a tubular, externally threaded stem 9 which extends outwardly from the casing and provides means for mounting the rheostat from a panel 10, as illustrated in Figure 2. The mounting stem 9 is passed through a suitable aperture in the panel and is secured thereon by nuts 11. The nuts 11 also serve to hold a dial 12 against the front of the panel, which bears indicia representing the various functions or operative conditions of the rheostat, and relative rotation between the dial 12 and the mounting stem 9 is prevented by a projection 13 extended from the dial opening into a longitudinal slot 14 in the outer end of the mounting stem, see Figure 1.

Journaled in the mounting stem is a shaft 15, the outer end of which projects from the stem to mount an actuating knob 16 and the inner end projects into the casing and has a spider-like driver 17 non-rotatably secured thereto, as at 18. The driver 17 has a non-rotatable connection with a movable contact carrying element, indicated generally by the numeral 19 and rotatably carried by a mounting head 20 of insulating material which closes the open side of the casing and is held assembled therewith by tangs 21 projected from the annular casing wall 8 and struck over the outer face of the mounting head.

The movable contact carrying element comprises a diametrically extending strip 22 of spring metal rotatably mounted on the panel 20 by a rivet or other suitable pivot means 23 which extends through the panel and also mounts a terminal 24, the terminal being electrically connected with the metal strip through the rivet. Disposed between the strip 22 and

the inner face of the mounting panel is a washer 25 and at one side of its point of pivot the strip 22 has a protrusion 26 struck therefrom which engages the adjacent face of the washer 25 and rides thereon as the strip is rotated about the axis of its mounting.

At its end, opposite the protrusion 26, the strip 22 carries a movable contactor 27 which, together with the protrusion 26, causes the strip 22 to bow and yieldably urge the movable contactor toward the mounting head for selective engagement with a plurality of stationary contacts 28 carried by the head 20. The stationary contacts 28 are cupped to cooperate with the movable contactor and provide a detent action, and have portions 29 projected from the outer face of the mounting head to which the ends of a series of resistance coils 30 are electrically and mechanically connected. The series of coils are preferably formed of one continuous length of wire and their adjacent attaching ends 31 are provided by extended loops. The extreme end 32 of one of the outer coils is secured to one of the stationary contacts through a terminal 33 which is secured to the mounting head by the adjacent stationary contact.

The movable contactor 27 being electrically connected with the terminal 24 through the metal strip 22 and being selectively engageable with the stationary contacts, it is readily apparent that, upon movement of the movable contactor, any one or all of the resistance coils may be connected in series with external conductors, not shown, connected to the terminals 24 and 32, or when the movable contactor is engaged with the stationary contact to which the terminal 33 is electrically connected, all of the resistance coils are shunted out of the circuit. In the present instance the movable contactor has five positions, and as there are but four stationary contacts, it follows that when the movable contactor is in its extreme position opposite that at which it is electrically connected with the terminal 33, it merely engages the inner surface of the mounting head and thus breaks the continuity of the circuit across the terminals 24 and 33 so that the rheostat also serves as a switch.

The manner of imparting motion from the driver 17 to the movable contactor assembly is exceedingly simple and effective. The movable contactor assembly, and specifically the strip 22, carries a ring 34 of fiber or other suitable insulating material, which is provided with diametrically opposite recesses or openings 35. The driver 17, as best illustrated in Figure 4, comprises a pair of diametrically extending arms 36 and 37 arranged at substantially right angles to each other and the outer ends of the arm 37 are directed laterally, as at 38, and have tangs or projections 39 at their extreme ends which are engageable in the recesses 35 of the ring 34 forming part of the movable contactor assembly. Rotation is thus imparted from the driver to the movable contactor.

To provide a positive and effective indication of the various positions of the rheostat, the detent action obtained through the cooperation of the movable contactor with the stationary contacts is augmented by a novel detent action afforded by ball bearings or other similar elements 40 mounted in apertures 41 at the extremities of the driver arm 37 and engageable in depressions 42 formed in the casing wall 7. The depressions 42 are circumferentially spaced at proper intervals to releasably hold the driver in its respective positions maintaining the movable contactor properly engaged with any one stationary contactor in its circuit breaking position. The ball bearings 40 are maintained against displacement by reason of the fact that the openings 41 are smaller than the ball bearings and also that the attachment of the driver with the shaft 15 holds the medial portion of the driver against the casing wall and thus bows the driver arm 36 so that a yielding pressure is maintained on the ball bearings.

To limit the motion of the driver, a tang 43 is struck inwardly from the casing wall 8 to lie in the path of the ends of the driver arm 36, see Figure 3.

In Figures 6 to 11 inclusive, a slightly modified embodiment of this invention is shown. In this construction, as in the embodiment described, the casing or housing 6 is supported from a panel 10 by a tubular stem 9, and the switch mechanism within the housing is actuated by means of a shaft 15 journalled in the stem and having an actuator 16' of slightly different construction on its outer end. A dial 12 is also provided, but in place of the pointer on the actuator, a knurled screw 44 which secures the actuator on the shaft and projects radially from the actuator, performs the function of the pointer.

The switch mechanism within the housing consists of the same general elements, but their construction is different than that shown in Figures 1 to 5 inclusive. The driver particularly is of different construction, and consists of an elongated metal strip 45, a spring strip 46 of substantially the same dimensions as the strip 45, and a pair of U shaped clips 47 and 48. All of these elements are rigidly and nonrotatably secured to the inner end 49 of the shaft 15 with the strips 45 and 46 and the clip 48 received by the arms of the clip 47.

The outer ends of the clip 47 are engaged in suitable recesses 50 formed in a plate of insulating material 51 riveted or otherwise attached to the medial portion 52 of the movable contactor and as best illustrated in Figure 4 the medial portion of the movable contactor conforms generally to the size and shape of the plate 51. The opposite ends 53 of the contactor are offset to lie in a plane outwardly of the medial portion 52 and form contacts which are engageable with stationary contacts 54 carried by the mounting head 20.

It is noted that the movable contactor is not mounted from the head 20, but is supported entirely by the engagement of the arms of the clip 47 in the recesses 50, and to hold the contactor against the head 20 and provide the necessary contact pressure, an expansive spring 55 is confined between the insulating plate 51 of the movable contactor and the clip 48, the arms or flanges of the clip 48 cooperating with the arms of the clip 47 to provide a pocket in which the adjacent end of the spring is received.

The stationary contacts 54 are arranged diametrically opposite in two sets or series so that the movable contactor when moved out of its "off" position at which its contact portions engage the mounting head between the two series of contacts, electrically bridges any two of the contacts. The contacts of each series are electrically connected either by metal connectors 56 or by resistance coils 57, the connectors being disposed on the inner surface of the mounting

head and the resistance coils on the outside surface. The resistance coils are so located that upon movement of the contactor from its "off" position to its first circuit making position, all of the resistance coils are in series with the two terminals 58 mounted on the front of the mounting head, and as the movement of the contactor is continued, the resistance coils are shunted out of the circuit.

The detent action for indicating the various positions of the switch is afforded by balls 59 received in openings 60 in the extremities of the metal strip 45 to be guided thereby for movement with the driver and held against the closed wall of the housing by the spring strip 46. As in the embodiment shown in Figures 1 to 5 inclusive the balls enter depressions 42 in the closed wall of the housing to indicate the various positions of the switch.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that I provide a novel rheostat and switch, which is particularly adapted to regulate the speed of hot water vehicle motors, and in which a positive detent action is obtained in a simple and effective manner. It will also be apparent that rheostats constructed in accordance with this invention, due to their simplicity and minimum number of parts, lend themselves especially well to production or manufacture.

What I claim as my invention is:

1. In a device of the character described, a casing, a movable switch element within said casing, a tubular mounting stem for the casing, a movable switch driver within the casing adapted to actuate said switch element, means journaled in said mounting stem and rotatably mounting the driver within the casing, oppositely extending arms on said driver, cooperating means carried by the extremities of one arm and the casing providing a detent action to indicate different positions of the driver, and means carried at the extremities of the other arm for imparting the motion of the driver to said movable switch element.

2. In a device of the character described, a casing, a movable contactor assembly within the casing, a driver, an actuating stem rotatable with respect to the casing and mounting the driver within the casing, said driver having a diametrically extending arm formed of resilient metal, ball elements rotatable between the extremities of said arm and one wall of the casing and engageable in depressions in said casing wall to provide a detent action to indicate the various positions of the driver, the medial portion of said diametrically extending arm being adjacent said casing wall whereby the arm is bowed to maintain a yielding pressure on the ball means.

3. In a device of the character described, a casing, a movable switch element within the casing, a driver within the casing for imparting rotation to the movable switch element, and means providing a detent action to indicate the position of the driver and movable switch element comprising, radially extending spring arms movable with the driver, and ball members engaging openings at the extremities of the radially extending arms, said openings being of smaller diameter than said ball members so that the spring tension of the arm surges the ball members into engagement with depressions in one wall of the casing.

4. In an electric switch device of the character described, a casing, a di-electric terminal head closing the casing, stationary contacts on the terminal head, a movable contactor within the casing selectively engaged with the stationary contacts, means to mount the movable contactor comprising, a strip of spring metal to one end of which the movable contactor is secured, a terminal for the movable contactor on the exterior face of the terminal head, common means to mount said terminal on the terminal head and pivotally mount the strip of spring metal on the inner face of the terminal head and electrically connect the terminal with said strip of spring metal, said movable contactor being of such size as to bow the strip of spring metal, whereby the inherent resiliency of said strip provides contact pressure, a di-electric member attached to the strip of spring metal, and an actuator drivingly engaging said di-electric member within the casing to impart movement to said strip to carry the movable contactor from one stationary contact to the other.

5. In an electric switch device of the character described, a cup-shaped casing, an actuator shaft rotatably mounted from said casing, a contactor driver attached to the shaft within the casing and comprising, a plurality of radially extending arms, the extremities of two opposite arms having ball retaining means, ball members disposed in said ball retaining means and engaging the adjacent inner face of the casing wall, said ball members being of a size to cause said radially extending arms to bow, whereby the inherent resiliency of said arms urges the ball members toward the casing wall, depressions in said casing wall in which said ball members are engageable to afford detent means and define various predetermined positions of said driver, and a movable contactor assembly operable from said driver.

6. In an electric switch device of the character described, a casing, a di-electric terminal head providing a cover for the casing, a plurality of stationary contacts on the terminal head, a movable contactor to be selectively engaged with said stationary contacts, means to permanently movably mount said movable contactor on the terminal head and to provide spring tension to afford contact pressure whereby said movable contactor, its mounting and the di-electric terminal head comprise a unit, an actuator shaft carried by the casing, a driver for the movable contactor within the casing attached to the actuator shaft and held assembled thereby with the casing, cooperating means carried by the driver and the casing to afford a detent action, whereby the casing, the actuator shaft, the driver and the detent means form a unit independent of said other unit, and means to provide a driving connection between said driver and the movable contactor assembly upon attachment of the di-electric terminal head to the casing.

EDGAR M. SORENG.