Jan. 19, 1943. A. A. JOHNSON 2,308,882

SWITCHING DEVICE

Filed Aug. 1, 1940

Fig. 2

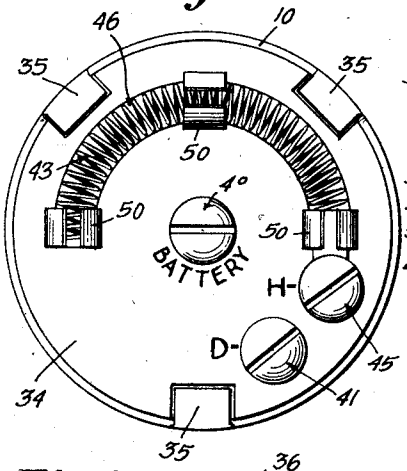



Fig. 1

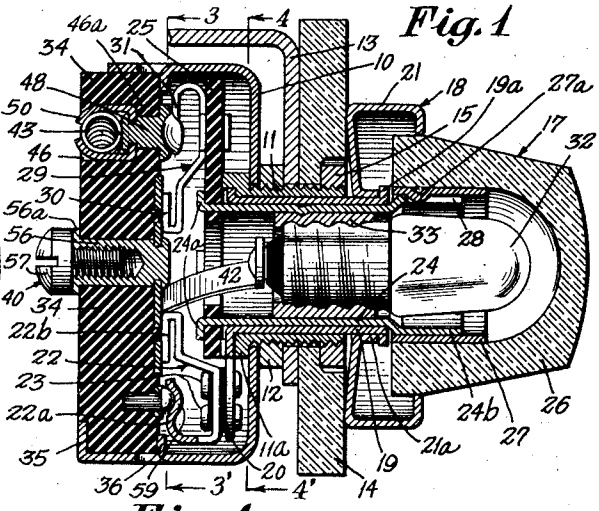



Fig. 3

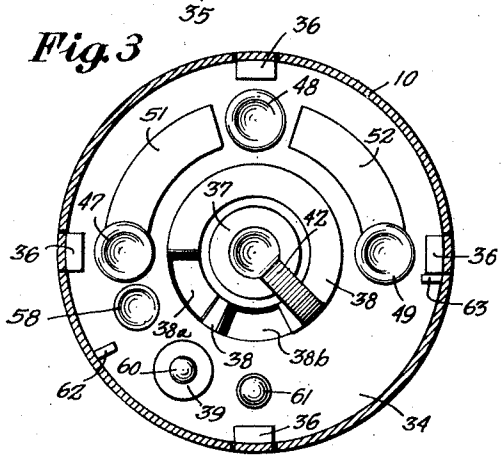



Fig. 4

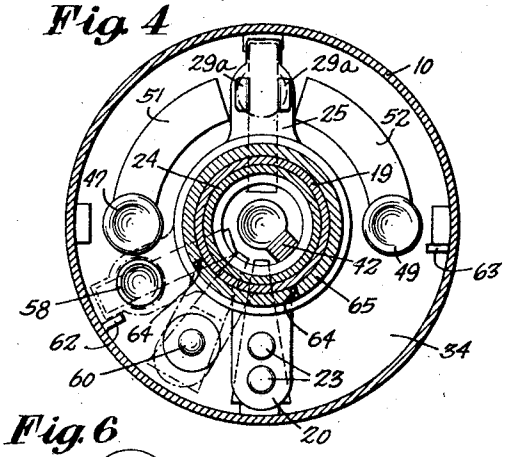



Fig. 5

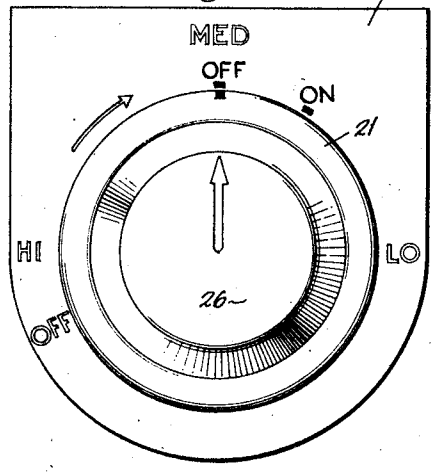



Fig. 6

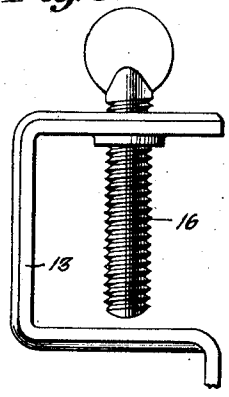
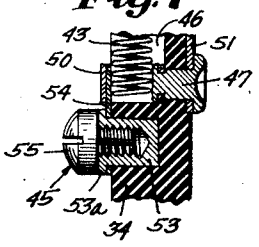
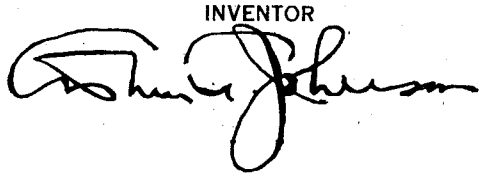



Fig. 7




INVENTOR



Patented Jan. 19, 1943 2,308,882

# UNITED STATES PATENT OFFICE

2,308,882

## SWITCHING DEVICE

Arthur A. Johnson, Bridgeport, Conn., assignor to Casco Products Corporation, Bridgeport, Conn., a corporation of Connecticut

Application August 1, 1940, Serial No. 349,064

9 Claims. (Cl. 201—48)

This invention relates to electric switches, and more particularly, to switches for controlling two circuits, either of which may be closed independently of the other.

An object of this invention is to provide, in a unitary structure, two separate switch mechanisms, one of which preferably also constitutes a rheostat, so that two separate circuits may be conveniently controlled from a single point and one of the circuits may be controlled so as to increase or decrease the current going to the translating device.

The switch of the present invention is particularly adapted for use in connection with accessories employed on automobiles, and is designed to control a defroster circuit and a car heater circuit. The defroster circuit is usually either opened or closed, but, for controlling the car heater, it is desired to vary the speed of the fan motor, as well as to open and close the circuit thereof, and hence one of the controls of the switch of the present invention also constitutes a rheostat.

According to the present invention in the form at present preferred, the switch has two manual controls, rotatably mounted, one within the other, one of the controls opening and closing the defroster circuit and the other control opening, closing and varying the heater control circuit. With the controls placed one within the other, they may be independently operated, or they may be operated jointly by the operator by causing his fingers to grip both controls at the same time.

According to the present invention in its broadest aspect, any suitable form of rheostat device may be used. However, it has been found that where a contact arm rides directly upon the resistance coil, it sometimes happens that only a few coils are cut into the circuit, and this results in overheating these coils. Of course, it is generally not intentional on the part of the user to have these few coils energized, the condition resulting when the user, intending to move the rheostat to the full-on position, leaves it in a position just short of full-on adjustment.

To avoid this difficulty, the present invention provides a contact shield over the resistance coil to prevent engagement of the contactor with the last few turns of the coil, and preferably this shield is connected to the binding post or other contact device which is connected directly to the battery so that the current will be full-on at all times when the contactor on the rheostat is moved to a position approximately at or adjacent to full-on position.

In the specific form of device herein disclosed, all direct engagement of the contact arm with the resistance coil is avoided by providing another contact shield connected to the other end of the resistance coil, the space between the two shields being bridged by an intermediate contact shield connected to the middle of the coil. With this construction, the rheostat has only four conditions of control—high, medium, low, and off. If a greater number of conditions are required, additional intermediate contact shields connected to said resistance wire at successive intervals may be employed.

In the preferred form of the invention, the contact arm and the contact points of the rheostat are suitably shaped so as to form detent elements whereby the contact arm and control therefor is positively held in the desired positions.

Another object of this invention is to provide a signal for visually indicating to the user when either the simple switch or the switch and rheostat, or both, are in circuit-closing position. For this purpose, an electric light bulb carried by the operating knob is caused to be energized when either the simple switch or the switch and rheostat have been moved away from the "off" position.

Other features and advantages will hereinafter appear.

In the accompanying drawing which shows one embodiment of the present invention, that at present preferred:

Figure 1 is a vertical axial cross-section of the switch device of the present invention.

Fig. 2 is a rear elevation of said switch.

Fig. 3 is a cross section substantially along the line 3—3' in Fig. 1 in the direction of the arrows, showing the contact shields and contact points of the switch.

Fig. 4 is a cross-section substantially along the line 4—4' in Fig. 1 in the direction of the arrows showing the contactors and various positions thereof.

Fig. 5 is a front elevation of the switch shown in Fig. 1.

Fig. 6 is a detail of clamping means for securing the switch of Fig. 1 to an automobile dashboard.

Fig. 7 is a detail in cross-section of a terminal screw and contact point at the full-on end of the rheostat.

As shown in the accompanying drawing, the

electric switch device of the present invention is a unitary structure comprising two separate manually operated switches, one of which also constitutes a rheostat, adapted respectively to operate a defroster circuit and a heater circuit from the dashboard of an automobile.

According to the present invention in the form at present preferred, the switches are housed in a cup-shaped casing 10 carrying an externally threaded bushing 11, a nut 12 clamping the wall of said casing to a flange 11a on the bushing. The bushing 11, which constitutes the neck of the switch device, is inserted through an aperture in a mounting bracket 13 and in a face plate 14, and is secured thereto by means of a nut 15. The said mounting bracket is provided with a thumb screw 16 so that the switch may be conveniently clamped to the dashboard of an automobile.

Two controls are rotatably mounted in the bushing 11, a car heater control 17 fitting into a defroster control 18, said controls being independently or jointly operable.

The defroster control 18 comprises a metal sleeve 19 rotatably carried by the bushing 11, having at its inner end a depending arm 20 within the casing 10 and at its outer end a metal ring 21 secured thereto by tabs 19a bent into conforming slots on the portion 21a of the ring 21. A resilient contactor 22 comprising two arms, 22a and 22b, is secured to the arm 20 by rivets 23 and is insulated therefrom as shown.

The car heater control 17 comprises a metal sleeve 24, mounted within the sleeve 19 and of such diameter as to rotate freely therein. At its inner end, the sleeve 24 carries a winged plate 25, preferably of some rigid insulating material, secured thereto by a plurality of tabs 24a, and at its outer end, said sleeve carries a translucent knob 26. An enlarged portion 24b is provided as shown at the knob-receiving end of the sleeve 24 to confine the latter within the sleeve 19 against axial displacement.

The knob 26 is slidably assembled to the portion 24b of the sleeve 24 by means of a sleeve 27 having a key dent 27a engaging a slot 28 on the enlarged sleeve portion 24b. The knob 26 is thereby secured to the sleeve 24 for rotation therewith, although it may be easily removed therefrom for replacement of an electric bulb 32, enclosed in the hollow interior thereof.

A contactor 29 comprising two resilient fingers 30 and 31 is secured to the winged plate by tabs 29a.

In order to indicate to the user when either or both switches are in circuit-closing position, the switch device is provided with a signal means comprising an electric light bulb 32 carried by a socket sleeve 33, key-dented to the sleeve 24.

At the rear of the switch device, a circular base plate 34, preferably of molded plastic insulating material, is carried by the casing 10 and rigidly clamped to the casing between lugs 35 and 36 as shown. The battery-, defroster-, and heater terminals and the contacts associated therewith are mounted on the base plate 34 and are so positioned as to complete electric circuits to the translating devices when the controls are manipulated.

If it is desired to operate the defroster, the ring 21 is rotated in a clockwise direction to "on" position as indicated by suitable indicia on the ring and face plate, as shown in Fig. 5, to bring the contactor 22 into engagement simultaneously, with three contact plates mounted on the base plate 34, comprising a battery contact plate 37, centrally positioned on the base plate 34, a signal bulb contact plate 38, and a defroster contact plate 39, radially disposed with reference to the contact plate 37. As shown in the drawing, contact arm 22a of contactor 22 engages defroster contact plate 39 while contact arm 22b engages battery contact plate 37 and signal bulb contact plate 38. In this "on" position, two circuits are completed, one from the battery to the defroster through a battery terminal 40, contact plate 37, contactor 22, contact plate 39, and defroster terminal 41, and the other from the battery to the signal bulb 32, through the contact plate 37, contactor 22, contact plate 38, and a contact arm 42 extending from the contact plate 38 into the neck of the switch to the bulb 32, which is grounded through the sleeves 33, 24 and 19, bushing 11, and bracket 13 to the dashboard of the automobile as shown, causing the signal bulb 32 to be illuminated.

If it is desired to operate the car heater, the knob 26 is rotated in a clockwise direction to bring the fingers 30 and 31 of the contactor 29, simultaneously into engagement with the contact plate 37, contact plate 38 and a variable portion of a resistance coil 43, carried by the base plate 34 as will be explained hereinafter. When the knob is thus operated, two circuits are simultaneously completed, one from the battery to the car heater through battery terminal 40, contact plate 37, contact finger 30, contact finger 31, a variable portion of the resistance coil 43, and car heater terminal 45, and the other from the battery to the signal bulb 32, through battery terminal 40, contact plate 37, contact finger 30, contact plate 38, and contact arm 42.

In prior switches of this type comprising a rheostat, the contactor for the resistance coil rides on the surface of the latter, and it sometimes happens that only a few coils thereof are accidentally left in the circuit, particularly near "full-on" position, this resulting in overheating of these coils and rapid deterioration of the same.

According to the present invention, this difficulty is avoided by cutting a portion of the resistance coil into the circuit indirectly. The resistance coil 43 is mounted in an arcuate channel 46 in the rear surface of the base plate 34. The coil 43 is secured in said channel at three spaced positions by binding posts, 47, 48, and 49. These posts are headed to U-shaped metal clamps 50, circumferentially engaging the resistance coil.

Since the wall 46a of the channel 46 insulates the coil 43 from contactor 31, direct contact between said coil and contactor is avoided. In order to provide a contact between one end of said coil and the said contactor for "full-on" adjustment, an arcuate contact plate or shield 51 on the surface of base plate 34 opposite the coil, is connected to binding post 47 and to car heater terminal 45. Contactor 31 engages said shield at all times when it is moved to a position approach-"full-on" adjustment, thus establishing a direct circuit from the battery to the car heater.

For the purpose of including the entire resistance coil 43 in the heater circuit, a similar arcuate contact plate 52 is connected by binding post 49 to the opposite end of said coil, contactor 31 engaging the latter plate when approaching the position for "low" adjustment.

An intermediate binding post 48 connected to the midpoint of the coil 43, disposed on the inner surface of the base plate 34 between the two arcu-

ate contact plates 51 and 52, provides a third contact position for the contactor 31 for "medium" adjustment.

Upon moving the contactor 31 beyond binding post 47 the circuit to the heater is interrupted.

With this construction, four positions for the rheostat control are provided: "off," "full-on," "medium" and "low," although the number of positions may be increased if desired by merely providing additional intermediate shortened contact plates connected at spaced intervals to the resistance coil 13, and corresponding binding posts on the base plate 34. Suitable indicia on the knob 26 and the face plate 14 indicate the adjustment of the switch to the operator.

The car heater terminal, as shown in Fig. 7, comprises an internally threaded bushing 53 force-fitted into the base plate 34. The bushing 53 is provided with a flange 53a clamping a connector plate 54 to the base plate 34 which is also clamped to the end of the resistance coil 43 by the U-shaped clamp 50. One conductor lead from the car heater is secured to said terminal by a screw 55, the other lead being grounded to the body of the automobile.

The defroster and battery terminals 61 and 46 are similar in construction, comprising internally threaded posts 56 receiving connecting screws 57. The posts 56 are provided with flanges 56a seated against the back of the base plate 34, extending to the inner side of said base plate, and headed to their respective contact plates.

For each position of the contactors 22 and 28, there are provided detent means to hold the contactors and their controls in desired positions against any accidental displacement of either switch when the other is being operated. For this purpose, the end of the contact finger 31 is semi-ball-shaped and is received with a snap action by the correspondingly cupped heads of the binding posts 47, 48 and 49, in each of the "on" positions. For the "off" position, the end of the contact finger 30 is received by an insulated cupped stud 58.

The defroster switch detent means comprises a cupped portion 59 at the end of the contact finger which is seated upon the round head pins 60 or 61, in "on" or "off" positions respectively.

Opposite the "off" positions for both switches, recessed portions 38a and 38b in the annular bulb contact plate 38 are provided, so that when the contact fingers 22b and 30 are adjusted in "off" position, they engage battery contact plate 37 but are disengaged from the bulb contact plate 36. By this means, the circuit to the bulb 32 is opened when both switches are adjusted in "off" position.

In the construction of the present switch device, the respective switch contacts are so positioned and the range of motion of the contactors so limited that neither contact will interfere with the other when one or both are operated. For this purpose, the motion of heater switch contactor 28 is limited to an arc extending from the stud 58 over the resistance coil 43 to the binding post 49, by a pair of tabs 62 and 63 on the casing 10, which abut the wing plate 25 at the extreme end positions. The motion of the defroster contact finger 22 is limited to an arc extending from the pin 60 to the pin 61, by confining the arm 20 within a cut-out portion 64 in the flange 65 of the bushing 11.

It will be observed that both switches are preferably moved from "off" to "on" position by rotation of the knob 26 and ring 21 in the same direction. Thus both switches may be moved to "on" position by a single manipulation, by grasping both knob and ring and turning them together. Likewise, the switches may both be turned to "off" position by a single manipulation. Moreover, if desired, either switch may be manipulated independently of the other, and adjustment of the heater switch to "low," "medium," or "high" position may be conveniently effected by turning the knob 26 to the desired position.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In a dual switch device, a pair of rotary members concentrically mounted one within the other for independent manual rotation; a pair of grip members mounted respectively on the outer ends of said rotary members and adapted to be simultaneously or independently grasped by one hand for simultaneous or independent manipulation thereof; a pair of radial contactors carried at the inner ends of said members respectively; stop means limiting angular motion of said contactors to mutually exclusive arcs; a plurality of contacts arcuately disposed about the axis of said members and adapted to be engaged by the contactors respectively upon adjustment thereof; and a common contact located in substantially the same plane and concentric with the arc of the aforesaid contacts, connected to a source of current and engaged by either of said contactors whenever one of the arcuately disposed contacts is engaged thereby, said contactors completing a circuit from said source of current to the arcuately disposed contacts.

2. A dual switch device comprising a pair of rotary members concentrically mounted one within the other for independent manual rotation; a pair of grip members carried respectively on the outer ends of said rotary members and adapted to be simultaneously or independently grasped with one hand for independent or simultaneous manipulation thereof; a pair of radial contactors carried at the inner ends of said rotary members respectively; stop means limiting the angular motion of said contactors to mutually exclusive arcs; a plurality of contacts arcuately disposed and adapted to be engaged by said contactors respectively upon manual adjustment thereof, at least two of said contacts being located within the angular range of motion of one of said contactors; a concentric series of arcuately disposed contacts adapted to be engaged by said contactors only as long as the first series is engaged thereby; and a contact concentrically disposed with reference to both series of contacts and engaged by either of said contactors respectively as long as a contact of the first series is engaged thereby, said contactors completing independent circuits from the central contact to a contact of each of the two arcuate series upon engagement therewith, all of the contacts being located in substantially the same plane.

3. In a dual switch device, a pair of hollow concentrically mounted members one within the other for independent manual rotation; a pair of grip members mounted on the outer ends of said members respectively and adapted to be grasped by one hand for independent or simultaneous manipulation thereof; a signal lamp mounted within the inner member; a pair of radial contactors carried by the inner ends of said rotary members respectively; stop means

limiting the angular movement of said contacts to mutually exclusive angles; a plurality of arcuately spaced contacts adapted to be engaged respectively by said contactors upon manual adjustment thereof, at least two of said contacts lying within the angular range of motion of one of said contactors; a series of arcuately disposed contacts concentric with the first series and adapted to be engaged and disengaged by said contactors simultaneously with the contacts of the first series; a contact concentric with said series of contacts adapted to be engaged by either contactor as long as the latter engages a contact of said arcuate series, all of said contacts lying substantially in the same plane; and means for connecting the second series of contacts with said signal lamp, whereby either contactor establishes a circuit from the common contact to the signal lamp whenever a circuit is closed from the common contact to one of the first series of contacts.

4. In a combined switch and rheostat device, a pair of hollow members concentrically mounted one within the other for mutually independent rotation; a pair of grip members mounted on the outer ends of said rotary members respectively and adapted to be grasped with one hand for independent or simultaneous manipulation thereof; a signal lamp mounted within the inner member; a pair of radial contactors carried by the inner ends of said members respectively; stop means limiting the angular motion of said contactors to mutually exclusive angles; a resistor element; a plurality of contacts connected at spaced intervals of said resistor, arcuately disposed about the axis of said rotary members within the range of one of said contactors, and adapted to be selectively engaged and disengaged thereby; a contact on an arc of the same circle, within the range of the other contactor, and adapted to be engaged at will thereby; a contact ring concentric with the aforementioned contacts and engaged by said contactors whenever one of said contacts is engaged by either contactor; a common contact engaged by both contactors as long as they engage one of the arcuately spaced contacts, said contact ring and said contacts being disposed in substantially the same plane; and means for connecting the contact ring to the signal lamp, whereby a circuit is completed from the common contact to the signal lamp whenever any of the other contacts is engaged by either of said contactors to close one or both of a pair of independent circuits, adjustment of the contactor cooperating with the resistor-engaging contacts varying the resistance of one of said circuits.

5. In a combined switch and rheostat device, a pair of hollow members concentrically mounted one within the other for mutually independent rotation; a pair of group members mounted on the outer ends of said members adapted to be grasped by one hand for simultaneous or independent manipulation thereof; a signal lamp mounted in the hollow of the inner member, its illumination being visible from the outer end of said rotary members; a base plate mounted adjacent the inner end of said rotary members; a resistor element arcuately mounted on said base plate, concentric with said rotary members; a radial contactor insulatedly mounted on the inner end of one of said rotary members, forming a connection to said resistor at various points thereon and interrupting said connection upon adjusting the rotary member to which it is attached; a switch contact mounted on the base plate at the same distance from the axis of said rotary members as said resistor element but angularly spaced from the latter; a radial contactor, carried by the other rotary member, engaging the latter contact at will upon manipulation of said member; stop means limiting arcuate motion of said contactors to mutually exclusive angles; a central contact carried by the base plate and engaged by both of said contactors; a contact ring on the surface of said base plate engaged by either of said contactors when a connection is formed thereby with the arcuate resistor, or with the switch contact adjacent thereto; and a resilient finger connected to said ring engaging one of the terminals of the signal lamp filament, the first contactor varying the resistance of a circuit between said central contact and the terminal of the resistance element, the second contactor opening and closing an independent circuit from said central contact to the other contact upon disengagement or engagement therewith, and either contactor closing a separate circuit from the central contact to said lamp filament through the contact ring whenever one of the aforesaid circuits is completed.

6. In a switch and rheostat device, a pair of hollow members concentrically mounted one within the other for mutually independent rotation; a pair of grip members mounted on the outer ends of said members and adapted to be simultaneously or independently grasped by one hand for manipulation thereof; a signal lamp mounted in the hollow of the inner rotary member, its illumination being visible from the outer ends of said members; a base plate of insulating material mounted adjacent the inner ends of said members having an arcuate recess concentric with said members in its rear surface; a coiled resistance element mounted in said recess; a terminal carried by the base plate and connected to one end of said resistance element; a plurality of arcuately spaced contacts extending through said base plate from the front surface into said recess and connected to said resistor element at spaced intervals; a radial contactor insulatedly mounted on the inner end of one of said rotary members adapted to engage said contacts selectively on the front of the base plate; a switch contact extending through said base plate on the same circle as the arcuately spaced contacts, but angularly spaced therefrom, said contact including a terminal on the rear surface of the base plate; a radial contactor carried by the other rotary member adapted to engage and disengage the latter contact upon manipulation thereof; stop means limiting arcuate motion of said contactors to mutually exclusive angles; a central contact extending through said base plate and including a terminal on the outer surface thereof, said contact being permanently engaged by both of said contactors; a contact ring on the surface of said base plate engaged by either of said contactors when one of the arcuately spaced contacts or the switch contact is engaged thereby; and a resilient finger connected to said ring and engaging one of the terminals of the lamp filament, the first contactor selectively varying the resistance of a circuit between said central contact and the resistance element terminal by selective engagement with the arcuately spaced contacts and interrupting said circuit upon disengagement from said contacts, the second contactor opening and closing an independent cir-

cuit from said central contact to said terminal bearing switch contact upon disengagement or engagement therewith, and either contactor closing a third circuit from said central contact to said lamp filament through the contact ring whenever one of the aforesaid circuits is completed.

7. A combined switch and rheostat device as defined in claim 6, comprising yieldable detent means for retaining the contactors in any of the contact-engaging positions and contact-disengaging positions, the clearance between said arcuately spaced contacts, connected to said resistor, being sufficiently small to be bridged by the contact cooperating therewith during movement from one contact to the next.

8. In a rheostat, a base plate of insulating material having an arcuate recess in the rear surface thereof; a coiled resistor disposed in said recess; a plurality of arcuately spaced contacts mounted on the front surface of said plate and extending therethrough and into said recess; a current-conducting clip, carried by the end of each contact extending through said plate, circumscribing said resistor, each clip electrically connecting a contact to a point on said resistor and mechanically retaining said resistor in said recess; a terminal on the rear surface of said plate electrically connected to one end of said resistor; a contact centrally carried by said plate on the front surface thereof and concentrically disposed relative to said arcuately spaced contacts; a terminal on the rear surface of said plate electrically connected to said central contact; a contact member having contact means in permanent engagement with said central contact and other contact means selectively movable into engagement with the arcuately spaced contacts to complete a circuit from the terminal of said central contact through a selected portion of said resistor to the terminal thereof; and manually operable means for moving said contact member to selectively move the last-named contact means thereof into engagement with the arcuately spaced contacts.

9. In a rheostat, a base plate of insulating material having an arcuate recess in the rear surface thereof; a coiled resistor disposed in said recess; a plurality of arcuately spaced contacts mounted on the front surface of said plate and extending therethrough and into the said recess; a current-conducting clip, carried by the end of each contact extending through said plate, circumscribing said resistor, each clip electrically connecting a contact to a point on said resistor and mechanically retaining said resistor in said recess, the contacts at the opposite ends of said arc being electrically connected to opposite ends of said resistor; an elongate arcuate conductive strip electrically connected to each of said last-named contacts and positioned on the front surface of said plate in alignment with said arcuately spaced contacts; a terminal on the rear surface of said plate electrically connected to one end of said resistor; a contact centrally carried by said plate on the front surface thereof and concentrically disposed relative to said arcuately spaced contacts; a terminal on the rear surface of said plate electrically connected to said central contact; and a contact member having contact means in permanent engagement with said central contact and other contact means selectively movable into engagement with the arcuately spaced contacts and the strips carried by said contacts at opposite ends of the arc to complete a circuit from the terminal of said central contact through a selected portion of said resistor to the terminal thereof; and means for moving said contact member to selectively move the last-named contact means thereof into engagement with the arcuately spaced contacts and the strips in alignment therewith.

ARTHUR A. JOHNSON.