June 18, 1940. O. H. HASSELBAUM 2,205,288

CONTROL RHEOSTAT

Filed Sept. 7, 1938 2 Sheets-Sheet 1

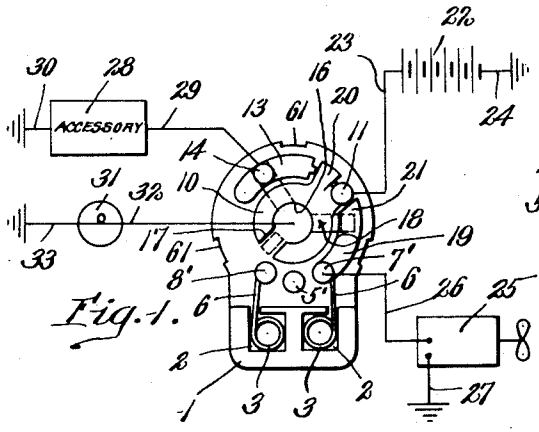


Fig. 1.

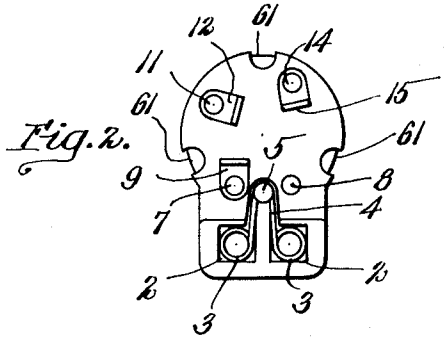


Fig. 2.

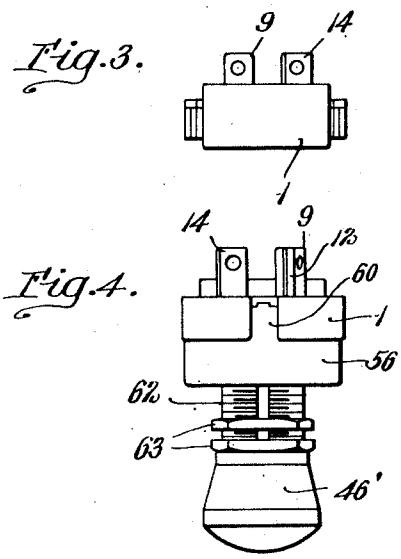


Fig. 3.

Fig. 4.

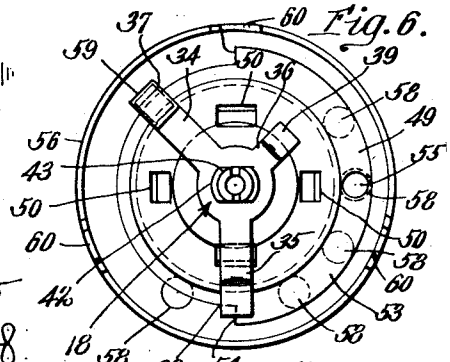


Fig. 6.

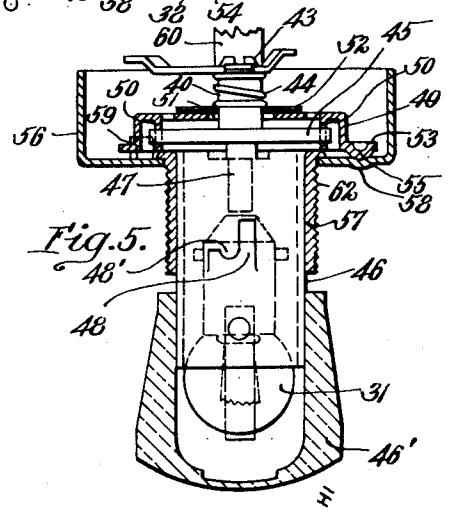


Fig. 5.

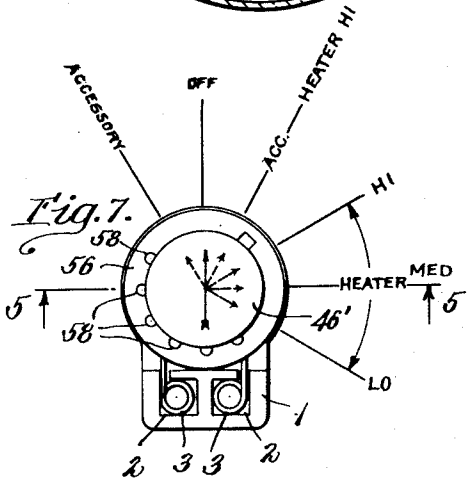


Fig. 7.

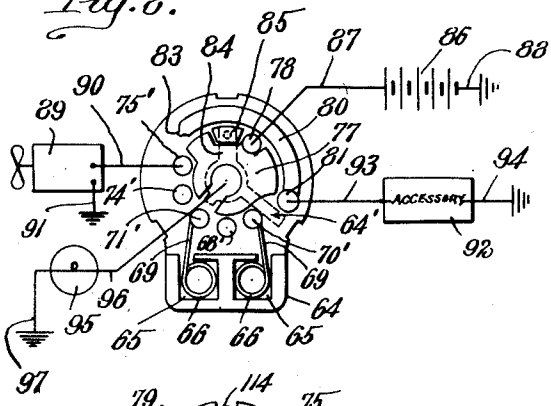
Inventor
Oscar H. Hasselbaum
by Elmer J. Gow.
Atty.

June 18, 1940. O. H. HASSELBAUM 2,205,288

CONTROL RHEOSTAT

Filed Sept. 7, 1938 2 Sheets-Sheet 2

Fig. 8.



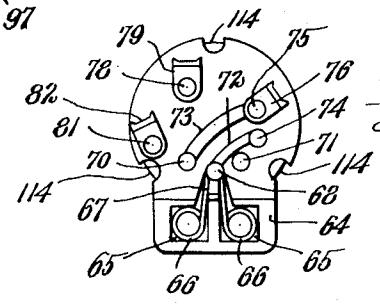


Fig. 9.

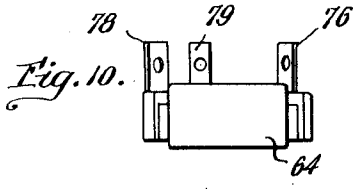


Fig. 10.

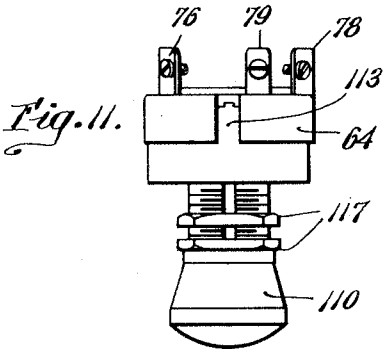


Fig. 11.

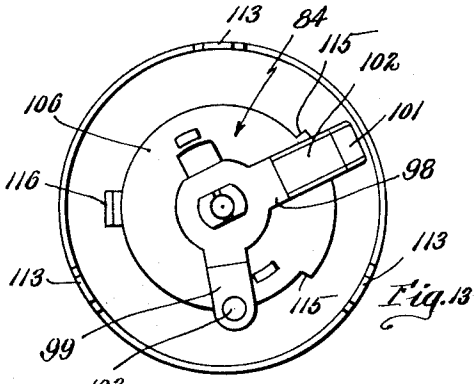


Fig. 13

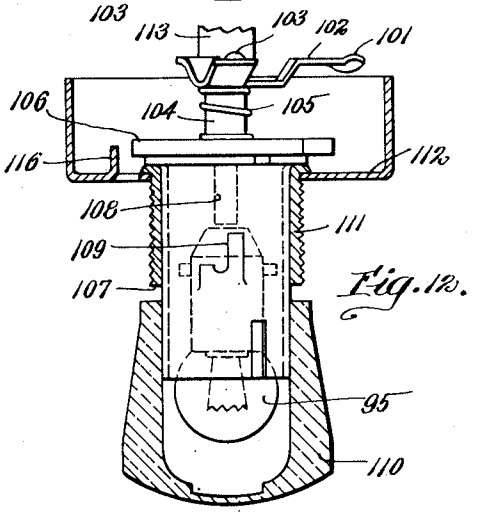


Fig. 12.

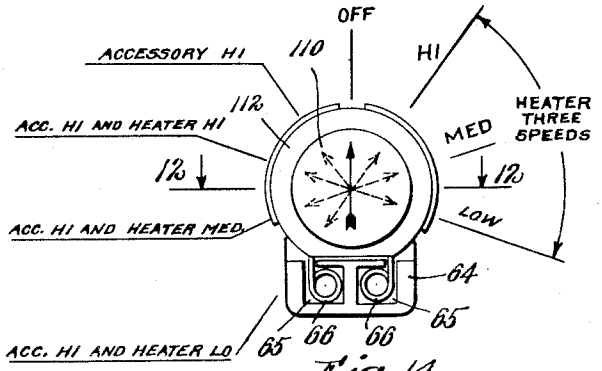


Fig 14.

Inventor.

Oscar H. Hasselbaum

by Elmer J. Jorn.

Atty.

Patented June 18, 1940 2,205,288

UNITED STATES PATENT OFFICE

2,205,288

CONTROL RHEOSTAT

Oscar H. Hasselbaum, Boston, Mass., assignor to Joseph Pollak Corporation, Dorchester, Mass., a corporation of Massachusetts, and Aetna Motor Products Corporation, Dorchester, Mass., a corporation of Massachusetts

Application September 7, 1938, Serial No. 228,785

8 Claims. (Cl. 201—48)

This invention relates to a control rheostat structure, and more particularly to such a rheostat structure which is utilized for controlling electrically-operated accessory elements in an automobile.

An object of this invention is to provide a novel rheostat structure of this type which will control a plurality of operating elements, together with an indicating lamp therefor.

Another object is to provide an arrangement in which the indicating lamp is illuminated at its maximum brilliancy for all positions of control.

A further object is to provide an arrangement in which the controlled elements are electric motors and in which the speed of one motor is varied independently.

A still further object is to devise a novel arrangement of parts for accomplishing the above objects in which a maximum facility of control and manipulation with a minimum complexity of construction is secured.

The foregoing and other objects of my invention will be best understood from the following description of exemplifications thereof, reference being had to the accompanying drawings, wherein:

Fig. 1 is a top view of the control unit of one embodiment of my invention with the switch and lamp assembly removed therefrom, wherein there is also shown diagrammatically a circuit with which the control unit may be used;

Fig. 2 is a back view of the control unit shown in Fig. 1;

Fig. 3 is an end view of the control unit viewed from the bottom of Fig. 2;

Fig. 4 is an end view of the control unit together with the switch arm and indicating lamp assembly in place thereon, as viewed from the top of Fig. 1;

Fig. 5 is an enlarged cross-section taken along line 5—5 of Fig. 7, showing the internal construction of the switch arm and indicating lamp assembly;

Fig. 6 is a view looking at the top of the construction shown in Fig. 5;

Fig. 7 is a top view of the assembled device showing the various positions of control;

Fig. 8 is a view similar to Fig. 1 of another embodiment of my invention;

Fig. 9 is a back view of the control unit shown in Fig. 8;

Fig. 10 is an end view of the control unit viewed from the bottom of Fig. 8;

Fig. 11 is an end view of the control unit together with the switch arm and indicating lamp assembly in place thereon as viewed from the top of Fig. 8;

Fig. 12 is an enlarged cross-section taken along line 12—12 of Fig. 14, showing the internal construction of the switch arm and lamp assembly;

Fig. 13 is a view looking at the top of the structure of Fig. 12; and

Fig. 14 is a top view of the assembled modification of Fig. 8 showing the various positions of control.

In the drawings, 1 represents an insulating body made of ceramic material or other suitable refractory insulation. The body 1 is provided at one end thereof with two square holes 2 extending through said body. In each of the holes 2 is mounted a coil 3 of resistance wire. Due to the fact that the holes 2 are square and the coils 3 are round, sufficient space is left between the walls of the holes 2 and the sides of the coils 3 through which air may freely circulate, thus providing cooling of the coils 3. The two coils 3 are connected in series by means of a loop 4 on the back of the body 1. The loop is secured in place and electrically connected to a conducting pin extending through the insulating body 1 to the front thereof where it is provided with a contact head 5'. The two outer ends 6—6 of the two coils 3 are connected respectively to the two pins 7 and 8 likewise extending through the insulating body 1. The coil ends 6—6 thus are securely retained in place on the body 1. The ends of the pins 7 and 8 at the front of the insulating body are provided with contact heads 7' and 8', respectively. The pin 7 supports a binding terminal 9 on the back face of the insulating body 1, whereby an external electrical connection may be made thereto. Adjacent the above-mentioned contacts there is supported on the front face of the insulating body 1 a conducting switch plate 10 which is secured in place by means of a pin 11 extending through the body 1 to the rear face thereof, where it engages and supports another binding terminal 12. An elongated contact strip 13 is also secured to the front face of the insulating body 1 by means of a pin 14 extending through said body to the rear face thereof, where said pin 14 supports a still further binding terminal 15. The switch plate 10 is cut away centrally at 16 from which a radial cut 17 is made so as to provide an insulating gap in the continuity of said switch plate 10. As indicated by the dotted lines in Fig. 1, the three-legged switch arm 18 is adapted to cooperate with the various contacts on the front face of the insulating body 1. In order that this three-legged switch unit shall always be in proper engagement with the contacts, it is desirable that all of the bearing surfaces upon which the three legs of said switch unit ride shall lie in a single plane. Thus an elongated contact strip 19 is connected to the contact head 7', and lies in the same plane as said contact head. Likewise the head of the pin 11 lies in the same plane and the switch plate 10 is provided with a raised section 20 so as to keep the surface of said switch plate adjacent the pin 11

likewise in the same plane. The elongated contact strip 13 and the contact heads 5' and 8' likewise lie in the plane referred to. It will be noted that all of these co-planar contact surfaces are concentrically disposed around the center point, forming the axis of rotation of the switch arm 18. At one point in this concentric circle there is an insulating gap, and in order to provide a co-planar bearing surface at said insulating gap, the body 1 is provided with a raised insulating bearing portion 21. The circular portion of the switch plate 10 immediately surrounding the central cut-away portion 16 likewise lies uniformly in the same plane as the other contacts. The insulating gap 17 in said switch plate 10 is provided with a raised insulating bearing surface likewise lying in the same plane so as to insure a continuity of bearing surface for another leg of the switch unit, as will be described below.

The typical circuit shown in Fig. 1 may consist of a battery 22, one terminal thereof being connected by means of a conductor 23 to the binding terminal 12, and thus to the switch plate 10. The other terminal of the battery is grounded at 24. A heater motor 25 may have one terminal thereof connected by means of a conductor 26 to the binding terminal 9, and thus to the contact 7' and contact strip 19. The other terminal of the heater motor may be grounded at 27. An accessory which may consist of a defroster motor 28 may have one terminal thereof connected by means of a conductor 29 to the binding terminal 15, and thus to the elongated contact strip 13. The other terminal of the accessory motor 28 may be grounded at 30. An indicating lamp 31 has one terminal thereof connected through the electrical connection 32 to the switch arm assembly 18, the other terminal of said lamp being grounded at 33.

The switch arm unit 18, as previously indicated, comprises three legs or arms, two long arms 34 and 35 and a shorter arm 36. The two long arms 34 and 35 are provided respectively with bearing surfaces 37 and 38 which are adapted to engage the outer circle of contacts previously referred to, while the shorter arm 36 is provided with a bearing surface 39 which is adapted to contact the more centrally-located circular portion of the switch plate 10. The switch arm assembly 18 is carried by a conducting sleeve 40. For this purpose the assembly 18 has provided centrally therein a relatively elongated slot 42 which slides over the outer end of the sleeve 40. The elongation of the slot 42 permits the switch assembly unit 18 to rock relatively with respect to the sleeve 40, but its shape does not permit a relative rotation therebetween in the plane of actuation. In order to keep the switch assembly 18 on the sleeve 40, an outer stop member 43 is provided on said sleeve. A spring 44 biases the switch assembly 18 to the outer end of the sleeve 40. The sleeve 40 carrying said switch assembly is mounted on and supported by an insulating plate 45 on one side thereof. The opposite side of the insulating plate 45 has supported thereon a conducting lamp socket sleeve 46 insulated from the sleeve 40. At the center of the insulating plate 45 within the sleeve 46 is located a central contact rod electrically connected to the sleeve 40 and adapted to contact the center base contact of a lamp 31, which is adapted to be received within the sleeve 46. In order to retain the lamp 31 in place within said sleeve, it is provided with a plurality of indented tongues 48, affording bayonet-receiving recesses 48' for receiving the bayonet pins in the base of the lamp 31, and thus retaining said lamp in place within the socket sleeve 46. A translucent operating head 46' is mounted non-rotatably on the outer end of the sleeve 46. The construction of the lamp socket and translucent head is more fully described and claimed in my co-pending application entitled Control rheostat unit, filed simultaneously herewith.

In order to yieldably hold the switch in predetermined definite operating positions, the structure is provided with a detent plate 49. This plate is carried by the insulating plate 45 and is retained thereon bp means of a plurality of tongues 50 passing through and engaging corresponding recesses in the insulating plate 45. The detent plate 49 is provided with a center opening 51 through which the sleeve 40 extends so as to insulate said sleeve from said detent plate. An additional insulating plate 52 overlies the opening 51 in the detent plate 49 so as to form a bearing surface for the lower end of the spring 44. In this way the switch arm assembly 18 and its associated conducting structure is insulated from the detent plate 49 which constitutes a grounded portion of the switch structure. The detent plate is provided with an annular portion 53 which is cut away along a limited portion thereof to provide shoulders 54—54. In the annular portion 53 there is formed a detent projection 55. Cooperating with said detent plate 49 is a casing 56 which is carried by an outer sleeve 57 in which the socket sleeve 46 freely rotates. The casing 56 is provided with a number of circularly-disposed detent indentations 58 which cooperate with the detent projection 55 so as to yieldably retain the switch arm assembly in predetermined positions of operation. The casing 56 is also provided with an upstanding stop 59 which engages the shoulders 54 at the opposite limits of operation of the switch arm assembly, and prevents further rotation. The switch arm assembly and indicating lamp unit is secured as a whole to the insulating body 1 by means of a plurality of tongues 60 formed on the lower edge of the casing 56. These tongues 60 are adapted to fit into corresponding grooves 61. When the ends of the tongue 60 are bent over on the rear face of the insulating body 1, the entire structure is maintained in its assembled relationship. For the purposes of mounting the assembled structure in position in an automobile, the sleeve 57 is provided with external threads and a plurality of clamping nuts 63.

When the structure described above is connected in the circuit, as shown in Fig. 1, and the head 46' is rotated to the off position, the switch arm unit 18 will occupy the position indicated by the dotted lines in Fig. 1. In this position, none of the three switch arms engages the switch plate 10 to which the battery 22 is connected, and thus all of the operating elements, including the lamp 31, are deenergized. As the switch assembly is rotated in a counter-clockwise direction, the bearing surface 38 of the long arm 35 rides off the insulating portion 21 onto the pin 11 which is electrically connected to the switch plate 10. The bearing surface 37 of the other long switch arm 34 remains in engagement with the elongated contact strip 13. Since the battery 22 is connected to the switch plate 10 and the accessory 28 is connected to the contact strip 13, the above operation of the switch, which interconnects the switch plate 10 and the strip 13, energizes the accessory motor 28. At the same time,

since the lamp 31 is electrically connected to the switch assembly 18, which engages the battery-energized switch plate 10, the lamp would likewise be energized to its full brilliancy. Therefore, in said position of actuation, the accessory motor 28 will be energized and the lamp 31 will be illuminated to full brilliancy.

If, however, the switch assembly is rotated from the off position in a clockwise direction, the bearing surface 38 of the long switch arm 35 will ride onto the elongated contact strip 19. The bearing surface 37 of the other long contact arm 34 will remain in engagement with the elongated contact strip 13. At the same time the bearing surface 39 of the short contact arm 36 will come into contact with the switch plate 10, which being connected to the battery 22 will thus energize both contact strips 13 and 19. Since the accessory 28 is connected to the contact strip 13 and the heater motor 25 is connected to the contact strip 19, this position of actuation will energize both accessory and heater motor. In this case likewise the lamp 31 being connected to the switch arm assembly 18, which is in contact with the battery-energized switch plate 10, will be energized to its maximum brilliancy.

In this position of the switch it will be noted that none of the resistance of the coils 3 is connected in series with the heater motor 28, and thus said motor will be operated at its maximum high speed.

If the switch assembly is now rotated clockwise to the next position, the bearing surface 37 of the long switch arm 34 will leave the elongated contact 13 and come into contact with the portion 20 of the switch plate 10. This will deenergize the accessory motor 28 since said accessory motor can only be energized through the contact strip 13. However, due to the provision of the elongated strip 19 and the continuously-conductive centrally-circular portion of the switch plate 10, the other circuit connections will be unchanged and the heater motor 25 will continue to operate at this high speed while the lamp 31 will likewise be energized to full brilliancy.

When the switch assembly is rotated clockwise to the next position, the bearing surface 38 of the long arm 35 will travel from the contact 7' to the contact 5'. The bearing surface 37 of the other long arm 34 will ride up onto the end of the pin 11. The bearing surface 39 of the short arm 36 will remain in electrical contact with the switch plate 10. This connection interposes the resistance of the right-hand coil 3 in series with the heater motor 25, which is thereby slowed down to its medium speed. However, the lamp 31 is still directly connected through the switch assembly 18 directly to the switch plate 10, and thus directly to the battery 22. Under these conditions, the lamp 31 remains energized to its maximum brilliancy.

When the switch assembly is rotated clockwise to the next position, the bearing surface 38 of the long arm 35 will leave the contact 5' and engage the contact 8'. The bearing surface 37 of the other long arm 34 will leave the pin 11 and engage the insulating section 21. This, however, does not deenergize the switch arm inasmuch as the bearing surface 39 of the short arm 36 easily remains in engagement with the switch plate 10. Under these conditions the resistance of both coils 3 is connected in series with the heater motor 25, which therefore operates as its lowest speed. As explained above, the lamp 31 still is maintained at its maximum brilliancy.

It will be noted that in each position of actuation of the switch, the bearing surfaces of the three arms of the switch assembly 18 are in engagement with the bearing surfaces of the underlying contact structure which all lie in the same plane. Thus the switch arm assembly 18 is maintained uniformly in an elevated position, insuring an adequate and substantially equally-disposed pressure on all of the three switch arms.

In each position of actuation of the switch, the projection 55 snaps into a corresponding depression 58 in the casing 56. In this way the switch is yieldably but firmly retained in its predetermined positions of actuation. The operator can easily feel this snapping action, and in this way is enabled to actuate the switch accurately without visually observing the same.

As pointed out and claimed in my co-opending application, the relative position of the heating coils 3 to the switch structure, in which said switch structure is out of substantial heat transfer relation with respect to said coils, prevents the heat generated from said coils from reaching and injuring the switch structure.

Another embodiment of my invention which is illustrated in Figs. 8 and 14, inclusive, permits the system to be controlled so that the speed of the heater motor may be varied whether or not the accessory motor is energized. In this embodiment 64 represents an insulating body similar to the body 1 in Fig. 1. The body 64 is provided at one end thereof with two square holes 65 extending through said body. In each of the holes 65 is mounted a coil 66 of resistance wire. In this case likewise there is provided spaces around the coils wherein cooling air may circulate. The two coils 66 are connected in series by means of a loop 67 at the back of the body 64. This loop is secured in place and electrically connected to a conducting pin 68 extending through the insulating body 64 to the front thereof where it is provided with a contact head 68'. The two ends 69—69 of the two coils 66 are connected respectively to two pins 70 and 71 likewise extending through the insulating body 64. The pins 70 and 71 are provided respectively at the front of said body with contact heads 70' and 71', respectively. Two additional pins 74 and 75 symmetrically disposed with respect to the pins 68 and 70 are mounted in the insulating body 64 on the opposite side of the pins 71. Conducting strips 72 and 73 connect the pins 68 and 70 to the pins 74 and 75, respectively. The pins 74 and 75 extend through the body 64, and are provided at the front face thereof with contact heads 74' and 75'. The pin 75 supports a binding terminal 76 on the back face of the insulating body 64. Adjacent the above-mentioned contacts there is supported on the front face of the insulating body 64 a conducting switch plate 77 which is secured to the body 64 by a conducting pin 78 extending through the body 64 to the rear face thereof where it supports another binding terminal 79. Concentrically disposed with the partial circle of contacts described below but located at a greater radius than said contacts, there is provided an arcuate contact strip 80 secured to the face of the insulating body 64 by means of a conducting pin 81 extending through said body to the rear face thereof where it supports another binding terminal 82. The pin 81 is located at one end of said contact strip 80, the other end of said strip being maintained

in place by a lug 83 fitting into a recess in the face of the insulating body 64. As in the case of the previous embodiment, a three-legged contact arm is adapted to overlie and make various connections with the contact surfaces described above. With a three-legged switch arm of this kind as previously indicated, it is desirable to provide a continuity of bearing surface in one plane in order that said switch arm is supported uniformly in each position of actuation thereof. For this reason the top surfaces of the various contacts, the switch plate 77, and the contact strip 80 are all disposed substantially in a single plane. The switch plate 77 is cut away at the upper side thereof in order to provide an insulating gap. In order to maintain the continuity of the plane bearing surface, the insulation of the body 64 is raised at 85 within this cut-away portion. The switch plate 77 is likewise cut away at the central portion thereof, and provided with a radial cut therefrom in a manner similar to that described in connection with Fig. 1. In the radial cut, the insulation of the body 64 is likewise raised in order to maintain the continuity of the plane bearing surfaces. Also at the point 64', the insulation of the body 64 is raised to the plane of the contact surfaces.

The typical circuit shown in Fig. 8 may consist of a battery 86, one terminal thereof being connected by a conductor 87 to the binding terminal 78 and thus to the switch plate 77. The other terminal of the battery 86 may be grounded at 88. A heater motor 89 may have one terminal thereof connected by means of a conductor 90 to the binding terminal 76, and thus to the contact 75'. It will be noted that the contact 75' is likewise connected to the contact 70' through the intermediary of the conducting strip 73. The other terminal of the heater motor 89 may be grounded at 91. An accessory 92, which may consist of a defroster motor, has one terminal thereof connected by means of a conductor 93 to the binding terminal 82, and thus to the arcuate contact strip 80. The other terminal of the accessory 92 is grounded at 94. An indicating lamp 95 has one side thereof directly electrically connected by means of a connection 96 to the switch arm 84. The other side of the indicating lamp is grounded at 97.

The three-legged switch arm assembly 84 is provided with one long leg 98, a shorter leg 99, and a still shorter leg 100. The longest leg 98 is provided at its outer end with a bearing surface 101 which is adapted to ride upon the arcuate contact strip 80. Said leg 98 is also provided with a relatively elongated bearing surface 102 which is adapted to engage the various contacts of the partial circle of contacts only. It will be noted that the bearing surface 101 when in contact with the strip 80 lifts the leg 98 so that the bearing surface 102 is raised and does not contact the switch plate 77. Thus each arm makes contact at but one point thereon, insuring a positive engagement in each switch position. The leg 99 is provided with a bearing surface 103. The front face of the shortest leg 100 constitutes its own bearing surface. The switch arm assembly 84 is mounted on a sleeve 104 in a manner similar to that described in connection with the sleeve 40 of Fig. 5. The switch arm 84 may be rocked relative to the sleeve 104 but cannot rotate with respect thereto. A spring 105 biases the switch arm 84 to the outer end of said sleeve 104. The sleeve 104 carrying the switch arm assembly 84 is mounted on the insulating plate 106 which likewise carries on its opposite side the lamp socket sleeve 107. The insulating plate 106 carries within the sleeve 107 the center contact rod 108 which is electrically connected to the sleeve 104 and the switch arm assembly 84. The lamp socket sleeve 107 is likewise provided with a plurality of bayonet-recessed tongues 109. Said lamp socket sleeve is adapted to receive the lamp 95, which thereby is placed in the circuit shown diagrammatically in Fig. 8. The lamp socket sleeve 107 likewise has securely connected thereto the translucent head 110 through which the illumination afforded by the lamp 95 may be observed.

A mounting sleeve 111 surrounds the socket sleeve 107 and is rotatable freely thereon. The sleeve 111 likewise carries the casing 112 which may be fastened to the insulating body 64 by a plurality of tongues 113 which are adapted to fit into grooves 114 formed in the outer edge of the insulating body 64. By having the outer ends of the tongues 103 turned over onto the rear face of the insulating body 64, the entire structure is maintained in assembled position.

The insulating plate 106 is cut away along a considerable portion of its circumference in order to provide a pair of shoulders 115—115. These shoulders are adapted to cooperate with a stop 116 formed in the casing 112. In this way the rotation of the switch element is kept within the correct limits of rotation. The sleeve 111 which serves to mount the assembly in the automobile structure may be provided with a pair of locking nuts 117 which are threaded onto the external surface of the sleeve 111.

When the structure described above is connected in the circuit shown in Fig. 8 and the head 110 is rotated to the off position, the switch arm assembly 84 will occupy the position indicated by the dotted lines in Fig. 1. In this position, none of the contact arms of said switch assembly is in electrical connection with the switch plate 77 which is the only element directly connected to the battery 86. Therefore, the heater motor 89, the accessory 92, and the lamp 95 are deenergized. As the switch assembly is rotated in a counter-clockwise position, the bearing surface 103 of the arm 99 leaves the insulating section 85 and comes into contact with the switch plate 77, thus energizing the switch arm assembly 84 and likewise the indicating lamp 95 directly electrically connected thereto. At the same time the bearing surface 101 of the leg 98 rides up onto the arcuate contact strip 80, which being directly connected to the accessory motor 92 energizes said accessory motor which thereupon operates at its maximum speed. In this position of the switch, however, the heater motor 89 is deenergized, and is therefore not set in operation.

As the switch assembly is rotated counter-clockwise to the next position, the bearing surface 103 leaves the switch plate 77 and engages the contact 75'. However, the switch arm assembly 84 is not thereby deenergized because the contact leg 100 has come into engagement with the switch plate 77. In this position of the switch, the circuit arrangement of the accessory motor 92 and the lamp 95 is unchanged. However, the heater motor 89 is directly connected from the contact 75' through the switch arm assembly 84 to the battery 86, and therefore said heater motor operates at its maximum speed.

If the switch is then moved counter-clockwise to its next position, the circuit arrangements

are unchanged except for the fact that the bearing surface 103 leaves the contact 75' and engages the contact 74'. This interposes the resistance of the right-hand coil 66, as viewed in Fig. 8, into the circuit of the heater motor 89 which is thereupon slowed down to its medium speed. The next counter-clockwise operation of the switch brings the bearing surface 103 into engagement with the contact 71', and thus interposes the entire resistance of both coils 66 into the circuit of the heater motor 89, in this way slowing the speed of said motor to its minimum value. Throughout the operation of the heater motor 89, it will be noted that none of the resistance is included in the circuit of the accessory motor 94, and therefore said motor operates at its full speed.

If in starting from the off position the head 110 is rotated in the clockwise position, both the leg 100 and the bearing surface 103 of the leg 99 will electrically engage the switch plate 77, thus energizing the switch arm 84. The bearing surface 102 of the arm 98 will at the same time engage the contact 70'. Since the motor 89 is directly connected to the contact 70' through the strip 73, said heater motor is likewise directly connected to the battery 86, and thus will be operated at its maximum speed. It will be noted, however, that the arcuate strip 80 which energizes the accessory motor 92 is of limited length so that it no longer engages the bearing surface 101, and therefore is deenergized in this and in successive positions.

As the switch 110 is rotated further in the clockwise position, the bearing surface 102 will successively engage the contact 68' and 71', successively interposing the resistances of each of the coils 66 into the circuit of the heater motor 89, and thus causing said heater motor to operate at its medium and low speeds, successively. It will be noted, furthermore, that in each of these various positions of actuation in which the switch arm assembly 84 is energized, the lamp 95 will be directly connected to the battery 86, and therefore will be operated at its maximum brilliancy.

Of course it is to be understood that this invention is not limited to the particular details of construction as described above as many equivalents will suggest themselves to those skilled in the art. It is accordingly desired that the appended claims be given a broad interpretation commensurate with the scope of the invention within the art.

What is claimed is:

1. A switch structure comprising a body of insulation having a flat face, a resistance mounted on said body, a plurality of contacts electrically connected to spaced points on said resistance and mounted on said face and arcuately disposed thereon, a plurality of arcuate contacts concentrically disposed with respect to said contacts also mounted on said face, three terminals connected respectively to said resistance and to each of said arcuate contacts for establishing an external electrical connection to said resistance and to each of said arcuate contacts, a multiple-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the legs of said switch arm being displaced from each other in the plane of actuation to such a degree with respect to said contacts that simultaneous connections are made to one of said first-named contacts and to each of said arcuate contacts in each position of the switch except for the "off" position.

2. A switch structure comprising a body of insulation having a flat face, a resistance mounted on said body, a plurality of contacts electrically connected to spaced points on said resistance and mounted on said face and arcuately disposed thereon, a plurality of arcuate contacts concentrically disposed with respect to said contacts also mounted on said face, means for establishing an external electrical connection to said resistance and to each of said arcuate contacts, a rigid three-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the three legs of said switch arm being displaced from each other in the plane of actuation to such a degree with respect to said contacts that three simultaneous connections are made to three of said contacts, said contacts being disposed in substantially a single plane; the face of said insulating body being provided with a raised portion in the spaces between conducting portions of said contacts, said portion having its surface in said single plane, whereby in each position of actuation or motion of said switch arm, the three legs thereof are provided with co-planar supporting surfaces.

3. A switch structure comprising a body of insulation having a flat face, a resistance mounted on said body, a plurality of contacts electrically connected to spaced points on said resistance and mounted on said face and arcuately disposed thereon, a plurality of arcuate contacts concentrically disposed with respect to said contacts also mounted on said face, three terminals connected respectively to said resistance and to each of said arcuate contacts for establishing an external electrical connection to said resistance and to each of said arcuate contacts, a multiple-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the legs of said switch arm being displaced from each other in the plane of actuation to such a degree with respect to said contacts that simultaneous connections are made to one of said first-named contacts and to each of said arcuate contacts in each position of the switch except for the "off" position, one of said arcuate contacts having a continuously conducting surface except for an insulating gap in the "off" position of the switch, said conducting surface being in contact with one of said switch arm legs in each position of said switch except the "off" position, an indicating lamp having one terminal in constant electrical connection with said switch arm, and having its other terminal grounded.

4. A switch structure comprising a body of insulation having a flat face, a resistance mounted on said body, a plurality of contacts electrically connected to spaced points on said resistance and mounted on said face and arcuately disposed thereon, each of said contacts except the end contact thereof being connected to another contact of a second set of contacts, said second set of contacts being symmetrically disposed with respect to said first-named contacts on the other side of said end contact and likewise arcuately supported on said face, a plurality of arcuate contacts concentrically disposed with respect to said contacts also mounted on said face, three terminals connected respectively to said resistance and to each of said arcuate contacts for establishing an external electrical connection to said resistance and to each of said arcuate contacts, a three-legged switch arm overlying said contacts

and rotatable in a plane parallel to said face around the center of said contacts as an axis, the three legs of said switch arm being displaced from each other in the plane of actuation, one of said arcuate contacts having a continuously conducting surface except for an insulating gap in the "off" position of the switch, said conducting surface being in contact with one of said switch arm legs in each position of said switch except for the "off" position, another of said arcuate contacts being of limited length and located adjacent said first-named arcuate contact, another of said legs contacting said latter arcuate contact in the position of actuation on one side of the "off" position and successively contacting the first set of resistance contacts in successive positions of actuation on the other side of the "off" position, the third leg contacting said first-mentioned arcuate contact in said latter positions of actuation and contacting the second set of resistance contacts in the former position of actuation.

5. A switch structure comprising a body of insulation having a flat face, a resistance mounted on said body, a plurality of contacts electrically connected to spaced points on said resistance and mounted on said face and arcuately disposed thereon, each of said contacts except the end contact thereof being connected to another contact of a second set of contacts, said second set of contacts being symmetrically disposed with respect to said first-named contacts on the other side of said end contact and likewise arcuately supported on said face, an arcuate contact concentrically disposed with respect to said contacts also mounted on said face, three terminals connected respectively to said resistance and to each of said arcuate contacts for establishing an external electrical connection to said resistance and to said arcuate contact, a three-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the three legs of said switch arm being displaced from each other in the plane of actuation, said arcuate contact having a continuously conducting surface except for an insulating gap in the "off" position of the switch, said conducting surface being in contact with one of said switch arm legs in each position of said switch except the "off" position, one of said legs engaging successive contacts of the first set of resistance contacts in successive positions of actuation on one side of the "off" position, another of said legs engaging successive contacts of the second set of resistance contacts in successive positions of actuation on the other side of the "off" position, whereby said single resistance is utilized as a controlling factor in two different circuit arrangements.

6. A switch structure comprising a body of insulation having a substantially flat face, a resistance mounted on said body, a first set of contacts electrically connected to spaced points on said resistance, mounted on said face and arcuately disposed thereon, each of a plurality of said first set of contacts being connected to another contact of a second set of contacts, said second set of contacts being likewise arcuately mounted on said face concentrically with the first set of contacts, two arcuate contacts concentrically disposed with respect to said sets of contacts and also mounted on said face, three terminals connected respectively to said resistance and said arcuate contacts for establishing external electrical connections thereto, a switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, said switch arm having contact portions interconnecting successive contacts of said first set of contacts and one of said arcuate contacts in a position of actuation on one side of the "off" position and interconnecting successive contacts of said second set of contacts and both of said arcuate contacts in successive positions of actuation on the other side of the "off" position, whereby said single resistance is utilized as a controlling factor in two different circuit arrangements.

7. A switch structure comprising a body of insulation having a substantially flat face, a resistance mounted on said body, a first set of contacts electrically connected to spaced points on said resistance, mounted on said face and arcuately disposed thereon along part of a circle, each of a plurality of said first set of contacts being connected to another contact of a second set of contacts, said second set of contacts being likewise arcuately mounted on said face along another part of said circle, an arcuate contact disposed in another circle concentric with said first circle and also mounted on said face, a second arcuate contact mounted on said face and having an arcuate contact surface disposed along another part of said first-named circle adjacent said first arcuate contact and having a second arcuate contact surface disposed in a third concentric circle, three terminals connected respectively to said resistance and said arcuate contacts for establishing external electrical connections thereto, a three-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the three legs of said switch arm being of different lengths to engage contacts respectively in said three concentric circles.

8. A switch structure comprising a body of insulation having a substantially flat face, a resistance mounted on said body, a first set of contacts electrically connected to spaced points on said resistance, mounted on said face and arcuately disposed thereon along part of a circle, each of a plurality of said first set of contacts being connected to another contact of a second set of contacts, said second set of contacts being likewise arcuately mounted on said face along another part of said circle, an arcuate contact disposed in another circle concentric with said first circle and also mounted on said face, a second arcuate contact mounted on said face and having an arcuate contact surface disposed along another part of said first-named circle adjacent said first arcuate contact and having a second arcuate contact surface disposed in a third concentric circle, three terminals connected respectively to said resistance and said arcuate contacts for establishing external electrical connections thereto, a three-legged switch arm overlying said contacts and rotatable in a plane parallel to said face around the center of said contacts as an axis, the three legs of said switch arm being of different lengths to engage contacts respectively in said three concentric circles, one of said switch arms having an elongated contact surface engaging said first-named arcuate contact and the first-named arcuate contact surface of said second arcuate contact in the position of actuation on one side of the "off" position and contacting only one of said sets of contacts in the position of actuation on the other side of the "off" position.

OSCAR H. HASSELBAUM.