Sept. 15, 1931. N. C. SCHELLENGER 1,823,472

METAL FRAME RHEOSTAT

Filed June 7, 1926

Fig. 1.

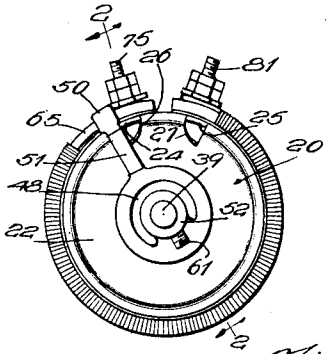


Fig. 3.

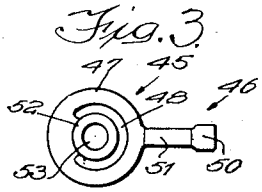


Fig. 4.

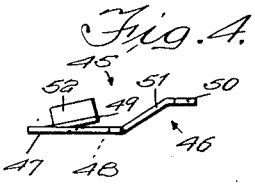


Fig. 2.

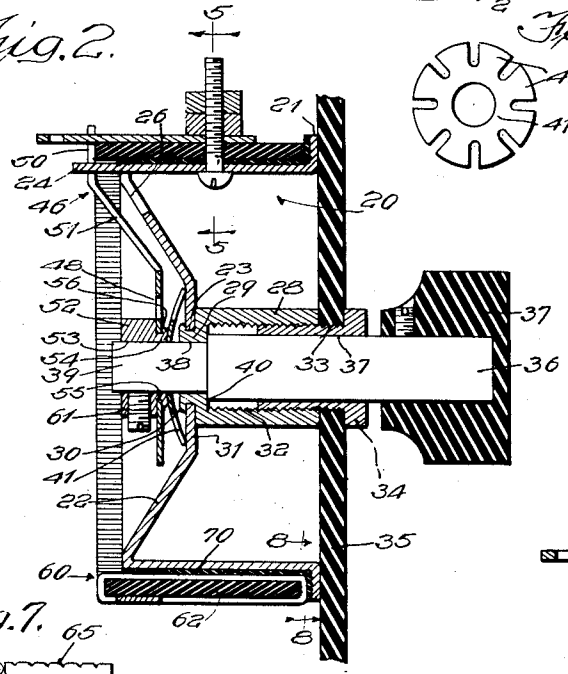


Fig. 6.

Fig. 9.

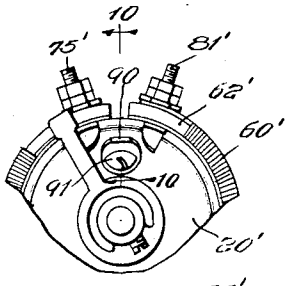


Fig. 10.

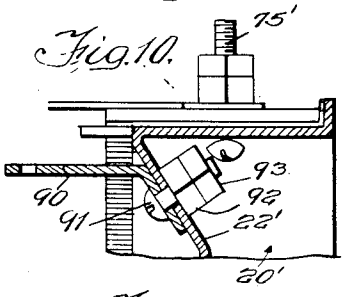


Fig. 7.

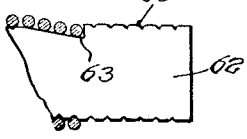


Fig. 5.

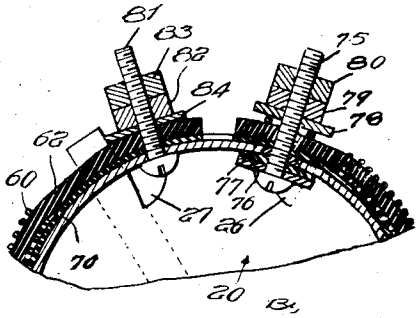
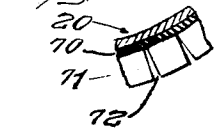


Fig. 8.



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Attys

Patented Sept. 15, 1931

1,823,472

UNITED STATES PATENT OFFICE

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METAL FRAME RHEOSTAT

Application filed June 7, 1926. Serial No. 114,126.

My invention in general pertains to electrical apparatus and more particularly to electrical current controlling apparatus such as rheostats and potentiometers.

In the operation of conventional rheostats and the like it is necessary to move the rheostat arm over an objectional hump or raised portion when moving it from the off position onto the winding. That is to say, on account of the winding being disposed on the edge of the strip or core it is necessary in moving the arm from the off position onto the winding that the arm be raised or forced thereon from the edge of the strip. Obviously, such a feature does not permit of a highly smooth and uniform movement on the part of the contact arm and in addition is deleterious to the longevity of the arm itself.

I propose to provide a simple, inexpensive and compact rheostat wherein a few turns of the resistance wire are buried, so to speak, in the insulator core or winding strip sufficiently deep so that the contact surface of these windings will be flush with the adjacent edge of the insulator strip, thus enabling the arm to be moved freely to and from an off position and onto the windings without it having to strike or over-ride a hump or raised portion.

In general the rheostat or potentiometer strip above referred to may be wound in accordance with the method disclosed and claimed in the co-pending patent application of Charles Havlish, Serial No. 729,479, filed August 1, 1924. The primary distinction between my present resistance strip or core and that illustrated in the co-pending application resides in the fact that I provide a notch in the edge of one end of the strip so that the last few windings may lie in this notch and be flush with the adjacent edge of the strip. The strip is first preferably completely wound in accordance with the method disclosed in the co-pending patent application. Then the last few windings are taken off or removed up to the notch. In other words, after the strip is wound I preferably sever the last several turns following the notch. This method of manufacture assures that the windings in the notch will be tightly wound on the strip.

I also provide an improved, simple and compact electrical current controller such as a rheostat having a metallic frame preferably circular in contour and having a concave portion or face in which is mounted the rheostat contact arm.

In accordance with the general features of my invention I provide a rheostat having a hollow metallic body with a peripheral or annular flange and a resistance strip disposed thereabouts and abutting the flange.

Another feature of the invention pertains to the positioning of an insulating strip intermediate the body and the resistance strip. This insulating strip has a castellated edge for insulating the turns on the strip from the body or frame.

By castellating the edge of the insulating strip the same is enabled to more properly seat or adjust itself on the flange of the body. Also, this castellated strip will not be damaged or broken very easily when being mounted on the body as is the case with analogous strips which have not been castellated.

In accordance with other features of my invention I form or punch spaced prongs from the concave portion of the hollow metallic frame which prongs serve as stops for limiting the movement of the contact arm.

The contact arm of my improved current controller is provided with a resilient integral mounting preferably a hub adapted to be secured to an end of the operating shaft or rod of the controller.

Other objects and advantages of my invention will more fully appear from the following detailed description taken in connection with the accompanying drawings which illustrates one embodiment thereof and in which:

Figure 1 is an elevation of a rheostat embodying the features of my invention;

Figure 2 is an enlarged sectional view taken on substantially the line 2—2 of Figure 1;

Figure 3 is a detail view of my novel contact arm assembly;

Figure 4 is a side view of the contact arm assembly illustrated in Figure 3;

Figure 5 is a sectional view taken on substantially the line 5—5 of Figure 2 and drawn to a somewhat enlarged scale;

Figure 6 in a detail view illustrating the resilient washer adapted to be associated with my novel contact arm;

Figure 7 is a fragmentary view of the notched end of the insulating strip and the windings thereon;

Figure 8 is a fragmentary view partly in section illustrating the castellated edge of the insulator and taken on substantially the line 8—8 of Figure 2;

Figure 9 is a fragmentary view somewhat similar to Figure 1 illustrating a potentiometer embodying the features of my invention; and

Figure 10 is a fragmentary sectional view taken on substantially the line 10—10 of Figure 9 looking in the direction indicated by the arrows.

Referring now to the drawings in detail in which like reference numerals designate similar parts throughout the several views, 20 denotes generally a metallic frame of a current controller preferably of the rheostat type. The frame 20 is preferably circular in form and is provided with an annular flange 21 which extends laterally therefrom and at right angles to the wall of the body. One end of the metallic frame 20 is provided with a concave portion 22 formed integral therewith. This concave portion is positioned inside of the annular wall of the body and is located at an end of the body opposite that of the annular flange 21.

The concave portion 22 is provided with an annular opening 23, disposed in a substantially central position. That is to say, this opening 23 is concentric with the body 20. Also formed integral with the concave portion 22 are a pair of prongs 24 and 25 which constitute stops and whose purpose will be more fully explained hereinafter. These prongs 24 and 25 are preferably punched from the portion 22 leaving apertures 26 and 27 respectively in the portion 22 (Fig. 1).

Associated with the body 20 is a sleeve or tubular element 28 having a reduced end 29 which extends through the opening 23 in the concave portion 22. This sleeve 28 is secured to the concave portion 22 by the turned-back portion 30 which may be formed by any conventional riveting apparatus or the like. In other words, the end of the reduced portion 23 of the sleeve 28 is in reality spread out over the surface of the concave portion 22 to clench the sleeve thereto. It should be observed that the concave portion 22 is provided at its center with a substantially flat portion 31 to which the end of the sleeve 28 is riveted, so to speak.

The bore 32 of the sleeve 28 is threaded and is adapted to receive a tubular sleeve 33. This sleeve 33 is threaded into the sleeve 28 and enters into a telescoping relation therewith. Also the sleeve 33 is provided with an enlarged head 34 between which and the end of the sleeve 28 a mounting or a panel may be interposed. In Fig. 2 I have designated a panel disposed intermediate the head 34 and the end of the sleeve 28 by reference character 35. This panel may be of a phenol condensation compound or any other analogous and conventional material. It should also be noted that the annular flange 21 is adapted to abut the surface of the panel 35. In other words, the end of the flange 21 is in line with the end of the sleeve 28 as is obvious in Fig. 2.

Extending through the telescoping sleeves 28 and 33 is an operating shaft 36. Secured to the external end of this shaft 36 is a handle or knob 37 by means of which the shaft may be actuated. The shaft 36 is journaled in the bore 37 of the sleeve 33 and in the reduced bore 38 of the reduced portion 29 of the sleeve 28. The shaft 36 is provided with a reduced end 39 and a shoulder 40 which abuts the reduced portion 29 of the sleeve 28.

Mounted upon the reduced end 39 of the shaft 36 is a resilient washer 41 such as that illustrated in Fig. 6. The edge of this washer is castellated as indicated at 42. The washer as shown in Fig. 3 is arcuate in shape and has an edge which engages the flat portion 31 associated with the concave portion 22 in the body 20. This washer serves two purposes, as will be obvious from the description to hereinafter follow.

Also mounted upon the reduced portion 39 is a contact arm assembly 45 such as that illustrated in detail in Figs. 3 and 4. This assembly includes a contact arm 46 having an arcuate shaped mounting portion 47. The base or mounting portion 47 is provided with an arcuate slot 48, as best illustrated in Figs. 1 and 3. The base is also provided with an offset portion 49 which is adapted to be flexed into the plane of the mounting or base 47 as will become more apparent hereinafter. The contact arm 46 and its base 47 may be made of any suitable material such, for example, as nickel, silver, or the like. The contact arm 46 includes a slanting portion 51 and a substantially flat contact portion 50. Mounted on the offset portion 49 is a collar or hub 52 having a bore 53 adapted to receive the end 39 of the shaft 36. The collar 52 has formed integral therewith a reduced portion 54 which extends through an opening 55 in the offset portion 49 and is clenched to the offset portion 49 as indicated at 56 in Fig. 2.

When the assembly 45 is removed from the end 39 of the shaft 36 the hub 52 and the portion 49 will assume the position illustrated in Fig. 4. However, when the assembly 45

is mounted upon the shaft the portion 49 will be flexed into the same plane as the rest of the mounting or base 48 of the contact arm 46. This will result in the contact portion 50 of the arm 46 being resiliently urged into engagement with the resistance wire or windings designated generally by the reference character 60. The collar 52 is provided with a set screw 61 by means of which the same may be fastened to the end 39 of the shaft.

Now the assembly 45 is mounted on the end 39 abutting the resilient washer 41. This washer 41 not only serves as a resilient mounting for the assembly but also serves as a universal mounting due to its arcuate shape. This arrangement secures a smooth movement on the part of the contact arm throughout its range of movement. Also, it should be observed that with the exception of the contact portion 50 the entire contact arm assembly 45 is disposed in the depressed portion 22 within the dimensions of the body 20, thus resulting in a very compact piece of electrical apparatus.

The resistance windings 60 previously referred to are wound upon an insulator or core 62 in accordance with the winding process disclosed in the co-pending patent application of Charles Havlish, Serial No. 729,479, filed August 1, 1924. The primary difference between the strip 62 that I employ and that disclosed in the co-pending patent application lies in the fact that I provide one end of the strip with a notch such as that designated by the reference character 63 in Fig. 7. The strip is wound from one end to the other, and thereafter I preferably sever the last few turns on the end of the strip after the notch 63. That is to say I remove the turns on this end of the strip 62 up to the notch. By winding over the notch initially I find that the windings in the notch are much more tightly wound than they would be otherwise. The unwound portion designated by the reference character 65 in Figs. 7 and 1 constitutes the off portion of the rheostat.

The strips 62 are wound by the same being revolved through a threaded nut as disclosed in the co-pending patent application. The threaded nut cuts into the edges of fibre thereby feeding it forward at a uniform rate and the wire is wound in the grooves made by the nut. This method of winding is an unusually cheap and efficient way of placing wire on the strip. The notch 63 is employed for burying the first few windings 60 so that they will be flush with the edge of the strip or core 62. This enables the end of the contact arm to be moved from the off position onto the windings without having to strike an objectionable hump as is the case with practically all other rheostats now on the market. It will be observed from Fig. 7 that the windings in the notch 63 are buried to such an extent that their top surface is flush with the edge of the strip 62.

After the strip 62 has been wound it is bent into an arcuate shape and disposed about the periphery of the body 20. Positioned intermediate the wound strip 62 and the periphery of the body 20 is an annular insulating strip 70 which may be made of any suitable insulating material. This strip 70 has an annular flange 71 adapted to fit over the flange 21 of the body 20. The flange 71 is preferably castellated as indicated at 72 in Fig. 8. This enables the insulating strip 70 to be snugly positioned intermediate the body and the wound strip 62. By castellating the flange 71 it is not necessary to break or damage this flange 71 adapted to fit over the flange 21 of the body. Also the flange 71 serves to insulate the bottom of the windings on the strip 62 from the metallic flange 21 of the body 20. The two strips 62 and 70 are tightly drawn around the periphery of the body 20 and are secured at opposite ends to the body adjacent the prongs or stops 24 and 25 as will now be described in detail.

Referring to Fig. 5, it will be seen that each end of the winding strip 62 and the associated end of the strip 70 is secured to the wall of the body 20 adjacent one of the two prongs. One end of the winding strip 62 is secured to the frame 20 by means of a bolt 75 having a washer 76 and an insulating washer 77 disposed about its shank. The washer 77 abuts the inner wall of the casing 20 and serves to insulate the bolt 75 from the body. The winding 60 on the strip 62 is connected to this bolt 75 and held in place by means of a washer 78. The washer 78 is maintained in place by a pair of lock nuts 79 and 80.

The other end of the strip 62 is secured to the wall of the frame 20 by means of a bolt 81 and a pair of lock nuts 82 and 83. I preferably dispose a washer 84 intermediate the strip 62 and the lock nut 82 as shown in Fig. 5. It will be obvious from the foregoing description that the frame 20 is connected to the contact bolt or post 81 and one end of the winding is connected to the contact bolt or post 75 which post is insulated from the frame by means of an insulating washer 77 previously described. The circuit is completed through the means of the movable contact arm 46.

The end 50 of this arm 6, as previously described, is resiliently urged into engagement with the exposed edge of the windings 60 on the strip 62. As previously described, the contact arm is adapted to be moved from the off portion 65 of the strip 62 onto the adjacent winding without striking any hump or raised portion. This is possible due to the fact that the first few windings are flush with the top edge of the insulated strip 62.

In Figs. 9 and 10, I have illustrated my invention applied to a potentiometer. The

primary difference between this device and that described in connection with Figs. 1 to 8 inclusive, resides in the provision of three terminals or binding posts instead of two. In this modification of the invention, the posts or bolts 75′ and 81′ are both insulated from the frame 20′ by means of washers such as the insulating washer 76 shown in Fig. 5. The opposite ends of the windings 60′ on the strip 62′ are secured to these two bolts 75′ and 81′ in a manner well known to those familiar with the potentiometer art. Positioned intermediate the two binding posts 75′ and 81′ is an additional terminal 90 which is originally secured to the concave portion 22′ of the metallic frame 20′ by means of a bolt 91 and lock nuts 92 and 93. Thus it will be seen that my invention can be readily applied to both rheostats and potentiometers. Of course, it is to be understood that the present invention is not to be limited in its application to these two forms of electrical apparatus but only insofar as defined by the scope and spirit of the appended claims.

I claim:—

1. A resistance strip for use in current controllers having a sliding contact, said resistance comprising a strip of insulating material having a notch in a portion thereof and wire turns each extending across the front and the rear of said strip, the said notch being adapted to receive a turn to cause the exposed surface of said turn to be flush with an adjacent bare surface of said strip, said bare surface being adapted to serve as the off point for the sliding contact.

2. In an electrical current controlling device, a frame, contact mechanism associated therewith including a contact arm, and a resistance strip associated with said frame and cooperable with said contact arm, said strip including an insulator core having a plurality of wire turns thereon, each extending across the front and the rear of the core, the turn adjacent the off point of said contact arm being buried in the strip with its exposed surface flush with the adjacent exposed edge of the insulator strip.

3. In an electrical current control device, a substantially cylindrical hollow body comprising a circular metallic shell having a concave shaped end, a resistance associated with the periphery of said shell, contact mechanism connected to the concave shaped end including a contact arm cooperable with said resistance, and means for limiting the movement of said arm including a stop consisting of a prong extending laterally from and integral with said concave shaped end.

4. In an electrical current control device, a substantially cylindrical metallic body having a concave shaped portion at one end, the other end having a peripheral flange to permit said body to be held tightly against a mounting panel, a resistance strip disposed about the periphery of said body, an insulator intermediate the said resistance strip and the body and contact mechanism associated with the concave portion and disposed substantially within the length of the body including a contact arm adapted to cooperate with the said resistance strip.

5. In an electrical current control device, a substantially cylindrical hollow body comprising a circular metallic shell having a concave shaped end, the other end of said body having a peripheral flange adapted to fit against a mounting panel, a resistance associated with the periphery of said shell, and contact mechanism connected to the concave end and disposed substantially within the overall length of the said shell including a contact arm cooperable with said resistance.

6. In an electrical current control device, a metallic frame comprising a substantially cylindrical hollow body having a concave shaped end, said body having a lateral flange associated with its periphery, a resistance strip disposed about the periphery of the body with an edge adjacent said flange, an insulator intermediate said body and said resistance strip, said insulator having a lateral extension adapted to lie over said flange to insulate it from said resistance strip, and contact mechanism cooperable with said resistance strip disposed substantially within the length of said cylindrical body, said contact mechanism being connected to the said concave shaped end.

7. In an electrical current control device, a metallic frame comprising a substantially cylindrical hollow body having a concave shaped end, said body having a lateral flange associated with its periphery, a resistance strip disposed about the periphery of the body with an edge adjacent said flange, an insulator intermediate said body and said resistance strip, said insulator having a lateral extension adapted to lie over said flange to insulate it from said resistance strip, a contact arm cooperable with the said resistance strip disposed substantially within the length of said cylindrical body, said arm being connected to said concave shaped end and having a portion adapted to engage an end of the said resistance strip, and means for limiting the movement of the arm comprising a stop consisting of a prong integral with and punched from said concave shaped end.

8. In an electrical current control device, a metallic frame comprising a substantially cylindrical hollow body having a concave shaped end, said body having a lateral flange associated with its periphery, a resistance strip disposed about the periphery of the body with an edge adjacent said flange, an insulator intermediate said body and said resistance strip, said insulator having a lat-

eral extension adapted to lie over said flange to insulate it from said resistance strip, a contact arm cooperable with the said resistance strip disposed substantially within the length of said cylindrical body, said arm being connected to said concave shaped end and having a portion adapted to engage an edge of the said resistance strip, and means for actuating the said arm, said resistance strip comprising a plurality of wire windings on an insulator core, the winding adjacent the off point of said contact arm being buried in the strip with its exposed surface flush with the adjacent exposed edge of the insulator core.

9. A resistance device for current controllers comprising a strip of insulating material, a resistance wire wound upon the strip, said strip being cut away from one edge at an inclination downwardly toward the adjacent end of the strip providing a notch decreasing in depth away from said adjacent end of said strip, the terminal coil of the wire being disposed at the deepest portion of the notch with its upper portion substantially flush with the upper face of the strip.

10. A resistance device comprising, a thin flat strip of insulating material, and a resistance wire wound upon the strip, said strip having a notch in one edge and adjacent one end, said notch receiving the terminal winding of the wire and the contact face of said terminal winding being substantially flush with said edge of the strip.

11. In combination, a contact arm, an insulating strip disposed in edgewise relation to the arm and provided with a notch in its edge over which the arm operates, and a resistance wire wound upon the strip for contact by the arm, the terminal winding of the wire lying in said notch and having its contact face substantially flush with the edge of the strip.

12. In an electric current control device, a metallic body comprising a rim and a concave end, a resistance disposed in insulated relation about said rim, a pair of insulated fastening members serving as terminals for fastening the ends of the resistance to the said rim, contact mechanism associated with the concave end of the body including a contact arm cooperable with the said resistance, and a third terminal riveted to the said concave part of the metallic body.

In witness whereof, I hereunto subscribe my name this 26th day of May, 1926.

NEWTON C. SCHELLENGER.