

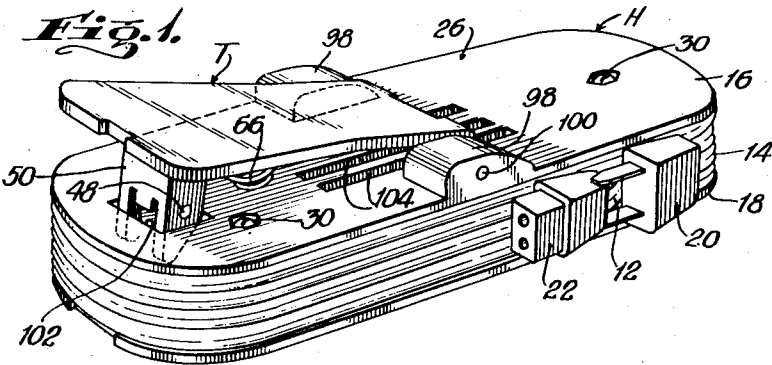
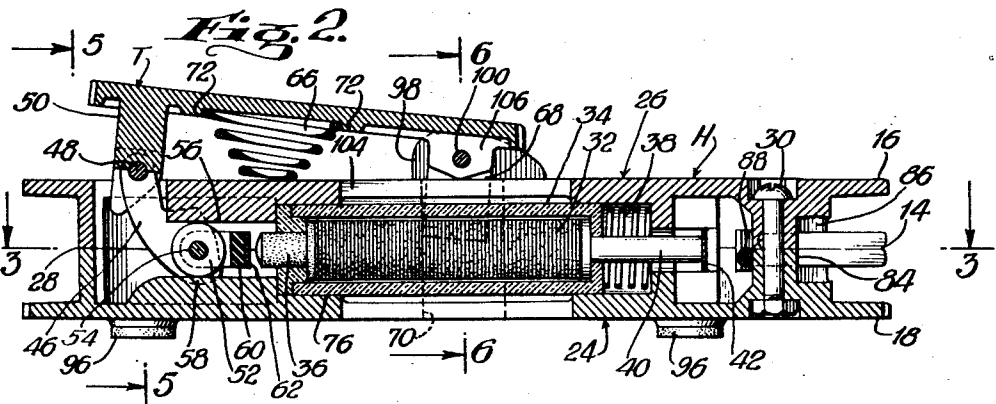
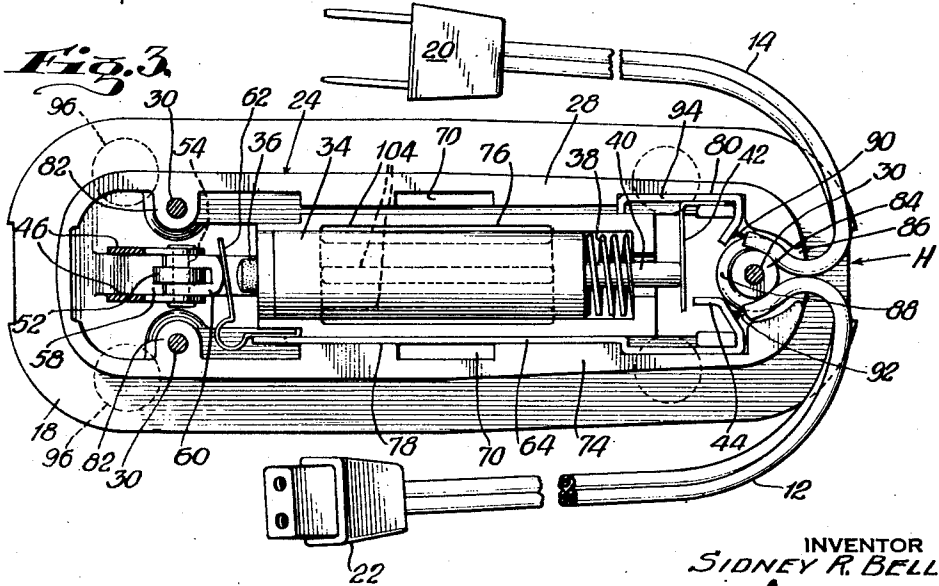
July 24, 1951

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RHEOSTAT

2,561,556

Filed May 8, 1948

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

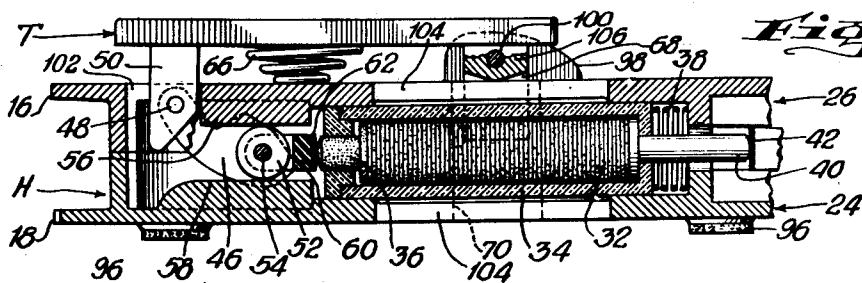


Fig. 4.

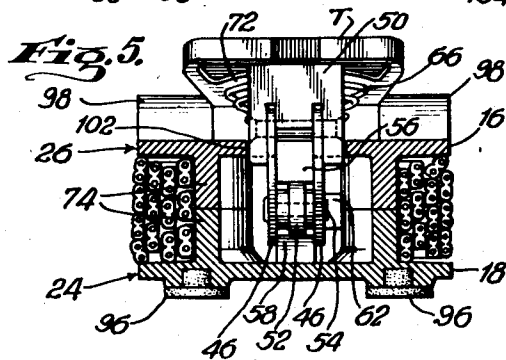


Fig. 5.

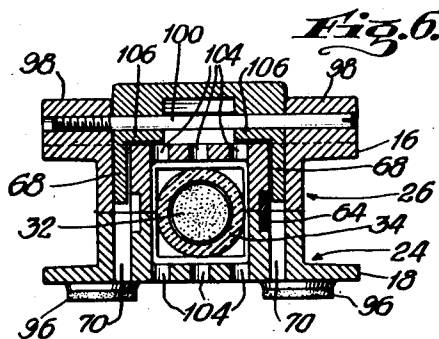


Fig. 6.

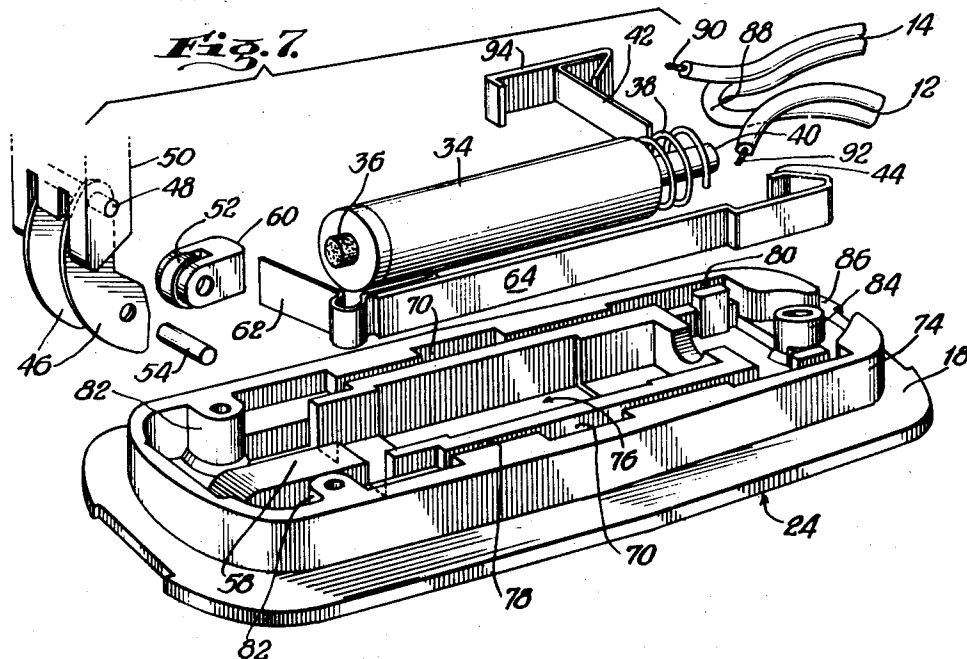


Fig. 7.

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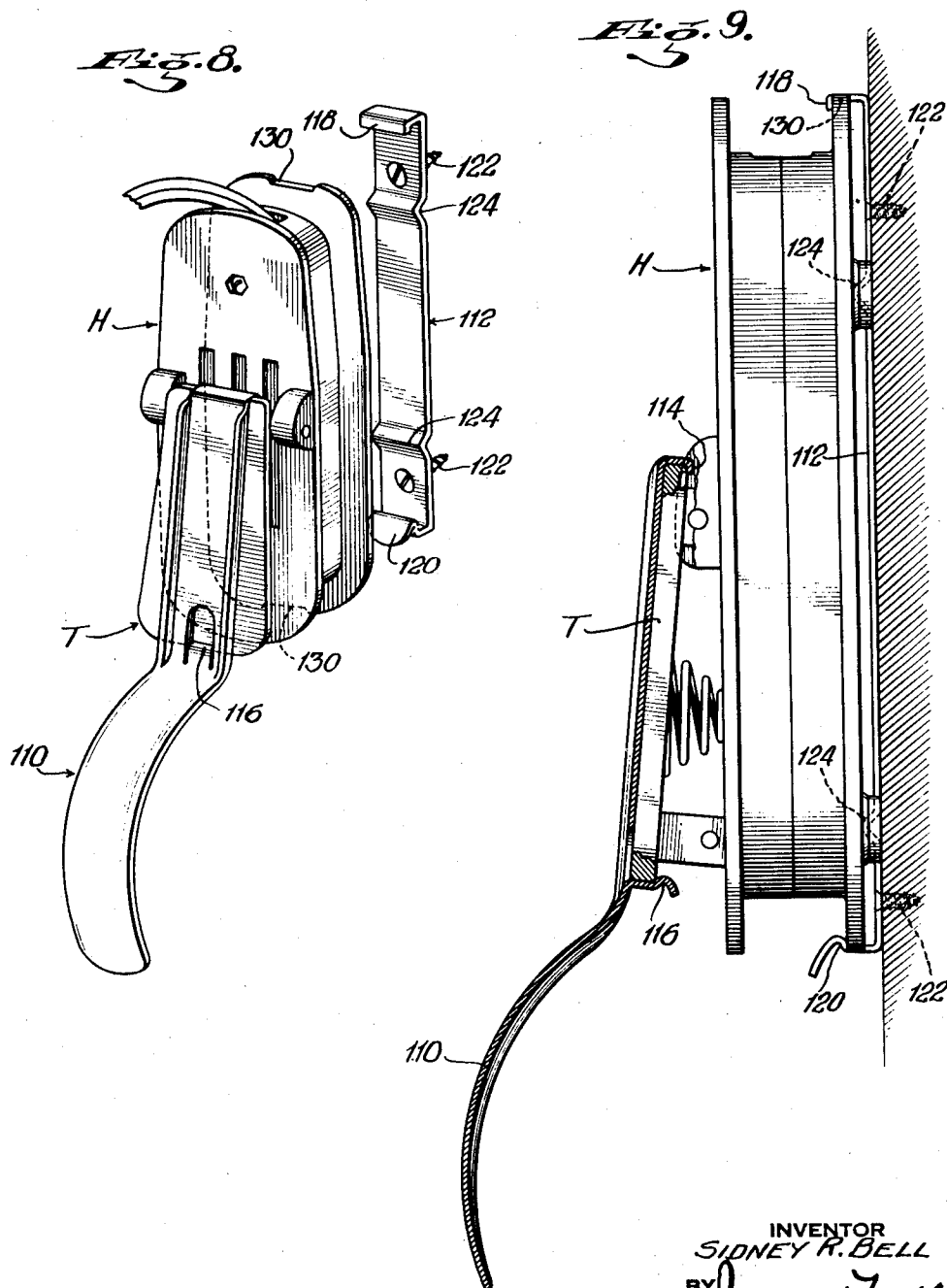
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3 Sheets-Sheet 3



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2,561,556

RHEOSTAT

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Application May 8, 1948, Serial No. 25,879

15 Claims. (Cl. 201—51)

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This invention relates to rheostats, and more particularly to a foot (or knee) operated rheostat.

The primary object of the invention is to generally improve rheostats, especially of the carbon pile or pressure type. Another general object is to provide a treadle operated rheostat suitable for speed control of light machinery such as portable sewing machines.

In accordance with one feature of the present invention, the rheostat is provided with a pair of flexible two-wire cords of substantial length, so that one can extend to a conventional wall outlet, while the other may extend upwardly from the floor to a sewing machine resting on a table, and the housing of the rheostat is arranged to protectively receive the cords when the rheostat is not in use.

In accordance with a further feature and object of the invention, the carbon discs are carried in a container which is itself yieldably movable in the housing of the rheostat, and appropriate contacts are arranged so that pressure applied to the carbon pile first compresses the pile, and thereafter shunts or bypasses the pile, thus bringing the resistance down to zero.

Further objects center about the molded housing. The housing is provided with chambers and passages for various contact strips and other parts of the rheostat, all so arranged that a few screws may be used to hold the halves of the housing together, the aforesaid parts being suitably located and supported by the configuration of the housing itself. This provides a simplified assembly, with greatly reduced manufacturing cost.

Another object is to improve the linkage between the treadle and the carbon pile.

Still another object of the invention is to provide inexpensive accessory parts which adapt the rheostat for knee operation as well as for foot operation. This part of the invention is not claimed herein, it being claimed in a copending divisional application, Serial No. 225,337, filed May 9, 1951.

To accomplish the foregoing objects, and other more specific objects which will hereinafter appear, my invention resides in the rheostat elements and their relation one to another as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

Fig. 1 is a perspective view showing a rheostat embodying features of my invention, with the cords wound up for storage;

Fig. 2 is a longitudinal section through the rheostat, with the cords unwound;

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Fig. 3 is a horizontal section taken in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a longitudinal section generally similar to Fig. 2, but showing the treadle in depressed position;

Fig. 5 is a transverse section taken approximately in the plane of the line 5—5 of Fig. 2, but with the cords wound on the housing;

Fig. 6 is a transverse section taken approximately in the plane of the line 6—6 of Fig. 2;

Fig. 7 is an exploded view showing the internal parts of the rheostat, and the lower half of the housing, all in perspective;

Fig. 8 is a perspective view explanatory of how the rheostat is adapted for knee operation; and Fig. 9 is a partially sectioned side elevation showing the same mounted for knee operation.

Referring to the drawing, and more particularly to Fig. 1, the rheostat comprises a housing H, with a treadle T pivoted thereon, and a pair of flexible two-wire cords 12 and 14 of substantial length. The housing H is provided at the top and bottom with flanges 16 and 18 of substantial width, providing a large channel therebetween in which the cords 12 and 14 may be wound to dispose of the same when the rheostat is not in use. The longitudinal section of Fig. 2 clearly shows how the flanges 16 and 18 provide a large channel therebetween in which the cords may be wound. In Fig. 3 the cords 12 and 14 are shown separated, the cord 14 terminating in a standard male plug 20 for use with a conventional wall outlet, and the cord 12 terminating in a suitable female plug 22 adapted for connection to a sewing machine motor or other light-duty motor or apparatus intended to be controlled by the rheostat. The cords 12 and 14 have been broken and shortened in Fig. 3, but it will be understood that in practice these cords are preferably long, the cord 14 being adequate to extend from the apparatus to a wall outlet, and the cord 12 being adequate to extend upwardly from the floor to a sewing machine resting on a table.

From examination of Figs. 2 and 3 it will also be seen that the housing H is preferably made up of a lower half 24 and an upper half 26, these being secured together in face to face relation, as by means of suitable screws 30 (in this case three) which pass through both halves of the housing, and the heads and nuts of which are suitably recessed into the housing. The upper flange 16 is formed as an integral part of the upper half of the housing, and the lower flange 18 is formed as an integral part of the lower half of the housing.

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Considering the resistor portion of the unit, and referring more particularly to Figs. 2 and 3, the rheostat comprises a pile of carbon discs 32, an insulation container 34 receiving said discs, a conductive plunger 36 passing into one end of the container 34 and bearing against the discs 32, and the housing H in which the container 34 is mounted for bodily axial movement. Resilient means, in this case a compression spring 38, urges the container in one direction, and suitable mechanism including the treadle T, is arranged to bear against the plunger 36 in order to first compress the discs and thereby progressively reduce the series resistance thereof, and also to thereafter bodily move the container 34 against the action of the spring 38. This latter movement causes a plunger 40 to bend a contact strip 42 into engagement with another contact strip 44, thereby shunting or bypassing the carbon pile 32 by a direct connection. When the contacts 42 and 44 are closed the effective resistance of the unit is zero, and there is a direct supply of full voltage power to the sewing machine motor or other accessory being controlled by the rheostat.

The action of the linkage for applying the movement of the treadle to the carbon pile will be clear from a comparison of Figs. 2 and 4, aided, if desired, by examination of Figs. 1, 5 and 7. The linkage comprises spaced metal arms 46 pivotally connected to the treadle by means of a pin 48 and a bearing 50. A guide wheel 52 is rotatably mounted between said arms 46 on a suitable pin 54. The guide wheel 52 runs between a rail 56 in the housing 26, and a rail 58 in the lower housing 24. The spaced arms 46 are disposed alongside the rails 56 and 58, and are preferably made wide enough, above and below the wheel 52, to be guided by the rails 56 and 58. Finally, there is a means to transfer the movement of the guide wheel and arms to the plunger 36. In the present case this consists of a U-shaped piece of insulation 60 which straddles the wheel 52 and is disposed between the arms 46, it being carried by the pin 54. The said piece of insulation bears against the movable end 62 of a relatively long contact strip 64 which extends collaterally of the container 34. It will be evident from inspection of Fig. 3, or from a comparison of Figs. 2 and 4, that downward movement of the treadle T causes the linkage to push the movable contact 62 against the conductive plunger 36.

The top and bottom rails 56 and 58 serve still another function in acting as motion limiting stops for the container 34. The compression spring 38 tends to move the container toward the rails, and this movement is arrested by the inner ends of the rails, as is clearly shown in Fig. 2. In Fig. 4 the container has been moved toward the right, and is thus spaced from the ends of the rails 56 and 58, whereas in Figs. 2 and 3 the container abuts the rails.

It is desirable to have a truly open circuit when the treadle is raised. For this purpose the treadle T is preferably provided with an independent restoring spring, shown at 66 in Figs. 1, 2 and 4. This restoring spring raises the treadle to the limit of its upward movement, and that is made such that the movable contact strip 64 moves away from the plunger 36, as is clearly shown in Figs. 2 and 3. This breaks the circuit completely. The upward movement of the treadle is limited by means of a pair of stop arms 68 which are formed fixedly with the

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treadle, and which extend downwardly into mating slots or passages in the housing, shown at 70. These passages are wider than the stop arms 68, and the additional width is such as to accommodate the desired range of motion of the treadle.

In Fig. 2 the stop arm 68 is moved counter-clockwise until it bears against the forward edge of the slot, thus arresting the treadle against further upward movement. This in turn is adequate to keep the compression spring 66 in position, for the spring, if it were fully expanded, would be greater in axial length than shown. It is preferably a frustro-conical spring, as shown, and is preferably inverted, as shown. The upper end of the spring is received within an annular bead 72 at the bottom of the treadle, thus preventing sideward movement of the spring. Consequently the pressure of the spring itself serves to insure its remaining in position.

Another feature of the present invention is the ease of assembly of the rheostat, which in turn helps reduce its cost. Referring to the drawing, and more particularly to Figs. 3 and 7, the lower half of the housing is molded in final form out of a suitable moldable insulation material. As molded it comprises not only the peripheral wall 74 and the flange 18 previously referred to, but also a central chamber 76 for the carbon pile container 34, and a side passage 78 for the metal contact strip 64 which extends from one end of the container to the other, and also a side passage 80 for the metal contact strip 42. The piece as molded also includes the bottom rail 58 previously referred to, passages 70 for the stop arms of the treadle, and bosses 82 and 84 for assembly screws. The latter boss is associated with a passage 86 for the cords 12 and 14 previously referred to. In practice the cords 12 and 14 are preferably made of one long continuous cord, one of the wires being left intact, as shown at 88, in Figs. 3 and 7 and the other wire being severed to provide ends 90 and 92 which are soldered to the contact strips 42 and 64. The boss 84, in relation to the passage 86 and the uncut wire 88, provides a means to withstand any normal pull which may be exerted on the cords.

The bendable contact 62 is preferably made of a highly conductive resilient material, such as beryllium copper, and is preferably brazed to the more rigid contact strip 64, which may be made of thicker brass. Similarly, the bendable contact 42 is preferably made of beryllium copper, and may be brazed to a thicker brass strip 84. The lower half of the housing is preferably provided with suitable non-slip rubber or other friction feet, indicated at 96.

The upper half of the housing has chambers and passages mating with those previously described for the lower half of the housing. In addition it has bearing ears 98, between which the treadle is pivoted by means of a pin 100. This pin is preferably a long slender screw, as is best shown in Fig. 6. The opening 102 in the top of the housing for receiving the bearing 98 is preferably made large enough for removal of the arms 46 and guide roller 52. Both the top and bottom of the housing are preferably provided with ventilating slots 104. These are best located directly above and below the carbon pile resistor.

The treadle T is also preferably molded, thus making it possible to provide the treadle with the depending stop arms 68 and the bearing 98,

as well as the locating ring 72 for the spring, all as a part of the molding operation. Extra bodies of material 106 may be included around the fulcrum pin to absorb any severe pressure on the treadle, thereby relieving the relatively slender pin 100 of bending stress.

The plunger 36 with its enlarged inner end is shown made of molded resistance material. It may instead be made of metal, as is shown for plunger 40. The use of resistance material has the advantage of adding resistance. The plunger is so short that no problem of breakage arises. The plunger 40, however, is long and is better made of metal. The container 34 may be molded ceramic, or other insulation material.

To assemble the parts of the rheostat it is merely necessary to press the container 34 and compression spring 38 into the center chamber of the lower housing, and to then drop the contact strips 64 and 94 together with the cords (which are most conveniently soldered to the contact strips prior to the final assembly) into the lower housing, the cord being passed around the boss 84. The upper housing is then placed over the lower housing and is secured by three screws. The roller and linkage are preliminarily assembled to the foot treadle and the latter is then added to the housing with the compression spring 66 therebetween. The linkage and roller move into proper position as the treadle is added and it is merely necessary to insert the fulcrum pin 100 to complete the assembly of the rheostat. The cords are then wound around the housing for storage or shipment.

The rheostat is readily adapted for knee operation instead of foot operation by detachable accessory means clearly shown in Figs. 8 and 9. Referring to those figures of the drawing it will be seen that two sheet metal parts 110 and 112 are provided. The part 110 is an extension of the treadle. It includes a hook 114 received over the fulcrum end of the treadle, and a spring detent 116 which is struck out of the body of the sheet metal strip and which snaps over the lower end of the treadle.

The other part 112 acts as a base, and includes a hook 118 at one end, and a spring tongue or detent 120 at the other end, so that the base of the rheostat may be snapped into position on the accessory 112. The latter is provided with screw holes receiving screws 122 for securing the same to a table leg or the like. The base 112 is preferably bent outwardly to form raised parts 124, these parts preferably having the same height as the rubber feet 96 of the housing previously referred to. This permits the rubber feet to come on either side of the base 112, and to bear against the surface or wall on which the base is screwed.

In this way the rheostat may be used for either foot operation or knee operation, and in fact, by supplying the two accessory pieces 110 and 112, the rheostat may be used in either way, according to the needs of any particular installation. Since the accessories are simple metal stampings they do not add appreciably to the cost of the complete rheostat. The flange 18 is preferably notched at the ends of the housing, as shown at 130 in Fig. 8 (and without a numeral in the other figures). Similarly the treadle is preferably notched at its ends, also to receive and hold the accessory piece against sideward movement. This is best shown in Fig. 1.

It is believed that the construction, assembly

and use of my improved rheostat, as well as the advantages thereof, will be apparent from the foregoing detailed description. The rheostat is comparatively small, yet is stable on the floor because of the extensive area provided by the addition of the large flange at the bottom. A similar flange at the top provides a large channel adequate to receive both cords, thus protecting the same against kinking or knotting, and affording a neat and compact assembly for storage or shipment. When used with a portable sewing machine which is boxed and put away when not in use, the present rheostat may be stored with the sewing machine and occupies a minimum of space. Two long cords are provided, thus facilitating connection from the rheostat to the machine, as well as from the rheostat to a wall outlet.

The rheostat is comparatively simple in construction. There is only a single carbon pile, thereby eliminating the need for complex equalizing bars or leverage systems such as have been employed in the past when two carbon piles were used. The parts of the rheostat are readily assembled, thus minimizing the labor cost in manufacturing the rheostat. The molded housing, although complex in providing chambers and passages for directly receiving and supporting the various parts of the mechanism, and for guiding the movable parts of the mechanism, is nevertheless inexpensive to manufacture because it may be produced in final form by known plastic molding processes in a simple two part mold. The circuit is fully opened when the treadle is raised, and is directly closed or short-circuited when the treadle is depressed. Between these extremes the carbon pile is progressively compressed, thereby gradually reducing the resistance, until finally bodily movement of the entire container of carbon discs brings about a direct connection, bypassing the carbon pile, and relieving it of current. The rheostat is adapted to either foot operation or knee operation, and in fact some features of the rheostat are of value even when using wholly different operating mechanism.

The brass strips 64 and 94 are intentionally stepped or bent, and the passages which directly receive the same are appropriately shaped to accommodate the steps or bends, with the net result that these strips are held against longitudinal movement as well as being held against lateral movement. This feature is perhaps best shown in Fig. 3 of the drawing.

If the rheostat is to be used with a sewing machine, and if the sewing machine is to be provided with a lamp, the two-wire conductor leading from the rheostat to the plug 22 may be replaced by a three-wire conductor, and plug 22 correspondingly replaced by a three socket female plug, thus providing continuous, full voltage current for the lamp independently of the operation of the rheostat. This in itself is a conventional arrangement which has already been used in connection with rheostats for sewing machines.

It will be apparent that while I have shown and described my invention in a preferred form, changes may be made in the structure disclosed without departing from the spirit of the invention, as sought to be defined in the following claims. In the claims the reference to carbon discs is intended to include wafers of graphite or other resistance material adapted for compression control of resistance. Reference to a

treadle is intended to include a lever for knee operation as well as for foot operation.

I claim:

1. A rheostat comprising a housing, an operating means on top of said housing, and a flexible cord of substantial length extending from said housing, the top and bottom of said housing being provided with flanges of substantial width providing a large channel therebetween in which said cord may be wound to dispose of the same when the rheostat is not in use, the bottom flange being flat and horizontal and acting as an enlarged base for the rheostat.

2. A rheostat comprising a housing, an operating treadle on top of said housing, a pair of flexible two-wire cords of substantial length extending from said housing, the top and bottom of said housing being provided with flanges of substantial width providing a large channel therebetween in which said cords may be wound to dispose of the same when the rheostat is not in use, the bottom flange being flat and horizontal and acting as an enlarged base for the rheostat.

3. A rheostat comprising a housing formed of mating bodies of insulation secured together in face to face relation, a flexible cord of substantial length extending from said housing, an operating means mounted on top of said housing, the lower half of said housing being provided with an outwardly projecting horizontal flange which enlarges the area of the base and adds stability to the rheostat, the upper half of said housing being provided at its upper face with an enlarged flange substantially coextensive with the base flange, the body of said housing together with said top and bottom flanges providing a channel of substantial dimension around the rheostat adequate in dimension to receive the aforesaid cord when wound around the rheostat in said channel.

4. A rheostat comprising a housing formed of mating bodies of insulation secured together in face to face relation, a pair of flexible two-wire cords of substantial length extending from said housing, a treadle pivotally mounted on top of said housing, the lower half of said housing being provided with an outwardly projecting horizontal flange which enlarges the area of the base and adds stability to the rheostat, the upper half of said housing being provided at its upper face with an enlarged flange substantially coextensive with the base flange, the body of said housing together with said top and bottom flanges providing a channel of substantial dimension around the rheostat adequate in dimension to receive the aforesaid two cords when wound around the rheostat in said channel.

5. A carbon pile rheostat comprising a pile of carbon discs, a container receiving said discs, a conductive plunger passing into one end of said container and bearing against said discs, a housing in which said container is mounted for bodily axial movement, a spring disposed at one end of said container for urging the same in one direction, mechanism for bearing against the plunger at the other end of the container in order to compress the discs and thereby progressively reduce the series resistance thereof, and to bodily move the container against the spring, and contacts for shunting or bypassing said carbon pile by a direct connection, said contacts being closed in response to bodily movement of the aforesaid container.

6. A carbon pile rheostat comprising a pile of

circular carbon discs, a cylindrical container receiving said discs, a conductive plunger passing into each end of said container and bearing against said discs, a housing in which said container is mounted for limited bodily axial movement, a compression spring disposed at one end of said container for urging the same in one direction, a control mechanism for bearing against the plunger at the other end of the container in order to compress the discs and thereby progressively reduce the series resistance thereof, and to bodily move the container against the spring, and contacts for shunting or bypassing said carbon pile by a direct connection, said contacts being closed in response to bodily movement of the aforesaid container.

7. A rheostat of the carbon pile type, said rheostat comprising a container of carbon wafers, a housing in which said container is axially movable, resilient means urging said container towards one end of the housing, a treadle on said housing, resilient means normally urging said treadle upwardly, and linkage whereby downward movement of the treadle compresses the carbon pile, said linkage comprising a sloping arm pivotally connected to the movable end of the treadle, a guide wheel on said arm, rails in the housing to guide said wheel toward or away from the pile, and means connected to said arm for exerting pressure on said carbon pile when the treadle is depressed.

8. A rheostat of the carbon pile type, said rheostat comprising a cylindrical container of carbon discs, a treadle pivotally mounted on top of said housing, resilient means normally urging said treadle upwardly, and linkage whereby downward movement of the treadle compresses the carbon pile, said linkage comprising sloping spaced sheet metal arms pivotally connected to the movable end of the treadle, a guide wheel between said arms, a rail at the top of the housing and a rail at the bottom of the housing between which said wheel rolls toward or away from the pile, said spaced arms being made wide enough to ride on the side edges of said rails and to be guided thereby, and means connected to said roller for exerting pressure on said carbon pile when the treadle is depressed.

9. A rheostat of the carbon pile type, said rheostat comprising a container of carbon wafers, a housing in which said container is axially movable, resilient means urging said container towards one end of the housing, a treadle on said housing, and linkage whereby downward movement of the treadle compresses the carbon pile within the container and moves the container against the aforesaid resilient means toward the other end of the housing, said linkage comprising a sloping arm pivotally connected to the movable end of the treadle, a guide wheel on said arm, rails in the housing to guide said wheel toward or away from the pile, and means connected to said arm for exerting pressure on said carbon pile when the treadle is depressed.

10. A rheostat of the carbon pile type, said rheostat comprising a container of carbon wafers, a housing in which said container is axially movable, a compression spring urging said container towards one end of the housing, a treadle pivotally mounted on top of said housing, and linkage whereby downward movement of the treadle compresses the carbon pile within the container and moves the container against the aforesaid compression spring toward the other end of the housing, said linkage comprising spaced arms

pivotaly connected to the movable end of the treadle, a guide wheel between said arms, a rail at the top of the housing and a rail at the bottom of the housing between which said wheel rolls, said spaced arms being made wide enough to ride on the side edges of said rails and to be guided thereby, and means connected to said roller for exerting pressure on said carbon pile, the ends of the aforesaid rails acting as motion limiting stops to arrest movement of the container under influence of the compression spring when the treadle is released.

11. A rheostat of the carbon pile type, said rheostat comprising a pile of carbon wafers carried in a container, an outside housing comprising top and bottom halves molded out of a moldable insulation, said halves being secured together in face to face relation and being molded with a central chamber for receiving the aforesaid container, with a side passage for a metal contact strip extending from one end of the container to the other, and with another side passage for a movable contact strip for shunting the resistor by a direct connection with the first contact strip, and a control device for first compressing the carbon pile and then shunting the pile.

12. A rheostat of the carbon pile type, said rheostat comprising a pile of carbon wafers carried in a container, a housing comprising top and bottom halves molded out of a moldable material, said halves being secured together in face to face relation and being molded with a central chamber for receiving the aforesaid container, and with a post about which one wire of a long pair of wires is bent at an intermediate point, the other wire being severed at an intermediate point and the severed ends being separately connected to parts of the rheostat.

13. A rheostat of the carbon pile type, said rheostat comprising a pile of carbon wafers carried in a container, a housing comprising top and bottom halves molded out of a moldable insulation, said halves being secured together in face to face relation and being molded with a central chamber for the aforesaid container, with a side passage for a metal contact strip extending from one end of the container to the other, with another side passage for a movable contact strip for shunting the resistor by a direct connection with the first contact strip, and with an insulation post about which one wire of a long pair of wires is bent at an intermediate point, the other wire being severed at an intermediate point and the severed ends being separately connected to the aforesaid two contact strips.

14. A rheostat of the carbon pile type, said rheostat comprising a pile of carbon wafers carried in a container, a housing comprising top and bottom halves molded out of a moldable insula-

tion, said halves being secured together in face to face relation and being molded with a central chamber for the aforesaid container, with top and bottom guide rails for linkage extending between the treadle and said container, with a side passage for a metal contact strip extending from one end of the container to the other, with another side passage for a movable contact strip for shunting the resistor by a direct connection with the first contact strip and with an insulation post about which one wire of a long pair of wires is bent at an intermediate point, the other wire being severed at said post and the severed ends separately connected to the aforesaid two contact strips.

15. A rheostat of the carbon pile type, said rheostat comprising a pile of carbon wafers carried in a container, conductive plungers passing into the ends of said container, a housing comprising top and bottom halves molded out of a moldable insulation, said halves being secured together in face to face relation and being molded with a central chamber for receiving the aforesaid container, with a side passage for a metal contact strip extending from and spaced from the plunger at one end of the container to the plunger at the other, with another side passage for a movable contact strip bearing against the plunger at one end for shunting the resistor by a direct connection with the first contact strip, and operating means for bearing against the first contact strip at the other end and thereby pressing it against the plunger at that end.

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