Feb. 23, 1960 W. A. BARDEN ET AL 2,926,324

ADJUSTABLE RESISTOR

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Fig. 1.

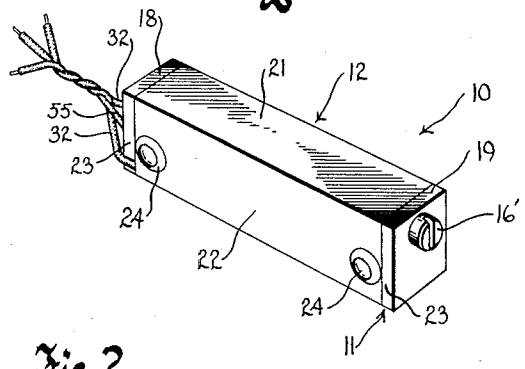


Fig. 2.

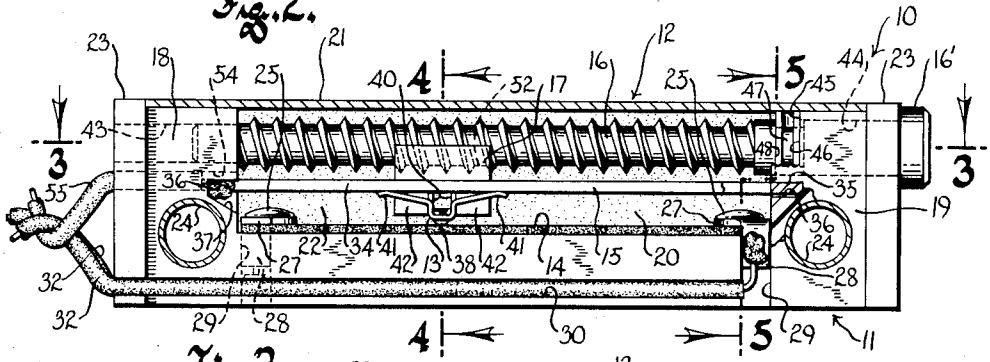


Fig. 3.

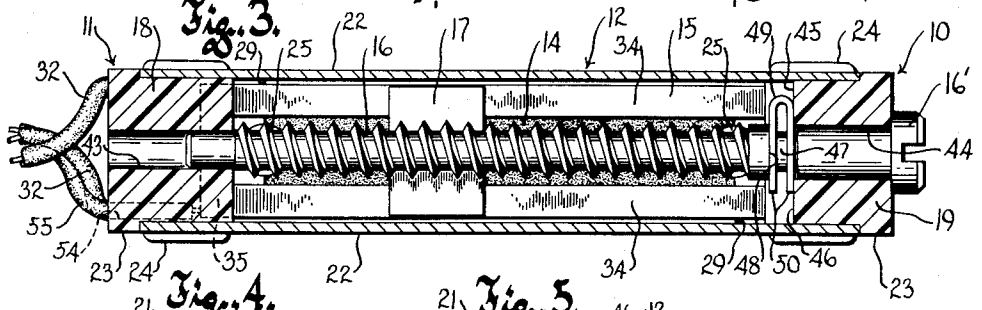


Fig. 4.

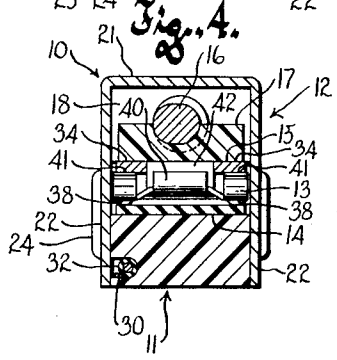
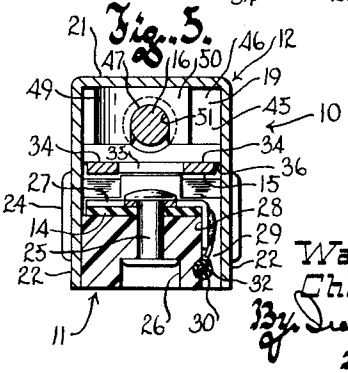


Fig. 5.



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ADJUSTABLE RESISTOR

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Fig. 8.

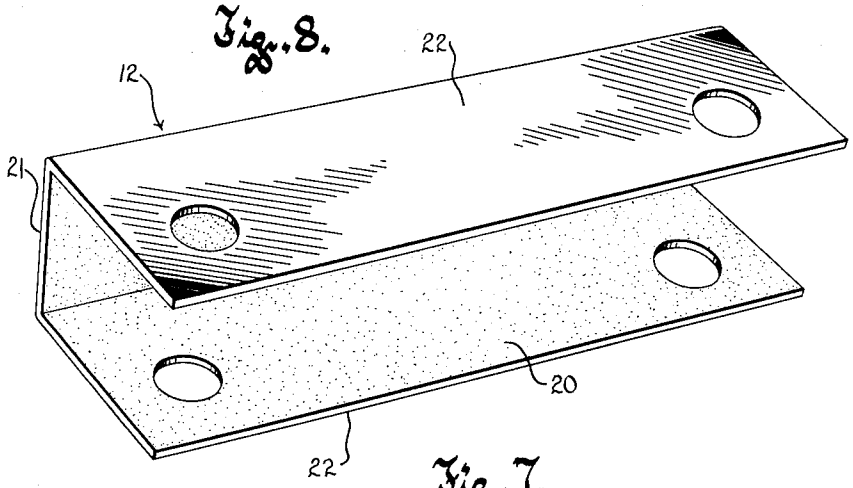


Fig. 7.

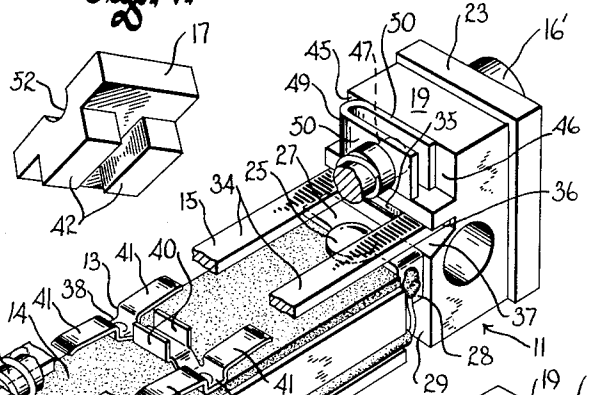


Fig. 6.

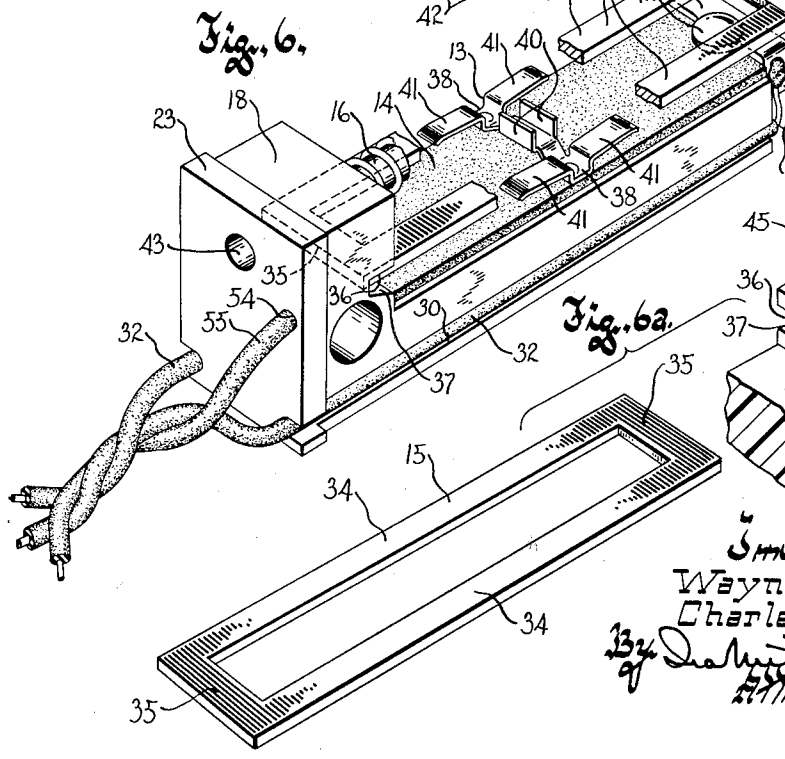
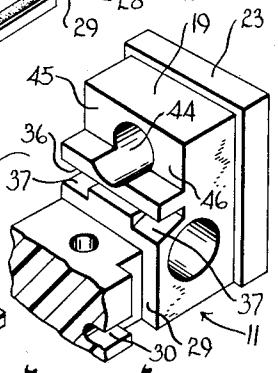


Fig. 6a.



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ADJUSTABLE RESISTOR

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Fig. 9.

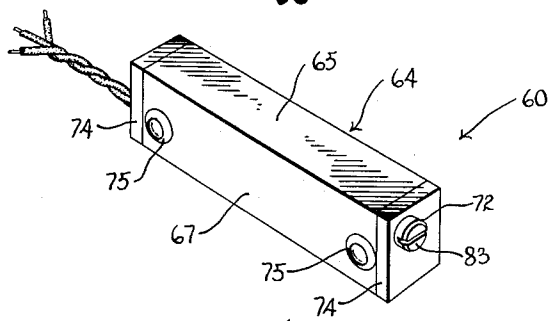


Fig. 10.

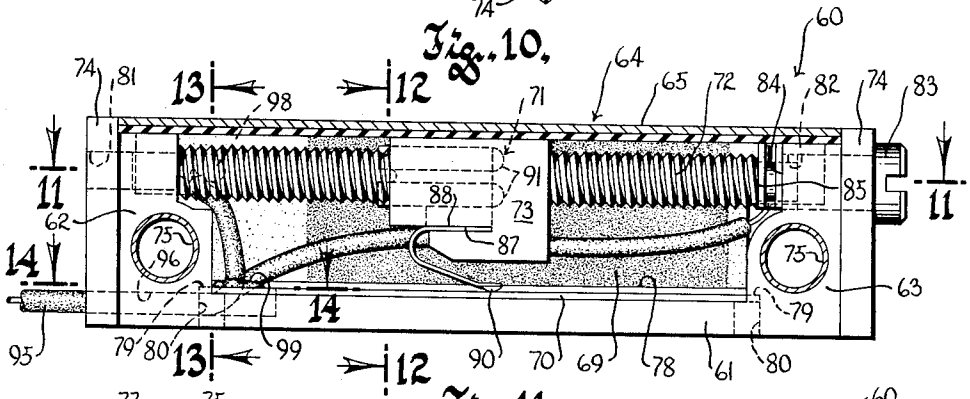


Fig. 11.

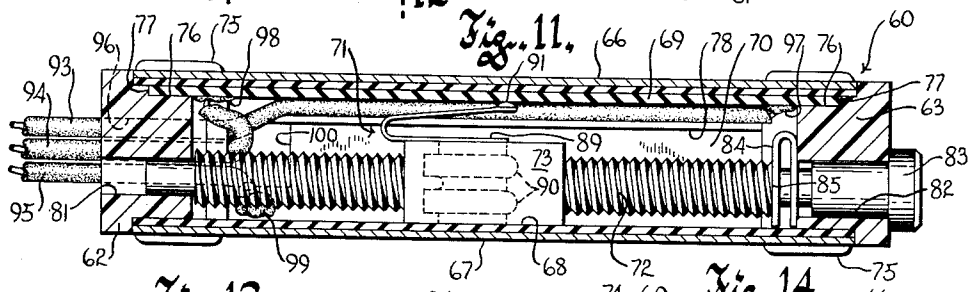


Fig. 12.

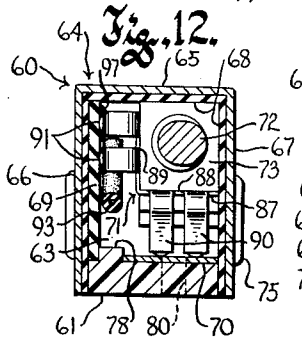


Fig. 13.

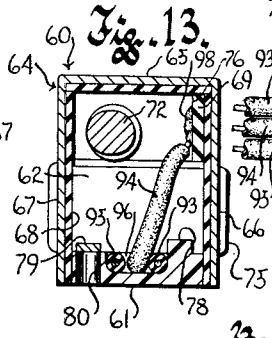
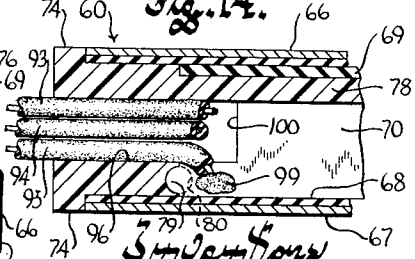


Fig. 14.



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ADJUSTABLE RESISTOR

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Fig. 17.

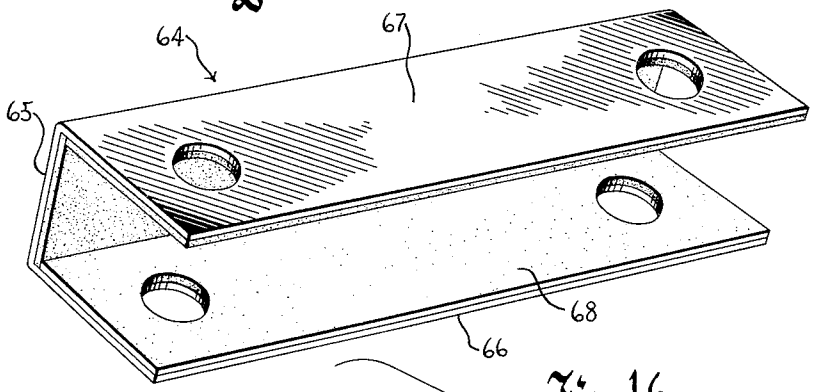


Fig. 16.

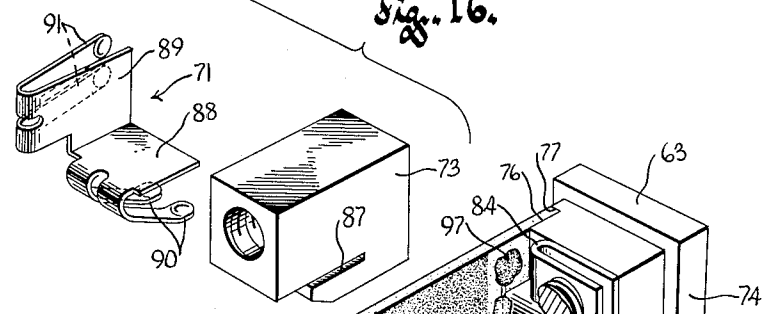


Fig. 15.

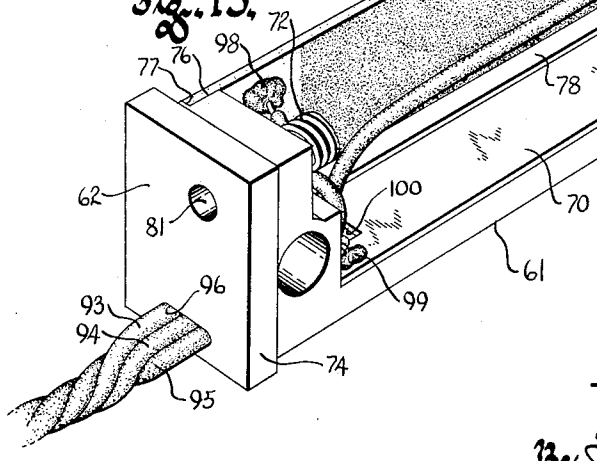
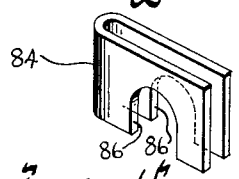


Fig. 15a.



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United States Patent Office 2,926,324
Patented Feb. 23, 1960

2,926,324

ADJUSTABLE RESISTOR

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Application September 22, 1958, Serial No. 762,451

11 Claims. (Cl. 338—180)

This invention relates to adjustable resistors and has more particular reference to improvements in adjustable resistors of the type known as trimmer potentiometers. Such control instruments are not intended for frequent adjustment, but must be capable of very fine and accurate adjustment.

One example of an adjustable resistor or trimmer type potentiometer of this nature is that shown and described in the copending application of Joseph Di Girolamo and Mervin B. Arisman, Serial No. 751,498, filed July 28, 1958, and the more general objectives of this invention are the same as those of said copending application. Hence, the adjustable resistor of this invention is characterized by a screw actuated bridging contactor constrained to move linearly back and forth in an elongated housing containing resistance and collector elements bridgingly engaged by the contactor; stability of resistance value under highly adverse temperature and humidity conditions; and ruggedness, and ease of manufacture despite exceptional compactness and small overall size.

In addition to the foregoing, it is also the purpose of this invention to provide an adjustable resistor of the character described which features such positional relationship and cooperation between the resistance and collector elements, the movable contactor bridging them, and a screw actuated driver for propelling the contactor linearly back and forth, that the forces incidental to the maintenance of good contact pressure are in nowise carried by the screw.

In this respect, it is a more specific object of this invention to provide a linear potentiometer of the character described having its resistance element and collector fixed in spaced flatwise opposed parallel relationship, and having a resilient bridging contactor confined under tension between the resistance element and collector so as to enable it to be propelled back and forth by a screw actuated driver without danger of reaction forces incidental to the tensioning of the contactor being transmitted to the screw through the driver thereon.

Another object of this invention resides in the provision of an adjustable resistor of the character described wherein the collector is employed to hold the contactor driver in operative relation to the actuator screw and against rotation with the screw, and to guide the motion of the driver upon rotation of the screw.

A further specific object of this invention resides in the provision of a linear potentiometer which is so constructed as to achieve a longer total length of resistive path and greater load capacities and resolution than was heretofore possible in controls of this type.

A related object is to provide a potentiometer of the character described having its parts so constructed as to accommodate a resistance element wider than usual and located in good heat transfer relationship with a metallic cover on the potentiometer, thereby significantly increasing the load capacity and wattage rating of the instrumentality.

Still another purpose of this invention resides in the

provision of an adjustable resistor or potentiometer featuring an elongated rotatable actuator screw which is held against axial motion and is mounted in lengthwise superimposed parallel relation to the resistance element of the unit, a collector comprising a flat elongated conductive member mounted intermediate the screw and resistance element, a bridging contactor located entirely beneath the collector, and a driver for the contactor having a lower portion drivingly connected with the contactor through an elongated guide slot in the collector and an upper portion operatively confined between the lower half of the screw and the collector to be held against rotation by the collector.

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

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of the adjustable resistor of this invention;

Figure 2 is an enlarged side elevational view of the resistor with portions thereof broken away and shown in section;

Figure 3 is a horizontal sectional view of the resistor taken through Figure 2 along the plane of the line **3—3**;

Figure 4 is a cross sectional view taken through Figure 2 along the plane of the line **4—4**;

Figure 5 is a cross sectional view taken through Figure 2 along the line **5—5**;

Figure 6 is an enlarged perspective view of the resistor with its cover and certain other parts thereof removed, and with parts thereof broken away and shown in section;

Figure 6A is a perspective view of the collector element per se and one end portion of the base;

Figure 7 is an enlarged perspective view of the contactor driver per se;

Figure 8 is an enlarged perspective view of the cover, per se, of the resistor;

Figure 9 is a perspective view showing another form of the adjustable resistor of this invention;

Figure 10 is an enlarged side elevational view of the resistor shown in Figure 9, with portions thereof broken away and shown in section;

Figure 11 is a horizontal sectional view through Figure 10 taken along the plane of the line **11—11**;

Figure 12 is a cross sectional view through Figure 10, taken along the plane of the line **12—12**;

Figure 13 is a cross sectional view taken along the plane of the line **13—13** in Figure 10;

Figure 14 is a fragmentary horizontal sectional view taken along the plane of the line **14—14** in Figure 10;

Figure 15 is an enlarged perspective view of the resistor shown in Figure 9, with its cover and certain other parts thereof removed;

Figure 15A is a perspective view of the screw retaining spring employed in this modification of the invention;

Figure 16 is an enlarged group perspective view of the contactor and its driver, showing said parts removed from the resistor illustrated in Figure 15; and

Figure 17 is an enlarged perspective view of the cover per se for the resistor shown in Figure 15.

Referring now to the accompanying drawings, wherein like reference characters have been applied to like parts throughout the several views, the adjustable resistor or

potentiometer shown in Figures 1 through 8 comprises an elongated narrow housing **10** formed of two cooperating parts, namely a base **11** and a cover **12**. Enclosed within the housing are the operating elements of the resistor, which include a contactor **13** bridgingly engaged between an elongated resistance element **14** and a collector **15**, an elongated actuator screw **16**, and a screw actuated driver **17** connected with the contactor for translating rotation of the screw into lineal motion of the contactor in one direction or the other lengthwise of the housing.

The base **11**, which has horizontal inner and outer faces, is formed of insulating material and provides an elongated bottom wall for the housing. Upright standards **18** and **19** are formed on and project up from the opposite ends of the base **11**, and these standards not only provide the end walls of the housing, but as will be described later, also serve to support the collector **15** and the actuator screw **16** in spaced superimposed relation to one another and to the resistance element **14**. The standards have coplanar horizontal top surfaces and parallel side surfaces which are coplanar with the opposite side edges of the base.

The cover **12** is of inverted channel shape, and may be formed of sheet metal having a coating **20** of insulating varnish or the like applied to its inner surfaces, as shown in Figure 8. Its web **21** seats flatwise upon the tops of the standards **18—19** and provides the top wall of the housing. The flanges **22** of the cover extend downwardly from the web to the plane of the lower face of the base, and provide flat opposite side walls for the housing that closely embrace the sides of the standards and the base. The ends of the cover, however, terminate a short distance from the ends of the housing and abut flat ribs or beads **23** formed on and projecting from the sides and tops of the standards a distance such that the flat exteriors of the beads are flush with the exterior surfaces of the cover. Hollow rivets **24** passing through the flanges and those portions of the standards embraced thereby secure the cover in place on the housing.

The resistance element **14** is in the form of a flat elongated strip having a length substantially equal to the distance between the standards **18—19**, and flatwise secured to the base, at its upper face, as by rivets **25** passing through the end portions of the resistance element and the base with the heads on their lower ends received in recesses **26** in the underside of the base. The rivets also serve to secure L-shaped terminal clips to the ends of the resistance element, with one leg **27** of each clip extending transversely across and bearing flatwise upon the element and its other leg **28** projecting downwardly into vertically aligning notches **29** in one edge of the element and the base. The notches **29** at one end of the unit are in one side edge of the base **11** and the resistance element directly adjacent to the standard **18** while those at the other end of the unit are in the other side edge of the base and the resistance element and directly adjacent to the standard **19**. The lower end portion of each notch communicates with a narrow longitudinally extending groove **30** in the adjacent side edge of the base. These grooves extend through the standard **18** to one end of the housing, and they are normally closed by the cover flanges except at the beaded cutter end portions of the standard **18**. Insulated terminal conductors **32** are received in each of the grooves **30**, one of them extending substantially the full length of the base and having its bared end soldered to the depending leg **28** of the terminal clip adjacent to the standard **19**. The other terminal conductor merely extends inwardly past the standard **18** and has its bared end soldered to the adjacent leg **28** of the other terminal clip for the resistance element.

The collector **15** is supported by the standards **18—19** in spaced flatwise superimposed relation to the resistance element **14**. It is formed from a flat rectangular strip of metal having good electrical conducting characteristics, and has an elongated rectangular hole in its center so that the collector may be said to comprise elongated, transversely spaced collector bars **34** overlying the opposite marginal portions of the resistance element and occupying a common plane parallel thereto, and cross pieces **35** connecting the adjacent ends of the bars.

The collector is accurately and firmly held in position in the housing by the engagement of the crosspieces **35** on its opposite ends in transversely extending notches **36** formed in the opposing inner faces of the standards **18—19**. At localized areas under the opposite ends of the collector bars, the lower faces of the notches **36** are tapered downwardly and inwardly, providing wider mouths **37** for the notches, for a purpose to be described shortly.

The contactor **13** is not only bridgingly engaged with the resistance element and the collector, but it is also bodily confined between said parts. It is formed of resilient sheet metal and has a transversely extending body of substantially channel shape, with opposite contact end portions **38** of its web bearing flatwise upon areas of the resistance element directly below each collector bar **34**. The intermediate portion of the web is offset upwardly and spaced from the resistance element a distance such as to clear the heads of the rivets **25** at each end of the resistance element in the opposite extremes of motion of the contactor.

The flanges **40** of the channel shaped contactor project upwardly from the web, in spaced parallel relation, but they are interrupted at areas between the end portions of the channel and its offset intermediate portion. The flanges at each end of the channel extend upwardly only a short distance, and are then widely divergingly extended to provide resilient contact fingers **41** projecting in opposite longitudinal directions and having their outer end portions engaged under tension with the underside of the collector bar thereabove at spaced areas along its length. The flanges **40** on the offset medial portion of the contactor body extend vertically upwardly and terminate at a level substantially corresponding to the plane of the underside of the collector. If desired, the end portions **38** of the web of the channel shaped contactor may have protuberances formed therein, to project from their undersides into good electrical engagement with the resistance element.

The driver **17** by which the contactor is propelled linearly back and forth along the length of the housing comprises a block of insulating material which bridges and seats flatwise upon the collector bars **34**. Longitudinally spaced lugs **42** formed on the underside of the driver project downwardly through the space between the collector bars and embrace the flanges **40** on the offset medial portion of the contactor to drivingly connect the contactor therewith. The lugs **42** also slidingly engage the opposing inner edges of the collector bars so that the latter serve to guide the driver for lineal motion lengthwise of the collector.

The driver is moved back and forth along the top of the collector by the actuator screw **16**. The screw has its opposite end portions freely rotatably journalled in coaxial bearing holes **43** and **44** in the standards **18** and **19**, respectively, so located as to dispose the screw in the upper central portion of the housing, in spaced, lengthwise superimposed relation to the collector. One end of the screw terminates in the bearing hole of the standard **18** at the terminal end of the housing, while the other end of the screw projects through the standard **19** and has an enlarged head **16'** thereon with a slot therein to facilitate turning the screw manually as by a screw driver.

Attention is directed to the fact that the standard **19** has a notch **45** in its inner top portion to provide an upright transversely extending abutment **46** facing the

other standard 18, and that the screw has a reduced portion 47 adjacent to said notch providing an abutment 48 spaced from and opposing the abutment 46. A hairpin type spring 49 having legs 50 confined between the abutments exerts an axial force on the actuator screw in the direction to maintain the head 16' on the outer end of the screw firmly engaged with the standard 19, thus accurately defining the axial position of the screw relative to the housing. The legs 50 of the spring extend transversely of the housing, and they have notches 51 in their lower edges to receive the reduced portion 47 of the screw.

It is also important to observe that the driver 17 is not only confined between the screw and the collector, but that it is also formed to embrace the lower half of the screw. For this purpose, the upper face of the driver is provided with a longitudinally extending semicircular groove 52 therein to accept the screw, the groove being threaded to match the threads on the screw. Consequently when the screw is turned in one direction or the other, the driver is moved lengthwise of the housing, being constrained against rotation with the screw by its flatwise engagement with the tops of the collector bars and by the engagement of the transverse ends of its drive lugs 42 with the opposing inner edges of the collector bars.

The bridging contactor 13, of course, is driven lengthwise of the housing by the driver 17, whenever the screw is rotated. The limits of such linear motion of the contractor are defined by the engagement of the driver with the two standards 18—19. It should be noted, however, that the spring contact fingers 41 on the contactor project beyond the longitudinal ends of the driver and would ordinarily preclude travel of the driver the entire distance between the standards. Similarly, the contact fingers would also ordinarily preclude engagement of the downwardly facing contact portions 38 of the contactor with the resistance element 14 along the entire length thereof between its terminal legs 27. In the present case, however, full travel of the driver and the contactor is assured by reason of the fact that the widened mouths 37 of the notches 36 in the standards, beneath the ends of the collector bars, accommodate the end portions of the spring fingers 41 as the driver approaches either of the standards, while the upwardly offset medial portion of the contactor passes over the heads of the rivets 25 to permit the contact ends 38 of the contactor to straddle the rivet heads. The construction described therefore, provides a resistive path of maximum length to thus assure greater load capacities and resolution than was possible with past controls of this type.

As shown best in Figures 2 and 3, the standard 18 has a hole 54 therethrough extending lengthwise of and aligning with one of the collector bars 34, through which the insulated terminal conductor 55 for the collector extends. The bared inner end of this conductor, of course, is soldered to the adjacent end portion of the collector, and all three terminal conductors may be conveniently twisted together externally of the standard 18 if desired.

From the description thus far, it will be apparent that the collector 15 of the adjustable resistor of this invention performs several important duties besides its main function of affording a stationary contact engaged by the bridging contactor in all positions thereof relative to the resistance element. Its confinement between the bottoms and side surfaces of the notches 36 in the standards precisely locates the collector lengthwise of the housing, while the close proximity of its longitudinal edges to the opposite side walls of the housing precludes lateral shifting of the collector in the housing. As a result, the collector bars 34 not only serve to accurately guide the movement of contactor driver lengthwise of the housing, but also serve to hold the driver properly engaged with the actuator screw and against rotation with the screw, as well as to hold the contactor itself engaged with the resistance element with the proper contact pressure.

The adjustable resistor illustrated in Figures 9 through 17 has many of the features of the resistor described above. Its parts are also enclosed within a housing 60 comprising an elongated substantially flat bottom wall or base 61 with upright standards 62 and 63 on its opposite end portions providing the end walls of the housing, and an inverted channel shaped cover 64 having its web 65 spanning and flatwise seated upon the standards to provide the top wall of the housing, and its depending flanges 66 and 67 transversely embracing the standards and the opposite sides of the base to provide the side walls of the housing. A liner 68 of insulating material is applied to all of the internal surfaces of the cover to assure against electrical breakdown between the cover and the current carrying parts of the resistor.

Enclosed within the housing is an elongated strip like resistance element 69, an elongated collector 70, a movable bridging contactor 71, a rotatable actuator screw 72, and a nut or driver 73 threaded on the screw and connected with the contactor to drive the same lengthwise of the housing when the screw is rotated.

The length of the cover of the housing is slightly less than the end to end dimension of the housing, and its ends abut ribs or beads 74 projecting from the tops and sides of the standards to accurately locate the cover on the housing, lengthwise thereof. This assures the alignment of holes in the standards and the cover flanges, and facilitates securement of the cover to the base by hollow rivets 75 passing through said aligning holes. The outer surfaces of the beads 74 are flat and flush with the external surfaces of the cover so that the exterior of the housing is substantially smooth throughout its length.

The resistance element 69 flatwise engages one side wall 66 of the housing, and it is edgewise confined between the base 61 and the top wall of the housing as seen best in Figure 12. It extends lengthwise along the interior of the housing side wall 66, beyond the inner faces of the standards, and its end portions overlap the adjacent sides of the standards and are received in shallow recesses 76 therein with its extremities in abutting engagement with vertical opposing shoulders 77 on the standards defining the longitudinal limits of the recesses 76.

Mounting of the resistance element 69 in the manner described, namely flatwise contiguous to one of the flanges 66 of the electrically insulated metallic cover 64, places the resistance element in good heat transfer relation with the side wall flange 66 to achieve good heat dissipating characteristics and thereby increase the wattage rating of the control instrumentality. It is also important to note that the housing has greater height than width, and that the edgewise disposition of the resistance element along one side of the housing assures that the element will have the greatest possible width and load capacity.

Inasmuch as the recesses 76 have a depth substantially equal to the thickness of the resistance strip, it will be apparent that the ends of the strip are clamped between the standards and the side wall 66 of the housing to be firmly held in place thereby. In fact, the entire lower edge portion of the resistance element is held pressed against the side wall 66 of the housing, due to the presence of a narrow upstanding ridge 78 formed on the top of the base and extending for the entire length thereof from one standard to the other. The outwardly facing edge of this ridge engages the inner face of the resistance element along its lower edge to thus preclude separation thereof from the inner face of the side wall 66. As will be brought out later, contact means on the bridging contactor is spring pressed against upper portions of the exposed face of the resistance element.

The collector 70 is an elongated flat strip of metal flatwise secured to the top of the base 61, with the strip edgewise confined between the ridge 78 and the opposite side 67 of the housing and lengthwise confined between

the standards 62—63. The ridge 78 thus provides an insulating barrier between the adjacent edge portions of the resistance element and the collector. Flatwise displacement of the collector off of the base is prevented partly by reason of the engagement of tongues 79 on the ends of the collector in recesses 80 in the opposing inner portions of the standards, the engagement being effected by slightly bowing the collector during assembly thereof with the base. Spring contact means on the contactor 71 engaging against the collector also serve to hold the collector down on the base.

The actuator screw 72 has smooth opposite end portions journaled in bearing holes 81 and 82 in the upper portions of the standards 62—63, respectively, for free rotation on a fixed axis with the screw disposed in the upper corner portion of the housing defined by the junction of its top and side walls 65 and 67, respectively, but spaced therefrom. Note that the screw is mounted in spaced parallel relation to the collector and the resistance element, directly laterally opposite the upper portion of the resistance element and directly over the collector.

One end of the screw projects entirely through the bearing hole in the standard 63 and has an enlarged head 83 thereon bearing against the outer end surface of the standard to preclude axial motion of the screw toward the opposite end of the housing. The head 83 may have a screw driver slot therein, as shown, to facilitate turning the screw manually. Axial motion of the screw in the direction to disengage its head from the adjacent end of the housing is inhibited by means of a flat hairpin type spring 84 reacting between the adjacent inner face of the standard 63 and an opposing abutment on the screw provided by one end of a circumferential groove 85 in the screw. To enable the spring to be applied, its legs have downwardly opening notches 86 to receive the grooved portion 85 of the screw.

The nut 73, which is threaded onto the screw, is formed of insulating material and has a generally rectangular cross section with one flat side slidingly engaging the inner insulated face of the side wall 67 and its flat top surface slidingly engaging the insulated underside of the web of the cover to hold the nut against rotation with the screw. Hence, whenever the screw is rotated, the nut is constrained to translatory motion lengthwise of the screw. A narrow horizontal slit 87 in the nut, below the screw and opening toward the standard 62 and to both sides of the nut, provides for attachment of the contactor 71 to the nut.

The contactor 71 is blanked and formed from flat spring stock, and is shown best in Figure 16. It comprises a flat body 88 which tightly fits in the slit 87 in the nut, and a flange 89 extending vertically from one side edge of the body and flatwise engaging the exposed side of the nut. The body 88 is parallel to the collector and carries downwardly facing contact means in the form of a pair of spring fingers 90, formed as extensions of the body bent under the same to extend lengthwise of the housing, toward the standard 63, in spaced relation to the underside of the nut 73. The outer ends of these spring fingers bear upon the collector 70 under spring tension and may be rounded, as shown, to facilitate sliding thereof along the upper face of the collector.

The vertical flange 89 is parallel to the inner face of the resistance element 69, and carries laterally facing contact means in the form of a pair of spring fingers 91 integral therewith and bent around to overlie the flange 89 and extend lengthwise of the housing, toward the standard 63. The outer ends of these fingers are spring urged against the upper portion of the resistance element. The engagement of the spring fingers 90 with the collector, of course, helps hold the collector against flatwise displacement relative to the base 61.

One of the features of the arrangement described is that the reaction forces of both the downwardly and the laterally facing spring contact fingers on the contactor are not imposed upon the screw 72 but instead are carried directly into the cover 64 of the housing by the engagement of the nut 73 therewith.

The three terminal conductors 93, 94 and 95 for this embodiment of the invention are insulated wires which enter the housing through a transversely widened hole 96 in the standard 62. The conductors occupy side-by-side positions in the hole 96 with the conductor 93 adjacent to the resistance element, the conductor 95 adjacent to the opposite side of the housing, and the conductor 94 between the conductors 93 and 95, but outside the resistor housing the conductors are twisted together as seen in Figure 15.

The conductor 93, nearest the resistance element 69, extends lengthwise through the housing in close proximity to the resistance element and has its bared end electrically joined to the element near the standard 63 as at 97. The conductor 94 has its inner end portion directed upwardly above the inner face of the standard 62 where it is bared and electrically joined to the end of the resistance element 69 as at 98.

The bared inner end of the conductor 95 is electrically joined to the end of the collector 70 adjacent to the inner face of the standard 62, as at 99, directly alongside a notch 100 in the collector adjacent to the hole 96 in the standard. The notch 100, of course, provides the clearance necessary for the conductors inasmuch as the hole 96 through which they pass is nearly at the same level as the collector.

From the foregoing description, together with the accompanying drawings, it will be apparent to those skilled in the art that this invention provides an exceptionally simple, compact, adjustable resistor or potentiometer capable of extremely fine and accurate adjustment and reliably secure against accidental loss of adjustment despite excessive environmental vibration and adverse conditions of temperature and humidity.

What we claim as our invention is:

1. An adjustable resistor comprising: an elongated housing having top, bottom and pairs of opposite upright side and end walls, all of the interior surfaces of said housing walls being comprised of electrical insulation, and the bottom wall of the housing having a narrow ridge extending lengthwise therealong near one of the side walls; a flat, elongated resistance element flatwise overlying said one side wall and extending lengthwise thereof, the lower marginal portion of the resistance element being closely confined between said ridge and said one side wall; a flat elongated collector flatwise overlying the bottom wall, between said ridge and the other side wall, and extending lengthwise of the bottom wall; an elongated actuator screw having its ends rotatably journaled in the housing end walls, extending parallel to the resistance element and the collector but spaced laterally from the resistance element and vertically from the collector; a carrier having a threaded connection with the screw and having surfaces slidingly engaging said other side wall and the top wall to preclude rotation of the carrier about the screw, whereby the carrier is constrained to travel lengthwise of the screw during rotation thereof; and a bridging contactor carried by the carrier to move therewith, said contactor having lateral contact means thereon slidably engaging the resistance element under pressure and cooperating with said ridge to hold the resistance element flatwise against said one side wall, said contactor also having contact means thereon slidably engaging the collector.

2. The adjustable resistor of claim 1, wherein: the collector is edgewise confined between said ridge and the opposite side wall of the housing, and lengthwise confined between the housing end walls to preclude shifting of the collector either transversely or longitudinally of the housing; and wherein the collector is held against upward displacement off of the bottom wall of the housing by interengaging means on the ends of the collector and the housing end walls.

3. The adjustable resistor of claim 2, wherein said interengaging means comprises recesses in the end walls, opening inwardly of the housing, and tongues on the ends of the collector projecting outwardly therefrom and fitting in said recesses.

4. An adjustable resistor comprising: an elongated base of insulating material; means providing a resistance path on said base extending lengthwise thereof; an actuator screw; means on the base journalling the screw for free rotation on an axis substantially parallel to the resistance path; an elongated substantially flat collector; means on the base mounting the collector by its ends in spaced parallel relation with respect to the resistance path and the actuator screw; longitudinally extending guide surfaces on the collector parallel with the resistance path and the actuator screw; a contactor driver confined between the actuator screw and the collector, the driver having a sliding engagement with the collector and a threaded connection with the actuator screw so that rotation of the screw propels the driver along the collector; guide means on the driver slidingly engaged with said guide surfaces on the collector to constrain the driver to linear motion as it is slid along the collector upon rotation of the screw; a bridging contactor having contact portions biased toward and having sliding engagement with the collector and the resistance path; and means tractively coupling the bridging contactor with the driver so that the contactor moves with the driver upon rotation of the actuator screw, said coupling means leaving the contactor free to move transversely with respect to the driver in response to the biasing reaction of its contact portions against the collector and the resistance path as the contactor traverses the same so that none of said biasing reaction is imposed upon the actuator screw.

5. The adjustable resistor of claim 4, wherein: the base is formed with upright standards at its opposite ends; the resistor is provided with a cover of inverted channel shape having its web spanning the standards and its flanges embracing the sides of the standards and the base to cooperate therewith in providing an enclosure for the resistor; and wherein said standards provide the means for mounting the collector and for journaling the actuator screw in spaced superimposed relation to one another and to the resistance path, whereby the resistor is completely operative independently of the cover.

6. The adjustable resistor of claim 4, wherein the collector comprises a flat elongated strip of metal having its central portion cut away to form parallel elongated edges which provide said longitudinally extending guide surfaces.

7. The adjustable resistor of claim 4, wherein: the base is formed with upright standards at its opposite ends; the actuator screw has its ends journalled in said standards for rotation on an axis parallel to the resistance path with the screw located a distance thereabove; and the standards have opposing transverse notches in those portions thereof which face one another, said notches being located at a common level intermediate the actuator screw and the resistance path and having the ends of the collector received therein to mount the collector in a position extending lengthwise between and spaced from the actuator screw and the resistance path.

8. The adjustable resistor of claim 6, wherein: said guide means on the driver comprises a pair of lugs spaced apart in the direction of the length of the collector and projecting through the space between said edges thereof to guide the carrier for linear motion lengthwise of the collector.

9. The adjustable resistor of claim 7, wherein: the collector comprises laterally spaced parallel bars connected together at their ends; the driver laterally spans and flatwise slidably engages said bars; and said guide means on the driver comprises lug means projecting downwardly between said bars and being slidingly engaged with the opposite side edges thereof.

10. The adjustable resistor of claim 9, wherein the contactor has means thereon interengaged with said lug means on the driver to provide the coupling means by which the contactor is constrained to move with the driver; and the contactor is provided with two laterally spaced spring contact members each confined under tension between one of said collector bars and the resistance path and comprising outwardly and upwardly diverging spring fingers engaging longitudinally spaced areas of the underside of its bar, and a single downwardly projecting contact portion centered with respect to said spring fingers and joining their inner ends, and slidingly engaged with the resistance path.

11. In an adjustable resistor: an elongated substantially flat base of insulating material having upright standards formed on its opposite ends; a cover of inverted channel shape having a web providing a top wall seated on and spanning said standards and opposite depending flanges embracing the sides of the standards and the base, said cover cooperating with the base and its standards to provide a housing; a resistance element on the base comprising an elongated flat strip overlying the top of the base and extending the entire distance between said standards; said standards having opposite transverse notches in their inner faces disposed at a common level above the plane of the resistance element; an elongated substantially flat collector having its end portions received in said notches to be held by the standards in spaced parallel relation to the resistance element; a movable contactor having portions bridgingly engaged between the collector and the resistance element; screw actuated means for propelling the contactor lengthwise of the base, with said portions of the contactor in bridging engagement with the resistance element and the collector; said base having a pair of vertically extending notches in the opposite side edges thereof, one of said notches being located adjacent to one end of the resistance element and the other notch being located adjacent to the opposite end of the resistance element; angle shaped terminal members secured to the ends of the resistance element, one leg of each terminal member overlying the resistance element and its other leg extending downwardly into the adjacent notch in the base, contiguous to the bottom of the notch and in spaced relation to the adjacent flange of the cover; one of said standards having a hole therethrough aligning with the adjacent end of the collector, and the base having longitudinal conductor receiving recesses in its opposite side edges which extend from said vertical notches through said designated standard to one end of the housing; an insulated terminal conductor extending through the hole in said designated standard and having a bared inner end electrically connected to the end of the collector supported by said standard; and a pair of insulated terminal conductors received in said recesses in the opposite side edges of the base and concealed by the cover flanges, said pair of conductors having bared inner ends electrically connected to the downwardly extending legs of the terminal members for the resistance element, and having opposite end portions which project to the exterior of the housing at said end thereof.

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