April 19, 1955 G. J. MUCHER 2,706,760

VARIABLE ELECTRIC CONTROL

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Fig. 1

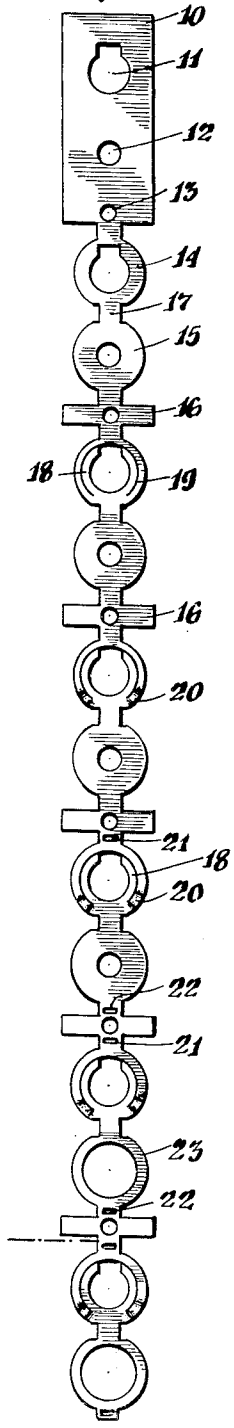



Fig. 2

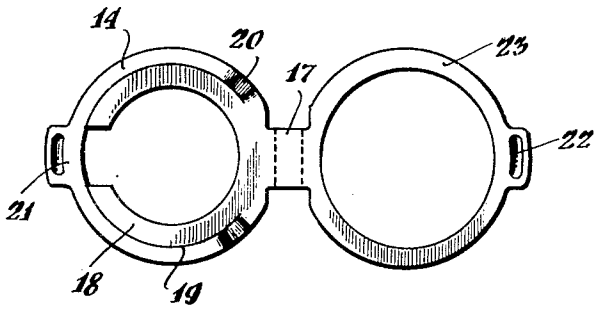



Fig. 3

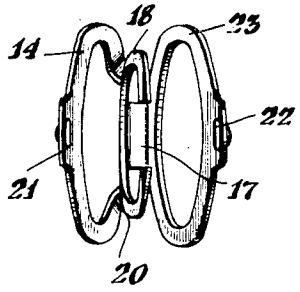
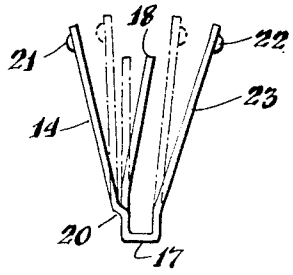



Fig. 4




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Fig. 5

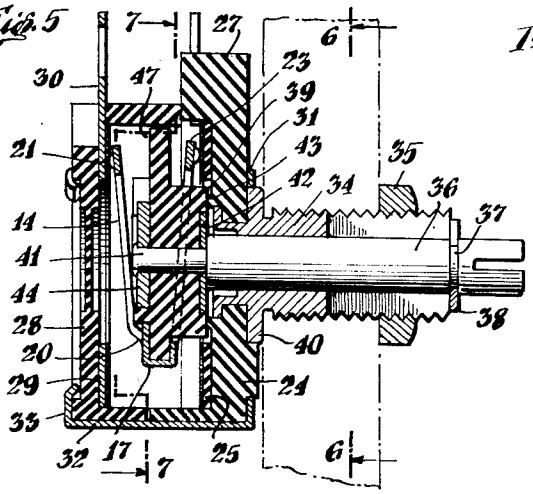



Fig. 6

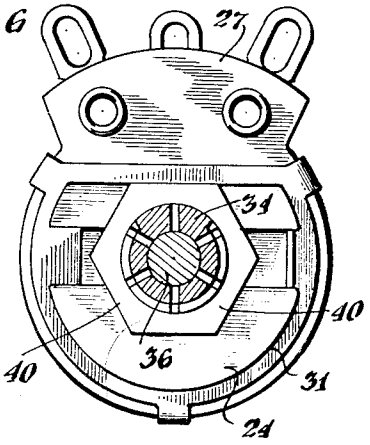



Fig. 7

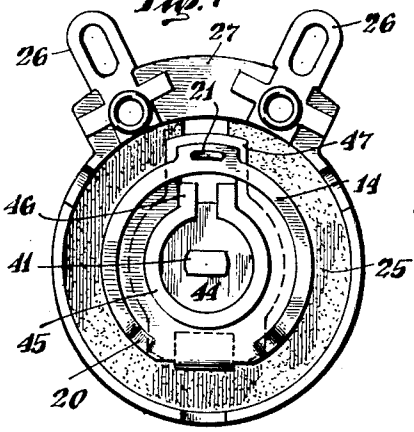



Fig. 8

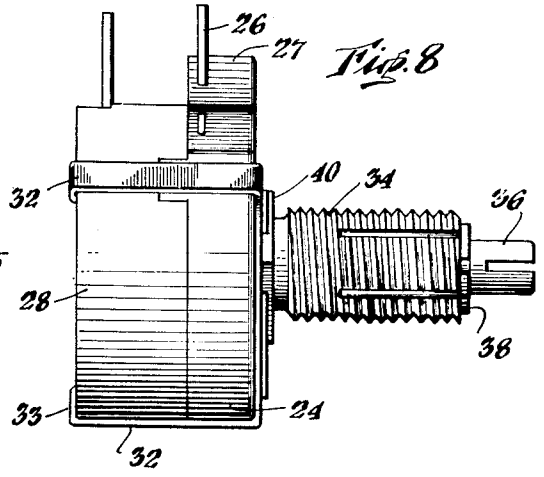



Fig. 9

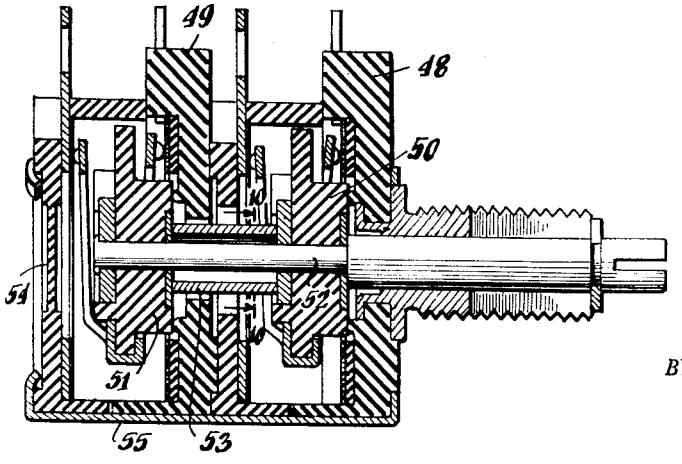
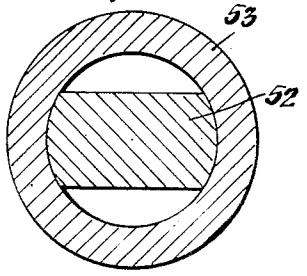



Fig. 10




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2,706,760

# VARIABLE ELECTRIC CONTROL

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Application November 9, 1951, Serial No. 255,708

6 Claims. (Cl. 201—55)

This invention relates to a variable control such as is used in connection with rheostats and potentiometers and aims to provide a structurally and functionally improved unit of this nature as well as a method of making the same.

It is an object of the invention to provide a device of this type which will have a long effective life and be capable of ready assembly by means of relatively unskilled labor so that units embodying the present teachings may be produced at nominal costs.

A further object of this invention is to provide a device of this type which may be of miniature size and yet observe maximum distances between the elements in order to maintain the proper electrical relations.

A further object is that of teaching a method of manufacturing the control which method will include the production of relatively few and rugged parts capable of being readily assembled.

With these and other objects in mind reference is had to the attached sheets of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a face view showing the formation of a strip throughout successive steps to provide one of the essential assemblies of the control;

Fig. 2 shows a unit of this assembly after separation from the strip;

Fig. 3 is an edge view of that assembly after it has been subjected to a further production step;

Fig. 4 is a top plan view of the unit as shown in Fig. 3;

Fig. 5 is a sectional side view of a control constructed in accordance with the present teachings;

Figs. 6 and 7 are transverse sectional views taken along the lines 6—6 and 7—7 respectively and in the direction of the arrows as indicated in Fig. 5;

Fig. 8 is a side elevation of the unit as shown in Fig. 5;

Fig. 9 is a sectional side view of an assembly embodying multiple controls; and

Fig. 10 is a transverse sectional view in enlarged scale taken along the the line 10—10 and in the direction of the arrows as indicated in Fig. 9.

A preferred embodiment of the present control will involve a stator and rotor assembly. The former will include a resistance traversed by a contact forming a part of the rotor. Also a contact ring will form a part of the stationary units of the stator assembly. This ring will likewise be traversed by a contact member. Figs. 1 to 4 inclusive have been primarily dedicated to illustrating the procedure and finished structure of the assembly of which the contact members form a part.

Thus, referring to Fig. 1, the numeral 10 indicates a strip of metal which is formed with what might be termed a keyhole opening 11 and annular openings 12 and 13 of diminishing diameters. Conveniently these openings are produced at one station. At a succeeding station the material is removed from points spaced from openings 11 and 12 to furnish ring-shaped bodies 14 and 15 having their centers defined by the openings 11 and 12. Conveniently in line with opening 13 a bar-shaped portion 16 is provided. Rings 14 and 15 are coupled by a connecting portion 17 and a similar portion may intervene ring 15 and bar 16 as well as the latter and the next adjacent ring.

At the next station ring portion 14 has arms 18 formed to extend substantially parallel to the edges defining its opening. These arms are defined by arcuate slits 19



which, as in Fig. 1, have their lower ends spaced from each other and their upper ends continued through to the offset keyhole portion of opening 11. At the next station those portions of ring 14 which are exteriorly of the arms 18 are formed with displaced or tangential parts 20 adjacent the lower ends of the slits 19. These offset portions 20 will serve to urge and maintain the outer ring body 14 into a plane different from that into which arms 18 extend.

The upper end of ring 14 as viewed in Fig. 1 is now provided with a "bumped out" portion 21. A similar portion 22 is formed adjacent the lower end of ring 15. These portions provide projections which, as will hereinafter be brought out, may function as contact elements. Preferably after the formation of these projections, ring 15 has its opening 12 enlarged so as to decrease the width of the ring as indicated at 23. The inner diameter of this ring 23 may be conveniently equal to the external diameter of arms 18 and the internal diameter of the ring part 14 beyond such arms.

After severance along the line indicated by dot and dash marks in Fig. 1 a unit as shown in Fig. 2 results. That unit may now be folded upon itself so that connecting part 17 forms a hinge portion extending substantially perpendicular to the surfaces of rings 14 and 23 as well as arms 18. As shown in Fig. 3 the parts in their positions after folding are preferably disposed in a manner such that the bodies of rings 14 and 23 extend outwardly at an angle with respect to each other while the bodies of arms 18 may extend substantially parallel to the body of ring 23. Strip 10 comprising a somewhat resilient metal it follows that all of the parts may be flexed for example from the position shown in full lines in Fig. 4 to that indicated in dot and dash lines in that figure.

Now referring to Figs. 5, 6, and 7 it will be seen that a stator of di-electric material has been indicated at 24. This stator carries a resistance strip 25 which is secured in position in any desirable manner. The ends of the strip are connected to terminals 26 conveniently secured to an extension 27 of the stator body. A cover 28 is applied to that body and thus forms a part of the stator assembly. The inner face of the cover supports a contact ring 29 from which a terminal 30 extends beyond the surface of the cover. The stator body 24 is provided with protrusions which coperate with recesses on cover 28 to prevent relative rotation of these parts. To retain the parts of the stator in assembled position, a strip 31 of metal or other material may bear against the outer face of body 24 and cover 28. Legs 32 extend from the body of this strip along the outer side faces of the assembly and terminate in foot portions 33 which may be bent inwardly to extend into the recessed outer face of the cover and thus prevent separation of the parts.

A bushing 34 is secured against movement with respect to body 24 and extends outwardly from the rear face of the same to mount upon its threaded exterior a nut 35 which may retain the assembly in association with a mounting panel indicated in dot and dash lines. An operating shaft 36 extends rotatably within the bore of the bushing and may be formed with a groove 37 in line with the outer end of the latter. A retaining element such as a C washer is conveniently disposed within this groove and thus prevents the shaft being axially displaced in an inward direction with respect to the assembly. It is apparent that when the shaft is turned, any rotor grouping attached to its inner end will be similarly moved with respect to the stator assembly.

Conveniently the bushing may provide adjacent the outer face of stator 24 a non-circular portion 40. Against one of the edges of this portion strip 31 may bear to prevent a relative rotation of that strip with respect to the assembly. The inner end portion of shaft 36 is preferably reduced as at 41 and upon this reduced portion mounts a plate 42 conveniently of metal. The latter may be recessed into the rear face of the rotor body 39 formed of dielectric material. That face of the stator which is adjacent the rotor body 39 may be formed with an outstanding edge portion 43. This will provide a bearing surface and also restrict axial movement of the rotor. The latter being secured in position conveniently

by a washer 44 bearing against its outer face and beyond which the reduced portion 41 of the shaft is headed, it follows that axial movement of the rotor assembly and its shaft in a direction towards the resistance strip 25 is prevented.

The rotor has upon its outer face an annular ridge 45 which is provided with outstanding end portions 46 extending in the direction of an enlarged portion 47 of the rotor. As shown especially in Fig. 5, the outer part of the rotor 39 is spaced from and may extend in overlapping relationship with respect to the contact strip 25. In mounting the contact member upon the rotor it is, of course, apparent that this operation is achieved before the rotor is affixed to the extended shaft portion 41. The connecting portion 17 bridges across the edge of the rotor at a point diametrically opposite the extended part 47. The arms or fingers 18 encircle the ridge or rib 45; the diameter of the opening 11 being such that these arms will grip the side faces of the rib and thus retain the contact member in position. The ends of arms 18 bear against the side edges of the extended portion 47. Due to the offset portions 20 which are preferably employed, the ring 14 extends at an angle to the outer face of the rotor as shown in Fig. 5. Its projection 21 may overlie portion 47. In any event with cover 28 in position this projection will serve as a contact and traverse the surface of ring 29. Ring 23 encircles the inner portion of the rotor 39. Its projecting part 22 serves as a contact in cooperation with the surface of the resistance strip 25.

Thus it is apparent that with the parts assembled in the manner shown the contact portions 21 and 22 of the assembly as shown in Figs. 3 and 4 will serve to provide electrical connection between the terminals 26 and 30. By rotating the shaft 36 the values within the circuits may be varied. Due to the manner in which the shaft and rotor are supported with respect to the parts of the stator assembly no axial shifting of these parts will occur. Also, due to the manner in which the cover 28 is secured to and forms a part of the stator assembly, the several portions of the latter will not shift with respect to each other. The resiliency of the material providing the contact assembly as in Figs. 3 and 4 will assure a proper cooperation of these parts with the adjacent ring and resistance surfaces throughout a long effective life.

It is, of course, obvious that any desired number of controls embodying the foregoing teachings might be combined. This has been shown in Fig. 9 in which a pair of these units have been illustrated. In that view the two stators are indicated at 48 and 49 and with which the rotor assemblies 50 and 51 cooperate. The operating shaft is provided with a relatively lengthy extended end portion 52 of non-circular cross-section. A spacer unit 53 may be interposed between the rotors 50 and 51 and encircle the shaft portion 52. To this end and as shown in connection with the cover 28 of the earlier figures the cover of the right hand assembly as viewed in Fig. 9 may be provided with a reduced portion 54 which is simply "knocked out". In this manner an opening adequate to receive shaft 52 and spacer sleeve 53 is provided. That shaft, as shown in Fig. 10, may conveniently be non-circular similar to the extended shaft portion 41 of the earlier figures. The retainer which maintains the cover and main stator body in assembled relationship will, in the instance of Fig. 9, simply include longer leg portions 55 such that it may engage the outer surfaces of the two outermost units.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. It is obvious that bodies 14 and 15 may embody any desired configurations compatible with the unit being incorporated as part of the rotor assembly. Also, these bodies need not embrace ring-shaped outlines. Additionally, numerous other changes in construction and rearrangement of the parts might be resorted to and the steps of the method might be varied without departing from the spirit of the invention as defined by the claims.

I claim:

1. A variable control assembly including in combination a stator comprising axially spaced resistance and contact elements, a rotor shaft, a contact carrier secured to said rotor shaft and intervening said elements, a pair of connected rotor shaft encircling portions, a projection extending from said rotor, an arm integral with one of said portions to engage said projection, said encircling portions and arm being formed of resilient material, an offset portion adjacent said arm to maintain one portion at an angle with respect to the other and parts forming units of said portions to engage and traverse said stator elements.

2. A contact assembly for a variable control comprising a pair of rotor-encircling portions, a bridging part connecting said portions, contacts associated with each of said portions and an arm extending from one of said portions and to provide a mounting in engagement with faces of a rotor.

3. A contact assembly for a variable control comprising a pair of rotor-encircling portions, a bridging part connecting said portions, contacts associated with each of said portions, an arm extending from one of said portions and to provide a mounting in engagement with faces of a rotor and an offset part disposed adjacent said arm to cause said portions to extend angularly with respect to each other.

4. A variable control including in combination a rotor body, a pair of conducting elements disposed one adjacent each of the opposite faces of said body, a portion connecting said elements and extending across an edge of said body, an abutment forming a part of said body, an arm formed from a part of one of said elements and said arm engaging a surface of said abutment to prevent relative turning of said elements with respect to said body.

5. A variable control including in combination a rotor body, a pair of conducting elements disposed one adjacent each of the opposite faces of said body, a portion connecting said elements and extending across an edge of said body, an abutment forming a part of said body, an arm formed from a part of one of said elements, said arm engaging a surface of said abutment to prevent relative turning of said elements with respect to said body and said arm being sprung beyond the plane of the element from which it extends to yieldingly engage the adjacent surface of said body and urge said element away from the surface of the same.

6. A variable control assembly including in combination a stator comprising axially spaced resistance and contact elements, a rotor shaft, a contact carrier intervening said elements carried by said rotor shaft, a pair of connected rotor shaft encircling portions, an arm integral at one end thereof with one of said portions, said arm being secured against rotations relative to said shaft, and parts forming units of said portions to engage and traverse said stator elements.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,040,277 | Siegel | May 12, 1936 |
| 2,040,278 | Siegel | May 12, 1936 |
| 2,206,662 | Conradi et al. | July 2, 1940 |
| 2,446,417 | Hastings | Aug. 3, 1948 |
| 2,454,816 | Levy | Nov. 30, 1948 |
| 2,458,552 | Blattner | Jan. 11, 1949 |