March 6, 1956 G. J. MUCHER 2,737,560

ELECTRIC RESISTOR

Filed July 18, 1952

Fig. 1

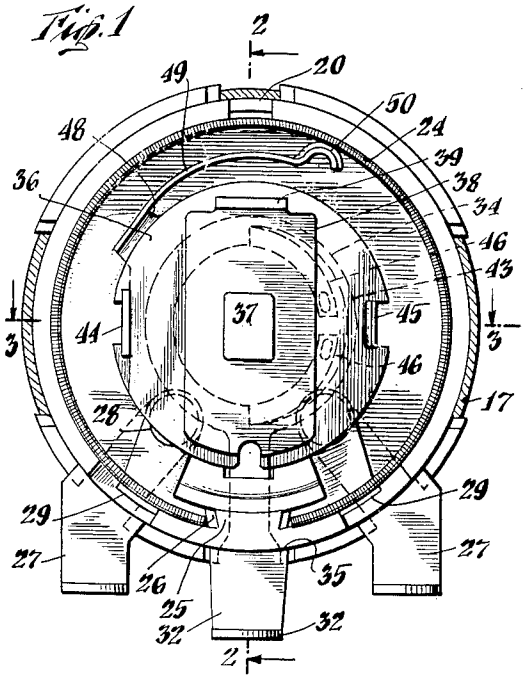


Fig. 2

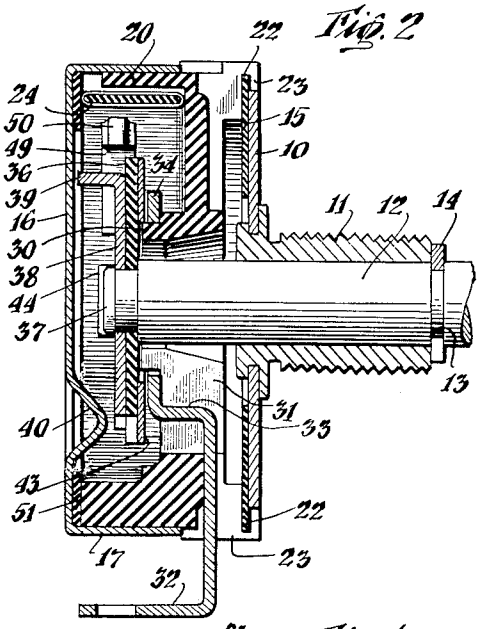


Fig. 3

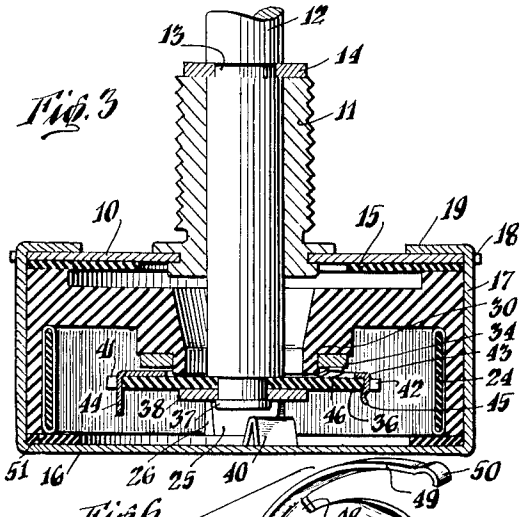


Fig. 4

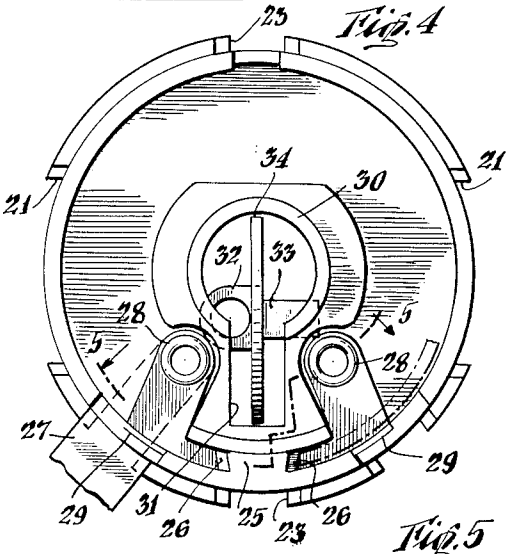


Fig. 5

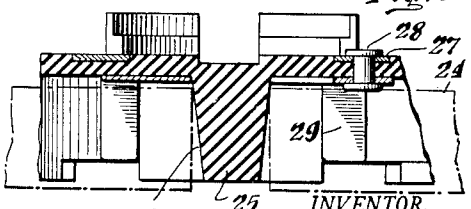
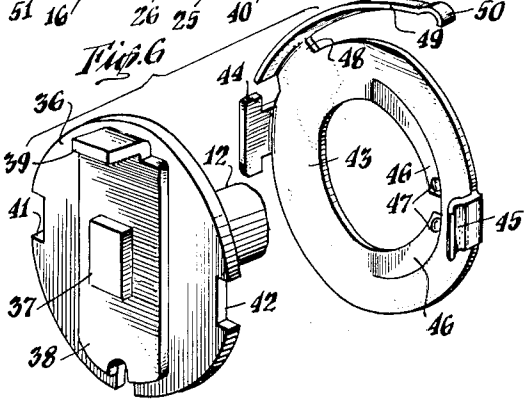


Fig. 6



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ELECTRIC RESISTOR

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9 Claims. (Cl. 201—48)

This invention relates to a functionally and structurally improved electrical control.

It is an object of the invention to furnish a control which will include parts designed in such a manner that it is not necessary to resort to the production and storage of an initial hub assembly, which only at a later time will be included as part of a main assembly or complete apparatus. Consequently, the liability of these parts becoming damaged in handling and storage will be materially reduced.

A further object is that of furnishing an apparatus of the type stated, the elements of which may be assembled largely without the aid of tools or extraneous fixtures; such assembly being capable of achievement by persons having ordinary skills.

Still another object is that of providing a control, the units of which, when assembled, will remain against all reasonable probability of displacement or movement with respect to each other. With the elimination of such undesired and accidental movements, the control will embody a long, effective life.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating a practical embodiment of the invention and in which:

Fig. 1 is a face view of the control with the cover removed;

Fig. 2 is a transverse sectional view taken along the line 2—2 and in the direction of the arrows as indicated in Fig. 1;

Fig. 3 is a similar view taken along the line 3—3 and in the direction of the arrows as also indicated in Fig. 1;

Fig. 4 is a face view of the casing with the rotor parts and the collector ring removed therefrom;

Fig. 5 is a sectional view taken along the line 5—5 and in the direction of the arrows as indicated in Fig. 4; and

Fig. 6 is a perspective view showing certain parts of the rotor assembly in separated condition.

Referring primarily to Figs. 2 and 3, the numeral 10 indicates a plate conveniently formed of metal and mounting a bushing 11 through which a rotatable actuating shaft 12 extends. To prevent inward movement of the shaft, the latter may be formed with a groove 13 within which a split washer 14 is disposed. That washer will bear against the outer edge of bushing 11. In accordance with conventional practice, the outer end of shaft 12 may mount a knob or other suitable actuating device (not shown) by means of which it may be turned. A cover plate 16 also conveniently of metal is provided at diametrically opposite points with a suitable number of extensions 17 having a length greater than the depth of the control base and extending through notches between projection portions 18 of plate 10. The arms or extensions 17 are bent to overlie the outer face of that plate as indicated at 19 thus maintaining the cover and plate against movements with respect to each other.

Likewise these extensions will serve to retain the base 20, which is preferably formed of insulating material, against movement with respect to these parts. This will

be because of notch portions 21 preferably formed in the outer face of the base; the extensions 17 preferably presenting an aggregate width such that they fill out the notches. The insulating ring 15 is interposed between plate 10 and the outer face of base 20. This ring 15 is preferably formed with projecting portions 22 which lie within notches 23 provided in te rear face of base 20. So disposed, it is apparent that ring or disk 15 will be retained against rotation and terminals extending through the notches will be insulated and shielded. In view of the fact that the disk is interposed between the rear base face and plate 10, it will be prevented from moving axially with respect to the remaining parts.

The resistance element is conveniently in the form of a strip 24 disposed around the inner face of the side wall of the cup-shaped base 20. As illustrated, this element embraces a layer preferably of insulating material upon which wire windings are disposed. It is apparent that it might embrace any other desired structure. The base 20 is formed with a wedge-shaped boss portion 25 extending from the inner face of its side wall or flange. The edges 26 of this boss are preferably undercut. In other words, they extend at angles of a few degrees less than 90° to the adjacent side wall face. Therefore, with the strip having a proper length, it may be introduced into the base with its end edges disposed adjacent edge surfaces 26. Thereupon, by exerting pressure upon the resistance strip, the latter is forced inwardly of the base. In such movement, its end edges contacting the edges 26 will be forced apart to in effect expand the diameter of the resistance. With such expansion, it will lie snugly in contact with the inner face of the base. Due to the preferably undercut nature of edges 26, the ends of the resistance strip will be anchored against accidental displacement.

Simultaneously with the positioning of the resistance strip in the base, the latter is connected to the proper terminals. This connection, according to the present teachings, is preferably achieved without the use of any special tools or skill. To this end, one of the terminals 27 extending from the rear face of the base is preferably secured against movement by a rivet 28. A similar structure anchors the second terminal which is disposed to the other side of the center line of the base. An extension 29 which is generally L-shaped is secured to the inner end of rivet 28 and disposed within the base to have its outer leg extend in contact with the inner face of the base flange. With two of these extensions disposed one to each side of boss 25, it follows that as the resistance strip is forced home, those portions of the same which are adjacent its ends will contact the metal elements 29. With radial expansion of the resistance strip as afore outlined, it is apparent that the more nearly the resistance strip is completely seated, the firmer will be the contact between the conducting end portions of the same and the arms of extensions 29. Therefore, the ends of the resistance element will be in proper electrical connection, one with each of terminals 27.

Extending inwardly from the base of the cup-shaped housing 20 is a preferably annular flange 30. It defines the central opening through the base and provides a centering and mounting structure for the collector ring 34. This flange is interrupted so that the opening is extended as at 31 to, in effect, define a "key hole" aperture. The central terminal or lead 32 of the assembly is continued as at 33 and is integral with the ring 34 which has an inner diameter equal to the diameter of the outer face of flange 30. Its external diameter is such that as shown in Fig. 4, it may be introduced through the key hole slot from the rear face of the base. Conversely, terminal portion 32 may, of course, be introduced through this slot from the opposite direction. In any event, collector ring 34 is mounted upon the hub portion of the

base with its terminal extending through to the rear face of this unit and centrally between terminals 27. This mounting is achieved without the use of any tools or securing elements. In this connection, it will be appreciated that the extension 33 being of relatively reduced width engages with the adjacent surfaces of base 20 to prevent any rotation of the ring upon the hub portion of the base. Conveniently, the end portion of terminal 32 is enlarged to furnish shoulders 35. These bear against adjacent base faces when the parts are properly positioned and serve to exert a tension or pull through extension 33 to draw the opposed inner edge of ring 34 against the adjacent surface of flange 30 and prevent axial movements of that ring.

The rotor assembly of the control inludes a plate 36 preferably in the form of a disk. In the embodiment shown it is provided of insulating material. The end of the shaft 12 may, in accordance with conventional construction, be passed through an opening in this disk. Both this opening and shaft end are conveniently non-circular so that relative rotation of the parts will not occur. Beyond disk 36 a stop plate 38 is disposed which is likewise formed with an opening which is non-circular and conforming to the contour of the shaft end. With the shaft passing through that opening, it may be headed as at 37. This will serve to secure stop plate 38 and disk 36 against the adjacent shoulder of the shaft as defined by the circular portion of the latter. The parts will be thus maintained against movement with respect to each other. Plate 38 is conveniently provided with an outstanding portion 39. Likewise, cover plate 16 is provided with an inwardly extending portion 40 which projects to a point such that it intersects the path of movement of the portion 39. Therefore, these parts will cooperate as a stop to limit the rotation of shaft 12.

A resistance-engaging contact and a collector ring wiper arm were, under earlier practice, initially secured as part of the rotor assembly. The present structure does not contemplate such an association until practially the final step in the assembly. Therefore, it will not be necessary to provide the complete rotor with its fragile accessory structures and to handle and store the same with the probability of damage to and the rejection of that assembly. Rather, in accordance with the present teachings the collector ring and the resistance-traversing contact, are designed to be separately produced and stored. Thereafter they may be readily associated with the other parts of the rotor.

Thus, as in Fig. 6, disk 36 is formed with a pair of notches 41 and 42 at preferably diametrically opposite points. A ring 43 conveniently of metal having a certain resiliency is furnished with extensions, also at diametrically opposite points. One of these extensions 44 is conveniently in the form of a T. Its shank has a width such that it may be accommodated within notch 41. Its head portion will not pass therethrough. The second extension is in the form of a latch or detent 45 which will pass through notch 42 and engage, as will be evident, with the adjacent edges and surfaces of disk 36 to maintain ring 43 in face-to-face contact with the rear surface of disk 36. Integral with and extending rearwardly from the plane of ring 43 are wiper arms 46 having contact portions 47. Ring 43 is also conveniently provided with a radial extension 48 which is continued in the form of a spring arm 49 having its width perpendicular to extension 48. This spring arm terminates in an outer contact 50. Thus, with the ring in position upon the disk 36, extension 48 will project slightly beyond the edge of that disk and arm 49 will project tangentially from and overlap the periphery of the disk.

In constructing and assembling this control, the several parts are manufactured in accordance with acceptable techniques and by machines especially suitable for their production. Shaft 12 will be secured to disk 36 and stop plate 38 and these parts may be stored. The ring 43 together with its integral or associated portions will likewise be manufactured and separately stored. Bushing 11 will be affixed to plate 10, the base 20 will be produced, the resistance strip 24 provided and severed into suitable lengths, etc. In the production of the base, the contacts 27 may of course be manufactured and secured in position by rivets 28 to retain the extensions 29 in association with the base. In any event, it will be apparent that with the several assemblies separately stored, danger of injury to the parts will be minimized.

Final assembly may be initiated in a number of manners. For example, strip 24 may be disposed in engagement with the face of the cup flange. To this end its terminal portions are disposed in engagement with the edge surfaces 26 and the strip forced by pressure of the operator's fingers into the base. So positioned, the end portions of the strip will be shorted out by extensions 29 with which they are in firm electrical engagement. Therefore, the resistance will become in effect a fixed part of the base with its ends connected one to each of terminals 27. Collector ring 34 is disposed upon the hub portion of the base and has its terminal 32 extending centrally between terminals 27. As afore brought out, this is again accomplished without the use of any tools. Ring 43 may now be secured to disk 36. Thereupon shaft 12 is passed through the central opening of the base hub and the insulating ring or disk 15 is positioned adjacent the rear face of base 20. Either at this time or previously plate 10 is disposed adjacent the rear face of the base. In any event, shaft 12 is passed through bushing 11 and axial movement of that shaft with respect to the bushing in one direction may then be prevented by lock ring 14 or any other desired expedient.

Movement of shaft 12 in an axial direction opposite to that restrained by ring 14 is limited due to the fact that the contact portions 47 of wiper arms 46 engage the surface of ring 34 which is retained against movement to the right as viewed in Fig. 2. The wiper arms 46 are part of ring 43 which lies in engagement with the rear face of disk 36. That disk is prevented from outward movement with respect to shaft 12 by the headed portion 37 or any other suitable structure. With the ring so mounted and retained, contact 50 will engage the surface of resistance 24. An insulating ring or washer 51 is now disposed beyond the outer edge of the resistance 24. Thereupon, cover plate 16 may be applied to the base as aforedescribed and its extensions 17 are bent over or otherwise locked as indicated at 19. Thus, the complete unit is provided.

From the standpoint of operation, it will, of course, be understood terminals 27 and 32 are connected to leads (not shown) and that for example bushing 11 extends through an aperture in a mounting panel which has likewise not been illustrated. Thereafter nuts or other securing media may be mounted upon the threads of the bushing and a knob or other actuating element may be secured to the outer end of shaft 12. Accordingly, that shaft may be turned. Therefore, contact 50 will traverse resistance 24. Likewise wiper arms 46 will have their terminal portions 47 traverse ring 34. Accordingly, current flow will be varied in accordance with conventional practice. As the parts are shifted it will be apparent that no undesired relative movements will occur. In this connection it is to be noted that extensions 44 and 45 and the notches 41 and 42 are preferably at diametrically opposite points in the ring 43 and disk 36 and to each side of the center of the shaft. Therefore, with the opposite shank edges of the extensions bearing against the adjacent edges of the notches, the parts will be retained and relative rotation will not occur.

When assembled, wiper arms 46 will exert axial pressure. Also, by employing a structure within the scope of the present teachings any relative movements in radial directions are prevented. The arm 49 being located in close proximity to extension 44, one is assured of a posi-

tive drive of this part of the rotor assembly and regardless of whether the control unit involves resistance or other elements of a radial or axial type. As is obvious the arm or arms of the rotor assembly would be modified to extend in proper directions according to the type of control contemplated. As previously brought out collector ring **34** is properly mounted by flange **30**. Whether this flange is continuous throughout the major portion of a circle, as shown, or is interrupted at a number of points, is, of course, immaterial.

Thus among others the several objects of the invention as specifically afore noted are achieved. It is obvious that numerous changes in construction and rearrangement of the parts may be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. In a control in combination a base formed with a keyhole shaped opening, a flange extending outwardly from said base to define the circular part of said opening, a collector ring encircling said flange and having an exterior diameter less than the length of said opening whereby it may be moved in an edgewise direction therethrough, an extension integral with said ring and a part of said extension bearing against a base surface to releasably retain said ring upon said flange.

2. An electrical control including in combination a base formed with an opening, a flange defining at least a part of said opening and extending outwardly from said base, a collector ring encircling said flange, the length of said opening being greater than the external diameter of said ring, whereby the latter may be passed in an edgewise direction therethrough and a lead connected with said ring to support the latter during its passage through the base opening and during subsequent rotation and retraction of such ring with respect to said base such that said ring assumes a position concentrically disposed with reference to said flange.

3. A control as specified in claim 2 and in which said opening is in the form of a keyhole, said flange being disposed around the circular part of said opening and supporting said collector ring and the circular part of such opening having a diameter less than the internal diameter of said ring.

4. A control as specified in claim 2, said lead embodying resiliency and cooperative surfaces forming a part of said lead and base to maintain said lead in a condition of tension such that an inner edge portion of said ring is drawn into yielding engagement with said flange.

5. An electrical control including in combination a cup-shaped base formed of insulating material, a wedge-shaped boss integral with said base and extending from the face thereof, a resilient strip including a body and

an electrically conductive layer extending to the ends of the same and such ends abutting the edges of the fixed boss, said edges diverging towards said base whereby—as said strip is moved towards the latter—it will have its ends separated by said boss to an increasing extent causing said strip to be forced into supporting relationship with the surfaces of said base as the side edge of said strip moves to a position immediately adjacent the latter.

6. An electrical control as specified in claim 5 in which the edges of said boss are under-cut to retain the adjacent end edges of said strip in association therewith during the movement of said strip towards said base and said strip being disposed in intimate engagement with the inner face of the wall defining the side of said base when said strip is immediately adjacent the latter.

7. A control as specified in claim 5 and including terminals carried by said base in fixed relationship adjacent said boss to cause the electrically conductive layers of said resistance strip to operatively engage said terminals as said strip moves to a position immediately adjacent the face of said base.

8. In a control a disc formed with openings adjacent its edges and providing a part of a rotor assembly for said control, a ring, a contact arm extending from said ring, a pair of extensions extending in a perpendicular direction from said ring, said extensions lying one within each of said openings to prevent rotation of said ring with respect to said disc and means forming a part of each of said extensions to provide a detachable coupling between said disc and ring operative upon said ring being moved in a direction away from said disc.

9. A control as specified in claim 8, one of said extensions comprising a T-shaped body the shank of which extends through one disc opening and a head of which is of greater length than such opening, the second of said extensions yieldingly resisting deflection and being spaced from the first extension a distance substantially equal to the spacing of the inner edges of said disc openings and a detent portion forming a part of said latter extension to yieldingly override the edge of the opening through which it extends and thereby provide a releasable latch portion.

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