June 10, 1941. N. C. SCHELLENGER 2,245,367

ELECTRICAL CONTROL UNIT

Filed April 6, 1939

Fig. 1

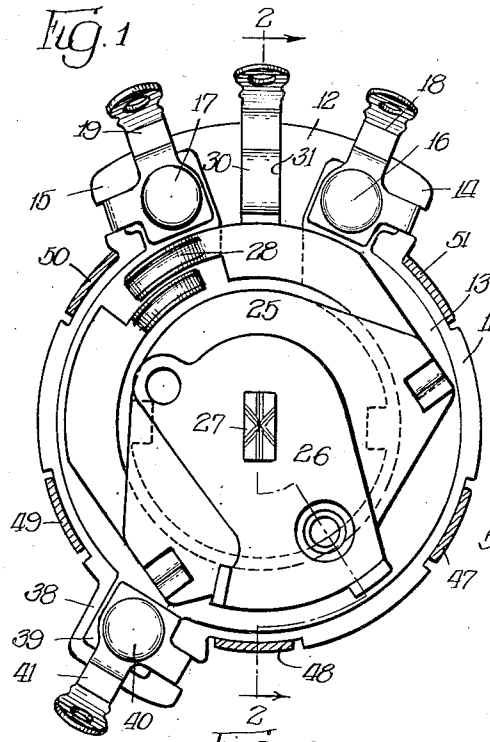


Fig. 2

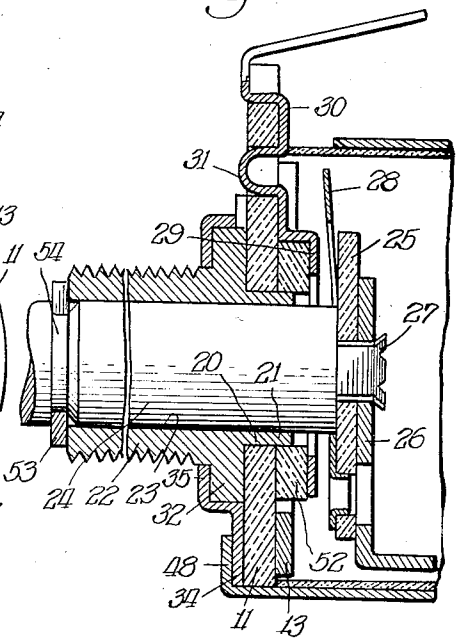


Fig. 3

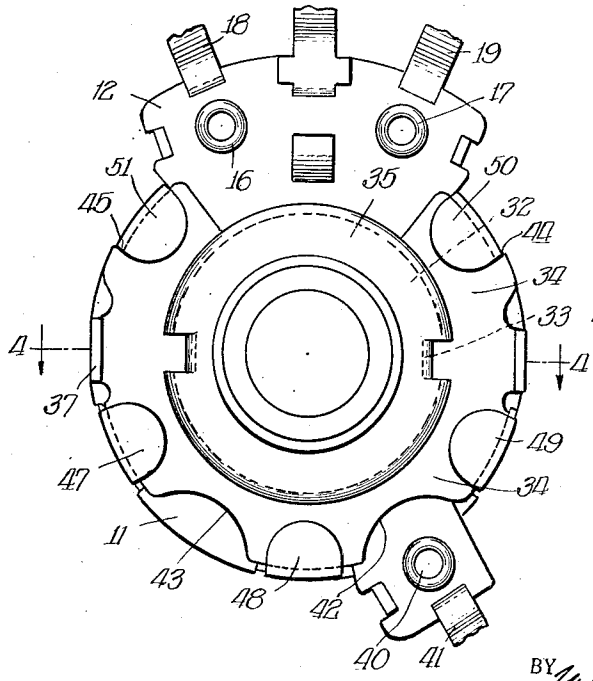
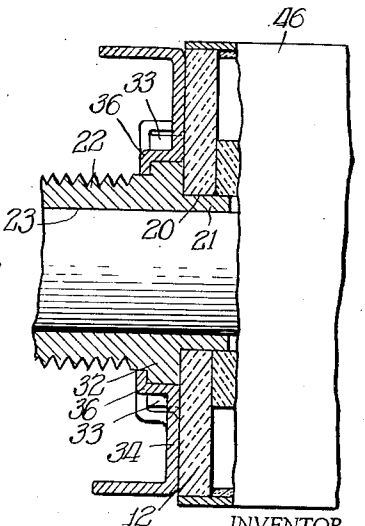


Fig. 4



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UNITED STATES PATENT OFFICE

2,245,367

ELECTRICAL CONTROL UNIT

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8 Claims. (Cl. 201—55)

This invention relates to a new and improved electrical control unit and more particularly to a construction of such units in which the parts of the unit are held in assembled relation with a minimum number of parts.

Units of this character, such as variable resistances alone or associated with switches or separate switches, are made in large quantities at low cost for use in radio receivers, test instruments, public address systems and the like. Their use requires them to be compact and efficient in that they must operate uniformly for many cycles of operation. In view of the commercial requirements for small size and low cost, it is important to eliminate all extra parts and to hold the necessary forming and assembling operations to a minimum.

It is an object of the present invention to provide a new and improved electrical control unit assembly.

It is a further object to provide such an assembly comprising a rotary shaft and a shaft bearing in which the shaft bearing is removably held in place relative to the body of the unit.

It is an additional object to provide an assembly of this character in which a single operation serves to secure a housing to the body of the unit and also to secure in place the shaft bearing.

It is also an object to provide a construction in which a grounding plate serves as means for securing a shaft bearing to a base of a unit.

It is a further object to provide an assembly in which the housing securing means jointly serve to secure the shaft bearing and grounding plate in position and to fix the parts in such manner as to prevent relative rotation.

It is an additional object to provide a unit assembly which may be disassembled without the destruction of major elements of the assembly.

It is another object to provide an assembly which is simple in design and composed of but few parts and is adapted for commercial production and use.

Other and further objects will appear as the description proceeds.

I have shown certain preferred embodiments of my invention in the accompanying drawing, in which—

Figure 1 is a face view of the assembly with the cover cut away to show the interior construction;

Figure 2 is a section, partly broken away, on line 2—2 of Figure 1;

Figure 3 is a view of the construction as seen from below the base; and

Figure 4 is a section partly broken away, taken on line 4—4 of Figure 3.

In the drawing, the base 11 is preferably formed of non-conducting materials, such as sheet synthetic resin or the like. This base 11 is provided with a lateral extension 12. The inner face of the base 11 carries the resistance strip 13 having the ends 14 and 15 held to the lateral extension 12 of the base by the rivets 16 and 17, which rivets also serve to hold the terminals 18 and 19 in position. The base 11 is provided with the central opening 20 through which extends a locating and bearing portion 21 of a thimble 22. This thimble 22 is provided with a central opening 23 which serves as a bearing for the shaft 24. The inner end of the shaft 24 has a drive plate 25 and a stop plate 26 secured thereto by deforming the inner end 27 of a reduced extension on the shaft. The drive plate 25 is formed of non-conducting material and drives the movable contact member 28 which engages the resistance strip 13. The collector ring 29, which is engaged by a portion of member 28, is provided with an integral terminal and extension portion 30 fitted in the opening 31 in the base 11.

The thimble 22 is provided with a laterally extending shoulder 32 which engages the outer face of the base 11. This shoulder 32 has oppositely located notches 33 formed therein, these notches being utilized to hold the thimble against rotation. The ground plate 34 has a raised portion 35 which fits over the shoulders 32 of the thimble and has locating portions 36 which fit within the notches 33 of the shoulder 32 on the thimble to maintain the thimble and plate against relative rotation. The ground plate 34 may be provided, as shown, with upstanding lugs 37 which serve to engage openings or notches in any suitable support such as a radio chassis, and thus prevent the entire assembly from rotation relative to its support.

In the form of construction shown, the base 11 is provided with an additional lateral extension 38 to receive a tap extension 39 of the resistance strip 13. This tap extension is held in place by the rivet 40 which also holds the connecting lug or terminal 41 in position. The ground plate 34 is provided with recesses 42 and 43 which provide ample clearance between the metal of the ground plate and the rivet holding the connecting lug to the tap extension. It will be understood that both the cutaway portions 42 and 43 are provided so that the plate may be standardized and used with tap extensions in either relative position. The plate 34 is further provided with

shoulders 44 and 45 which, with the plate in proper assembled relation on the base, are located adjacent and spaced from the main lateral extension 12 of the base.

The housing 46 is preferably formed of metal and houses the variable resistance parts located upon the inner face of the base 11. This housing 46 is provided with securing ears 47, 48, 49, 50 and 51 which are bent over against the under face of the ground plate 34 to secure the cover in place. These ears not only secure the parts together but serve to ground the metal cover to the ground plate so that a fully grounded shield is provided for the entire assembly. It will be noted that the ears 50 and 51 are so proportioned as to fit snugly between the shoulders 44 and 45, respectively, and the adjacent sides of the lateral extension 12 of the base. By this fit the plate 34 is definitely located relative to the base and is positively prevented from rotating relative to the base.

It will be apparent that the construction shown serves to connect all of the several elements going to make up the electrical control unit shown, without the necessity for rivets or other securing means insofar as the housing, grounding plate and bearing thimble are concerned. In assembling the parts after the resistance strip has been riveted to the base, the thimble 22 may be inserted in the opening 20 in the base. The insulating washer 52 is fitted against the inner face of the base 11 around the bearing portion 21 of the thimble, and the collector ring 29 and its associated terminal are next put in place. The shaft 24, already provided with the drive plate, variable contact and stop plate, is inserted through the thimble 21 from the inner face of the base. This portion of the assembly is then held in place by inserting the C-washer 53 in the groove 54 in the shaft 24. The ground plate 34 is next slipped over the thimble and the portions 36 properly seated in the notches 33 in the shoulder 32 of the thimble. With the plate, and consequently the thimble, turned to the proper relative rotary position, the housing is slipped over the inner face of the base, enclosing the parts, and the ears 47 to 51 are bent over against the outer face of the ground plate, completing the assembly.

While the unit assembly has been shown as directed to a variable resistance, it will be apparent that it may be applied to a variable resistance having a switch mounted upon its housing for joint operation therewith. It may also be used with other electrical control units mounted upon the base and enclosed within the housing, such for example, as switches alone. The unit may be disassembled by bending back the securing ears and by removing the C-washer holding the shaft in place. This makes it possible to salvage major portions of defective units which is not true when the thimble and ground plate are permanently secured in place as in usual constructions.

Besides the several features noted above, the present invention has a further very important inherent advantage. In the light of the continually growing demand for smaller controls, the conventional rivet-like manner of securing the bushing or bearing thimble to the insulated base has been found objectionable. It necessitated the presence of a shoulder or flange on the inner end of the bushing to engage over the inner face of the insulated wall. The grounded bushing was thus exposed to the control instrumentalities and as a consequence special provision had to be made for adequate electrical clearance. This required space.

In the present invention, no part of the grounded bushing is exposed at the inside of the control; and this desirable result is obtained without sacrificing rigidity in the mounting of the bushing or loss of accuracy of alignment. Moreover, it is effected entirely without special provision for covering the end of the bushing or otherwise guarding it from contact with the control instrumentalities.

The simple though highly expedient and effective manner of locating or centering the bushing on the base in conjunction with the rigidity of its securement brought about by clamping the medial flange of the bushing between the base and the grounding plate is responsible for the attainment of this desideratum.

The centering or locating end portion of the bushing, serving only as a dowel pin, i. e., to hold the bushing properly centered on the base, need not pass entirely through the aligned holes in the base and spacing washer, and preferably terminates short of the inner face of the insulated wall formed jointly by the base and spacing washer. The presence of the bushing, therefore, need not be considered from the standpoint of electrical clearance.

The optimum of compactness and accuracy of alignment is thus achieved without sacrifice of rigidity and with the advantage of simplified less expensive assembly.

I have shown certain preferred embodiments of my invention by way of example, but it is capable of modification and change to meet varying conditions and requirements and I contemplate such variations as come within the spirit and scope of the appended claims.

What is claimed is:

1. In an electrical control unit assembly, a base having an opening therein, a separate shaft bearing thimble having a portion engaging one face of the base and having its bore in line with the opening in the base, control mechanism upon the opposite face of the base, a shaft operatively connected to said mechanism and extending through the bore of the thimble, the base having a lateral extension thereon, a plate on the thimble side of the base having portions overlying portions of the thimble, shoulders on the plate adjacent to the lateral extension of the base, and a housing upon the opposite side of the base, said housing having ears extending beyond the base and engaging the plate to maintain the members in assembled relation, certain of the ears interfitting with the lateral extension of the base and the shoulders on the plate to prevent relative rotation of the parts.

2. In a variable resistance unit, a non-conducting base having a central opening therein and having a lateral extension thereon, a resistance strip secured to the inner face of the base having terminals upon the lateral extension of the base, a separate thimble upon the outer face of the base, said thimble having its bore in line with the opening in the base and having a locating and bearing portion within the opening in the base, said thimble having an extended shoulder upon the outer face of the base, a notch in said shoulder, a shaft extending through the bore of the thimble, movable contact means carried by the inner end of the shaft engaging the resistance strip, a ground plate upon the outer face of the base, said plate having a portion overlying the

shoulder of the thimble to hold the thimble against the base and having a portion fitting into the notch of the thimble shoulder to prevent relative rotation between the thimble and plate, the plate having shoulders adjacent to the lateral extension of the base, a housing covering the inner face of the base, said housing having securing ears extending beyond the base and engaging the plate to maintain the parts in assembled relation, certain of said ears engaging the shoulders on the plate and the extension on the base to maintain the parts fixed against relative rotation.

3. In an electrical control unit having a rotatable operating shaft, a bushing providing a bearing for the shaft and having a flange medially of its ends, a base having a hole receiving one end portion of said bushing and having the outer face thereof engaging the adjacent side of the flange, said entire end portion being no larger in diameter than the hole, control mechanism adjacent to the inner face of the base, a metal grounding plate fitted over the opposite end portion of the bushing and engaging the flange so that the flange lies between the grounding plate and the base, said grounding plate having portions extending outwardly from the periphery of the flange and lying adjacent to the periphery of the base, a housing for said control mechanism having an open end thereof closed by the base, means on the housing engaging the base and supporting the base against movement into the housing, and ears on said housing having portions bent over the outer face of the grounding plate to clamp the base and the grounding plate to the housing with the flange of the bushing clamped between the plate and the base to thus establish good electrical contact between the bushing and the grounding plate.

4. In an electrical control unit having instrumentalities controlled by an operating shaft, a metal housing for the instrumentalities having an open end, a wall of insulating material closing said open end of the housing and supported against movement into the housing, said wall having a hole through which the operating shaft passes, a metal bushing seated on the outer face of the wall and providing a bearing for the shaft, readily separable interengaging means on the bushing and wall for holding the bushing against shifting laterally from its position at which the shaft is properly aligned with the control instrumentalities, means on the bushing providing a laterally projecting shoulder spaced outwardly from the adjacent portion of the wall, a metal grounding plate overlying the outer face of the wall and having a part engaging said shoulder, a metal to metal connection between the housing and grounding plate by which the grounding plate is drawn toward the wall to clamp the bushing against the outer face of the wall and whereby the bushing, grounding plate, and metal housing are electrically connected, and means for preventing relative rotation between the bushing and grounding plate.

5. In an electrical control unit having an operating shaft, a wall of insulating material, said wall having a hole through which the shaft passes, a bushing providing a bearing for the shaft, one end portion of the bushing providing a centering projection fitted in the hole, no part of the centering projection being larger than the hole, a flange on the bushing engaging one side of the wall, control instrumentalities at the other side of the wall, a metal plate having a portion engaging the outer face of the flange, a housing covering the control instrumentalities and closed by the wall, means on the side of the housing extending beyond the wall and over the metal plate to draw the plate toward the housing and thereby clamp the bushing to the wall and secure the wall to the housing, and interengaging means on the bushing and plate for holding the same against relative rotation.

6. In an electrical control unit having an operating shaft, a base of insulating material having a hole through which the shaft passes, a bushing providing a bearing for the shaft, a centering projection on the bushing fitting in said hole, no portion of said centering projection having a diameter larger than that of the hole, a shoulder on the bushing projecting laterally out from the centering projection to engage the outer face of the base and support the bushing against inward movement, a second shoulder on the bushing spaced axially outwardly from the first named shoulder, an apertured plate fitted over the outer end of the bushing and bearing against said second shoulder, said plate overlying the outer face of the base, a cover for the control unit engaged over the inner face of the base, and means connecting and drawing the cover and plate together to thereby clamp the shouldered portion of the bushing between the plate and the base and also clamp the base between the plate and cover.

7. In an electrical control unit of the character described, a housing for the instrumentalities of the control, a wall of insulating material closing one end of the housing and providing a base for the control instrumentalities, said wall having a hole therethrough, an operating shaft entering the housing through said hole, a bushing providing a bearing for the shaft, a projection on the bushing fitted in the hole to center the bushing and hold the shaft in proper alignment with the control instrumentalities, said centering projection being no longer than the total length of the hole in the wall, means for supporting the bushing on the exterior of the wall against inward axial movement, so that no part of the bushing is exposed to the control instrumentalities, a shoulder on the bushing exteriorly of the wall, an apertured plate fitting over the outer projecting end portion of the bushing and resting against said shoulder, and means connecting the plate and the housing in a manner clamping the wall between the housing and plate and confining the shouldered portion of the bushing between the plate and the wall.

8. In an electrical control unit assembly, a base having an opening therein, a separate shaft bearing thimble having a portion engaging one side of the base and having its bore in line with the opening in the base, control mechanism at the opposite side of the base, a shaft operatively connected with said mechanism and extending through the bore of the thimble, a shoulder projecting laterally from the thimble adjacent to the base, said shoulder having a notch therein, a metal grounding plate having a portion fitting over said shoulder, a portion engaging the notch in the shoulder for preventing relative rotation between the plate and the thimble, and a portion overlying the major part of the base, a metal housing covering the mechanism, and ears integral with the side wall of the metal housing extending beyond the base and bent over the grounding plate to clamp the thimble between the plate and the base.

NEWTON C. SCHELLENGER.