Aug. 7, 1956

G. J. MUCHER

2,758,182

ELECTRIC CONTROL ASSEMBLY

Filed Jan. 7, 1954

Fig. 1

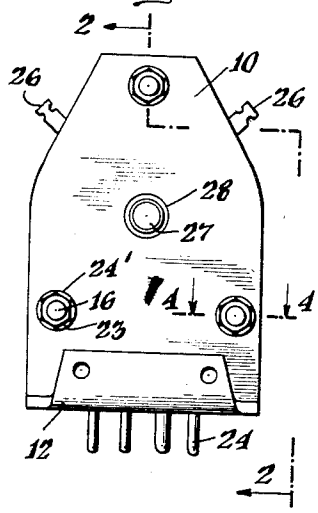


Fig. 2

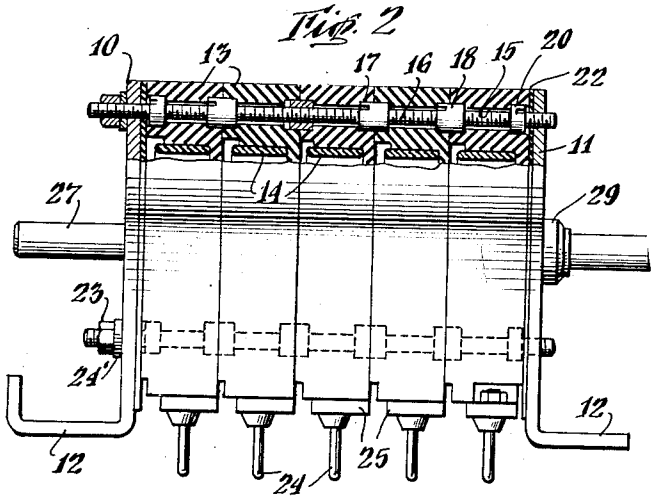


Fig. 3

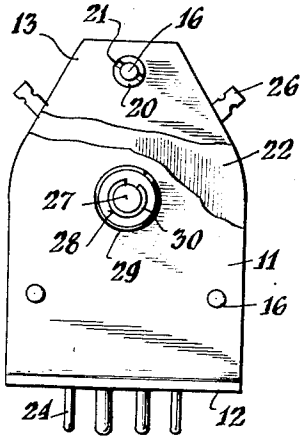


Fig. 5

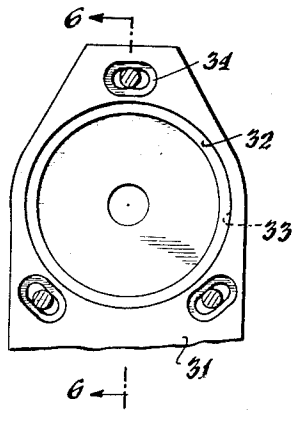


Fig. 6

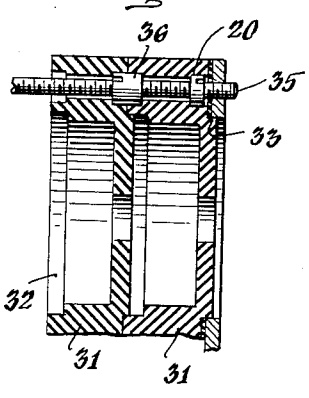
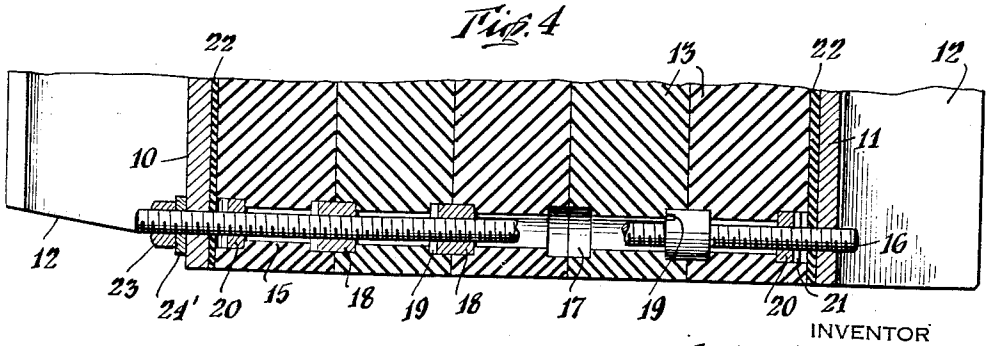


Fig. 4



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United States Patent Office 2,758,182 Patented Aug. 7, 1956

2,758,182

ELECTRIC CONTROL ASSEMBLY

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Application January 7, 1954, Serial No. 402,764

11 Claims. (Cl. 201—48)

This invention relates to a structurally and functionally improved control assembly of the electrical type and in its more specific aspects, aims to provide a ganged potentiometer grouping of the plug-in type.

Primary objects of the present invention are those of providing an assembly embracing a number of control units such as potentiometers. These will be operated, for example, by a single shaft; the entire grouping of apparatus, in effect, forming one solid body, with its component parts maintained in proper positions. Moreover, the shaft and bushings of the assembly will remain in strict concentricity.

A further object is that of providing an apparatus of this nature in which the cups or bodies of the control units will be maintained in proper axial alignment and also in right-angle relationship to the axis of the assembly; this relationship being maintained under rigorous use and despite variations in temperature conditions tending to expand and contract the parts.

Still another object is that of accomplishing the desired results by means of a structure which is relatively simple and capable of use and maintenance by ordinarily skilled labor.

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

Fig. 1 is an end view of the assembly;

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

Fig. 3 is an elevation of the end of the assembly opposite to that shown in Fig. 1 with certain of the parts broken away to disclose underlying structure;

Fig. 4 is an enlarged transverse sectional and fragmentary view taken along the line 4—4 in the direction of the arrows as indicated in Fig. 1.

Fig. 5 is a fragmentary side elevation of an alternative assembly; and

Fig. 6 is a sectional view taken along the line 6—6 in the direction of the arrows as in Fig. 5.

As will be seen with particular reference to Figs. 1 and 2, the numerals 10 and 11 indicate the end plates of the assembly which may terminate in bracket portions 12. Intervening these end plates are the bodies of controls. These have been designated by the numeral 13 and are preferably formed of an insulating plastic. The bodies or cups 13 may embrace any suitable number and are of any proper design including, for example, resistances 14 and rotor assemblies (not shown). As many as 18 of these potentiometers may be included in a single assembly and the whole should form one solid body embracing rigid characteristics with the parts properly aligned with respect to each other.

Cups 13 are each formed with transversely extending bores 15 (for example, three in number) and which align with each other when these cups are assembled. Common to each of these bores are rods or bolts 16 which, as shown, may be threaded throughout their entire length

or be otherwise suitably formed to furnish mounting and adjusting threads at the zones adjacent which they will align with the outer surfaces different from cups 13. Those cups, as illustrated in Figs. 2 and 4, will preferably have their opposite side faces substantially smooth so that they can lie in firm, face-to-face contact. Adjacent the entrance and exit ends of a bore individual to a body 13, that bore is preferably enlarged as at 17; reference being had primarily to Fig. 4. At these points, the threads of rod 16 mount nuts 18, conveniently provided with slots or other tool-engaging portions 19. The height of these nuts 18 should be equal to each other and also to the height of a pair of adjacent enlarged bore portions 17.

This will be true throughout the entire assembly, excepting only the outer faces of the outermost cups 13. Within the enlarged bore portions of the latter cup faces, nuts 20 will be disposed, which are provided with slots or other manipulating portions 21. Nuts 20 will be one half, or less than the height of nuts 18. The length of the rods 16 is such that they extend throughout the entire gang of potentiometers and beyond the same through openings in the end plates 10 and 11. They also extend through the openings of spacer sheets 22, preferably formed of insulating material and intervening the end plates 10 and 11 and the faces of adjacent cups 13. As shown, plate 11 may have the openings for the accommodation of the ends of rods 16 formed with threads to engage with the rod thread. At the opposite end of the assembly, nuts 23 may be mounted on the ends of the rods, and washers 24' are conveniently interposed between these nuts and the outer face of plate 10.

With bodies or cups 13 forming parts of controls such as potentiometers, plug-in pins 24 extend from each unit. These pins are mounted upon plates 25 which are suitably attached one to each of bodies 13. Also, test terminals such as 26 may extend from each unit to permit of the testing of the latter without the necessity of disassembling the apparatus. An operating shaft 27 common to all of the cups extends through the assembly and is secured in any suitable manner against movement with respect to the rotors of the potentiometers. It also rides within the bushings (not shown) of the assemblies and a further bushing 28 may be associated with plate 10 to support one end of the shaft. A similar bushing is also associated with the plate 11 and extends through a collar portion 29. A C-ring 30 is coupled with shaft 27 and rides within a groove formed in the latter to prevent axial shifting of that shaft.

Based upon the foregoing structure, it will be understood that one method of procedure would be that of threading the ends of rods 16 into the correspondingly threaded openings of plate 11. Thereupon, a spacer sheet 22 could be positioned upon these rods and moved to a station at which it lies in face-to-face contact with plate 11. At this time, or previously, the parts of the assembly may be applied to or associated with a mounting frame or other gauging means in showing the absolute proper relationship of the cups and the parts associated therewith. This frame or gauging means may also have associated with it electrical attachments which permit the accurate phasing of the electrical elements of the assembly either separately or in relation to each other. In any event, nuts such as 21 will now be disposed in proper positions upon the rods 16 and a body or cup 13, which is to provide the outermost unit, will receive within its bores 15 the several rods 16. When this cup has been properly positioned, then it may be secured in that position by introducing into its enlarged bore portions (opposite those disposed adjacent sheet 22) nuts 18. The latter will bear firmly against the base portions defining the bores 17 and in conjunction with nuts 20 will assure the desired result.

It is to be remembered that nuts 18 have a height equal to twice that of the enlarged bore portions 17. Therefore, when this first set of nuts has been properly disposed, the outer end portions of the same will extend beyond the adjacent surface of cup 13 which they retain. So extended, these projecting parts will, in effect, furnish dowel or guide pins which may be received in the enlarged bore portions of the next adjacent cup 13 which is moved over the rods 16. Accordingly, the latter will be guided to a proper position where it is in face-to-face contact with the first cup 13 and be maintained against axial rotation with respect to that first cup. The foregoing operations will be continued throughout the assembly including up to a maximum number of cups or bodies 13. When the outermost unit has been secured in position by nuts 20 and against the possibility of axial or transverse displacement, then a sheet 22 and end plate 10 will be applied to the assembly and in turn secured in position by, for example, nuts 23. It is to be remembered that rods 16 may conveniently move with freedom through the openings formed in plate 10 and bodies 13, while their threads engage the openings in plate 11. Therefore, longitudinal adjustment or shifting of these rods with respect to the assembly becomes feasible and wherever such an adjustment may be desirable or necessary, prior to assembly.

By a construction such as this, it is obvious that all the cups or bodies 13 will be maintained in strict axial alignment. Also, they will be retained in rigorous right-angle relationship to the axis of the assembly and with movement of one cup with respect to adjacent cups precluded. The shaft 27 will be maintained in proper relationship with respect to the several bushings. Accordingly, the precision phasing of the apparatus will not be disturbed under any circumstances. Also, the relationship of pins 24 in one assembly will not be varied, nor will shifting of these elements between various assemblies occur. This is especially important when it is realized that the tolerance allowed with respect to these pins may be as high as two thousandths of an inch.

As will be understood, the present invention might readily be adapted to a structure which would permit of a slight rotation of the cup for phasing adjustments. This has been illustrated in Figs. 5 and 6. In those views, the numeral 31 indicates the cups which conveniently would be provided with recessed portions 32 in one of their side faces and a projecting part 33 of corresponding size in their opposite faces. These cups would also be provided with transversely extending openings corresponding to the bores 15. Such openings, however, instead of being circular, would extend a few degrees radially as indicated by the reference numeral 34. Rods 35 would extend through the bores 34 and correspond to rods 16. Likewise, these rods would mount nuts 36 corresponding to the nuts 18 and 20 and which would lie within the countersunk or enlarged bore portions of the several bodies. These enlarged portions, in common with bores 34 would also have an oblong configuration.

As will be apparent, projecting portion 33 of one cup will extend into recess 32 of an adjacent cup. This would permit of relative rotation of the cups although preventing any sideway's shifting of the same. With such rotation occurring, it is apparent that a suitable phasing adjustment could be resorted to. This would be in addition to any adjustment of the internal mechanism which might form a part of the rotor assembly. With the tightening of the entire assembly as described in connection with the structure of Figs. 1 to 4 inclusive, any shifting of the several components of the assembly would be precluded.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. Obviously, numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. In an assembly of the character described in combination a plurality of controls each including a body formed with an opening, a single mounting member common to all of said bodies and passing through the openings thereof, anchoring elements individually thrusting against said bodies, means whereby said elements are adjustably supported with respect to said mounting member, said openings being enlarged adjacent a side face of said body and the height of the element received therein being greater than the single depth of such enlargement whereby said element projects beyond said side face.

2. A control assembly including in combination a plurality of cups to be disposed adjacent each other, said cups being formed with transversely extending openings providing in aggregate a bore extending longitudinally of the assembly, a single rod lying within said bore and elements mounted by said rod and each individually engaging surfaces of a pair of adjacent cups to secure the latter against movement with respect to each other.

3. A control assembly including in combination a plurality of cups to be disposed adjacent each other, said cups being formed with transverse openings providing in aggregate a bore extending longitudinally of the assembly, a rod lying within said bore, elements mounted by said rod and individually engaging said cups to secure the latter against movement with respect to each other, means whereby said elements may be shifted longitudinally of said rod, said transverse openings being provided with countersunk portions adjacent the side faces of said cups, said elements extending into said countersunk portions and the height of certain individual elements being equal to the aggregate height of a pair of countersunk portions to completely fill the space defined by the latter.

4. A control assembly including in combination a plurality of cups to be disposed adjacent each other, said cups being formed with transversely extending openings which are oblong in an arcuate direction, said openings providing in aggregate a bore extending longitudinally of the same, a single rod lying within said bore and elements mounted by said rod and individually engaging said cups to secure the latter against movement with respect to each other.

5. A control assembly including in combination a plurality of cups to be disposed adjacent each other, said cups being formed with transversely extending openings which are oblong in an arcuate direction, said openings providing in aggregate a bore extending longitudinally of the same, a single rod lying within said bore, elements mounted by said rod and individually engaging said cups to secure the latter against movement with respect to each other and cooperating guiding portions forming parts of and extending between said cups whereby rotation of one cup with respect to an adjacent cup may be effected.

6. A ganged potentiometer assembly including in combination a plurality of cups disposed in parallel relationship and each formed with bores extending through and within the area of their side walls from one side face of the cup body through to the other, bearing portions within said bores at points short of such side faces, the bores of the several cups being aligned, a single screw-threaded rod extending through and located within the aligned bores and nuts mounted upon such rod and engaging said bearing portions to maintain said cups in predetermined positions upon such rod.

7. A ganged potentiometer assembly including in combination a plurality of cups disposed in parallel relationship and each formed with bores extending through and within the area of their side walls from one side face of the cup body through to the other, bearing portions within said bores at points short of such side faces, the bores of the several cups being aligned, a single screw-threaded rod extending through and housed within the aligned bores, nuts mounted upon such rod and engaging said bearing

portions to maintain said cups in predetermined positions upon such rod, said nuts having a length such that they extend simultaneously into two adjacent cup bores to provide a guide structure in the placement of one of said cups and said nuts having a diameter to substantially fill said bores.

8. A ganged potentiometer assembly including in combination a plurality of cups disposed in parallel relationship and each formed with bores extending through and within the area of their side walls from one side face of the cup body through to the other, bearing portions within said bores at points short of such side faces, the bores of the several cups being aligned, a single screw-threaded rod extending through and housed within the aligned bores, nuts mounted upon such rod and engaging said bearing portions to maintain said cups in predetermined positions upon such rod, said nuts having a diameter to substantially fill said bores and an end plate formed with threaded openings to be engaged by the rod threads.

9. A ganged potentiometer assembly including, in combination, a plurality of superposed units arranged in face-to-face contact and each comprising bodies formed with transversely extending bores to individually receive a

bolt, said bores having constrictions providing bearing portions housed within said bodies, a single threaded bolt extending through the aligned bores of the different bodies, nuts mounted by said bolt to thrust against said bearing portions, and said nuts being housed within said bores.

10. An assembly as specified in claim 9, the height of one nut being in excess of the spacing between a bearing portion which it engages and the face of the body embracing such portion, and said nut thereby extending beyond said face to furnish a dowel to enter the bore of an adjacent body and guide the latter to assume a predetermined position with respect to the unit from which it projects.

11. An assembly as specified in claim 9, end plates beyond the outermost of the units, said plates being formed with openings through which the ends of said bolt extend, and means for securing the latter against movement with respect to said plates.

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