April 20, 1954 G. J. MUCHER 2,676,226

CONTROL FOR RHEOSTATS

Filed April 16, 1951

Fig. 1

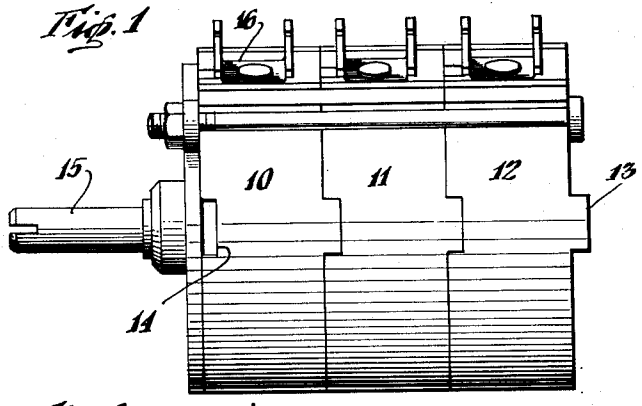


Fig. 6

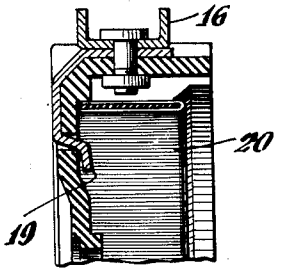


Fig. 2

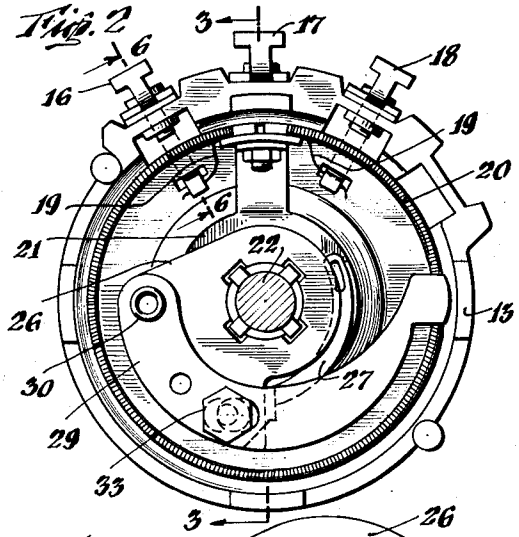


Fig. 3

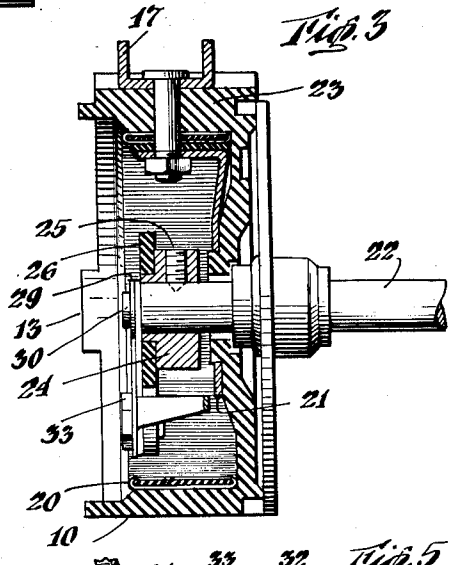


Fig. 4

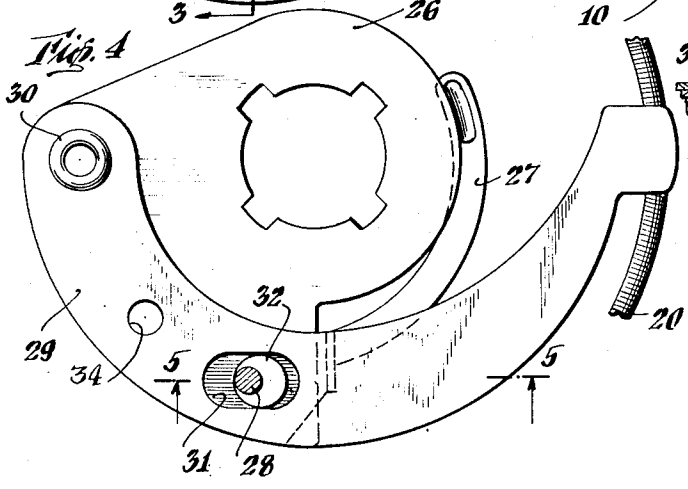
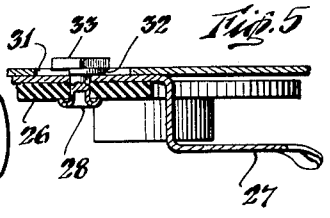


Fig. 5



INVENTOR
George J. Mucher
BY Duell and Kane
ATTORNEYS

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CONTROL FOR RHEOSTATS

George J. Mucher, Rochester, N. H., assignor to Clarostat Mfg. Co., Inc., Dover, N. H., a corporation of New York

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14 Claims. (Cl. 201—48)

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This invention relates to a structurally and functionally improved control of the electric type and especially aims to provide a unit the parts of which may be readily adjusted.

It is an object of the invention to provide a control such as a potentiometer and which may be used either singly or in a gang assembly with a number of similar or identical units; the present invention serving to permit of a ready phasing of the several elements so that their electrical characteristics and operating cycles may coincide.

A further object is that of providing a potentiometer or similar structure in which a definite voltage ratio or resistance value will be set up when a predetermined angular relationship of the contact arm of the unit is established with respect to a definite stop of the rotor or radial point.

An additional object is that of furnishing a structure which will embody a relatively simple design involving few parts capable of quantity production and ready assemblage to furnish a compact and simple mechanism operating for long periods of time with freedom from all difficulties.

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 a side elevation of an essembly of units;

Fig. 2 is a face view of one of such units with the cover removed and showing a structure embodying the present teachings;

Fig. 3 is a transverse sectional view taken along the lines 3—3 and in the direction of the arrows as indicated in Fig. 2;

Fig. 4 is a face view of the rotor in enlarged scale;

Fig. 5 is a fragmentary sectional view taken along the lines 5—5 and in the direction of the arrows as shown in Fig. 4; and

Fig. 6 is a fragmentary sectional view of a part of the assembly as shown in the preceding views.

Referring primarily to Fig. 1 there have been shown three units arranged in "gang assembly" relationship. This is merely illustrative; potentiometers and similar units in the case of servo mechanisms involving in most instances a considerable number of assemblies. As is well understood, such a grouping includes in each unit a resistance which is traversed by an element of a rotor. A shaft common to the servo units extends through them. Terminals extend from each unit and are connected in desired electrical circuits. It is essential that the rotors of each

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unit occupy positions upon the shaft such that identical electrical values or characteristics are present on the part of each unit or else that these values have a definite and predetermined relationship. To assure this result it has been customary to furnish a coupling (either embodying a set screw or functionally similar element) by means of which the position of the rotor can be adjusted with respect to the shaft. As is also well understood, the tolerance permitted in this connection is very small and an operator has had to work with painstaking care to relate each of the units of a gang assembly to the other and then secure the parts against subsequent disarrangement.

The reference numerals 10, 11 and 12 designate the casings of controls. These casings are preferably formed of di-electric material and are identical. Bridging portions 13 and recesses 14 are formed in opposed edges of the units. These serve to lock the casings with respect to each other and prevent their relative movements when a number of them are assembled. A shaft 15 common to all of the units may extend through the same. As in Figs. 2 and 3 terminals such as 16, 17 and 18 conveniently project from the peripheral edges of the casings and are connected by leads 19 to, for example, the ends of a resistance element 20 and a contact ring 21. The resistance as shown will ordinarily be arranged in the form of a circle or arc and may be wire wound. It is obvious that other forms of resistance element might be employed.

In any event the surface of the resistance element is traversed by a contact arm which forms a part of a rotor assembly. Collector ring 21 is also traversed by a wiper arm and electrically connected to the contact arm which traverses the resistance. Conveniently both of these arms are carried by a hub which by means of a set screw is secured against movement with respect to the rotating shaft. It is by means of this structure that the rotor may be positioned with respect to the operating shaft and then may be locked against movement with respect to that shaft. It is in connection with this technique of positioning and locking that difficulties have heretofore been experienced.

With especial reference to Fig. 3 a single shaft has been indicated at 22 which shaft extends rotatably through the base of the housing 23 and is encircled by a hub 24. This hub carries set screw 25 engageable with the surface of the shaft to lock the hub in position. A dielectric plate 26 is affixed to hub 24. The former mounts the arm

traversing collector resistance 20 as well as the arm traversing ring 21. These arms in accordance with conventional practice are electrically connected and may include any desired number of parts.

According to the present teachings and as shown especially in Figs. 2, 4 and 5, a spring wiper arm 27 traverses collector ring 21. This arm extends upwardly and is connected by a stud 28 to the outer face of plate 26. A second arm 29 overlies that portion of arm 27 which is disposed upon plate 26 and a common pivot 30 passes through the forward ends of both arms 29 and 27. In this manner arm 27 is secured against rotation with respect to hub 24 and plate 26. However, arm 29 may pivot and is formed with an opening 31 through which stud 28 passes. The area of this opening is substantially greater than the diameter of stud 28. The latter has affixed to it within the space defined by the edges of the opening a cam 32. The diameter of that cam is substantially equal to the space between the side edges of opening 31. The stud terminates in a manipulating portion such as a head 33. Conveniently that head is non-circular so that its edges may be engaged by a suitable wrench. Otherwise, it may be formed in any desired manner so as to be capable of being rotated with respect to the plate or contact carrier 26.

So rotated, it is apparent that contact arm 29 will be swung with respect to its pivot 30. Accordingly, the outer end of the arm which traverses the resistance will have imparted to it a movement tangential to the surface of that resistance. Therefore, according to one extreme of adjustment of the cam 32 the arm may be advanced a matter of, for example, two or three degrees for the position which it assumes when the cam is in its other extreme of adjustment. Adjusted through this range, the arm will include or exclude a portion of the resistance strip. In the instance of a wire wound unit, several strands will be involved. Thus, by the adjustment, resistance will be added or subtracted to a desired point of adjustment usually in relation to other units on the same shaft. Accordingly, it is apparent that an operator may secure the rotor assembly in approximately correct position with respect to the shaft 22. This securing will be effected by set screw 25 or its equivalent. With the parts so secured, and by rotating the stud and cam 32 a vernier adjustment is obtained without difficulty. At this time it is to be understood that while in certain respects it is preferred to have the contact arms respectively traversing the resistance strip and contact ring, generally embody an assembly such as has been shown, they might be entirely separate units. Also, any desired number of parts might provide these units.

Regardless of detailed structures such as this, it will be understood that an operator may with minimum skill and expenditure of time assemble a unit so that its rotor will occupy substantially a predetermined position with respect to a given stop or electrical value. With the parts locked he may then precisely adjust them to establish definite electric values. As afore brought out, this will be especially desirable in cases of gang assemblies involving a number of potentiometers or similar units. It will permit of a ready phasing of these units to establish predetermined resistance and voltage ratios. When the positioning of the parts is completely correct, then a drop of solder may be disposed within opening 34. This will, of course, serve to establish good electrical contact between arms 27 and 29. It will also serve to fix or secure the parts in the positions to which they have been adjusted.

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

I claim:

1. A control assembly comprising in combination a plurality of units each including a circular resistance, a mounting therefor, a rotor encircled by said resistance and a contact arm cooperative with said resistance and movably connected to said rotor to be shiftable in an arcuate direction with respect thereto, a shaft common to all of said units, means for rotatably supporting said shaft, means for securing the several rotors of said units against movement with respect to said shaft whereby when the latter is rotated, each of said contact arms will traverse the resistance with which it cooperates and adjusting means individually connected to each of said rotors and arms for moving the latter in an arcuate path with respect to the former and with a stationary condition of said shaft advancing and retracting a given arm with reference to the resistance with which it cooperates.

2. A control assembly comprising in combination a plurality of units each including a circular resistance, a mounting therefor, a rotor encircled by said resistance and a contact arm cooperative with said resistance and movably connected to said rotor to be shiftable in an arcuate direction with respect thereto, a shaft common to all of said units, means for rotatably supporting said shaft, means for securing the several rotors of said units against movement with respect to said shaft whereby when the latter is rotated, each of said contact arms will traverse the resistance with which it cooperates, adjusting means individually connected to each of said rotors and arms for moving the latter in an arcuate path with respect to the former and with a stationary condition of said shaft advancing and retracting a given arm with reference to the resistance with which it cooperates and means connecting the several mountings for the resistances to prevent movements of the same with respect to each other.

3. A control assembly comprising in combination a plurality of units each including a circular resistance, a mounting therefor, a rotor encircled by said resistance and a contact arm cooperative with said resistance and movably connected to said rotor to be shiftable in an arcuate direction with respect thereto, a shaft common to all of said units, each of said rotors being shiftable around said shaft to correspondingly shift the arm carried thereby with respect to the resistance with which it cooperates, means for locking each of said rotors against shifting with respect to said shaft whereby when the latter is rotated each of said contact arms will traverse the resistance with which it cooperates and adjusting means individually connected to each of said rotors and arms for shifting the latter in an arcuate path with respect to the former and with a stationary condition of said shaft advancing and retracting said arms with respect to the resistances with which they cooperate.

4. A control including in combination an arcuately disposed resistance, means for mounting the same, a hub encircled by said resistance, a contact arm movable with respect to said hub and traversing said resistance as said hub is rotated, means carried by said hub and cooperative with said arm for advancing and retracting the latter with respect to said resistance while said hub remains stationary and means for rotating said hub.

5. A control including in combination an arcuately disposed resistance, means for mounting the same, a hub encircled by said resistance, a contact arm movable with respect to said hub and traversing said resistance as said hub is rotated, means carried by said hub and cooperative with said arm for advancing and retracting the latter with respect to said resistance while said hub remains stationary, means whereby said hub and arm may be locked against relative movements and means for rotating said hub.

6. A control including in combination an arcuately disposed resistance, means for mounting the same, a hub encircled by said resistance, a contact arm movable with respect to said hub and traversing said resistance as said hub is rotated, means carried by said hub and cooperative with said arm for advancing and retracting the latter with respect to said resistance while said hub remains stationary, a shaft rotatable with respect to said hub and means for locking said hub against movement with respect to said shaft.

7. In a control a hub to be supported for rotation, a resistance-traversing arm movably connected to said hub and means carried by said hub and cooperative with said arm for shifting a portion of the latter under a stationary condition of said hub in a direction around the axis of said hub.

8. In a control a hub to be supported for rotation, a resistance-traversing arm movably connected to said hub, means carried by said hub and cooperative with said arm for shifting a portion of the latter, under a stationary condition of said hub, in an arcuate direction around the axis of said hub and means whereby said arm and hub may be locked against relative shifting.

9. In a control a hub to be supported for rotation, a resistance-traversing arm movably connected to said hub, means carried by said hub and cooperative with said arm for shifting a portion of the latter, under a stationary condition of said hub, in an arcuate direction around the axis of said hub and a wiper arm also connected to said hub and secured against shifting with respect to the same.

10. In a control in combination a hub to be supported for rotation, an arm having an outer contact portion, said arm being of lengthwise curved configuration and means for pivotally securing the opposite arm ends to said hub with the body of said arm arcuately circling the hub center and its contact end extending beyond said hub to provide a resistance-engaging contact end which is adjustable over said resistance as said arm is swung around its pivot.

11. In a control in combination a hub to be supported for rotation, an arm having an outer contact portion, said arm being of lengthwise curved configuration, means for pivotally securing the opposite arm end to said hub with the body of said arm arcuately circling the hub center and its contact end extending beyond said hub to provide a resistance-engaging contact end which is adjustable over said resistance as said arm is swung around its pivot and means for locking said arm in the position to which it has been adjusted.

12. In a control in combination a hub to be supported for rotation, an arm having an outer contact portion, said arm being of lengthwise curved configuration, means for pivotally securing the opposite arm end to said hub with the body of said arm arcuately circling the hub center and its contact end extending beyond said hub to provide a resistance-engaging contact end which is adjustable over said resistance as said arm is swung around its pivot and means carried by said hub and cooperating with said arm for swinging the latter around its pivot.

13. In a control to form a part of an electrical resistance unit a mounting to be coupled against movement with respect to a rotary operating member, a contact arm rockingly mounted by said member and having an outer end to traverse a circular path as said mounting is rotated and in such traversal to cooperate with the resistance and whereby, with said mounting stationary, said arm may be moved with respect to said mounting to advance and retract the outer end of said arm with respect to a resistance.

14. In a control to form a part of an electrical resistance unit a mounting to be coupled against movement with respect to a rotary operating member, a contact arm movably mounted by said member and having an outer end to traverse a circular path as said mounting is rotated and in such traversal to cooperate with the resistance whereby, with said mounting stationary, said arm may be moved with respect to said mounting to advance and retract the outer end of said arm with respect to a resistance, said arm presenting an edge portion and a rotary cam mounted by said mounting and cooperating with said edge portion to move said arm.

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