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VARIABLE RESISTOR CONSTRUCTION

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Fig. 1

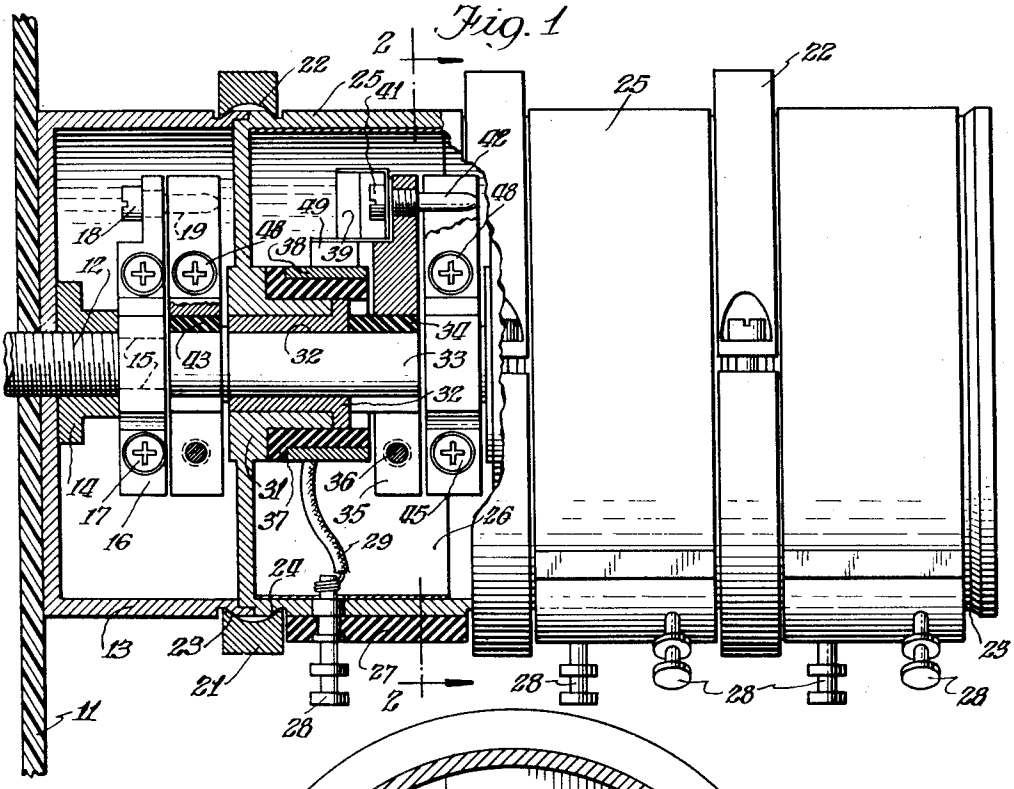
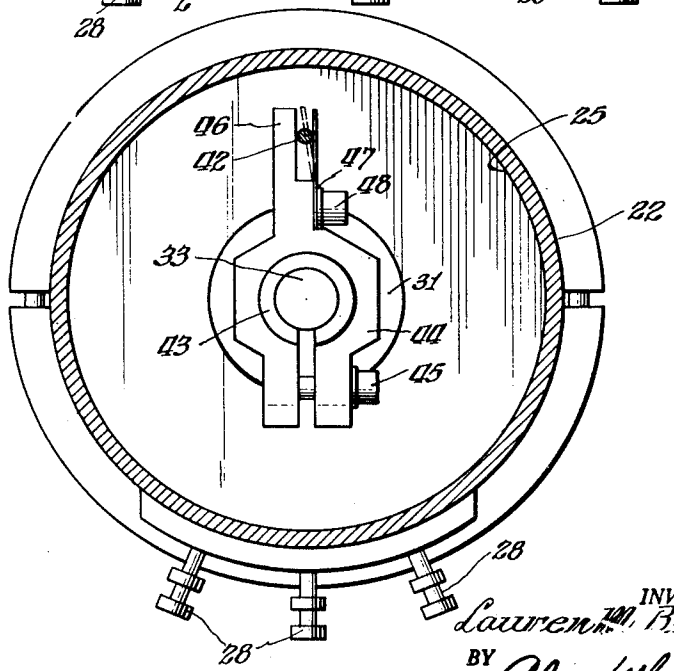


Fig. 2



INVENTOR.
Lawrence M. Burgess.
BY
Alois W. Graf
Attorney.

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VARIABLE RESISTOR CONSTRUCTION

Lauren M. Burgess, Lexington, Mass., assignor to Technology Instrument Corporation, Waltham, Mass.

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1

The present invention relates to ganged precision adjustable resistors or potentiometers, and more particularly to a provision whereby the contact arms of the potentiometers are readily driven in unison.

In certain control and measurement circuits, it is desirable to provide for the simultaneous control of a plurality of adjustable resistors or potentiometers. These resistors or potentiometers are of a high precision type having an accuracy within one per cent of the total resistance value. In order to provide some adjusting means for the synchronization of the several resistor or potentiometer units, the casings holding the resistor strips are arranged to be coupled to each other by means of clamping rings so that for any selected position of the contact arms, each resistor of each unit will have the proper resistance value relative to its contact arm at that position. This adjustment provides compensation where the resistance strip mounted within the casing may not have quite the accurate orientation desired because of a slight displacement with respect to similar or other resistors or potentiometers. In certain control circuits, it also is desirable to have the contact arm of one of the resistors or potentiometers displaced a certain number of degrees relative to the contact arms of the other potentiometer when it is assumed that all potentiometers have the beginnings of their respective resistors in their common axial plane.

With an arrangement for adjusting the positions of the potentiometer casings relative to each other when arranged in ganged relation, it would be desirable to provide a simple arrangement for interconnecting the various contact arms with a high degree of accuracy and a simplicity of mechanical connection.

It, therefore, is an object of the present invention to provide an improved arrangement for interconnecting the movable contact arms of a plurality of precision resistors or potentiometers.

Still another object of the present invention is to provide an unique contact arm for potentiometers and resistors which is readily interconnected with the contact arm of another unit without the use of tools or fastening devices.

Other and further objects of the present invention subsequently will become apparent from reference to the following description taken in conjunction with the accompanying drawing wherein

Figure 1 shows the application of the present invention to a ganged potentiometer unit, a portion of the drawing being shown in cross section; and

Figure 2 is a view as shown in the direction of the arrows along the line 2—2 of Figure 1.

In accordance with the present invention a ganged potentiometer may be mounted on a control panel 11 by means of a single hole mounting arrangement. A threaded sleeve 12 extends through a suitable aperture in the panel 11 and the outer end of the sleeve is engaged by the usual locking nut. The sleeve 12 extends into a cylindrical casing 13 which, at its inner wall, has a support nut or stud 14 connected to the sleeve 12. This supporting member 14 is suitably secured in rigid manner to the inner front wall of the cylindrical casing 13. Mounted within the sleeve 12 is a shaft 15 which is engaged by a bifurcated driving arm 16 having its bifurcated portion drawn together by a cap screw 17. The arm 16 at one extremity carries a cap screw pin 18 having a pointed pin end 19 arranged to engage a cooperating member on a potentiometer mounted upon the casing 13 by means of clamping means 21.

2

The clamping ring 21 on its inner surface has a concave cross sectional shape 22 arranged to engage a groove 23 in the outer surface of the casing 13 and a groove 24 in the outer surface of a casing 25 which houses a potentiometer or resistor. The housing 25 carries a strip resistor 26 which may be formed in any desired manner as is customary in devices of this character. In some instances, the strip 26 may have a coated resistance surface whereas in others, the strip 26 is of insulating material which carries a wired resistance element. The casing 25 carries at its exterior an insulating electrical terminal block 27 having a plurality of electrical terminals 28. One of the terminals 28 is connected by a suitable conductor 29 to one of the conductive elements of a rotatable mechanism or member which carries the adjustable contact which engages the resistance element of the strip 26.

The vertical wall of the casing 25 which extends across the front of the casing is provided with a boss 31 which supports a bearing member 32. The bearing member 32 carries a shaft 33. The shaft 33 extends beyond the bearing 32 for a short distance and this extended portion is covered by a split insulator sleeve 34. The split insulator sleeve is engaged by a bifurcated arm 35 which is held in position by a clamping cap screw 36. The end of sleeve 34 takes the thrust of the brush arm assembly against bushing 32. A stepped insulator sleeve 37 is mounted upon the boss 31 and the flange of the bushing 32. Surrounding a substantial portion of the insulator 37 is a conductive sleeve 38 which is electrically connected to the conductor 29 leading to the electrical terminal 28.

The arms 35 carries contact springs 39 and 49 which are held in position by a cap screw pin 41. Contact spring 39 makes contact on the resistance wire and pickup spring 49 has dual arms making contact on conductive sleeve 38. The cap screw pin 41 has a pin terminal 42 extending

an appreciable distance beyond the plane surface on one side of the bifurcated arm 35. The pin 42 is provided for cooperative engagement with a driving member of the adjacent potentiometer or resistor.

The shaft 33 extends to the outside surface of the bifurcated arm 35 as may be seen from Figure 1. The forward portion of the shaft 33 is fitted with an insulator sleeve 43 which is engaged by a bifurcated arm 44 held in position by a clamping cap screw 45. The arm 44 has a narrowed arm portion 46 which cooperates with a spring leaf member held in position by a cap screw 48. Interposed between the spring leaf member 47 and the narrowed arm portion 46 is a pin 42 of the first unit of the stacked potentiometers. The space between the arm portion 46 and the leaf spring 47 is controlled so that when pin 42 is inserted, the surfaces of arm 46 and spring 47 are parallel. This arrangement maintains constant pressure on pin 42 by the spring 47 in the event that eccentricity exists between units, thereby causing the pin 42 to slide between the spring 47 and the arm 46. Figure 2 by dotted lines shows how the spring 47 is preloaded so that this pressure is maintained on the pin 42 and the surfaces of the spring 47 and the arm 46 become parallel. Figure 2 shows the driving arm arrangement of the next adjacent potentiometer, but also illustrates the driving arrangement for all potentiometers. The first potentiometer shown in cross section in Figure 1 has a similar arrangement and a front view thereof would correspond to Figure 2 with the exception that the pin 19 would be inserted between the member 46 and the spring 47. By virtue of the insulating sleeves 34 and 43, the contact arms of each potentiometer are kept insulated from the adjacent potentiometer.

By the arrangement described, all of the contact arms are aligned without incurring any of the disadvantages heretofore incurred by such arrangements which used a common shaft. Where a common shaft is used, other insulating means must be employed or an insulated rod is used to interconnect the various potentiometers in stacked relation. Such arrangements generally are subject to a certain amount of warpage and mis-alignment which is not effective in the present arrangement. By virtue of the arm extension 46 and the spring member 47, each of the arms is arranged in alignment irrespective of any minute differences which may occur in manufacture, with respect to an axial alignment of the stub shafts 33.

While for the purpose of illustrating and describing the present invention a preferred embodiment has been shown in the drawing, it is to be understood that such variations are contemplated as may be commensurate with the spirit and scope of the present invention set forth in the accompanying claims.

I claim:

1. A variable resistor arranged to be coupled in tandem with another similar resistor comprising a casing having a shaft, an actuating arm mounted on the exterior portion of said shaft, said arm carrying a spring spaced from the free end of said arm and extending therealong, an insulated contact arm mounted on said shaft within said casing, said arm adjacent its free end carrying a rearwardly extending pin adapted to fit into the space between the actuating arm and the spring of a succeeding resistor.

2. A variable resistor arranged to be coupled in tandem with another similar resistor comprising a casing having a shaft, an actuating arm mounted on the exterior portion of said shaft, said arm carrying a spring spaced from the free end of said arm and extending therealong, an insulated contact arm mounted on said shaft within said casing, said arm adjacent its free end carrying a rearwardly extending pin adapted to fit into the space between the actuating arm and the spring of a succeeding resistor, and a clamping ring for engaging adjacent portions of coupled resistor casings.

3. A variable resistor arranged to be coupled in tandem with another similar resistor comprising a casing having a bearing for a shaft, a shaft mounted in said bearing and having means for limiting longitudinal movement of said shaft in one direction, an actuating arm mounted on the exterior portion of said shaft, said arm carrying a spring spaced from the free end of said arm and extending parallel thereto, an insulating sleeve mounted on said shaft within said casing, a contact arm mounted on said sleeve, said arm adjacent its free end carrying a rearwardly extending pin adapted to fit into the space between the actuating arm and spring of a succeeding resistor.

4. A variable resistor arranged to be coupled in tandem with another similar resistor comprising a casing having a shaft, an actuating arm mounted on the exterior portion of said shaft and insulated therefrom, said arm carrying a spring spaced from the free end of said arm and extending parallel thereto, an insulated contact arm mounted on said shaft within said casing, said arm adjacent its free end carrying a rearwardly extending pin adapted to fit into the space between the actuated arm and spring of a succeeding resistor, and an adjustable clamping ring for engaging adjacent portions of coupled resistor casings, said clamping ring when loosened permitting rotatable adjusting of one casing to another thereby to bring the resistors within said casings into proper phase relation.

5. A plurality of ganged resistors comprising a plurality of cylindrical casings each provided adjacent the front end and rear surfaces with an annular ridge, a clamping ring having a concave inner surface for engaging the ridge of each adjacent casing whereby the selected phase relation of ganged resistors may be fixedly adjusted, means for tightening each clamping ring, a shaft for each casing having a length slightly less than the axial length of a casing, an actuating lever connected to said shaft adjacent the outer extremity, said lever having a flat driving surface, a spring positioned parallel to said flat surface, a contact carrying arm mounted adjacent the other end of said shaft within said casing, and a pin extending out from said arm for engaging the driving surface and spring of a subsequent ganged resistor thereby to align both shafts of said resistors without angular displacement therebetween.

6. The combination for ganging together in adjustable relation a plurality of variable resistors comprising a plurality of cylindrical casings each provided at the front and rear ends with an annular groove, each groove having an inclined surface on the side toward the end of the casing, a clamping ring having a concave inner surface for engaging the inclined surface of each groove, means for tightening each clamping ring whereby adjacent casings may be fixedly

adjusted with a desired angular relation between said casings, a shaft for each casing having a length slightly less than the axial length of a casing, an insulated contact carrying arm mounted adjacent one end of said shaft within said casing, a pin extending out at right angles from said arm, an insulated actuating lever connected to said shaft adjacent the outer extremity on the exterior of said casing, said lever having a flat driving surface for engaging the pin extending out from the contact carrying arm of an adjacent variable resistor, and a flat spring positioned parallel to said flat surface for engagement by said pin whereby said shafts are coupled together without angular displacement therebetween.

7. The combination for adjustably ganging together a plurality of precision variable resistors comprising a cylindrical casing for each resistor, each casing having an annular ridge with an inclined surface on the side away from the end of the casing, a split clamping ring having a concave inner surface for engaging only the inclined sides of the front and rear ridges of adjacent casings, means for tightening each clamping ring to lock in adjusted angular position adjacent casings, a shaft for each casing having a length slightly less than the axial length of a casing, a contact carrying arm mounted in insulated manner adjacent one end of said shaft within said casing, a pin extending out from adjacent the end of said arm at right angles thereto, an actuating lever insulatedly mounted on said shaft adjacent the outer extremity, said lever having a driving surface, said driving surface being arranged to be engaged by a pin from the contact carrying arm of a preceding variable resistor, and spring means carried by said driving arm for urging said pin against said driving surface of said contact carrying arm.

LAUREN M. BURGESS.

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