June 8, 1937. N. C. SCHELLENGER 2,082,979

VARIABLE RESISTANCE DEVICE

Filed May 28, 1934

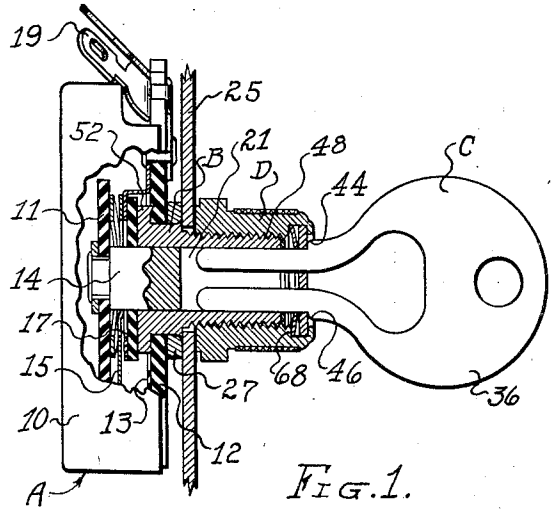


FIG. 1.

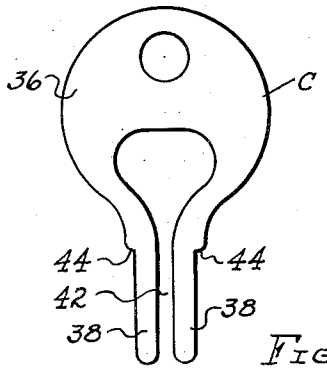


FIG. 2.

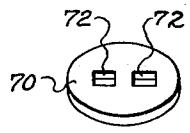


FIG. 3.

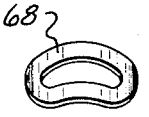


FIG. 4.

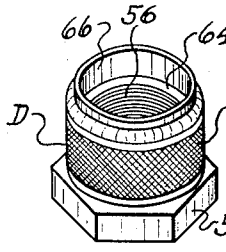


FIG. 5.

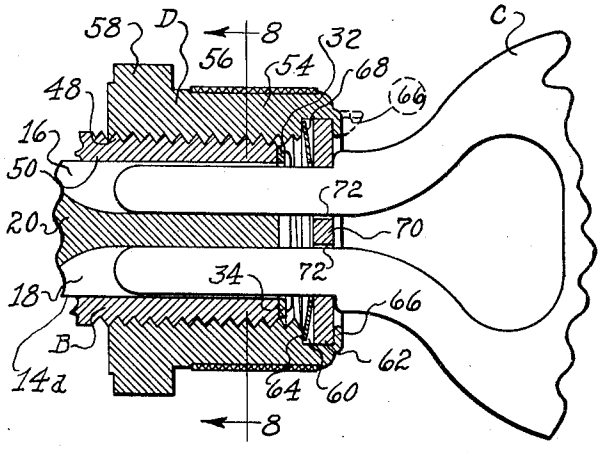


FIG. 7.

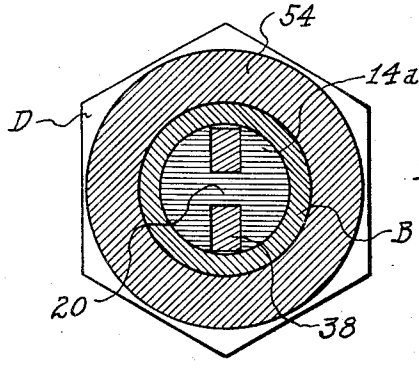


FIG. 8.

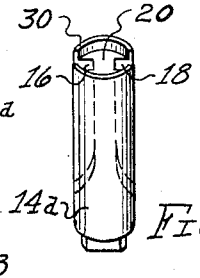


FIG. 9.

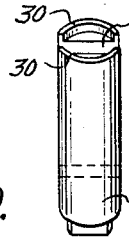


FIG. 6.

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UNITED STATES PATENT OFFICE

2,082,979

VARIABLE RESISTANCE DEVICE

Newton C. Schellenger, Elkhart, Ind., assignor to Chicago Telephone Supply Co., Elkhart, Ind., a corporation of Indiana

Application May 28, 1934, Serial No. 727,917

4 Claims. (Cl. 201—48)

My invention relates to a device wherein the resistance in an electrical circuit may be varied, and relates more particularly to a key controlled and key actuated variable resistance device.

It is an object of my invention to construct a rheostat or an adjustable resistance device which may be actuated solely by the use of a key.

Another object of my invention is to provide a key actuated variable resistance device with a rotatable shaft and to utilize a retaining or securing nut to cover or to enclose one end of the rotatable shaft, and which securing nut is constructed to prevent the operation of the shaft by the use of a blunt instrument, as for example, a screw driver.

Another object of my invention is to construct a key actuated variable resistance device in which a substantially large bearing area is provided between the key and the shaft.

Another object of my invention is to provide a key actuated variable resistance device in which a portion of the shaft itself is utilized for the prevention of any excessive movement of the shaft in one direction along its longitudinal axis.

Another object of my invention is to provide a key controlled and actuated variable resistance device in which objectionable rattling of the mechanism thereof or of the key in the lock after a long period of use will be very materially reduced if not entirely eliminated.

Other objects of my invention are to provide an improved device of the character described, that is easily and economically produced, that is sturdy in construction and which has a maximum efficiency.

Still further objects and advantages of the invention will become evident by reference to the following detailed description taken in connection with the accompanying illustrations of the specific embodiments thereof, it being understood that the scope of the invention is to be limited only as set forth in the appended claims.

In the drawing, in which the various views are illustrated considerably larger than the actual size of the invention:

Fig. 1 is a fragmentary sectional view of a variable resistance device embodying my invention;

Fig. 2 is an elevational view of a key for actuating the variable resistance device;

Fig. 3 is a perspective view of a rotatable key locating disk;

Fig. 4 is a perspective view of a spring spacing washer;

Fig. 5 is a perspective view of a securing nut showing the same at an intermediate stage of manufacture;

Fig. 6 is a perspective view of a slotted actuating shaft for the variable resistance device;

Fig. 7 is an enlarged fragmentary sectional view of a modified form of key actuated variable resistance device;

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7;

Fig. 9 is a perspective view of a grooved actuating shaft as used in the modified form of variable resistance device shown in Fig. 7.

Referring now in detail to the specific illustrations of my invention shown in the drawing, Fig. 1 shows a variable resistance device generally designated by A. The variable resistance mechanism is mounted within a cupped housing or casing 10, the open face of which is closed by a disk or base plate 12 which may be secured to the housing in any suitable manner. The variable resistance device shown in Fig. 1 is of the type disclosed in my co-pending application, Serial No. 692,665, filed October 7, 1933, to which application reference is made for the details of construction and the specific manner of mechanical arrangement of parts thereof. However, the present invention is not restricted to any particular type of variable resistance device, but the same may be easily adapted to any rotatable shaft actuated device of this nature.

A rotatably mounted actuating shaft 14 serves to operate the variable resistance device by carrying at one end thereof a securely fixed contacting arm 11. The contact arm 11 is adapted to roll or slide a contact shoe or the like (not shown) over the surface of the resistance element 13 in a well known manner to vary the effective resistance thereof. The current is conducted from the contact shoe to terminal 19 by means of the conductor 15 and collector ring 17.

One end of a mounting bushing, generally designated by B, is secured to the base plate 12 in any desired manner. I prefer to secure the bushing B to the said base plate by forming serrated teeth on a flange 52 of the bushing, passing the bushing through an opening in the base plate, placing a washer 27 on the projecting end of the bushing, and forcing the flange 52 and washer 27 toward each other with the base plate therebetween, whereby the serrated teeth will be forced into the surface of the base plate. Then the material of the bushing is swaged onto the outer surface of the washer. The end of the bushing projecting from the variable resistance device housing is provided with external threads as

shown at 48. The shaft 14 projects through and is concentrically journalled in a longitudinal bore 50 of the bushing B.

The end of the shaft 14 extending through the bushing is provided with a centrally located longitudinally extending narrow slot or keyway 21. The extreme end of the shaft is provided with arcuate flanges 30 extending longitudinally from the end of the shaft 14. These arcuate flanges 30 are adapted to project from the end of the bushing which is located externally of the housing. In order to prevent any substantial longitudinal movement of the shaft in the bushing, a small metallic washer 32 is positioned over the arcuate flanges 30 and against the end surface 34 of the bushing B. The flanges 30 are then expanded or rolled outwardly over the top surface of the washer 32 to prevent longitudinal movement of the shaft in the bushing in one direction. Any substantial longitudinal movement of the shaft in the other direction is prevented by the securely fixed contact arm 11. It will be obvious that a slight longitudinal play of the shaft in the bushing is necessary to prevent any great pressure between the contact shoe and the resistance element and to allow the shaft to rotate freely within the bushing.

The variable resistance device may be secured to a mounting panel by inserting the projecting end of the bushing B through an opening in the panel 25 and placing a securing or retaining nut D on this projecting end. The securing nut comprises a substantially cylindrical body portion 54, which is internally threaded as shown at 56 and provided with knurling on the external surface thereof. Facets 58 are formed adjacent the threaded end of the body, whereby the nut may be grasped by a suitable tool for securely tightening the same on the bushing B. The nut, opposite the facets, is provided with an internally located offset shoulder 64, and is constructed with a cylindrical flange 66 surrounding the shoulder 64 and extending longitudinally of the nut.

A bowed or dished annular spring washer 68 is positioned on the shoulder 64 on top of which is placed a disk shaped key locating member 70. The member 70 is provided with two narrow apertures or slots 72 which are adapted to be positioned over and in substantial alignment with the slot 21 in the shaft 14. The disk must have a material amount of play to prevent binding of the shaft or the key when there is a slight mis-alignment between the apertures 72 and the slot 21 of the shaft. It is primarily for this reason that the spring washer 68 is sandwiched in between the shoulder 64 and the disk 70. The cylindrical flange 66 is now rolled or swaged inwardly to engage the outer marginal portion of the locating disk 70, thereby placing a tension on the washer 68, and securing the disk 70 and spring washer 68 between the shoulder 64 and the inwardly pressed flange 66. The disk 70 and washer 68 are therefore rotatably positioned in an annular race or groove 60. The loosely fitting disk 70 is therefore prevented from rattling, or wabbling by the tension of the spring washer 68 which will permit rotation of the disk only when the key is inserted and turned.

A key, generally designated as C, for operating the variable resistance device is adapted to be inserted through the slots 72 of the disk 70 into the slotted keyway 21 of the actuating shaft 14 and to be turned to actuate the shaft. The key C, as is clearly shown in Figs. 1 and 2, has an enlarged, substantially disk-like head 36, similar to the head of an ordinary key. Extending from the head 36 are two substantially rectangular levers or prongs 38 having flat parallel sides. The prongs 38 are separated by an extended slit or notch 42. The key is made of slightly resilient material whereby the two prongs may be slightly sprung relative to each other when inserted through the slots 72 of disk 70, so that the key may be retained in the variable resistance device against retraction as by jostling from its position by a violent impact.

Shoulders 44 are formed on the key substantially at the points where the prongs are joined to the head 36. These shoulders 44 are adapted to function as stop members to limit the insertion of the key in the disk 70.

If, due to exceptional circumstances, the slots 72 of the disk are not in alignment with slot 21 of the shaft, obviously the key may be inserted through the slots 72 and turned until they are in alignment with the slot 21 at which time the prongs of the key may be inserted to their full length into the said slot 21.

In Figs. 7, 8 and 9 is shown a modified construction of the actuating shaft by use of which a key controlled variable resistance device can be made more fool-proof against tampering and operation thereof by unauthorized persons. This modified construction will furthermore permit cooperation with the key to more securely retain the latter in position in the device.

The shaft 14*a*, instead of being slotted in the manner above-described with reference to shaft 14, is provided with two diametrically opposed grooves 16, 18 extending longitudinally of the shaft 14. The shaft 14*a* is otherwise constructed identically to shaft 14 and is secured in the variable resistance device in the same manner and by the use of the same elements as shaft 14.

The shaft 14*a* is provided with a web 20 positioned between the two longitudinally extending grooves 16 and 18, which web is adapted to be engaged by the prongs 38 of the key C, as is clearly shown in Figs. 7 and 8. The grooves are of slightly wider dimensions than the thickness of the prongs 38 so that the latter may be easily inserted in the grooves. The web is preferably made slightly thicker than the slit 42 so that upon insertion of the prongs 38 of the key into the grooves 16, 18 the prongs will be spread apart to a certain extent by the web 20 so that they may engage the extreme outer end walls of the slots 72 of the disk 70.

The prongs 38 of the key C will thus be firmly engaged by both the web 20 of the shaft and the outer end walls of the slots 72 of the disk to more securely hold the key in its inserted position.

Although I have shown and described the spring-pressed key locating disk as being mounted in the securing nut which also secures the variable resistance device to a supporting panel, it is obvious that a securing nut may be provided which is entirely separated from the member supporting the locating disk. It is believed furthermore apparent that the invention may be incorporated in the rotatable shaft of similarly mounted switches or combination switch rheostat devices such as are well known in the arts.

It is to be understood that the specific embodiments of the invention illustrated and specifically described may be varied in many details of its construction within wide limits without departing from the spirit of the invention, and that the in-

vention is to be limited only within the terms of the appended claims.

I claim:

1. A key actuated circuit control device having in combination, a housing, an externally threaded bushing projecting from said housing, a shaft having a keyway therein rotatably journalled in said bushing, a securing nut cooperative with said externally threaded bushing for securing said circuit control device to a supporting member, one end of said nut overlying said keyway and having a spring pressed key locating member therein, and a key for cooperation with said keyway to actuate said shaft.

2. A key actuated circuit control device having in combination, a rotatable shaft for actuating the circuit control device, oppositely disposed, longitudinally extending grooves in said shaft, a web portion in said shaft between said grooves, a key having resiliently mounted prongs for engagement with said web portion, said web portion being of sufficient thickness to cause a resilient gripping of said web and a spreading of said prongs when engaging the same.

3. A key actuated circuit control device having in combination, a rotatable shaft for actuating the circuit control device, oppositely disposed, longitudinally extending grooves in said shaft, a web portion in said shaft between said grooves, a key locating member having slots overlying said grooves, a key having resiliently mounted prongs adapted to be projected through said slots to engage said web portion, said web portion being of sufficient thickness to cause spreading of said prongs to resiliently grip said web portion and to engage the walls of the slots in the key locating member.

4. A retaining nut for a key actuated variable resistance device comprising a substantially cylindrical internally threaded body portion, an annular race in one end of said body portion, a disk having a keyway therein positioned within said race, and facets externally positioned adjacent the other end of said body portion.

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