United States Patent

[11] 3,602,284

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[73] Assignee **Bourns, Inc.**

[54] **VARIABLE RESISTOR SCREWSHAFT RETAINER**
1 Claim, 9 Drawing Figs.

[52] **U.S. Cl.** ..... **151/69,** 85/1 K, 338/148
[51] **Int. Cl.** **F16b 43/00**
[50] **Field of Search** ..... 151/69, 41.75, 41.74; 85/1 K, 8.8; 339/263, 263 B, 263 E, 263 L, 272; 338/148; 16/38

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ABSTRACT: A potentiometer screwshaft-retaining structure in which the screwshaft comprises an annular groove adjacent the shaft head exterior of the potentiometer body, and a spring-wire clip having end portions engaged in a recessed formation in the exterior surface of the potentiometer body and engaging the screwshaft around a major portion of the periphery thereof in the annular groove and compressively engaging the body of the potentiometer to hold the clip to the body and to prevent translation of the screwshaft relative to the body.

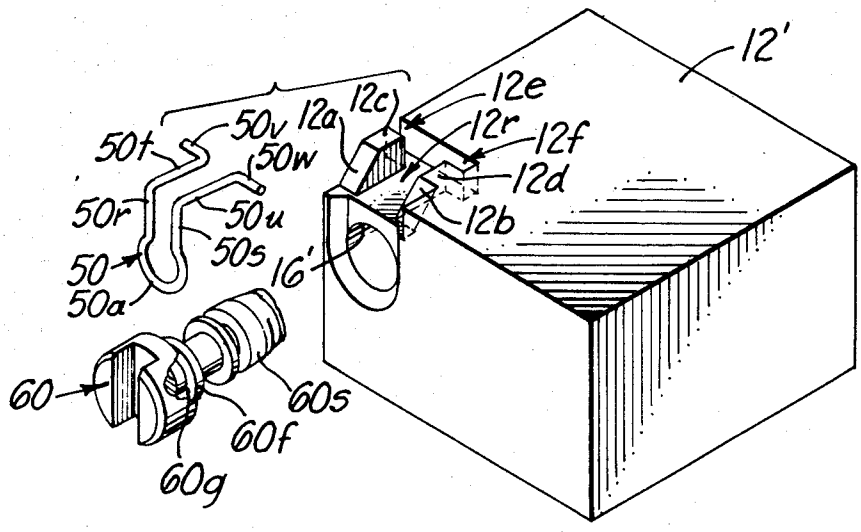


FIG. 1.

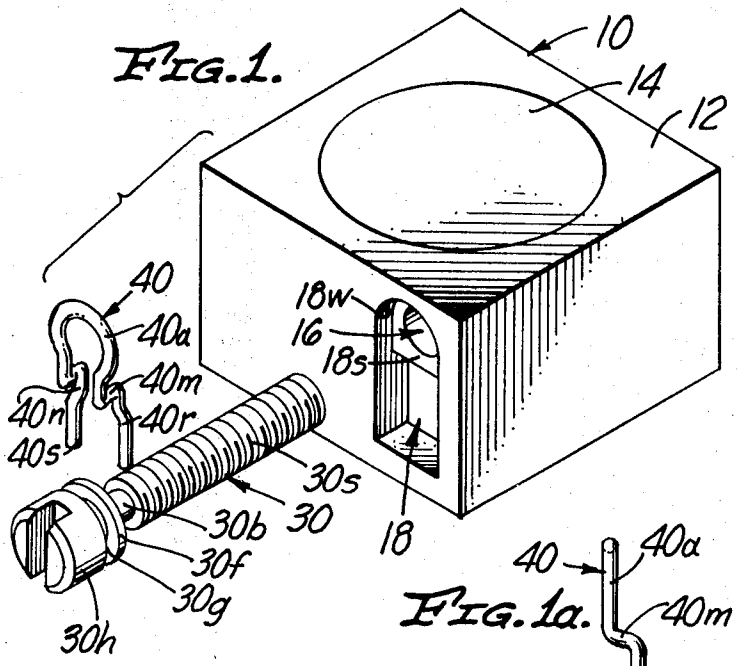


FIG. 2.

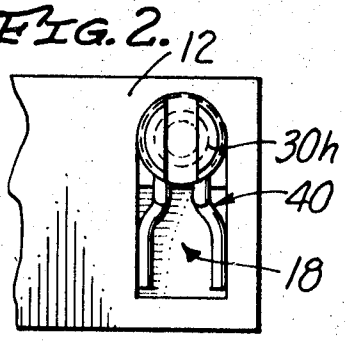


FIG. 3.

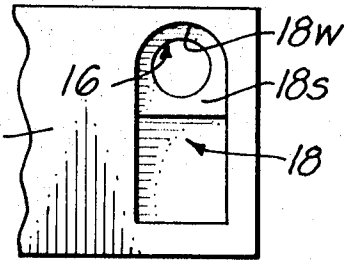


FIG. 1a.

FIG. 4.

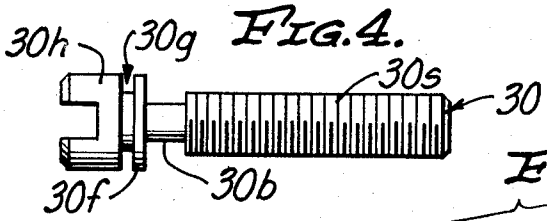


FIG. 5.

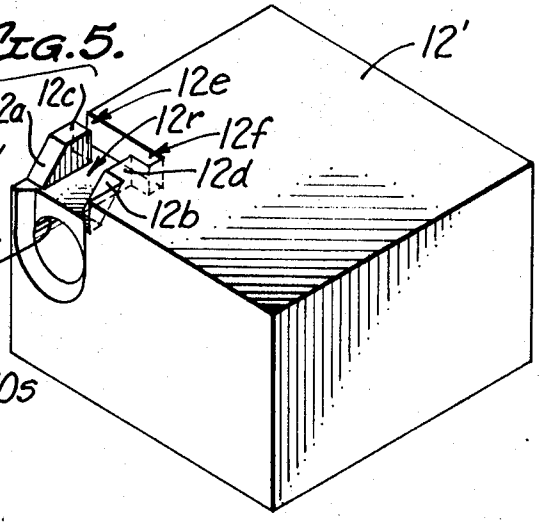


FIG. 8.

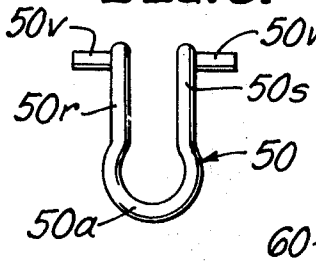


FIG. 6.

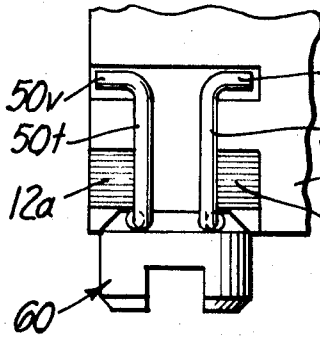
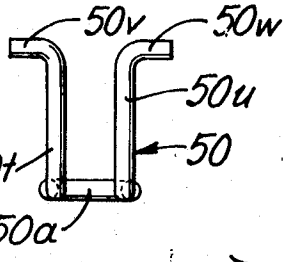


FIG. 7.



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VARIABLE RESISTOR SCREWSHAFT RETAINER

BRIEF SUMMARY OF THE INVENTION

Background of the Invention

Screwshaft-actuated variable resistors, principally in the form of adjustment potentiometers, employ as an actuating means a screw shaft which, either in the form of a lead screw or of a worm screw, is manually rotated to effect adjustment of the value of resistance made effective between two terminals of the resistor. Various means have heretofore been used to prevent endwise movement of the screwshaft after it is assembled into the body of the resistor in actuating engagement with the slider or gear of the resistor-operating mechanism, whereby undesired change of adjustment by axial movement of the shaft induced by vibration or the like is avoided. The prior art means include drive pins inserted in a hole drilled in the body and seated in an annular groove formed in the shaft, U-shaped retainer clips which are devised to straddle the screwshaft and seat in a groove therein and in a slot formed in the resistor body. All of such prior art devices are expensive to install, and require precision construction of the mating surfaces if axial translation of the screwshaft is to be reduced to an acceptable or minimum value. Additionally, such means require either destruction of the resistor body, or removal of the resistor cover, or extremely careful and delicate mechanical manipulation, for removal of the screwshaft after completion of assembly of the resistor,

Brief Description of the Present Invention

The noted undesirable features of prior art resistor screwshaft retainer schemes and means are avoided by the present invention by the provision of a wire-spring-retainer device which when in use is on the exterior of the resistor body and is under tension and thus holds itself affixed to the resistor body while permitting easy removal; and which is inexpensive to manufacture and to install and which by virtue of spring tension insures against undesired translation of the screwshaft while adding the bonus feature of providing a desired measure of countertorque to rotation of the screwshaft and hence serving as an automatic lock to prevent undesired rotation of the shaft due to vibration of the resistor. The wire spring retainer is in the form of a clip having two resilient shaped limbs or end portions each integral with an arcuate shaft-engaging portion disposed intermediate the end portions. The limbs are shaped to be stressed toward each other during installation of the retainer in a recess in the exterior of the resistor body, and to expand away from each other and compressively engage confining wall portions of the resistor body with the arcuate intermediate portion of the clip diametrally reduced and brought into snug engagement with the screwshaft.

The foregoing brief summary of the invention makes it evident that it is a primary object of the invention to provide improvements in screwshaft-retention methods and means for variable resistors. Another object is to provide resistor-screwshaft-retaining means which are readily applied to the resistor following assembly of the body including any cover, and readily removable without disassembly of the body. Another object of the invention is to provide a screwshaft retainer for variable resistors, that is easily adjustable to provide a desired brake effect on the screwshaft to which it is applied. Other objects and advantages of the invention are hereinafter set out or made evident in the appended claims and the following detailed description of a principal and a subsidiary embodiment of the invention. An exemplary simple form of clip or retainer according to the invention, and a more complex modified form, are illustrated in the accompanying drawings, in which:

FIG. **1** is a pictorial representation to no specific scale of a screwshaft-adjusted variable resistor, with the adjusting screwshaft withdrawn from the resistor body and the spring wire screwshaft retainer removed from the shaft, to show details;

FIG. **1***a* is a side view of the spring-wire screwshaft retainer shown pictorially in FIG. **1**;

FIG. **2** is a fragmentary view of an end face of the resistor depicted in FIG. **1**, showing the screwshaft and retainer in place;

FIG. **3** is a view similar to FIG. **2**, but with the screwshaft and retainer removed;

FIG. **4** is a plan view of the screwshaft depicted in pictorial view in FIG. **1**;

FIG. **5** is a pictorial view of a screw-adjusted variable resistor in the form of a potentiometer, utilizing a modified form of spring-wire retainer according to the invention, with the screwshaft and retainer disassembled and the screwshaft having portions removed or broken away;

FIG. **6** is a fragmentary top view of a portion of the variable resistor of FIG. **5**, with the screwshaft and retainer in operative positions; and

FIGS. **7** and **8** are top and end views, respectively, of the screwshaft retainer shown in FIGS. **5** and **6**.

DETAILED DESCRIPTION OF THE ILLUSTRATED STRUCTURES

In FIG. **1**, a variable resistor in the form of a worm-screw-adjusted potentiometer **10** is shown. The potentiometer comprises a box like body **12** which provides a shaped internal chamber in which operating components are disposed and which chamber is closed by a lid or cover **14**. The general arrangement of parts, except in respect of the parts shown in the drawing, is conventional and may be, for example, like or similar to that shown in one or another of U.S. Pats. Nos. 3, 3,059,200; 200; 3,108,245; 3,127,583; and 3,150,343. Mounting holes and terminal means are not herein shown since they may be of various sorts and are not per se or in combination a part of the present invention.

The body **12** of the resistor is of strong rigid material such as thermoplastic or thermosetting synthetic resin. The cover **14** may be of metal, or of strong cured polymeric material. The body is provided with a screwshaft-receiving bore **16** for reception of the shank **30***s* of the screwshaft **30**. The body further has formed in the end face adjacent and around the outer end of the bore, a shaped recess **18**. The lower portion of the recess is deep, and as is indicated in FIG. **3**, is of rectangular boxlike configuration. The upper part of the recess is less deep and is bounded at the top by a semicircular wall **18***w*.A shelf **18***s* forms a flat floor for the upper portion of the recess, against which floor an annular flange portion **30***f* of the screwshaft bears when the latter is in operating position.

As shown in FIGS. **1** and **4**, the screwshaft **30** has a threaded shank **30***s* , a transversely slotted head **30***h* the rearward end of which is annularly grooved to provide the groove **30***g* and the flange **30***f*; and, optionally, a reduced portion **30***b* is provided for reception of an elliptical ring seal which is conventional and hence is not shown.

The screwshaft **30** is adapted to be retained in operative position in body **12** for rotation to adjust the resistor, and prevented from axial translation, by the wire-spring clip or retainer **40**. The clip or retainer comprises first and second limbs **40***r* and **40***s* with respective offsets **40***m* and **40***n*, both of which limbs are integral with and join or merge with respective ends of an arcuate intermediate portion **40***a*. The limbs as formed diverge as they recede from the arcuate portion **40***a*, that is, they are spread divergently apart when free. Thus the arcuate portion may be readily mounted on the screwshaft at groove **30***g* where it is easily rotated about the shaft axis. The offsets **40***m* and **40***n* position the extremities of the limbs rearwardly of the plane of the arcuate portion. Thus, with the clip mounted on the screwshaft, the latter may be started into bore **16** and the limbs **40***r*, **40***s* forced toward each other in a compressing action into a stressed configuration indicated in FIG. **1**, and the clip pressed into recess **18**. By pressing or forcing the limbs to the bottom or inner floor of recess **18**, the shaft is carried inwardly until flange **30***f*, presses on the shelf **18***s*. Thereafter, upon release of the limbs, they tend to spread

apart due to the stress created when they were forced toward each other; and as shown in FIG. 2, compressively engage the sidewalls of recess 18 with sufficient force to prevent outward translation of the screwshaft under action of any force to which it is subjected in normal use. The clip 40, aided as may be by flange 30*f*, prevents further inward translation of the screwshaft.

For esthetic reasons, such as appearance and to preclude accumulation of dust therein, and/or to make a more permanent mounting of clip 40 to body 12, the otherwise unoccupied portion of recess 18 can be filled with potting compound, embedding the limb portions of the clip in recess 18.

In FIGS. 5, 6, 7 and 8 is illustrated a somewhat more complex form of spring wire clip or retainer 50, and appurtenant cooperating structural features including a grooved portion of a screwshaft 60 and a recess 12 *r* formed in body 12' of a variable resistor. The clip comprises an arcuate intermediate portion 50*a* adapted to fit in the groove 60*g* of the screwshaft, and two doubly-bent limbs 50*r* and 50*s* comprising reaches 50*t* and 50*u*, respectively, and feet 50*v* and 50*w*, respectively. As formed, the limbs are divergent, but may be forced toward each other into a stressed configuration as shown in FIGS. 5, 7 and 8. After application of the arcuate portion 50*a* onto the screwshaft to seat in groove 60*g*, the limbs are compressed or forced toward each other, and the screwshaft is pressed into bore 16' of the resistor body 12' in a now evident manner. As the flange 60*f* of the screwshaft approaches bore 16', the feet 50*v* and 50*w* strike inclines 12*a* and 12*b* formed on the body 12', ride up the inclines as the limbs resiliently flex, and ride over flats 12*c* and 12*d* and snap down into slots 12*e* and 12*f* respectively, of the T-shaped recess 12*r* formed as shown in the body. Thus the next-adjacent reaches 50*t* and 50*u* of the limbs move into the trunk of the T-shaped recess 12*r*, between the flats 12*d* and 12*e;* and when the clip is released the limbs move away from each other and engage the walls of the recess and firmly lock the screwshaft in position as indicated in FIG. 6, with the feet 50*v* and 50*w* engaged in the limbs of the T of the recess.

Removal of the clip for removal of the screwshaft without opening the resistor body is readily accomplished by inserting a pointed tool laterally into the bottoms of slot 12*e* and slot 12*f* and lifting the feet over flats 12*c* and 12*d* while exerting withdrawing force on the head of the screwshaft. As in the case of the first-described embodiment of retainer, the otherwise unoccupied portions of the slots and other portions of the recess 12*r* may, for the noted reasons, be filled with potting compound. The latter is not shown in the drawings in the interest of clarity of illustration.

While in the particular embodiments shown in the drawings the retainer clips are associated with variable resistors of the worm-screw-adjusted potentiometer variety, it is evident that the retainer clips described are equally applicable and useful in connection with the lead screws of lead-screw-adjusted variable resistors, since the housings or bodies of both varieties are made of the same materials and by the same processes, and are of shapes or configurations equally well adapted for provisions of the clip-receiving recesses.

We claim:

1. A variable resistor comprising

a resistor body having a bore receiving a rotatable actuating screwshaft and a T-shaped recess in the body adjacent the bore, said recess having a trunk portion parallel to said bore and slots extending transversely from the trunk and said recess having walls;

a screwshaft disposed in operative position in said bore and having an annular groove disposed adjacent the outer end of said bore and disposed generally transverse of the trunk portion of said recess; and

a spring-wire screwshaft retainer disposed outside of said body and having an intermediate arcuate portion engaging said screwshaft in the annular groove therein and having first and second doubly-bent limbs each integral with said arcuate portion and extending away therefrom to said recess and each having a reach portion disposed in the trunk portion of said recess and each of said limbs having a foot portion disposed in a respective one of said slots of said recess and compressively engaging a respective one of said walls,

whereby said retainer restrains said screwshaft against axial translation relative to said body while permitting rotation thereof and removal of the retainer and screwshaft from said body without alteration of said body.