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R. J. DE LONG ET AL

3,371,305

MOVABLE ELECTRICAL CONTACT CARRIER BLOCK FOR POTENTIOMETERS

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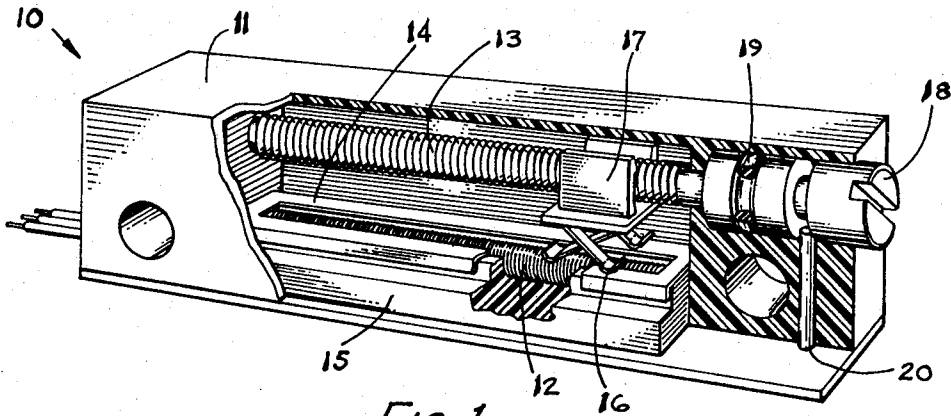


FIG. 1

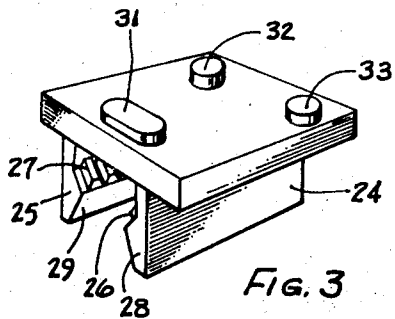


FIG. 3

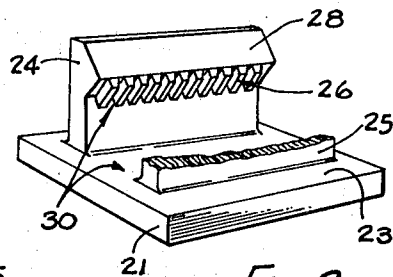


FIG. 2

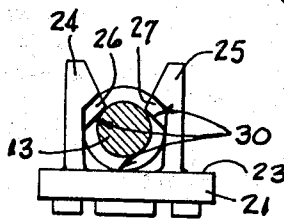


FIG. 5

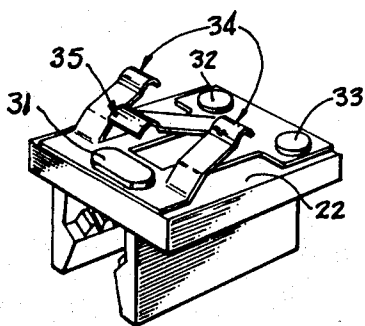


FIG. 4

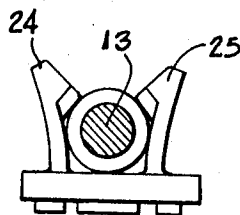


FIG. 6

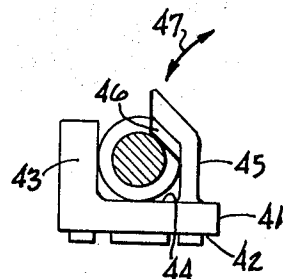


FIG. 7

Robert J. DeLong  
Robert D. Johnson  
Bud A. Paine  
INVENTORS

BY  
Hilason Robbins & Anderson

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**MOVABLE ELECTRICAL CONTACT CARRIER  
BLOCK FOR POTENTIOMETERS**

Robert J. De Long, Temple City, Robert D. Johnson,  
Pomona, and Bud A. Paine, Monterey Park, Calif., as-  
signors to Spectrol Electronics Corporation, City of In-  
dustry, Calif., a corporation of Delaware  
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**ABSTRACT OF THE DISCLOSURE**

Disclosed is a trimmer type potentiometer having a resistance element and a lead screw disposed in parallel relationship therein. A slider block engages the lead screw and moves in such a manner to carry electrical contact along the resistance element. The slider block is constructed of a molded integral unit having a flat base member with arms extending from one major phase thereof. The arms have inwardly directed ridges defining threads thereon which engage the threads in the lead screw so as to carry the slider block in the attached contacts along the resistance element. The arms are resiliently deformable in such a manner that the slider block can be snapped in place over the lead screw.

This invention relates generally to variable resistors and more particularly to lead screw actuated trimming potentiometers. More specifically, the present invention is directed to a unique construction for the movable electrical contact carrier block used in such potentiometers.

In the development of lead screw actuated trimming potentiometers, the movable electrical contact carrier blocks were first constructed by having a threaded opening longitudinally disposed through the slider block. The threaded adjusting shaft (lead screw) was threaded through this opening to obtain desired voltage ratio or resistance adjustment. It was very quickly found, however, that at the terminus of travel at each end of the internal housing formed by the potentiometer housing the movable electrical contact carrier block exerted extreme force upon the housing as the lead screw was turned, thus causing the housing to rupture leaving the potentiometer non-adjustable.

As a result of the foregoing problem, the next stage of development of such carrier blocks was to utilize a wire spring as a part of the carrier block. This wire spring was used as the portion of the contact carrier block which engaged the threads of the lead screw to cause the desired movement. The wire spring was designed in such a manner that at the terminus of travel of the carrier block the wire spring would ratchet or ride over the threads of the lead screw. Although such a construction operated quite well for the purpose intended, i.e., to eliminate the force exerted by the slider block at each end of its travel, the construction sometimes introduced backlash into the contact element thus causing difficulty during adjustment, and furthermore created some additional assembly problems. It is thought that the backlash resulted from the minimal contact between the wire and the threads of the lead screw thus causing the carrier block to be somewhat unstable.

An attempt was also made to eliminate each of the problems above referred to by going to a resilient plastic material which would grip the threads upon the lead screw without having formed threads provided therein, thus at the terminus of travel causing the carrier block to slip before rupturing the housing. It was however found that such a construction did not operate satisfactorily.

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Accordingly, it is an object of the present invention to provide a lead screw actuated trimmer potentiometer including a movable electrical contact carrier block having multiple thread engagement with the lead screw and which ratchets or idles at each end limit position or terminus within the housing.

It is another object of the present invention to provide a lead screw actuated trimmer potentiometer including a movable electrical contact carrier block which is readily assembled with the lead screw by springing a side of the carrier block as it is placed upon the lead screw, yet which eliminates backlash and thereby gives a positive travel in each direction to the electrical contact fingers which engage the resistance element within the potentiometer.

It is another object of the present invention to provide a lead screw actuated trimmer potentiometer including an electrical contact element carrier block which is extremely simple in configuration, is easy and inexpensive to manufacture and assemble, yet which is rugged and provides positive electrical contact element travel under the most adverse operating conditions.

Other and more specific objects and advantages of the present invention both as to its method of operation and its organization will become apparent from a consideration of the following description taken in conjunction with the accompanying drawing which is presented by way of example only and is not intended as a limitation upon the scope of the claims appended hereto and in which:

FIGURE 1 is a perspective view partially cut away illustrating an assembled lead screw actuated potentiometer embodying an electrical contact element carrier block constructed in accordance with the present invention;

FIGURE 2 is a perspective view, partially cut away, illustrating some of the features of an electrical contact element carrier block constructed in accordance with the present invention;

FIGURE 3 is a bottom perspective view of the electrical contact element carrier block in accordance with the present invention;

FIGURE 4 is a view similar to FIGURE 3 but having the electrical contact element affixed in place;

FIGURES 5 and 6 are end views of an electrical contact carrier block constructed in accordance with the present invention in place upon the lead screw and illustrating the two extreme positions of the carrier block during adjustment of the resistance of the potentiometer; and

FIGURE 7 is an end elevational view of a modified form of carrier block constructed in accordance with the present invention.

An electrical contact carrier block constructed in accordance with the present invention is adapted for use in a potentiometer having a lead screw and a resistance element disposed in parallel positions within a housing. The carrier block is constructed of electrically non-conductive material and includes a base member having the contact element affixed to and extending from one side thereof and a pair of resiliently deformable arm members affixed to and extending from the other side thereof. The two arm members extend around the lead screw more than 180° but less than 360° and have opposed threaded surfaces which engage the lead screw threads. The two resiliently deformable arms, at each terminal end of travel of the carrier block, ride over the threads of the lead screw by springing outwardly and then return to a position such that the threads on the arm members and the lead screw are in mated engagement.

Referring now to the drawing and more particularly to FIGURE 1 thereof, a potentiometer of the lead screw actuated type is shown generally at 10 and includes a housing 11 having a resistance element 12 and a lead

screw 13 disposed in parallel longitudinal relationship within the housing. An electrical return element or collector bar 14 is disposed upon the base 15 of the housing 11. The electrical contact element 16 is mounted upon a carrier block 17 the construction of which will be more fully described below. The lead screw 13 terminates in a slotted head 18 for purposes of rotating the lead screw 13 to cause the carrier block 17 to travel therealong. Such travel effects adjustment of the potentiometer by moving the contact element fingers along the resistance element 12 and collector bar 14 as is well known in the art. An O ring 19 is utilized to seal the interior of the potentiometer from contaminants that may be contained in the ambient atmosphere while a pin member 20 is utilized to preclude longitudinal movement of the lead screw 13 within the housing 11.

The remainder of the detailed construction and operation of a lead screw actuated potentiometer is well known in the prior art and further explanation thereof is not deemed necessary at this point. The present invention is primarily directed to the electrical contact carrier block 17 illustrated in more detail in FIGURES 2 and 3, to which reference is hereby made.

As is shown, the carrier block includes a base member 21 having a first major surface 22 and a second major surface 23. Extending from the second major surface 23 are a pair of resiliently deformable arm members 24 and 25 (the bulk of the arm member 25 being removed in FIG. 2 for clarity of illustration). Preferably the base 21 and the resiliently deformable arms 24 and 25 are formed of electrically non-conductive material such as fiberglass filled nylon or other plastic. On the internal surface of each of the outwardly extending resiliently deformable arms there is provided a row of threads 26 and 27 respectively. As is illustrated, the threads are in opposed relationship with each other and face somewhat downwardly toward the second major face 23 of the base member 21. It should also be noted that the row of threads 26 and 27 is in each instance formed upon an elongated ridge 28-29 respectively having surfaces directed towards the second major face (this relationship is more clearly seen in FIG. 5). It should become apparent at this point that when the carrier block is in position upon the lead screw 13 of the potentiometer as illustrated in FIGURE 1, there are only 3 areas of contact therebetween. Such areas of contact are the threads 26 and 27 along the resilient arms 24 and 25 respectively, and an area which is disposed intermediate and midway between the arms 24 and 25 and which extends longitudinally along the second major face of the base member 21. Such 3 contact areas are designated at 30 and are clearly seen in FIGURES 2 and 5.

Extending outwardly from the first major face 22 of the base member 21 (more clearly seen in FIG. 3) are 3 protrusions 31, 32 and 33. These 3 protrusions cooperate with openings provided in the movable electrical contact 16 to retain the contact 16 rigidly affixed to the first major face 22 and extending outwardly therefrom so that positive electrical contact can be made to the resistance element and the collector bar as above described. As is shown specifically and more particularly in FIGURE 4 the contact 16 is fitted upon the first major face 22 of the base member 21 in such a manner that the protrusions 31 through 33 extend through openings provided therein. The three protrusions 31 through 33 are then deformed as by application of heat thereto to rigidly affix the contact 16 in place. In this manner a pair of electrical contact fingers 34 are provided to engage each side of the collector bar 14 as shown in FIGURE 1 while an additional electrical contact finger 35 is provided to engage the resistance element 12 as shown in FIGURE 1.

Referring now more particularly to FIGURES 5 and 6, the operation of the electrical contact carrier block is more clearly illustrated. As is seen in FIGURE 5 the resiliently deformable arms 24 and 25 have the threads 26 and 27 respectively thereof in engagement with the threads

on the lead screw 13 as shown at 30. The lead screw 13 is also in engagement at a tangent thereof with the area intermediate the arms 24 and 25 along the second major face 23 of the base 21. The arms 24 and 25 as shown in FIGURE 5 are in a position such that the threads 26-27 thereof are in mating engagement with the lead screw threads. In this position, the contact herein is caused to move along the lead screw 13 as it is rotated at any point other than at each end limit position of travel thereof.

Assuming now that the carrier block 17 as shown in FIGURE 1 is at either end limit position of its travel along the lead screw 13 in such a manner that it is abutting the housing. Under these circumstances, if the lead screw 13 is rotated the threads 26-27 on the resiliently deformable arms 24-25 are caused to ride over the threads on the lead screw 13 until in their maximum outward position the arms 24-25 are as illustrated in FIGURE 6. As the lead screw 13 is further rotated, the arms 24-25, due to their being resiliently deformable, return to the position shown in FIGURE 5. This operation continues so long as the lead screw 13 is turned in the same direction. At each turn of the lead screw the arms 24-25 reciprocate outwardly to the position of FIGURE 6 and then back inwardly to the position illustrated in FIGURE 5. Although no damage is being imparted to the potentiometer, electrical adjustment is not being made and rotation of the lead screw should be reversed.

A carrier block in accordance with the present invention may include only one resiliently deformable arm having threads thereon which engage the threads of the lead screw. Such a carrier block is illustrated in FIGURE 7 to which reference is now made. As is therein shown, a base member 41 has a first major face 42 to which an electrical contact is affixed and extends outwardly therefrom as above described. A rigid arm 43 extends upwardly from a second major face 44 of the base member 41. A resiliently deformable arm 45 also extends upwardly from the second major face 44 of the base 41 and is in opposed relationship to the rigid arm 43. Formed on an internal downwardly directed surface of the arm 45 is a row of threads 46 which cooperatively engage the threads on the lead screw 13. When the carrier block as shown in FIGURE 7 is at an end limit of travel, the arm 45 reciprocates as is indicated by the arrow 47 to cause the threads 46 to ride over the threads on the lead screw 13.

There has thus been disclosed a carrier block for a movable electrical contact for a lead screw actuated potentiometer which provides multiple thread engagement with a lead screw thereof and which rides over or idles at each end limit position thereof, yet which has no backlash, which is simple and inexpensive to manufacture and assemble and which is rugged of construction. Although the movable electrical contact carrier block of the present invention has been disclosed and described in some detail with respect to two separate embodiments thereof, such is not intended as a limitation upon the scope of the present invention as is defined in the appended claims.

What is claimed is:

1. In a potentiometer having a parallel disposed resistance element and threaded lead screw within a housing, an electrical contact carrier block comprising:
  - an electrically non-conductive base member having first and second major faces;
  - an electrically conductive contact element affixed to and extending from said first major face of said base member; and
  - a pair of resiliently deformable arm members formed of electrically non-conductive material integrally with said base member and disposed in opposed relationship on said second major phase of said base member, said arm members extending around said lead screw more than one-hundred-eighty degrees but less than three-hundred-sixty degrees, each of said arm members including an elongated ridge having a surface thereon directed toward said second

major phase, said surface having threads formed thereon for engagement with said lead screw.

2. A contact carrier block as defined in claim 1 in which said threads on said ridges and an area intermediate and midway between said arm members on said second major face and extending longitudinally therealong are the only areas of engagement between said carrier block and said lead screw. 5

## References Cited

## UNITED STATES PATENTS

|           |        |                     |           |
|-----------|--------|---------------------|-----------|
| 2,870,302 | 1/1959 | Bourns et al. ----- | 338—202 X |
| 2,873,337 | 2/1959 | Bourns et al. ----- | 338—180   |

ROBERT K. SCHAEFER, *Primary Examiner.*

H. J. HOHAUSER, *Assistant Examiner.*