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LEAD SCREW OPERATED POTENTIOMETER

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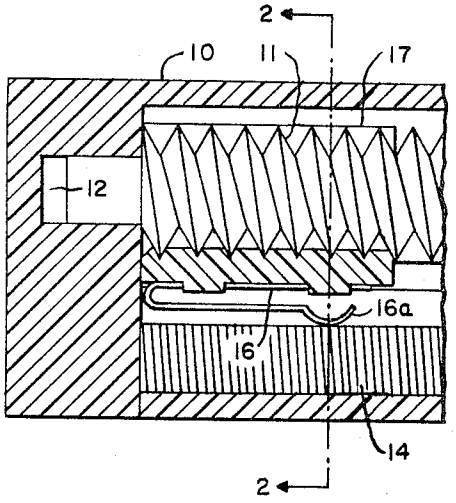


FIG. 1

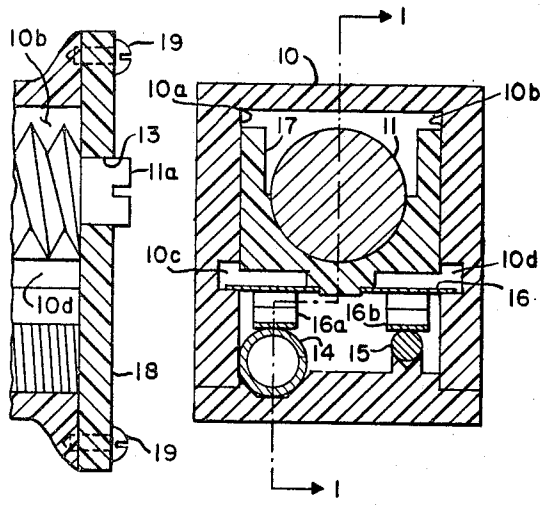


FIG. 2

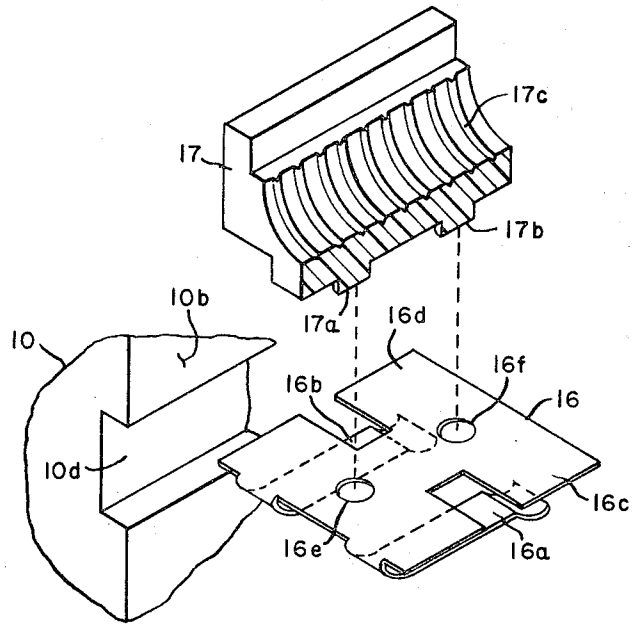


FIG. 3

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LEAD SCREW OPERATED POTENTIOMETER

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ABSTRACT OF THE DISCLOSURE

A lead screw operated potentiometer comprises a housing having a longitudinal cavity with the side walls forming guide surfaces. In the cavity are disposed an elongated resistance element, a longitudinally movable carriage carrying a resilient contact U-shaped in cross-section, and a lead screw. The lead screw engages complementary threads or grooves in the carriage extending only for 180° or less. As the lead screw is rotated, it exerts a downward camming action on the carriage, biasing the contact into engagement with the resistance element. In the event it is attempted to drive the carriage beyond its limit of travel, the lead screw cams the carriage out of engagement with its threads against the resilience of the contact element, thereby constituting an automatic overload release clutch.

Background of the invention

This invention relates to lead screw operated potentiometers and particularly to such potentiometers of the type in which a resilient contact element serves both to bias its carriage into engagement with the lead screw and to act as an overload release clutch.

There have heretofore been marketed and proposed numerous lead screw potentiometer mechanisms. In general, these have comprised some form of carriage positively engaging the lead screw for axial movement upon its rotation and a resilient contact element supported by such carriage for engaging a resistance element disposed parallel to the lead screw. Due to the positive engagement of the contact carriage and the lead screw, the device is subject to damaging in the event longitudinal movement of the contact carriage is jammed or obstructed, for example by an attempt to move it beyond its limit of travel.

It is an object of the invention, therefore, to provide a new and improved lead screw operated potentiometer which obviates the above-mentioned disadvantage of prior devices of this type.

It is another object of the invention to provide a new and improved lead screw operated potentiometer in which the contact carriage is biased into engagement with the lead screw by the contact element so that it serves as an overload release clutch.

Summary of the invention

In accordance with the invention, there is provided a lead screw operated potentiometer comprising a housing member for containing the operative elements of the potentiometer and including two opposed parallel guide surfaces having opposed longitudinal guide slots, a lead screw rotatably mounted within the housing parallel to its guide surfaces and including a portion accessible from the exterior of the housing for rotating the same, a resistance element supported in the housing parallel to the lead screw, a resilient sliding contact engaging the resistance element and having lateral extensions riding in the guide slots of the parallel guide surfaces, and a carriage for the contact having longitudinal and transverse sliding engagements with the parallel guide surfaces and having a plurality of transverse grooves complementary to substantial portions of the threads of the lead screw and engaging the same over a substantial arc not greater than 180° facing the resistance element, whereby the resilient contact serves to bias the carriage into engagement with the lead screw and to permit disengagement therefrom if it is attempted to drive the carriage beyond its limit of travel, thus forming an automatic overload release clutch. The term 'potentiometer" is used herein and in the appended claims in accordance with its ordinary trade usage, referring to a resistance element with a sliding contact.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description, taken in connection with the accompanying drawing, while its scope will be pointed out in the appended claims.

Referring now to the drawing:

FIG. 1 is a longitudinal view, partly in section, of a lead screw operated potentiometer embodying the invention, the sectionalized portions being taken along the line 1—1 of FIG. 2;

FIG. 2 is a cross-sectional view of the potentiometer of FIG. 1 along the line 2—2; while

FIG. 3 is an exploded perspective view, partly broken away, of the contact assembly of the potentiometers of FIGS. 1 and 2.

Referring now more particularly to FIGS. 1 and 2 of the drawing, there is represented a lead screw operated potentiometer embodying the invention comprising a housing member **10** for containing the operative elements of the potentiometer and including two opposed parallel guide surfaces **10***a*, **10***b* having opposed longitudinal guide slots **10***c* and **10***d* formed therein. A lead screw **11** is rotatably mounted in the housing member **10** as in sleeve bearings **12** and **13**. As shown in FIG. 2, the lead screw is disposed parallel to the guide surfaces **10***a*, **10***b* and includes a portion **11***a*, such as an extension of the root diameter of the lead screw, provided with a screwdriver slot accessible from the exterior of the housing for rotating the lead screw.

The potentiometer of the invention further comprises an elongated resistance element **14**, shown in the form of a wire-wound element, supported in the housing member **10** parallel to the lead screw. The potentiometer further includes an elongated contact element **15**, shown in the form of a conductive rod, supported in the housing parallel to the resistance element **14**.

The potentiometer further comprises a resilient sliding contact element **16** including a pair of extending resilient arms **16***a* and **16***b*, the arm **16***a* engaging the resistance element **14** and the arm **16***b* engaging the contact element **15**. The element **16**, with its arms **16***a* and **16***b*, has a U-shaped cross-section, as indicated. The contact element **16** also has lateral extensions **16***c* and **16***d* which ride in the guide slots **10***c* and **10***d*, respectively. The main portion of the contact element **16** is provided with a pair of holes **16***e* and **16***f* for a purpose described hereinafter.

The potentiometer of the invention further comprises a carriage **17** for the contact element **16** and having a pair of protrusions **17***a* and **17***b* for detachably engaging the holes **16***e*, **16***f*, respectively, of the contact element **16**. As shown more clearly in FIG. 3, the carriage **17** is of approximately U-shaped cross-section, the outer arms of which have longitudinal sliding engagements with the guide surfaces **10***a*, **10***b* of the housing member **10**. The carriage **17** has a plurality of transverse grooves or threads **17***c* in the base of the U, substantially complementary to and engaging substantial portions of the threads of the lead screw **11** over a substantial arc not greater than 180°, and preferably approximately 180°, on the side of the lead screw **11** facing the resistance element **14**.

As shown more clearly in FIG. 1, the grooves or threads

in the carriage **17** engage substantial portions of the threads of the lead screw **11** but not the entire threads as in an ordinary, threaded engagement. The potentiometer will also be provided with conventional external electrical terminals connected to the contact rod **15** and to the terminals of the resistance element **14** (not shown). As shown, the carriage **17** is of insulation material but if it is permissible that the head **11***a* of lead screw **11** be at the potential of the sliding contact **16**, the carriage **17** may be of a conductive metal and the lead screw **11** used as the electrical connection to the contact **16**, in which case the contact rod **15** may be omitted. An enclosing cap **18** is secured to the end of the housing member **10** as by suitable screws **19** to retain the parts in their assembled positions.

It is believed that the operation of the lead screw operated potentiometer of the invention will be apparent from the foregoing description. In brief, rotation of the lead screw **11** by its extension **11***a* causes the carriage **17** and the contact element **16** to move longitudinally, varying the amount of the resistance between the contact **16***a* and the terminals of the resistance element **14** in a conventional manner. During this movement, the outer faces of the U-shaped carriage **17** slide along the guide surfaces **10***a*, **10***b* of the housing member. In FIG. 1, the parts are shown with the carriage **17** and contact **16** at their extreme left-hand positions. If, now, it were attempted to move these elements still further to the left by further rotation of the lead screw **11**, the camming action of the lead screw on the threads or grooves of the carriage **17** would force it downwardly against the bias of the extensions **16***c* and **16***d* of resilient contact element **16** which bear on the lower faces of the guide slots **10***c* and **10***d*, respectively, as shown in FIG. 2, disengaging the lead screw from the carriage **17**. During this movement, the outer surfaces of the carriage **17** would slide vertically along the guide surfaces **10***a*, **10***b*, that is, transverse to the normal sliding movement.

The lead screw operated potentiometer described has a number of distinct advantages over prior devices of this type. The carriage **17** can be readily molded from a thermosetting resin since the threads **17***c* do not extend over 180° of arc so that the upper half of the threads are completely open. Further, the carriage **17** engages the lead screw with a plurality of threads over approximately 180° of arc, thereby reducing and distributing wear and assuring long life and reliability. This construction is to be contrasted with some prior designs in which a single wire or bail on the carriage engages a single thread of the lead screw. The camming action of the threads of the lead screw on the grooves of the carriage **17** is such as to assist in biasing the contacts **16***a*, **16***b* into engagement with the resistance element **14** and the contact **15**, respectively, assuring positive electrical contacts. Moreover, as described above, the carriage **17** and contact element **16** serve as an overload release clutch, preventing damage to the device.

While there has been described what is, at present, considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein, without

departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A lead screw operated potentiometer comprising:
a housing member for containing the operative elements of the potentiometer and including two opposed parallel guide surfaces having opposed longitudinal guide slots;
a lead screw rotatably mounted within said housing parallel to said surfaces and including a portion accessible from the exterior of said housing for rotating the same;
a resistance element supported in said housing parallel to said lead screw;
a resilient sliding contact engaging said resistance element and having lateral extentions riding in said guide slots;
and a carriage for said contact having longitudinal and transverse sliding engagements with said surfaces and having a plurality of transverse grooves complementary to substantial portions of the threads of said lead screw and engaging the same over a substantial arc not greater than 180° facing said resistance element;
whereby said resilient contact serves to bias said carriage into engagement with said lead screw.

2. A lead screw operated potentiometer comprising:
a housing member for containing the operative elements of the potentiometer and including two opposed parallel guide surfaces;
a lead screw rotatably mounted within said housing parallel to said surfaces and including a portion accessible from the exterior of said housing for rotating the same;
a resistance element supported in said housing parallel to said lead screw;
a resilient sliding contact engaging said resistance element and including a plurality of holes;
and a carriage including a plurality of protrusions detachably engaging said holes in said sliding contact to actuate the same, having longitudinal and transverse sliding engagements with said surfaces and having a plurality of transverse grooves complementary to substantial portions of the threads of said lead screw and engaging the same over a substantial arc not greater than 180° facing said resistance element;
whereby said resilient contact serves to bias said carriage into engagement with said lead screw.

References Cited

UNITED STATES PATENTS

2,926,324	2/1960	Barden et al.	338—180
3,187,289	6/1965	Rolwes	338—180
3,238,488	3/1966	Laugenbach et al.	338—180

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