

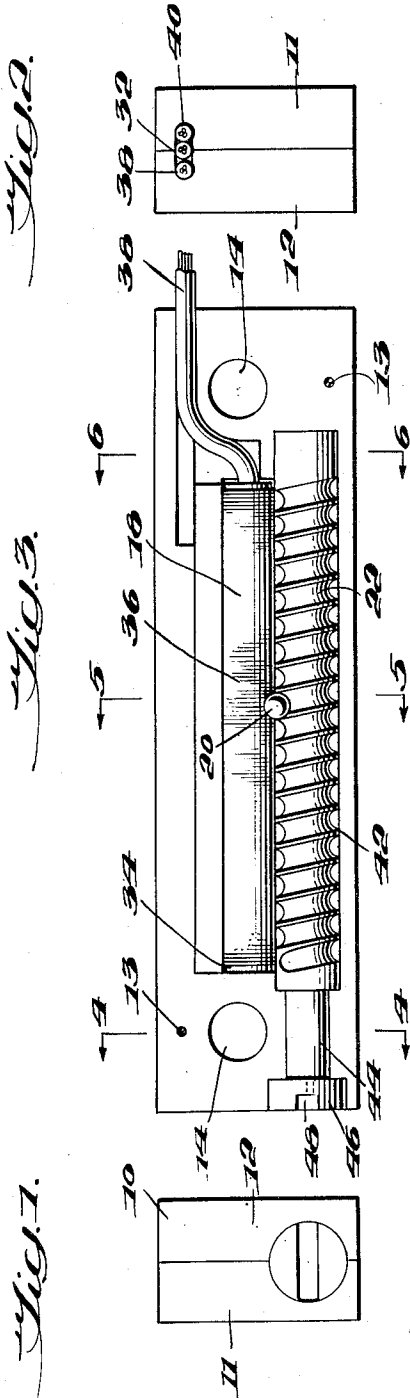
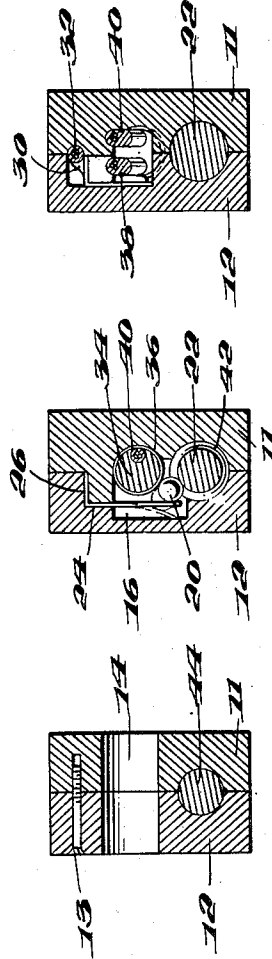
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ADJUSTABLE RESISTOR WITH SCREW-ACTUATED WIPER

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ADJUSTABLE RESISTOR WITH SCREW-ACTUATED WIPER

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7 Claims. (Cl. 201—62)

This invention relates to an adjustable resistor, and particularly to an adjustable resistor in which the wiper is driven by a screw threaded rod along the length of an elongated resistance element.

Adjustable resistors or potentiometers are widely used in applications where it is impossible or uneconomical to build the required degree of accuracy and stability into an electrical circuit using fixed elements. Moreover, the use of adjustable resistors permits compensation for manufacturing tolerances in associated circuitry, changes in operating conditions, and the like.

Because a large number of these trimming adjustable resistors are frequently required in a complex circuit, the mechanical design of the resistors has become quite important, and an effort has been made to make the design very simple and inexpensive to manufacture. Further, the external configuration has been made rectangular so that a number of these trimming resistors can be stacked so as to occupy as small a space as possible.

In miniature adjustable resistors of the type described in which the wiper has a rectilinear motion, the extent of movement of the wiper, between the limits of the ends of the resistance element, is normally very small, that is, approximately one inch or less. Since the operating parts are normally concealed, it is necessary to provide some means for indicating that the limits of the movement of the wiper have been reached. Such an indicating arrangement becomes critically important where the wiper is driven by a rotatable plastic screw, as in the present invention. If no such means are provided, the operator runs the risk of shearing the screw at its weakest point when the limit has been reached, or the operator might continue to turn the screw, without breaking it, but without obtaining further adjustment of the resistance value.

It is therefore an object of the invention to provide a miniature trimming adjustable resistor which has means for indicating when the wiper has reached the limits of its movement.

It is a further object of the invention to provide an adjustable resistor as described above in which the indicating means provide a clicking which can either be felt or be heard when the limit of movement has been reached.

It is yet another object of the invention to provide an adjustable rheostat in which the wiper consists of a ball driven by a plastic rod having a helical groove therein, with means to permit the ball to ratchet with respect to the grooved rod when the limit of movement has been reached.

These and other objects may become more readily apparent from a consideration of the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is an end elevational view of one end of the resistor,

Fig. 2 is an end elevational view of the other end of the resistor,

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Fig. 3 is an elevational view with one half of the casing and the spring removed,

Fig. 4 is a cross-sectional view taken along lines 4—4 of Fig. 3,

Fig. 5 is a cross-sectional view taken along lines 5—5 of Fig. 3, and

Fig. 6 is a cross-sectional view taken along lines 6—6 of Fig. 3.

The operating parts of the adjustable resistor are housed in a casing 10 which is divided into two parts 11 and 12, respectively. The two parts are joined by screws 13 or other fastening means such as an adhesive so as to form a casing which is substantially rectangular in section to facilitate the stacking of one resistor on top of another. In addition, holes 14 are provided at either end of the casing to receive a rod or bolt which may be used to clamp the resistor in the desired position on the chassis of the device with which the resistor is used.

Internally, the casing is formed with a cavity 16 which receives a resistance wound mandrel 18 contacted by a metallic, electrically conducting ball, the ball being drivable along the length of the mandrel by a rotatably mounted screw 22. A bent strip of electrically conducting spring metal 24, parallel to and substantially equal in length to the mandrel, is clamped at one of its edges 26 between the two parts 11 and 12 of the casing, and its other edge engages the ball 20. The spring 24 spring loads the ball 20 into engagement with the mandrel 18 and the screw 22 and at the same time provides an electrical contact with the ball 20. As shown in Fig. 6, the end 26 of the spring 24 is soldered or otherwise electrically connected at 30 to a conductor 32 which extends outside of the casing 10.

The design of the resistance element of the invention is subject to considerable variation and forms no part of the invention. In this embodiment, it consists of a plastic or ceramic tube 34 wound along the major portion of its length with an insulated wire 36 connected at either end to conductors 38 and 40 which extend out of the housing 10. The conductor 40 is connected to the left hand end of the resistance element wire, as viewed from Fig. 3, and passes through the tubing as shown in Fig. 5.

The screw 22 which drives the ball 20 may be constructed of plastic and is formed with a helical groove 42 having a depth sufficient to cause a perceptible indication that the ball is rising out of and dropping back into the groove when it has been driven to the end thereof. In the described embodiment the depth is approximately one-fourth the diameter of the ball. The left end of the screw is formed with a shank 44 to which is attached a head 46 having a slot 48 therein, the head being seated in a recess in casing 10. The slot 48 may be engaged by a screwdriver or the like to rotate the screw 22 to thereby drive the ball along the length of the resistance wire 36, and thus constitutes the adjusting mechanism in the particular embodiment of the invention shown in the drawings.

It will be noted that all of the operating elements of the potentiometer are retained in their required positions in the casing and with respect to each other by the clamping of casing part 11 to casing part 12. When thus clamped together, the cavity 16 is large enough to permit ball 20 to ride out of groove 42 to the position shown in the broken lines of Fig. 5. This operation is further permitted by utilizing a contact spring 28 which is sufficiently strong to maintain good electrical contact between the spring and ball and the ball and resistance element, while at the same time enabling the ball to be forced out of the end of groove 42 without unduly straining the screw 22.

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Electrically, the operation of the adjustable resistor is similar to the operation of known resistors of this type. Mechanically, however, an important difference arises when the ball reaches either end of groove 42, which is the extent of the resistance element 36 of the device. At these points, the flexibility of the spring 24 and the size of the cavity permits the ball to ride out of the groove, while maintaining its engagement with the resistance element 36, and, upon continued rotation of the screw, the ball drops back into the groove 42. This action is repeated as the screw is rotated, providing a ratcheting which can be heard or felt by the operator so as to advise him that the limit of adjustability in one direction has been reached. Further adjustment can be made only by rotating the screw in the opposite direction to reverse the direction of the wiper.

In a general manner, while there has been disclosed in the above description what is deemed to be the most practical and efficient embodiment of the invention, it should be well understood that the invention is not limited to such embodiment, as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What is claimed as new is:

1. An adjustable resistor comprising an elongated casing having a longitudinal cavity extending through a major portion of said casing, a screw threaded rod rotatably mounted in said cavity, a wire wound mandrel mounted in said cavity parallel to said rod, an electrically conducting ball wiper lying in the groove in said rod and contacting the wire on said mandrel, a metallic spring mounted in said casing and urging said ball into engagement with said spring, and means at either end of said casing permitting said ball to ratchet with respect to said screw to provide a perceptible indication that the limit of movement of the wiper has been reached.

2. An adjustable resistor according to claim 1 in which said last-named means comprises means forming a space at either end of said cavity permitting said ball to rise out of said screw thread.

3. An adjustable resistor comprising an elongated casing having a longitudinal cavity extending through a major portion of said casing, a rod rotatably mounted in said casing and extending through said cavity, said rod

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having a ball-receiving helical groove, an elongated electrical resistance element disposed in said cavity parallel to said rod and having at least a portion thereof exposed along its length for electrical contact by a ball wiper, an electrically conducting ball normally located in said groove and contacting the exposed portion of said resistance element, an elongated sheet metal spring anchored in said casing and urging said ball in contact with said groove and resistance element, said cavity having, at either end of said rod, sufficient space to permit said ball to move out of said groove, and means blocking longitudinal movement of said ball to cause ratcheting of said ball with respect to said groove upon rotation of said rod.

4. An adjustable resistor comprising an elongated resistance element, an electrically conducting ball wiper engaging said element, a rotatable rod having a helical groove for receiving said ball and propelling said ball in the longitudinal direction upon rotation of said rod, said groove having a depth of at least one-fourth the diameter of said ball, a spring biased electrical conducting member urging said ball into engagement with said element and said rod, and means blocking axial movement of said ball beyond the ends of said groove while permitting said ball to ratchet into and out of said groove upon rotation of said rod.

5. An adjustable resistor according to claim 3, in which said casing is rectangular in section comprising two halves having grooves formed therein for receiving and holding firmly in position said spring, said resistance element and said rod.

6. An adjustable resistor according to claim 4, in which said ball maintains contact with said resistance element during said ratcheting.

7. An adjustable resistor comprising an elongated resistance element, a wiper engaging said element, a rotatable mechanism for driving said wiper along said element, and means for perceptibly indicating that said wiper has reached either end of said element while the rotation of said mechanism is continued.

References Cited in the file of this patent

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