United States Patent

[11] 3,588,779

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[45] Patented June 28, 1971
[73] Assignee Globe-Union Inc.
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[54] LINEAR MOTION VARIABLE RESISTANCE CONTROL
8 Claims, 5 Drawing Figs.

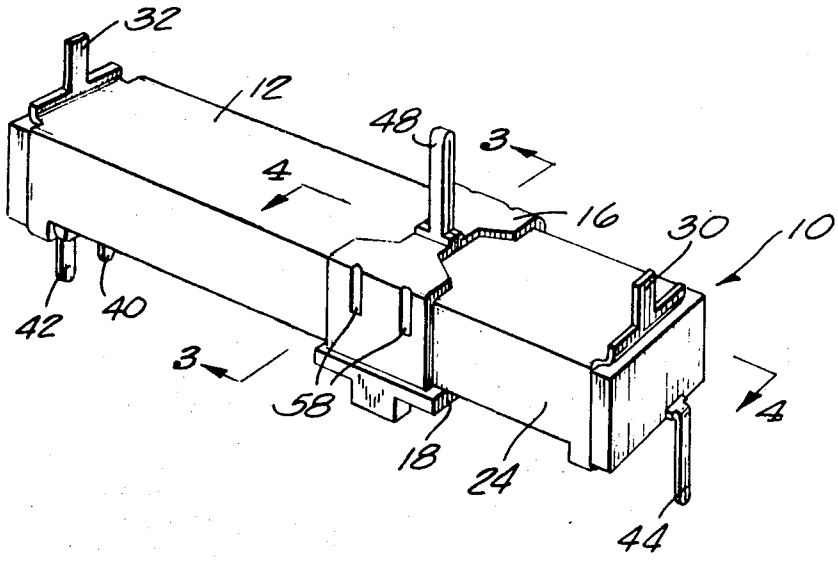
[52] U.S. Cl. 338/183, 338/184
[51] Int. Cl. H01c 9/02
[50] Field of Search 338/183, 176, 184, 178, 179, 180, 181, 182, 199

[56] References Cited
UNITED STATES PATENTS

2,242,327	5/1941	Rubenstein	338/183
3,412,361	11/1968	Lovejoy et al.	338/183X

Primary Examiner—Lewis H. Myers
Assistant Examiner—D. A. Tone
Attorneys—John Phillip Ryan, Glenn A. Buse', Donald D. Denton and David T. Terry

ABSTRACT: The channel-shaped housing of a linear motion variable resistance control is provided with a closed or unslotted top wall and a dielectric base, to which the resistant and conductive elements are mounted, is disposed in the housing so as to define parallel, elongated openings between the housing sidewalls and the longitudinal edges of the base. A carrier block carrying the bridging contact is provided with side members which extend through these openings and a slider, guided by the exterior of the housing, is operably attached to at least one of the carrier block side members.



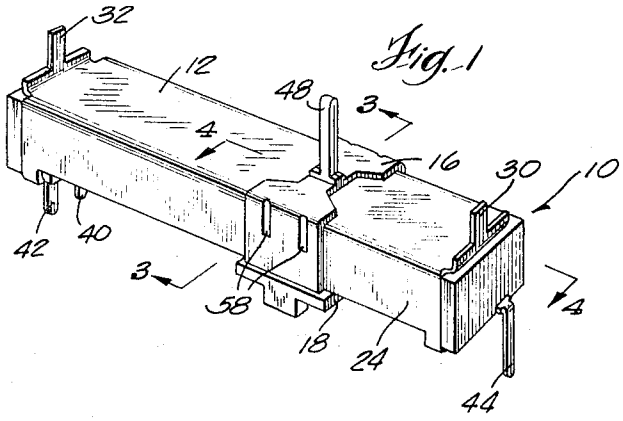


Fig. 1

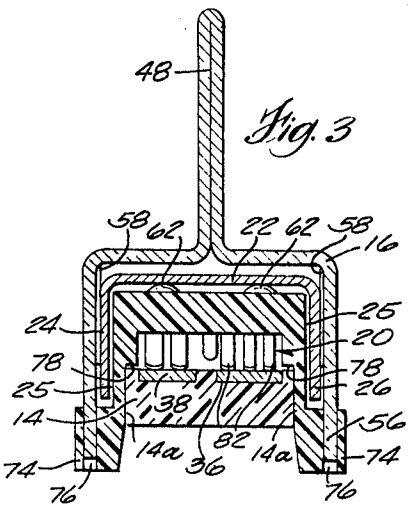


Fig. 3

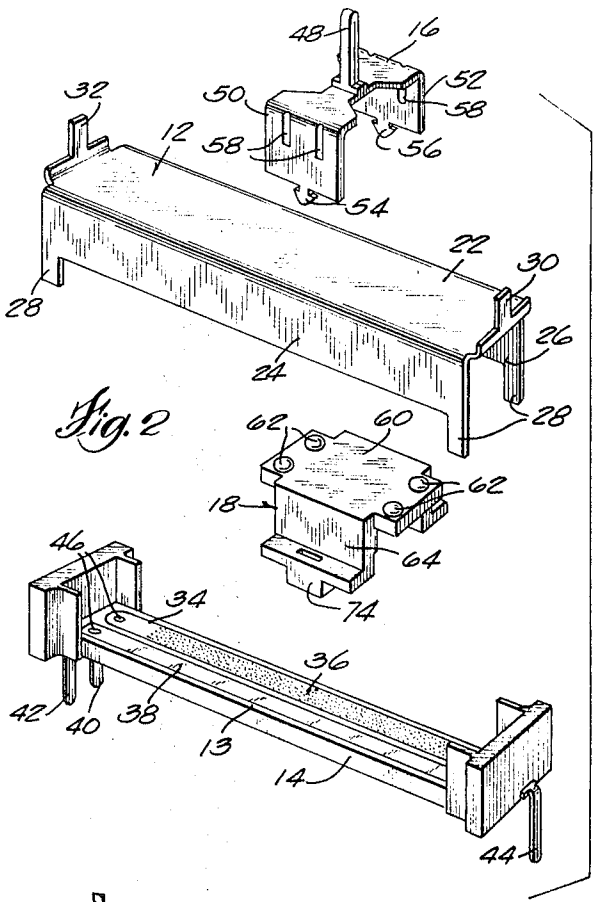


Fig. 2

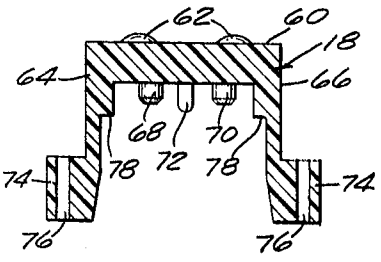


Fig. 5

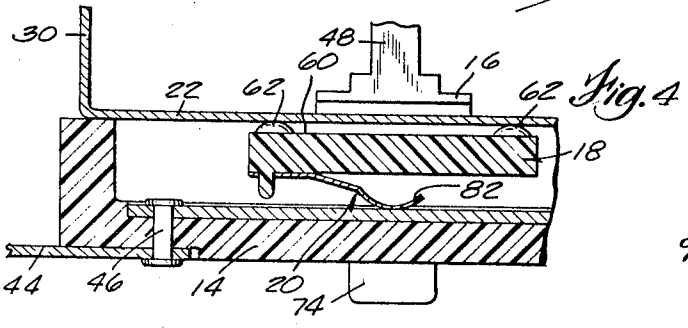


Fig. 4

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LINEAR MOTION VARIABLE RESISTANCE CONTROL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a variable resistance control and, more particularly, to a variable resistance control having a linear motion.

2. Description of the Prior Art

Variable resistance controls having resistance and conductive elements disposed in an elongated, channel-shaped housing with a slider carrying a bridging contact in wiping engagement with the resistance and conductive elements are well known. Variable resistance controls of this type, exemplified by U.S. Pat. Nos. 2,242,327 (Rubenstein) and 3,412,361 (Lovejoy et al.), typically are provided with an elongated, longitudinal slot in the top wall of the housing through which slider actuation means project. In some applications, the exposure of the resistance and conductive elements resulting from this slot is especially undesirable. For instance, variable resistance controls of this type have been considered for use on television sets for manual and/or remote operation. For such use, the control is mounted for ready access to operate. When so positioned, the slot of the prior art devices permit the insertion of foreign objects into contact with the resistance and conductive elements, thereby presenting a potential electrical shock hazard to children who might insert such objects through the opening. Also, the slot permits the ingress of deleterious foreign matter directly onto the resistance and conductive elements.

Various means, such as movable dust shields, have been suggested for closing the slot in order to prevent this internal exposure. Generally, these means increase the cost and complexity of the manufacturer and assembly of the control. These means also usually increase the slider friction with resultant uneven operation of the device.

SUMMARY OF THE INVENTION

A primary object of this invention is to provide a simple, inexpensive linear motion variable resistance control protected against the direct entrance of foreign objects onto the resistance and conductive elements.

Another object of this invention is to provide such a linear motion variable resistance control that does not have a slotted housing for accommodation of the slider actuation means.

A further object of this invention is to provide a linear motion variable resistance control with minimum sliding friction.

A still further object of this invention is to provide a linear motion variable resistance control having limited rocking movement of the slider during actuation.

In accordance with this invention, the variable resistance control has an elongated, channel-shaped housing with a closed or unslotted top wall and a pair of sidewalls. A dielectric base, to which the resistance and conductive elements are mounted, is disposed inside the housing as the bottom thereof with the outside longitudinal edges of the base being in spaced relationship with the housing sidewalls so as to define parallel, elongated openings therebetween. A carrier block carrying a bridging contact in wiping engagement with both the resistance and conductive elements is provided with side members which extend outwardly through these openings. A slider disposed about the exterior of the housing and guided thereby is operably attached to at least one of the carrier block side members. Preferably, the carrier block, which is most preferably made from a plastic material, is provided with a shoulder in sliding engagement with the top surface of the base and guide means in sliding engagement with the underside of the housing top wall to limit any rocking movement when the slider is actuated, i.e., when a longitudinal force is applied thereto. Preferably, the slider is provided with guide means in slidable engagement with the exterior of the housing sidewalls to further minimize binding of the control during operation.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an isometric view of a variable resistance control made in accordance with this invention.

FIG. 2 is an exploded view of the variable resistance control shown in FIG. 1.

FIG. 3 is a cross-sectional view taken along the plane designated by line 3–3 in FIG. 1.

FIG. 4 is a fragmentary elevation sectional view taken along the plane designated by line 4–4 of FIG. 1.

FIG. 5 is a cross-sectional view of the carrier block.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1—5, a variable resistance control constructed in accordance with this invention is illustrated. The variable resistance control, generally designated **10**, comprises an elongated, channel-shaped housing **12**, formed from a single piece of suitable material, such as stamped metal or molded plastic, a dielectric base **14**, a slider drive **16**, and a carried block **18** carrying sliding spring contacts **20**. Housing **12** includes a closed or unslotted top wall **22** and a pair of sidewalls **24** and **26** integral with the top wall and projecting downward therefrom. Housing **12** is secured to base **14** by end tabs **28**, extending downwardly from the end portions of sidewalls **24** and **26**, which are folded laterally over the base **14**. Ears **30** and **32**, integral with top wall **22** and extending upwardly therefrom, are provided for attachment of control **10** to a mounting panel (not shown). These ears are insertable into slots provided in such a mounting panel and are either folded over or twisted to secure the control **10** to the panel. The control also can be attached to the mounting panel in any other conventional manner such as with tap screws.

Base **14** includes an elongated resistance element **34** having an overlaying strip of carbonaceous or equivalent resistance film **36** and an elongated conductive element **38**, preferably in the form of an elongated strip of highly conductive material (such as a silver-plated metal) secured to the top surface **13** of base **14**. Terminals **40**, **42** and **44** are electrically connected to resistance element **34** and conductive element **38**, respectively, and are secured to the bottom surface of base **14** by rivets **46**. As shown in FIG. 4, rivets **46** extend through base **14** to serve the double function of securing the resistance element **34**, conductive and terminals **40**, **42** and **44** to base **14** and to electrically connect the resistance and conductive elements to their respective terminals. Other conventional mounting means such as an adhesive, and other conventional electrical connecting means, such as solder, can be used for this purpose. Although the resistance means is shown as a separate element **34**, it can be provided in the form of a striplike resistance film or coating applied directly onto the top surface **13** of the dielectric base **14**. When base **14** is assembled into housing **12** (FIGS. 2 and 3), there are parallel, elongated openings **25** defined between longitudinal edges **14***a* and the interior of housing sidewalls **24** and **26** through which carrier block side members **64** and **66** extend as described hereinafter.

Slider drive **16**, configured to encompass the outer surfaces of housing **12**, includes an operating shank **48** to which a knob (not shown) or other operating means is attached, a pair of spaced vertical members **50** and **52**, and a pair of tangs **54** and **56** which are integral extensions of vertical members **50** and **52**, respectively. Vertical members **50** and **52** include a plurality of integral protuberances or ribs **58** which slidably engage the outer surfaces of walls **24** and **26** of housing **12**. These protuberances **58** act as guide means in providing minimum area of contact between slider drive **16** and housing **12** thereby minimizing friction as the slider bar is operated. The friction can be further minimized by fabricating slider drive **16** from a plastic material such as polymers of propylene, ethylene, acetal and the like.

Carrier block **18**, formed from an insulating material, preferably a plastic material, includes a top wall **60** having a

plurality of hemispherically-shaped nubs **62** integral with the upper surface thereof which ride in contact with the underside of top wall **22** of housing **12**, a pair of side members **64** and **66** integral with the top wall **60**, projecting downwardly therefrom and extending through the elongated opening **25** between the longitudinal edges **14***a* of the base **14** and housing sidewalls **24** and **26** and a plurality of nibs **68**, **70** and **72** integral with the top wall **60**. Each side member of carrier block includes a lower flange section **74** having a slot **76** into which tangs **74** and **76** into which tangs **54** and **56** of the slider drive **16** are inserted and an integral shoulder **78** which rides on the top surface **13** of base **14**. Tangs **54** and **56** are dimensioned so that they are slightly larger than slots **74** to provide a press fit.

The sidewalls **24** and **26** of housing **12**, the side members **50** and **52** of carrier block **18** and base **14** are dimensioned so that there is a minimum of clearance between the inside of the housing and the outer surface of the side members and between the outside edge of the base and inside surfaces of the side members. The combined effect of the guiding engagement between protuberances **58** of slider drive **16** and outer surfaces of walls **24** and **26**, between nubs **60** on carrier block **18** and the underside of the top wall **22** of the housing **12**, and between shoulders **78** of carrier block **18** along with a minimum clearance between the side members **64** and **66** of carrier block **18** and the longitudinal edges **14***a* of base **14** prevents any appreciable rocking of the carrier block or slider during actuation thereof yet insures free sliding movement. Binding or jerky motion of the slider drive is thereby precluded. As indicated above, carrier block **18** preferably is constructed from a plastic material, such as polymers of propylene, ethylene, acetal and the like, which further minimizes the friction and insures free sliding motion.

Carrier block **18** carries a bridging contact **20** which is in wiping engagement with both the resistance and conductive elements. Bridging contact **20**, preferably formed from a spring metal ribbon, is attached to carrier block by press fitting nibs **68** and **70** into apertures (not shown) in the base thereof. After installation, nibs **68** and **70** can be deformed, if desired, to insure a fixed connection. If carrier block **18** is constructed from a plastic material, this deformation can be effected by the simultaneous application of heat and light pressure. Nib **72**, which is slightly longer than nibs **68** and **70**, serves as a pilot to assist in the alignment of nibs **68** and **70** with their respective apertures in the base of the bridging contact during assembly of the bridging contact onto the carrier block. The bridging contact **20** is provided with a plurality of downwardly inclined spring fingers or tines **82**, the lower ends of which slidably press against the resistance and contact elements. To assure good contact, bridging contact **20** is provided with two or more tines for each element.

From the above description, it can be seen that this invention provides a variable resistance control with a closed or unslotted top which prevents the external insertion or direct ingress of foreign objects onto the resistance and conductive elements. Also, the novel structure of the slider drive and carrier block provides a control capable of free sliding motion with a minimum of binding or jerky motion. In addition, the novel structure of the control allows simplified and inexpensive fabrication and assembly techniques.

I claim:

1. A linear motion variable resistance control comprising:
- an elongated, channel-shaped housing having a closed top wall and a pair of sidewalls;
- a dielectric base having longitudinal edges and a top surface disposed inside said housing, said longitudinal edges being in spaced relationship with said sidewalls so as to define parallel, elongated openings therebetween;
- a carrier disposed within said housing having side members extending outwardly through said openings and guided by said sidewalls and said edges;
- spaced parallel resistor and collector elements mounted on the top surface of said base and extending lengthwise thereof;
- terminals connected to said resistance and conductive elements and said base;
- a bridging contact attached to said carrier and insulated from said housing in wiping engagement with both of said elements; and
- a slider disposed exteriorly of said housing and operably attached to at least one of said side members.

2. The control according to claim **1** wherein the slider includes spaced, vertical portions guided by said sidewalls and connected to the side members of the carrier.

3. The control according to claim **2** wherein the carrier side members are provided with a shoulder in sliding engagement with the top surface of the base.

4. The control according to claim **3** wherein the carrier includes a top portion having a first guide means in sliding engagement with the interior of the top wall of the housing which cooperate with said flanges to limit the rocking movement of the carrier when a longitudinal force is applied to the slider.

5. The control according to claim **4** wherein said vertical portions of the slider are provided with integral tangs which are press fitted into slots provided in the side members of the carrier.

6. The control according to claim **5** wherein said vertical portions of the slider are provided with second guide means in sliding engagement with the exterior of said sidewalls.

7. The control according to claim **6** wherein said first guide means comprise nubs integral with the top surface of said carrier.

8. The control according to claim **7** wherein said second guide means comprise vertical ribs integral with said vertical portion of the slider.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,588,779 Dated June 28, 1971

Inventor(s) Charles Richard GOERG

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 10, after 4-4 "of" should be --in--

Column 2, line 21, "carried" should be --carrier--

Column 2, line 45, after "34, conductive" insert --element 38--

Column 3, line 10, delete "tangs 74 and 76 into which"

Column 3, line 42, "light" should be --slight--

Signed and sealed this 6th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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