Nov. 19, 1968 R. E. LOVEJOY ETAL 3,412,361

VARIABLE RESISTANCE CONTROL

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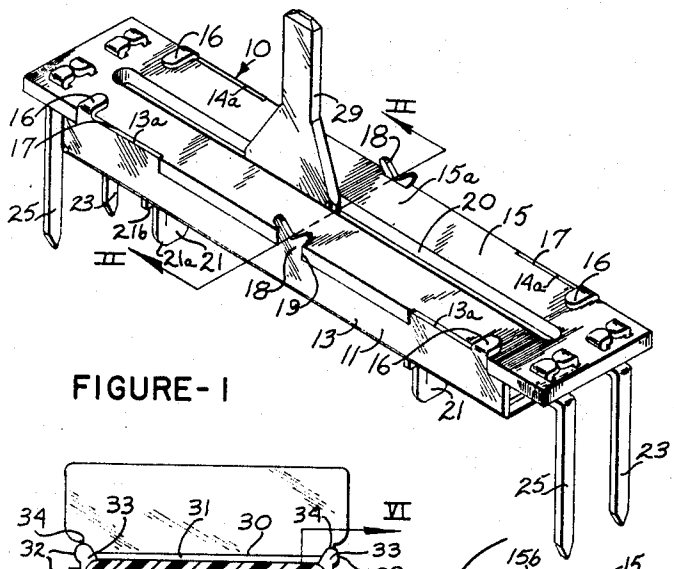


FIGURE-1

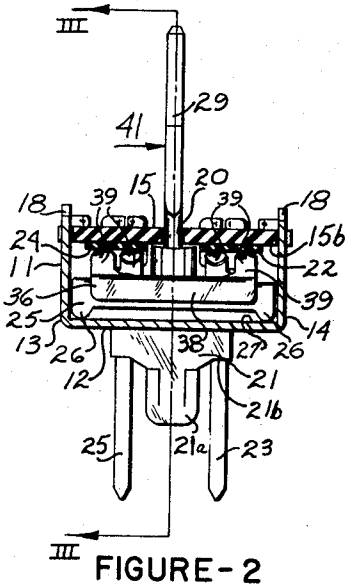


FIGURE-2

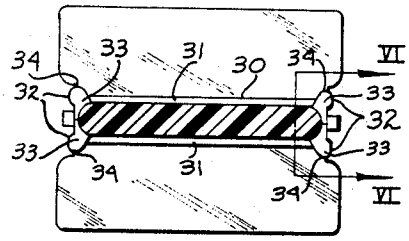


FIGURE-5

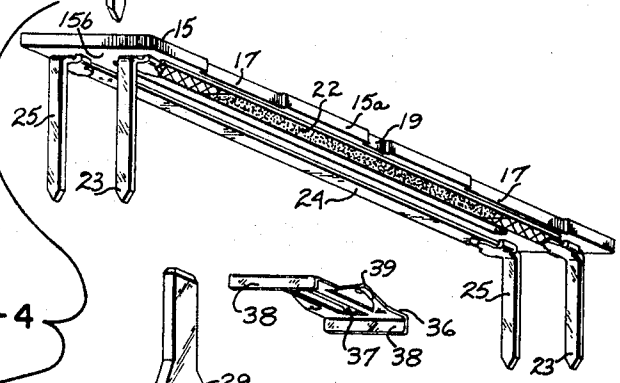


FIGURE-4

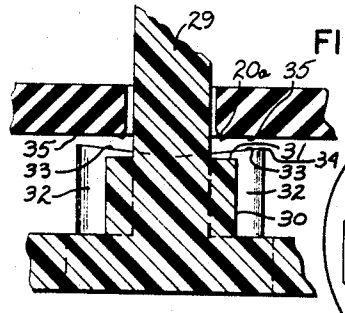
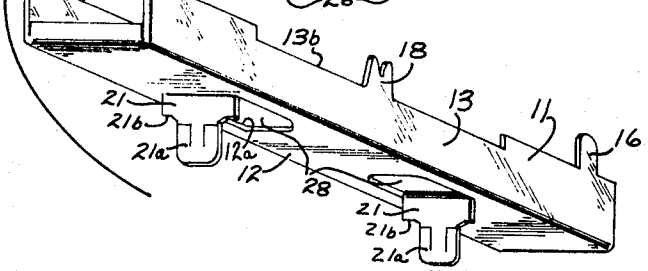


FIGURE-6



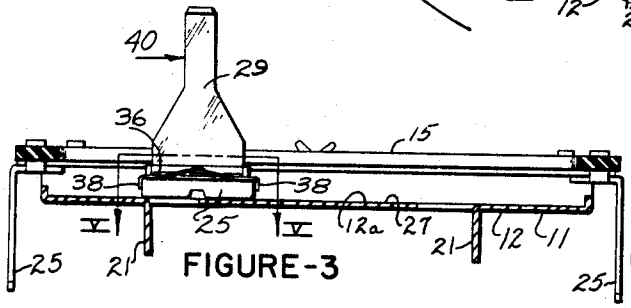


FIGURE-3

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VARIABLE RESISTANCE CONTROL

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ABSTRACT OF THE DISCLOSURE

A variable resistance control having a channel-shaped housing closed by a dielectric base supporting resistance and conductive elements. A rectilinear slider carrying a contactor provided with spring contacts wipably engages the resistance and conductive elements. Smooth movement of the slider is obtained by providing the bottom of the slider with a pair of spaced runners bearing against lands of the housing. Laterally extending shoes on the top of the slider space the slider from the resistance and conductive elements. The shoes preferably have laterally inclined surfaces to assure that the shoes do not engage the raw edges of an elongated slot provided in the base. The position of the slider is altered by an operating member connected to the slider and extending outwardly through the slot.

The present invention relates to a variable resistance control and, more particularly, to a variable resistance slide control having a slider movable rectilinearly in the housing.

It is well known to provide a variable resistance slide control with resistance and conductive elements supported by an elongated channel-shaped housing and with a slider carrying a contactor wipingly engaging the resistance and conductive elements. Such variable resistance slide controls are exemplified by Rubinstein Patent No. 2,242,327 issued May 20, 1941. Variable resistance slide controls currently available, although satisfactory for altering the resistance in a circuit, employ sliders which tend to jump or skip or rock as adjustment of the control is made. Generally the erratic motion of the slider is caused by rough edges engaging the slider. It would, therefore, be desirable to provide a variable resistance slide control having a smooth and uniform slider movement.

Accordingly, it is an object of the present invention to provide an improved variable resistance slide control. Another object of the present invention is to provide a variable resistance slide control capable of being finely adjusted without having the slider jump or skip. An additional object of the present invention is to provide a slide control with a slider having a pair of spaced depending runners bearing against lands of a channel-shaped housing. A further object of the present invention is to provide a variable resistance slide control with a slider having means closely spaced from a slotted base to limit rocking motion of the slider when the slider is moved rectilinearly. Yet another object of the present invention is to provide a slide control with a slider having upwardly extending shoes abutable against lands spaced from the edge of an elongated slot in a base supporting resistance and conductive elements. Yet an additional object of the present invention is to provide an elongated channel-shaped housing of a slide control with means for securing a slotted dielectric base to the top of the housing without narrowing the width of the slot in the base. Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of novelty characterizing the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly, the present invention is concerned with a variable resistance slide control employing a contractor wipably engaging a resistance element and a conductive element supported by a channel-shaped housing. A rectilinear slider mounted in the housing carrying the contractor has a pair of spaced depending runners engaging lands of the channel-shaped housing and a pair of upwardly extending shoes engaging lands of a dielectric base supporting the resistance and conductive elements and spaced from an elongated slot provided in the base. The channel-shaped housing is secured to the base with folded tabs at opposite end portions of the housing and with split tabs at the center portion of the housing. The folded tabs are bent laterally of the housing while the split tabs preferably are spread apart or bent longitudinally of the housing to prevent the width of the slot in the base from being reduced at its midpoint. An operating member connected to the slider extends outwardly through the slot in the base.

For a better understanding of the present invention reference may be had to the accompanying drawings wherein the same reference numerals have been applied to like parts and wherein: FIGURE 1 is an isometric view of a variable resistance slide control made in accord with the present invention; FIGURE 2 is a sectional view taken along line II—II of FIGURE 1; FIGURE 3 is a sectional view taken along line III—III of FIGURE 2, assuming that FIGURE 2 is shown in full; FIGURE 4 is an exploded view of the control shown in FIGURE 1; FIGURE 5 is a sectional view only of the slider taken along line V—V of FIGURE 3; and FIGURE 6 is an enlarged fragmentary sectional view of the slider taken along line VI—VI of FIGURE 5 with the operating member of the slider extending outwardly through a slot in the base.

Referring now to FIGURES 1–4 of the drawings, there is illustrated a variable resistance slide control, generally indicated at **10**, comprising an elongated channel-shaped housing **11** formed and stamped from a single piece of metal and defined by a bottom wall **12** and a pair of side walls **13** and **14** integral with the bottom wall and projecting upwardly therefrom. The top of the housing is closed by a slotted dielectric base **15** of suitable material and end tabs **16** extending upwardly from the end portions **13***a* and **14***a* of the side walls are folded laterally over the base **15** securing the base to the housing **11**. Side notches **17** provided in the base **15** receive the upwardly extending end tabs locating the base to the housing. The center portion of each of the side walls is also provided with an upwardly extending split tab **18** received in a center notch **19** of the base securing the center portion **15***a* of the base **15** to the housing. In order to maintain the width of the elongated slot **20** provided in the base uniform, the split tabs are folded or spread apart in opposite directions longitudinally of the base assuring that no transverse compressive forces are applied to the base. A pair of ears **21** folded downwardly from the bottom wall **12** of the housing are insertable into slots provided in a not-shown mounting panel and the ends **21***a* of the ears are twisted to secure the housing to the panel. Shoulders **21***b* provided on the ears space the housing from the panel. Suitable ears can also extend upwardly from end portions **13***a* and **14***a* of the side walls **13** and **14** adjacent to the end tabs **16** when forward mounting of the control **10** is desired.

An elongated resistance element **22** preferably of laminated material having a strip-like carbonaceous or equivalent resistance film deposited on a surface thereof is secured to one side of the bottom surface **15***b* of the base **15** with a pair of terminals **23**. The terminals **23** are also electrically connected to the ends of the resistance element **22**. Although the means defining the resistance path is shown in the form of a resistance element

22, the means can be in the form of a strip-like resistance film or coating directly applied onto the surface 15*b* of the dielectric base 15. Disposed on the other side of the bottom surface 15*b* in spaced parallel relationship to the resistance element 22 is a conductive element 24 preferably in the form of a elongated strip of material having high electrical conductivity. Terminals 25 electrically connected to the ends of or integral with the conductive element 24 secure the conductive element to the base 15.

According to the present invention, a slider 25 mounted in the housing has a pair of spaced depending runners 26 extending longitudinally of the slider and engaging lands 27 on the inner surface 12*a* of the bottom wall 12 of the channel-shaped housing 11. By having the runners 26 engage the lands 27, smooth and uniform movement and fine adjustment of the slider is obtainable since the runners engage only smooth surfaces extending longitudinally of the housing adjacent to the side walls and between the notches 28 formed by the ears 21 and the raw or cut edges 13*b* and 14*b* of the side walls such smooth surfaces being referred to as lands 27. An operating member 29 integral with the slider 25 extends outwardly through the elongated slot 20 provided in the base 15 for moving the slider in the housing. As best shown in FIGURES 5 and 6, a wall 30 extending upwardly from the slider 25 on opposite sides of the operating member 29 forms a shoulder 31 for limiting upward movement of the slider 25 as the slider is moved rectilinearly assuring that a minimum distance is maintained between the slider and the resistance and conductive elements. Preferably a pair of shoes 32 extending laterally outwardly from the front and rear of the slider space the slider from the base. More specifically the top surface 33 of each shoe 32 is tapered laterally upwardly to assure that only the outer tip 34 of each of the shoes engages a land 35 of the base 15 to prevent the raw edges 20*a* (see FIGURE 6) defining the elongated slot 20 in the base from engaging the slider. The raw edges generally cause jumping and skipping of the slider when fine adjustment of the slider is attempted. A contactor 36 having an elongated opening 37 and downwardly extending ends 38 is mounted on the top of the slider and constrained to move with the slider. Contact fingers 39 extending upwardly from the contactor 36 engage the resistance element 22 and the conductive element 24. The contact fingers 39 have sufficient resilience to urge the slider 25 toward the bottom wall 12 causing the runners 26 to bear against the lands 27 provided on the inner surface 12*a* of the bottom wall of the housing. The contact fingers 39 also take up any tolerance present in the parts forming the slide control.

During adjustment of the control and referring particularly to FIGURES 3 and 6, movement of the operating member 29 as indicated by the arrow 40 (see FIGURE 3) causes the slider 25 to cock slightly forcing the rear of the slider upwardly causing the outer tips 34 of the shoes 32 to engage the lands 35 of the base. Since the shoes are tapered laterally upwardly, the outer tips of the shoes prevent the raw edges 20*a* defining the elongated notch 20 from engaging the slider. Without the laterally inclined shoes, the raw edges defining the elongated slot would bite into the slider causing a jumping and skipping motion of the slider at it is being adjusted. Should any transverse force as indicated by arrow 41 (see FIGURE 2) be applied to the slider as it is being adjusted rectilinearly, rotation about a longitudinal axis of the slider is precluded since the shoes 32 immediately bear against the lands 35 while the runners 26 depending from opposite sides of the slider 25 bearing against the lands 27 of the housing continue to stabilize the slider. To assure that the operating member 29 does not engage the edges 20*a* of the slot 20, the clearance between the operating member and the slot is preferably slightly larger than the clearance between the slider and the side walls 13 and 14 of the housing. It is to be appreciated, therefore, that by preventing the raw edges 20*a* of the elongated notch 20 from engaging the slider, by providing spaced depending runners 26 on the slider 25 bearing against the lands 27 of the housing and by preventing the elongated slot from being reduced in width at its mid section, smooth and uniform rectilinear movement and fine adjustment of the control 10 is readily obtainable.

While there has been illustrated and described what is at present considered to be a preferred embodiment of the present invention, it will be appreciated that numerous changes and modifications are likely to occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications which fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A variable resistance control comprising an elongated channel-shaped housing having a bottom wall and a pair of side walls, a dielectric base closing the open top of the housing, said base being provided with an elongated slot having a bottom edge, an elongated resistance element and a conductive element fixedly secured to the base on opposite sides of the slot, terminals connected to the ends of the resistance element and to the conductive element, a slider mounted in the housing, means depending from the slider bearing against lands of the bottom wall for spacing the slider from the bottom wall, a contactor carried by the slider and having spring fingers in wiping engagement with the resistance element and the conductive element, the spring fingers biasing the slider away from the base and toward the bottom wall, and operating means disposed exteriorly of the housing, said operating means being connected to the slider and passing through the slot.

2. The control of claim 1, wherein the means bearing against the lands of the inner surface of the bottom wall comprises a pair of spaced runners depending from opposite sides of the slider.

3. The control of claim 2, wherein shoes extend upwardly of the slider and engage lands on opposite sides of the longitudinal slot for spacing the slider from the edge of the slot.

4. A variable resistance control comprising a first member and a second member defining the top and bottom walls of a housing, means spacing the first and second members from each other, one of said members being of dielectric material, a resistance element on the member of dielectric material, a conductive element disposed in the housing, a rectilinear slider mounted in the housing and having a first surface and a second surface, the first surface having a pair of laterally spaced bearing means for slidably engaging the other member, a contactor carried by the slider and having spring fingers in wiping engagement with the resistance element and the conductive element, one of the members being provided with an elongated slot, operating means disposed exteriorly of the housing connected to the slider and passing through the slot, and a pair of laterally spaced bearing means on the second surface adjacent to the member of dielectric material for limiting rocking movement of the slider when a longitudinal force is applied to the operating means thereby assuring a uniform motion to the slider.

5. The control of claim 4, wherein the means on the second surface is a shoulder extending around the operating means.

6. A variable resistance control comprising a bottom member, a pair of end portions and a center portion integral with the bottom member, a top member supported by the end portions and the center portion, said top member being provided wih a longitudinal slot, an elongated resistance element and a conductive element disposed between said members, terminal means connected to the resistance and conductive elements, end tabs integral with the end portions securing the top member

to the bottom member, said tabs being folded transversely of the members, center tabs integral with the center portion securing the top member to the bottom member, said center tabs being folded longitudinally of the members, contactor means wipably engaging the resistance element and the conductive element, and operating means connected to the contactor means and passing through the slot.

7. The control of claim **6**, wherein the bottom member is defined by a bottom wall of a channel-shaped housing having a pair of side walls, the pair of end portions and the center portion forming the side walls, the tabs are integral with the side walls, and the top member is of dielectric material and the elements are secured to a surface of the top member on opposite sides of the slot.

8. The control of claim **6**, wherein each of the center tabs is a split tab having tab portions spread in opposite directions longitudinally of the members.

9. A variable resistance control comprising a bottom member and a top member spaced from and supported by the bottom member, said top member being provided with a longitudinal slot, the bottom member having a pair of laterally spaced bearing surface areas, an elongated resistance element and a conductive element disposed between said members, terminal means connected to the resistance and conductive elements, a slider having first and second surfaces disposed between one of said members and the elements, a pair of laterally spaced bearing surfaces on the slider on the side thereof adjacent said bottom member and bearing against said laterally spaced bearing surface areas for uniformly guiding rectilinear movement of the slider, contactor means carried by the slider and wipably engaging the elements, and operating means connected to the slider and passing through the slot.

10. A variable resistance control comprising a bottom

member, a pair of spaced side walls extending upwardly from the bottom member, a dielectric top member supported by the side walls and spaced from the bottom member, said top member being provided with a longitudinal slot, an elongated resistance element and a conductive element secured to the top member on opposite sides of the slot and facing the bottom member, terminal means connected to the resistance and conductive elements, a slider disposed between said bottom member and the elements, contactor means carried by the slider and wipably engaging the elements, operating means connected to the slider and passing outwardly through the slot, and a pair of shoes extending upwardly of the slider on opposite sides of the operating means and bearing against lands of the top member when the slider is operated, said shoes being disposed on opposite sides of the slot and spacing the slider from the slot.

11. The variable resistance control of claim **10** wherein the top surface of each of the shoes is tapered laterally upwardly and outwardly toward an outer edge, the distance between the outer edges being greater than the width of the slot causing the shoes to engage the lands spaced from the slot.

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