United States Patent

Koenig

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[45] **Sept. 26, 1972**

[54] CUSHION SWITCH MEANS

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[73] Assignee: **Tapeswitch Corporation of America**, Farmingdale, N.Y.

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[52] **U.S. Cl.** ..... **200/86 R**, 340/278

[51] **Int. Cl.** **H01h 13/16**

[58] **Field of Search** ...307/105 B; 200/86 R; 340/228

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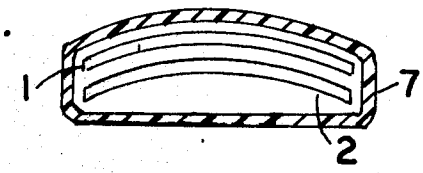
Primary Examiner—David Smith, Jr.

Attorney—James P. Malone

[57] **ABSTRACT**

A ribbon switch is provided for operating on soft surfaces such as cushioned seats; for instance, automobile seats. First and second flexible conductive strips are normally separated by a plurality of insulating members sandwiched between them. The insulating members are spaced so as to hold the conductive strips separated unless the conductive strips are flexed or bowed; as for instance, into a soft cushion by someone sitting on them. The spacing of the insulatng members and the flexibility of the strips is chosen so that after a predetermined amount of flexing, the conductive strips will snap together forming a good electrical contact.

6 Claims, 11 Drawing Figures



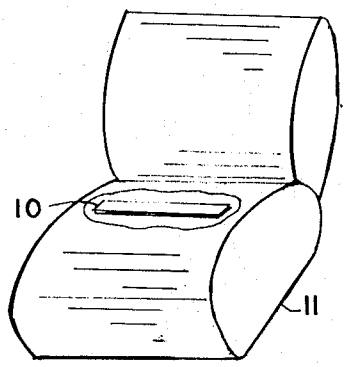


FIG 1A

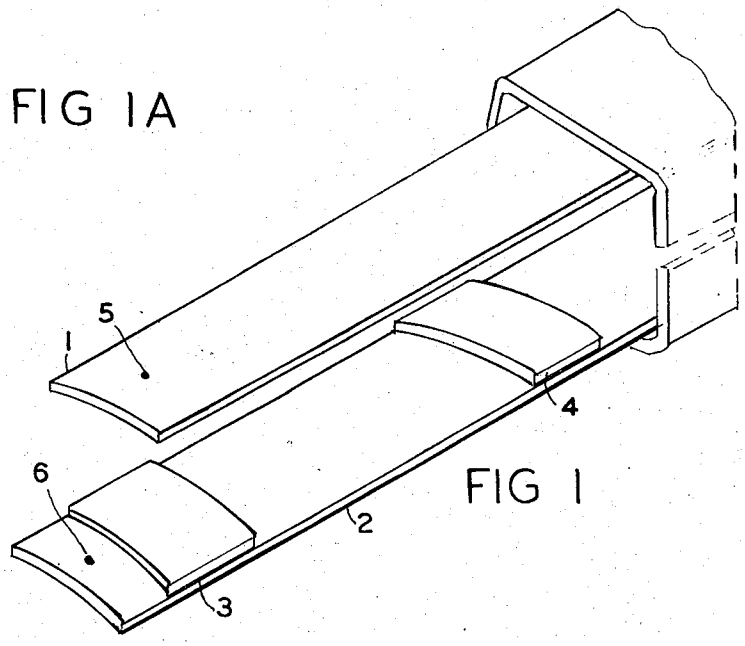


FIG 1

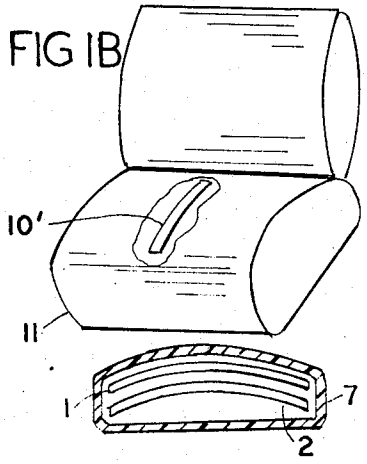


FIG 1B

FIG 2

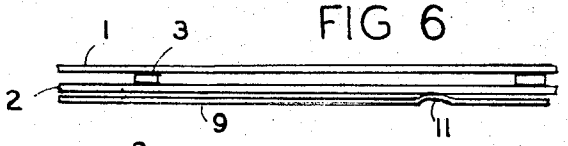


FIG 6

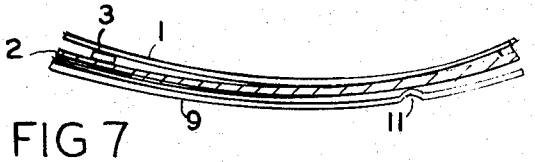
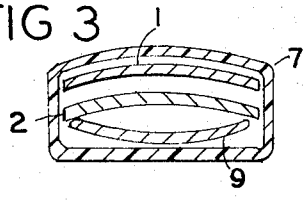


FIG 7



FIG 2A

FIG 3



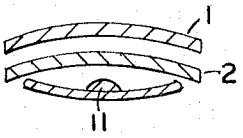


FIG 4

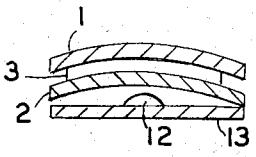


FIG 5

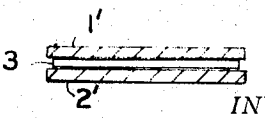


FIG 8

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CUSHION SWITCH MEANS

This invention relates to ribbon switches, and, more particularly, to such switches adapted to be used on soft yielding surfaces such as cushioned seats. One use of the invention would be to detect someone sitting in a cushioned seat; for instance, an automobile or aircraft seat.

Ribbon seat switches have special design requirements since the surface upon which they are placed is soft and yielding.

This invention is a sensitive ribbon switch featuring reliable switch action even at extremely low temperature. It uses simple conductor contact strips and has a narrow width dimension. This design achieves reliable results without requiring one conductor to be stamped out.

Accordingly, the principal object of the invention is to provide new and improved ribbon switch means for operation on soft, yielding surfaces, for example seats and safety cushions.

Another object of the invention is to provide new and improved snap-action ribbon switch means.

Another object of the invention is to provide new and improved ribbon switch means for detecting a person sitting in a seat.

Another object of the invention is to provide new and improved ribbon switch means which will operated at very low temperature.

Another object of the invention is to provide new and improved safety cushion switch means.

Another object of the invention is to provide new and improved ribbon switch means for mounting on soft, yielding surfaces comprising a first flexible conductive strip, a second flexible conductive strip, a plurality of insulating members connected between first and second strips, said insulating members being spaced along the axes of said strips so that said strips will be held in non-contact, separated position unless said strips are flexed about the axes perpendicular to their longitudinal axes whereby when said strips are mounted on a soft surface and a force is applied on top of them, they will flex, and after a predetermined amount of flexing, the strips will snap together to provide a good electrical contact.

These and other objects of the invention will be apparent in the following specifications and drawings, of which,

FIG. 1 is a perspective exploded view, partially cut away, and an embodiment of the invention.

FIGS. 1A and 1B are perspective views showing the invention mounted in the padding on a soft seat.

FIG. 2 is a sectional view of an embodiment of FIG. 1, shown in relaxed open position.

FIG. 2A shows the embodiment of FIG. 2, in closed position due to flexing.

FIGS. 3 to 5 and 8 are sectional views of modifications of the invention.

FIGS. 6 and 7 are side detail views of a modification of the invention.

Referring to the drawings, FIG. 1A illustrates one use of the invention and shows a ribbon switch **10** mounted on a cushioned seat **11**, which may be an automobile-type seat, for the purpose of detecting when a person is sitting in a seat. There may be many reasons for detecting a person sitting in a particular seat and this information may be used for safety purposes and other monitoring purpose.

Conventional ribbon switches are generally not acceptable for mounting on a soft surface such as seat cushions since the force is not concentrated as is the weight of a person applied on one foot. In the seat application, the person's weight is spread over a considerable area so that the ribbon switch must be designed to flex considerably and it must be designed so that it is sensitive to the surprisingly small force per unit area applied by a person sitting down.

The present switch is designed so as to flex to conform to the shape of the person's body sitting on a soft cushioned seat. The switch is also designed so that when there is sufficient flexing, the contact members will undergo a snap action and provide a good electrical contact.

FIG. 1B shows a ribbon switch **10'** mounted perpendicular to the switch **10** of FIG. 1A.

FIG. 1 shows an embodiment of the invention comprising a first flexible conductive strip **1** and a second flexible conductive strip **2**, which are separated by insulating member **3** and **4**. Strips **1** and **2** may be connected to external electrical circuits by means of leads **5** and **6** in conventional manner. Strips **1** and **2** have a transverse curvature.

FIG. 1 shows an exploded view, and FIG. 2 shows a sectional view with the members **1** and **2** in normal open, non-contacting position wherein they are separated by the insulating members **3**, **4**, etc., and the assembly is enclosed by a flexible insulating jacket **7**.

FIG. 2A shows a side view of FIG. 2 with the cover removed, showing a flexing snap action. This figure illustrates that after the switch has been flexed by a predetermined amount of force, it will tend to snap into a closed position at the point **3**.

FIG. 3 shows a modification of the invention having a stabilizing member **9**, which may be flat or have a transverse curvature opposite to that of the first and second strips. The strip **9** is preferably made of a springy material, such as spring steel.

FIGS. **4**, **5**, **6** and **7** show the switch with stabilizing strips with periodic mechanical bumps or elevations **11**,, **12**. When the switch is curved, thse bumps cause an additional force to bring conductor strips **1** and **2** together, as shown in FIG. **7**. Notice that in rest position raised bump **11** does not cause contact. This relaxed, out-of-touch condition is also shown in the cross sections FIGS. **4** and **5**.

In FIG. **5** the supplementary strip **13** is flat. This adds little to the stability but does give improved action on curvature, as described.

FIG. **8** shows a modification with flat strips **1'** and **2'**.

DESCRIPTION OF OPERATION

Operation of this detector switch is such that contact is made by either of two ways. One is simple downward pressure, squeezing contacts **1** and **2** together at intervals where no insulator is placed. This action is analagous to pushing down on a switch while it is lying on a table.

The other mode of contacting takes place by bending or forming a longitudinal curvature as when pressed into a soft padding, FIGS. **2A** and **7**. This is important in very low temperature operation because economical jacketing materials tend to become partially rigid at these very low temperatures, and this would make the Detector Switch inoperative in the flat mode described

above. This design will operate, however, at minus 35° F. or below by closing with the longitudinal flex action described. This invention will respond even at the extremely low temperatures to the small forces present in an automobile seat by means of its longitudinal flex-closing mode.

In use, this switch could be installed in the padding of the seat at any active location to be sensed. Alternately, it may be fastened to the spring structure where it will operate by flexing and/or squeezing.

I claim:

1. Ribbon switch means for mounting on soft, yielding surfaces comprising,

a first flexible conductive strip, having transverse curvature,

a second flexible conductive strip, having transverse curvature,

a plurality of insulating members connected between first and second strips, said insulating members being spaced along the axes of said strips so that said strips will be held in non-contact, separated

position unless said strips are flexed about an axis perpendicular to their longitudinal axes,

whereby when said strip assemblies are mounted on a soft surface and a force is applied on top of them, they will flex, and after a predetermined amount of flexing, the strips will snap together to provide a good electrical contact.

2. Apparatus as in claim 1, having a third strip mounted parallel and adjacent to one of said first and second strips.

3. Apparatus as in claim 2 wherein said third strip has a transverse curvature.

4. Apparatus as in claim 2 wherein said third strip has raised projections extending towards one of said first and second strips.

5. Apparatus as in claim 1 having a flexible insulating jacket enclosing said first and second strips.

6. Apparatus as in claim 3 wherein said third strip have a transverse curvature opposite to that of one of said strips.

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