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[54] **TREAD TYPE SWITCH FOR USE IN PASSENGER SEATS OR THE LIKE**

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[52] **U.S. Cl.** ..... **200/86 R,** 200/85 A

[51] **Int. Cl.** **H01h 3/02**

[58] **Field of Search** ..... 200/61.54, 61.57, 61.58, 200/85 A, 86 R, 86 A, 166 BH

[56] **References Cited**

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[57] **ABSTRACT**

This invention relates to an electrical switch that includes a pair of resilient metal contact strips mounted in parallel spaced relationship in a hollow resilient casing. One of the contact strips has a plurality of diagonally positioned slits therein that are located between opposite lateral edges while the other strip has a plurality of longitudinally spaced protrusions extending towards the adjacent strip.

The casing is mounted within an outer cover and the casing has an elongated bead or projection aligned with the protrusions while a thin sheet metal strap is positioned between the projection and the casing to concentrate the pressure applied to the adjacent surface of the casing to a localized area aligned with the protrusions.

18 Claims, 4 Drawing Figures

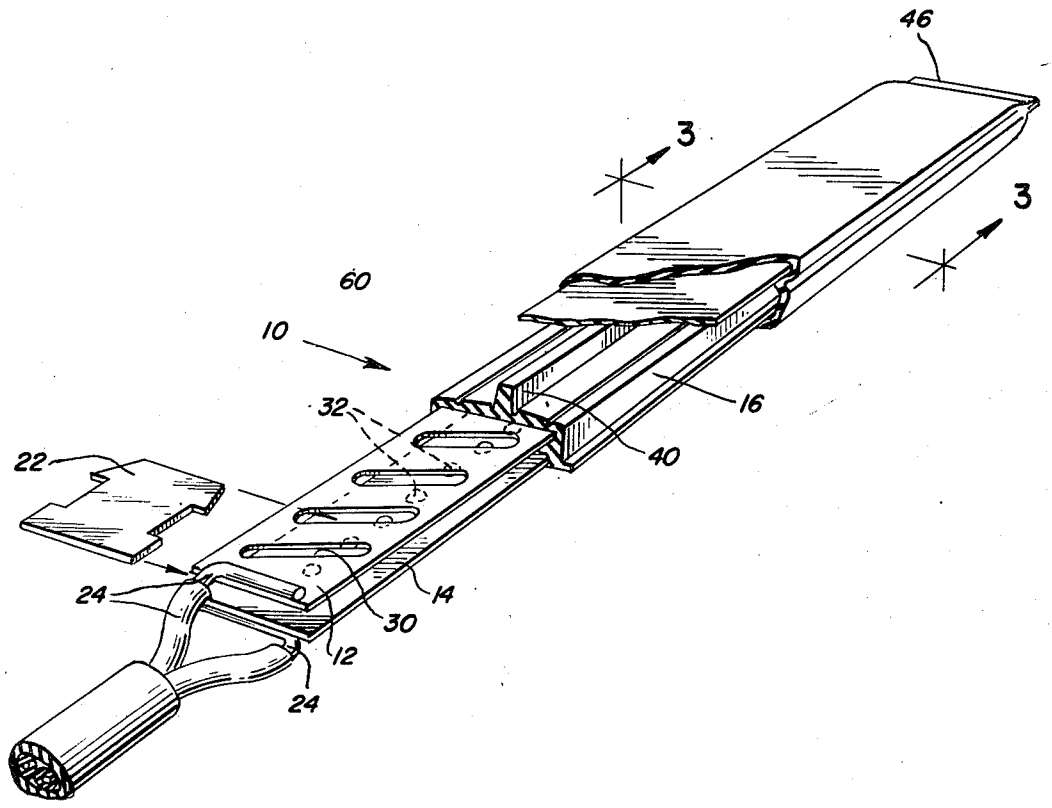


FIG. 1

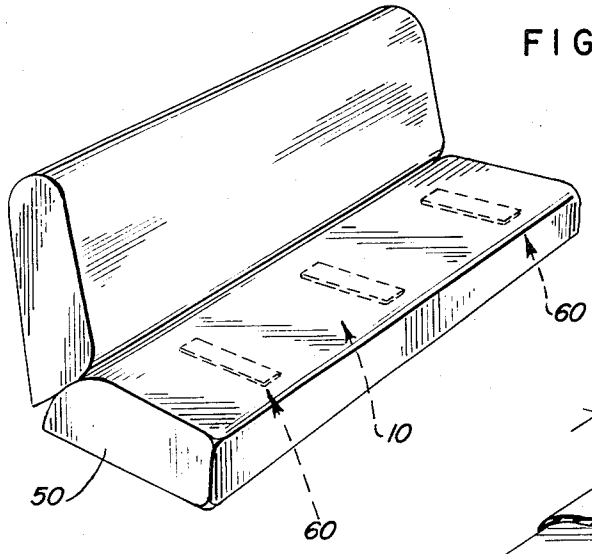
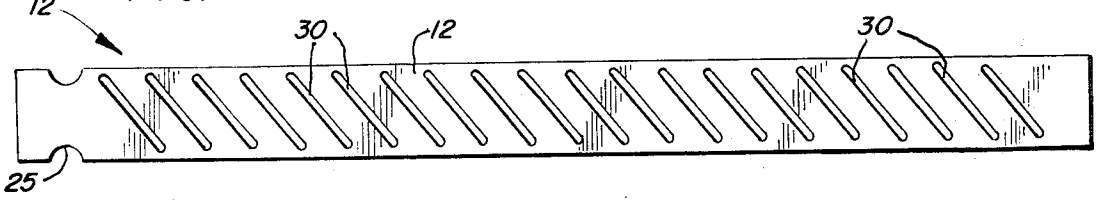


FIG. 2

FIG. 3

FIG. 4



TREAD TYPE SWITCH FOR USE IN PASSENGER SEATS OR THE LIKE

BACKGROUND OF THE INVENTION

The present invention relates generally to elongated switches and more particularly to an improved type seat switch for indicating the presence of an occupant within the seat of a vehicle, such as an automobile.

In the recent past, great emphasis has been placed upon the safety of automobile passengers and, hence, in an effort to compel passengers to utilize seat belts, the federal government has required that automobile manufacturers incorporate sensing mechanisms operatively associated with the seat belts to give a warning signal to the passengers when the seat is occupied and the seat belt is not fastened. Initially, the federal requirement was that such signaling devices be incorporated into the seats occupied by the out-board passengers of the vehicle.

However, it has recently been required that signaling devices be incorporated for the occupants of the center seat position in the vehicle, as well as outboard seating positions.

The problem of providing a suitable sensing mechanism for the outboard passengers has been admirably solved by switching mechanism of the type disclosed and claimed in commonly assigned U.S. Pat. No. 3,670,119 and copending Wolf et al., Appln. Ser. No. 120,263, filed Mar. 2, 1971 now U.S. Pat. No. 735,380. Such sensing mechanisms have received wide spread commercial success and are presently utilized in most automobiles built in the U.S.

However, these switches, in certain seating applications, do not lend themselves to direct incorporation into the center position of a seat for use as a sensing mechanism.

One of the problems encountered in a suitable switching mechanism for use in a center seat position relates to the sensitivity of the mechanism. A suitable sensing mechanism used for the center of the seat must be sensitive to the presence of an occupant in the center seat position and yet be insensitive to occupants of the outboard positions when the center position is unoccupied.

Another difficult problem is that the seat structure and composition vary from one manufacturer to another and the different resiliency and deflection characteristics makes it difficult to utilize a single switching mechanism that can be used for all types of seat structures and compositions and still be actuated with relatively the same pressures being applied to the seat.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a switch or sensing mechanism for the center passenger position of a vehicle seat, such as an automobile, which (1) is capable of operating at a substantially uniform operating pressure under various conditions, (2) is not actuated even though both outboard seat positions are occupied and (3) is sensitive and positive in actuation so as to consistently and reliably function with different types of seat structures and compositions.

The above functions are accomplished by a switch that consists of two elongated resilient metal contact strips that are mounted in a casing and have their respective opposite lateral edges held in spaced relation to each other. One of the resilient or flexible contact strips has a plurality of narrow longitudinally spaced slits extending diagonally of the longitudinal axis of the strip and opposite ends of the slits terminate at a location spaced from the adjacent lateral edges. The other of the contact strips has a plurality of longitudinally spaced protrusions extending towards the first contact strip and the protrusions are located substantially along the center line of the strips.

The construction and configuration of the contact strips allows the strips to readily be deflected into engagement with each other between opposite lateral edges even though the strips may be bowed or curved between opposite ends thereof.

According to another aspect of the invention, the switch incorporates means for concentrating an actuating pressure to an area along the center of the contact strip. The means for concentrating the actuating pressure to the center of the strip increases the sensitivity of the switch.

According to a further aspect of the invention, the sensitivity of the switch is further increased by enclosing the casing in an outer cover and positioning an elongated thin spring metal strap between the cover and the casing on the side of the casing that has the means for concentrating the actuating pressure.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF DRAWINGS

FIG. 1 shows a general environment for the switch constructed in accordance with the teachings of the present invention;

FIG. 2 is a fragmentary perspective view of the entire switch;

FIG. 3 is a transverse sectional view taken generally along line 3—3 of FIG. 2;

FIG. 4 is a plan view of one of the contact strips of the switch.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

FIGS. 2 and 3 of the drawings show a switch 10 constructed in accordance with the teachings of the present invention. Switch 10 consists of first and second elongated resilient metal contact strips 12 and 14 that are enclosed within a casing 16.

Casing 16 is generally rectangular in cross-section and defines an elongated passage 18 and the casing has inwardly directed members 20 extending from opposite sides thereof to define upper and lower recesses that respectively receive lateral edges of the respective contact strips 12 and 14. Members 20 hold the lateral edges of the respective contact strips spaced from each other.

Non-conductive insulators 22 (only one being shown) are located between the strips 12 and 14 adjacent opposite ends while insulated wires 24 are connected to the respective strips and lead to a warning circuit (not shown) of the type disclosed in the above patents. Each strip also has recesses 25 in the side edges of each strip adjacent one or both ends, for a purpose to be described later.

The portion of the switch so far described is generally known and has been utilized for a variety of purposes. However, one of the difficulties encountered with a switch of this type is the actuation thereof when the switch is in a generally curved or bowed condition between opposite ends thereof. In order to actuate a switch of this type, center portions of the two contact strips must be moved towards each other. Thus, when the switch is in the bowed or curved condition, at least one of the strips must still be flexed or bowed between opposite lateral edges in order to provide contact between the contact strips. Because of this feature, it has not heretofore been possible to utilize such a switch in varying bowed or curved conditions and still have the switch actuate at a uniform operating pressure.

According to the present invention, this objection is overcome by the particular construction and design of the contact strips **12** and **14**. As clearly shown in FIGS. **2** and **4**, contact strip **12** has a plurality of elongated narrow spaced slits or slots **30** extending between lateral edges thereof. As further shown in FIG. **4**, the slits extend diagonally with respect to the longitudinal axis of the strip **12** and have a length many times greater than their width. Also, the slits extend parallel to each other and have a length that is greater than the width of the strip **12** and both ends of the slits terminate at the location spaced from the adjacent lateral edge. This arrangement allows the strip to be readily flexed or bent between opposite lateral edges even when it is in a curved condition between opposite ends thereof.

To increase the sensitivity of the switch and produce point contact between the two strips, the second or other contact strip **14** has a plurality of longitudinally spaced protrusions **32** that are located substantially along the center line between opposite lateral edges thereof. In the illustrated embodiment, the protrusions **32**, which extend towards the strip **12**, are formed by deforming the strip to produce a plurality of longitudinally spaced dimples.

The respective protrusions or dimples allow the switch to be actuated when a localized pressure is applied to a restricted area of the switch contact. The height of protrusions can readily be varied during maufacture to vary the sensitivity of the switch. The protrusions also produce limited point contact between the strips resulting in higher contact pressure in the contact area and the advantages of this arrangement are set forth in U. S. Pat. No. 3,485,974, assigned to the assignee of this invention.

According to another aspect of the invention, switch **10** incorporates means for concentrating an actuating pressure to a location aligned with the protrusions. This means is most clearly shown in FIGS. **2** and **3** and consists of an elongated member or bead **40** that is integral with the resilient casing **16** and has a free end terminating at the location spaced from the adjacent surface of the casing. This elongated narrow bead or member **40** concentrates the pressure in a localized area above the respective protrusions.

According to a further aspect of the invention, the casing **16** is designed to allow the switch to be actuated at a substantially uniform operating pressure at various temperatures. It will be appreciated that a resilient material, such as rubber, will have varying degrees of flexibility at different temperatures which will require different pressures to flex or deflect the casing.

This objection is overcome by producing relief grooves **42**. The relief grooves **42** provide an area of reduced cross-section in the wall of the casing that has the bead integral therewith and, as indicated above, allows the wall to readily be deflected and produce engagement between the contact strips.

The switch **10** also includes an outer cover or tube **44** that encloses the casing and is sealed at opposite ends **46** (only one end being shown) to produce a waterproof assembly. The outer cover or jacket may have accordian pleats **49** defined in the vertical side walls to define a bellows construction accommodating ready deformation of the side walls upon compression of the casing. During dielectric sealing of the cover, the material flows into the recesses **25** to hold the insulators **22** and strips **12, 14** in position.

According to a further aspect of the invention, the switch also incorporates an elongated narrow sheet member **48**, preferably made of thin spring steel, that is located between the bead or member **40** and the adjacent wall of the outer cover. This actuating member cooperates with the bead **40** to localize the actuating pressure applied to any portion of the outer cover, between opposite lateral edges, to the bead to concentrate the actuating pressure to the center of the contact strips.

When switch **10** is used as a sensing mechanism for sensing the presence or absence of an occupant in the center position of the seat, switch **10** is preferably inserted into the cushion material of seat **50** (shown in FIG. **1**) with the elongated dimension of the switch extending from the front to the back of the seat and with the actuating strap **48** located adjacent the upper surface. When inserted in this position, occupants in the outboard positions of the seat will tend to bend or curve the switch **10** between opposite ends thereof and, of course, the amount of bending the curvature will depend on the weight of the respective occupants.

However, the switch **10** will not be actuated until an occupant is located in the center of the seat and applies pressure directly on the switch. When this occurs, any forces applied to any area of the upper surface of the upper wall of cover **44** will be transmitted to the longitudinal bead **40** through the spring metal strap **48** and will deflect the upper strip **12** between opposite lateral edges to produce engagement with at least some of the protrusions **32**.

The diagonally positioned slits **30** will allow the strip **12** to be flexed between opposite lateral edges with approximately the same amount of actuating pressure being applied without regard to the amount of curvature of the strips **12** and **14**.

The switch could also be inserted into the seat with the strap **48** located adjacent the bottom of the seat cushion without effecting the sensitivity of the switch. When positioned in this manner, any pressure applied to the surface of any portion of the casing that is adjacent strip **14** will collapse the side walls of the casing which in turn will cause the strip **12** to be flexed between opposite lateral edges to produce the contacting engagement.

While the switch has been described as being particularly adapted for use as a switching mechanism forming part of the signal system for the center seat of a vehicle, it will be appreciated that the switch has numerous other uses. For example, the switch also can be utilized as a switching mechanism **60** for the outboard seats of

a vehicle such as an automobile. Alternatively, the switches **60** could be of the type disclosed in the above patents.

We claim:

1. A switch comprising first and second elongated flexible contact strips, and spacing means normally maintaining said contact strips spaced from each other, characterized by one of said contact strips having a plurality of longitudinally spaced protrusions extending towards the other of said contact strips and the other of said strips having a plurality of narrow spaced substantially parallel slits, said slits being located between lateral edges thereof to readily accommodate bending between opposite edges and opposite ends.

2. A switch as defined in claim **1,** in which each of said slits has a length greater than the width of said other strip.

3. A switch as defined in claim **2,** in which each of said slits extend at an angle with respect to the longitudinal axis of said other strip.

4. A switch as defined in claim **1,** in which said spacing means includes a casing defining an elongated passage with means in said passage normally maintaining opposite lateral edges of said strips spaced from each other and actuating means forming part of said casing and aligned with said protrusions.

5. A switch as defined in claim **4,** in which said protrusions are centered between opposite lateral edges of said one strip and said actuating means includes an elongated narrow bead integral with said casing and extending from the surface thereof.

6. A switch as defined in claim **5,** in which said casing has elongated areas of reduced cross section extending generally parallel to said bead on opposite sides of said bead.

7. A switch as defined in claim **5,** further including an outer cover surrounding said casing and an elongate thin sheet member between said outer cover and said bead, said sheet member having elongate and transverse dimensions substantially corresponding to the dimensions of said strips.

8. A switch as defined in claim **7,** further including a pair of insulated wires respectively connected to said strips with said outer cover sealed around said strips and said casing.

9. A switch comprising a resilient casing defining an elongated passage with a pair of elongated contact strips in said passage, means for holding adjacent lateral edges of said strips in spaced relation, one of said strips having a plurality of narrow slits extending diagonally with respect to the axis of said passage to permit said one strip to be bent between opposite lateral edges while the strips and casing are in a bowed condition between opposite ends.

10. A switch as defined in claim **9,** in which the other of said strips has a plurality of spaced protrusions located substantially between opposite lateral edges and extending toward said one strip.

11. A switch as defined in claim **10,** in which said casing has an elongated narrow integral bead extending from the surface thereof with the bead aligned with said protrusions and said casing has relief grooves adjacent opposite sides of said bead to increase the resiliency of said casing.

12. A switch as defined in claim **10,** further including an outer cover surrounding said casing with an elongated actuating strap between said cover and said casing and located adjacent said one strip and means for concentrating an actuating pressure applied to said cover adjacent said strap to a location aligned with said protrusions.

13. A switch as defined in claim **12,** in which said means for concentrating an actuating pressure includes an elongated member aligned with said protrusions and engaging said strap intermediate opposite edges.

14. A switch as defined in claim **13,** in which said casing has an integral bead extending above its surface adjacent said strap to define said member.

15. A switch as defined in claim **14,** in which said casing has areas of reduced cross-section on opposite sides of said bead.

16. A switch as defined in claim **15,** in which said strap is a thin spring steel member that has a length and width substantially corresponding to the length and width of said strips.

17. A switch as defined in claim **9,** in which said slits have a length many times greater than the width and the length of said slits is greater than the width of said one strip.

18. A switch as defined in claim **17,** in which said slits extend parallel to each other.

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