

[54] **VIBRATING SWITCH**

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[22] Filed: **March 16, 1971**

[21] Appl. No.: **124,791**

[52] U.S. Cl. **200/61.45 R**, 200/61.93

[51] Int. Cl. **H01h 35/14**

[58] Field of Search 200/61.45-61.53,
200/61.93; 340/261, 262, 276

[56] **References Cited**

UNITED STATES PATENTS

2,236,689 4/1941 Lemire et al.....200/61.49

3,389,236 6/1968 Guthart200/61.48

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[57]

ABSTRACT

A switch which is operable responsive to impact comprises a ring-shaped contact biased into bridging contact with spaced stationary contacts. The ring-shaped contact is rotatable relative to the spaced contacts to present new contacting surfaces upon rotation, and is biased toward the stationary contacts by the pressure of leaf springs pressed against the ring contact by an adjustable screw which passes through the center of the contact.

7 Claims, 3 Drawing Figures

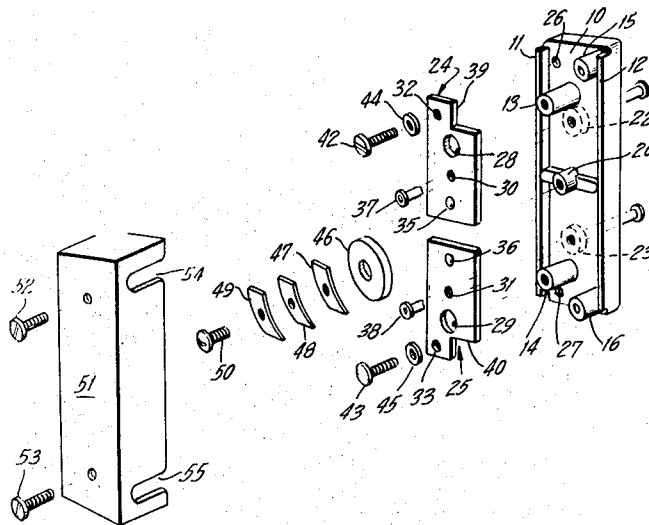


FIG. 1.

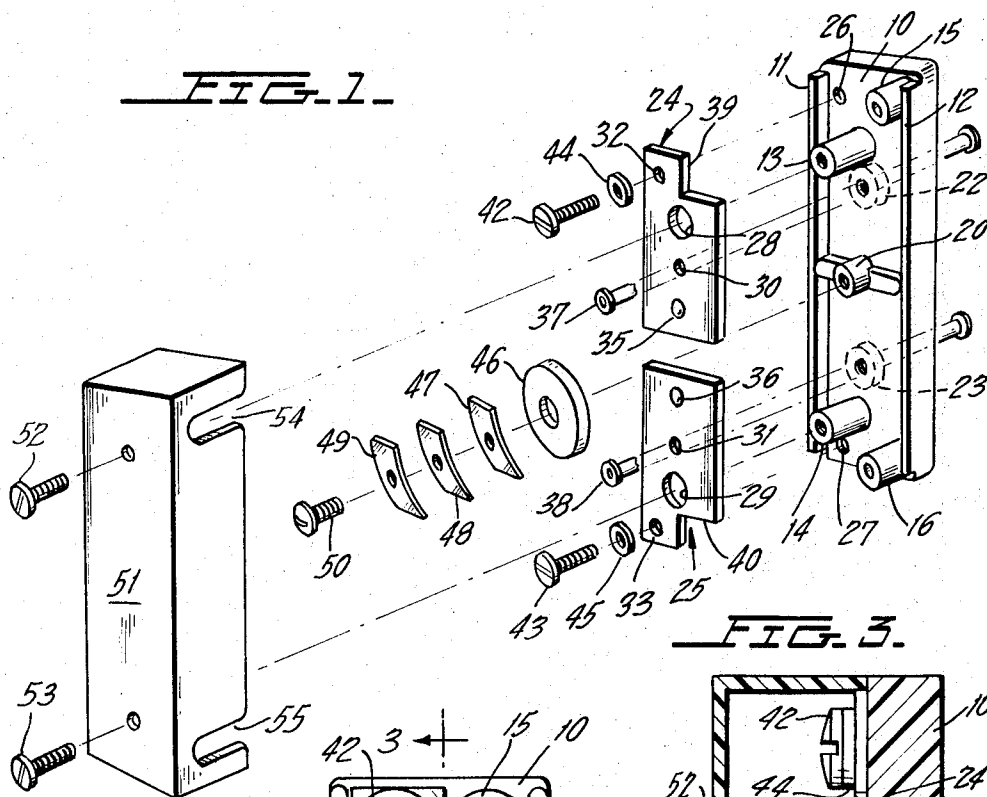


FIG. 3.

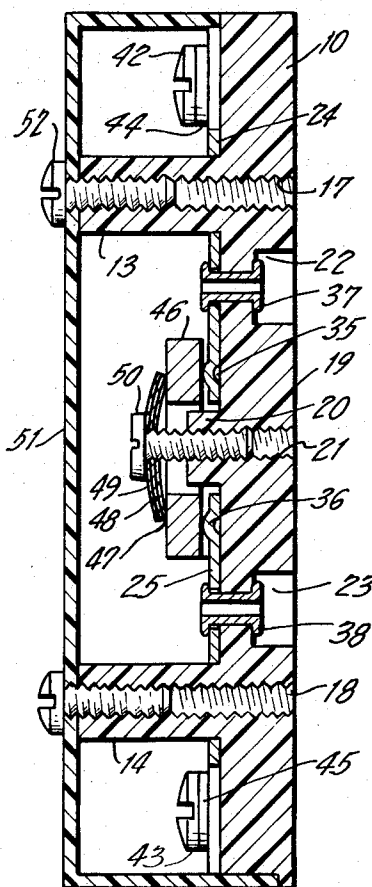
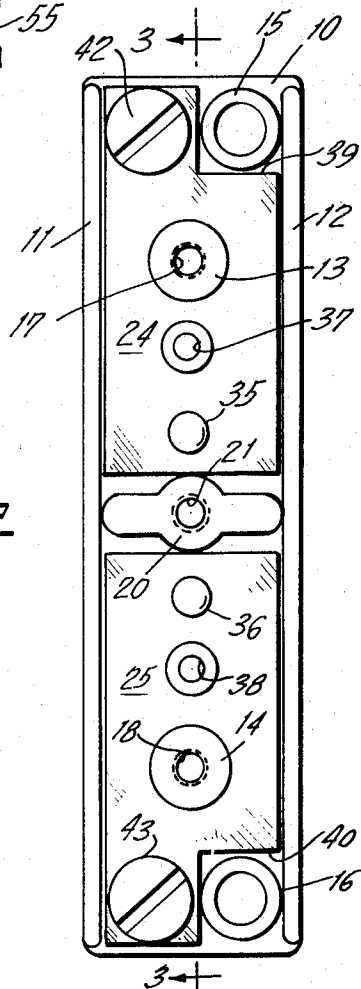


FIG. 2.



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VIBRATING SWITCH

BRIEF SUMMARY OF THE INVENTION

This invention relates to a switch device which is operable responsive to impact forces, and more particularly relates to a switch for use in a burglar detection system.

It is known to mount switches on structures which will be subject to impact forces during the forced entry of an enclosure. A typical switch of this type is shown in U. S. Pat. No. 3,389,236 to Guthart, issued June 18, 1968.

The present invention provides a novel switch which is operated by impact, whereby a circuit can be momentarily interrupted, or closed, thereby to activate detection and/or alarm equipment. The switch of the present invention incorporates a ring-shaped contact which makes bridging contact with a pair of spaced contacts. A novel centrally disposed biasing spring structure is then pitted across the center of the ring-shaped contact to adjustably bias the contacts closed. The use of the ring-shaped contact substantially simplifies the switch structure and permits the use of a minimum number of parts of very high reliability. Moreover, the contact ring can be rotated relative to the stationary contacts to present new contact surfaces after extended use and pitting of the ring which would otherwise interfere with its best operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of the switch of the invention.

FIG. 2 is a plan view of the top of the switch of FIG. 1 with the upper cover removed.

FIG. 3 is a side cross-sectional view of FIG. 2 taken across section line 3 — in FIG. 2, and further shows the upper cover in position.

DETAILED DESCRIPTION OF THE DRAWINGS

The switch of FIGS. 1, 2 and 3 is mounted on an insulation base 10 which could, for example, be a molded ceramic body having preformed integral extensions and openings. Thus, base 10 has side ribs 11 and 12 (FIGS. 1 and 2) and pairs of cylindrical extensions 13-14 and 15-16, respectively. Extensions 13 and 14 have respective tapped openings 17 and 18, respectively, while extensions 15 and 16 have relatively large openings which pass through the entire base, and which could receive fasteners used to fasten the switch assembly to a structure. Alternatively, the switch can be cemented to a structure at its base 19 (FIG. 3) which may be suitably roughened. Base 10 further contains a central integral extension 20 having a central tapped opening 21, and a pair of openings 22-23 which are enlarged at the bottom of base 10. A further pair of clearance openings 26-27 (FIG. 1) are provided to receive terminal screws, as will be described later.

A pair of conductive contact plates 24 and 25 are then provided, each having pairs of openings 28-29, 30-31, and 32-33 (FIG. 1) which are aligned with pairs of elements 13-14, 22-23, and 26-27, respectively, in base 10. Moreover, contact plates 24 and 25 are contained between ribs 11 and 12 in base 10. Contact projections 35 and 36 in plates 24 and 25 are thereby fixed in position relative to base 10. Contact plates 24 and 25 are then held in position on the upper surface of base 10 by rivets 37 and 38, respectively, or by any other suitable fastening means. Note that plates 24 and 25 have corner cutouts 39 and 40, designed to fit around projections 15 and 16, respectively.

A pair of terminal screws 42-43 are then provided with appropriate washers 44-45, respectively, and are threaded into tapped openings 32 and 33, respectively, in plates 24 and 25, respectively. The ends of screws 42-43 can extend into openings 26 and 27, respectively, in base 10.

A movable ring-shaped contact 46 (FIGS. 1 and 3) is then disposed on top of contact plates 24 and 25 and engages contacts 35 and 36 in bridging contact relation. Note that contacts 35 and 36 lie on a line which passes through the center of

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contact ring 46. Contact ring 46 is biased into engagement with contacts 35 and 36 by spring members 47, 48 and 49 which span the central opening in ring contact 46 and are pressed toward ring contact 46 by pressure screw 50 which passes through aligned openings in springs 47, 48 and 49 and is threaded into tapped opening 21 in base 10. This biasing force is suitably adjusted by rotating screw 50 until the contact 46 is pressed against contacts 35 and 36 with a given pressure which insures against unintentional separation of contact 46 and contacts 35 or 36 by impact forces less than a given magnitude which would be encountered during a forced entry.

An insulation cover 51 is then provided which encloses the base 10, as shown in FIGS. 1 and 3, and which is held in place by screws 52 and 53 which thread into tapped openings 17 and 18, respectively. Note that cover 51 is easily removed to gain access to adjustment screw 50 for adjustment of contact pressure, and to contact 50 to rotate the contact to a new position relative to contacts 35 and 36. Cover 51 is further provided with slots 54 and 55 (FIG. 1) in the wall thereof adjacent extensions 15 and 16, respectively. Slots 54 and 55 permit access of electrical leads to terminal screws 42 and 43, which leads must bend around extensions 15 and 16. Extensions 15 and 16 then block easy access through slots 54 and 55 to exposed conductive members within the cover 51.

The operation of the device should be clear since any impact force having at least a component which is parallel to the axis of contact 46 will, if sufficiently high, cause contact 46 to move against the restraining force of springs 47 to 49, to open its connection to one or both of contacts 35 and 36. This will then interrupt some appropriate detection or alarm circuit connected to terminal screws 42 and 43. The use of the ring-shaped contact 46 permits many economics of space and number of parts and permits the manufacture of a rugged and reliable switch device, which is easily installed and adjusted.

Although this invention has been described with respect to preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art and, therefore, the scope of this invention is to be limited not by the specific disclosure herein, but only by the appended claims.

1. The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. An impact responsive switch comprising, in combination: an insulation base member; contact means including a pair of fixed contacts mounted on the upper surface of said insulation base member and being spaced from one another; first and second terminal means respectively connected to said pair of fixed contacts; a ring-shaped contact disposed in a plane generally parallel to the plane of said upper surface and being movable between a bridging contact engagement position and a disengaged position with said pair of fixed contacts; means including resilient biasing means supporting said ring-shaped contact for translation movement in the direction along the axis of said ring-shaped contact and normally biasing said ring-shaped contact toward one of said bridging contact engagement and disengagement positions; said ring-shaped contact being movable responsive to impact forces having components directed in the direction along said axis of said ring-shaped contact to the other of said bridging contact engagement and disengagement positions; said ring-shaped contact being rotatably adjustable relative to said resilient biasing means to present new contact surfaces with said pair of fixed contacts.

2. The impact responsive switch of claim 1 wherein said means including said resilient biasing means includes a plurality of stacked spring plates disposed above said ring-shaped contact and bearing against the top thereof and a support screw; said support screw extending serially through said spring plates and through the center of said ring-shaped contact and being terminated by threading into said upper surface

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of said base member, thereby to press said spring plates against said ring-shaped contact to bias said contact toward said position of bridging contact engagement.

3. The impact responsive switch of claim 1 wherein said contact means includes first and second flat conductive plates spaced from one another and secured to symmetric and spaced regions of said upper surface of said insulation base member; said pair of fixed contacts being respectively disposed on adjacent end regions of said first and second flat conductive plates; said first and second terminal means being connected to opposite end regions of said first and second plates.

4. The impact responsive switch of claim 1 which includes a cover member for enclosing at least said upper surface of said base member, said fixed contacts, said movable ring-shaped contact, and said resilient biasing means; said base member having first and second integral raised sections extending from said upper surface thereof for contacting an interior surface of said cover member.

5. The impact responsive switch of claim 1 wherein said pair

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of fixed contacts are spaced from one another along a line; the said axis of said ring-shaped contact bisecting said line.

6. The impact responsive switch of claim 2 which includes a cover member for enclosing at least said upper surface of said base member, said fixed contacts, said movable ring-shaped contact, and said resilient biasing means; said base member having first and second integral raised sections extending from said upper surface thereof for contacting an interior surface of said cover member; removal of said cover member exposing said support screw for adjustment.

7. The impact responsive switch of claim 6 wherein said contact means includes first and second flat conductive plates spaced from one another and secured to symmetric and spaced regions of said upper surface of said insulation base member; said pair of fixed contacts being respectively disposed on adjacent end regions of said first and second flat conductive plates; said first and second terminal means being connected to opposite end regions of said first and second plates.

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