

# United States Patent

Lea

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[54] **SPRINGLESS SWITCH  
CONSTRUCTIONS FOR USE IN THE  
PROTECTIVE CIRCUIT OF BURGLAR  
ALARM SYSTEMS**

[72] Inventor: **Lawrence N. Lea, 3601 Johnson Avenue,  
Bronx, N.Y. 10463**

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335/285

[51] Int. Cl. .... H01h 1/54  
[51] El. M. 1G

[58] **Field of Search** ..... 335/205, 206, 207, 285;  
200/61.62, 61.73, 61.84; 340/274

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*Primary Examiner*—Bernard A. Gilheany

*Assistant Examiner*—R. N. Envall, Jr.

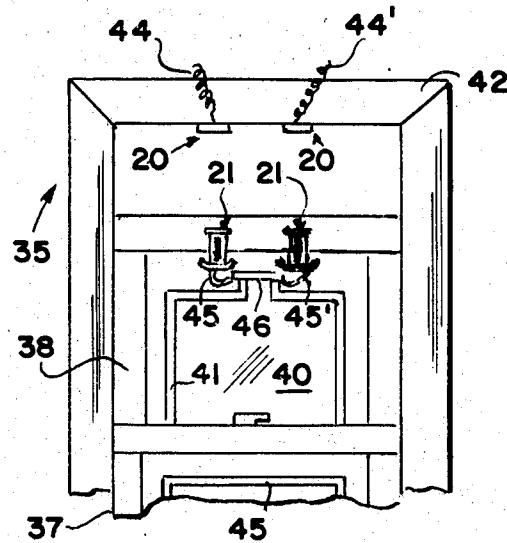
*Attorney—Polacheck, Saulsbury & Hough*

[57]

## ABSTRACT

A conductive permanent magnet structure fixed on the frame of a protected opening, attracts into contact with itself, a conductive loosely slideable armature having limited movement on the closure member; such magnet and slide constituting a switch protecting the opening. In closed condition of the switch, these switch parts are contiguous portions of the current path in the protective circuit. In installations where slide movement during the attraction is vertical, gravity returns the slide to a rest position, to be ready for a reestablishment of the protective circuit. When such direction is horizontal, the slide is automatically cammed to be in proper position if necessary, for the protective circuit to be put into operative condition. These switches avoid the need of cords across a parting of the frame and its closure. Stocking a few parts, affords the fabrication of switches of different constructions, either in the shop or on the job, to meet installation requirements and conditions.

## 7 Claims, 14 Drawing Figures



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FIG.1

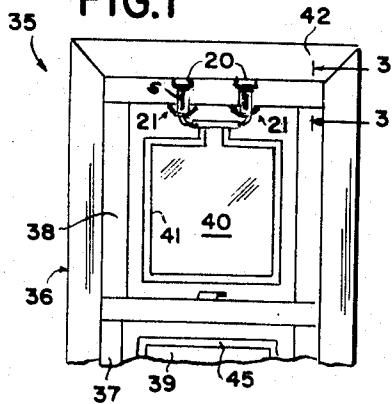


FIG.2

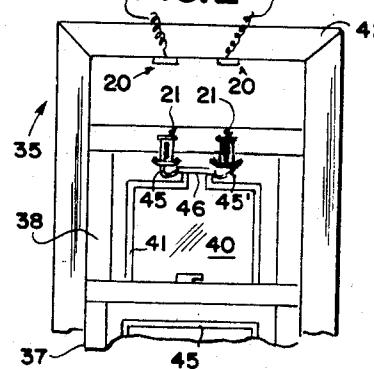


FIG.4

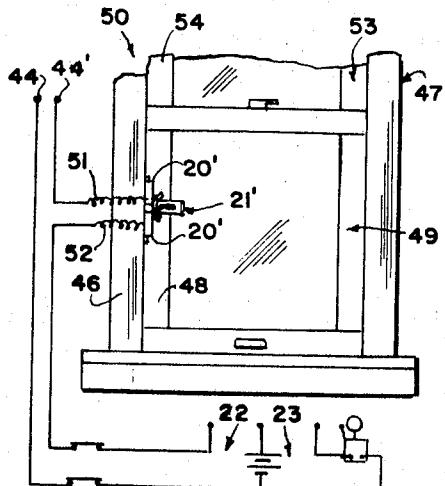
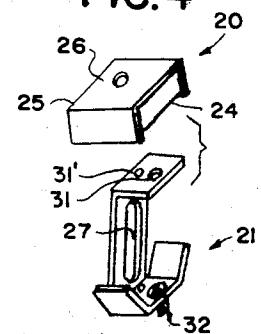


FIG.5

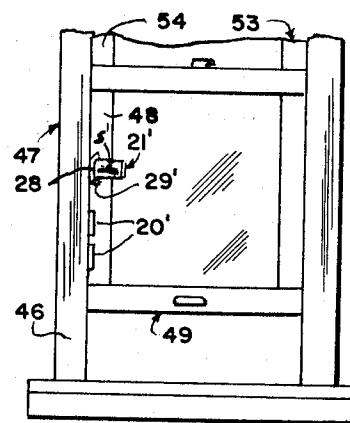


FIG.6

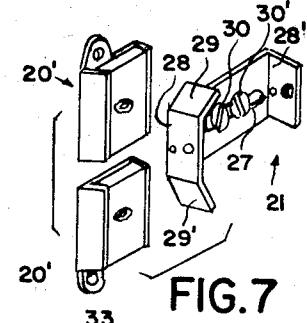


FIG.7

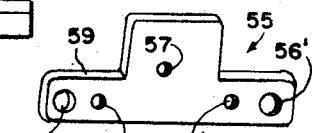


FIG.8

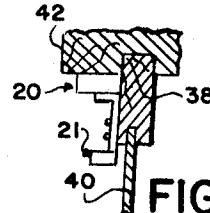


FIG.3

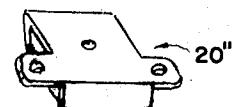


FIG.9

FIG.10

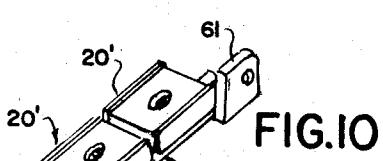


FIG.10

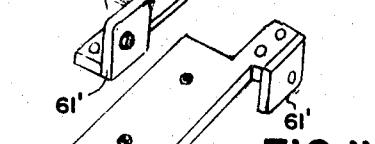


FIG.11

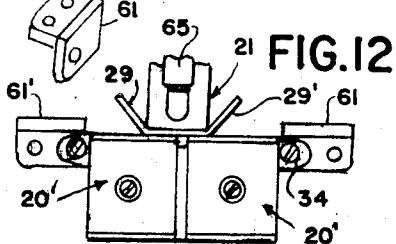


FIG.12

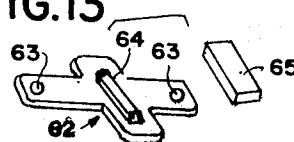


FIG.13

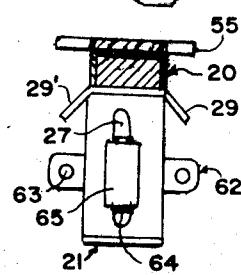


FIG.14

INVENTOR,  
Lawrence N. Lea,

*Lawrence N. Lea*  
by

ATTORNEY.

**SPRINGLESS SWITCH CONSTRUCTIONS FOR USE IN  
THE PROTECTIVE CIRCUIT OF BURGLAR ALARM  
SYSTEMS**

The present invention relates to switches for use in the normally closed protective circuits of electrical burglar alarm systems, and more particularly to the type of switch having the essential combination that one part thereof is a permanent magnet structure, and its other part is the armature, forming contiguous portions of the current path when such switch is closed, or such switches may comprise various combinations of magnets and armatures forming current path when such circuit is in closed condition.

As is well known in burglar alarm systems generally, they give protection by actuating the alarm circuit when there is an unauthorized movement of the closure member of a protected opening, from closing position, and when there is a breakage of conductive tape mounted on glass pane structure. It is preferred in the practice of this invention that the armature shall be movably mounted on the closure member, and that its companion magnet structure shall be fixedly carried on the frame member of the protected opening. Upon bringing the closure member to closing position, the armature is attracted by its related magnet to be in contact therewith, thus offering path for current in the protective circuit. Upon movement of the closure member to an open position, the armature returns to a rest position on the closure member, automatically in prior switches of this class, because the armatures were spring-biased. Such construction involved expenses in material and labor which added appreciably to the cost of manufacture.

It is therefore an object of this invention to provide a novel and improved magnetic switch construction of the character described, which is springless. Its simplified makeup, lowers its cost, and yet, there is timely return of the armature accomplished automatically, regardless of whether the armature movement need be vertical or horizontal, to be properly oriented.

The preferred form of the armature in the practice of this invention, is that it shall be a slide on the closure member with a limited scope of movement determined by what it has to do when the closure member it is on, assumes closed position, and then when said member is shifted to open position. The slide has some special construction as will be described. Where the frame and closure are of wooden construction, the switch parts, though they carry current, may be mounted thereon directly, as is evident. If the mounting surfaces are of conductive material, for they are of metal in modern buildings, the said switch parts need be mounted so they are insulated from the building and from each other.

It is therefore another object of this invention to provide insulative mounts for the switch parts which will also serve as tracks for the slides, and which will present the magnets for action on the slides which are the armatures as mentioned.

A further object thereof is to have the magnets and armatures as well as the insulative mounts therefor, marketed as separate pieces, so with a supply of them as stock, the electrician can readily fabricate any combination of them to suit the different conditions and installations he need make for any alarm system to meet switch requirements.

A further object of this invention is to provide novel and improved magnetic switch constructions of the kind set forth, having the stated attributes and advantages, and which are simple, easy to install and efficient in carrying out the purposes for which they are designed involving new modes of operation brought about by novel cooperation of the parts.

Other objects and benefits of this invention will become evident as this disclosure proceeds. For example, these switches make it unnecessary to have permanent cords across a parting between a closure and the frame.

For one practice of this invention, one part of the switch is a permanent magnet mounted fixed on the frame of a protected opening, and the other part is a loose armature which is a slide on the closure member of said opening, so arranged that when the closure member is in closing position, the armature is at-

tracted by the magnet into contact therewith, so the switch such parts constitute, is in closed condition; such parts offering contiguous portions of the current path in the protective circuit of the burglar alarm system. No springs are used to

5 bring the slide to any position. Where armature movement is upwardly vertical when attracted by the magnet, the movement of the closure member to open position, will allow gravity to act on the raised slide, to accomplish automatic return to its rest position on the closure member; the limits of movement permitted the slide allowing it to come to the magnet when subject thereto, with an impact on contact. Where armature movement is downwardly when attracted by the magnet, the armature on contact therewith will retract a bit from its lowered position and make good contact with the magnet. 10 When the installation is such that armature movement is along the horizontal when attracted by the magnet, should the armature be accidentally in a position to be intercepted by the magnet or other structure, so the closure member could not complete its required travel, then cam means on the slide, will automatically shift the slide to a retracted position, thereby allowing completion of the necessary movement of the closure member. When the building structure is of metal, insulative backings or mounts are included. Various combinations and 15 arrangements are made of these magnets and slide armatures, to suit the needs of particular installations. These switch parts and insulative pieces can constitute "stock" parts for fabrication in the shop or on the job.

In the drawing forming part of this specification, similar 20 characters of reference indicate corresponding parts in all the views.

FIG. 1 is a fragmentary front view of a window equipped with protective switch structure in accordance with the 25 teachings of this invention, so that upon opening of a sash or upon the breaking of a metallic tape on its pane, the alarm circuit will be actuated. The window is shown in closed condition.

FIG. 2 is a view like FIG. 1, with the window open.

FIG. 3 is an enlarged fragmentary section taken at line 3—3 30 in FIG. 1.

FIG. 4 is a perspective view showing the switch parts of the kind used for the switch structure included in FIG. 1.

FIG. 5 is a fragmentary front view of a window equipped 35 with another arrangement of switch structure of slightly modified construction, which will cause the actuation of the alarm circuit when the window is open. The wiring diagram of the burglar alarm system is fragmentarily shown.

FIG. 6 is a view like FIG. 5, with the window open.

FIG. 7 is a perspective view showing the switch parts included in the installation shown in FIG. 5.

FIG. 8 is a perspective view of an insulating piece for use to mount the magnet structure on, where the window frame is of metal.

FIG. 9 is a perspective view of another slightly modified form of magnet structure. The insulative piece of FIG. 8, is useable as a backing therefor.

FIG. 10 is a perspective view showing an assembly of the two magnets of FIG. 7, on an insulative piece.

FIG. 11 is a perspective view showing the insulative piece included in FIG. 10, in inverted position.

FIG. 12 is a top plan view of FIG. 10. Included fragmentarily, is the associated armature on an insulated mount.

FIG. 13 shows in perspective, the parts of the insulative 65 mount which carries the armature as included in FIG. 12.

FIG. 14 is a front view which is partly in section, showing the magnet structure on its insulative mount, contacting the armature which is shown in assembly with its own insulative mount which comprises the parts shown in FIG. 13.

70 In FIGS. 1 and 2, the means for mounting and slidably guiding the slide armature, is symbolized by a line "S," and in FIGS. 5 and 6, by a line "S'."

A detailed description will now be given.

In the drawing, the numeral 20 designates generally a conductive permanent magnet structure, and the numeral 21 in-

dicates generally the conductive armature therefor. These basically, are the parts of switches to be made for use in the protective circuit 22 of burglar alarm systems so upon a violation of a protected opening, the alarm circuit 23 shall be actuated. As shown, it is preferred that the structure 20 comprise a block 24 which is a barium ferrite flexible magnet or the magnet material marketed under the name of "Alnico," set within a channel 25 of sheet steel, through which block and channel are aligned holes centrally located as 26, for the reception of a wood screw, when such magnet structures are to be mounted on woodwork as in FIGS. 1 and 5. Of course, any permanent magnet may be used in its stead, without the channel. The armature 21, in all instances shown, is a slide made of sheet metal, and preferably is of the form illustrated, which comprises a channel of rectangular shape, whose floor wall has a crosswise slot 27 which is along the direction of its sliding movement. The end edges of one of its sidewalls 28, has the outward wing extensions 29, 29' which diverge towards the other sidewall 28', and serve as cams as will be explained. Two wood screws 30,30' mount the armature on the woodwork, and their spacing will of course determine the scope of movement of the slide. The numeral 31 indicates a threaded hole for a binding post screw 32, to which connection may be made by having the connecting wire first pass through the hole 31'. Similar provision may be made by holes in the channel wall 28'. If desired, the channel may have a mounting lug 33 integral therewith in any desired direction which may be other than shown, and such lug may be used for a binding post screw 34 as illustrated in the embodiment FIG. 12, designated as 20', and there may be two lugs as in the magnet structure 20".

In FIG. 1, the numeral 35 designates generally a window having a wooden frame 36, a lower sash 37, and an upper sash 38, both these sashes having wood frames for their glass panes 39 and 40 respectively, each of which has an open loop as 41 of metallic tape adhered thereto in a marginal format, as is well known in the burglar alarm art, to be part of the closed protective circuit 22, so should a pane be broken, its tape will also break, and hence the alarm circuit 23 would be actuated. Two permanent magnet structures 20 are mounted in spaced relation on the bottom surface of the overhang of the window frame's upper rail 42. For each magnet, there is an armature 21 which is slidably mounted on the face of the upper sash 38, in similar spaced relation so that each armature is directly opposite its respective magnet, and slidably mounted for movement along the vertical, will be attracted with impact into contact with its companion magnet when the upper sash is raised to closed position. The installation of said slide armatures and the location of the mounting screws 30,30' therefor respectively, shall allow the armatures to override, so contact caused by magnetic attraction shall be with an impact to effect good contact. The extent of permitted return downward movement of the armatures shall keep them within the influence of the magnets, when the upper sash is raised. The wings 29,29' serve as weight to aid the action of gravity to return the slide armatures to their normal lowered rest positions on the sash. Conductors 44,44' leading from said magnets, are interposed as switch terminals in the protective circuit; the tape 41 being connected to shunt the magnets, by having its ends connected to the respective binding posts 32 by short pieces of flexible wire 45,45', whose ends and those of the tape loop are connected, and held supported on an insulative piece 46 which is adhered to the pane 40.

The installation involving the lower sash 37 and the metallic tape 45 on its pane 39, will have the same switch installation and connections as for the upper sash. Of course, the magnets will be mounted therefor on the window sill, and their armatures will be on the lower rail of the lower sash, all of which is believed readily understood by those versed in the art, so no further showing or explanation is necessary. When the window 35 is closed top and bottom, and the burglar alarm system is set into operative condition, as is well known, upon the movement of any of the sashes to an open position, or should any of the tapes 41 or 45 be broken, the protective circuit 22 will become open, and cause actuation of the alarm circuit 23.

It is evident that if the protection sought is only against the opening of the window, meaning that the tapes 41 and 45 are omitted, then, the pair of armatures would be connected by a conductor on each sash respectively, or the two magnets for each sash, would need only one armature to shunt both of them, as shown in another installation in FIG. 5, all of which is believed readily comprehended without the need of any further illustration.

In the installation of protective switch means shown in FIG. 10 5, the permanent magnets 20' are mounted slightly spaced along the vertical on the inner face of the vertical section 46 of the window frame 47, and have the single armature 21' which is slidably mounted for horizontal movement on the vertical frame piece 48 of the lower sash 49 of the window 50, and so 15 arranged that when the said sash is down, said armature will overlap and contact both said magnets and shunt them; conductors 51 and 52 respectively connected to said magnets, are interposed as the switch terminals of such installation, in the protective circuit, wherein all switches are in series as is well known. It is important to note that here, it is the cam-carrying wall 28' of the armature, that makes contact with the magnets 20', and is moved thereto upon lowering of the sash to closed 20 position. When the premises are occupied and the alarm system is set into inoperative condition, the sash may be raised to keep the window open. Raising the sash 49, will of course carry the armature 21' with it, which will remain in brush wiping contact of the upper magnet until it passes it as shown in FIG. 6. If there has occurred no accidental displacement of the armature so that it lies in the path of the upper magnet, 25 subsequent lowering of the sash 49, will not affect reestablishment of the shunt. In particular, it is to be noted that even if such displacement did happen, the interception of the armature by the uppermost edge of the magnet structure will not prevent full downward movement of the sash, because the wing 29', coming in contact with said edge, will act as a cam upon further downward movement of the sash, and cause the armature 21' to move to the right, sufficient to allow sash movement and so contact of the armature with both magnets 30 can be established. Magnetic attraction does its work, and when armature displacement is towards the right, there certainly is no interference with switch function. For the protection of the upper sash 53, a similar switch installation is provided therefor, the included armature of which would be on the sash frame piece 54. This is fully understandable without 35 further illustration, as well as the use of the double armature switch means and the inclusion of a tape loop, where the magnets would be as in FIG. 5, at the side of the window, but using the arrangement of switch structure as in FIG. 1.

Where window frame and sash construction is of metal, it is of course necessary to have the switch parts insulated therefrom. For mounting the magnets, a plastic T-shaped underlay 55 may be used, which has the holes 56,56' for screws for attachment to the building structure. The threaded hole 57 is for a short screw to hold the magnet structure, and the holes 58,58' are clearance holes for terminal connection screws, as for instance in the hole 33 which may be threaded so it can receive such screw; all screws through the holes 57,58 and 58' ending within the body of the insulating backing piece 55. A 40 suitable insulator for one of the magnets may be just part of said piece 55, that is, it may be an L-shape made by omitting one of the horizontal perforated extensions 59. On one face, it would be for a right lugged, and on its other face, it would be for a left lugged channel component when the magnets are as 45 shown in FIG. 7. The T-form scheme is included in the insulator construction shown in FIG. 11, which is for mounting a pair of magnets, which may be used for the switch arrangements of FIGS. 1 and 5, and particularly, for FIG. 5, the feet 61,61' may be included to cooperate with the cam extension 50 pieces 29 and 29' as is illustrated in FIG. 12.

A dielectric mount for the slide armature 21, is illustrated in FIGS. 13 and 14, where the backing member 62, moulded of plastic, is cross-shaped, with holes 63 for mounting screws on a line crossing an integral elongated boss 64 55 which is received as a track means in and along the slot 27 of

the armature, out of which it extends a bit to allow the armature its sliding movement. The assembly is maintained by a piece or tab 65 which overlaps the edges of said slot and is cemented onto the boss 64. The length of said boss is less than the length of the said slot, a distance which determines the extent of slide travel.

The permanent magnet used in these switch means is a conductive block, whose use this invention includes, the armature is arranged to contact one of its poles which might be its large faces. Where the magnet structure is built up as illustrated, using the steel channel filled by a magnetic block which might be nonconductive, armature contact is made with the face, or with one or both longitudinal edges, of the channel walls. The assembly shown in FIG. 10, whether mounted on a wall or surface, resting either on the plate 66 or the feet 61, 61', any of the channel walls and their longitudinal edges, are accessible for choice to be contacted by the armature.

For installation of required switch arrangements, they may be fabricated on the job, or prefabricated in the shop, from a stock in hand of the magnet structures and the armature, shown in the FIGS. 4, 7 and 9, and of insulator elements, as for instance shown in the FIGS. 8, 11 and 13, and of course a supply of mounting screws and those to make connections to conductors to be interposed in the circuit.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiments herein shall be deemed merely illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth; reference being had to the following claims rather than to the specific showing and description herein, to indicate the scope of this invention.

I claim:

1. In a springless switch device interposed in a conductor included in the circuit of an electrical burglar alarm system protecting a frame member having a movable closure member; said switch comprising two conductive parts one of which is a permanent magnet structure and the other of which is an armature for said one part; one of said switch parts being fixedly mountable on one of said members and means for loosely slidably mounting the other switch part on the other of said members and said other switch part being shiftable into contact with the first switch part when the closure member is in a closed position, such that said switch parts remain in contact by action of magnetic attraction of one of said parts for the other of said parts; said switch parts being separated upon the closure member assuming an open position; said switch parts when in contact being formable of contiguous portions of the current path through said conductor.

2. A switch device as defined in claim 1, including stops associated with that member the slidable switch part is on, and with said slidable switch part, determining the scope of movement of said slidable part on the member it is on; such part when at one such stop which is farthest from the fixed switch

part when the closure member is in closing position, holding said slidable switch part at a position that it will be attracted by the magnetic action into contact with the fixed switch part, when the closure member assumes closed position; the other

5 stop allowing the slidable switch part a greater distance of travel towards the fixed switch part than is necessary for it to reach the fixed switch part when the closure member assumes closed position whereby on movement into contact with the fixed switch part, the movable switch part will meet it with an 10 impact.

3. A switch device as defined in claim 2, wherein the magnet is fixed on the frame member, and the armature is loosely slidably mounted on the closure member.

4. A switch device as defined in claim 3, including a dielectric 15 backing positioned fixed on the closure member and carrying the slide switch part; said backing being between the slide and closure member; said slide having an elongated slot along the direction it need move, a boss of insulative material extending fixed from said backing and into said slot to serve as

20 a track for said slide; said boss being shorter than the length of said slot a distance equal to the scope of movement of the slide, and means attached to the longitudinal exposed face of the boss, overlapping the longitudinal edges of said slot, to maintain the assembly; the slide being loose for free movement 25 on said backing.

5. A switch device as defined in claim 1, wherein the line of movement of the closure member is along the vertical, and the line of movement of the slide switch part on the closure member is also along the vertical; the direction of movement 30 of the closure member to closing position being the same as the direction of movement of the slide switch part on the closure member when it moves into contact with the other switch part by the action of magnetic attraction.

6. A switch device as defined in claim 1, wherein the line of 35 movement of the closure member is along the vertical and the line of movement of the slide switch part is along the horizontal; the slide switch part being on the closure member, and including a cam element extending from the slide switch part to that edge of the fixed switch part that the movable slide switch 40 part approaches when the closure member is moving from fully open position to fully closed position, whereby when the slide switch part is accidentally in position so that its cam is intercepted by said edge when the closure member is moving from open to closed position, said cam in cooperation with 45 said edge will cause the slide switch part to shift and clear the fixed switch part thereby allowing the closure member to proceed to closed position.

7. A switch device as defined in claim 6, including a dielectric 50 backing on the frame and carrying the fixed switch part, an insulative tab on said backing presenting the first edge the cam would meet when the closure member is moving to fully closed position; said edge of the tab cooperating with the cam for moving the slide switch member to allow the closure member to proceed to fully closed position.

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