Jan. 6, 1953 A. W. FRUH 2,624,792

CLOSURE MEMBER OPERATED SWITCH

Filed Aug. 18, 1949

Fig. 1.

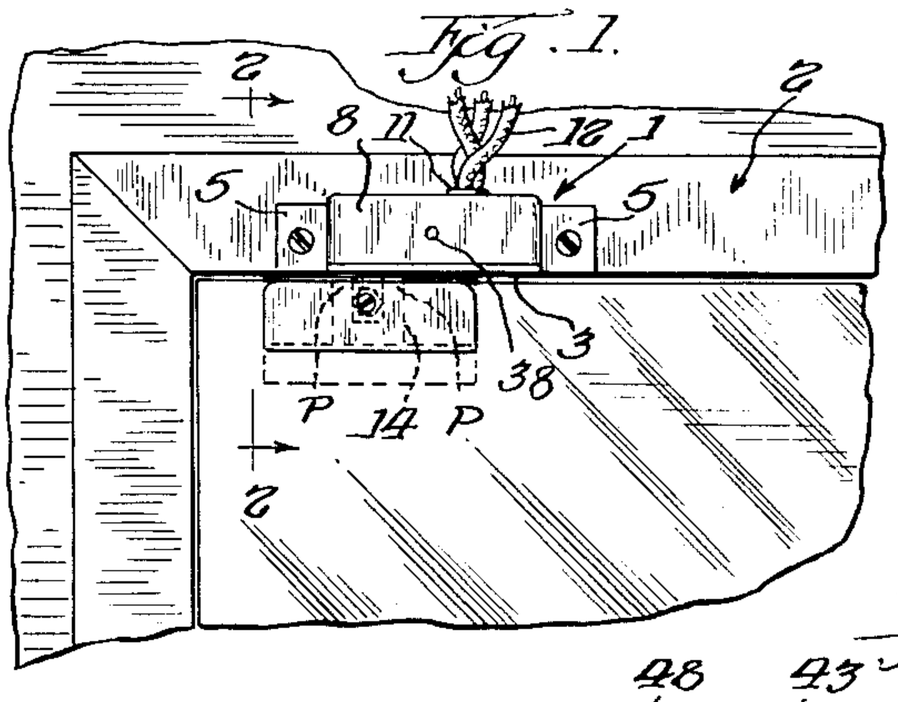


Fig. 2.

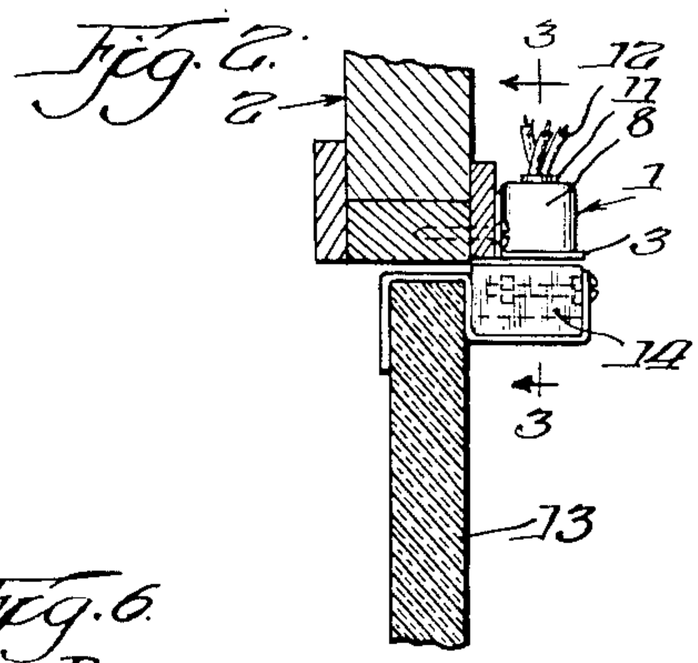


Fig. 5

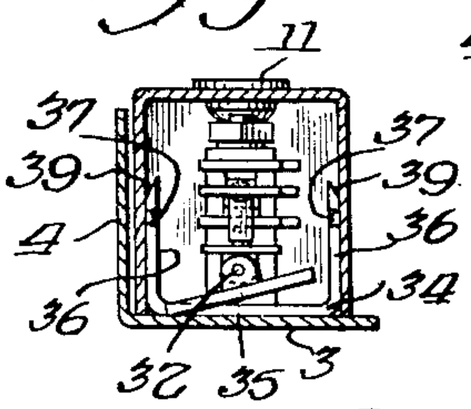


Fig. 6.

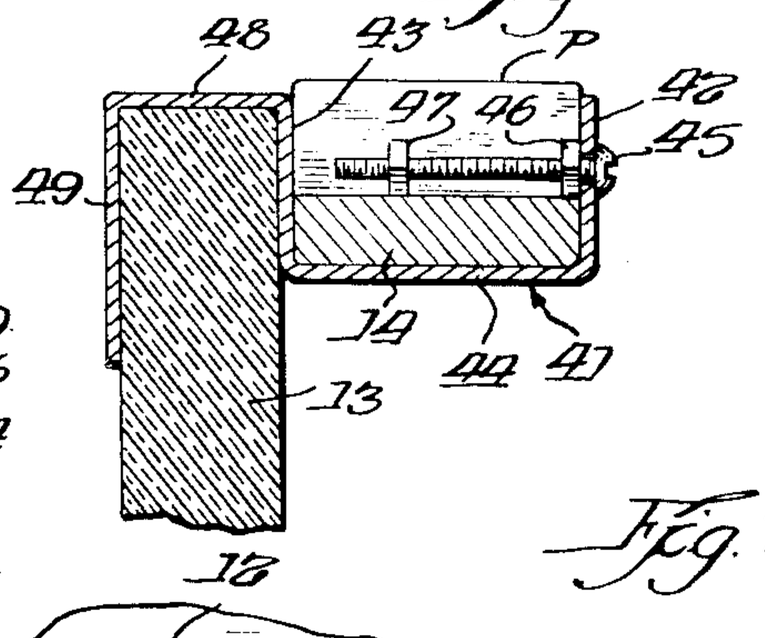


Fig. 7

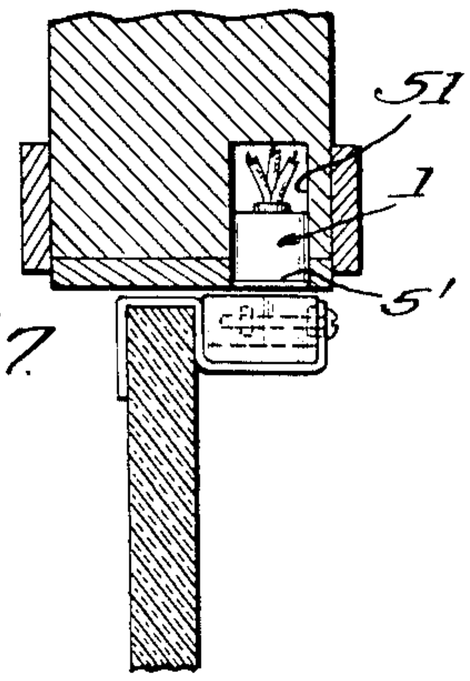


Fig. 3

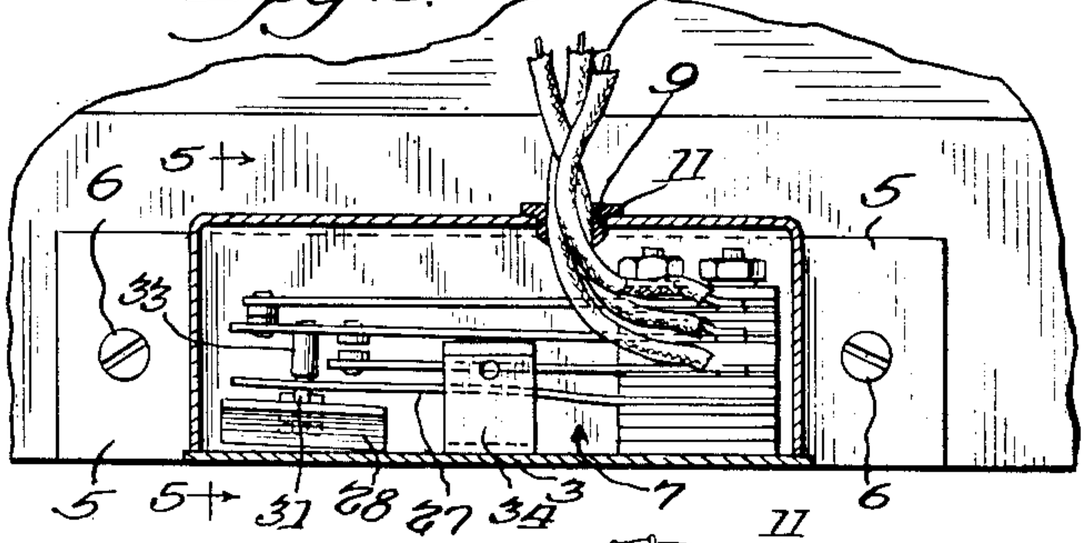
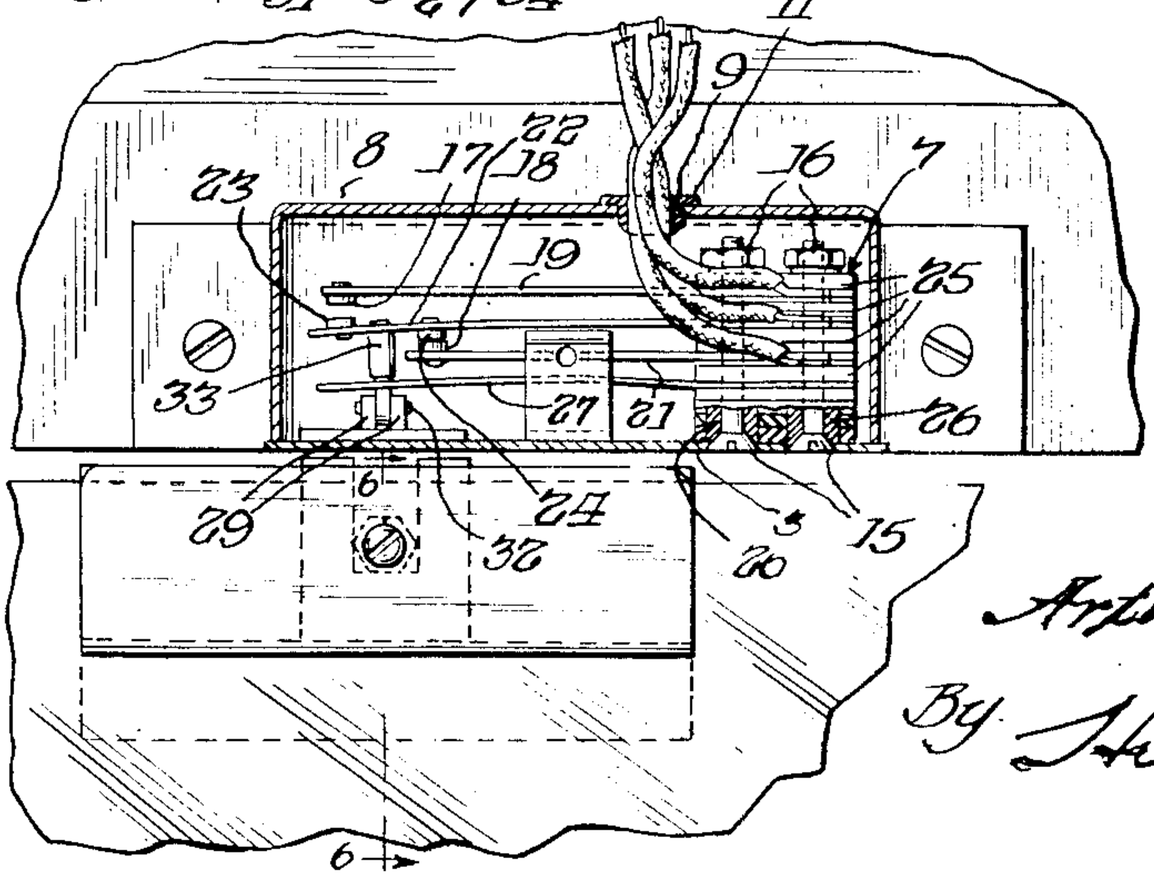


Fig. 4



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CLOSURE MEMBER OPERATED SWITCH

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9 Claims. (Cl. 177—314)

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The invention relates generally to a switch structure and, more particularly, to a magnetically actuated switch particularly adapted for use in burglar alarm systems, and the like.

The invention has among its objects the production of a switch actuatable by a permanent magnet, or the like, whereby engagement of the actuating member with the switching mechanism is not required, so that the device is particularly adapted for use in burglar alarm systems, and the like, as for example, in connection with a glass door, or other movable member.

Another object of the invention is the production of a magnetically actuated switch mechanism which is so constructed that the actuation of the device is positive at all times, insuring very efficient operation.

Another object of the invention is the production of such a switch mechanism which may be employed on doors which swing in both directions.

A further object of the invention is the production of such a switch mechanism which may be constructed to a large extent from stampings, resulting in a simple, relatively inexpensive, but very durable and efficient switch mechanism and which may be readily constructed for either flush or external mounting on a supporting member.

Other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement, and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is an elevational view of a portion of a door structure with the switch mechanism mounted thereon;

Fig. 2 is a sectional view taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view through the stationary portion of the device and taken approximately on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view similar to Fig. 3 illustrating the actuation of the switch by the magnetic means;

Fig. 5 is a sectional view taken approximately on the line 5—5 of Fig. 3;

Fig. 6 is a sectional view through the magnetic assembly taken approximately on the line 6—6 of Fig. 4; and

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Fig. 7 is a sectional view similar to Fig. 2 illustrating a switch housing constructed for flush mounting.

The present invention is of particular advantage in connection with burglar alarm systems employing either the normally open or normally closed types of circuits, and broadly includes a stationary member, containing the switch mechanism, mounted on the frame of the door, or other closure, and a magnet structure adapted to be mounted on the door, or other movable member, the magnet being so located on the movable member that the switch mechanism is actuated thereby when the movable member is in a closed position. However, if the magnet is moved out of the predetermined relationship with respect to the switch mechanism, either by opening of the movable closure member in any direction, or by tampering with the magnet assembly, the switch mechanism is released to actuate an alarm circuit.

Referring to the drawings, and particularly to Figs. 1 and 2, 1 indicates a stationary housing for the switch mechanism, illustrated in the present instance as being mounted on the upper portion of a door frame, indicated generally by the numeral 2. The housing 1 comprises a base plate 3 having an upwardly extending flange 4 adjacent the rear edge of the base 3 with the latter and the flange 4 being constructed, in the embodiment of the invention illustrated, from a single sheet of material and bent to the desired shape. The flange 4 is of a greater length than the base 3 to provide outwardly extending mounting ears 5 having apertures therein for the reception of mounting screws 6, which may be engaged with the frame structure 2 to support the housing 1 in operative position. The switch mechanism, indicated generally by the numeral 7, is enclosed by a cap or cover member 8 having an opening 9 in the top thereof for the passage of the wiring 12, and protected by a suitable grommet 11.

Suitably mounted on the door or movable closure member 13 is a permanent magnet 14, the magnet being so located and supported on the member 13 that the magnet is positioned directly opposite the housing 1 when the member 13 is in closed position with respect to the frame 2, whereby the magnet will actuate the switch mechanism, as hereinafter described. When the member 13 is opened with respect to the frame 2 to move the magnet 14 out of its position adjacent the housing 1, the switch mechanism is released, thereby actuating the electrical circuit associated therewith. Referring to Figs. 1 and 2, it will be

noted that the movement of the closure member 13 may be in any direction. For example, if the member 13 is a pivoted door, or the like, the member 13 may be pivoted inwardly, outwardly, or both; or if the member 13 is vertically movable, such as a window sash, or the like, actuation of the switch will take place when the magnet is moved a distance sufficient to decrease the magnet field adjacent the housing 1 to a point where it is insufficient to actuate the switch mechanism.

Referring to Figs. 3, 4, and 5, the switch mechanism 7 is mounted on the base 3 by screws 15 and nuts 16. The switch mechanism 7, being of the leaf type, includes upper and lower stationary contacts 17 and 18 carried by the leaves 19 and 21, respectively, and a movable leaf 22 positioned intermediate the leaves 19 and 21, upon which is carried contacts 23 and 24 engageable with the contacts 17 and 18, respectively. The leaves 19, 21, and 22 are supported by a plurality of insulating strips 25 having aligned apertures therein through which extend insulating sleeves 26, the leaves likewise having apertures through which the sleeves 26 extend, thus maintaining the leaves in operative position and insulating the same from the screws 15, in a manner similar to the usual leaf type switch assembly. Positioned below the contacts 17, 19, 23, and 24 is a leaf spring 27, to which is pivotally connected a flat plate-like armature 28, the latter having an upwardly extending clevis 29 in which is positioned an apertured shank 31 rigidly secured to the spring 27. The armature 28 is secured to the shank 31 by a pin 32, the axis of the pivotal connection thus formed extending substantially parallel to the plane of the plate 28. Carried by the movable contact leaf 22 is a stem 33 extending downwardly, and operatively engaging the spring 27 whereby upward movement of the latter is transmitted to the movable contacts. The inherent resiliency of the leaf 22 urges the movable contacts downwardly as illustrated in Fig. 4, while the spring 27, which possesses a stronger spring action than the leaf 22, urges the leaf 22 upwardly in opposition to the latter as illustrated in Fig. 3 and carries the armature upwardly with itself.

The cap or cover member 8 of the housing is secured to the base plate 3 by a U-shaped bracket 34, the intermediate portion 35 of which is secured to the plate 3 by any suitable means, such as brazing, spot welding or the like, and the vertically extending legs 36 are each provided with apertures 37 therein, in which may be positioned inwardly extending indentations or beads 38 formed in the opposite side walls of the cover 8. The legs 36 of the bracket 34 are provided with tapered ends, as indicated at 39, and the material comprising the member 34 possesses sufficient inherent resiliency to permit the legs to be sprung inwardly until the beads 38 on the cover may be positioned in the apertures 37, thus securely retaining the cover 8 on the base 3 but permitting ready removal of the cover when desired.

The magnet 14 may be supported from the movable member 13 by any suitable means, and in the construction illustrated, the magnet is mounted on a bracket 41 bent to form a pair of opposed legs 42 and 43 connected by an intermediate portion 44, the magnet being mounted between the walls 42 and 43, with the poles P of the magnet positioned at the top of the structure. The magnet illustrated is of more or less horseshoe-shape in cross section, as will be apparent from a reference to Fig. 1, and is held in position on the bracket 41 by means of a screw 45 having nuts 46 and 47 threaded thereon, the location of the hole in the leg 42 of the bracket being such that the nuts will engage the intermediate portion of the magnet and prevent movement thereof, with the distance between the leg or pole portions of the magnet being approximately equal to the transverse dimension of the nut. The bracket 41 is provided with a horizontally extending portion 48 connected at one edge to the free edge of the leg 43 thereof, and connected at the opposite edge of the portion 48 is a downwardly extending leg 49. As illustrated, the member 13 may be constructed of glass, or other similar material, and the distance between the legs 43 and 49 of the bracket is approximately equal to the thickness of the member 13. As the bracket is made of more or less resilient material, the legs 43 and 49 may be so formed that such portions of the bracket must be sprung slightly to permit engagement of the member 13, so that the bracket is frictionally held in position on the member. If desired, a suitable cement, or other adhesive, could be interposed between the engaging portions of the member 13 and the bracket; or if the member 13 is constructed of wood, or other similar material, the bracket may be constructed for mounting thereon by means of wood screws, or the like.

In operation, assuming the movable member 13 is in open position, the switch mechanism will assume the position illustrated in Figs. 3 and 5, with the contacts 17 and 23 closed, the contacts 18 and 24 open, and the armature 28 maintained in elevated position by the spring 27, the pivotal connection of the armature, however, permitting the latter to move into a position such as that illustrated in Figs. 3 and 5, whereby one edge of the armature is positioned adjacent the base 3. The bracket 41 and magnet 14 are so located on the movable member 13 that the poles of the magnet will be directly opposite the armature when the member 13 is in its closed position, as illustrated in Figs. 1, 2, and 4; and referring to Fig. 4, it will be noted that the field strength of the magnet when in such position, although the latter is not engaged with the base 3, is sufficient to draw the armature 28 into contact throughout its area with the base plate 3, thus permitting the leaf 22 and movable contacts 23 and 24 to move downwardly into the position illustrated in Fig. 4, wherein the contacts 17 and 23 are opened and the contacts 18 and 24 closed. Upon sufficient movement of the magnet out of the position illustrated in Figs. 1, 2, and 4, the field strength of the magnet will be decreased to a point where it is insufficient to maintain the armature in the position illustrated in Fig. 4, at which point the armature, leaf 22, and contacts 23 and 24 will resume their original positions illustrated in Fig. 3. It will be noted that as the armature 28 is free to pivot into the position illustrated in Figs. 3 and 5, the initial air gap between the lower edge of the armature and the magnet as the latter moves into actuating position is relatively small, so that the armature reluctance is reduced to a minimum to insure positive actuation of the armature and contacts. Two sets of contacts are provided on the switch assembly 7, one pair being normally open, and one pair being normally closed to enable the utilization of a single switch structure for either normally open or normally closed alarm circuits.

The construction illustrated in Fig. 7, insofar as the operating structure is concerned, is identical with that illustrated in the other figures, the only difference in construction being that the flange 4 is omitted, and the mounting ears 5' are formed as extensions of the base 3 at each end of the latter, thereby permitting a flush mounting of the stationary member 1, as illustrated in Fig. 7, where the latter is positioned in a recess 51 formed in the top of the door frame. The length of the recess would be approximately equal to the longitudinal length of the cover 6, whereby the mounting ears 5' could be inset flush with the surface of the door frame and screws driven into the frame adjacent the ends of the recess 51. Obviously the operation of the device would be the same as that previously described.

It will be noted from the above description that I have provided a very simple switch mechanism adapted to either open or close an alarm, or other circuit, upon movement of an actuating member positioned adjacent to the switch mechanism but not engaged therewith, and which is actuatable upon movement of the movable member in any direction away from the switch assembly, thus permitting the switch to be mounted in any position, and the movable member to be slidably, rotatably, or otherwise movable in any direction with respect to the switch mechanism.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. In a switch construction adapted for use in an alarm system including relatively movable closure members, a base member of non-magnetic material adapted to be mounted on one of said relatively movable closure members, a leaf-type switch assembly adapted for use with normally open and normally closed circuits having a plurality of spaced, transversely aligned leaves extending therefrom, a pair of stationary contacts each carried by a respective leaf, and a pair of movable contacts carried by another leaf positioned between the first-mentioned leaves, each of said movable contacts being selectively engageable with a respective stationary contact, said intermediate leaf being relatively resilient and tending to urge the movable contacts toward said base member whereby one pair of co-operable contacts are closed and the other pair open, a flat armature operatively related to said intermediate leaf, a spring supporting element for the armature, said armature being pivotally connected to its supporting element with the pivotal axis extending parallel to the face of the armature, the resiliency of said spring supporting element normally urging said armature away from said base member, means for transmitting such movement of the armature to said intermediate leaf for moving the contacts carried thereby away from said base member in opposition to the spring action of said intermediate leaf, and a magnet adapted to be mounted upon the other of said relatively movable closure members and operative when positioned adjacent said base member opposite

said armature to pivot the latter toward said magnet whereby said movable contacts will move into the desired relationship with said stationary contacts.

2. In a switch construction adapted for use in an alarm system including a stationary frame member and a movable closure member, a base member of non-magnetic material adapted to be mounted on the stationary frame, a leaf-type switch assembly having a plurality of spaced transversely aligned leaves extending therefrom, a stationary contact carried by one of said leaves, and a co-operable movable contact carried by a second leaf, the latter leaf being relatively resilient and tending to urge the movable contact towards said base member, a spring leaf positioned between said second leaf and the base member, a flat armature pivotally connected to said last-mentioned leaf with the pivotal axis extending parallel to the face of the armature, said last-mentioned leaf operative to urge said armature away from said base member, means for transmitting such movement of the armature to said movable contact for moving the latter away from said base member in opposition to the resilient action of said second leaf, and a magnet adapted to be mounted upon the movable closure member and operative when positioned adjacent said base member opposite said armature to draw the latter toward said magnet whereby said movable contact may move into the desired relationship with said stationary contact.

3. In a switch construction adapted for use in an alarm system including relatively movable members, a base member of non-magnetic material adapted to be mounted on one of said relatively movable members, a switch assembly having a stationary contact and a movable contact, a resilient means for urging the latter towards said base member, a flat armature operatively related to said movable contact, a spring supporting element for the armature, said armature being pivotally connected to and longitudinally of said supporting element with the pivotal axis extending parallel to the face of the armature, the resiliency of said spring supporting element normally urging said armature away from said base member, means affixed to the movable contact for transmitting such movement of the armature to said movable contact for moving the latter away from said base member in opposition to the resilient means associated with said contact, and a magnet adapted to be mounted on the other of said relatively movable members and operative when positioned adjacent said base member opposite said armature to pivot the latter toward said magnet whereby said movable contact in one direction will move into the desired relationship with said stationary contact and said armature pivoting about its axis upon lateral movement of the magnet away from the armature, whereby the movable contact is actuated in the opposite direction upon the spring means urging the armature away from the base member.

4. In a switch construction, a base member of non-magnetic material, means on the base member for mounting the latter on a supporting element, a switch assembly having a stationary contact and a movable contact, resilient means for urging the latter towards said base member, a flat armature operatively related to said movable contact, a spring supporting element for the armature, said armature being pivotally con-

nected to and longitudinally of its supporting element with the pivotal axis extending parallel to the face of the armature, the resiliency of said spring supporting element normally urging said armature away from said base member, means for transmitting such movement of the armature to said movable contact for moving the latter away from said base member in opposition to the resilient means associated with said contact, a cover enclosing said switch assembly and armature, means for removably securing said cover to said base member, a movable magnet, and means for mounting the latter on a second supporting element movable relative to the first element, said magnet being operative when the relationship between said elements is such that the magnet is positioned adjacent said base member opposite said armature to draw the latter toward said magnet whereby said movable contact will move in one direction into the desired relationship with said stationary contact and said armature pivoting about its axis upon lateral movement of the magnet away from the armature, whereby the movable contact is actuated in the opposite direction upon the resiliency of said spring supporting element normally urging the armature away from the base member.

5. In a switch construction, a base member of non-magnetic material, means on the base member for mounting the latter on a supporting element, a leaf-type switch assembly having a plurality of spaced, transversely aligned leaves extending therefrom, a stationary contact carried by one of said leaves, and a co-operable movable contact carried by a second leaf, the latter leaf being relatively resilient and tending to urge the movable contact towards said base member, a spring leaf positioned between said second leaf and the base member, a flat armature pivotally connected to and longitudinally of said last-mentioned leaf with the pivotal axis extending parallel to the face of the armature, said last-mentioned leaf operative to urge said armature away from said base member, means for transmitting such movement of the armature to said movable contact for moving the latter away from said base member in opposition to the resilient action of said second leaf, a cover enclosing said switch assembly and armature, means for removably securing said cover to said base member, a magnet, and means for mounting the latter on a second supporting element movable relative to the first element, said magnet being operative when the relationship between said elements is such that the magnet is positioned adjacent said base member opposite said armature to draw the latter toward said magnet whereby said movable contact will move into the desired relationship with said stationary contact.

6. The combination with a closure and a housing therefor in which the closure is movable with respect thereto and an alarm system therefor comprising a magnetically operated switch assembly including a structure having a base member and an armature and another structure movable with respect to the aforesaid structure comprising a magnet operatively mounted with respect to the armature, said structures operatively mounted respectively on the aforesaid closure and housing for relative movement, said switch assembly adapted for actuating the alarm system, of actuating means for said switch assembly comprising a movable spring biased contact member operatively connected with the alarm system, the resiliency of said movable

spring biased contact member urging the movable spring biased contact member toward the base member, the aforesaid armature being flat and operatively related to said movable contact member, a spring biased supporting element for the armature, said armature being pivotally connected to and longitudinally of said supporting element, the resiliency of said spring biased supporting element normally urging said armature away from said base member, means for transmitting such movement of the armature to said movable contact member for moving the latter away from said base member in opposition to the resiliency of said spring biased contact member whereby, with the magnet positioned contiguous to the armature upon the closure being closed, the movable spring biased contact member is urged toward the base member upon movement of the armature, and with the magnet moved away from the armature upon opening of the closure, the movable spring biased contact member is urged away from the base member by the action of the spring-biased armature so that the alarm system is actuated or rendered inactive, depending upon the position of the movable spring biased contact member.

7. A switch assembly adapted for use with a magnet and comprising a housing, a base member of non-magnetic material, a stationary contact, a movable spring biased contact member having a contact complemental to the stationary contact, the resiliency of said movable spring biased contact member urging the movable spring biased contact member towards the base member, a flat armature operatively related to said movable contact member, a spring biased supporting element for the armature, said armature being pivotally connected to and longitudinally of said spring biased supporting element, the resiliency of said spring biased supporting element normally urging said armature away from said base member, and means for transmitting such movement of the armature to said movable spring biased contact member for moving the latter away from said base member in opposition to the resiliency of said spring biased contact member, whereby the armature is adapted to swing on the supporting element when operatively positioned relatively with respect to the magnet for actuating the movable spring biased contact member in its desired relationship with said stationary contact.

8. A switch assembly for use with a normally open or normally closed circuit adapted for use with a magnet and comprising a housing, a base member of non-magnetic material, stationary contacts and a movable spring contact member having contacts complemental to the stationary contacts, the resiliency of said movable spring control member urging the movable contact member towards said base member, a flat armature operatively related to said movable spring contact member, a spring supporting element for the armature, said armature being pivotally connected to and longitudinally of said spring supporting element, the resiliency of said spring supporting element normally urging said armature away from said base member, means for transmitting such movement of the armature to said movable spring contact member for moving the latter away from said base member in opposition to the resiliency of said movable contact spring member, whereby the armature is adapted to pivot on the spring supporting element when operatively positioned relatively with respect to

the magnet for actuating the contacts of the movable spring contact member in their desired relation with the stationary contacts so that the switch assembly may be used with a normally open or normally closed circuit.

9. In a switch construction adapted for use in an alarm system, a base member of non-magnetic material, a switch assembly adapted for use with either normally opened or normally closed circuits having stationary contacts and a movable contact member having contacts complemental to the stationary contacts, the resiliency of said movable spring contact member urging the movable spring contact member towards said base member, a flat armature operatively related to said movable spring contact member, a spring supporting element for the armature, said armature being pivotally connected to and longitudinally of said spring supporting element, the resiliency of said spring supporting element normally urging said armature away from said base member, means for transmitting such movement of the armature to said movable spring contact member for moving the latter away from said base member in opposition to the resiliency of said movable spring contact member, a movable magnet operative when positioned adjacent said

base member opposite said armature to draw the latter toward said magnet whereby the contacts of said movable spring contact member will move into the desired relationship with said stationary contacts, and said armature pivoting upon lateral movement of the magnet in either direction away from the armature, whereby the movable spring contact member is actuated upon the spring supporting element urging the armature away from the base member.

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