

[54] **LOCK AND ALARM DEVICE**

[75] Inventor: **Paul Maddison Hawkins**, Afton, Minn.

[73] Assignee: **Minnesota Mining and Manufacturing Company**, St. Paul, Minn.

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[51] Int. Cl. **E05b 45/12**

[58] Field of Search **340/274**; 70/DIG. 40; 200/61.68, 61.67, 61.93

[56] **References Cited**

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Primary Examiner—Thomas B. Habecker

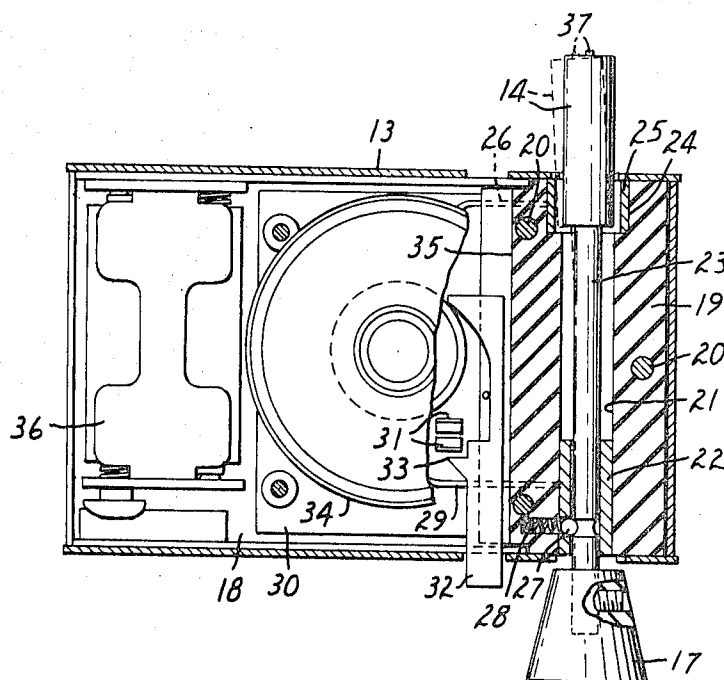
Assistant Examiner—Glen R. Swann, III

Attorney—Kinney, Alexander, Sell, Steldt & Delahunt

[57] **ABSTRACT**

A bolt-type lock wherein the bolt is supported by a resilient member in the projected locking position such that the bolt can be deflected upon a predetermined opening force being applied against the closure members. Electrical contact means are positioned at the opening through which the bolt is projected and spaced from the bolt to be contacted by the bolt and close a circuit when said predetermined force is applied.

7 Claims, 7 Drawing Figures



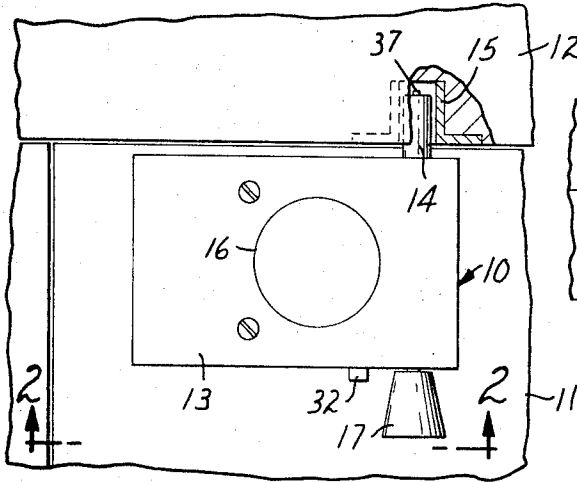


FIG. 1

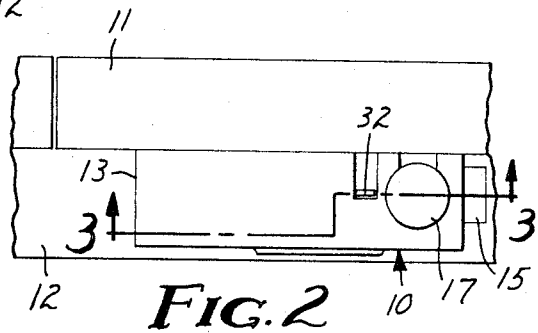


FIG. 2

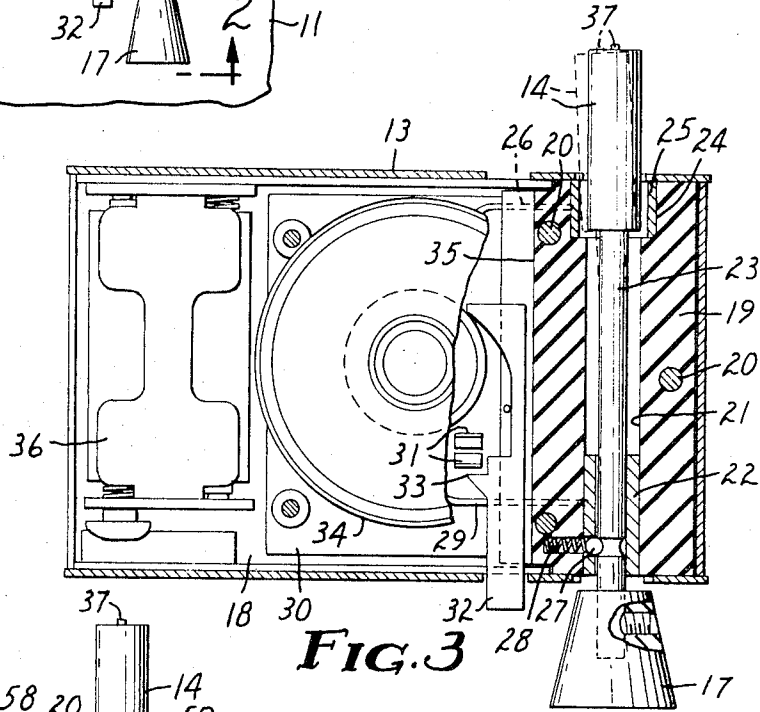


FIG. 3

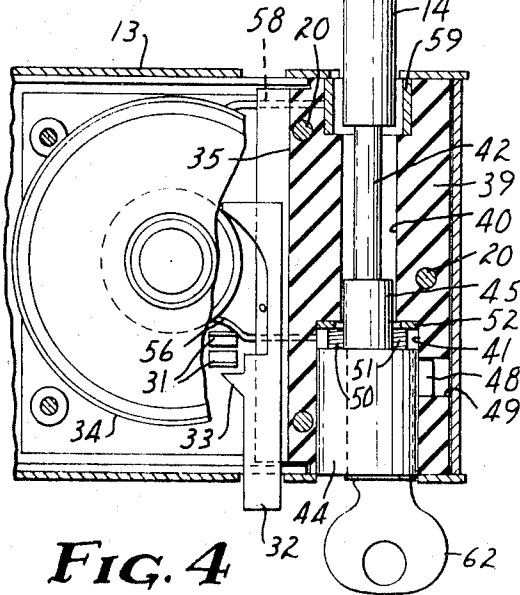


FIG. 4

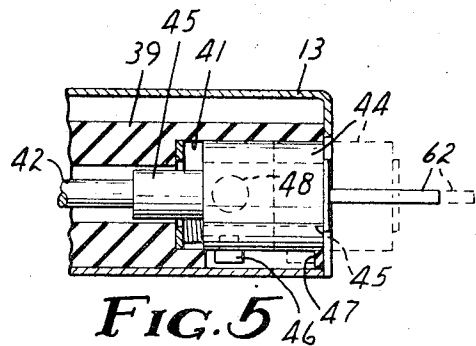
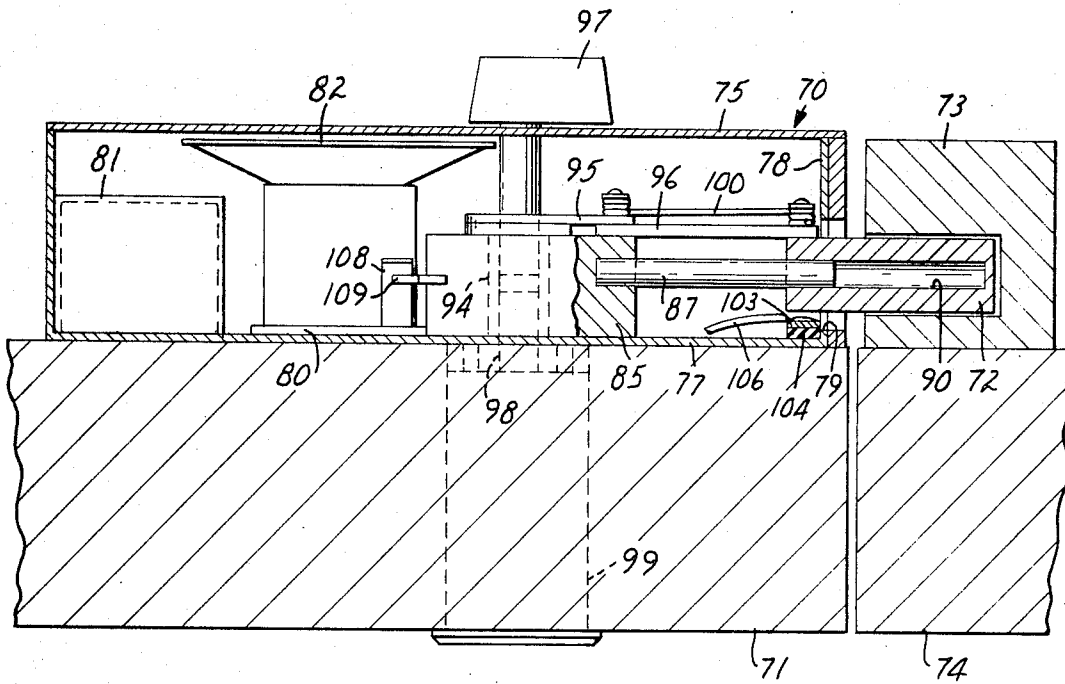
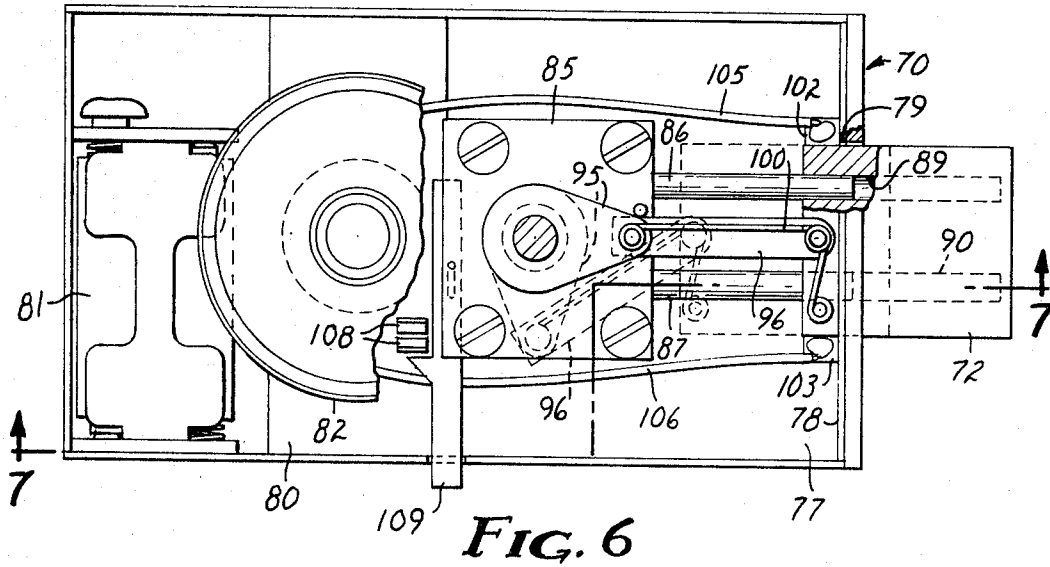


FIG. 5

INVENTOR.
PAUL MADDISON HAWKINS
 BY *Kinney, Alexander,*
Sell, Stoldt & DeLo Hunt
 ATTORNEYS



INVENTOR.
 PAUL MADDISON HAWKINS
 BY Kinney, Alexander,
 Sell, Steldt & De La Hunt
 ATTORNEYS

LOCK AND ALARM DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to locks including an alarm system to be actuated when an attempt is made to force the lock.

Combinations of locks and alarms are well known in the art and various constructions of locks have been developed which actuate an alarm upon a predetermined force being applied against the lock in an attempt to force open a closure. The prior art includes combinations where the bolt member is supported in a housing in a manner such that upon a predetermined force being applied against a projected bolt the entire housing will be pivoted to actuate a switch setting off an electrically actuated alarm or other signal. Other forms include means for resiliently supporting the bolt within a lock casing such that when a predetermined force is applied against the bolt the bolt is fulcrumed at the opening in the lock casing to trip a switch or catch to actuate an alarm. These devices generally incorporate spring-mounting devices which tend to maintain the bolt in a normal centered position in the lock casing as it is moved between projected and retracted positions.

Other examples of prior art include electrical contacts positioned in a keeper which is mounted on one of the closure members for receiving the bolt. A predetermined force being applied against the closure member supporting the bolt causes the bolt to move relative to the keeper and engage the electrical contact, thus actuating an alarm.

The earlier constructions using a resilient mounting for the bolt or the casing have used an increasing number of parts and therefore the assembly operation is increased. Further, the manufacture of locks of that type utilizing springs permit the alarm to be actuated under varying amounts of force depending upon the precision with which the locks are assembled and the springs are set. Other vagaries in manufacture change the operation of the alarm system due to friction between the cooperating movable parts. A lock and alarm system wherein the alarm is actuated by movement of the bolt in the keeper requires increased installation costs when both the door and the jamb require more reconstruction than is normal for installation of other forms of locks and alarms.

A lock and alarm structure according to the present invention affords a simpler construction and greater uniformity between locks. Uniformity of operation between lock structures according to the present invention is not dependent on the assembly operation of the lock. The new lock structure also affords greater versatility in its use as the structure permits its use with a greater variety of closure members without a change in the structural elements.

SUMMARY OF THE INVENTION

The lock and alarm device of the present invention utilizes a conductive bolt which is supported by a resilient support member or rod cantilever mounted within the housing. The resilient rod may be movable relative to the support to place the bolt in the retracted and projected positions or the bolt may be movable upon a fixed cantilever mounted resilient rod. The bolt projects through an opening in the lock casing which is

somewhat larger than the dimensions of the bolt and when a predetermined force is applied against the closure members with the bolt in a projected position the resilient rod permits movement of the bolt under the force of an attempted opening to make electrical contact with contact means disposed at the opening to close a circuit. A suitable alarm circuit is employed to generate a signal and this alarm circuit once closed would remain closed as by an SCR such that upon release of the force against the closure members and a return of the bolt to its normal position the signal would be continued until the circuit is subsequently opened by a separate switch.

DESCRIPTION OF THE DRAWINGS

The present invention will be more fully described in the following detailed description which relates to the accompanying drawing wherein:

FIG. 1 is an elevational view of a lock and alarm device, constructed according to the present invention, mounted on a closure member which cooperates with an additional closure member;

FIG. 2 is a bottom view of the device as seen along the lines 2—2 of FIG. 1;

FIG. 3 is a view of the device with the casing in section and some of the parts of the lock in section to show interior parts, and is taken generally along the lines 3—3 of FIG. 2;

FIG. 4 is a fragmentary sectional view showing a second embodiment of a lock and alarm device constructed according to the present invention;

FIG. 5 is a fragmentary sectional view of the device of FIG. 4;

FIG. 6 is a sectional view of a further embodiment of a lock and alarm device constructed according to the present invention; and

FIG. 7 is a sectional view of the device of FIG. 6 taken along the lines 7—7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawing there is shown in FIG. 1 a lock and alarm structure 10 mounted on a closure member 11 in a position to be adjacent a second closure member 12 which may be a door jamb, a second door slidable relative to the first closure member 11, or the members 11 and 12 may be relatively movable window frames or a window frame and sash. The lock structure 10 comprises a bolt 14 which is movable from a retracted position to a projected position as shown in FIG. 1 and is received within a bolt-receiving housing or keeper 15 on the other closure member 12. The casing for the lock structure 10 is formed with a grill 16 positioned over a speaker within the lock structure and a knob 17 is used for moving the bolt 14 from a retracted to a projected position to lock the closure members. As seen in FIG. 3 with the front plate of the casing 13 removed the lock structure comprises a support member including a base plate 18 which is mounted on the closure member and a support block 19, which is formed by two mating identical halves secured to the base plate by fasteners 20. The halves of the support block 19 are formed to define a central cavity or bore 21 extending axially through the support block 19. Positioned in the bore 21 at one end

thereof is an electrically conductive sleeve 22 which is formed with a central bore to define a slidable support for a resilient rod 23 of spring steel. The opposite end of the bore 21 is enlarged and defines a circular opening 24 through which the bolt 14 passes in moving from a retracted position within the bore 21 to a projected position beyond the periphery of the lock and alarm device 10. Mounted within this opening 24 is an annular ring 25 of conductive material defining contact means which may be engaged by the bolt when the same is forced (as shown in broken lines) transversely of its axis toward the ring 25 in the opening 24. The ring 25 is connected to an alarm circuit by means of a conductor 26. The annular contact 25 thus forms one contact in the circuit. A second conductor 29 from the alarm circuit is connected to the conductive sleeve 22 and contact with the resilient rod 23 is assured by the use of a detent comprising a ball 27 and spring 28. The spring 28 urges the ball 27 into contact with the resilient rod 23. The ball 27 engages a groove in the resilient rod 23 to maintain the same in its projected position to avoid displacement of the bolt from its projected position. Alarm circuit is closed by the bolt 14 engaging the ring 25 upon a predetermined force being applied against the bolt 14 by relative movement of the closures to flex the rod 23 along its length between the bolt and the sleeve 22 where it is supported in a cantilever manner.

The conductors 26 and 29 are connected to the alarm circuit which may be any suitable alarm circuit which will generate a predetermined signal. As illustrated the lock and alarm device has a self-contained circuit and a speaker 34 will produce an audible signal. The electrical circuit has an SCR and is adapted to maintain the generation of the audible signal until a second set of contacts 31 are coupled by operation of a switch blade 32 formed with a shoulder 33 to engage the contacts. The switch blade 32 is slidable in a slot 35 in the support block 19 between an operative and in-operative position. The switch blade 32 extends outward of the casing 13 for the lock and alarm device 10 to be actuated. Power to the enclosed circuit in the lock alarm device 10 illustrated is provided by a power pack 36 comprising dry cell batteries. The electrical alarm circuit is mounted on a circuit board 30 disposed within the casing 13 below the speaker 34 and is supported by the mounting plate 18.

The bolt 14 of the lock alarm structure 10 is machined of brass and is machined to retain a pointed end 37 which may be used on installation of the lock and alarm device 10 on the closing members to fix the position for the bolt-receiving member 15 on the other closure member 12.

The lock and alarm device as shown in FIGS. 4 and 5 corresponds generally to that shown in FIGS. 1 through 3, however this embodiment is provided with a key-operated lock to maintain the bolt 14 in the projected position. This embodiment has particular utility for use with closure members having glass or breakable panels to avoid the unlocking of the lock. As seen in FIGS. 4 and 5 the bolt 14 is supported for movement in a support block 39 provided with a bore 40. The bore 40 is enlarged at one end providing an enlarged cavity 41 to slidably receive a lock cylinder 44 of a pin tumbler lock in which is mounted a rotatable plug 45 formed with a

keyway. A resilient rod 42 is fixed to the bolt 14 and is secured to one end of the rotatable plug 45. The cylinder 44 is maintained in the cavity 41 by a screw 46 which is threadably connected to the cylinder and is guided in a slot 47 formed in the mounting block 39 to permit reciprocation of the cylinder. A spring biased projection 48 extends from the lock cylinder 44 to engage a recess 49 when the lock cylinder 44 is moved inwardly in the cavity 41 to the solid line position shown in FIG. 4. The projection 48 retains the lock cylinder in this position until a suitable key 62 is inserted in the keyway in the plug 45 and rotated to release the projection from the recess. The cylinder 44 is moved from the inserted position outwardly of the cavity 41 under the bias of compression springs 50 and 51 which extend from the lock cylinder 44 parallel to the axis and into engagement with a conductive washer 52 disposed at the inner end of the cavity 41.

In this embodiment the electrical contact means comprises a conductor 56 joined to the washer 52 and a conductor 58 which is joined to an annular conductive ring 59 surrounding the opening in the support block 39 through which the bolt 14 projects.

Referring now to FIGS. 6 and 7 there is disclosed a lock and alarm structure 70 mounted on a closure member 71 and having a conductive bolt 72 projecting into a bolt receiving member 73 supported by a second closure member 74. The lock structure comprises a casing 75, a support plate 77 having an upturned flange 78 formed with an opening 79, a support member for the bolt 72, an electric circuit on a printed circuit board 80, a power pack 81 comprising dry cell batteries, and a speaker 82. The support member for the bolt 72 comprises a support block 85 which is fixed to the support plate 77 and a pair of parallel resilient rods 86 and 87, formed of spring steel. The rods 86 and 87 are fixed at one end to the support block 85 and extend therefrom toward the opening 79. The rods 86 and 87 are received within bores 89 and 90 formed in the bolt 72. The rods 86 and 87 support the bolt 72 for sliding movement between the retracted position within the casing 75 to a projected position outward of the opening 79 to engage the bolt receiving member 73. In its projected position the bolt 72 securely locks the enclosure members 71 and 74.

The bolt 72 is moved between its retracted broken line position to its projected solid line position, as shown in FIG. 6, by rotation of a sleeve 94 supported by the support block 85. The sleeve 94 is fixed to a radial arm 95 which is coupled to a link 96 which link 96 is pivotally connected to the bolt 72. Rotation of the sleeve 94 through an angle of 90 degrees by a thumb turn 97 or by the rotatable plug 98 of a pin tumbler lock cylinder 99 will cause reciprocation of the bolt 72 on the rods 86 and 87. A spring 100 assists the arm 95 and link 96 to position the bolt.

The electrical circuit is energized when a force is applied transverse to the axis of the rods 86 and 87 against a closure member to move the bolt 72 toward the closure 71. The circuit is energized by joining contact means placed at the opening 79. As illustrated the contact means comprises a pair of spaced conductive strips 102 and 103 supported on a backing 104. The strips 102 and 103 are connected to the alarm circuit by conductors 105 and 106 and are positioned to be en-

gaged and joined by contact with the bolt. Similar contacts, not shown, may be positioned on the opposite side of the opening from the strips 102 and 103 to close the circuit when the lock and alarm structure 70 is used with outswinging closures. The circuit can be opened to stop the alarm by closing a further pair of contacts 108. The contacts 108 can be closed by connecting them through a pivoted conductive bar 109 or by forcing them together by reciprocating the bar 109. The bar 109 is supported by the support block 85.

The operation of the locking bolt in the devices of the present invention is very similar to the operation of existing dead bolts. The opening through which the bolt projects however has dimensions greater than that of the bolt so as not to confine the bolt against movement transverse to its axis. The resilient rod supporting the bolt and the spacing between the bolt and the contact means at the opening determine the force necessary to cause an alarm to be actuated.

Having thus described the present invention and several embodiments of lock and alarm devices constructed according to the invention, it is understood that structural modifications can be made in said devices without departing from the spirit or scope of the invention.

What is claimed is:

1. A lock apparatus for use with cooperating closure members to effect an alarm upon limited relative movement of said closure members, said apparatus comprising

a bolt member formed to join said closure members when in a projected position, said bolt being formed to afford electrical conduction,

a support member adapted to be secured to one of said closure members, said support member having an opening through which said bolt may be moved from a retracted position to a projected position,

resilient support means for supporting said bolt for movement along its axis from said retracted to said projected position through said opening and for movement transverse to its axis, and

electrical contact means positioned adjacent the opening in a position for contact by said bolt such

that movement of said bolt in said opening in a direction transverse to its axis under a predetermined force will afford contact with said contact means to close a circuit.

2. A lock apparatus according to claim 1 wherein said resilient support means comprises a resilient rod fixed to said bolt, and said apparatus comprises support means for said rod affording sliding movement of said rod to move said bolt between said retracted and projected position and affording a cantilever mount for said rod when said bolt is in said projected position.

3. A lock apparatus according to claim 1 wherein said resilient support means comprises a fixed resilient rod and a fixed support for one end of said rod to project the same toward said opening, and wherein said bolt is formed with an opening to slidably receive said rod to afford movement of said bolt on said rod between a projected position and a retracted position, and wherein said apparatus comprises means for sliding said bolt on said fixed rod between said projected and retracted positions.

4. A lock apparatus according to claim 2 wherein said contact means comprises an electrical contact connected to said resilient support means and a conductive member positioned at said opening for contact by said bolt when a predetermined force is applied against said bolt to flex said rod sufficiently to move said bolt into contact with said conductive member.

5. A lock apparatus according to claim 3 wherein said contact means comprises a pair of spaced contact members positioned at the edge of said opening for engagement by said bolt to close a circuit when said fixed rod is flexed sufficiently to move said bolt against said spaced contact members.

6. A lock apparatus according to claim 2 wherein a key operated lock cylinder is secured to the end of said rod opposite said bolt, and said support means includes a cavity for receiving said cylinder and retaining the same upon sliding movement of said bolt to said projected position.

7. A lock apparatus according to claim 1 wherein said support member supports a speaker to produce an audible signal upon contact of said bolt with said contact means.

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