

[54] ALARM WITH TRUNDLE SWITCH

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[52] U.S. Cl. 340/283, 200/61.45, 200/61.5, 200/61.52, 340/262, 340/280
[51] Int. Cl. G08b 13/02
[58] Field of Search 200/61.45, 61.5, 61.52; 340/63, 65, 261, 262, 283, 280

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[57] ABSTRACT

The invention relates to a burglar alarm system which may be connectable to portable office equipment of varying types. The invention provides a noise-generating element such as a horn which is connectable to a battery to permit the sounding of the horn when the office equipment is either tilted or lifted. An angular displacement arrangement permits the connection of the battery to the noise-generating element and comprises a cuplike member having an aperture in the center thereof. A solid of revolution is freely movable on the bottom surface of said cuplike member to either prevent or permit the projection of a pin through the aperture, when the office equipment or other portable equipment on which the burglar alarm is installed, is either tilted or moved. The pin prevents the solid of revolution from shutting off the alarm system once the solid of revolution is moved from its normal position over the aperture, so that the alarm sound continues until the alarm is reset by a key mechanism.

17 Claims, 12 Drawing Figures

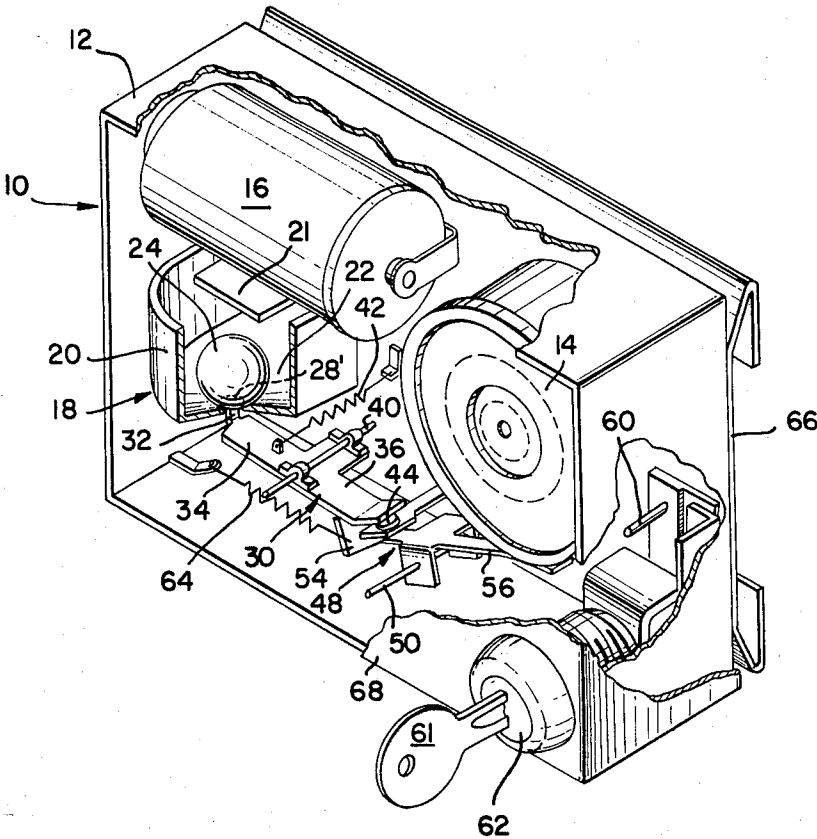


FIG. 1

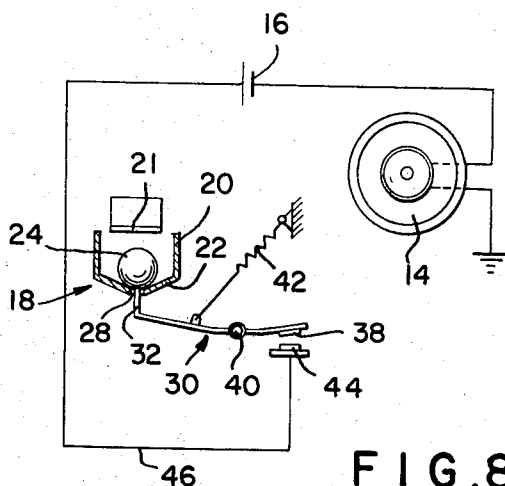
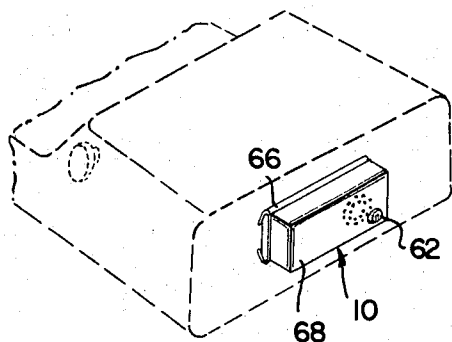


FIG. 8

FIG. 8a

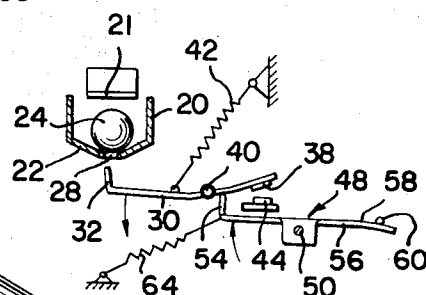
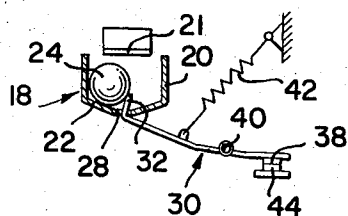


FIG. 8b

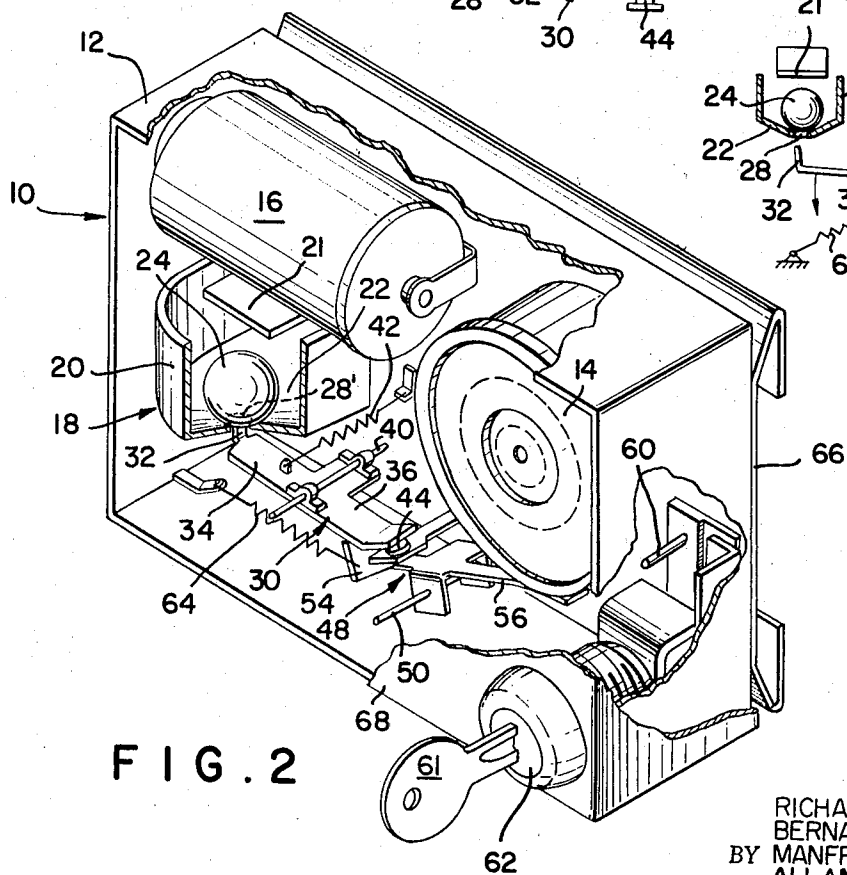


FIG. 2

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FIG. 3

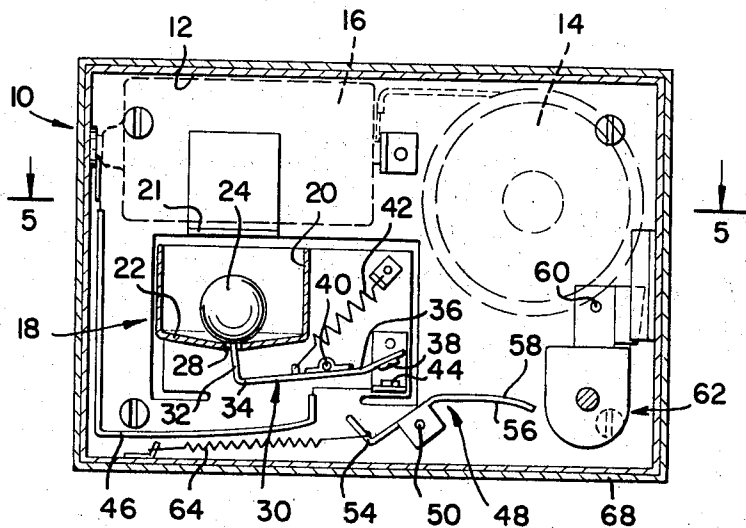


FIG. 4

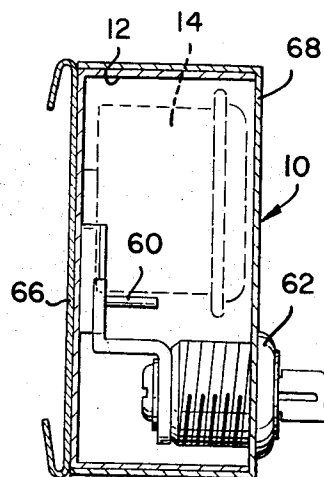


FIG. 5

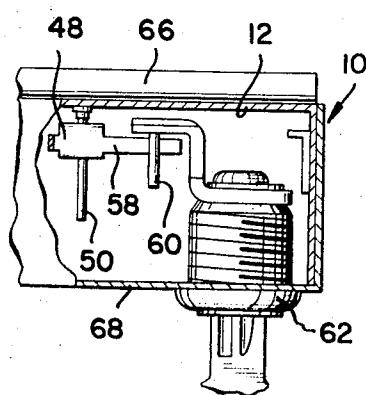
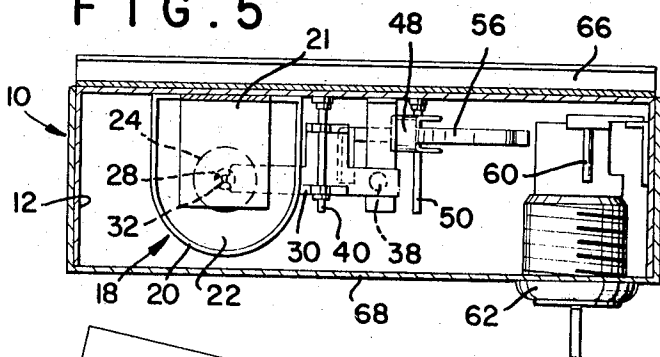


FIG. 6

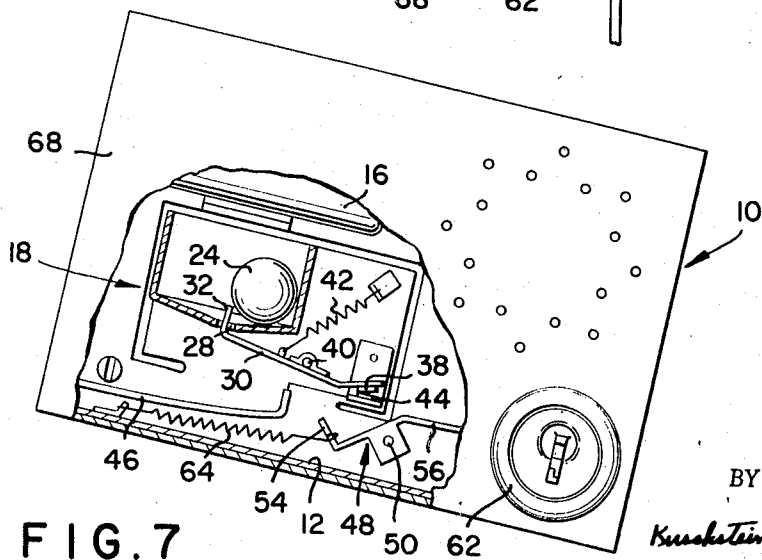


FIG. 7

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FIG. 9

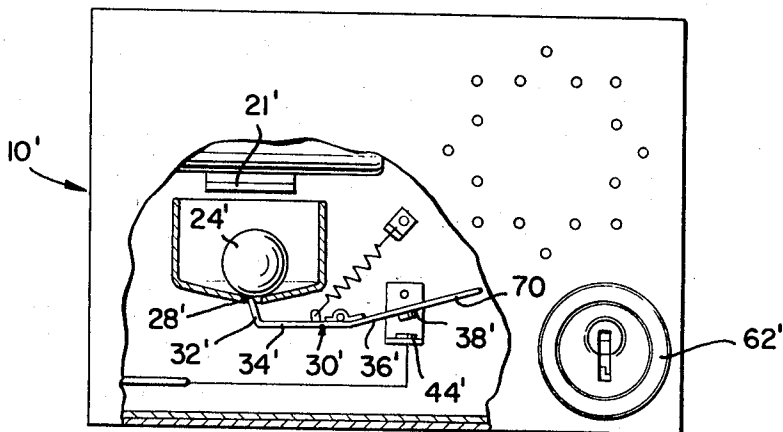
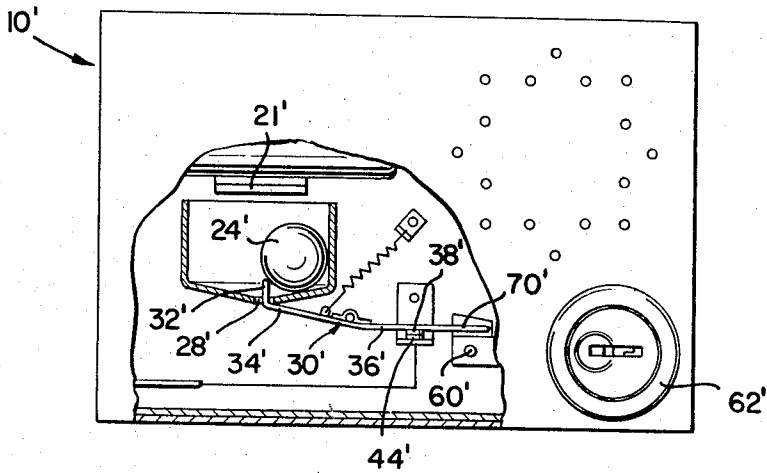


FIG. 10

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ALARM WITH TRUNDLE SWITCH

BACKGROUND OF THE INVENTION

The invention relates to a burglar alarm system for portable office equipment and more particularly to an alarm which when once activated cannot be deactivated by the mere placement of the office equipment back in a normal position.

Heretofore, it has been known to provide a burglar alarm for portable types of equipment which provides for the continuous ringing of an alarm while the equipment is being unauthorizedly removed. Numerous attempts have been made at providing small compact alarm units which are easily attachable to office equipment and which will continuously ring during the burglarizing of the equipment. However, in most instances heretofore known, the systems relied upon solenoid-operated switching arrangements which are in the form of relays or other electrically controllable switches for the necessary continuous ringing of the alarm. These electrically operated switching arrangements did not permit a compact unit and further increased the costs thereof to such a degree that in many instances the costs would be deemed prohibitive.

It had been determined that reliable mechanically operated switching arrangements such as an angular displacement switch would provide a more stable, less expensive, and more reliable unit which would permit miniaturization to the degree that the burglar alarm unit would not create an unsightly piece of equipment but which would afford the same protection previously sought.

It is the general object of the present invention to avoid and overcome the foregoing difficulties found in the prior art devices by providing a compact burglar alarm unit which is both inexpensive to manufacture and which is mechanically reliable.

Another object of the present invention is to provide a burglar alarm unit which is adapted to continuously ring after the alarm has been activated.

Another object of the present invention is to provide a burglar alarm system which will continuously ring utilizing an angular displacement switch arrangement.

Still another object of the present invention is to provide an angular displacement operated switch arrangement which will not permit the deactivating of the switch, unless reset by a security device.

Still a further object of the present invention is to provide a burglar alarm system which is provided with its own energy source and which is of a compact nature.

Yet a further object of the present invention is to provide a burglar alarm system which has an internal adjustment to vary the sensitivity of the angular displacement switch which is adapted to varying applications.

Another object of the present invention is to provide a burglar alarm system having a key with which an operator may deactivate the alarm mechanism to permit the servicing or movement of the alarm without having the mechanism emit an alarm signal.

Another object of the present invention is to provide a burglar alarm system which is attachable to portable or stationary office equipment and which will permit the continuous ringing of an alarm system which is attachable to portable or stationary office equipment and which will permit the continuous ringing of an alarm system during the movement of the equipment and which will not create an unsightly appearance.

The aforesaid objects, and other objects which will become apparent as the description proceeds, are achieved by providing a burglar alarm unit having a housing, a horn adapted to emit an audible signal, a source of electrical energy adapted to be connected to said horn or suitable compact noise generator, and an angular displacement switching arrangement for activating the horn when the equipment is attempted to be burglarized, said switching arrangement further permitting the horn to ring continuously after the same has been activated and thereby preventing the deactivation of the horn by the burglar.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention reference should be had to the accompanying drawings wherein like numerals of reference indicate similar parts throughout the respective views and wherein:

FIG. 1 is a perspective view of a portable office equipment having the burglar alarm connected thereto,

FIG. 2 is a perspective view of the burglar alarm unit,

FIG. 3 is a cross-sectional view of the burglar alarm unit,

FIG. 4 is an under cross-sectional view of the invention,

FIG. 5 is a cross-sectional view of the invention taken along lines 5-5.

FIG. 6 is a partial cross-sectional view showing the operation of the reset key,

FIG. 7 is a partial cutaway view of the invention,

FIG. 8 is a schematic diagram of the invention,

FIG. 8a is a schematic diagram showing the operation of the electrical switch,

FIG. 8b is a further schematic view showing the operation of the reset,

FIG. 9 is a partial cutaway front view of an alternative embodiment of the alarm mechanism with the switch in the activated position, and

FIG. 10 is a partial cutaway front view of an alternative embodiment of the alarm mechanism with the trundle switch in the deactivated condition.

DESCRIPTION OF THE PREFERRED EMBODIMENT

It should be particularly understood that the principles of the present invention are broadly applicable to numerous uses such as alarms for furniture, valuable papers, traveling purposes and the like, however, the invention shall be described as being particularly applicable to portable office equipment but it should not be considered to be limited thereto.

Referring now to FIGS. 1 and 2, a self-contained alarm unit is represented generally by the reference numeral 10. The unit is provided with a boxlike frame 12, with one side open having disposed therein a noise-making element 14, such as a horn, which is adapted to continuously create a piercing loud noise when activated by an electrical source or battery 16.

The alarm unit 10 is so constructed as to give an alarm when the equipment to which the alarm is connected is either tilted off a normal stance position, moved suddenly or jolted. The alarm is of a continuous nature, that is once the horn has been connected to the source of electrical energy, and continuously gives off an alarm sound, the alarm will continuously sound until the horn has been physically disconnected from the electrical source 16 or is reset to its normal ready position.

It should be particularly understood by those skilled in the art that the type of alarm is not limited to the mere use of a loud piercing sound but can be adapted to generate sufficient electrical energy to activate flashing lights of varying colors and may also include the ability to transmit a signal to activate alarm systems at remote points.

In order to provide a mechanical means of activating the horn 14, as shown in FIG. 2, an angular displacement switching arrangement 18 is provided which has a cuplike element 20 having a concave bottom surface 22. The cuplike element 20 is adapted to receive a solid revolution 24 such as a steel ball, which is freely movable on the concave surface 22. At the lowest point 26 in the concave surface 22 there is provided an aperture 28 therein over which the ball 24 is adapted to seat when the alarm unit 10 is in its normal or rest position as shown in FIG. 1. It may be seen, that if the concave surface 22 is tilted the ball or solid of revolution 24 will move from its normal rest position, over the aperture 28, and seek another position relative to the movement of the concave surface 22. In so doing, the ball 24 uncovers the aperture 28. As previously indicated not only a tilting action will unseat the ball 24 from over the aperture 28 but a sudden movement of the concave surface 22 will also provide the necessary impetus to move the ball 24 from its rest position over the aperture 28.

As part of the angular displacement switch arrangement 18, disposed beneath the concave surface 22 of the cuplike element 20 there is provided a first lever arm 30 structure having an upwardly extending pin 32 at one end 34 thereof. The pin 32 is in alignment with the aperture 28 in the bottom of the cuplike element 20 and is adapted to move through the aperture 28 when the solid of revolution 24 is moved away from its rest position over said aperture 28. At the other end 36 of the first lever arm 30, there is provided an electrical contact 38. The first lever arm 30 is adapted to pivot about a shaft 40 from which the first lever arm 30 depends and is journaled thereto. A resilient member, such as a spring 42, is connected to the first lever arm 30 at a point near the one end 34 of the first lever arm 30 and near the upwardly extending pin 32 and is adapted to urge the first lever arm 30 and pin 32 to an upward position. When the ball 24 is moved from its seated position over the aperture 28 the pin 32 will move upwardly and through the aperture. In this manner, the pin 32 protrudes through the aperture 28 and prevents the ball 24 from coming to rest thereover even if the cuplike element 20 moves to its normal upright position. Once the pin 32 is in and through the aperture, the first lever arm 30 must be rotated counterclockwise (as shown by the arrow in FIG. 8 b) about the axis of rotation (the shaft 40), in order to remove the pin 32 from the aperture 28 and permit the ball 24 to reset over the aperture. Under normal conditions the ball 24 is heavy enough to keep the upwardly urged pin 32 from entering the aperture 28. As shown in FIG. 8, the normal position is achieved when the ball 24 is seated over the aperture 28. FIG. 8a shows the ball removed from the aperture 28 and the pin 32 inserted therein.

Another electrical contact point 44 is disposed beneath the other end 36 of the first lever arm 30 and is adapted to engage the electrical contact 38 positioned on the other end 36 of the first lever arm when the pin 32 has been rotated clockwise and is inserted in the aperture 28, as shown in FIG. 8a. The electrical contact point 44 is connected by a conduit 46 to one side of the energy source or battery 16, as shown in FIG. 8. It may be seen, therefore, that when the pin 32 enters the aperture 28 the electrical contact 38 on the other end 36 of the first lever arm 30 rotates downwardly, or clockwise, to make contact with the electrical contact point 44 positioned therebelow. The first lever arm 30 is electrically connected to the frame 12 or electrical ground so that, when the contacts (38,44) "make" an electrical connection a circuit is closed between the battery 16 and electrical ground. As shown in FIG. 8, this will complete an electrical circuit to the horn 14 such that the horn may be activated to emit a piercing alarm noise. As previously indicated, the invention should not be considered to be limited to the use of a horn mechanism for emitting a piercing noise but may be adapted to activate lights or a radio transmitter for giving an alarm signal at a remote point.

It will be recognized by those skilled in the art that once the alarm is given, unless the ball 24 is repositioned over the aperture, meaning that the first lever arm 30 has been rotated counterclockwise so that the pin 32 no longer protrudes through the aperture 28, the electrical contacts 38,44 are in electrical contact and the alarm remains activated.

In order to rotate the first lever arm 30 counterclockwise to turn off the alarm sound, a second lever arm 48 is provided having a pivot point 50 in approximately the center thereof. At the front end 52 of the second lever arm 48, there is provided an upwardly extending protrusion 54 which is adapted to engage the first lever arm 30 at a point between the axis of rotation 40 and the electrical contact 38 so that pressure may be applied upwardly on the first lever arm 30 thereby rotating counterclockwise the one end 34 of the first lever arm 30 having the upwardly extending pin 32 connected thereto. In this manner by rotating the other end 36 of the first lever arm 30 in a counterclockwise direction the pin 32 is disengaged from the aperture 28 thereby permitting the ball 24 to come to its rest position over the aperture 28 when the machine to which the alarm unit 10 is connected, is placed in its normal upright position. The rear end 56 of the second lever arm 48 is pro-

vided with a downwardly curved section 58 which may be contacted by a reset member 60, as will be more fully described.

In order to permit the disengagement of the pin 32 from the aperture 38 of the cuplike element 20, a reset lock 62 is provided which, when using the proper security element, such as a key, may be turned so that the reset member 60 may be rotated counterclockwise as seen in FIG. 2, by rotating the key 61, to contact the downwardly curved section 58 of the second lever arm 48 to rotate the front section 52 thereof into contacting relationship with the first lever arm 30 to swing the pin 32 counterclockwise disengaging the pin 32 from the aperture 28 and permitting the ball 24 to reset over the aperture 28. This operation is clearly shown in FIGS. 3, 5 and 6. The reset lock 62 may take the form of a lock and key 61 which permits the turning of the reset member 60 from a normal upward position counterclockwise, as shown by the arrow in FIG. 3, so that the reset member 60 engages the downwardly curved section 58 of the second lever arm 48 moving the same in a counterclockwise direction which will move the pin 32 from the aperture 28, as previously described. As shown in FIGS. 3 and 7, a spring 64 may be connected to the front end section 52 of the second lever arm 48 for holding the same in a normally downward position out of physical contact with the other end 36 of the first lever arm 30. In this manner, it may be seen that the turning of the reset member 60 works against the spring 64 connected to the front end 52 of the second lever arm 48 so that after the resetting contact has been made between the second lever arm 48 and first lever arm 30 and the reset member 60 is thereafter moved to its normal upright position by the turning of the key 61, to move the reset member clockwise, the front end 52 of the second lever arm 48 is urged out of contact with the other end 36 of the first lever arm 30.

It should be noted that the springs 42, 64 may be adjusted to provide a varying of the stresses on the lever arms 30, 48 to which each spring is connected; in this manner the sensitivity and movement of the lever arms 30, 48 will be adjustable. For example, by slackening the tension on the spring 42 connected to the first lever arm 30, the pin 32 will not push the ball 24 from its seated position over the aperture 28 when the ball 24 is moved only slightly. If the tension were greater the pin 32 might more forcefully urge the ball 24 away from its seated position after only a slight movement of the ball 24. The adjustable feature enhances the flexibility of the angular displacement switch 18 and permits a greater degree or lesser degree of sensitivity of the burglar alarm unit 10 per se.

The frame 12 may be connected to the body of a portable machine, which is to be protected, by means of a screw plate 66 integrally connected to the back of the frame 12. Although the screw plate is shown as a means of connection to the frame 12 to the unit to be protected, other fastening means, not shown, may be provided which will permit a secure connection between the alarm unit and the object to be protected. It should be particularly understood that a firm connection is the object so that the alarm unit is not easily separable from the object to be protected.

In operation, as shown in FIG. 7, the tilting of the entire alarm unit 10 causes the ball 24 to move off the aperture 28. As soon as the aperture 28 has been cleared by the unseating of the ball 24, the pin 32 is rotated into the aperture 28 by means of the first lever arm 30. The other end 36 of the first lever arm 32 is rotated downwardly thereby permitting the physical contact of the electrical contacts 38 and 44 thereby electrically connecting the battery 16 to the horn 14 resulting in the activation of the alarm. The ball 24 cannot reset over the aperture 28 since the pin 32 prevents such reseating. The reset lock 62, having a reset member 60 may be rotated in a counterclockwise direction so that the reset member 60 urges the rear end 56 of the second lever arm in a clockwise direction thereby having the front end 52 of the second lever arm contacting the other end 36 of the first lever arm 30 for movement of the pin 32 in a counterclockwise direction, out of the aperture 28. The ball 24 may therefore reset over the

aperture 28 and the actions of the springs 42, 64 will hold the first lever arm 30 and the second lever arm 48 in such position as to permit the ball 24 to be maintained over the aperture 28 thereby disconnecting the electrical contacts 38, 44 out of physical contact.

It should be noted that a front cover 68 fits over the frame 12 to enclose the total alarm unit. The front cover 68 is fastened to the frame in such a way as to be firmly positioned and only releasable from the frame when the reset lock is turned to unlock the cover 68 from the frame 12. In this manner, the reset lock 62 performs a twofold purpose:

1. to unlock the front cover 68 from the frame to permit access to the interior of the frame 12 without setting off the alarm mechanism, and

2. to reset the alarm unit by disengaging the upwardly extending pin 32 from the aperture 28 in the cuplike member 20.

Alternatively, as shown in FIGS. 9 and 10, the second lever arm 48 may be completely eliminated from the structure, the alternative embodiment provides an extension member 70 connected to the other end 36' of the first lever arm 30' which is adapted to be contacted by the reset member 60' of the reset lock 62'. The reset lock 62' is positioned toward the other end 36' of the first lever arm 30' such that when the key is turned in a clockwise movement the reset member 60' is turned clockwise the reset member 60' will lift the extension member 70 so as to pivot the one end 34' of the first lever arm 30' counterclockwise thereby bringing the pin 32' out of engagement of the aperture 28'.

Structurally, the reset lock 62' is positioned close to the extension member 70 so that contact may be made by the reset member 60' when it is rotated clockwise. The resetting of the alarm unit 10' results in the breaking of the physical contact between the electrical contacts 38' and 44' in the alternative embodiment. The function of the angular displacement switch is identical to the application that has been described in detail with the preferred embodiment. It will be recognized by those skilled in the art that the object of the present invention to wit that a continuous alarm may be sounded by the tilting or sudden movement of the alarm unit and the use of an angular displacement switching arrangement for activating and continuously providing an alarm noise.

While in accordance with the patent statutes a preferred embodiment and alternative embodiment has been shown and described in detail, it is particularly understood that the invention is not limited thereto or thereby.

We claim:

1. A burglar alarm system comprising a frame, said frame being connectable to an object to be protected, a noise-making element disposed within said frame, a source of electrical energy mounted within said frame, an angular displacement switch disposed between said electrical source of energy and said noise-making element for connecting said electrical source of energy to said noise-making element when the object to be protected to which the frame is connected is either tilted, moved or jarred, said angular displacement switch having a solid of revolution movable from a rest position when said frame is tilted, moved or jarred, a first lever arm being spring actuated when said solid of revolution is moved from its rest position, said first lever arm rotatably moving to close a pair of electrical contacts and preventing said solid of revolution from returning to its rest position, a front cover releasably connected to said frame, and a reset lock disposed on said front cover and adapted to communicate with said first lever arm to rotate the same permitting the solid of revolution to repose in its rest position thereby disengaging said noise-making element.

2. A burglar alarm system according to claim 1 wherein said angular displacement switch comprises a cuplike element, said cuplike element having a concave bottom surface, an aperture disposed at the lowest point of said concave surface, said first lever arm being disposed adjacent said cuplike element, an upwardly extending pin positioned on one end of said first lever arm and adapted to cover the aperture in the concave bottom

surface of said cuplike element when said solid of revolution is unseated from over said aperture, said first lever arm being provided with an electrical contact at the other end thereof, the rotative motion of said first lever arm being controlled by the position of said solid of revolution over said aperture in said cuplike element.

3. A burglar alarm system according to claim 2 wherein a second lever arm is rotatably engageable with said other end of said first lever arm for moving said first lever arm out of engagement with the aperture in said cuplike element permitting the solid of revolution to reset over said aperture.

4. A burglar alarm system according to claim 3 wherein said second lever arm is rotatably moved by a contact with a reset member connected to said reset lock such that when said reset lock is rotated said reset member rotates to move said second lever arm into contacting relationship with said other end of said first lever arm.

5. A burglar alarm system according to claim 4 wherein said solid of revolution is movable from its seated position over said aperture when said frame is tilted or suddenly moved permitting the introduction of said upwardly extending pin into said aperture by the movement of said spring-biased first lever, said solid of revolution being unable to reseat for said aperture while said upwardly extending pin is engaged in said aperture.

6. A burglar alarm system according to claim 5 wherein while said pin is engaged in said aperture said electrical contacts are in mating relationship permitting said noise-making element to continuously provide an alarm signal.

7. A burglar alarm system according to claim 6 wherein said reset lock is rotatable to permit the reseating of said solid of revolution over said aperture thereby disconnecting said noise-making element.

8. An alarm system according to claim 7 wherein said reset lock is adapted to unlock said front cover from said frame to permit the opening of said cover while said angular displacement switch is moved to the deactivated position.

9. An alarm system according to claim 2 wherein said first lever arm is rotatably moved by a contact with reset member connected to said reset lock such that when said reset lock is rotated said reset member rotates to move said other end of said first lever arm and said one end of said first lever arm.

10. A burglar alarm system according to claim 9 wherein rotative movement of said other end of said first lever arm moves said upwardly extending pin out of engagement with said aperture in said cuplike element permitting the solid revolution to reseat over said aperture.

11. A burglar alarm system according to claim 10 wherein said reset member is connected to said reset lock and is rotatable when said reset lock is turned.

12. A burglar alarm system according to claim 11 wherein said reset lock is adapted to unlock said front cover from said frame to permit the opening of said cover while said angular displacement switch is moved to the deactivated position thereby permitting access to the interior of said frame.

13. A trundle switch comprising a cuplike element, said cuplike element having vertical sidewalls and having a concave bottom surface, an aperture disposed at the bottom of said concave surface, an annulus adapted to freely move on said concave surface, said annulus having a deactivated position seated over said aperture, a first lever arm disposed beneath said cuplike element, said first lever arm having an upwardly extending pin in rotative alignment with said aperture, an electrical contact disposed on the other end of said first lever arm, said first lever arm being spring activated to hold said upwardly extending pin in said aperture, the weight of said annulus preventing said pin from protruding through said aperture, said upwardly extending pin extending into and through said aperture when said annulus is unseated from over said aperture, said electrical contact being movable into position when said upwardly extending pin is moved into and through said aperture.

14. An angular displacement switch according to claim 13 wherein said solid of revolution is a steel ball.

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15. An angular displacement switch according to claim 14 wherein said aperture is disposed through the lowest point of said concave surface.

16. An angular displacement switch according to claim 15 wherein said first lever arm is rotatable about a fixed axis such that when said other end of said first lever arm is rotated in a counterclockwise direction said upwardly extending pin on

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said one end of said lever arm is rotated in a counterclockwise direction out of engagement with said aperture.

17. An angular displacement switch according to claim 16 wherein said ball cannot reseal over said aperture when said upwardly extending pin is extending through said aperture.

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