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July 21, 1970 R. A. HALL 3,521,266

BURGLAR ALARM SYSTEM HAVING PLURAL VIBRATION DETECTORS WITH ACTUATION INDICATORS

Original Filed May 17, 1967

FIG. 1

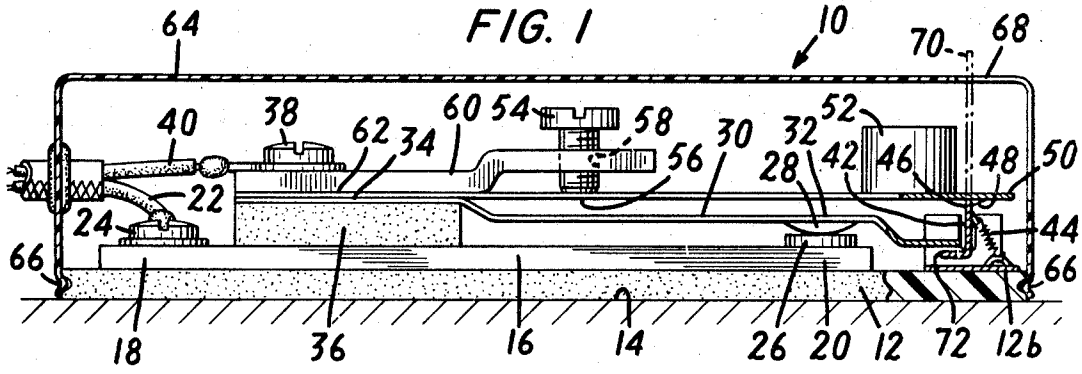


FIG. 2

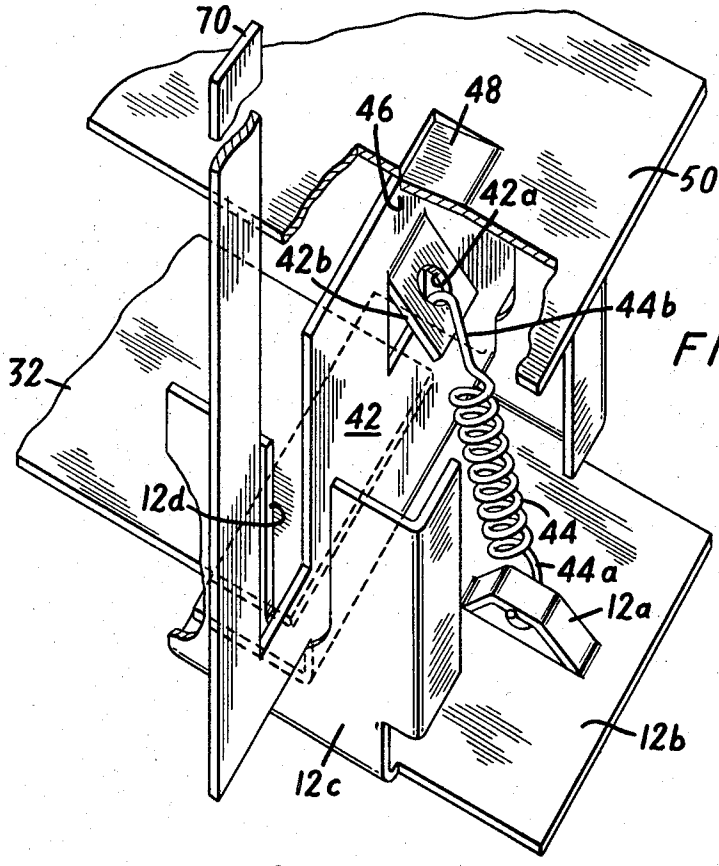


FIG. 3

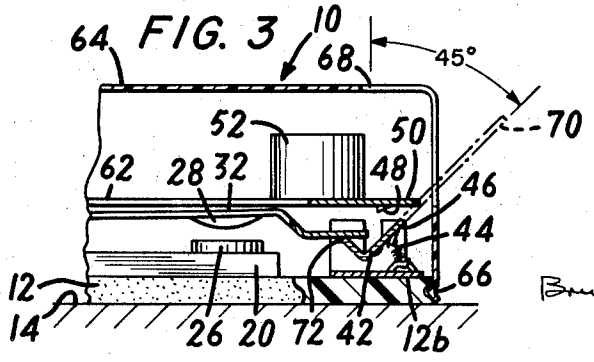
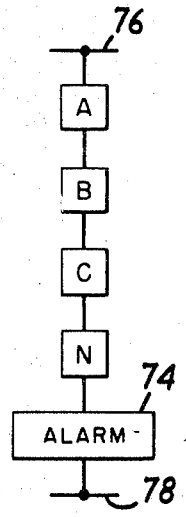


FIG. 4



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BURGLAR ALARM SYSTEM HAVING PLURAL VIBRATION DETECTORS WITH ACTUATION INDICATORS

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Original application May 17, 1967, Ser. No. 639,181, now Patent No. 3,392,246, dated July 9, 1968. Divided and this application May 1, 1968, Ser. No. 725,757

Int. Cl. G08b *13/02*

U.S. Cl. 340—261 1 Claim

ABSTRACT OF THE DISCLOSURE

A burglar alarm system comprises a plurality of vibration detection devices mounted on one or more surfaces to be protected at a plurality of spaced-apart locations to detect vibration thereof. An alarm in circuit with the devices responds to actuation of any one of the devices. Each of the vibration detection devices includes an actuator for actuating such device upon the occurrence of vibrations exceeding a predetermined intensity. In addition, the actuating means maintains such actuated device in an actuated condition to facilitate identification of the actuated device among a plurality of devices. The devices are manually engageable for resetting.

CROSS-REFERENCE TO RELATED APPLICATION

This is a division of my copending application Ser. No. 639,181, filed May 17, 1967, now Pat. No. 3,392,246, for Vibration Detection Device.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a burglar alarm system and, in particular, to a novel and highly-improved burglar alarm system including a plurality of devices the sensitivity of each of which is adjustable independently of the force with which first and second break contacts are normally pressed together. Means are provided for maintaining each device of the system in such condition following actuation as to facilitate ready identification of the device as having been actuated.

Description of the prior art

Vibration detectors are known and are used, for example, for burglary detection. In such use, vibration detectors are typically mounted on windows, doors, or walls and are designed to open momentarily normally-closed electrical contacts when vibration results from an attempt to break through the protected surface. Conventional vibration detectors have, however, a number of serious disadvantages. For example, they are typically prone to produce false or spurious alarms after installation, and their design is such that it is extremely difficult to locate the malfunctioning detector or detectors in a typical multi-detector burglar alarm installation.

One reason for the difficulty in detecting an improperly adjusted device is that the contacts opened by, for example, nearby vehicular traffic promptly close again after the passage of the disturbance so that inspection of the devices fails to reveal which of them actuated the alarm.

Another shortcoming of conventional devices is that the force with which the contacts are normally held together is a function of the adjustment of the sensitivity. For a sensitive adjustment, a light force is necessary, which means that dry circuit phenomena including resistive oxides formed on the contact surfaces or heat and aging causing deformation of the base or mounting surface give rise in time to spurious actuation of the devices.

SUMMARY OF THE INVENTION

An object of the present invention is to remedy the shortcomings noted above. In particular, an object of the invention is to provide a burglar alarm system comprising a plurality of rugged, simple, inexpensive, compact vibration detection devices in which the relatively movable contacts are strongly held in their normal relative positions irrespective of the sensitivity adjustment and which, once actuated, remain in a condition adapted to facilitate ready verification of the fact of actuation.

The foregoing and other objects are attained in accordance with the invention by the provision of a burglar alarm system comprising a plurality of vibration detection devices mounted on surfaces at a plurality of spaced-apart locations to detect vibration thereof and alarm means in circuit with such devices responsive to actuation of any one of such devices to produce an alarm, the vibration detection devices respectively including a plurality of actuating means for (a) actuating the respective devices upon the occurrence of vibrations of the respective surfaces exceeding predetermined intensities and (b) maintaining the actuated devices in an actuated condition, to facilitate identification of actuated devices without employment of separate alarm circuits therefor. Manually engageable means is provided for resetting the devices.

BRIEF DESCRIPTION OF THE DRAWING

An understanding of other aspects of the invention may be gained from a consideration of the following detailed description of representative embodiments of the invention and of the accompanying figures of the drawing, in which:

FIG. 1 is a side elevational view, partly in section, of an exemplary embodiment of a device suitable for use in accordance with the invention;

FIG. 2 is a fragmentary perspective view, on an enlarged scale, of the apparatus of FIG. 1;

FIG. 3 is a fragmentary elevational view, on the same scale as FIG. 1, of the apparatus of FIG. 1 in an actuated condition; and

FIG. 4 is a schematic diagram of a plurality of devices according to FIGS. 1–3 in an alarm circuit according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows apparatus **10** constructed in accordance with my copending application identified above. The apparatus includes an insulating base **12** mounted on a surface **14** to be protected. The surface **14** is typically the surface of a wall, door, window, floor, or ceiling.

A first electrically conducting strip, which may be of brass, is mounted on the insulating base **12**. The electrically conducting strip **16** has a terminal portion **18** and a contact portion **20**. The terminal portion **18** is electrically connected to a lead **22** by a terminal screw **24**. The contact portion **20** of the strip **16** is preferably formed with a contact **26** which is normally closed with a second contact **28**.

The contact **28** is formed on a second electrically conducting member **30**, which may also be of brass. The conducting member **30** is preferably a flexible spring mounted in cantilever fashion, the free end **32** accommodating the contact **28** and the other end **34** being supported by an insulating mounting **36** in insulated relation from the conducting strip **16** and serving as a second terminal portion.

A terminal screw **38** connects a second electrically conducting lead **40** to the portion **34** of the spring **30**.

The contacts or contacting portions **26** and **28** and normally pressed firmly together so that minor heating or warping of the surface **14** or the formation of oxides on the contacts will not cause the generation of spurious signals. The spring **30** is not provided with a weight, as in typical conventional devices, so the contact **28** tends to follow the vibration of the surface **14** just as does the contact **26**.

Actuation of the device to separate the contacts **26** and **28** is effected by a biased lever **42**. The biased lever is pivotally mounted and biased by means such as a tension coil spring **44**. The upper end **46** of the lever is normally retained by a notch **48** formed in a leaf spring **50**. Those skilled in the art will readily understand that other retaining means can be employed in lieu of the notch **48**. For example, the lever **42** could be provided with pins insertable within holes formed in the spring **50**.

As FIG. 2 best shows, the spring **44** is anchored at its lower end **44***a* in a boss **12***a* formed on a plate **12***b* securely attached to the base **12**. At its upper end **44***b*, the spring **44** is secured through an eye **42***a* formed in a tab **42***b* on the lever **42**. A wall portion **12***c* integral with the plate **12***b* is formed with a slot **12***d* permitting pivoting movement of the lever **42**, as will hereinafter become evident.

The notched spring **50** tends to remain stationary notwithstanding vibration of the surface **14** because of the inertia of a weight **52** mounted thereon. The position and, if desired, the magnitude of the weight **52** are adjustable to adjust the sensitivity of the device. In addition, the sensitivity of the device is adjustable by a threaded screw **54** adapted to bear on the spring **50** at a point **56**. The spring **50** is flexible, and the force with which the screw **54** bears on the spring **50** adjusts the tendency of the notch **48** to follow downward movement of the lever **42** as seen in FIG. 1.

The adjustment screw **54** is mounted in a threaded aperture **58** formed in a spring retainer **60**. The spring retainer **60** and the end **62** of the spring **50** are secured by the terminal screw **38** to the insulating mounting **36**.

A dust cover **64**, preferably formed of an insulating material, forms a snap-on engagement at **66** with the base **12** and protects the apparatus from dust.

The dust cover **64** is formed with a slot **68**, and the lever **42** has a protruding portion **70** which extends exteriorly of the dust cover **64** to facilitate manual engagement for resetting the device after actuation. The protruding portion **70** of the lever **42** also facilitates ready verification of the fact that a device has been actuated and makes it possible to identify one or more vibration detection devices of a plurality of such devices arranged in circuit with an alarm which may be generating spurious alarm signals.

Specifically, in operation, when the surface **14** and base **12** vibrate, the portion **46** of the lever **42** (see especially FIG. 2) engaging the notch **48** in the spring **50** will, if the intensity of the vibration exceeds a predetermined magnitude which is a function of the position and mass of the weight **52** and of the adjustment of the screw **54**, move out of engagement with the notch **48**, so that the spring **44** pivots the lever **42** clockwise as seen in FIG. 1 and the end **72** separates the contacts **26** and **28**, as shown in FIG. 3.

Inasmuch as the lever **42** remains in the actuated condition shown in FIG. 3 until it is reset, the portion **70** extending at an angle of about 45° to the horizontal, the fact that the device has been actuated is readily determined upon visual inspection.

In accordance with the present invention, a plurality of such devices A, B, C, and N is arranged in circuit with an alarm **74** between leads **76** and **78**. If experience shows that one of the devices is adjusted so that it repeatedly gives a spurious indication of an attack upon the protected surface, the device may be rendered less sensitive by adjustment of the screw **54**. Any detector which has been actuated can be manually reset by manual engagement of the portion **70** of the lever **42** to move the lever **42** to a position normal to the base member **12**.

Thus there is provided in accordance with the invention a novel and highly-effective burglar alarm system. The apparatus of the invention is rugged, simple, compact, and inexpensive to manufacture and repair. A relatively large contact force of, say 12 to 20 grams may be provided notwithstanding a very sensitive adjustment of the device.

Many modifications within the spirit and scope of the invention of the representative embodiments disclosed herein will occur to those skilled in the art. For example, vibration detectors, other than the one specifically illustrated, may be employed in accordance with the invention. Accordingly, the invention is to be construed as including all of the embodiments thereof within the scope of the appended claim.

I claim:

1. A burglar alarm system comprising a plurality of vibration detection devices mounted on surfaces at a plurality of spaced-apart locations to detect vibration thereof and alarm means in circuit with said devices responsive to actuation of any one of said devices to produce an alarm, each of said vibration detection devices including a lever, each of said levers (a) actuating the vibration detection device with which it is associated upon the occurrence of vibrations of the surface protected by said device exceeding a predetermined intensity and (b) maintaining said actuated device in an actuated condition, said levers being mounted to be visible at least in part from outside said respective devices and the appearance of said levers facilitating identification of actuated devices among said plurality of devices without employment of separate alarm circuits therefor, and said levers respectively including portions manually engageable for resetting said devices.

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