United States Patent [19]

Willis

[11] **3,827,038**

[45] **July 30, 1974**

[54] **ALARM SYSTEM**

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[73] Assignee: **Solid State Technology, Inc.,** Wilmington, Mass.

[22] Filed: **Oct. 26, 1972**

[21] Appl. No.: **300,913**

[52] **U.S. Cl.** **340/224,** 340/274

[51] **Int. Cl.** **G08b 13/02**

[58] **Field of Search** ..... 340/224 R, 274 R

[56] **References Cited**

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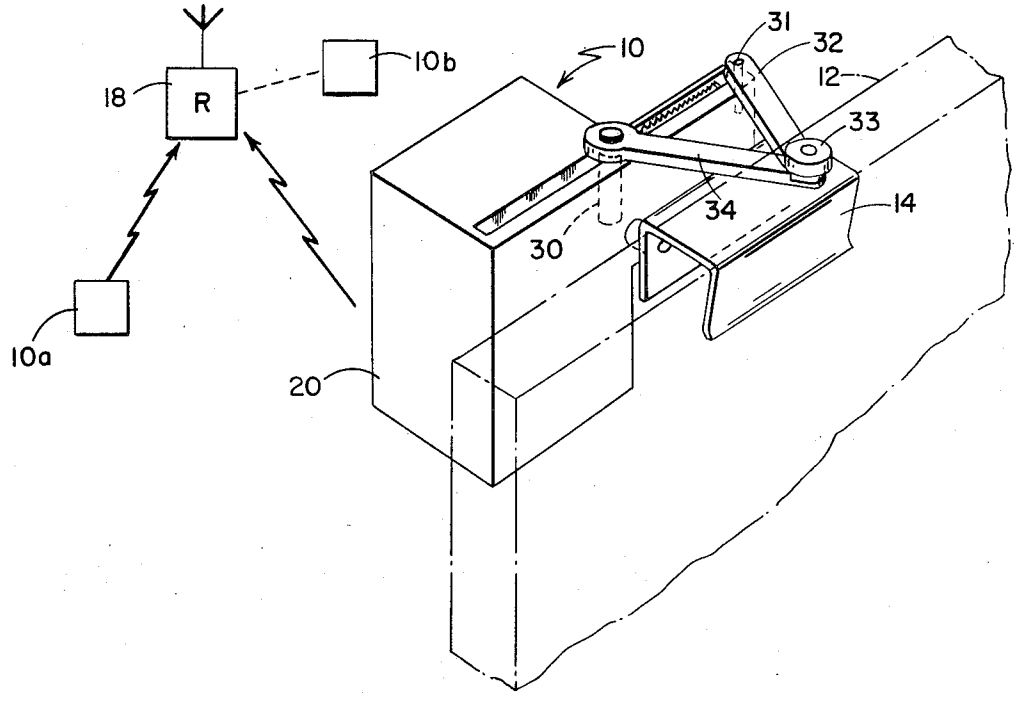
Primary Examiner—Harold I. Pitts

[57] **ABSTRACT**

An alarm system having a central radio receiver and a plurality of independent alarm devices for mounting on a door or the like movable to and from a closed position adjacent a stationary door frame element or the like toward an open position. Each device comprises an electro-mechanical generator, a radio transmitter energized by it and a load-and-fire mechanism having loading means movable into loaded position upon movement of the door into closed position and firing means triggered by release of the loading means upon movement of the door from its closed position to drive the generator and operate the radio transmitter for reception by the central radio receiver.

4 Claims, 8 Drawing Figures



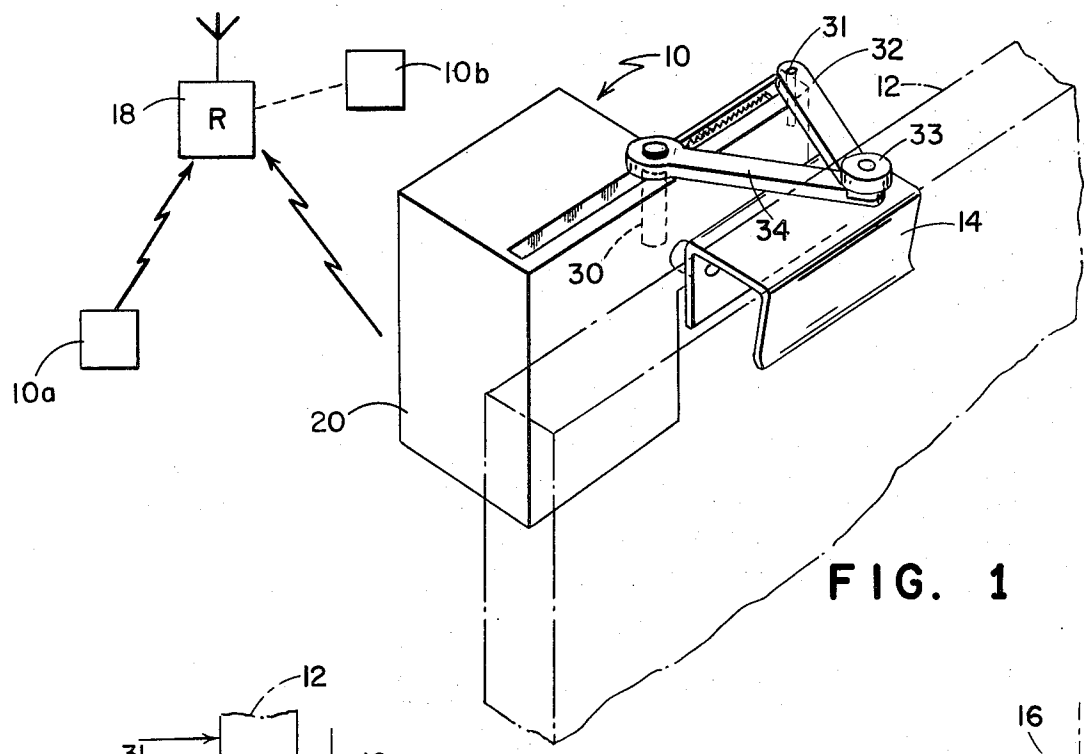


FIG. 1

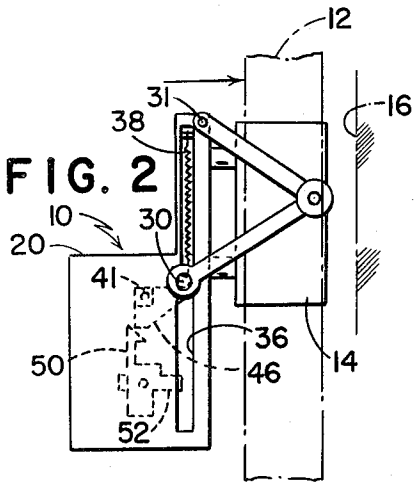


FIG. 2

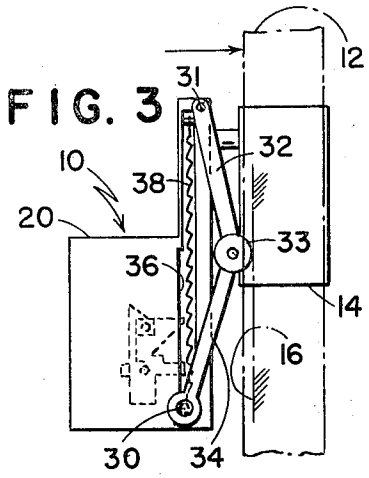


FIG. 3

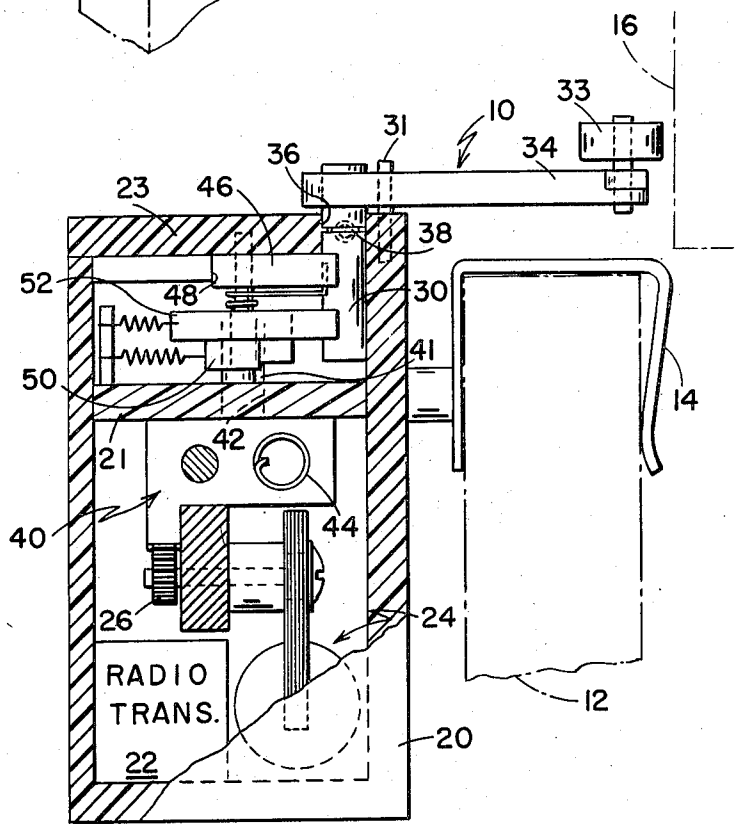
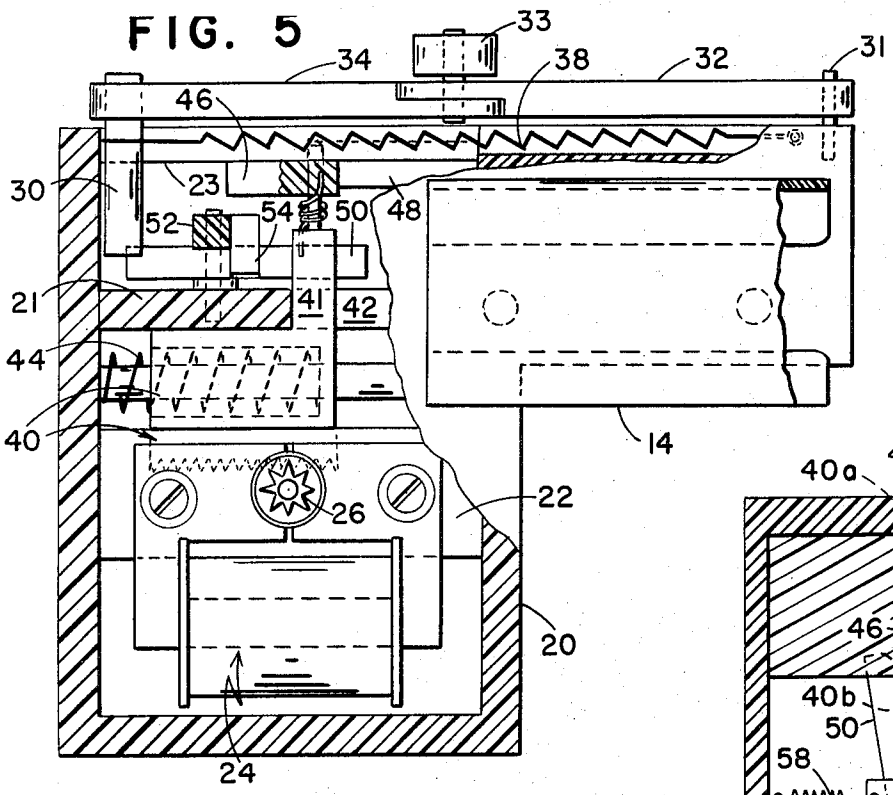


FIG. 4

FIG. 5



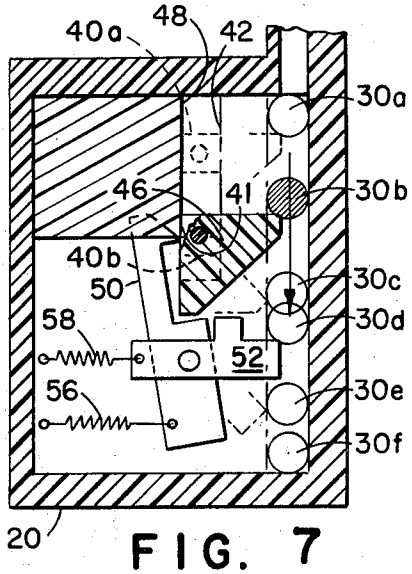
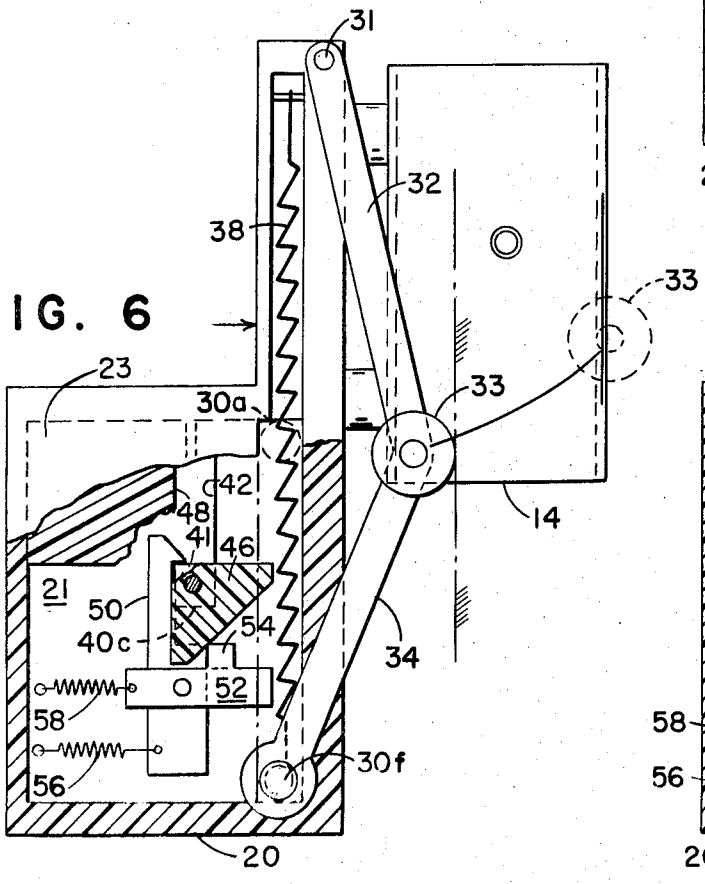


FIG. 7

FIG. 6



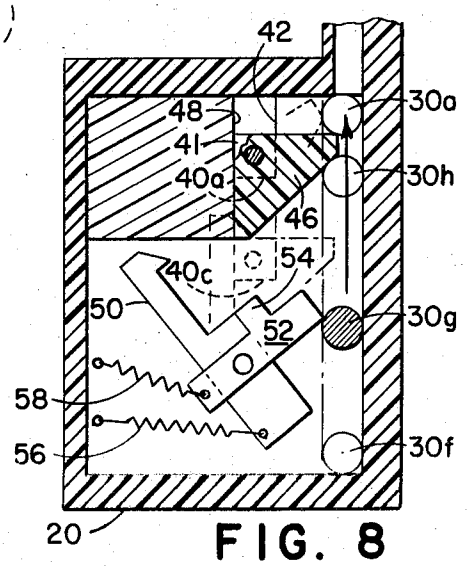


FIG. 8

ALARM SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to alarm apparatus and more particularly to such apparatus for signalling the opening of a door or the like.

2. Description of the Prior Art

The provision of simple, effective alarm devices for signalling the opening of a door, window or the like has long been a problem. Wired devices are expensive to install if the wiring is to be concealed and are unattractive if not. Furthermore, their operation may be prevented by cutting of their wires. Wireless devices have been of the standing wave type which are operated by the inside presence of an intruder rather than the initial opening of a door or window. In addition to being expensive, they tend to be unstable in operation and subject to power failure, or, if battery operated, subject to battery failure.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a novel, independent, wireless, batteryless alarm device capable of signalling the initial opening of a door or the like.

It is another object of the invention to provide an alarm device including a radio transmitter operable upon the initial opening of a door or the like to emit a radio signal.

It is still another object of the invention to provide an alarm system including a central radio receiver and a plurality of independent, wireless, batteryless radio devices each operable upon the initial opening of a door or the like to emit a radio signal for reception by the central radio receiver.

The above and further objects and features are provided according to the invention by novel alarm apparatus for use with a door or the like element movable to and from a closed position adjacent a stationary door frame element or the like toward an open position. Such apparatus comprises alarm means, which may include an electro-mechanical generator having a driving wheel such as a pinion and a radio transmitter energized by the generator, and a load- and-fire mechanism. The latter mechanism may have loading means including pin means movable along a line of travel between a loaded and an unloaded position and spring means urging the loading pin means toward its unloaded position, firing means includang a rack or similar element engaging the generator driving pinion movable along a line of travel between a rest position and a firing position and spring means urging the firing rack toward its rest position and latch means for retaining the firing rack means in its firing position.

The loading pin is movable along its line of travel, upon movement of the door to its closed position, to engage the firing rack to move it to its firing position in engagement with the latch means and, upon movement of the door toward its open position, to engage the latch means to release the firing rack for driving the generator pinion for operation of the radio transmitter.

An alarm system is also provided including a central radio receiver and a plurality of independent alarm devices as above described.

For the purpose of more fully explaining the above and still further objects and features of the invention, reference is now made to the following detailed description of a preferred embodiment thereof, together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall perspective view of apparatus according to the invention, including the system thereof;

FIGS. 2 and 3 are general top views of the apparatus of FIG. 1 showing it in unloaded and loaded (firing) position, respectively;

FIGS. 4, 5 and 6 are, respectively, end, side and top detail views of the apparatus of FIGS. 1 through 3, partly broken away and in section; and

FIGS. 7 and 8 are partial top sectional views of the apparatus of FIGS. 1 through 3 illustrative of its operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, in FIG. 1 is illustrated an overall view of the radio alarm system of the invention, including the device thereof, generally designated **10**, mounted on a door element **12** by a suitable bracket **14**, in conjunction with similar devices **10***a*, **10***b* and a central receiver **18** for receiving radio signals therefrom for building security, for example. FIGS. **2** through **8** show the details of device **10** as well as its mounting on a door element **12** or the like movable to and from a closed position (FIGS. **3** and **6**) adjacent a stationary door frame element **16** or the like to an open position (FIGS. **1, 2** and **4**). It may also be mounted on other building closure elements, such as a window, or on the stationary elements adjacent thereto.

More specifically, the independent, wireless, batteryless radio alarm device of the invention includes a housing **20**, which is preferably of an organic plastic material, having alarm elements mounted therewithin including a conventional miniature radio transmitter **22** and a rotary electro-mechanical generator **24** having a driving pinion **26**. For driving pinion **26** at the high rotational speed necessary to produce sufficient power from generator **24** to operate radio transmitter **22**, regardless of how slowly door **12** is opened, a load and fire mechanism is uniquely provided for driving said pinion.

Such load and fire mechanism, in brief, includes a loading pin **30**, having associated elements adapted to engage door frame element **16**, a firing rack **40** engaging generator pinion **26** and a pivotable latch member **50**.

Loading pin **30** is mounted on the free end of a pair of arms **32, 34**, pivoted together and carrying thereat a door frame contacting roller **33**, with the other end of said arms being pivotally mounted at pivot **31** on housing **20**. A slot **36** in housing **20** provides a guide for loading pin **30** along a line of travel between an unloaded position at **30***a* adjacent pivot **31** and a loaded position **30***f* at the other end of housing **20**. A tension spring **38** is mounted at one end of slot **36** adjacent pivot **31** and at its opposite end on loading pin **30** for urging said pin toward its unloaded position at **30***a*.

Firing rack **40** is mounted for reciprocable sliding movement as guided by its upwardly extending arm **41** in a slot **42** in interior web member **21** of housing **20**

so that it is movable along a line of travel between a rest position 40*a* and a firing position 40*c*. A compression spring 44 is positioned between rack 40 and housing 20 for urging said rack toward its rest position. On the upper end of its arm 41 above housing web member 21, rack 40 has pivotally mounted thereon a triangular cam follower 46 which cooperates with a cam surface 48 extending downwardly from housing cover 23 for moving rack 40 by loading pin 30 to its firing position as hereinafter described.

For releasably retaining rack 40 in its firing position 40*c*, latch member 50 is provided pivotally mounted on web member 21 with a cooperating actuating arm 52 mounted thereabove having a downwardly extending lug 54 engaging latch member 50. Tension springs 56 and 58 are provided, respectively, for maintaining latch member 50 on its latched position and arm 72 in position to be engaged by loading pin 30.

In operation, with door 12 in its open position (FIGS. 1, 2 and 4) movement of said door to its closed position, as best shown in FIG. 7, will, upon initial contact of roller 33 with door frame 16, begin to move pin 30 from its initial position 30*a*. This will result in engagement between said pin and triangular cam follower 46 to move it and rack 40 in opposition to rack spring 44 to position 40b. At this point, follower 46 begins to pass beyond cam surface 48, where arm 41 is engaged by latch 50, and to rotate to allow pin 30 at 30*b* to move beyond it. At this point, rack 50 is in its firing position (FIG. 6) and is so maintained by latch 50. Pin 30 continues to advance through position 30*c*, at which it releases follower 46, to position 30*d*, at which it engages and pivots latch arm 52, to position 30*e* at which it passes latch arm 52 for return of said latch arm by its spring 58, and finally to its loaded position 30*f* at which door 14 is closed against frame element 16.

Upon movement of door 14 toward its open position, as best shown in FIG. 8, pin 30 moves from its loaded position 30f to engage arm 52, pivot latch 50 and release arm 41 and triangular cam follower 46. Upon such release, rack spring 44 rapidly drives rack 40 to its rest position, rotating generator pinion 26 to energize radio transmitter 22 to produce an alarm signal for reception by central receiver 18.

Pin 30 continues to move upon further opening of said door past arm 52 which pivots out of the way at pin position 30*g*, and into engagement with follower 46 at position 30*h* which also pivots out of the way at unloaded pin position 30a, so that the drive is ready for a succeeding loading operation by the closing of door 12.

I claim:

1. Alarm apparatus for mounting on a door or the like element movable to and from a closed position adjacent a stationary door frame element or the like toward an open position,

said apparatus comprising

alarm means including an electro-mechanical generator having a driving wheel and a radio transmitter energized by said generator and

a load-and-fire mechanism having

loading means movable along a line of travel between a loaded and an unloaded position

firing means engaging said generator driving wheel and movable along a line of travel between a rest position and a firing position and

latch means for retaining said firing means in its firing position

said loading means being movable along its line of travel:

upon movement of said door to its closed position to engage said firing means to move it to its firing position in engagement with said latch means and

upon movement of said door toward its open position to engage said latch means to release said firing means for driving said generator wheel for operation of said radio transmitter alarm.

2. Alarm apparatus as claimed in claim 1 wherein

said driving wheel is a pinion and

said firing means includes a rack for driving said pinion upon release thereof by said latch means.

3. Alarm apparatus for mounting on a door or the like element movable to and from a closed position adjacent a stationary door frame element or the like toward an open position,

said apparatus comprising

alarm means including an electro-mechanical generator having a driving wheel and a radio transmitter energized by said generator and

a load-and-fire mechanism having

loading pin means movable along a line of travel between a loaded and an unloaded position and spring means urging said loading pin means toward its unloaded position

firing means engaging said generator driving wheel and movable along a line of travel between a rest position and a firing position and spring means urging said firing means toward its rest position and

latch means for retaining said firing means in its firing position

said loading pin means being movable along its line of travel:

upon movement of said door to its closed position to engage said firing means to move it to its firing position in engagement with said latch means and

upon movement of said door toward its open position to engage said latch means to release said firing means for driving said generator wheel for operation of said radio transmitter alarm.

4. An alarm system comprising

a central radio receiver and

a plurality of independent alarm apparatus as claimed in claim 3.

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