A device to be mounted on a fence, or other structure, and adapted to switch a circuit, such as an alarm circuit, in response to excessive motion of the fence and/or in response to tampering with the device in an effort to inactivate it. The device includes a housing having a removable closure and containing a single, normally closed switch connected in an alarm system, means responsive to removal of the closure for opening the switch to activate the alarm system, and means responsive to excessive motion of the housing for opening the switch to activate the alarm system.
Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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DEVICE RESPONSIVE TO MOTION AND TAMPERING

BACKGROUND OF INVENTION

The present invention relates in general to alarm systems and, more particularly, to a circuit which incorporates a device responsive to tampering and/or excessive motion. Such devices are commonly used on fences to detect any excessive motion which may result from attempts to gain access to the fenced areas by climbing the fences, cutting through them, or the like. However, the invention may be utilized in connection with other structures where detection of excessive motion is desirable.

Devices of the nature to which the invention relates are ordinarily incorporated in normally closed electrical circuits which energize alarms when opened, thereby making circumvention more difficult. To achieve this mode of operation, such devices conventionally include normally closed switches openable in response to excessive motion, and normally closed switches openable in response to tampering with the devices. Opening of either the motion responsive switch or the tamper responsive switch of a device of this character results in activation of the alarm which it controls.

SUMMARY AND OBJECTS OF INVENTION

A primary object of the invention is to provide a device of the foregoing type having but a single switch responsive both to excessive motion and to tampering, thereby considerably simplifying the device and the cost of manufacturing and/or maintaining it.

More particularly, the invention may be summarized as including, and an important object thereof is to provide a device which includes: a housing having a removable closure; a switch; means mounting the switch in the housing for movement from a first position wherein the switch is closed to a second position wherein the switch is open; means biasing the switch toward its second position; interengageable means on the closure and the switch for holding the switch in its first position when the closure is in place; and means embodied in the switch and responsive to excessive motion of the housing for opening the switch even when it is in its first position.

Another object of the invention is to provide a device of the foregoing nature wherein the switch is a mercury switch and the means responsive to excessive motion comprises a body of mercury moveable out of bridging relation with two contacts when the housing of the device is subjected to excessive motion.

Still another object is to provide a motion and/or tamper responsive device wherein the interengageable means for holding the switch in its first position includes a seat carried by the closure and includes adjustable means connected to the switch and engageable with the seat for adjusting the switch in its first position.

An additional object is to provide a device of the nature set forth in the preceding paragraph wherein the adjustable means includes an adjusting screw threadedly connected to the switch and engageable with the seat, the latter being a sledge-like leaf spring.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art, may be achieved with the exemplary embodiment of the invention illustrated in the accompanying drawing and described in detail hereinafter.

DESCRIPTION OF DRAWING

FIG. 1 is a view of a motion and/or tamper responsive device of the invention showing the device partially in vertical section and partially in elevation, a switch incorporated in the device being shown in its closed position;

FIG. 2 is a vertical sectional view taken in a plane at right angles to the plane of the vertical section of FIG. 1;

FIG. 3 is a view similar to FIG. 2, but showing a closure of the housing of the device removed and showing the switch in its open position, the position of the removed closure being shown in broken lines; and

FIG. 4 is an enlarged vertical sectional view of the switch of the motion and/or tamper responsive device.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENT OF INVENTION

The device of the invention for responding to excessive motion and/or tampering is designated generally opening the numeral 10 and includes a housing 12 having a removable closure 14 shown as forming the front and bottom walls of the housing. The closure 14 is normally held in place by a screw 16 threaded into a nut 18 carried by an insulating body portion 15 of the housing 12. Externally mounted on the rear wall of the housing 12, as by rivet 19, is a straplike bracket 20 adapted to receive a bracket 22 mounted on a fence or other structure, excessive motion of which is to be detected by the device 10.

Located within the housing 12 is a mercury switch 26 comprising a switch body 28 suitably secured to an intermediate portion of a leaf spring 30. One end of the leaf spring 30 is rigidly secured to the structure of the body 15 of the housing 12, as by a rivet 32. The leaf spring 30 biases the switch 26 into its open position, shown in FIG. 3.

The switch body 28 is provided therein with a cavity 34, FIG. 4, containing a body 36 of mercury. When the switch 26 is in its closed position, FIGS. 1 and 2, the mercury body 36 bridges two contacts 38 which are suitably connected to leads 40 split out of a continuous cable 41 leading to the exterior of the housing 12, as through notches 42 in the removable bottom wall thereof, one such notch being visible in FIG. 2. In stringing the cable 41 through the device 10, it hinged possible to receiving the cable, remove the conductor to be wired to the switch 26, cut it and put terminals on it and connect it to the contacts 38, all without disturbing the continuity of the main cable. This is very important for speed of installation.

The cable 41, as it is installed in the device 10, makes four 90° bends, one as viewed from each side and two as viewed from the top. This serves the purpose of a strain relief and firmly anchors the cable 41 in the device 10.

The free end of the leaf spring 30 is doubled back on itself to provide a U-shaped portion 44 receiving therein a nut 46. Threaded into the nut 46 and extending through the arms of the U-shaped portion 44 is an adjusting screw 48 by means of which the sensitivity of response of the switch 26 to motion can be adjusted.

The head of the adjusting screw 48 is provided with a screwdriver recess 49 and is adapted to engage a seat 50 which comprises a saddle formed intermediate the ends of a generally U-shaped leaf spring 52 the ends of which are suitably secured to the removable closure 14. The seat 50 holds the end of the screw 48 against a stop portion 53 of the insulating body 15 when the closure 14 is installed. When the closure is removed, the end of the screw 48 may be held against the stop 53 by a screwdriver 55 while adjusting the screw, this being the same position in which the seat 50 holds the screw. Thus, the screw 48 may be adjusted as desired and this adjustment will be maintained by the seat 50.

Operation

It is thought that the operation of the device 10 is virtually self-explanatory. Consequently, it will be described only briefly.

When the closure 14 is in place, as shown in FIGS. 1 and 2, the head of the adjusting screw 48 engages the seat 50 to maintain the switch 26 in its closed position in opposition to the bias provided by the leaf spring 30. Under such conditions, the mercury body 36 bridges the contacts 38 to prevent activation of the alarm circuit in which the switch is connected.

However, if excessive motion is imparted to the device 10, as the result for example, of an attempt to scale the fence, not shown, on which the device is mounted, the mercury body 36
will disengage one or both contacts 38 to open the circuit in which the device is connected, thereby activating the alarm system. The same thing happens, of course, if someone attempts to inactivate the alarm system by cutting one of the leads 40, for example. As will be apparent, the sensitivity of the switch 26 to motion may be adjusted by means of the adjusting screw 48. If less sensitivity is desired, the screw, assuming a right hand thread, is rotated in the counterclockwise direction to increase the angle of inclination of the switch in its closed position. Alternatively, if more sensitivity is desired, the adjusting screw 48 is turned in the clockwise direction to decrease the angle of inclination of the switch 26 in its closed position. Either such adjustment is made with the screw 48 held in the same position by the screwdriver 55 as that in which it is held by the seat 50 in operation, so that accurate setting is easily obtained.

In the event that someone attempts to inactivate the device 10 by removing the closure 14, the switch 26 is automatically moved to its open position, FIG. 3, by the leaf spring 30 as the result of disengagement of the seat 50 from the adjusting screw 48. Thus, any tampering attempt also results in energization of the alarm system.

Thus, the single mercury switch 26 performs two functions, i.e., it responds to excessive motion, and it responds to tampering. This is an important feature since it not only reduces the cost of the device 10, but makes it more reliable and less expensive to maintain as the result of minimizing the number of components.

Although an exemplary embodiment of the invention has been disclosed for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in this embodiment without departing from the spirit of the invention as defined by the claims appearing in the next section of this specification.

1. A self-contained alarm-system switching device responsive to tampering with the device and/or to excessive motion of a fence, or the like, on which the device is mounted, including:
   a. a housing providing a switch compartment and having a closure which is removable for access to said switch compartment;
   b. mounting means on said housing for mounting it on a fence, or the like, excessive motion of which is to be detected;
   c. a single switch in said switch compartment and including spaced contacts and a body of mercury for bridging said contacts;
   d. means movably mounting said switch in said switch compartment for movement between a closed position wherein said body of mercury bridges said contacts and an open position wherein said body of mercury is out of engagement with at least one of said contacts;
   e. means biasing said switch toward its open position;
   f. interengageable means on said closure and said switch for holding said switch in its closed position when said closure is in place; and
   g. whereby removal of said closure and/or excessive motion of said housing causes said body of mercury to disengage at least one of said contacts and thus open said switch.

2. A switching device as defined in claim 1 wherein said interengageable means for holding said switch in its closed position includes a seat carried by said closure and includes adjustable means connected to said switch and engageable with said seat for adjustable maintaining said switch in said closed position.

3. A switching device according to claim 2 wherein said adjustable means includes an adjusting screw threadedly connected to said switch and engageable with said seat.

4. A switching device as defined in claim 3 wherein said seat comprises a saddle-like leaf spring.

* * * *
UNIVERS STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,646,289

Dated February 29, 1972

Inventor(s) BURNIE M. CRAIG

It is certified that error appears in the above-identified patent and
that said Letters Patent are hereby corrected as shown below:

Column 2, line 8, delete "opening" and insert --by--;
Column 2, line 24, "lead" should be --leaf--;
Column 2, line 33, "hinge" should be --is--;
Column 2, line 34, "receiving" should be --slit--;
Column 2, line 48, "wall" should be --with--;
Column 4, line 18, "g." should be --f.--;
Column 4, line 21, "6." should be --g.--.

Signed and sealed this 25th day of July 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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[SEAL]

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