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Gould

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[54] **ALARM UTILIZING PRESSURE AND TEMPERATURE RESPONSIVE SWITCH**

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[73] Assignee: **Cable Switch Corporation,** Asbury Park, N.J.

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[52] **U.S. Cl.** ..... **340/272,** 340/221 C, 200/85 R

[51] **Int. Cl.** **H01k 3/02,** G08b 13/10

[58] **Field of Search** ..... 340/272, 227 C, 213, 340/258 R; 200/86 R, 86 A, 52, 61.13, 61.08

[56] **References Cited**

UNITED STATES PATENTS

3,588,776	6/1971	Horwinski	340/227 C X
3,257,530	6/1966	Davies	340/227 C
2,820,085	1/1958	Crowley	340/227 C UX
2,437,969	3/1948	Paul	200/86 R
2,790,873	4/1957	Fleming	200/86 R
2,790,872	4/1957	Helsper	200/86 R
2,728,827	12/1955	Towle	200/86 R
2,926,343	2/1960	Postal	340/227 C UX
2,156,715	5/1939	Basquin	200/86 R
3,375,477	3/1968	Kawazoe	340/227 C UX
3,052,772	9/1962	Koenig	200/86 R X

FOREIGN PATENTS OR APPLICATIONS

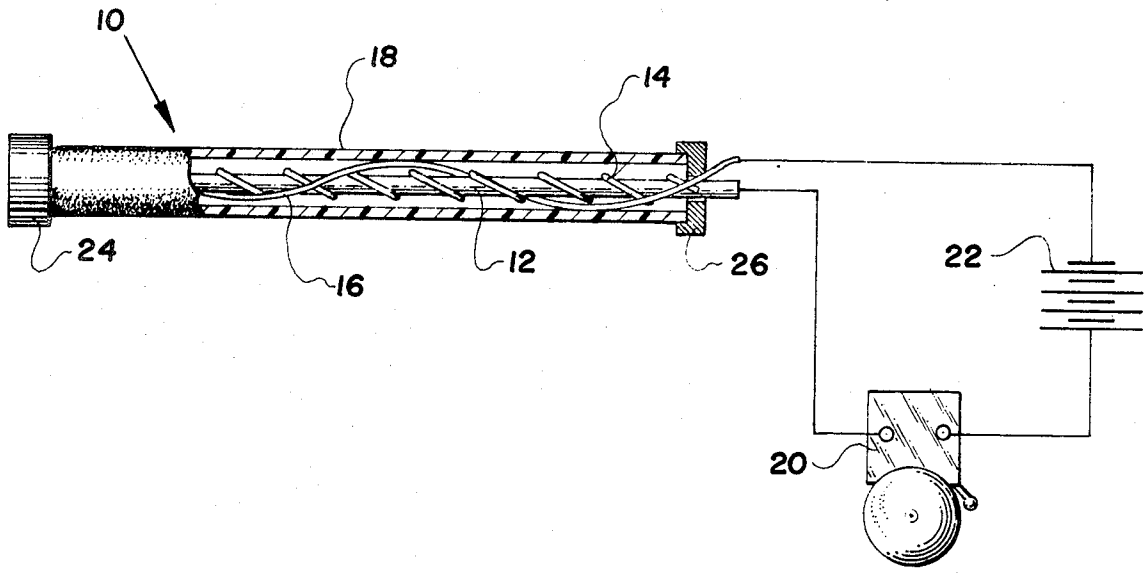
1,064,595	8/1957	Germany	200/86 R
272,893	8/1928	Great Britain	200/86 R
2,013,597	4/1970	France	200/86 R
390,028	3/1933	Great Britain	340/227 C

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[57] **ABSTRACT**

An electric switch in which an insulator wire and an outer conductive spring wire are wrapped about a central conductive spring wire core with the outer conductive spring wire separated at all points from the central core in its undeformed position. The three elements are normally covered by an insulator such as a tube of insulating material. The insulating winding separates the outer spring conductive wire from the central core wire in normal usage. If pressure is applied to the outer insulating covering, the outer spring conductive wire is forced into contact with the central core completing a circuit to an alarm. As soon as the pressure is removed, the spring characteristic returns the spring conductive wires to their initial position and the alarm circuit is broken. Further, the insulating winding is also temperature sensitive so that, in the case of fire, the outer spring conductive wire will make contact with the central conductive core and again close an alarm circuit.

7 Claims, 3 Drawing Figures



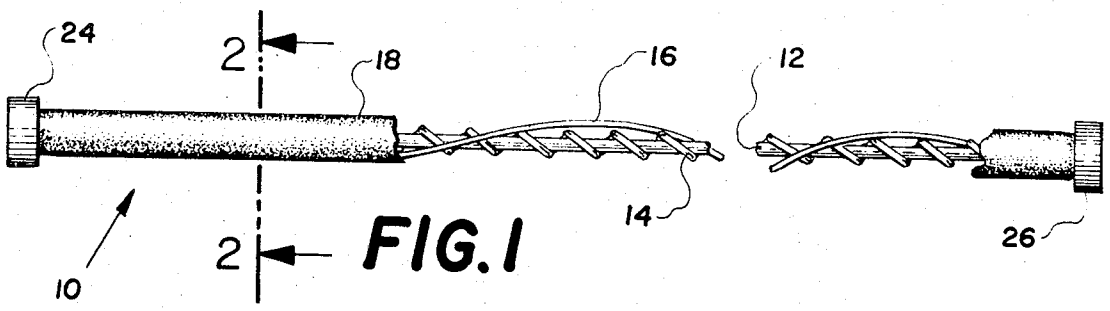


FIG. 1

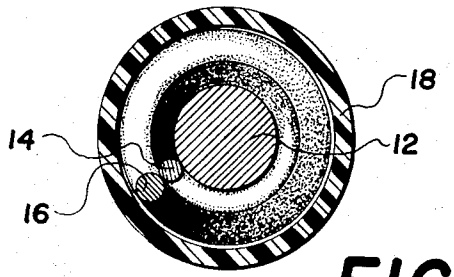


FIG. 2

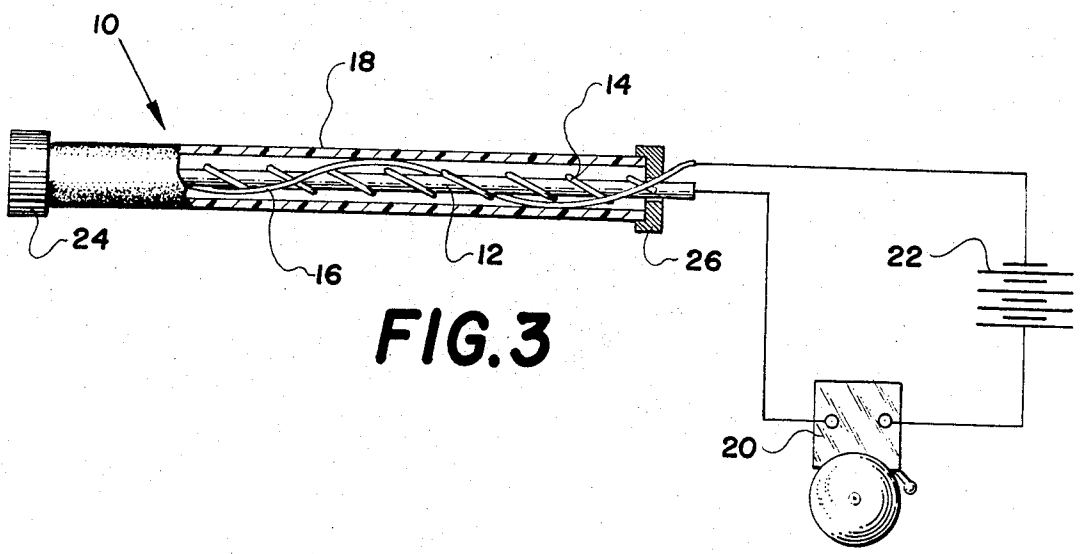


FIG. 3

ALARM UTILIZING PRESSURE AND TEMPERATURE RESPONSIVE SWITCH

BACKGROUND OF THE INVENTION

There have been many prior art pressure sensitive devices for detection of an intruder, especially those in which a wire is placed under mat. For example, U.S. Pat. No. 683,341 shows an electrical alarm mat in which an upper mesh of wire conductors are separated from a lower mesh of wire conductor by a spring like insulation material. If one were to step above the mat, one would force the upper wire mesh into contact with the lower wire mesh and complete a circuit. If one were to lift the foot, the insulating material would return the upper wire mesh to its initial position. This concept has also been shown in a strip-like form as in U.S. Pat. No. 2,728,827 which shows three parallel conductor strips separated one from the other by spaced insulating members and having a non-conductive tube protecting the entire strip. If one were to step on the strip at any point, one would force either the first conductor into contact with the second conductor or the second conductor into contact with the third conductor thus completing the circuit to an alarm. Here again, however, these are flat strips and the insulating material must be particularly positioned along the length of the conductors.

U.S. Pat. No. 2,790,872 shows a similar pressure switch in which the insulating member is in the form of a continuous strip wound in a spiral manner about the central flat conducting strip. Other similar switches can be seen in U.S. Pat. No. 2,790,873 and U.S. Pat. No. 3,052,772.

SUMMARY OF THE INVENTION

The present invention relates to a pressure/fire detector which is simple and easy to manufacture and inexpensive to operate and insures safe usage over long periods of time. That is, it includes a central core spring wire which is conductive, and a spirally wound insulator wound in one direction around the central core. A spirally wound conductor made of spring steel wire is oppositely wound around the central core and is maintained spaced from the central core by the spirally wound non-conductor. All three elements are placed in an insulating sleeve and, when pressure is applied, the spirally wound outer spring wire is forced between the nonconductive wiring and comes into rubbing contact with the central core. The spring characteristic of the spirally wound electrical outer conductor member in cooperation with the spring characteristic of the central core maintains a separation between the conductors until such time as pressure is again applied, e.g., someone steps on the switch. When the pressure is removed, the circuit is broken and the alarm is turned off. It should further be noted that the spirally wound nonconductor is manufactured from a material having a low melting point so that, in case of fire, this conductor will melt causing immediate contact between the outer spring member and the central core so that the switch acts as both a pressure detector and a fire detector. The wire is fixed at opposite ends to hold all members in place.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of a switch wire constructed in accordance with the principles of the present invention.

FIG. **2** is a cross sectional view of the switch wire of FIG. **1** taken along lines **2—2.**

FIG. **3** is a schematic showing of the manner in which the switch wire of FIG. **1** would be used in an alarm circuit.

In designing a switch wire for use under carpeting, mats or the like, there are many criteria which must be considered. First, the switch wire must be sufficiently thin so as not to be noticeable, it must be manufacturable in great lengths and flexible enough to be laid on a floor so that it gives effective coverage to the entire floor or, at least, to those areas at which unauthorized entry might take place. Further, it must be extremely durable so that it will not wear out after long usage and further, must return to its normal position without fail after usage. Additionally, the switch wire must be manufacturable in continuous lengths so that it is economical in usage in large installations.

All of the above criteria are met by the present invention shown in the drawings.

In FIG. **1**, there is shown the switch wire of the present invention generally designated by the numeral **10.** The switch wire **10** comprises a central spring wire conductive core **12** around which is spirally wound an insulating member **14** which in the preferred embodiment is made of nylon.

Spirally wound in the opposite direction to the insulating winding **14** is a spring conductive member **16.** The spring conductive member **16** is spirally wound with a different pitch than the spirally wound conductor member **14** and oppositely wound so that, at all points along the length of the switch wire **10** the spring conductive member **16** is spaced from the central conductor **12.** The members **12, 14,** and **16** are held in place by solid terminals **24** and **26** at opposite ends thereof.

The insulating member **14** is not only electrically insulated, but can be selected to have a low melting point which allows it to act as a fire detector such as, for example, around 180°F. The spacing between windings of the insulating member **14** is considerably larger than the diameter of the insulating material. Thus, the outer spirally wound member **16** which is helically wound over the insulator **14** and core **12** in a direction opposite to the winding direction of the insulator **14,** has spacing between its windings which are a few times greater than the spacing between the insulator windings **14.** The three elements **12, 14** and **16** may, depending on the specific use, be protected from environmental contamination by being covered with a loosely fitting tube **18.**

When used in an alarm circuit, as shown in FIG. **3,** the central conductor **12** is connected to an alarm means such as a bell **20** in series with a source of electrical energy such as a battery **22.** It is to be understood that the battery **22** is merely a source of electrical energy which could be an alternating current source and the alarm means **20** can be a light, transmitter, a remote operating alarm, or any other of the many alarm devices presently known in the art.

When used as a pressure detector, the switch wire **10** is placed under a mat, carpet, or the like. When some-

one steps on a given portion of the mat, under which this switch wire **10** is located, the spring steel conductor **16** will, at some point along the core, make electrical contact with the core **12.** This contact will then complete the circuit to activate alarm **20.** Once the pressure has been removed, the outer winding **16** will, by spring action, return to its original position opening the circuit to the alarm **20.** It will be understood that the apparatus provides very little electrical hazzard as the system will operate on low voltages and currents so as to avoid any possibility of injury. The switch wire **10** exhibits extremely high resistance before activation and very low resistance upon activation. Since the invention may be used in very low power circuits, an insulating cover is not necessarily required. For instance, in an intrusion and fire alarm system it could be affixed to a wooden floor with a rug placed over it. In a fire alarm system it could be affixed to window and door casings. If used out of doors, a weather proof cover would be required.

Further, the switch wire **10** can be laid in any configuration to provide an extended sensing area. Further, the switch wire **10** could be molded or otherwise constructed into a mat such as a welcome mat in front of an entrance way. Because of the spiral wound feature of the elements of the switch wire **10,** it can be made in indefinite lengths and can be wound on reels and then cut to length as desired. The outer jacket **18** can be plastic or other material extruded or otherwise formed around the switch wire **10.** In fact, the jacket can be continuously placed on the switch wire **10** as it is being manufactured.

Because of its highly flexible nature, the switch wire **10** can be laid over irregular contours without short circuiting. Further, it can be laid around corners or in circles with radii down to about an inch. The sensing characteristics of the switch wire **10** can be established to suit the application, by the selection of wire sizes, insulation sizes, and winding pitch of each of the elements **12, 14** and **16** making up the switch wire **10.**

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and accordingly, reference should be made to the appended claims rather than to the foregoing specification as indicating the scope of the invention.

I claim as my invention

1. A switch wire comprising a central conducting spring core, an insulator spirally wound around said core with the spacing between adjacent windings of said insulator being greater than the thickness of said insulator, and a spirally wound outer spring conducting member wound around said insulator and said core without touching said core, said outer spring member having spacing between windings greater than the spacing between windings of said insulator;

said spirally wound outer spring conducting member being wound in a second direction opposite from the direction of winding of said insulator.

2. The switch wire of claim **1** wherein said outer spring wire is spring steel.

3. The switch wire of claim **1** wherein said insulator is nylon.

4. The switch wire of claim **1** including a loose fitting insulating member extending about said core, insulator, and outer spring conducting member.

5. The switch wire of claim **1** including a load circuit connected between said core and said outer conducting spring member, said load circuit including a source of electric energy and a load means.

6. The switch wire of claim **5** wherein said load is an alarm means.

7. A switch wire as defined in claim **1** in which said insulator is manufactured from a material having a low melting point.

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