March 30, 1948. J. MEHUT 2,438,512

PNEUMATIC SWITCH

Filed March 1, 1943

FIG. 1.

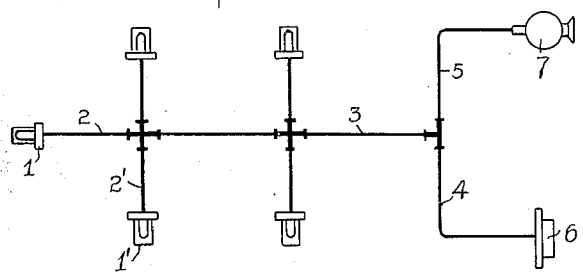


FIG. 2.

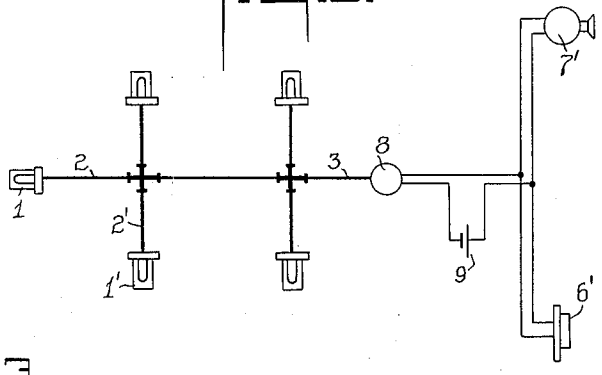


FIG. 3.

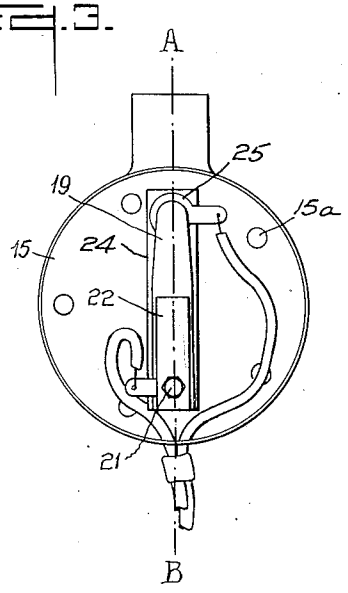
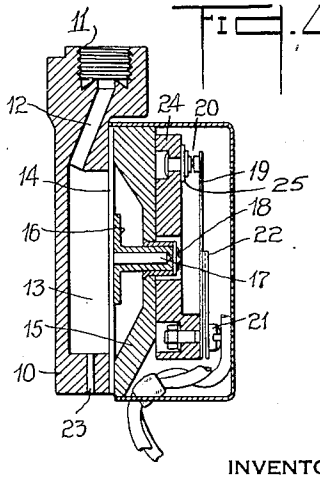


FIG. 4.



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PNEUMATIC SWITCH

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2 Claims. (Cl. 200—83)

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The present invention relates to a fire alarm system and to a pneumatic relay for use in such system.

More specifically, the invention relates primarily, though not exclusively, to a fire alarm system with pyrotechnical detectors, i. e. detectors which operate when a powder charge contained therein is heated beyond a predetermined temperature to transmit the sudden increase in pressure caused by the combustion of said charge through suitable conduits to an alarm or indicator device, and, if desired, to a mechanism for releasing a sprinkler mechanism at the point where the detector has been excited.

In fire alarm systems of this type, it is highly desirable to shorten the pneumatic conduits leading to the indicator device or to the sprinkler mechanism, because the powder charges used in the detectors of such alarm systems are subject to a gradual decrease of their power of expansion upon aging, and when the pneumatic conduits are too long, it may happen that the pressure wave produced by the excitation of a detector containing a more or less stale charge fails to develop sufficient power for the actuation of the alarm or the sprinkler. On the other hand, for certain purposes, and especially if the alarm device is to be located on a switchboard carrying electrical elements, it is desirable to insure the homogeneousness of the switchboard by the provision of electrical control means for the alarm device.

Consequently, it is one object of the present invention to provide a fire alarm system of the type mentioned, in which the pneumatic conduits are extremely short.

Another object of the invention is to provide a fire alarm system with pyrotechnical detectors in which the mechanisms controlled by the detectors, such as the alarm device and the sprinkler are operated by means of an electric current.

Still another object of the invention is to provide a pneumatic-electrical relay which is capable of converting pneumatic energy rapidly and safely into electric energy, e. g. for the control of the alarm devices and sprinklers in a fire alarm system.

These and other objects are accomplished, according to the present invention, by the arrangement and combination of parts set forth in the following description, defined in the appended claims and illustratively exemplified in the accompanying drawing, in which

Fig. 1 is a diagram of a pyrotechnical fire alarm system of known type;

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Fig. 2 is a similar diagram of a pyrotechnical fire alarm system according to the present invention;

Fig. 3 is an elevational view of a pneumatic-electrical relay suitable for use in a fire alarm system according to Fig. 2, the protective cover being removed to show the contact arrangement; and

Fig. 4 is a sectional view of this relay taken on line A—B of Fig. 3.

Referring to the drawing and particularly to Fig. 1, the fire alarm system shown in the diagram comprises a number of pyrotechnical detectors 1, 1' arranged at suitable points of the premises or installations to be protected and connected by individual pneumatic conduits 2, 2' to one end of a common pneumatic conduit 3. The other end of the common conduit 3 is connected to two branch conduits 4 and 5, the branch conduit 4 leading to a device 6 producing a visual or audible signal, and the branch conduit 5 terminating in a sprinkler control device 7.

Experience has shown that pyrotechnical detectors of the type in question are rather unreliable because, after a certain time, the powder charge is subject to a chemical deterioration. Consequently, the pressures transmitted by the operation of the detectors into the conduits 1, 1', 2, 2', 3, 4 and 5 are of variable magnitude, and the energies transmitted through the long pneumatic conduits may become insufficient to cause the operation of the alarm device and of the sprinkler or of either one of them. This disadvantage of a fire alarm system of the type described is eliminated according to the invention by an arrangement, as shown diagrammatically in Fig. 2, including means disposed close to the detectors 1, 1' for transforming the pneumatic energy received from the detectors into electrical energy. As shown in Fig. 2, the device accomplishing this transformation is a relay 8 disposed at the beginning of the common conduit 3. The alarm device 6' and the sprinkler 7' are, in this case, designed in a manner well known in the art to be electrically activated by the application or cessation of a current from the battery 9 controlled by the relay 8 in response to the pressure wave arriving at said relay 8 through the conduit 3 when one of the detectors 1, 1' is excited.

The relay which serves for the conversion of the pneumatic energy into electrical energy may be constructed in any desired manner with pneumatically actuated dry contacts or mercury contacts.

Figs. 3 and 4 illustrate a preferred embodiment of a converter relay suitable for this and other purposes.

In these figures, 10 denotes the body of the relay, said body being provided with a screw threaded recess 11 to receive the end of the pneumatic conduit 3. From the recess 11, a passage 12 leads to a gas expansion chamber 13 having its bottom and side walls formed by the body 10 itself. The top wall of the chamber 13 is formed by a rubber diaphragm 14, clamped along its circumference between the body 10 and a dome-shaped cover 15 secured to the body 10 by means of screws 15a, so as to make the chamber 13 completely tight. Centrally on the outer face of the diaphragm 14, rests a push button having a flat portion 16, the large surface of which contacts the diaphragm 14, and a piston 17 freely displaceable in a guide sleeve mounted in the apex of the cover 15. The piston 17 is provided with a needle point 18.

When an increase of pressure occurs in the cylindrical chamber 13, the diaphragm 14 is deformed and takes along the push button 16, 17 displacing the same along the axis of the guide sleeve in the cover 15. A switch base 24 is secured to the cover 15, and carries at one end thereof a fixed contact 25. A conductor spring blade 19 is mounted on the other raised end of the base 24 by means of a screw 21. The spring blade 19 extends parallel to the base 24 and carries on its free end, opposite the fixed contact 25, a movable contact 20. A pressure plate 22 with an inwardly bent portion is mounted on top of the spring blade 19 and holds the latter normally in the position shown in the drawing. When, upon transmission of a pressure wave to the chamber 13, the diaphragm 14 is deformed and the needle point 18 knocks against the portion of the spring blade 19 at the end of the pressure plate 22, the blade 19 is abruptly deformed and the contact 20, 25 is instantaneously broken.

Reversely, when the needle point 18 ceases to act upon the spring blade 19, upon a reduction of the pressure in the chamber 13, the spring blade 19 returns instantaneously to its normal position. The time required for a reduction of the pressure in the chamber 13 is very brief, because the overpressure produced in said chamber is rapidly dissipated through the leak passage 23.

Thus opening and closing of the circuit controlled by the relay takes place freely and abruptly and any burning of the contacts due to self-induction of the circuit is positively avoided.

It will be understood that the invention is not limited to the embodiment shown and described but is capable of numerous variations and modifications within the scope of the following claims.

I claim:

1. A pneumatic-electrical relay for the conversion of a rapid pulse of pneumatic energy to a corresponding rapid pulse of electrical energy, said relay including a body formed with a chamber open on one side thereof, a flexible diaphragm of rubber like material secured to said body so as to close the open side of said chamber, means to connect said chamber with a source of rapidly pulsing pneumatic energy, a push button having a radial enlargement providing a substantially flat surface resting on the outer face of said diaphragm, a switch base mounted on said body and carrying a fixed contact element and a movable contact element, said movable contact element including a spring blade disposed in the path of said push button and deformable by the latter to open its normally closed contact, a dome shaped cover member inserted between said body and said switch base and provided with a guide sleeve to receive the push button and said push button being provided at its outer end with a contact element engaging portion radially enlarged to engage the sleeve end to limit inward movement of the push button.

2. A pneumatic-electrical relay as claimed in claim 1 wherein the body is formed with a bleeder opening to the exterior.

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