United States Patent [19]

Owen

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[54] **FIRE ALARM**

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[52] **U.S. Cl.** ..... **340/229,** 200/83 R, 337/401

[51] **Int. Cl.** **G08b 17/04**

[58] **Field of Search** ..... 340/227, 227.1, 229; 337/401, 407, 409, 5; 116/114.5; 200/83 R, 83 J

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[57] **ABSTRACT**

A fire alarm system for buildings, especially dwellings, including a pressurized conduit extending through substantially all parts of a building and which includes fusible parts responsive to heat, such as that caused by a fire, for releasing the pressure from the conduit, to release a distended diaphragm which is connected to the conduit system. Release of the diaphragm permits movement of a detent rod, connected thereto, to a position for releasing a clock mechanism for mechanically producing an audible alarm. Release of the clock mechanism effects release of an electric switch which is spring biased to a circuit closing position for energizing electrical alarms which may constitute lights or audible alarms and which may additionally function as a visual indicator to indicate that the alarm has been inadvertently activated.

7 Claims, 6 Drawing Figures

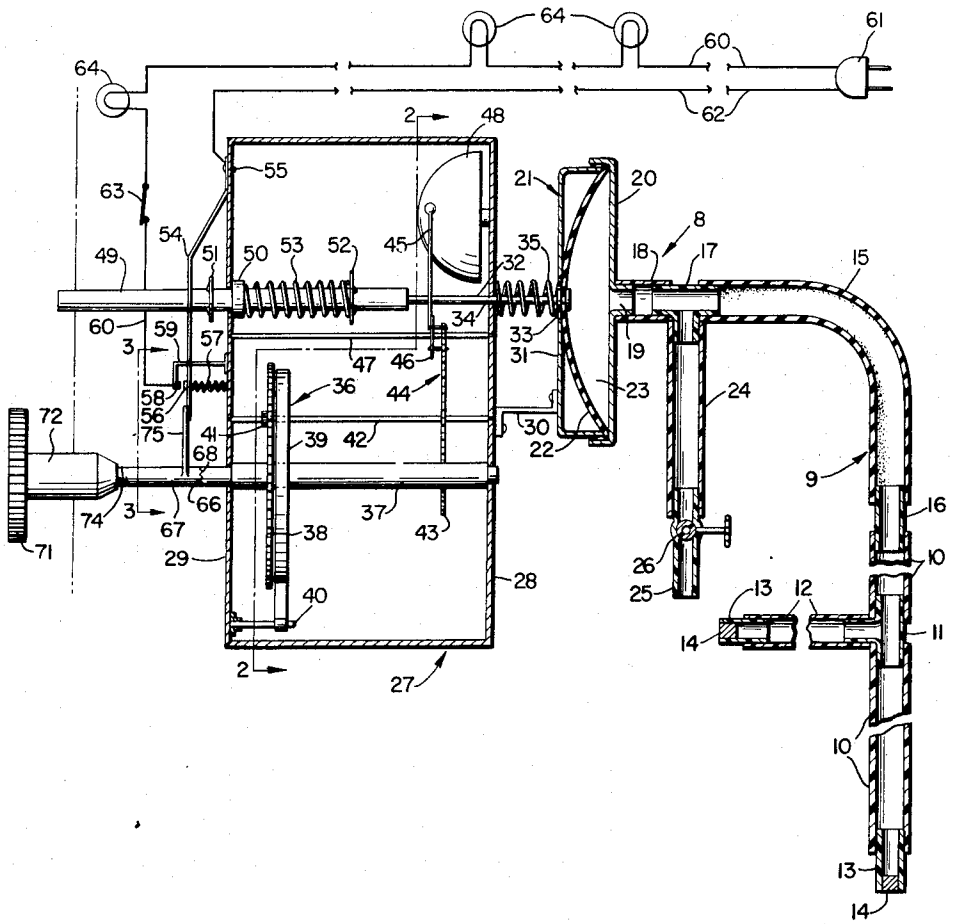


FIG. 1

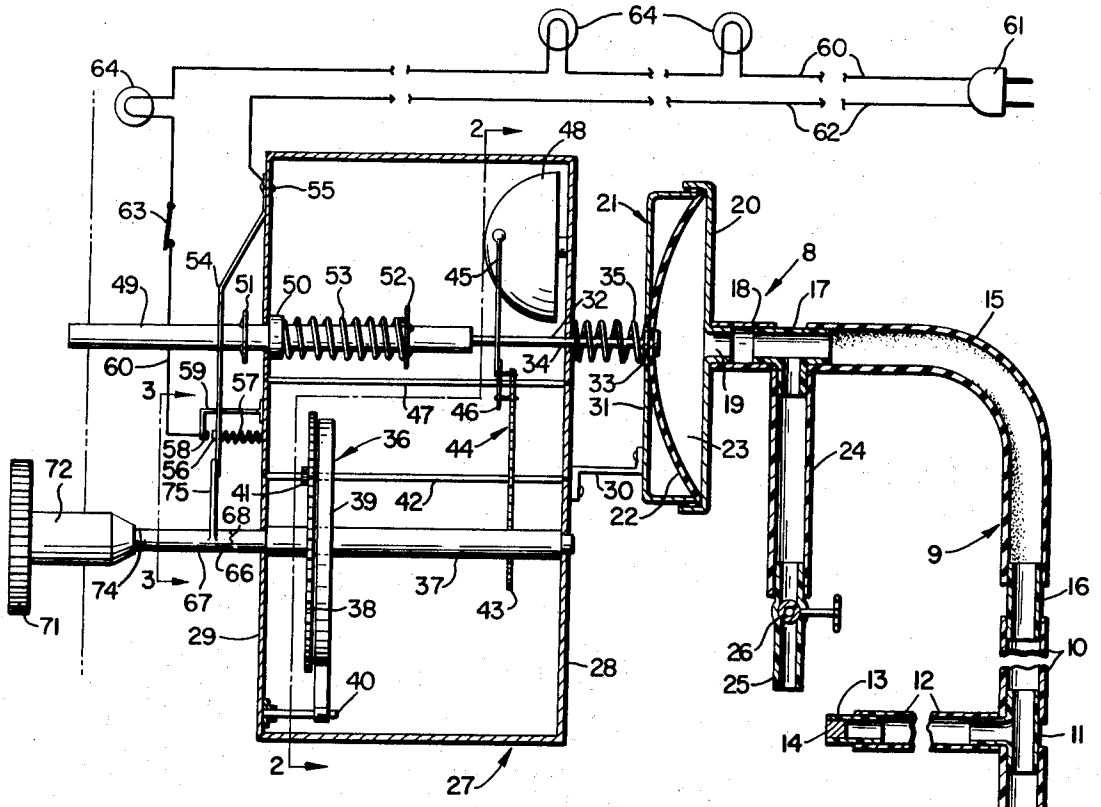
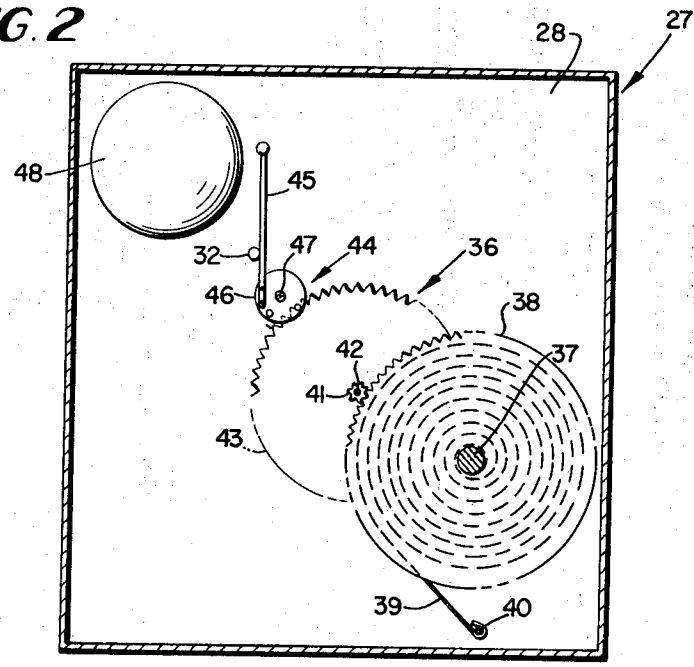


FIG. 2



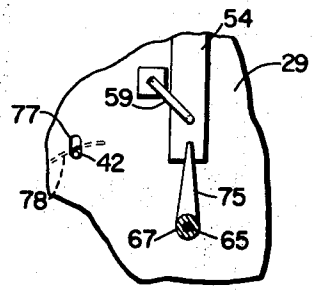
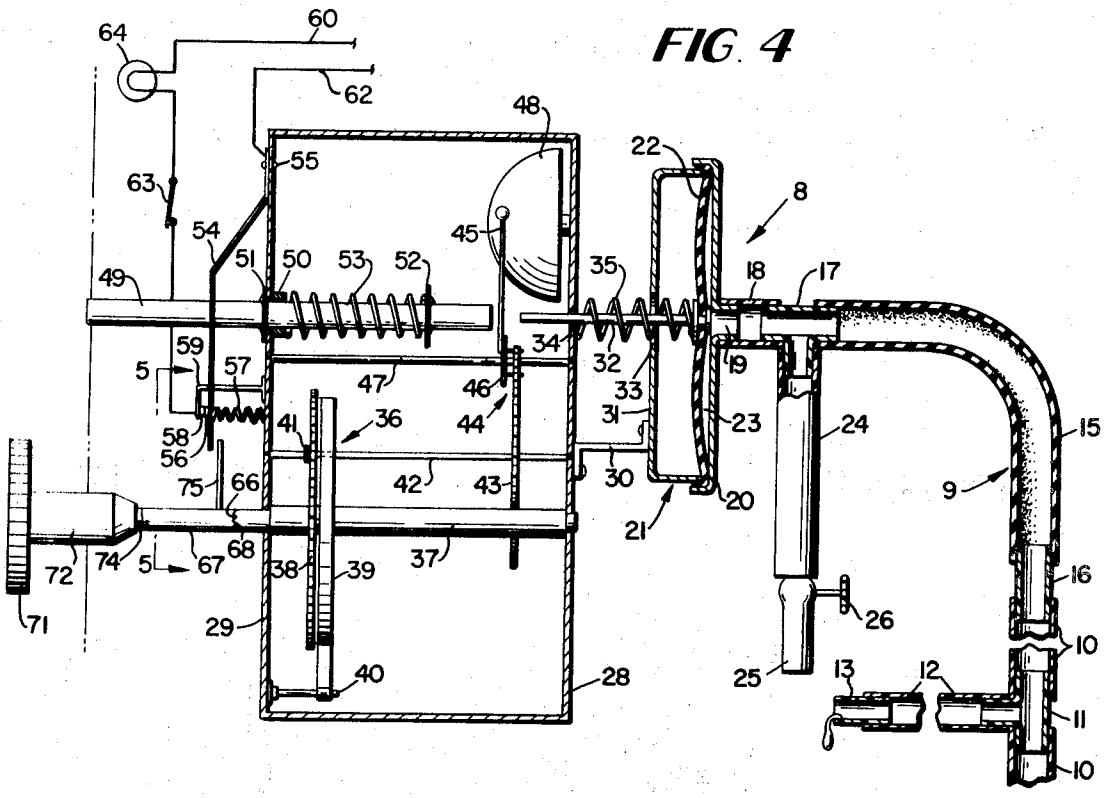


FIG. 3

FIG. 4



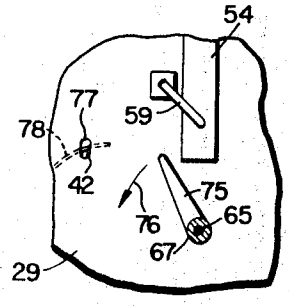
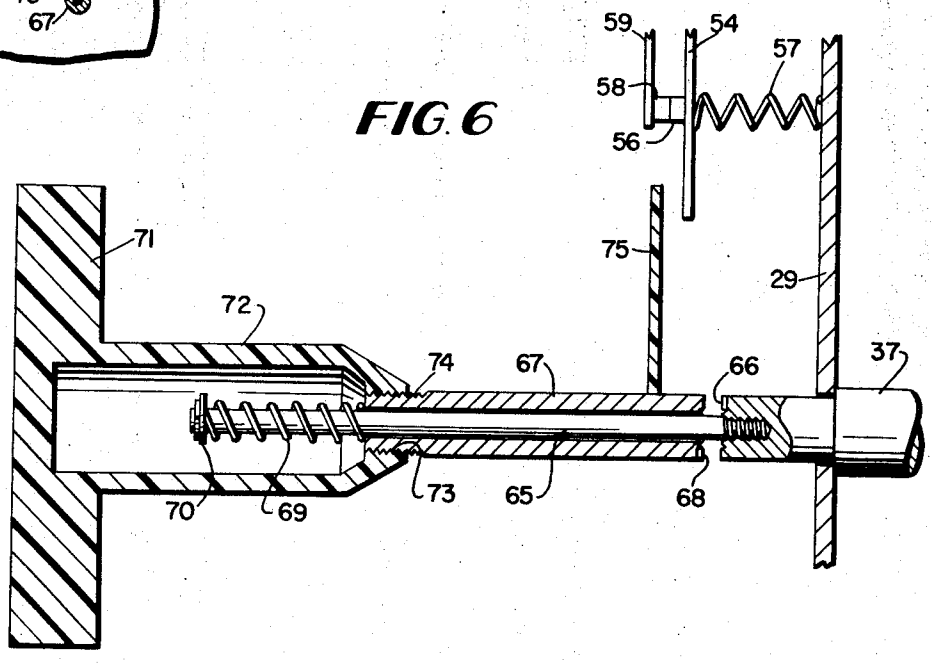


FIG. 5

FIG. 6



FIRE ALARM

SUMMARY

It is a primary object of the present invention to provide a fire alarm system capable of affording protection for an entire building, such as a home, for warning the occupants, should a fire occur in any part of the building, by means of both a visual and an audible alarm.

Another object of the invention is to provide such a system including means activated by the alarm for illuminating the building, in case of a fire, to assist the occupants in their escape.

Still a further object of the invention is to provide a fire alarm system which utilizes a part of a conventional alarm clock mechanism for mechanically producing an audible alarm in case of a fire.

Various other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, illustrating a presently preferred embodiment thereof, and wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary view, partly in elevation and partly in section, illustrating the complete fire alarm system;

FIG. 2 is a sectional view, taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view, taken substantially along a plane as indicated by the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary view, similar to FIG. 1, but showing the parts in a released position;

FIG. 5 is a fragmentary sectional view taken substantially along a plane as indicated by the line 5—5 of FIG. 4, and

FIG. 6 is an enlarged fragmentary sectional view, partly in elevation, showing another position of certain parts of FIGS. 1 and 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more specifically to the drawing, the fire alarm system in its entirety is designated generally 8 and includes a conduit system, designated generally 9, composed of a number of pipes 10, preferably formed of plastic, connected together by T-joints 11, to each of which is connected a branch pipe 12 having a tubular extension 13, preferably formed of rubber or metal, which is closed and sealed by a plug 14 of a fusible material, such as candlewax or solder. Any number of the branches 12 may be provide, preferably one for each room of a building, such as a dwelling, in which the fire alarm system is mounted, and so that a tube 13 protrudes through the ceiling of each room, with other of the tubes being located at strategic points in the attic and basement.

The conduit system 9 includes a section 15 formed of rubber which is connected to an end one of the plastic pipes 10 by a short tube section 16. The other end of the pipe 15 is connected by a T-joint 17 to the short length of plastic pipe 18 which connects with a nipple 19 of a detachable end wall 20 of a casing 21. A diaphragm 22 is clamped across the casing 21 by the detachable wall 20 and combines therewith to form a chamber 23, within the casing 21, which communicates with the conduit system 9 through the nipple 19.

A plastic branch pipe 24 connects with and leads from the T-coupling 17 and has a plastic extension 25 containing a manually operated valve 26. One of the pipes 10, located at the end of the conduit system 9, remote from the casing 21, terminates in an additional tube 13 closed by a fusible plug 14.

The outer end of the tube 25 may be employed as a mouthpiece for pressurizing the conduit system 9 when the valve 26 has been turned from its closed position of FIG. 1 to an open position, for moving the diaphragm 22 to a distended position, as seen in FIG. 1, from its released or relaxed position of FIG. 4. If desired, tube 25 may be connected to an air pump, not shown.

A housing 27 has a front wall 28 and a rear wall 29. A bracket 30 is secured to the outer side of the front wall 28 and to the outer side of a wall 31 of the casing 21, which is located opposite to the wall 20, for supporting the casing 21 in predetermined space relation to the housing wall 28. A rod 32 has one end secured to the center of the diaphragm 22 and extends therefrom through an opening 33 of the wall 31 and slidably through an opening 34 of the wall 28. The opening 33 is sufficiently large to accommodate an end portion of a compression spring 35 which bears against the diaphragm 22. The opposite end of the spring 35 bears against the outer side of the wall 28, around its opening 34, for urging the rod 32 and diaphragm 22 to their positions of FIG. 4.

A part of a mechanical alarm clock mechanism, designated generally 36, is contained within the housing 27 and includes a shaft 37 having end portions journaled in walls 28 and 29. A large gear 38 is fixed to the shaft 37. The inner end of a main spring 39, which is spirally wound around the shaft 37, is fixed thereto, and the outer end of the spring 39 is anchored to a pin 40 which is secured to the wall 29. The gear 38 meshes with a pinion 41 which is secured to a shaft 42 which is also journaled in the walls 28 and 29. A toothed wheel 43, forming a part of an escapement 44 is also fixed to the shaft 42. A hammer 45 is fixed to and carried by a disc 46 of the escapement 44, which is mounted to oscillate on a shaft 47, which likewise extends between and is supported by the walls 28 and 29. When the conduit system 9 is pressurized to maintain the diaphragm 22 in its distended position of FIG. 1, the rod 32 extends across and bears against the hammer 45 to provide a detent to hold the hammer from swinging into and out of engagement with a bell or gong 48 which is mounted on the wall 28 within the housing 27.

A rod 49 extends slidably through and is supported and guided by a boss 50 of the wall 29, and has an inner end which abuts the end of the detent rod 32, which is located in the housing 27, when the diaphragm 22 is distended. The rod 49 is substantially larger in diameter than the rod 32 and has stops 51 and 52 secured thereto on opposite sides of the wall 29. An expansion coiled spring 53 is mounted on the rod 49, within the housing 27, between the inner end of the boss 50 and the stop 52, for urging the rod 49 from left to rights of FIGS. 1 and 4 and toward the rod 32. The diaphragm 22, when distended, is capable of holding the springs 35 and 53 compressed, as seen in FIG. 1, so that the stop 51 is spaced from the wall 29 to visually indicate that the springs are compressed and that the conduit system 9 is pressurized.

A spring strip 54 has one end secured by a fastening 55 to the outer side of the wall 29 and has an opposite

free end which is outwardly offset from the wall 29 and which carries an electrical contact 56 which is spaced from the terminal of said free end. A weak compression spring 57 may be disposed between the wall 29 and a part of the free end portion of the spring strip 54 for urging said free end outwardly, so that the contact 56 will be spring biased into engagement with a stationary electrical contact 58 carried by a bracket which is supported by and extends outwardly from the wall 29, as best seen in FIGS. 3 and 5.

One end of an electric wire 60 connects with the contact 58 and the opposite end of the wire 60 is connected to an electric plug 61. A second wire 62 leads from the plug 61 to the fastening 55 and is thus electrically connected to the spring strip 54 which provides an electrical conductor leading to the contact 56. A conventional manual switch 63 and several light bulbs 64 are shown interposed in the wire 60, in FIG. 1.

Referring to FIG. 6, a rod 65 has one end threadedly anchored in the end of the shaft 37 which protrudes from the wall 29. Said shaft end is toothed as seen at 66 around the rod 65. A sleeve 67 is slidably and rotatively mounted on the rod 65 and has a toothed inner end 68 which normally meshes with the teeth 66, as seen in FIGS. 1 and 4. A compression spring 69 is mounted on the opposite end of the rod 65 between the opposite end of the sleeve 67 and a detachable spring stop 70, which is attached to said rod, for urging the sleeve 67 toward the shaft 37. A knob 71 has a hollow shank 72 for accommodating the parts 69 and 70 and the rod end on which said parts are mounted. Said shank 72 has a restricted threaded bore 73 which detachably and threadedly engages an externally threaded end 74 of the sleeve 67. An arm 75 extends laterally from the sleeve 67 and normally bears against the outer side of the free end of the spring strip 54, as seen in FIGS. 1 and 3, to maintain the strip 54 deflected inwardly to hold the contact 56 out of engagement with the contact 58.

Assuming that the parts are in their positions of FIG. 1 with the switch 63 in a closed position and the switch 56,58 in an open position and with the plug 61 electrically connected to a conventional electrical outlet, not shown, the circuit including the switches and the lamp bulbs 64 will be maintained deenergized by the open switch 56,58. Also, assuming that the clock mechanism 36 is wound and is held inoperative by the detent rod 32 bearing against the hammer 45 to prevent it from swinging toward the gong 48, the fact that the alarm system 8 is thus properly set and ready for operation can be visually determined by observing that the switch 63 is closed, that the switch 56,58 is open and that the stop 51 is spaced from the wall 29.

Should a fire occur in any part of the building equipped with the fire alarm 8, one or more of the fusible plugs 14 or one or more of the pipes 10, 11, 16, 17 or 18 will melt sufficiently to allow air to escape from the conduit system 9, thereby releasing the air pressure from the chamber 23 and allowing the spring 35 to move the diaphragm 22 and rod 32 from their positions of FIG. 1 to their positions of FIG. 4. Movement of the rod 32 out of engagement with the hammer 45 releases the escapement 44 allowing the clock mechanism to unwind which includes rotation of the shaft 37 in a counterclockwise direction, as seen in FIG. 2, and as indicated by the arrow 76 in FIG. 5. As the clock mechanism is unwound, the escapement wheel is revolved for oscillating the escapement disc 46 and hammer 45. The hammer 45 will strike the gong 48 each time that it swings counterclockwise, as seen in FIG. 2, to thereby mechanically produce an audible alarm.

Furthermore, the sleeve 67 will revolve with the shaft 37, so that as the shaft 37 commences to turn counterclockwise, the arm 75 will disengage the spring strip 54 so that the spring 57 will displace the free end of the strip 54 outwardly to move the contact 56 into engagement with the contact 58 for completing the electric circuit to energize the light bulbs 64. These light bulbs in addition to providing visual alarms can be located so as to afford illumination for the occupants during their escape from the building. In addition, audible electric signals may be substituted for certain of the light bulbs 64 or added to the electric circuit. Further, the light bulbs 64 can be utilized to visually indicate that the system has been inadvertently actuated and therefore must be reset. One such indicator light may be wired into another circuit and constitute a light bulb which is frequently employed for other purposes so that should it burn out, this fact would be readily apparent.

In resetting the system 8, the winding knob 71 is turned in a direction for turning the shaft 37 clockwise, as seen in FIG. 2, until the clock mechanism 36 is fully wound. At such time, the arm 75 will be disposed inwardly with respect to the free end of the strip 54, as seen in FIG. 4, so that an outward pull must be exerted on the knob 71 to move the arm 75 to its position of FIG. 6, after which it can be turned clockwise from its angular position of FIG. 5 to its position of FIG. 3. The knob 71 is then released to allow the spring 69 to return the sleeve 67 to its position of FIG. 1. During this movement, the arm 75 will contact the strip 54 and move it inwardly against the compression of the weaker spring 57 to move the contact 56 out of engagement with the contact 58 to open the electric circuit of FIG. 1.

The detent rod 32 will move across one side or the other of the hammer as the conduit 9 is pressurized and the diaphragm 22 is distended back to its position of FIG. 1 from its position of FIG. 4. During this movement, the rod 32 will engage the rod 49 and move said rod 49 back to its position of FIG. 1, from its position of FIG. 4.

As seen in FIGS. 3 and 5, wall 29 has a vertical slot 77 in which one end of the shaft 42 is journaled. A spring 78 bears on said shaft end to normally hold it in the bottom of slot 77, but to allow said shaft end to rise, so that the pinion 41 can disengage the gear 38 while the clock mechanism 36 is being rewound.

Two or more of the mechanical and electrical alarms may be incorporated into the conduit system 9, so that should one alarm unit fail to function, operation of another unit will produce the mechanical audible alarm and the electrical visual and audible alarms.

The rubber pipe section 15 is sufficiently elastic to expand and contract and thereby compensate for temperature variations, so that too great a pressure will not be exerted on the diaphragm 22 in response to an unusually large increase in the ambient temperature.

Various other modifications and changes are contemplated and may be resorted to, without departing from the function or scope of the invention.

I claim as my invention:

1. A fire alarm system comprising a pressurized conduit system including a distended diaphragm, said con-

duit system having fusible parts for releasing the pressure from the system in response to heat, such as that caused by a fire, an alarm, an alarm actuating mechanism, a detent member carried by said diaphragm and maintained by the distended diaphragm in a position to prevent operation of the alarm actuating mechanism, said detent being movable with the diaphragm to a position to release the alarm mechanism for actuation when the conduit system is depressurized, a compression spring moving the diaphragm and detent to a position for releasing the alarm actuating mechanism, said alarm actuating mechanism comprising a part of a mechanical clock mechanism including a rotatable shaft, an electric circuit having an electrical alarm interposed therein and including an electric switch, said switch including a contact normally spring biased to a circuit closing position, and an arm carried by said shaft for holding said contact in a circuit breaking position until said detent member is moved to a released position permitting rotation of the shaft.

2. A fire alarm system as in claim **1**, said mechanical clock mechanism including an oscillating escapement member, a hammer carried thereby, and a gong disposed to be sounded by engagement of the hammer therewith when the detent member is moved out of engagement with the hammer to release the clock mechanism.

3. A fire alarm system as in claim **1**, said electrical alarm including visual alarms so located as to provide illumination for the escape of occupants of a building in case of a fire.

4. A fire alarm system as in claim **1**, at least one of said electrical alarms comprising a visual alarm disposed to additionally function as a warning light to indicate when the alarm actuating mechanism has been inadvertently released.

5. A fire alarm system as in claim **1**, and means for visually indicating when the conduit system is fully pressurized and the diaphragm is fully distended.

6. A fire alarm system as in claim **1**, said conduit system including an elastic section capable of expanding and contracting to compensate for temperature variations.

7. A fire alarm system as in claim **1**, said fusible parts comprising plugs located in different parts of a building containing the fire alarm system.

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