Aug. 29, 1950 J. H. McDOWELL 2,520,219

SIGNALING DEVICE

Filed March 26, 1947

Fig. 1.

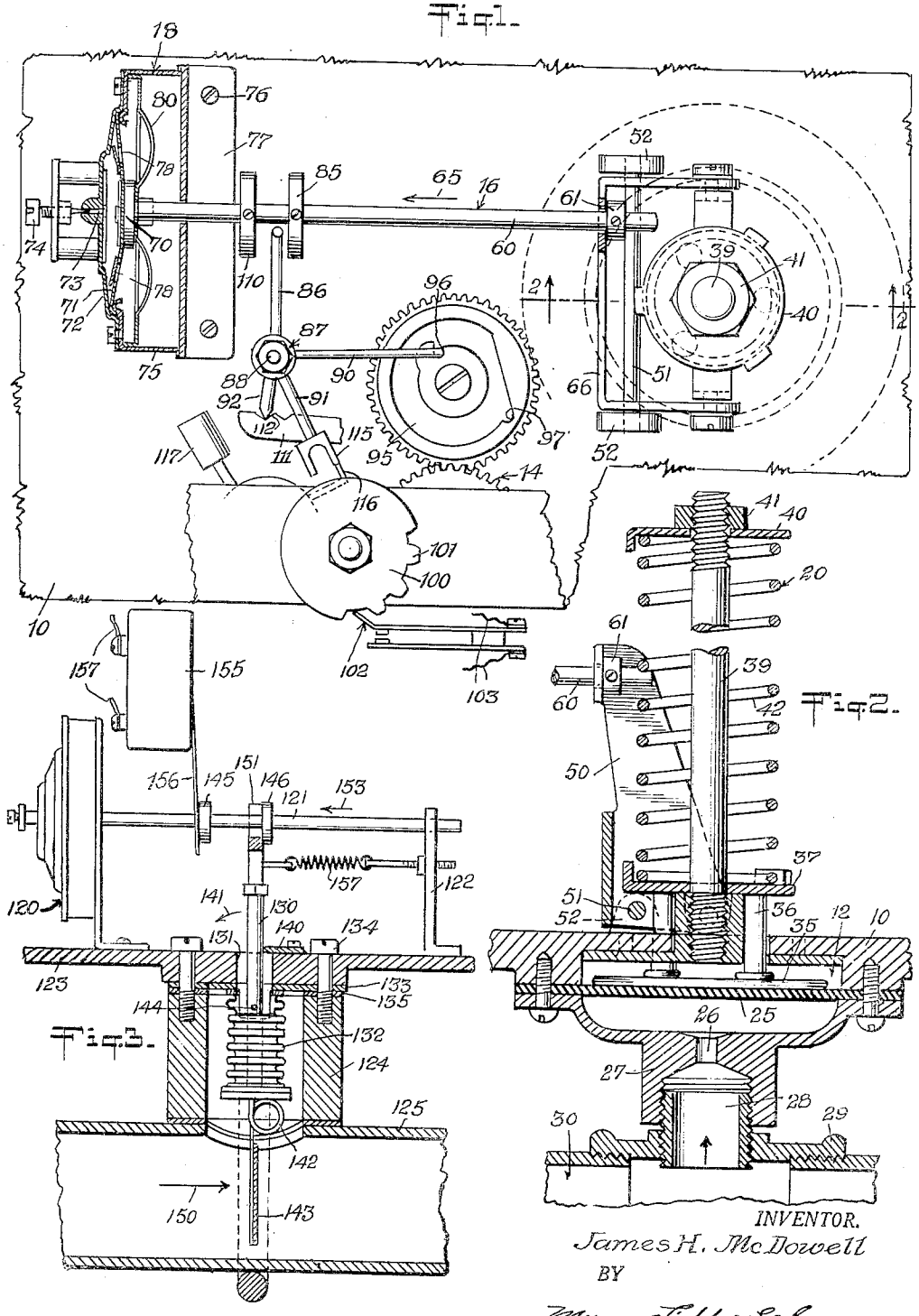


Fig. 2.

Fig. 3.

INVENTOR.

James H. McDowell

BY

Mum, Liddy & Glaccum

Attorneys

Patented Aug. 29, 1950

2,520,219

UNITED STATES PATENT OFFICE

2,520,219

SIGNALING DEVICE

James Henry McDowell, Greenwich, Conn.

Application March 26, 1947, Serial No. 737,280

3 Claims. (Cl. 200—81.9)

1

This invention relates to a signalling device sensitive to changes in water flow or pressure.

The principal object of this invention is the provision of an instantly recycling signalling device which is sensitive to changes in flow or pressure of a fluid such as water. In high pressure water systems such as water sprinkler systems used for fire-fighting purposes in large buildings, signalling devices are used to communicate abnormal or emergency conditions to a central office. For example, in the event of a fire the sprinkler heads are caused to release the water contained in the sprinkler system. There accordingly develops a sudden flow of water through the sprinkler system, and this flow operates a signalling device which is in communication with the central office, thereby notifying the central office of the fire. There are times, however, when false alarms occur. An illustration may be found in the sudden changes of flow or pressure in such sprinkler systems as are directly connected to the city water supply system. Fluctuations in flow or pressure frequently occur in the city systems and corresponding fluctuations would result in the sprinkler system thereby causing a signal to be transmitted to the central office of an abnormal condition which is in reality totally harmless.

It is the object of this invention to prevent false alarms such as result from circumstances last above described. If it be assumed that the fluctuations in flow or pressure in the city water supply system normally extend over a period of say twenty seconds, the signalling device forming the subject matter of this application would be set to transmit signals only when the abnormal condition is of longer duration than twenty seconds. For example, it may be set to go into operation at the end of thirty seconds of abnormal conditions. The temporary abnormality of a fluctuation in flow or pressure in the city water supply system would be of insufficient duration to cause the signalling device to function. As soon as the temporary condition of abnormality subsides or disappears, the signalling device here under discussion instantly and automatically recycles itself for the next abnormal condition which may arise.

Two forms of the present invention are shown in the accompanying drawing in which

Fig. 1 is a top view partly in section of a signalling device made in accordance with the present invention in which a diaphragm sensitive to changes or fluctuations in flow or pressure of the fluid in the pipe system is used;

2

Fig. 2 is a fragmentary view of said device in section on the line 2—2 of Fig. 1; and

Fig. 3 is a side view of the second form of this device partly in section, this form having a flap member which is sensitive to variations or fluctuations in flow of the fluid in the pipe system.

Referring now to Figs. 1 and 2, it will be seen that a housing 10 is provided in which the mechanism under description is encased and to which it is affixed. The following elements encased within housing 10 comprise the signalling device shown in Figs. 1 and 2: The flow and pressure sensitive mechanism 12, the signal transmitting apparatus 14, the connecting means 16 by which the sensitive mechanism 12 transmits its impulses to the signal transmitting apparatus 14, retarding means 18 which control the length of time it will take the sensitive means to transmit the impulses it receives to the signal transmitting means, and the recycling mechanism 20 which resets the sensitive mechanism 12 for further fluctuations in flow or pressure of the fluid in the pipe system.

Referring now to the sensitive mechanism 12, it will be seen that its principal element is a flexible diaphragm 25 which communicates on one side with what is known as the neutral chamber or pipe system 30 in the sprinkler pipe system. This neutral chamber is under atmospheric pressure at all times except when there is a flow of water through the main pipe system. This flow of water opens a large check valve and a small port which communicates with the neutral chamber. Water passes through the port and causes an increase of pressure in the neutral chamber. This increase of pressure affects the flexible diaphragm 25 in the manner hereinafter described. The check valve mechanism is not shown in the drawing, because it is standard equipment and forms no part of the present invention.

Communication between diaphragm 25 and neutral chamber 30 is effected through hole 26 in socket member 27 which is affixed to the casing 10 and through a nipple 29 which connects the socket 27 to a nipple 29 on the neutral chamber 30. The upwardly pointing arrow in Fig. 2 indicates the direction of increased pressure, and it will be understood that such increased pressure will cause the diaphragm 25 to balloon upwardly. When atmospheric pressure again obtains in the neutral chamber, the diaphragm 25 will resume its normal position as shown in Fig. 2.

Mounted atop diaphragm 25 is a plate 35 car-

rying a plurality of pins 36. These pins engage a ring-shaped plate 37 which is slidably mounted on a fixed rod 39. At the opposite end of the fixed rod is another ring-shaped plate 40 held in place by means of nut 41. A compression spring 42 is mounted on said rod between and bearing against the two ring-shaped plates. This spring tends to maintain the diaphragm 25 in the normal condition and position shown in Fig. 2, and when an abnormal pressure condition occurs, the diaphragm balloons upwardly against the action of spring 42. When pressure conditions normalize in the neutral chamber 30, the spring returns the diaphragm to its normal position.

Pivotally connected at one end to the ring-shaped plate 37 is a bell crank 50 whose fulcrum is pin 51 mounted in a pair of brackets 52 connected to the casing 10. Slidably mounted in a hole at the upper end of a bell crank 50 is a rod 60 which acts as the transmitting agent between the sensitive mechanism 12 and the signal transmitting mechanism 14. It is also connected to the retarding means 18 which times the reaction of the signal transmitting means to abnormal conditions registered by the sensitive means 12.

At one end rod 60 is provided with a collar 61 which engages a flange 66 on the bell crank 50. The abutment of the collar 61 against the flange 66 of the bell crank 50 prevents rod 60 from moving in the direction of arrow 65 in Fig. 1 when the bell crank occupies the position shown in Figs. 1 and 2. When an abnormal condition is registered upon the diaphragm 25 the bell crank 50 is tilted upwardly and to the left around fulcrum 51 and contact is thereby broken between collar 61 and flange 66 of the bell crank. Rod 60 is now free to move in the direction of arrow 65.

At the opposite end of rod 60 is a head 70 which is connected to a flexible diaphragm 71. This diaphragm is affixed along its peripheral edge to a dish-shaped plate 72 having a small aperture 73 formed therein centrally thereof. An air-pocket is thereby formed between the diaphragm 71 and the plate 72, and the diaphragm is movable in the direction of the plate only to the extent that an escape vent is provided for the air in said air-pocket. Hole 73 serves as such escape vent. An adjustable pin valve 74 controls the size of the opening 73 so that passage of the air therethrough may be facilitated or retarded as desired. Check valves 78 permit passage of the air in the opposite direction.

Dish-shaped plate 72 is mounted on a frame 75 which in turn is affixed by means of screws 76 and flange 77 to the floor of casing 10. Connected to frame 75 is a plurality of leaf springs 80. These springs are also connected to the head 70 of rod 60 and they act to urge the rod to move in the direction of arrow 65.

As has already been indicated, two elements serve either to prevent or retard such movement of rod 60. The first of these elements is bell crank 50 and more particularly its flange 66. Unless an abnormal condition occurs in pipe system 30, the bell crank will prevent movement of rod 60 in the direction of arrow 65; but should such abnormal condition occur, the bell crank will free the rod for such movement and springs 80 will act upon the rod as above described. Pin valve 74 now acts to obstruct or retard passage of the air from the air-pocket through opening 73. This in turn has the effect of retarding movement of the diaphragm 71 in the direction

of arrow 65, and since rod 60 is connected to said diaphragm the movement of said rod in the same direction will correspondingly be retarded.

A collar 85 is affixed to rod 60 intermediate its two ends. Adjacent said collar and in a position to be tripped thereby is an arm 86. Arm 86 is connected to a collar or sleeve 87 rotatably mounted on a pin 88. Arms 90, 91 and 92 are also connected to said collar so that all four arms are adapted to move integrally with each other. Arm 90 controls the movement of cam wheel 95. There are two pockets 96 and 97 in said cam wheel which are adapted to receive arm 90. When the arm enters either of these two pockets, rotary movement of cam wheel 95 is prevented. When arm 90 is pushed out of these pockets, cam wheel 95 is free to rotate. Although this forms no part of the present invention, it may be said here that cam wheel 95 is connected to a motor, generally a clock spring motor, and that when freed it rotates by reason of the action of the motor upon it.

When rod 60 moves in the direction of arrow 65 in response to abnormal conditions in pipe system 30 and at a rate of speed controlled by adjusting valve 74, it will eventually and at a predetermined time carry collar 85 into tripping contact with arm 86 and cause said arm and hence arm 90 which moves integrally therewith to pivot to the left around pin 88. This movement will cause arm 90 to leave notch 96 in the cam wheel 95 thereby freeing said wheel for rotary movement.

Interconnected with cam wheel 95 is a code wheel 100. This wheel has a plurality of arbitrarily spaced teeth 101 which engage a switch 102 connected to the central office by means of wires 103. There is the usual gear connection between cam wheel 95 and code wheel 100. This connection is not shown because it forms no part of the present invention. Suffice it to say, however, when rotary movement of the cam wheel is blocked by arm 90, corresponding movement of the code wheel is also blocked. It is evident therefore that the code wheel will actuate switch 102 only when the cam wheel 95 is permitted to rotate in response to the action of the spring motor upon it. It is further evident therefore that until collar 85 on rod 60 engages arm 86 to cause arm 90 to release cam wheel 95, the code wheel will not actuate the switch 102. Since the adjusting valve 74 determines the time interval between the releasing of rod 60 by the bell crank 50 and the engagement of collar 85 with arm 86, it will be apparent that the adjusting valve 74 controls the time interval between the action of the pressure in pipe system 30 upon diaphragm 25, and the action of the code wheel 100 upon switch 102.

The reason for using notches 96 and 97 instead of a single notch only will now appear. When an abnormal pressure condition obtains in the pipe system 30 and this abnormal condition is of sufficiently long duration to cause actuation of switch 102 as above described, but the abnormal condition ends before a complete revolution of the code wheel 100 is made, then what happens may be described as follows: Collar 85 engages arm 86 and throws arm 90 out of notch 96 thereby freeing the cam wheel 95 for rotation. Before notch 97 engages arm 90 and causes a stoppage of the cam wheel 95, the abnormal condition in pipe system 30 comes to an end and bell crank 50 in response to the action of spring 42 thereon, retracts rod 60 and collar 110 on said

rod engages arm 86 and throws arm 90 back toward the center of cam wheel 95 and into position to enter notch 96 again. When on the other hand the abnormal condition in the pipe system is of relatively long duration, bell crank 50 will not retract rod 60 in time to prevent arm 90 from entering notch 97 in the cam wheel 95. But as soon thereafter as the abnormal condition in the pipe system disappears, bell crank 50 acts upon rod 60 and causes collar 110 to engage arm 86 and dislodge arm 90 from notch 97. Cam wheel 95 is again permitted to rotate. Arm 90 is again in position to encounter notch 96.

A cam piece 111 is shown in Fig. 1 as engaging arm 92 on collar 87. It will be noted that this cam piece has two notches separated by a raised portion or ridge 112. This cam piece serves the function of assisting in throwing arm 90 the whole way over to notch 96 or notch 97 as the case may be, thereby preventing arm 90 from assuming an intermediate position which would avoid engagement with both notches. It also serves the function of insuring secure engagement between arm 90 and either of the notches 96 and 97, so that when the arm enters either of these notches it remains there until further movement of rod 60 throws it out of the notch in question.

An escapement 115 is connected to the end of arm 91 on collar 87. Member 116 engages in reciprocatory movement by reason of a pawl and ratchet action which need not here be described, because it forms no part of the present invention. It should be said, however, to complete the picture that such reciprocatory movement is prevented by member 115 unless and until an abnormal condition takes place in the pipe system causing a pivotal movement of arm 86, collar 87, and arm 91 thereby positioning member 115 so that it is enabled to receive member 116 between its two arms. Member 117 is connected to the escapement mechanism hereinabove described, and its acts in the manner of a pendulum or governor.

Referring now to Fig. 3 of the drawing, the second embodiment of this invention includes a pneumatic retarding mechanism 120 similar to the retarding mechanism 18 of the first embodiment. Rod 121 is connected to retarding mechanism 120 in substantially the same manner as rod 60 is connected to retarding mechanism 18. Thus far the two embodiments are in all respects alike.

The free end of rod 121 rides in a bracket 122. Both the retarding mechanism 120 and the bracket 122 are mounted in a casing 123. Casing 123 is mounted on a yoke 124 which is clamped to pipe 125. Pipe 125 is part of the pipe system in which flow fluctuations are recordable through the mechanism under discussion. A rod 130 extends through an opening 131 in casing 123 and into yoke 124. It is supported in place by means of a bellows 132 which is affixed to a plate 133 which in turn is held in place between yoke 124 and casing 123 by means of bolts 134. A gasket 135 provides a watertight connection between the plate and the yoke. A small plate 140 affixed to the inside of casing 123 abuts rod 130 on one side thereof. This plate 140 serves as a stop for rod 130 enabling said rod to pivot in the direction of arrow 141 in Fig. 3 on pivot 144.

Connected to the bottom of bellows 132 by means of spring 142 is a flap 143. This flap extends into pipe 125, and it is this flap that increased water flows encounter. There are two collars 145 and 146, respectively, on rod 121 corresponding to collars 110 and 85, respectively, of the first embodiment. When an increase in flow takes place in pipe 125 in the direction of arrow 150 the entire rod 130, bellows 132, and flap 143 assembly pivots around fulcrum 144 in the direction of arrow 141. In consequence of such pivotal movement the top end of rod 130, and more particularly the yoke 151 which is thereon mounted, breaks contact with yoke 146 thereby freeing rod 121 for movement in the direction of arrow 153. During the course of such movement and after a predetermined interval of time controlled by retarding mechanism 120, collar 145 actuates switch 155 through switch arm 156. Switch 155 is connected to the central office by means of wires 157. When the abnormal flow condition which produced the pivotal movement of rod 130 as aforesaid comes to an end, the rod is pulled to its normal position as shown in Fig. 3 by means of spring 157 which interconnects said rod with bracket 122. Spring 142 tends to keep the flap 143 in line with rod 130.

It will be appreciated that the foregoing describes two perfect forms of the present invention and that these forms may be modified in many ways within the broad principles of the invention.

The retard mechanism hereinabove described is a pneumatic pressure device which is obtainable in the form in which it is shown on the open market. No claim is herein laid to the retard mechanism per se, and other retarding mechanisms may be used in the present device to equal advantage. For example hydraulic or vacuum retards may be used to prevent the signalling mechanism from going into operation immediately upon the rise of an abnormal condition in the sprinkler system. Although these two last-mentioned types of retarding mechanism are not shown in the drawing and not described in the specimen, it should be understood that they are encompassed within the scope of the present invention to the extent that they or any other kind of conventional retarding mechanism may be used in connection with the apparatus hereinabove described. In other words this invention is not limited to any one kind of retarding mechanism; any conventional type may be used.

I claim:

1. A signalling device comprising a pivotally mounted flap extending into a fluid pipe system and which is movable about its pivot in response to fluctuations in flow in said pipe system, an element pivoted and movable with said flap, a reciprocable element with which said pivoted element is associated, an adjustable pneumatic retarding mechanism connected to said reciprocable element and tending to move it in a predetermined direction in a regulated manner, and resilient means connected to the pivoted element.

2. A signalling device comprising a pivotally mounted flap extending into a fluid pipe system and which is movable about its pivot in response to fluctuations in flow in said pipe system, a rod extending from said flap and movable therewith, a reciprocable rod with which said first mentioned rod is associated, an adjustable pneumatic retarding mechanism connected to said reciprocable rod and tending to move it in a predetermined direction in a regulated manner, and resilient means connected to the first mentioned rod and tending to restore it to a normal position.

3. A signalling device comprising a pivotally

mounted flap extending into a fluid pipe system and which is movable about its pivot in response to fluctuations in flow in said pipe system, a support, a bellows mounted on said support and supporting said flap, a rod extending from said bellows and movable therewith in a pivotal manner, a reciprocable rod having spaced collars thereon one of which is associated with said pivoted rod, an adjustable pneumatic retarding mechanism connected to said reciprocable rod and tending to move it in a predetermined direction in a regulated manner, the normal engagement of the pivoted rod with the collar on the reciprocable rod preventing said movement, a spring means engaging the pivoted rod and tending to restore it to a normal position, and a signalling mechanism associated with the other collar on the reciprocable rod to be actuated when said rod is moved from a normal position in response to the movement of the flap from a normal position.

JAMES HENRY McDOWELL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
946,257	Nolen	Jan. 11, 1910
1,287,972	Gross	Dec. 17, 1918
1,662,711	Maynard	Mar. 13, 1928
1,994,970	Turner	Mar. 19, 1935
2,119,783	Harrington	June 7, 1938
2,188,685	Josephson	Jan. 30, 1940