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C. A. ELMORE

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ALARM SYSTEM

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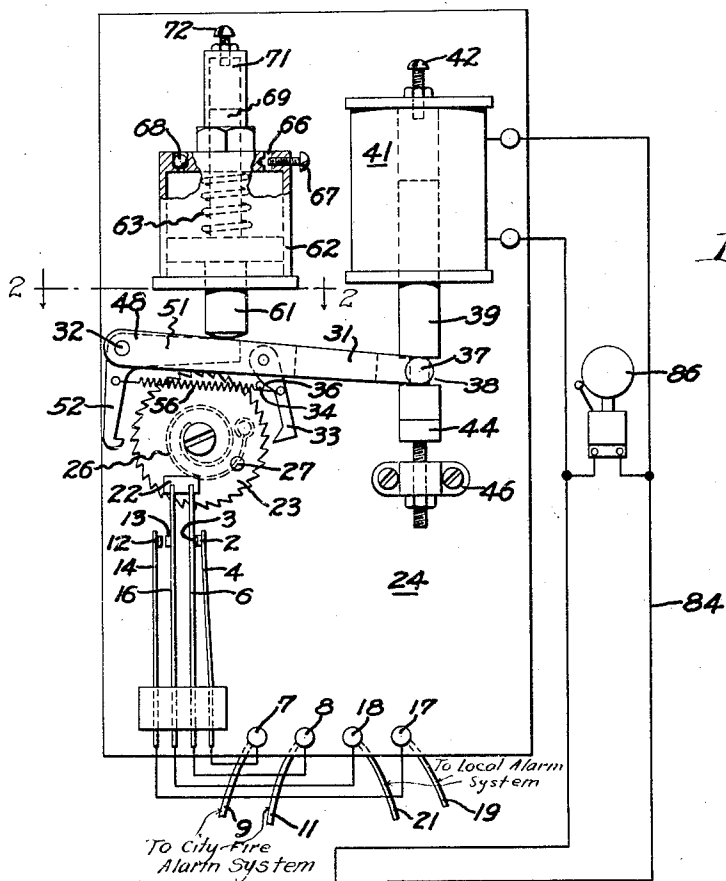


Fig. 1.

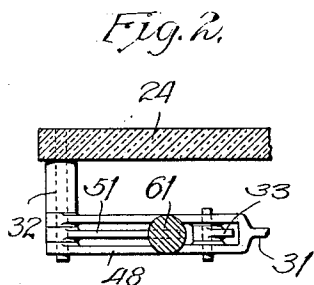
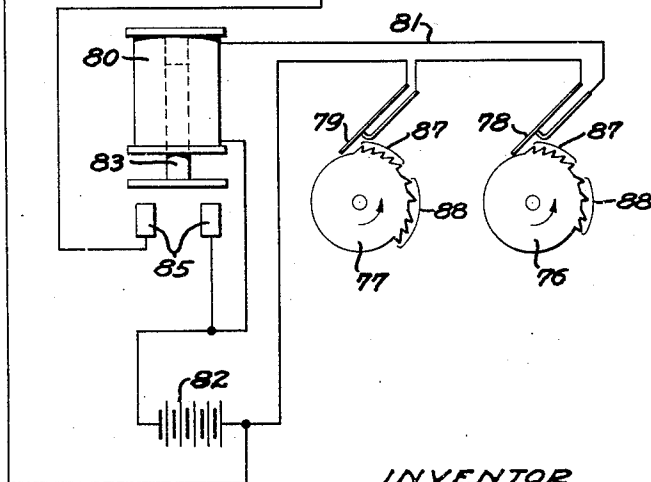


Fig. 2.



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UNITED STATES PATENT OFFICE

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ALARM SYSTEM

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My invention relates to alarm systems, and more especially to alarm systems used in industrial plants, with or without connection to the city fire alarm system, or to a commercial watchman's supervisory service.

The common alarm system of this class usually operates on a closed circuit, any interruption of which will bring into action a system of alarm bells or whistles, as well as a set of recording instruments which make a permanent record of the alarm sounded. The sounding of the alarm results not only from the operation of one of the code boxes connected in the circuit, but also from any breaking of the circuit, inadvertent or otherwise. If the alarm system is connected to a city fire alarm system, any such breaking of the circuit will cause a general fire alarm to be turned in, with the result that much of the apparatus of the city fire department is rushed to the plant from which the alarm was sent. It is obvious therefore, that not infrequently a false alarm will be sent in owing to an accidental opening of the circuit, resulting in the unnecessary expense and danger connected with calling out the fire department on a general alarm.

One of the objects of the invention is the provision of a device which will prevent false alarms as a result of a broken circuit, but which will cause an alarm to be sounded whenever one of the code boxes interposed in the circuit is operated.

The invention possesses other objects and valuable features, some of which will be set forth in the following description of my invention which is illustrated in the drawings forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said description and drawings, as I may adopt varying forms of my invention within the scope of the claims.

Referring to the drawing:

Figure 1 is a front elevation of the retarding relay used in conjunction with my alarm system. The code boxes by which it is operated, together with the electrical connections, are shown in diagram; and parts of the relay are broken away to better disclose the structure.

Figure 2 is a horizontal sectional view of the relay, the plane of section being indicated by the line 2—2 of Figure 1.

In terms of broad inclusion, my invention comprises an alarm circuit controlled by a switch which in turn is operated by a plate, which must be moved thru a predetermined distance before its switch operative position is reached. Means controlled at a remote point are provided for moving the plate step by step to its operative position, and then for imparting to the plate the series of movements necessary to operate the switch so as to send the selected code signals. Means are also provided for effecting the recovery movement of the plate; and a latch is also provided for preventing such recovery during the step-by-step movement and for retaining the plate within the range of its switch operating movements. Means are further provided for releasing the latch to allow the plate to return to its normal position after an interval greater than the maximum interval between successive movements of the plate.

In greater detail, the preferred embodiment of my invention comprises a switch, preferably including normally engaged contact points 2 and 3, mounted on resilient switch arms 4 and 6, and connected thru binding posts 7 and 8 to conductors 9 and 11 respectively. These conductors are part of a normally closed circuit, and are adapted to be connected in a city fire alarm system so as to cause an alarm upon the separation of contacts 2 and 3. The switch also includes contact points 12 and 13, normally separated, and similarly mounted on resilient switch arms 14 and 16, and connected thru binding posts 17 and 18 to conductors 19 and 21 respectively. These conductors are part of a normally open circuit, and may be connected in a circuit adapted to cause gongs or whistles to be sounded within the plant employing the alarm system upon contacts 12 and 13 being brought together.

Resilient switch arms 6 and 16 are united into a unitary mechanical structure, but separated electrically by an insulating block 22. These switch arms are longer than their associated switch arms so that they overlie the

edge of a toothed plate or disk 23, pivotally mounted on the supporting instrument board 24. The toothed plate is urged in a counter-clockwise direction, preferably by a spring 26, interposed between the disk and its mounting. A pin 27 is fixed to the disk adjacent its edge, and is adapted to engage the block of insulation 22 to actuate the switch arm unit 6—16, upon the rotation of the disk in a clockwise direction thru a suitable arc. After the pin 27 engages the block 22 the contact 3 is disengaged from its associated contact 2, interrupting the circuit 9—11 of which they are a part; and contact 13 is engaged with its associated contact 12, closing the associated circuit 19—21.

Means subject to remote control for rotating the disk step-by-step in a clockwise direction, are provided, comprising a lever 31, pivotally mounted on a pin 32, fixed to the instrument board 24. Pivotally mounted upon the lever 31 is a pawl 33, adapted to engage one of the teeth of the disk 23 when the lever 31 is in its raised position, but moved out of engagement as the lever falls to its lower position by the pin 34, fixed to the instrument board, and bearing against the cam face 36 of the pawl. The free end of the lever 31 is bifurcated, and the prongs 37 are engaged in an annular slot 38 in the core 39 of a solenoid 41, rigidly mounted on the instrument board. The solenoid core has its upward thrust adjustably limited by a screw 42, threaded thru the top plate of the solenoid, and its downward thrust adjustably limited by a stop 44, threaded thru a lug 46, projecting from the instrument board. Thus it will be seen that with energization of the solenoid, the core is raised and the lever and latch picked up. Upon deenergization of the solenoid the parts fall, the pawl moving the disk thru one step.

Latch means are provided for preventing the recovery movement of the disk 23 after each step of the rotary movement imparted to it by the lever and pawl. The lever 31 is also bifurcated at its pivoted end; and mounted upon the same rigid pivot pin 32, between the prongs 48 of lever 31, is a latch comprising the arm 51, extending longitudinally of lever 31, and an arm 52, preferably at substantially a right angle thereto, and extending into proximity with the toothed disk.

A spring 56, stretched between arm 52 and pawl 33, urges both pawl and latch into engagement with the toothed disk at opposite sides thereof. The latch is normally held out of engagement with the disk by the plunger 61, bearing against the latch arm 51. The plunger is arranged in a dash pot 62 and is urged downwardly by a spring 63 to release the latch. The plunger normally rests upon the lever 31, so that whenever the lever is raised, the plunger is forced into the dash

pot; but no resistance is offered by the dash pot to the recovery movement of the lever 31, when it falls.

Ingress of air to the dash pot is permitted by an opening 66 in the upper head of the cylinder; and the interval after which the latch is released is predetermined by the screw 67 adjustable in the opening. A check valve 68 is also provided to permit rapid egress of the air when the plunger is forced into the dash pot upon the lifting of the arm. The plunger is provided with a guide 69 fitted for reciprocating motion in a guide chamber 71; and an adjusting screw 72, threaded thru the top of the chamber, limits the upward thrust of the plunger.

Upon energization of the solenoid 41, core 39 is drawn upwardly, carrying with it lever 31, pawl 33 and plunger 61 of the dash pot. Upon deenergization of the solenoid, the core, lever and pawl drop back to their normal positions by gravity. Upon falling, the pawl is drawn by the spring 56 into engagement with one of the teeth on disk 23, and rotates the disk one step in a clockwise direction. Because of the retarded recovery movement of the dash pot core however, the latch is free to engage one of the teeth on the opposite side of the disk before the ratchet is forced out of engagement with its tooth by the pin 34, so that recovery movement of the disk is prevented until enough time has elapsed for the dash pot to disengage the latch from the disk. Should the core of the solenoid be again raised and dropped before the expiration of this interval, another step of the rotary movement of the disk is attained. If this process is repeated a sufficient number of times, the time between each repetition being less than that required for the dash pot to release the latch, the disk will be rotated a sufficient distance to bring pin 27 into position to operate the switch upon further rotation, so as to open and close the alarm circuits as above described. The switch arm unit has sufficient rigidity, however, to prevent the weight of the engaging parts forcing the disk far enough for the latch to engage the next succeeding tooth; and therefore, after the disk has reached its switch operating position, each lifting and dropping of lever 31 will cause only oscillatory motion of the disk, each of such oscillations causing the sending of a signal impulse over the alarm circuits. If, however, a greater interval elapses between any two operations of the solenoid than that required for the recovery of the dash pot plunger, the latch will be released, and the requisite number of preliminary energizations of the solenoid again will be necessary before the alarm circuits are caused to function.

The relay thus described is intended for use in conjunction with a local alarm system comprising signal dispatching boxes employ-

ing code wheels. The code boxes of an industrial plant may be connected in series as a part of a closed circuit, and two of such boxes are represented diagrammatically by the code wheels 76 and 77, and their associated spring contacts 78 and 79 respectively. A solenoid 80 in the alarm box circuit 81 is normally energized by a source of current 82. Upon the operation of any one of the boxes, the associated code wheel is rotated slowly in the direction indicated by the arrows, and as each tooth passes the spring contact, the circuit 81 is broken momentarily. This causes the solenoid 80 to drop its core 83, and close the circuit 84 across the contacts 85. This circuit is also connected to the source of power 82, and contains solenoid 41 and a trouble bell 86, connected in parallel. Therefore, each time a tooth of any one of the code wheels, for example code wheel 76, lifts spring contact 78, solenoid 41 and trouble bell 86 are energized for a short interval. Certain of the code wheel teeth 87 corresponding to the number of steps required to bring the disk 23 into its switch operating position. Thus in the present embodiment five operations of the solenoid are required to bring disk 23 to its operative position; and accordingly code wheels 76 and 77 are each provided with five preliminary teeth 87.

Solenoid 80 and all the connections between it and the trouble bell 86 and solenoid 41 are so located that the opportunity for unauthorized interference is minimized. If the code box circuit is interrupted for any reason the trouble bell is sounded, and the solenoid 41 energized once. As pointed out, however, this will not transmit a general fire signal, but will prompt investigation as to the cause of the trouble without any action outside the local plant.

I claim:

1. In an alarm system, a switch for controlling the alarm circuit, a toothed plate operatively engageable with the switch and movable thru a predetermined distance to operative position, means for moving said plate step by step to its operative position and imparting thereto successive switch operative movements, means tending to effect the recovery movement of said plate, a holding latch engaging a succeeding tooth of said plate with each step thereof, means limiting the length of the switch operating movements of the plate to a degree less than that necessary for the latch to engage the next tooth, and means operative after an interval greater than the interval between successive movements of said plate for releasing said latch.

2. In an alarm system, a switch for controlling the alarm circuit, a toothed plate operatively engageable with the switch and movable thru a predetermined distance to operative position, means for moving said

plate step by step to its operative position and imparting thereto successive switch operative movements, means tending to effect the recovery movement of said plate, a holding latch engaging a succeeding tooth of said plate with each step thereof, means preventing progressive operation of the latch during the switch operating movements of the plate, and means operative after an interval greater than the interval between successive movements of said plate for releasing said latch.

3. In an alarm system, a switch for controlling the alarm circuit, a toothed plate operatively engageable with the switch and movable thru a predetermined distance to operative position, means for moving said plate step by step to its operative position and imparting thereto successive switch operative movements, means tending to effect the recovery movement of said plate, a holding latch engaging a succeeding tooth of said plate with each step thereof, means preventing progressive engagements of the latch with the toothed plate after it reaches operative position, and means operative after an interval greater than the interval between successive movements of said plate for releasing said latch.

4. In an alarm system, a switch for controlling the alarm circuit, a plate operatively engageable with the switch and movable thru a predetermined distance to operative position, means for moving said plate step by step to its operative position and imparting thereto successive switch operative movements, means tending to effect the recovery movement of said plate, holding latch means for preventing the recovery movement of said plate during the step-by-step movement thereof and for retaining said plate within the range of its operative movement, and means operative after an interval greater than the interval between successive movements of said plate for releasing said latch.

5. In an alarm system a switch for controlling an alarm circuit, a toothed plate operatively engageable with the switch and movable thru a predetermined distance to operative position, means for imparting a successive step by step movement to the plate in response to a predetermined number of electrical impulses to bring the plate into operative position, means tending to effect the recovery movement of the plate, a holding latch engaging a succeeding tooth of the plate with each step thereof, means preventing progressive operation of the latch during further impulses, and means operative after an interval greater than the interval between successive movements of the plate for releasing said latch.

In testimony whereof, I have hereunto set my hand.

CHARLES A. ELMORE. 130