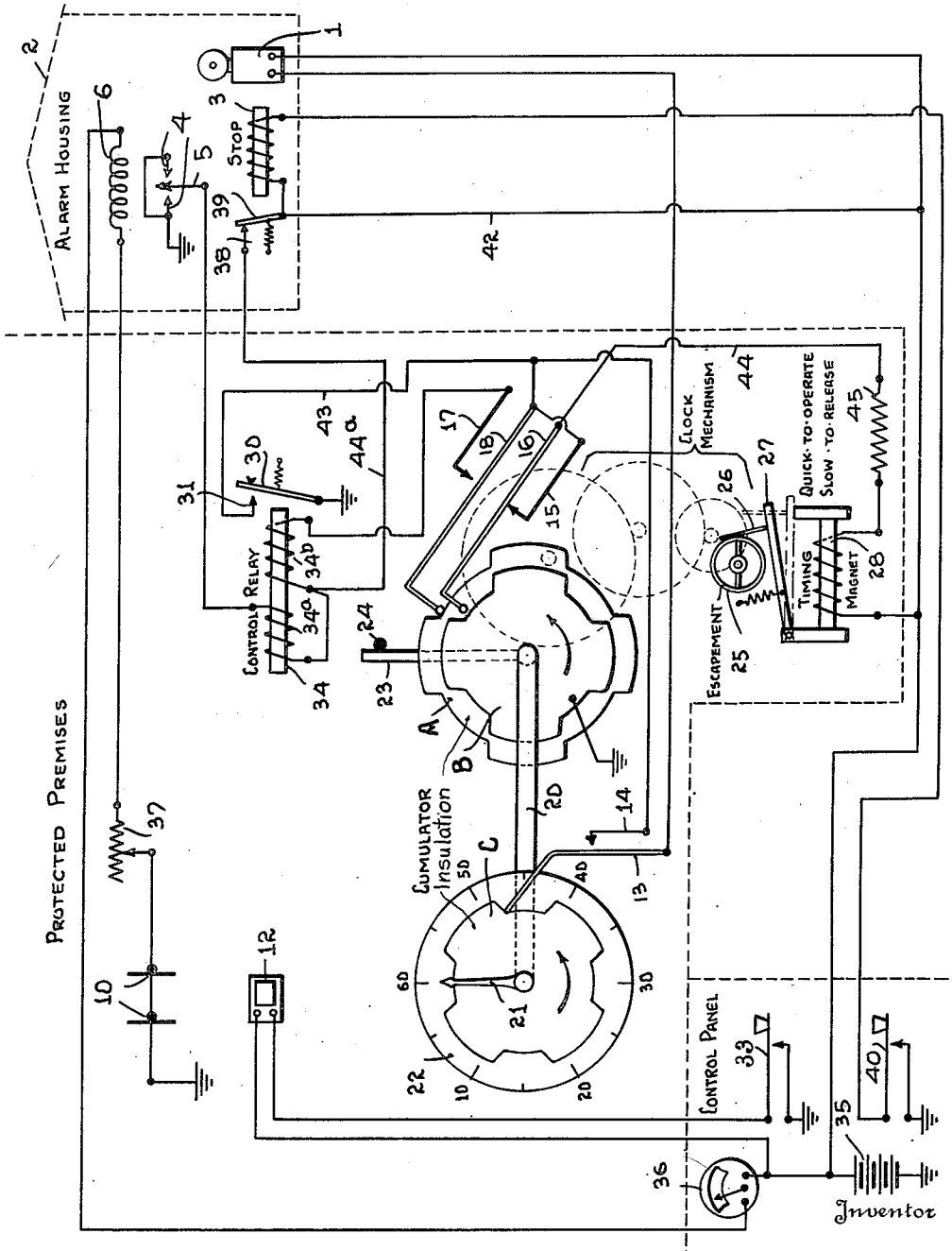
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ALARM SYSTEM AND CUMULATIVE CONTROL DEVICE THEREFOR

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ALARM SYSTEM AND CUMULATIVE CONTROL DEVICE THEREFOR

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This invention relates to a signaling system wherein an indication is given in the event of a disturbance to certain apparatus occasioned by shocks, or noises. It is particularly adapted for use in burglar alarm systems wherein sound responsive devices, such as microphones are used as a means of detecting noises or other disturbances incident to such attacks and which are relied upon to cause the operation of the alarm devices.

More specifically stated, this invention relates to an intermediate unit interposed in the circuit of an alarm system between a signaling device and a circuit closer so that after an initial closure of the circuit by some disturbance, subsequent operation of the signaling device is dependent upon a time element which is the equivalent of the accumulation and absorption of a predetermined number of impulses resulting either from a continuous disturbance or from disturbances occurring at irregular intervals, the invention also providing an arrangement such that after the signaling device is started into operation it will continue to operate for a definite predetermined time interval.

In protection systems of this character, the use of microphones for detection purposes has proven to be very efficient. When, however, commercial requirements necessitate the installation of alarm systems in localities where certain inherent noises or other disturbances are known to occur at various intervals, which are sufficient under the operating conditions heretofore existing to disarrange the systems and cause the alarm devices to operate, various special and expensive arrangements have been proposed as a means of overcoming such difficulties, but all of such arrangements have been unsatisfactory from a commercial standpoint and moreover require special care and supervision.

The object of my invention is to provide an equipment which constitutes an accumulator adapted to be introduced into an alarm or protection system between a translating device direcly controlled by the microphones and an alarm signaling device, which is capable of absorbing either an indefinite number of shocks or impulses, or a continuous series of impulses extending over a definite predetermined time interval before permitting the alarm devices to operate.

I have disclosed herein one arangement or equipment for accomplishing this purpose in which a set of cams is arranged to be rotated as a unit by clockwork mechanism which is controlled by an escapement that is started and stopped by an electromagnet. The latter is preferably of the type which is quick to operate but slow to release its armature.

Each cam operates a set of contacts controlling various circuit connections and the relations of the cams and contacts are such that a definite movement of the cams must take place before the contacts operate. After certain of the contacts have been actuated, a holding circuit is established for the controlling mechanism of the clockwork, thereby continuing the rotation of the cams until the holding circuit has been opened.

The apparatus for carying out my invention and its mode of operation will be understood from the following description in connection with the accompanying drawing which shows a schematic arrangement of mechanism and operating circuits embodying the invention.

The alarm signaling device 1 is indicated for purposes of illustration as an electric bell located in an alarm housing 2, exterior to the protected premises. Located also within this housing are the control relays 3 and 6, the latter being of the galvanometer type having its energizing winding in circuit with the microphones or detectors 10 in the protected premises. The needle or armature 5 of the relay 6 is normally centered between its contacts.

A buzzer 12 in proximity to the microphones may be actuated to test the operation of the microphones by closing the switch 33 on the control panel. A milliammeter 36 on the control panel indicate at all times the current flowing through the protection circuit.

The impulse-accumulator and its electromagnetically controlled clock-driving mechanism are located in the protected premises.

This comprises cams A, B and C carried by the shaft 20 of the clock mechanism. A pointer 21 is secured to one end of shaft 20 and arranged to move over a dial 22 which is divided into 12 parts, as indicated by the numerals, 10, 20, 30 etc. An arm 23 is also secured to the shaft to engage a stop pin 24 to limit the rotation of the cams in either direction. Cam B is made of metal and is grounded electrically. This cam cooperates with contact springs 15 and 16. In the position shown, spring 16 engages spring 15, but is not in contact with the cam. As cam B rotates in the direction indicated by the arrow, the raised portion engages spring 16 and grounds it, and while maintaining the ground on 16, breaks the connection between springs 16 and 15.

Cams A and C are made of insulating material and are arranged to operate simultaneously insofar as their associated contacts are concerned, but in such relation to cam B that the contacts of cams A and C operate and release before those of cam B. The cams are fastened to each other but are connected to the shaft 20 by means of a friction clutch, not shown. As a result of this arrangement, the cams rotate with the shaft 20 when it is turned in a counter-clockwise direction while they are held stationary by the engagement of the spring 13 with an abutment of the cam C when the shaft 20 is rotated in a clockwise direction to wind the spring of the clock mechanism. When the shaft 20 is turned in a clockwise direction until the arm 23 is engaged by the stop pin 24, the spring of the clock mechanism is wound for a run of one hour as indicated by the numerals on the dial 22.

The brake device or escapement wheel 25 of the clock mechanism is held from oscillation by the pawl 26 attached to the armature 27 of the electromagnet 28 when the latter is deenergized. When the electromagnet is energized, the escapement is released by the pawl, the clockwork is set in motion and the cams start to rotate in the direction indicated by the arrows. Due to the slow releasing action of the electromagnet, the escapement will operate for an appreciable time for each release of the electromagnet and the clockwork will rotate the cams accordingly.

The circuit of the electromagnet 28 is controlled by the contacts 30, 31 of relay 34, which is in turn controlled by the contacts 4 and needle or armature 5 of galvanometer relay 6. The winding of relay 6 is connected serially in a circuit from grounded battery 35, which also includes a milliammeter 36, an adjustable rheostat 37 and the microphones 10.

The relay 3 is provided for stopping the operation of the alarm signal 1, and is controlled by the switch 40 on the control panel. The operation of relay 3 breaks the current supply for the relay 34 through its contact 38 and armature 39.

Referring now to the operation of the equipment:—Assuming that the clockwork has been wound for a run of one hour, as indicated in the drawing, and that the parts of the apparatus are in the positions shown, current will flow from grounded battery 35, through milliammeter 36, the winding of galvanometer relay 6, through rheostat 37 and the microphones 10 to return ground. The needle or armature 5 of galvanometer relay 6 will assume a central position between the contacts 4.

Any disturbance due to a noise, shock or vibration of any kind will affect the microphones and produce a change in the resistance of the circuit, resulting in a variation in the current. This will cause the galvanometer needle 5 to swing to one side or the other and make connection with one of the contacts 4, thereby completing a circuit from grounded battery 35 for winding 34^a of relay 34, through conductor 42 and the armature 39 and back contact 38 of relay 3. The energization of magnet 34 closes a starting circuit for the magnet 28, through its armature 30 and front contact 31, conductor 43, contact springs 15, 16, conductor 44, resistance 45, winding of electromagnet 28 to grounded battery 35. Magnet 28 attracts its armature 27 and withdraws pawl 26, thereby releasing escapement 25 and permitting the clockwork to start the rotation of the cams. It will be noted that as the pawl 26 is pulled away from the periphery of the escapement wheel 25, it initiates a movement of the latter and thus facilitates the instantaneous starting of the clockwork.

If the disturbance affecting the microphones is only momentary, the circuit and current value will stabilize as soon as the disturbance ceases and galvanometer needle 5 will swing back to its central position. Relay 34 will release its armature and break the circuit for electromagnet 28, which, in turn, will release its armature and stop the clockwork and further movement of the cams.

Should another disturbance occur to affect the microphones, the operation above described will be repeated with a resultant further advance of the cams. If the disturbances are continued at irregular intervals, such disturbances will unbalance the circuit and cause successive advances of the cams in the manner described, the movement being equivalent to the accumulative effect of all of them.

Should the disturbances be continuous or come at intervals, short enough to bring them within the operating time constant of electromagnet 28, the clockwork will operate continuously and a corresponding continuous rotation of the cams will follow.

As soon as the cams have advanced far enough for cams A and C to close the contacts of their associated springs, the subsequent operation of relay 34 and the closure of contacts 30 and 31 will complete a holding circuit for relay 34 through winding 34^b, contacts 17 and 18 associated with cam A, and conductors 44^a and 42 to battery 35. Electromagnet 28 will then be again energized, releasing the escapement, and the clockwork and cams will continue in operation.

In addition to closing the holding circuit for itself as just described, relay 34 at this time also closes a circuit through contacts 13 and 14 associated with cam C for the alarm signal 1. This bell or alarm signal will continue to operate until cam C has advanced far enough for contacts 13 and 14 to break contact or until relay 34 has been deenergized and released its armature 30.

The three cams continue to rotate and a short time after A and C have closed their contacts as just described, cam B engages spring 16. This cam is of metal and is connected to ground as before stated. By engaging spring 16, a holding circuit is completed for electromagnet 28. As spring 16 rides up on the cam, the connection between contacts 15 and 16 is broken and the starting or initial operating circuit for magnet 28 is opened.

In this condition of the equipment the circuit of relay 34 is closed or locked through its own contacts, 30 and 31, and contact springs 17 and 18 of cam A. The alarm signal circuit is closed through contacts 13 and 14 and relay contacts 30 and 31. Electromagnet 28 is energized over a circuit closed through cam B and contact 16. As a result, the escapement for the clockwork is released and the cams continue to advance, the alarm signal continuing in operation.

As shaft 20 continues to rotate, cam C eventually releases spring 13 and breaks the connection between springs 13 and 14. This action opens the circuit for the alarm signal 1, and stops its further operation. Cam A releases spring 18 and breaks the connection between springs 18 and 17, thereby opening the holding circuit for winding 34^b of relay 34. The relay in turn releases its armature, 30, and breaks connection with contact 31. Finally cam B releases spring 16 and breaks the ground connection for electromagnet 28. The magnet releases its armature, pawl 26, engages the escapement 25 and the clockwork stops with the cams again in their original relation to the contact springs as shown in the drawing but with the pointer, 21, indicating on the dial, 22, the extent to which the clock is still set to run.

Should subsequent disturbances occur to affect the microphones, the above described operations are repeated.

It should be noted here that the segments of the various cams as shown are in schematic form only and on an exaggerated scale. This is for the purpose of illustrating the operating principles and sequences of operations. The cams are shown as cut to permit only four complete operating phases for a run of one hour of the clockwork. In the actual structure of the device for commercial use, the cutting of the cams may be varied to suit the requirements of the installation. The standard construction of the cams provide for at least twelve complete phases.

The clock-driven cam mechanism with its associated spring contacts and timing magnet constitute a cumulator which adds together or integrates the successive impulses caused by noises, impacts or vibrations affecting the microphones, introducing a time-element to postpone the sounding of the alarm in case the impulses occur in rapid succession during a short interval but without any further repetition, as for instance when caused by the vibrations set up by a passing truck, yet taking into account the period of disturbance in totalizing the disturbances so that when a certain period has elapsed equal to the sum of the several disturbances, the alarm will be sounded. By my invention, therefore, the sensitiveness of the system has not been impaired but the annoyance of having the alarm sounded at each recurrence of momentary disturbing vibrations has been overcome. The cumulator, therefore, serves as a reservoir interposed between the microphone detectors and the alarm signal to suspend the operation of the latter and introduce a predetermined time interval between successive operations of the alarm regardless of the actual number of impulses caused by sound waves or mechanical vibrations occurring during such interval.

I claim:—

1. In an alarm system, a microphonic device responsive to sound or mechanical disturbances, an electrically actuated alarm means, a cumulative timing mechanism having a rotary member provided with alternate cam projections and recesses, a normally open alarm circuit having contact elements positioned to be closed by said cam projections and to be opened while traversing said recesses, motor means controlled by said device and operating to move said rotary member a fraction of the length of a recess after each operation of the device, thereby closing the alarm circuit after a predetermined number of either continuous or intermittent vibrations of said device, and means causing the motor to operate continuously while the contacts engage a cam projection and until the contacts are disengaged therefrom.

2. In an alarm system, a microphonic device responsive to sound or mechanical disturbances, an electrically actuated alarm means, a cumulative timing mechanism hav-

ing an actuating member provided with alternate cam projections and recesses, a normally open alarm circuit having contact elements positioned to be closed by engagement with said cam projections, and opened while traversing said recesses, the length of said cams determining the period of continuous operation of said alarm means and the length of the recesses determinating the aggregate period of successive movements of said actuating member caused by momentary disturbances of said device, operating means for said mechanism provided with a brake device, and an electro-magnet in circuit with said contacts controlling the operation of said brake device.

3. In an alarm system as set forth in claim 2, said electro-magnet being quick to operate and slow to release, whereby the timing mechanism will operate over a definite period in response to a momentary disturbance.

4. In an alarm system, a microphonic device responsive to sound or mechanical disturbances, an electrically actuated alarm means, a cumulative timing mechanism having a plurality of actuating members provided with alternate cam projections and recesses, a normally open alarm circuit having contact elements positioned to be closed by engagement with said cam projections and opened while traversing said recesses, operating means for said mechanism provided with a brake device, an electro-magnet in circuit with said contacts and controlling the operation of said device, one of said actuating members being metallic and grounded, and a contact connected to said electro-magnet positioned in the path of the cam projections on said metallic member to thereby close a locking circuit through the magnet.

In testimony whereof I affix my signature.

RICHARD M. HOPKINS.