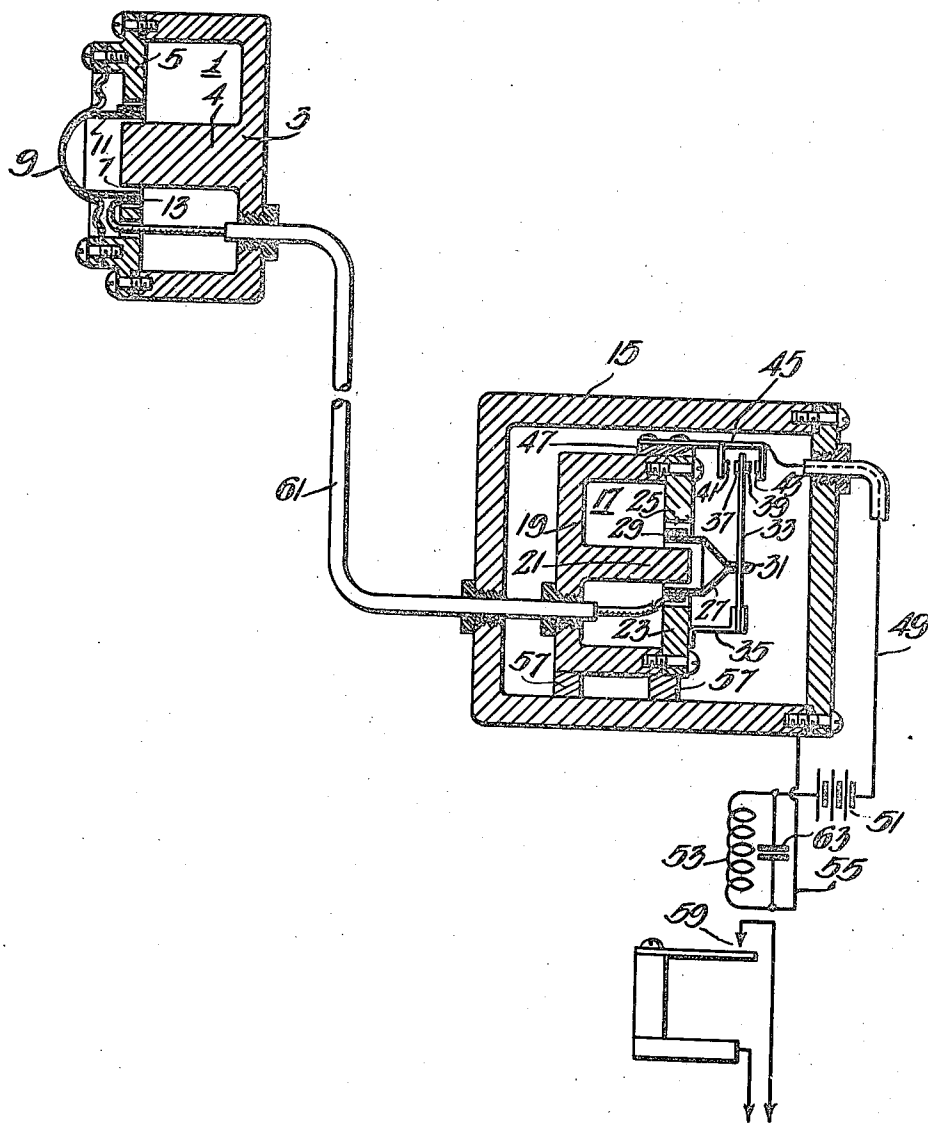


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ELECTRICAL CONTROL SYSTEM

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ELECTRICAL CONTROL SYSTEM

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This invention relates to electrical control systems, and more particularly to an alarm system employing an acoustically responsive switch.

Various alarm systems are known employing microphones coupled to amplifiers and loudspeakers, the microphones being arranged to pick up sounds which are to be detected. In such systems, it is customary to turn on the amplifier and to have it energized at all times. The disadvantage of such an arrangement is that the amplifiers require constant application of power and are therefore constantly subjected to wear, and, after a period of use, lose their efficiency.

The primary object of our present invention is to provide an improved alarm system which will not be subject to the aforementioned disadvantage.

More particularly, it is an object of our invention to provide an improved alarm system wherein the amplifier or other similar electrical apparatus is turned on only when the sounds to be detected appear.

Another object of our present invention is to provide, in an alarm system, acoustically responsive apparatus which, when actuated by sound waves, will close an electrical circuit.

A further object of our invention is to provide an improved alarm system and control apparatus therefor which is simple in construction, inexpensive in cost, and highly efficient in use.

In accordance with one form of our invention, the system consists of a microphone connected to a vibratile reed relay. When the system is actuated by the sound to be detected, the reed is caused to vibrate, and when the amplitude of the reed is sufficiently large, the reed strikes the contacts of a switch in a suitable work circuit to close this circuit. This, in turn, may close a larger relay for completing the circuit of the amplifier or other suitable apparatus, or the amplifier or the like may be turned on or actuated directly, as may be found most suitable.

The novel features that we consider characteristic of our invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description, when read in connection with the accompanying drawing, in which the single figure is a partly structural and partly diagrammatic view of one form of our invention.

Referring more particularly to the drawing, there is shown an acoustically responsive generator or microphone 1 which may be of the dy-

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namic type and comprises a magnetic field structure 3 having a center pole piece 4 and an annular, outer pole piece 5 spaced therefrom to provide an air gap 7, the annular pole piece 5 having fluid-tight connection with the remainder of the field structure. Secured to the annular pole piece 5 in fluid-tight relation therewith is a suitable fluid impervious diaphragm 9 provided with a voice coil form 11 having a voice coil 13 wound thereon, the voice coil 13 being received in the air gap 7.

Suitably spaced from the generator 1, either locally or at a remote point, as may be most suitable, is a fluid-tight casing 15 of conductive material within which is housed an electromechanical converter or motor 17. The motor 17 may be generally similar to the generator 1 and includes a field structure 19 having a center pole piece 21 and an outer, annular pole piece 23 spaced from the pole piece 21 to provide an air gap 25 within which is vibratively mounted a vibratile element or coil supporting form 27. A voice coil 29 is wound on the vibratile form 27 and is located in the air gap 25.

The coil form 27 has an extension 31 by means of which it is connected to a vibratory conductive reed 33 intermediate the ends of the reed, the lower end of the reed 33 being secured to a conductive bracket 35 which, in turn, is secured to the annular pole piece 23. The upper, free end of the reed 33 carries a pair of movable contacts 37 and 39 on the opposite faces thereof, these contacts being adapted to coact, respectively, with stationary contacts 41 and 43 on a conductive bracket 45 secured to the field structure 19 but insulated therefrom by a block 47 of insulating material. The switch bracket 45 is connected through a lead 49 and a battery or the like 51 to the winding 53 of a suitable relay one end of which is connected through a conductor 55 to the conductive casing 15 on the bottom of which rest a pair of conductive blocks 57 which support the motor 17. The circuit comprising the switch elements 37, 39, 41 and 43, the battery 51, and the relay winding 53 constitutes a work circuit which may be part of the amplifier proper or which may, when energized, actuate a second switch 59 in the amplifier or other apparatus (not shown) which is to be turned on.

In operation, the microphone 1, which may be directional, is placed at a suitable point at which the presence of a sound source is to be detected. For example, the microphone 1 may be immersed in the ocean to detect the passage of ships or submarines, or it may be set up at a suitable point

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to detect the presence of traffic, or as a part of a burglar alarm system, or the like. In any case, when the sound source approaches within the range of the microphone 1, the acoustic waves set up thereby actuate the diaphragm 9 to set up signal currents in the voice coil 13. These signal currents are transmitted to the voice coil 29 of the motor 17 by a connecting cable 61, thus causing the vibratile form 27 to vibrate and effect vibration of the reed 33 which normally is at rest midway between the stationary contacts 41 and 43. When vibration of the reed 33 has reached a predetermined amplitude as determined by the spacing between the contacts 37 and 41, or the contacts 39 and 43, the cooperating pairs of contacts will be brought into engagement to close the circuit to the relay coil 53, this circuit being completed from the reed 33, through the contacts 37, 41, or 39, 43, the lead 49, the battery 51, the coil 53, the lead 55, the conductive casing 15, the blocks 57, the field structure 19, 23, the bracket 35 and back to the reed 33. As soon as the relay 53 is energized, it will close the switch 59 and thereby complete the circuit to the amplifier or other suitable signal indicating apparatus to provide a warning of the presence of the sound source within the range of the microphone 1. The amplifier may then remain energized for a suitable period, after which it may be turned off again by suitable apparatus known in the prior art but immaterial to the present invention. If desired, a capacitor 63 may be shunted across the relay winding 53 to keep the relay closed during intermittent opening and closing of the contacts 37, 41 and 39, 43.

Although we have shown and described but one embodiment of our invention, it will be apparent to those skilled in the art that many other modifications, as well as changes in the particular embodiment disclosed, are possible. For example, where the system is to be used under water, both the microphone 1 and the converter 17 may be housed in a single, water-tight casing with the microphone set in one wall of the casing so that the diaphragm 9 will remain exposed to the water. If desired, the converter 17 may be placed at a point remote from the microphone 1 rather than in close proximity thereto. Also, instead of employing dynamic units for the microphone and the converter, other suitable units may be employed. Other changes and modifications of a similar nature may also be made. We therefore desire that our invention shall not be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

We claim as our invention:

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1. In combination, an acoustically powered, electromagnetic microphone including a vibratory member responsive to acoustical energy and an operating coil associated therewith, an electro-mechanical converter of the electromagnetic type, said converter also including a vibratory member and an operating coil associated therewith, said coils being connected to each other, the vibration of said first named member in response to acoustical energy generating corresponding electrical impulses in said coils and said generated impulses effecting vibration of said second named vibratory member through said second named coil, a vibratile reed coupled to said second named member and movable therewith, a work circuit associated with said converter, and a switch in said work circuit, said switch including at least one stationary contact and a movable contact carried by said reed, said contacts being normally out of engagement with each other and being arranged to be brought into engagement with each other upon vibration of said reed by said second named member with predetermined amplitude to close said work circuit.

2. In combination, a dynamic microphone including a vibratory diaphragm responsive to acoustical energy and an operating coil associated with said diaphragm, an electro-mechanical converter of the dynamic type, said converter also including a vibratory member and an operating coil associated with said member, said coils being connected to each other, the vibration of said diaphragm in response to acoustical energy generating corresponding electrical impulses in said coils and said generated electrical impulses effecting vibration of said second named coil and said vibratory member, a vibratile reed fixed at one end and free at its other end, said reed being coupled to said vibratory member at a point intermediate its said ends, and a work circuit including a switch associated with said converter, said switch including at least one stationary contact element and a movable contact element carried by said reed adjacent its said free end, said contacts being normally out of engagement with each other and being arranged to be brought into engagement with each other upon vibration of said reed by said vibratory member with predetermined amplitude to close said work circuit.

3. The invention set forth in claim 2 characterized in that said microphone is adapted to be energized solely by the acoustical energy received thereby.

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