

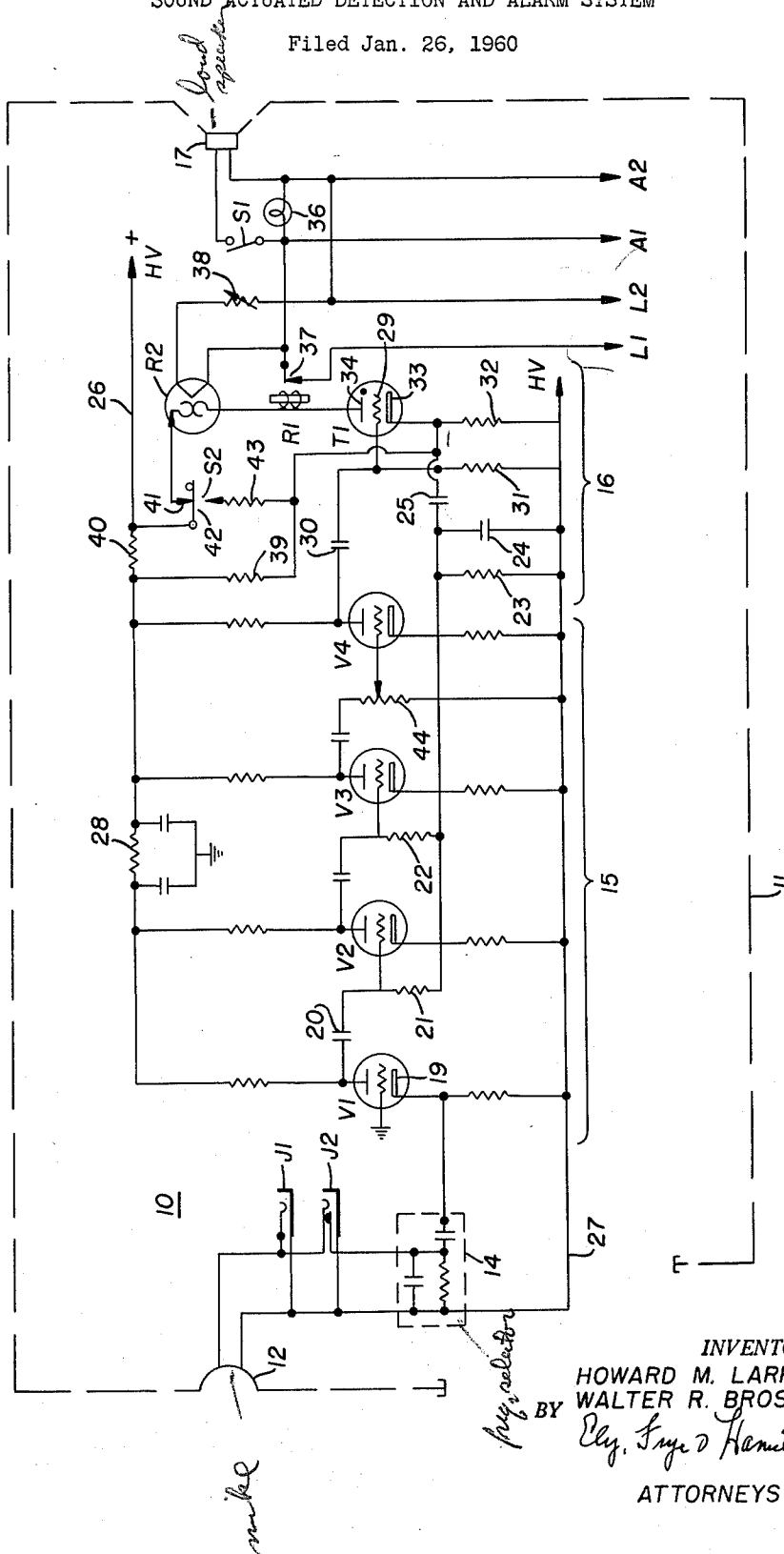
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SOUND ACTUATED DETECTION AND ALARM SYSTEM

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SOUND ACTUATED DETECTION AND ALARM SYSTEM

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The present invention relates to detection and alarm systems. More particularly, the invention relates to a self-contained portable alarm device which is activated or set off by certain specific sound vibrations picked up by a speaker enclosed in the device.

A general object of the invention is to provide a portable alarm device which will detect sound vibrations from glass breakage, sawing, burning, pounding, etc.

Another general object of the invention is to provide an alarm device which is self resetting, following an alarm.

A specific object of the invention is to provide electric circuit apparatus for a portable and self-contained alarm device suitable for sound surveillance in rooms, buildings, warehouses, and the like; which will respond to specific and predetermined sounds, vibrations of an unusual nature and yet will remain inactive in the presence of "normal" or environmental sounds.

The alarm device of the invention comprises an electrical alarm apparatus which is arranged in a portable carrying case such that the device may be utilized for surveillance where permanent alarm installations are not necessary or desirable. The device responds to sound disturbances, referred to as intrusion sounds, which would not normally be present in the space under surveillance. It is assumed herein that the sound disturbances result from the presence of unauthorized persons in the space under surveillance, but the device may be utilized to detect and signal the occurrence of sound disturbances of any kind or nature.

The invention together with the features and advantages thereof will be understood by reference to the drawing, in which a schematic diagram of the operative circuits of the alarm device are shown.

The alarm device 10 is incorporated in an enclosure, indicated in schematic outline at 11, preferably in the form of a portable case. As so embodied, the alarm device is self-contained and may be moved about from place to place requiring only to be connected to the usual alternating current service line. The apparatus may however be suitably incorporated in any fixed alarm installations or systems.

A microphone 12 is mounted in a side of the enclosure and generates electrical signals in response to sound waves in the room or space under surveillance. The signals from the microphone pass through a filter 14 and are amplified by an amplifier 15. The amplified signals are fed from the output of the amplifier to a control apparatus 16, which, when the signals are of sufficient amplitude, acts to energize a loudspeaker 17 which is also mounted in the side of the enclosure. Signals from additional or substitute sensing devices may be fed to the filter 14 through jacks J1 or J2 and auxiliary audible or visual signalling devices, sirens, blinkers, or the like may be connected to the terminal leads A1 and A2.

The filter 14 functions to emphasize certain sound frequencies or to de-emphasize others, so that the alarm device may be made more or less responsive to certain types of intrusion sounds. The filter may be omitted where such specific response is not required.

The amplifier 15 comprises a tube V1 connected as a grounded grid amplifier and having the output of the filter 14 connected to the cathode 19. Tubes V2, V3, and V4 are connected in grounded cathode amplifier stages, ar-

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ranged in cascade, with the input of the tube V2 taken from the plate of the tube V1 through the capacitor 20. The circuits of the tubes V1, V2, V3 are generally conventional, except that the grid returns of the tubes V2 and V3, through the resistors 21 and 22, are made to an amplification control circuit which includes resistor 23, capacitor 24, and capacitor 25.

Direct current voltages are supplied to the amplifier 15 and to the control circuit 16 through a positive line 26 and a negative common line 27. The lines 26 and 27 are connected to a rectifier-filter supply (not shown in the diagram) incorporated in the enclosure 11. A resistor-capacitor filter 28 provides additional filtering, desirable for the amplifier stages which include the tubes V1 and V2.

The control circuit 16 comprises a grid-controlled gas discharge tube T1, an alarm relay R1, and a time delay relay R2, all connected in series between the lines 26 and 27. The output of the amplifier 15 is coupled to the control grid 29 of the gas tube T1 through a capacitor 30, and the control grid circuit is returned to the negative line 27 through a grid resistor 31. A cathode resistor 32 establishes a positive bias on the cathode 33 of the gas tube T1 and hence establishes the amplitude of signal voltage which must be applied to the control grid 29 to fire the tube T1. The cathode 33 and plate 34 of the tube T1 constitute a series circuit with the resistor 32 and relays R1 and R2.

The alarm relay R1 has normally-open contacts 37 thereof connected in a series circuit which includes terminal leads L1 and L2 and parallel branches comprising a loudspeaker 17 and series switch S1, the indicator lamp 36, and terminal leads A1 and A2 (referred to, either generally or separately, as an alarm circuit), and another parallel branch including the time delay relay R2 and a variable resistor 38 (referred to as a reset circuit). When the tube T1 fires, the alarm relay R1 is energized and the contacts 37 are closed to activate the alarm circuit. With the terminal leads connected to an alternating current line, activation of the alarm circuit will cause the loudspeaker 17 to be sounded. In testing or setting the alarm device, the switch S1 is opened and the indicator lamp 36 is observed to determine the operability of the device.

The time delay relay R2 functions to open the plate circuit of the gas tube T1 after the lapse of a predetermined interval of time following the firing of the tube T1 and activation of the alarm circuit. Thus, when the contacts 37 are closed, relay R2 is energized from the power line (through the terminal leads L1 and L2) and, following the delay interval, the closed contacts 37 are opened. Accordingly the relay R1 is de-energized and the alarm circuits deactivated. Simultaneously therewith, the relay R2 becomes de-energized, and, since interruption of the series circuit caused the gas tube T1 to de-ionize, the circuit remains open until the gas tube T1 is again fired by an alarm signal of sufficient amplitude.

The relay R2 is a thermal time delay relay of known design and the variable resistor 38 provides adjustment of the delay interval to the desired predetermined time. Delay intervals of 30 seconds are useful in many applications of the device and other known delay devices may be utilized to obtain greater delay intervals or to provide other adjustment means.

The terminal leads L1 and L2 are referred to as an energizing circuit, e.g. for the loudspeaker 17, the indicator lamp 36 or an auxiliary signalling device connected to the terminal leads A1 and A2. As so used, the term may or may not include the energizing source, to which the leads L1 and L2 are intended to be connected.

The amplification control circuit, e.g. resistor 23, capacitor 24, and capacitor 25, functions to impress a high negative bias upon the control grids of tubes V2 and V3 during an interval following the sounding of the loud-

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speaker. Thus the cathode 33 of the gas tube T1 has a small positive bias voltage, determined by the resistor 32 and resistors 39 and 40, when the tube is not conducting. However, when tube T1 fires, the voltage of the cathode 33 increases to a relatively high positive value and the capacitor 25 charges to that voltage (through the resistor 23). Then, when tube T1 again becomes non-conducting due to the opening of the contacts 37 and the cathode 33 returns to its original voltage, the voltage across the capacitor 25 is impressed, as a high negative bias, upon the control grids of tubes V2 and V3. The high negative bias effectively blocks the amplifier stages so that the tube T1 cannot again be fired by signals from the microphone 12 during the interval when the bias is applied.

The negative bias is applied to the grids of tubes V2 and V3 substantially throughout the time interval required to discharge the capacitor 25 through the resistors 23 and 32 and into the capacitor 24. The value of resistor 23 is chosen so that the time required to discharge capacitor 25 and bring the voltage across the resistor 23 and capacitor 24 to the normal operating level inactivates the amplifier for the desired interval following the cessation of the alarm. In the embodiment of the invention described herein the cathode bias voltages were 8 volts and 98 volts; resistor 32, 10,000 ohms; capacitor 25, 4 mfd.; resistor 23, 1 megohm; capacitor 24, 1 mfd.; and the discharge time was between 15 and 30 seconds. Accordingly the amplifier 15 was inactive and the device did not respond to sounds, which would otherwise fire tube T1, for an interval of from 15 to 30 seconds following cessation of sounding of the speaker.

The advantages of the arrangement will be apparent. The device is made insensitive to echoes and vibrations caused by the loudspeaker and self-retripping is prevented with a simple and efficient control circuit 16.

The alarm device includes a test circuit for determining the performance or operability of the device, either during installation or at any time thereafter. To this end a test switch S2 has a normally closed contact 41 connected in the series cathode circuit of the gas tube T1 and does not affect the operation of that circuit. A normally open contact 42 is connected to the cathode 33 through a series resistor 43 such that, when the test switch is depressed, the resistor 43 is connected to the positive line 26 and the cathode 33 is energized to the same positive voltage that it acquires when the tube T1 fires in the ordinary operation of the control circuit, e.g. in the exemplary case, 98 volts. Upon release of the test switch, the voltage across the capacitor 25 is applied to inactivate the amplifier 15. With this arrangement, the amplification control circuit may be tested at will, and, further, the alarm device may be inactivated for a time sufficient to permit the user to leave the room without tripping the alarm, after the device has been set.

A potentiometer 44 in the grid circuit of tube V4 enables adjustment of the amplifier 15 to accommodate ambient noise in the space under surveillance and permits adjustment of the device to determine the magnitude of sound disturbance which will actuate the alarm.

It is to be understood that the foregoing description is not intended to restrict the scope of the invention and that various rearrangements of the parts and modifications of the design may be resorted to, giving effect to a liberal interpretation of the claims as herein set forth.

What is claimed is:

1. In a sound actuated detection and alarm device, an amplification control circuit;

said alarm device having a microphone, an amplifier means having the input thereof connected to the microphone, a signalling device, and an energizing circuit actuated by said amplifier for triggering said signalling device;

said energizing circuit having a gas tube T1 the cathode 33 of said gas tube T1 connected to the negative side 27 of a direct current source, the plate 34 of said gas

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tube T1 connected to one side of a thermal time delay relay R2, the other side of said thermal time delay relay R2 connected with the positive side 26 of a direct current source, said thermal time delay relay R2 energized with said signalling device for deactuating said energizing circuit after the lapse of a predetermined interval following the actuation of the alarm;

said amplification control circuit comprising a cathode resistor 32 connected in series with the cathode 33 of said gas tube T1 and the negative side 26 of said direct current source, one side of a control circuit capacitor 25 connected between said cathode 33 and said cathode resistor 32, the other side of said capacitor 25 connected to said amplifier 15 to supply a negative blocking bias thereto for a predetermined interval following deactivation of the energizing circuit, and means 23, 24 to discharge the charge on the amplifier side of said control circuit capacitor into the negative side of said direct current source.

2. In a sound actuated detection and alarm device, an amplification control circuit;

said alarm device having a microphone, an amplifier means having the input thereof connected to the microphone, a signalling device, and an energizing circuit actuated by said amplifier for triggering said signalling device;

said energizing circuit having a gas tube T1 the cathode 33 of said gas tube T1 connected to the negative side 27 of a direct current source, the plate 34 of said gas tube T1 connected to one side of a thermal time delay relay R2, the other side of said thermal time delay relay R2 connected with the positive side 26 of a direct current source, said thermal time delay relay R2 energized with said signalling device for deactuating said energizing circuit after the lapse of a predetermined interval following the actuation of the alarm;

said amplification control circuit comprising a cathode resistor 32 connected in series with the cathode 33 of said gas tube T1 and the negative side 26 of said direct current source, one side of a control circuit capacitor 25 connected between said cathode 33 and said cathode resistor 32, the other side of said capacitor 25 connected to said amplifier 15 to supply a negative blocking bias thereto for a predetermined interval following deactivation of the energizing circuit, one side of a discharge resistor 23 connected between said control circuit capacitor 25 and said amplifier 15, the other side of said resistor 23 connected to the negative side 27 of said direct current source to discharge the amplifier side of said control circuit capacitor.

3. In a sound actuated detection and alarm device, an amplification control circuit;

said alarm device having a microphone, an amplifier means having the input thereof connected to the microphone, a signalling device, and an energizing circuit actuated by said amplifier for triggering said signalling device;

said energizing circuit having a gas tube T1 the cathode 33 of said gas tube T1 connected to the negative side 27 of a direct current source, the plate 34 of said gas tube T1 connected to one side of a thermal time delay relay R2, the other side of said thermal time delay relay R2 connected with the positive side 26 of a direct current source, said thermal time delay relay R2 energized with said signalling device for deactuating said energizing circuit after the lapse of a predetermined interval following the actuation of the alarm;

said amplification control circuit comprising a cathode resistor 32 connected in series with the cathode 33 of said gas tube T1 and the negative side 26 of said direct current source, one side of a control circuit

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capacitor 25 connected between said cathode 33 and said cathode resistor 32, the other side of said capacitor 25 connected to said amplifier 15 to supply a negative blocking bias thereto for a predetermined interval following deactivation of the energizing circuit, one side of a discharge resistor 23 connected between said control circuit capacitor 25 and said amplifier 15, the other side of said resistor 23 connected to the negative side 27 of said direct current source, a second capacitor 24 connected in parallel with said discharge resistor 23, said resistor 23 and said second capacitor 24 adapted to control discharge of the amplifier side of said control circuit capacitor 25.

4. In a sound actuated detection and alarm device, an amplification control circuit;

said alarm device having a microphone, an amplifier having the input thereof connected to the microphone, said amplifier comprising a cascade of grounded cathode tubes, said tubes having grid returns, the input of said amplifier connected to said microphone, a signalling device and an energizing circuit actuated by said amplifier for triggering said signalling device;

said energizing circuit having a gas tube T1 the cathode 33 of said gas tube T1 connected to the negative side 27 of a direct current source, the plate 34 of said gas tube T1 connected to one side of a thermal time delay relay R2, the other side of said thermal time delay relay R2 connected with the positive side 26 of a direct current source, said thermal time delay relay R2 energized with said signalling device for deactuating said energizing circuit after the lapse of a predetermined interval following the actuation of the alarm;

said amplifier control circuit comprising, a cathode resistor 32 connected in series with the cathode 33 of said gas tube T1 and the negative side 26 of said direct current source, one side of a control circuit capacitor 25 connected between said cathode 33 and said cathode resistor 32, the other side of said control circuit capacitor 25 connected to at least one of the grid returns of said amplifier tubes, one side of a discharge resistor 23 connected between said control circuit capacitor and said grid returns, the other side of said discharge resistor 23 connected to the negative side 27 of said direct current source to discharge the charge on the amplifier side of said capacitor into the negative side of the direct current source.

5. In a sound actuated detection and alarm device, an amplification control circuit;

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said alarm device having a microphone, an amplifier having the input thereof connected to the microphone, said amplifier comprising a cascade of grounded cathode tubes, said tubes having grid returns, the input of said amplifier connected to said microphone, a signalling device and an energizing circuit actuated by said amplifier for triggering said signalling device;

said energizing circuit having a gas tube T1 the cathode 33 of said gas tube T1 connected to the negative side 27 of a direct current source, the plate 34 of said gas tube T1 connected to one side of a thermal time delay relay R2, the other side of said thermal time delay relay R2 connected with the positive side 26 of a direct current source, said thermal time delay relay R2 energized with said signalling device for deactuating said energizing circuit after the lapse of a predetermined interval following the actuation of the alarm;

said amplifier control circuit comprising, a cathode resistor 32 connected in series with the cathode 33 of said gas tube T1 and the negative side 26 of said direct current source, one side of a control circuit capacitor 25 connected between said cathode 33 and said cathode resistor 32, the other side of said control circuit capacitor 25 connected to at least one of the grid returns of said amplifier tubes, one side of a discharge resistor 23 connected between said control circuit capacitor and said grid returns, the other side of said discharge resistor 23 connected to the negative side 27 of said direct current source, a second capacitor 24 connected in parallel with said discharge resistor, said discharge resistor 23 and said second capacitor 24 adapted to control discharge of the amplifier side of said control circuit capacitor 25.

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