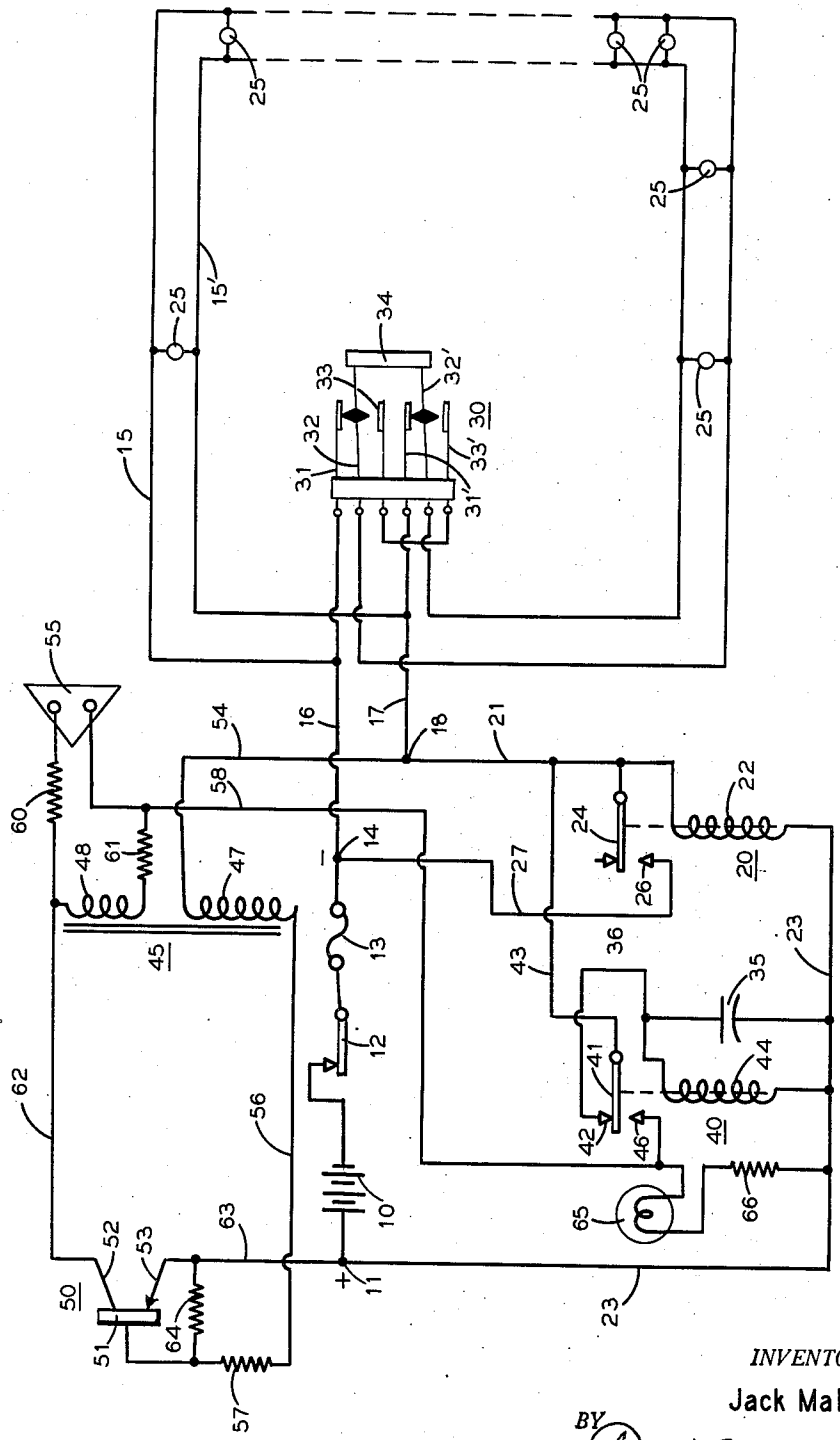
June 26, 1962 J. MALIN 3,041,588

ELECTRONIC DETECTION SYSTEM

Filed June 10, 1958



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United States Patent Office 3,041,588 Patented June 26, 1962

3,041,588

ELECTRONIC DETECTION SYSTEM

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Filed June 10, 1958, Ser. No. 741,140
10 Claims. (Cl. 340—213)

This invention relates to alarm systems, such as fire and burglar alarm systems, and more particularly to such a system including an inductively coupled transistorized audio oscillator including tone generating means, intermittently and periodically energized when a detector device is tripped.

In accordance with the present invention, a pair of parallel loops are provided and connected to opposite polarity terminals of a source of electric potential. The detector devices, which are, in effect, normally open switches, are connected between these loops at pre-set or predetermined locations. Due to isolating relay means included in the system, the loops may extend relatively great distances, such as two (2) miles or more, without appreciable drain upon the power supply or potential source even when a detector device is tripped.

Tripping of any detector device picks up a self-latching relay which, when energized, charges a capacitor in shunt with the coil of an interrupter relay. When the condenser is charged a pre-set amount, this interruptor relay is closed to trigger the transistorized audio oscillator to generate a warning tone. As the interruptor relay is closed, it opens the condenser or capacitor charging circuit so that, upon discharge of the condenser, the interruptor relay is dropped or opened to deenergize the oscillator and re-charge the condenser. This action is cyclically repeated at a rate determined by the constants of the condenser and interruptor relay circuit. The frequency of the generated tone is determined by the constants of the audio oscillator circuit.

A normally closed switch is provided in series with the hold or latching relay to re-set the system after it has been tripped. When this switch is opened, the latching relay is dropped. In order to test the operativeness of the system, the loops are carried through a double pole, double throw switch which, in its normal position, completes the loops and maintains them isolated. In the test position of this switch, the loops are interconnected to energize the tone generator.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing, the single FIGURE is a schematic wiring diagram of an alarm system embodying the invention.

Referring to the drawing, a source of electric potential is illustrated, by way of example, as a battery **10** connected to a positive polarity junction point **11** and, in series with a normally closed re-set switch **12** and a fuse **13**, to a negative polarity junction point **14**. A conductor **16** connects point **14** to a test loop **15** in parallel with a second test loop **15'**. A conductor **17** connects loop **15'** to a junction point **18** which is connected by a conductor **21** to one end of the coil **22** of a latching relay **20**. A conductor **23** connects the opposite end of coil **22** to positive polarity junction point **11**.

Detector devices **25**, which may be thermostatic or other normally open switches, are connected between loops **15**, **15'** at selected locations along the extent of these loops, which latter may extend for two miles or more. The loops **15**, **15'** are individually closed and isolated from each other by a test switch **30**. A relatively fixed contact arm **31** of switch **30** is connected to one end of loop **15** and normally engaged by a relatively movable contact arm **32** connected to the other end of loop **15**. Similarly, the ends of loop **15'** are connected respectively to relatively fixed contact arm **31'** and relatively movable contact arm **32'** which are normally engaged. Arms **32**, **32'** are conjointly operable by an operator **34** to engage relatively fixed and interconnected contact arms **33**, **33'**.

Relay **20** has an armature **24** normally disengaged from a contact **26** and connected to conductor **21** and thus to one end of coil or winding **22**. A conductor **27** connects contact **26** to negative polarity point **14**. Hence, when relay coil **22** is energized, armature **24** engages contact **26** to hold relay **20** closed until such time as re-set switch **12** is opened.

Loop **15** has a negative polarity due to its connection to point **14**, and loop **15'** has a positive polarity due to its connection to point **11** through relay coil **22**. Consequently, when loops **15** and **15'** are interconnected either by operation of test switch **30** or operation of detector devices **25**, relay coil **22** is energized to engage armature **24** with contact **26** to latch relay **20** and connect conductor **21** to point **14**. Test switch **30** may be operated at any time to test the operativeness of the system, whereas devices **25** interconnect the loops only upon occurrence of a condition necessitating an alarm.

When conductor **21** is connected to point **14**, a condenser **35** is charged over the following circuit: point **11**, conductor **23**, condenser **35**, conductor **36**, contact **42** of a relay **40**, armature **41**, conductor **43**, conductor **21**, armature **24**, contact **26**, conductor **27** and point **14**. When capacitor or condenser **35** is charged to a predetermined arount, it discharges through coil **44** of relay **40** to energize this coil.

Armature **41** is engaged with contact **46** to energize the audio oscillator including transformer **45** and power transistor **50**. Transformer **45** has two windings, **47** and **48**. Transistor **50** has a base **51**, collector **52**, and emitter **53**. A conductor **54** connects one end of winding **47** to conductor **21**. The other end of winding **47** is connected by a conductor **56** and a biasing resistor **57** to base **51** of transistor **50**. A conductor **58** connects relay contact **46** to loud speaker **55**, and a bias resistor **61** connects conductor **58** to one end of winding **48**. The other end of winding **48** is connected to a conductor **62** interconnecting collector **52** and speaker **55**. A ballast resistor **60**, replaceable by a loud speaker, is connected in conductor **62**. A conductor **63** connects emitter **53** to point **11**, and is connected by a bias resistor **64** to base **51**. A pilot lamp **65** is connected between relay contact **46** and conductor **23** in series with a resistance **66**.

Relay **40** remains closed while capacitor **35** is discharging, and then drops to re-engage armature **41** with contact **42**. When armature **41** is engaged with contact **46**, the tone generating transistorized audio oscillator, which is inductively coupled, is energized to generate a tone at a frequency of, for example, 700 c.p.s. The frequency may be changed to another figure by proper selection of resistances **57**, **61** and **64**. When armature **41** is re-engaged with contact **46**, condenser **35** is re-charged. The frequency of the intermittent operation of relay **40** is determined by the values of capacitor **35** and resistance **66**. Re-setting of the system is effected by momentarily opening re-set switch **12** to drop relay **30**.

The frequency of operation of cyclic relay **40** is controlled by the value of condenser **35** and the resistance of relay coil **44**, as well as by the combined values of the potential source and other circuit resistances. As the potential of battery **10** drops, the frequency of operation of relay **40** will tend to increase and the audio oscillator frequency will decrease. The speaker coils or magnets, acting as additional inductance in the audio oscillator circuit, also affect its frequency.

Test switch **30**, when in the "test" position, breaks the continuity of loops **15**, **15'** and tests the entire length of both loops by shorting the extreme ends of the loops. This will test the continuity of the loop as, if a loop **15** or **15'** is broken, the system will not operate in the "test" position of switch **30** thus indicating a fault. A discontinuity or break in either loop will not disable the alarm system, which will still function through any element **25**. However, a fault shown in the "test" position of switch **30** indicates the need for repair of either or both loops.

Light **65** and resistance **66** have values such that, when switch **30** is in the "test" position, a dim light shows the need for recharging or replacing battery **10**, and a bright light indicates good condition of the battery.

Relays **20** and **40** isolate the oscillator from loops **15**, **15'** so that the oscillator energy is not fed to the loops. This enables the use of very long loops.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An electronic detection system comprising, in combination, an audio oscillator arranged, when connected to a source of electric potential, to generate audio pulses at a pre-set frequency; a source of electric potential; a first relay operable, when energized, to connect said oscillator to said source; a self-latching relay connected to said source; a detection circuit, including at least one normally open detector switch, connected across said source, said detector switch controlling energization of said latching relay; and means effective responsive to energization of said latching relay to periodically energize said first relay; said latching relay, when energized, connecting both sides of said detection circuit to the same terminal of said source to isolate said oscillator from said detection circuit to prevent feeding of oscillator energy to said detection circuit.

2. An electronic detection circuit as claimed in claim 1 in which said detection circuit comprises a pair of relatively elongated loops respectively connected to one terminal of said source and to said latching relay; and plural normally open detector switches connected between said loops; said latching relay, when energized, connecting both loops to said one terminal of said source, to isolate said loops from said audio oscillator.

3. An electronic detection system comprising, in combination, an audio oscillator arranged, when connected to a source of electric potential, to generate audio pulses at a pre-set frequency; a source of electric potetial; a first relay operable, when energized, to connect said oscillator to said source; a self-latching relay connected to said source; a detection circuit, including at least one normally open detector switch, connected across said source, said detector switch controlling energization of said latching relay; and a capacitance connected in charging relation to said source when said latching relay is energized and said first relay is deenergized and effective, when charged, to energize said first relay; said first relay, when energized, opening the charging circuit of said capacitance; whereby said first relay is periodically energized during energization of said latching relay; said latching relay, when energized, connecting both sides of said detection circuit to the same terminal of said source to isolate said oscillator from said detection circuit to prevent feeding of oscillator energy to said detection circuit.

4. An electronic detection system comprising, in combination, an audio oscillator including a transistor triode arranged, when connected to a source of electric potential, to generate audio pulses at a pre-set frequency; a source of electric potential; a first relay operable, when energized, to connect said oscillator to said source; a self-latching relay connected to one terminal of said source; a detection circuit, including at least one normally open detector switch, connected between the other terminal of said source and said latching relay, said detector switch controlling energization of said latching relay; and a capacitance connected in charging relation to said source when said latching relay is energized and said first relay is deenergized and effective, when charged, to energize said first relay; said first relay, when energized, opening the charging circuit of said capacitance; whereby said first relay is periodically energized during energization of said latching relay; said latching relay, when energized, connecting both sides of said detection circuit directly to said other terminal of said source.

5. An electronic detection system comprising, in combination, an inductively coupled audio oscillator including a transistor triode arranged, when connected to a source of electric potential, to generate audio pulses at a pre-set frequency; a source of electric potential; a first relay operable, when energized, to connect said oscillator to said source; a self-latching relay connected to one terminal of said source; a detection circuit, including at least one normally open detector switch, connected between the other terminal of said source and said latching relay, said detector switch controlling energization of said latching relay; and a capacitance connected in charging relation to said source when said latching relay is energized and said first relay is deenergized and effective, when charged, to energize said first relay; said first relay, when energized, opening the charging circuit of said capacitance; whereby said first relay is periodically energized during energization of said latching relay; said latching relay, when energized, connecting both sides of said detection circuit directly to said other terminal of said source.

6. An electronic detection circuit as claimed in claim 5 in which said detection circuit comprises a pair of relatively elongated loops respectively connected to one terminal of said source and to said latching relay; and plural normally open detector switches connected between said loops; said latching relay, when energized, connecting both loops to said one terminal of said source, to isolate said loops from said audio oscillator.

7. An electronic detection circuit as claimed in claim 6 including a double-pole, double-throw test switch connected in the respective loops and manually operable to interconnect the loops.

8. An electronic detection circuit as claimed in claim 5 including a normally closed manually openable switch in the latching circuit of said latching relay.

9. An electronic detection system comprising, in combination, a signal generator; a source of electric potential; a pair of elongated detection loops extending, in parallel circuit relation, from respective ends adjacent said generator and said source; at least one detection switch connected between said loops and adapted, when actuated, to interconnect said loops; means connecting one loop to one terminal of said source and the other loop to the other terminal of said source in series with an electrically operated switch means, said switch means, when operated, connecting said signal generator across said source; and a multi-pole switch having a normal position connecting the respective ends of each loop to each other to independently close each loop, and a test position interconnecting said loops.

10. An electronic detection system as claimed in claim 9, in which said switch means, when operated, connects said other loop directly to said other terminal of said source to effectively shunt said loops during operation of said signal generator.

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