

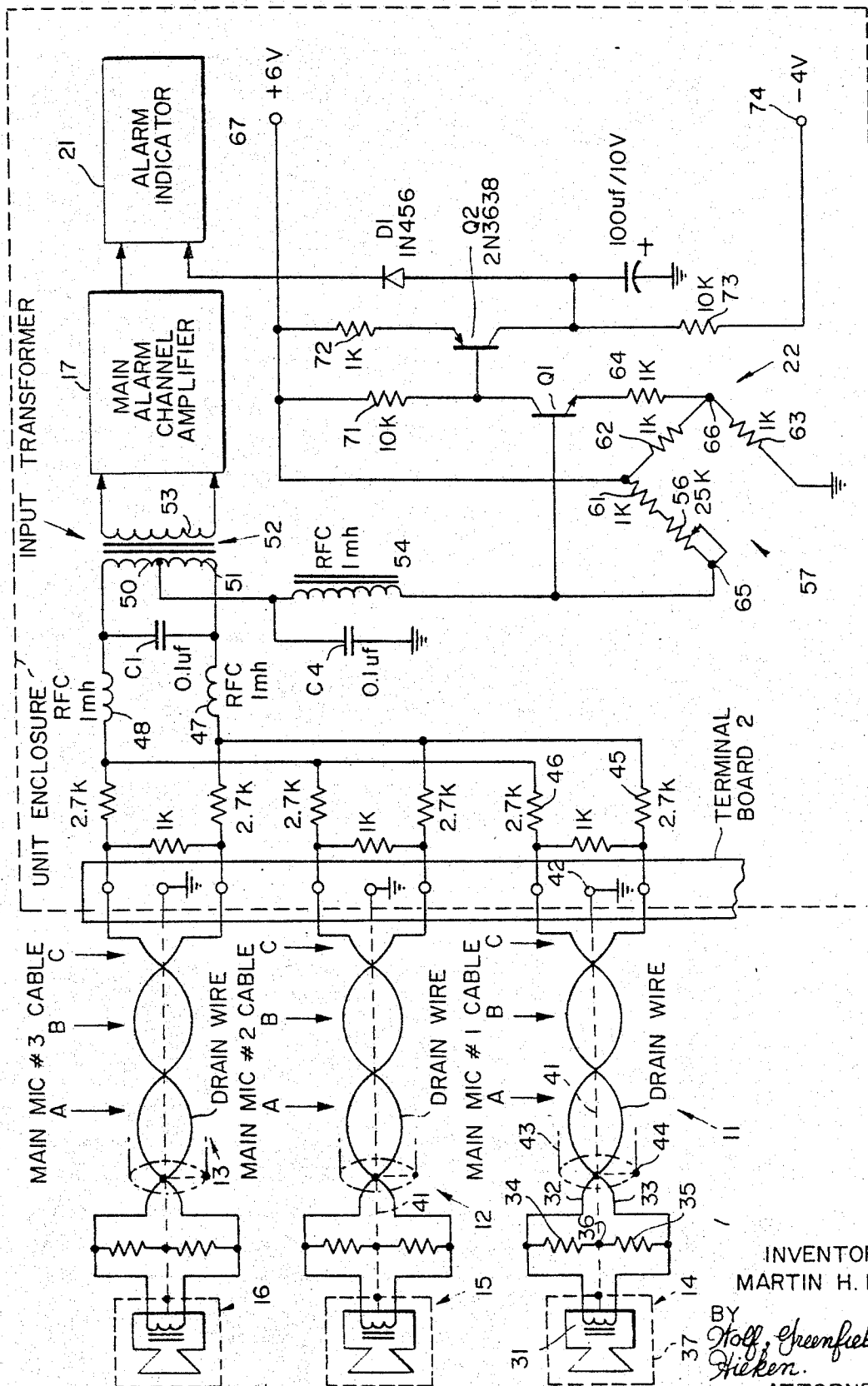
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ALARM SYSTEM SENSITIVE TO CUT CABLES AND
 INSENSITIVE TO R-F INTERFERENCE
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1

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ALARM SYSTEM SENSITIVE TO CUT CABLES AND INSENSITIVE TO R-F INTERFERENCE

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11 Claims

ABSTRACT OF THE DISCLOSURE

In an alarm system with a balanced shielded microphone cable a bare drain wire is tied to the cable shield at the end of the microphone cable, the end microphone being terminated with resistors so that a cable cut bridge circuit detects an unbalance when any microphone cable is cut to provide an alarm signal and reduce R-F interference.

BACKGROUND OF THE INVENTION

The present invention relates in general to alarm systems and more particularly concerns an acoustical alarm system of the type including an input transducer for sensing an alarm condition having means for sensing that a cable from the sensing transducer to the alarm indicating equipment has been cut.

Acoustical alarm systems, such as the Detectalarm system made by Alarmtronics Engineering, Inc. perform well for the purpose of indicating an alarm condition when a microphone receives an unfriendly noise produced by an intruder. Should an unfriendly intruder somehow cut the cable joining the sensing microphone to the alarm indicating unit, such as by gaining access to the cable during the day when the alarm system is disabled, it is possible that such an intruder could gain entry without producing an alarm condition.

Accordingly, it is an important object of this invention to provide methods and means for indicating that a cable has been cut.

It is a further object of the invention to achieve the preceding object while reducing the R-F interference.

It is another object of the invention to achieve the preceding object with reliably operating apparatus that is relatively inexpensive to fabricate.

SUMMARY OF THE INVENTION

According to the invention, there is transducing means at a remote location for sensing an unfriendly signal source and providing an electrical signal over a transmission cable to the alarm condition monitoring unit. The transmission cable includes a drain conductor connected to the end of the cable shield where the most remote transducer is located, this most remote transducer being terminated in impedance means such that cutting of the cable produces an unbalance that is sensed by a detecting unit.

More specifically, the transmission cable is balanced two-wire shielded cable including a third conductor inside the shield that is connected to the shield at the microphone end and to ground at the unit end. The two twisted signal wires that are connected to the remote

2

sensing transducer have a pair of equal resistors connected therebetween with the junction of these resistors connected to the shielded conductor. The alarm unit end of the cable is coupled by a pi network to the primary of the input transformer that carries normal microphone sounds to the main channel amplifier. The primary of this transformer is center tapped and coupled to a detecting circuit that senses a D-C unbalance whenever a cable is cut to provide an appropriate signal that could be an alarm signal. Twisted conductors and a grounded drain wire coupled to a balanced input help reduce R-F interference.

Numerous other features, objects and advantages of the invention will become apparent from the following specification when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

The single figure shows a schematic circuit diagram of a preferred embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference now to the drawing, there is shown a schematic circuit diagram of an exemplary embodiment of the invention. In this specific example there are shown three main microphone cables 11, 12 and 13 for coupling microphones 14, 15 and 16, respectively, to the main alarm channel amplifier 17 of the alarm monitoring unit which causes alarm indicator 21 to indicate an alarm condition when an unfriendly noise is sensed. The output of detecting circuitry 22 will also cause alarm indicator 21 to indicate an alarm condition when any of the cables have been cut.

Each of the microphones 14, 15 and 16 are the end microphones of cables 11, 12 and 13. It is to be understood that additional microphones may be connected into the main cables 11, 12 and 13 at intermediate points, such as those designated by the letters A, B and C along the line, but these microphones are not terminated with resistors as are in microphones 14, 15 and 16. The detailed description which follows shall be only of elements associated with main cable #1 because those associated with cables #2 and #3 are similar.

Each of the end microphones may be of a type having an input winding such as 31 with each end connected to one of the two twisted microphone signal conductors, such as 32 and 33. Equal resistors, such as 34 and 35, terminate the ends of winding 31 as shown with their junction 36 connected to the microphone case 37 and to the bare drain wire 41 shown by broken line for clarity inside microphone cable 11 which in turn is grounded at the input terminal 42 at the alarm monitoring unit. This bare drain wire 41 is also connected to the cable shield 43 at the end 44 as indicated. Signal conductors 32 and 33 are connected by equal isolating resistors 45 and 46, respectively, to R-F chokes 47 and 48, respectively, which in turn are connected to respective ends of the primary 51 of transformer 52. The secondary 53 of transformer 52 is coupled to the main alarm channel amplifier 17 to transmit sounds received by any of the microphones to alarm indicator 21 for analysis and provision of an alarm indication when the noise is unfriendly.

Primary winding 51 has a center tap 50 that is coupled by R-F choke to the base of transistor Q1 and one end of balancing potentiometer 56 of cable cut bridge circuit 57. The bridge circuit 57 includes only three outside arms, the first being balancing potentiometer 56 in series with resistor 61, the second being resistor 62 and the third being resistor 63. When transistor Q1 conducts, the series combination of its base-emitter resistance and resistor 64 is connected across opposed junctions 65 and 66.

Potentiometer 56 is normally adjusted so that transistor Q1 is nonconductive. The base of transistor Q1 is normally at +3 v. DC when the cables are not cut and the end microphones terminate the cable. However, if the cable becomes cut, center tap 54 is no longer at a +3 v. DC potential. The base of transistor Q1 then begins to rise toward the +6 supply voltage on terminal 67 at the junctions of resistors 61 and 62. Transistor Q1 then conducts, and its collector drops in potential as current is drawn through collector resistor 71. Since transistor Q2 has its base connected to the collector of transistor Q1, PNP transistor Q2, previously nonconductive because its emitter is coupled through emitter resistor 72 to the +6 volt potential on terminal 67, conducts. The potential on the collector of transistor Q2 then begins to rise as current flows through its collector resistor 73 connected to the -4 volt potential on terminal 74. This positive going potential rise is coupled by diode D1 to alarm indicator 21 to provide an alarm indication, thereby warning that the cable has been cut.

The invention thus allows virtually any practical number of microphones to be connected to the monitoring unit while providing an indication that even one microphone signal conductor has been cut, for cutting any one signal conductor will destroy the balance and cause transistor Q1 to conduct. This cable cut monitoring is accomplished reliably and with a relatively few inexpensive components that consume negligible power.

In summary the invention detects cable cut, reduces R-F interference and utilizes a pair of lines performing the dual function of both carrying D-C cable cut current and audio signal current.

It is evident that those skilled in the art may now make numerous uses and modifications of and departures from the specific embodiment described herein without departing from the inventive concepts. Consequently, the invention is to be construed as embracing each and every novel feature and novel combination of features present in or possessed by the apparatus and techniques herein disclosed and limited solely by the spirit and scope of the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed, are defined as follows:

1. An alarm system comprising, transducing means for providing a signal representative of an alarm condition, cable means for coupling said transducing means to a location remote from said transducing means, said cable means having first and second signal conductors, and a drain conductor, and first and second substantially equal resistors connected in series across the input to said transducing means, the junction of said series-connected resistors being connected to said drain conductor, the other end of each of said resistors being connected to a respective one of said first and second signal conductors.
2. An alarm system in accordance with claim 1 wherein said cable comprises said first and second signal conductors forming a twisted pair inside an insulatedly separated conducting shield also enclosing said drain conductor,

said drain conductor being connected to said shield at the end thereof near said transducing means.

3. An alarm system in accordance with claim 1 and further comprising,

alarm signal monitoring means at the remote location having an input balanced with respect to a reference terminal thereat defining reference potential, the other end of said drain conductor being connected to said reference terminal,

means for coupling said first and second signal conductors to the latter balanced input,

said latter balanced input having an intermediate terminal for providing a cable cut signal,

and detecting means coupled to said intermediate terminal for providing an indication of a change in said cable cut signal indicative of said cable having been cut.

4. An alarm system in accordance with claim 3 wherein said means for coupling to the latter balanced input comprises a pi resistive network having first and second legs of substantially equal resistance in series with respective ones of said first and second signal conductors.

5. An alarm system in accordance with claim 3 wherein said latter balanced input comprises a transformer having a tapped primary, the tap on said primary comprising said intermediate terminal.

6. An alarm system in accordance with claim 5 wherein said detecting means comprises,

a bridge having first, second and third resistive legs connected in series between a first bridge junction and said reference terminal to define a second bridge junction between said first and second legs and a third bridge junction between said second and third legs,

means for D-C coupling said tap to said first bridge junction,

a normally nonconductive first transistor having its base connected to said first bridge junction, its emitter D-C coupled to said third bridge junction and its collector D-C coupled to a source of energizing potential that is connected to said second junction,

whereby cutting of said cable causes said transistor to become conductive.

7. An alarm system in accordance with claim 6 wherein said cable comprises said first and second signal conductors forming a twisted pair inside an insulatedly separated conducting shield also enclosing said drain conductor,

said drain conductor being connected to said shield at the end thereof near said transducing means.

8. An alarm system in accordance with claim 7 wherein said means for coupling to the latter balanced input comprises a pi resistive network having first and second legs of substantially equal resistance in series with respective ones of said first and second signal conductors.

9. An alarm system in accordance with claim 3 and further comprising at least one other of said transducing means,

at least one other of said cables for coupling said at least one other transducing means to the remote location,

at least one other pair of first and second substantially equal resistors connected in series across the input to said at least one other transducing means,

the junction of the latter series connected resistors being connected to the drain conductor of said at least one other cable,

the other end of each of the latter resistors being connected to a respective one of the first and second signal conductors of said at least one other cable, the other end of the latter drain conductor being connected to said reference terminal,

and means for coupling the latter first and second signal conductors to said alarm signal monitoring means balanced input.

5

10. An alarm system in accordance with claim 9 where-
in each of said cables comprises said first and second
signal conductors forming a twisted pair inside an in-
sulatedly separated conducting shield also enclosing said
drain conductor,

said drain conductor being connected to said shield
at the end thereof near said transducing means.

11. An alarm system in accordance with claim 1 and
further comprising at least one other transducing means
having first and second input terminals connected respec-
tively to said first and second signal conductors respec-
tively at a point on said cable spaced from the end there-

6

of where said first-mentioned transducing means is con-
nected.

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