

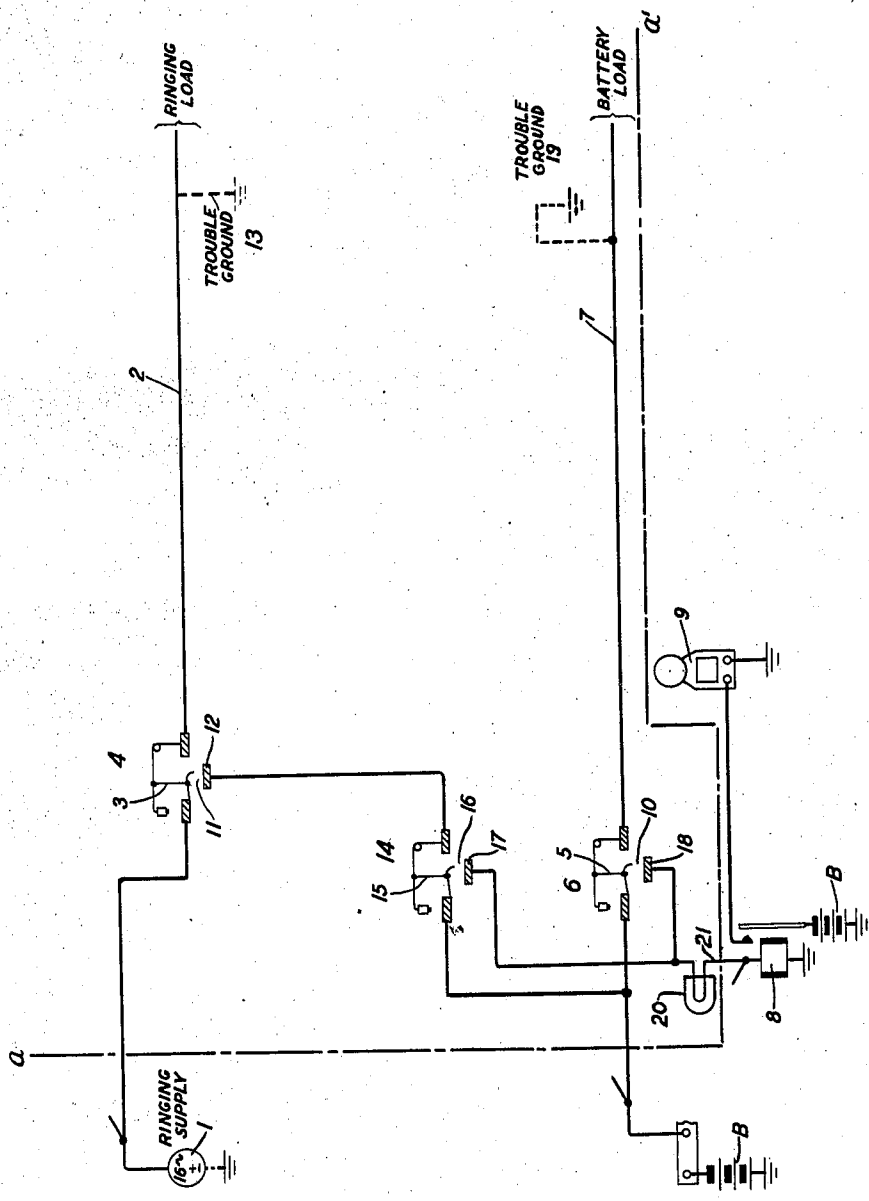
Sept. 14, 1943.

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2,329,518

ALARM SYSTEM

Filed March 15, 1941



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UNITED STATES PATENT OFFICE

2,329,518

ALARM SYSTEM

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Application March 15, 1941, Serial No. 383,516

5 Claims. (Cl. 177-311)

This invention relates to fuse alarm systems and more particularly to improvements in such systems employing so-called alarm fuses which operate, responsive to rupture of the fusible element, to connect the current source to a relay which in operating controls any desired arrangement of signal devices such as lamps, bells, or combinations of both.

It is a well-understood practice in telephone exchanges to connect the main or central office battery, through a main fuse, to a plurality of branch circuits which supply direct current to small switching circuit groups, for example, small groups of automatic switches and their associated equipment and circuits. These small groups of switches and associated circuits are usually mounted in horizontal rows, one above another, on iron frames which rows are sometimes called shelves. Low frequency alternating ringing current is also supplied to each shelf of switches. In order that a short circuit ground in the switching circuits of one of the above-described shelves shall not affect the supply of current to other shelves it is the practice to provide each shelf with so-called alarm fuses of the type disclosed in Patent 819,959 to E. B. Craft, issued April 17, 1906, which alarm fuses are connected in series with both the battery and ringing current supplied to the shelf equipment.

It is well understood that the rupture of the fusible element of these alarm fuse devices causes the incoming supply conductor to be connected to ground through a relay, usually common to a number of shelves, thereby causing the relay to operate which in turn causes a bell to ring as a trouble signal to the attendant. Due to the fact that both alternating and direct currents are involved in the arrangement above described, it is obvious that two common alarm relays are required for a predetermined number of shelves, one relay being responsive to alternating current and the other responsive to direct current.

Further, in order to insure prompt location of the shelf on which the operated fuse is located the practice is to also provide lamps on each shelf, one for each alarm fuse, which lamps are connected in the respective leads to the alarm relay which light as soon as the respective fuse operates to serve as a visual indication of the shelf on which the trouble has occurred. It will therefore be noted that a minimum of two common relays plus two lamps per shelf are required for each exchange and as the size of the exchange increases the number of alarm relays will also increase, it being understood that in prac-

tice at least one direct current relay and one alternating current relay will be required for each line of switch frames.

An object of the present invention is to reduce the number of common alarm relays and the number of shelf lamps required for telephone exchange fuse alarm systems of the character described.

The improved arrangement, according to the present invention, whereby the foregoing object is attained, will be understood from the following description and accompanying drawing which shows a source of alternating current and a source of direct current, each source supplying a respective load circuit, an alarm fuse individual to each load circuit, an alarm relay directly controlled by the operation of a first one of said alarm fuses and means comprising a third or additional alarm fuse so connected and arranged that rupture of the second fuse will cause rupture and operation of the third fuse to connect the source of current associated with the first fuse to the alarm relay independent of the first fuse.

Referring to the drawing, a source of alternating ringing current *I* and a source of direct current *B* are shown connected to respective load circuits *2* and *7* to supply ringing and direct current to circuits of a so-called shelf of automatic switches (not shown), which load circuits include respective alarm fuses *4* and *6*.

The circuits shown to the right and above the broken line *a-a'* are individual to one switch shelf and it will be understood that sources *I* and *B* supply a plurality of other shelf equipments (not shown).

Below the broken line *a-a'* and common to a plurality of other shelf equipments, is a direct current relay *8* adapted to control an auxiliary circuit including an audible signal device, such as a bell *9*.

Alarm fuses *4* and *6* may be of the type described in the before-mentioned Craft Patent 817,959 and are so constructed and arranged that when connected between a current source and a load circuit, in the manner shown, rupture of the fusible elements, such as *3* or *5*, closes a normally open contact, such as *11* or *10*, between the current supply source and a third terminal, such as *12* or *13*. In the present arrangement alarm fuse *6* is shown connected as usual, in the battery (direct current) load circuit *7*, whereby rupture of its fuse *5*, due to a ground *19* on the load circuit *7*, permits closure of contacts *10* to close a circuit from the battery *B* to ground in series with relay *8*, which, in turn, may con-

trol an auxiliary circuit including some audible or visible signal such as bell 9. Device 4 is also connected in a similar manner in the ringing load circuit 2 whereby rupture of fuse 3, by a trouble ground 13 on the circuit 2, permits closure of contacts 11 but the circuit closed thereby is, in this instance, from ringing supply source 1 to battery B in series with fuse 15 of a third or auxiliary alarm fuse device 14 which is so connected that the consequent rupture of fuse 15 by closure of this circuit permits contacts 16 to close thereby completing an operating circuit for relay 8, from battery B, independent of contacts 10 of fuse alarm device 6.

Operation of the alarm system of the invention is obvious from the above description, i. e., if an excessive load is placed on the battery load circuit 7, fuse 5 will rupture thereby permitting closure of contacts 10 of device 6 to cause operation of relay 8 and audible signal 9. On the other hand, if an excessive load is placed on the ringing voltage source 1, as for example by a low resistance ground connection 19, fuse 3 will be ruptured thus permitting contacts 11 to close a low resistance circuit from the grounded ringing source 1 to the grounded battery B in series with fuse 15 of the auxiliary device 14 which causes immediate rupture of the fuse 15. When fuse 15 ruptures it permits contacts 16 of the associated device to close. As these contacts are in parallel with contacts 10 of device 6, relay 8 will be operated from battery B as in the case when fuse 5 ruptured.

As a visual indication of a ruptured fuse associated with either load circuit, a lamp 20 is connected in the conductor 21 common to alarm terminals 17 and 18 of fuses 14 and 6 which lamp lights whenever contact 16 or 18 close to connect battery B to the common relay 8, it being understood that a similar lamp is connected in the same manner and associated with each shelf of switch circuits thereby facilitating prompt location of trouble.

From the foregoing it will be noted that in the arrangement of the present invention a single relay is made to serve both as a direct and an alternating current alarm by the employment of a single inexpensive alarm fuse device and also that a single lamp serves both load circuits instead of the necessity of providing two lamps one for each load circuit as in the case of prior arrangements.

It will also be understood that the operation of the arrangement shown will be the same if the alternating source 1 and battery B are interchanged with respect to load circuits 2 and 7 and the relay 8 is constructed to respond to alternating instead of direct current.

What is claimed is:

1. In a fuse alarm system, a first source of current, an alarm device adapted to operate in response to connection of said first source thereto, a second source of current having a different characteristic from said first source, a load circuit connected to said second source, a main alarm fuse and an auxiliary alarm fuse, said main fuse being included in said load circuit and

adapted when ruptured to disconnect said load circuit therefrom and connect said second source in series with said auxiliary fuse to said first source, said auxiliary fuse being arranged to connect said first source to said alarm device when ruptured.

2. In an alarm system, first and second sources of different characteristic current supply, individual load circuits connected to each source, an individual alarm fuse in series with each load circuit, a signal device adapted to be operated by said first source responsive to operation of the associated fuse device, and means including an auxiliary alarm fuse device adapted to be operated and to connect said first source to the signal device responsive to operation of said second fuse device.

3. In an alarm system, a first source of current having a grounded terminal, a grounded alarm device arranged to operate in response to the connection of said first source thereto, a second grounded source of current having a different characteristic from said first source, a load circuit connected to said second source, main and auxiliary alarm fuse devices each including a fuse element, said main device being arranged to disconnect said second source from the load circuit and connect said second source to said first source in series with said auxiliary device responsive to rupture of said main device fuse element, said auxiliary device being so arranged that rupture of its respective fuse element following rupture of the main device fuse will connect said first source to said alarm device.

4. In a fuse alarm system for telephone exchanges, a source of direct current having one pole grounded, a direct current relay having one terminal connected to ground, a grounded source of alternating current, a load circuit connected thereto, a first alarm fuse in said load circuit having an alarm terminal and adapted when ruptured in response to a predetermined current flowing therein to connect said alternating source to the alarm terminal thereof, an auxiliary alarm fuse also having an alarm terminal, a connection between said first alarm terminal and said direct current source including said auxiliary fuse, and a connection between said auxiliary alarm terminal and said relay, said auxiliary fuse being connected between said first alarm terminal and said direct current source in such a direction that when ruptured said direct current source will be connected to the auxiliary alarm terminal.

5. In an alarm system, a first source of current, a signal device responsive to connection of said first source thereto, an alarm fuse device adapted when operated to connect said first source to said signal device, a second source of current of different character from said first source, a load circuit connected thereto, and a second alarm fuse in series therewith adapted when operated to connect said second source to said first source in series with said first alarm fuse to cause its operation.

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