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Reynolds et al.

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[54] **PARALLEL ALARM CIRCUIT HAVING SERIES SUPERVISION**

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[52] **U.S. Cl.** .....**340/409,** 307/37, 317/150, 340/176, 340/253 B, 340/256, 340/326, 340/328

[51] **Int. Cl.**.....**G08b 21/00**

[58] **Field of Search**.....340/409, 411, 214, 176, 326, 340/227, 227.1, 328, 253 R, 253 B, 256; 317/150; 307/37

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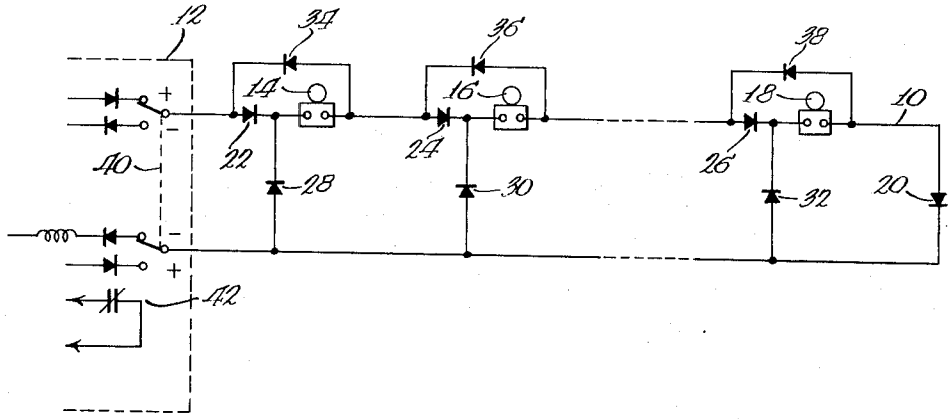
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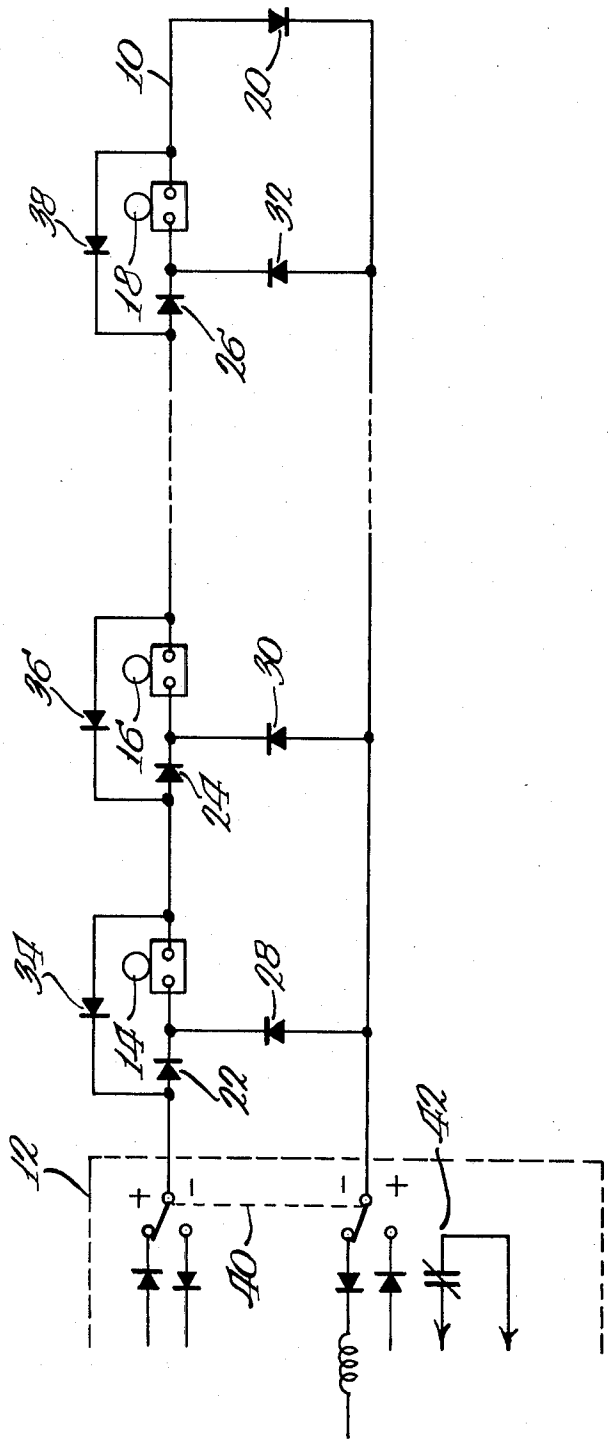
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[57] **ABSTRACT**

An alarm circuit having a plurality of audible sounding devices is arranged in series relative to a supervisory current in one direction of flow to enable supervision of the coils of the devices. The circuit is arranged in parallel in the other direction of flow via polarized devices to enable sounding of the devices in parallel.

6 Claims, 1 Drawing Figure




10
20
38
18
32
26
36
16
30
24
34
14
28
22
12
40
42
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-
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+

PARALLEL ALARM CIRCUIT HAVING SERIES SUPERVISION

BACKGROUND OF THE INVENTION

This invention relates to a supervised alarm circuit having a plurality of alarm sounding devices connected by common wiring to a control unit, wherein a small current is continuously conducted through the circuit to enable detection of faults or defects in the circuits.

It is common to connect a plurality of alarm signal devices in parallel or in series, whereby the alarms may be sounded simultaneously. In the case of a series connection, a small supervising current which is considerably less than the operating current of the signal devices may be passed through the circuit and the coils of the devices without causing the signal to sound. The small current may be used to operate a relay and therefore permit continuous electrical supervision of the circuit in the case of a defect, accidental grounding, break in the wiring, or the like. A difficulty with a series arrangement is that a break in the line will disconnect all of the signals. Also, since the voltage required to produce rated operating current depends upon the voltage rating of the signals and the number of signals, a balance resistor or transformer must normally be incorporated into the circuit to prevent overloading of the signal devices.

A parallel alarm circuit may comprise a plurality of alarm devices connected in parallel with a diode connected in series with each device. The diodes are orientated to permit parallel sounding of all alarm devices in one direction of current flow; the supervisory current flows in the opposite direction. One advantage of such a parallel circuit is that a break of the signal circuit wiring will result in the loss of alarm devices only from the break to the end of the alarm signal circuit. A disadvantage is that the supervisory current flows through the field wiring of the circuit only and not through the coils of the alarm; hence defects within the individual alarms will not be detected.

BRIEF SUMMARY OF THE INVENTION

The present invention achieves the advantages of both series and parallel circuits without their normally inherent disadvantages. The circuit incorporates polarized devices in a manner such that the alarms are arranged in series relative to a supervisory current but are arranged in parallel relative to a reverse flow power circuit. The circuit includes a control or other unit having means to reverse the polarity of the current under alarm conditions. Thus, the coils of the alarm sounding devices as well as the circuit wiring may be supervised, although no balancing resistors or transformers are required. Since the alarm devices act in parallel under alarm conditions, a break in the signal circuit wiring will cause a loss only of those alarm devices beyond the break to the end of the alarm circuit. Also, because of reduced current requirements, a large number of alarm sounding devices may be placed in the circuit due to its unidirectional behavior as a parallel circuit.

THE DRAWING

The drawing is a schematic of the circuit employed in the practice of the presently described invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the circuit shown in the drawing, it may be seen that the wiring may be considered as being in series in one direction and in parallel in the other. A loop **10** extends from a control unit **12** to which is supplied the supervisory current as well as the required current for sounding the alarm devices. A plurality of alarm devices, such as **14**, **16**, and **18** are connected in series in the loop **10**, and the loop may comprise a series resistor or diode **20** at the end of the loop for the purpose of controlling or regulating the flow of supervisory current through the series loop. The series circuit also includes diodes such as **22**, **24**, and **26** connected in series with the respective alarm devices **14**, **16** and **18**, said diodes being located in the loop nearer to the control unit **12** than their respective alarm devices. The diodes **20**, **22**, **24** and **26** are each orientated to permit series flow of current around the loop in one direction only, in this case a clockwise direction.

In order to achieve a parallel circuit in the reverse direction of current flow, a plurality of diodes, such as **28**, **30** and **32** are each connected in parallel across the loop with one side of the diode connected to the loop between each respective alarm device and its associated series diode, and the other side of the diode being connected to the other side of the loop. In addition, a loop is provided around each alarm device and its associated series diode to complete the reverse parallel circuit, each of said loops including a diode, such as **34**, **36** and **38**, all of which have the same polarity orientation as the parallel diodes, which is opposite to that of the series diodes.

The control unit **12** preferably includes a power reversal switch or relay **40** for the purpose of reversing the polarity of the current flowing through the circuit. Preferably, a DC current is used for supervisory purposes, and a half-wave alternating current is provided for activating the alarms, although the alarm current can be half-wave, full-wave rectified or filtered D.C. The supervisory current when interrupted may close a relay contact **42** connected to a circuit or device to indicate a fault in the alarm circuit.

Having described the circuit and its components, the operation of the circuit will now be described. In the condition shown in the drawing, the relay **40** is in supervisory position, whereby a DC current may flow in a clockwise direction around the loop through the series supervisory circuit and hence directly through the coils of the alarm devices. In the event that a defect occurs, the relay contact **42** is closed by loss of current to indicate the malfunction.

Under alarm conditions, the power reverse relay **40** is activated to cause current to flow in the reverse or counterclockwise direction in the loop **10**. For example, the current flows through the diode **28**, the alarm **14** and back around the loop through the diode **34**, as in a parallel circuit. It will be noted that the placement of the diodes positively restricts current flow to series around the loop in one direction, while positively restricting current flow to parallel through the alarm devices in the other or reverse direction.

It will be obvious to those skilled in the art that various modifications may be made to the design of the cir-

cuit and the components thereof without departing from the spirit and scope of the invention as expressed in the appended claims.

Having thus described the invention, what is claimed is:

1. A parallel signal circuit having series supervision comprising a plurality of signal devices utilizing common wiring, means for limiting conduction of current in series through said wiring and said devices in one direction of current flow, and means for limiting conduction of current sufficient to sound such devices in parallel through said wiring in a reverse direction of current flow.

2. A parallel alarm circuit having series supervision comprising a loop, a plurality of alarm devices connected in series in said loop, series polarized means connected prior in series with each of said alarm devices for limiting series current flow through said devices to one direction in said loop, parallel polarized means connected in parallel across said loop and associated with each of said alarm devices, said parallel polarized means each being connected at one end of between said series polarized means and its corresponding alarm device, and polarized loop means around each alarm device and its associated series polarized means, said parallel polarized means and polarized loop means serving to limit flow of current to parallel through said alarm devices in the other direction of current flow around said loop.

3. The circuit of claim 2 wherein a series current regulator means is provided at the closed end of said loop beyond said alarm devices.

4. The circuit of claim 2 wherein said loop is connected to a control unit having means for reversing flow of current through said loop.

5. The circuit of claim 4 wherein said control unit includes a relay activated by said series current flow.

6. A parallel alarm circuit having series supervision comprising a power loop, means for reversing polarity of current in said loop, a plurality of alarm devices connected in series in said loop, first polarized means connected in series with each of said alarm devices and limiting series flow of current through said devices to one direction around said loop, second polarized means connected across said loop to each device in parallel, and third polarized means connected around each device and its associated first polarized means, said second and third polarized means limiting flow of current in the other direction in said loop to parallel flow through said devices.

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