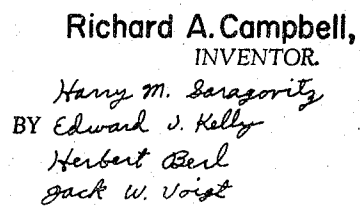


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INTERLOCK CIRCUIT FOR FLOATING POWER SUPPLY

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ABSTRACT OF THE DISCLOSURE

A shorted secondary winding filament transformer provides the proper isolation for the interlock circuit. A relay winding is connected to the DC power supply. A resistor connects the contacts of the relay to the DC power supply to keep the contacts near the voltage level of the relay winding.

The problem exists to provide an indication of whether a floating power supply, many kilovolts from ground, is operating or not. A desired indication is a relay closure for an interlock chain but this requires a relay with an extremely high coil to frame insulation and is, therefore, expensive. In order to avoid the costly approach of using the relay with high frame insulation, a circuit to isolate voltages is required. To do this by ordinary transformer circuit systems obviously requires primary signals of the AC type and will not work when the floating supply is a DC voltage.

It is an object, therefore, of my invention to provide proper isolation of a floating power supply to a relay circuit by unique transformer circuitry.

A further object of the present invention is to provide isolation of a floating power supply, many kilovolts from ground, by means of a filament transformer.

A still further object of the present invention is to provide an inexpensive, effective method of coupling go-no-go signals from one point to another wherever isolation must be maintained between points.

The invention further resides in certain novel features of construction, combinations and arrangements of parts, and further objects and advantages of the invention will be apparent to those skilled in the art to which it pertains, from the following description of the preferred embodiment thereof described with reference to the accompanying drawing, which forms a part of the specification, and wherein the same reference characters represent corresponding parts throughout the drawing, and in which:

The single figure shows a schematic diagram illustrating a preferred form of the invention.

In order to better understand the operation of the system described in the figure, a description of its components referred to is first presented. A DC power supply 1 has an output of 30 volts but is many kilovolts from ground potential. A DC sensing relay 3 has a solenoid winding 5 and contacts 7. Resistor 9 is provided as a secondary winding current limiting means. A grounding resistor 11 is provided. Transformer 13 is a filament transformer having a high primary to secondary voltage breakdown. Transformer 13 has its primary winding 21 connected between a 115 volt AC input 15 and a 115 VAC interlock relay 17. Contacts 19 of relay 17 are connected to an interlock circuit so as to indicate whether the power supply 1 is operating.

Operation

In the operation of this invention a series impedance in the form of the primary winding 21 of the filament transformer 13 is caused to vary. This varying impedance is connected between the 115 VAC input 15 and the in-

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terlock relay solenoid 23. When the secondary winding 25 of transformer 13 is open, the impedance of primary winding 21 is at a high value. However, when relay 3 is closed, the secondary winding 25 is shorted through a current limiting resistor 9 and draws current; therefore causing the impedance of the primary winding 21 to drop.

When the power supply 1 is off, sensing relay 3 has its contacts 7 in open condition. This means that the voltage drop across primary winding of transformer 13 is at a high level, resulting in insufficient current through solenoid 23 to close contacts 19. When the power supply 1 is on, relay 3 closes its contacts 7. With contacts 7 closed, current is drawn in the secondary 25, limited by resistor 9, and the voltage drop across the primary 21 is reduced. This allows solenoid 23 to close contacts 19 so that the interlock circuit can indicate an on condition for the floating power supply.

A resistor 11 is connected between the floating power supply 1 and the contacts of relay 3. This resistor is used to keep the coil to contact voltage of relay 3 to a safe limit by raising the voltage of the contact to the level of the floating supply. This insures that the high voltage appears between the transformer windings rather than across the relay 3.

This system can be used wherever there must be signal switching by relays in the presence of large DC voltages between the source of the switching signal and the voltage to be switched. In the drawing the source is a low voltage floating many kilovolts from ground, while the switched signal is an interlock string at or near ground potential. Other embodiments of the invention can include control circuitry, where the source is at ground and the controlled element is above ground, or in a pulsed or low noise system where isolation between two circuits is desired, in which case the transformer would be a low capacitance, high isolation type.

A preferred embodiment of the invention has been chosen for purposes of illustration and description. The preferred embodiment illustrated is not intended to be exhaustive nor to limit the invention to the precise form disclosed. It is chosen and described in order to best explain the principles of the invention and their application in practical use to thereby enable others skilled in the art to best utilize the invention in various embodiments and modifications as are best adapted to the particular use contemplated. It will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention as set forth in the appended claims, and that in some cases certain features of the invention may sometimes be used to advantage without a corresponding use of other features. Accordingly, I desire the scope of my invention to be limited only by the appended claims.

I claim:

1. An isolating system comprising first and second circuits which are to be isolated from each other, a floating power supply which is above ground potential, said first circuit being supplied by said floating power supply, said second circuit being substantially at ground potential, first relay means having its solenoid connected across the floating power supply so its contacts will be responsive to whether the floating power supply is on or off, a transformer having a primary winding and a secondary winding, the contacts of said relay means being connected across said secondary winding, a first resistor connected between the contacts of said first relay means and one side of the floating power supply, and a source of AC power connected in series with the primary winding of said transformer and with said second circuit.

2. An isolating system as set forth in claim 1, wherein

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said second circuit is an indicating circuit including a second relay means.

3. An isolating system as set forth in claim 2, wherein said second relay means has a solenoid connected in series with said primary winding and said AC source.

4. An isolating system as set forth in claim 3, further including a second resistor connected in series with the contacts of said first relay means and said secondary winding of said transformer.

5. An isolating system as set forth in claim 4, wherein said second relay means has contacts connected in series with an interlock circuit.

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6. An isolating system as set forth in claim 5, wherein said transformer is a filament transformer.

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