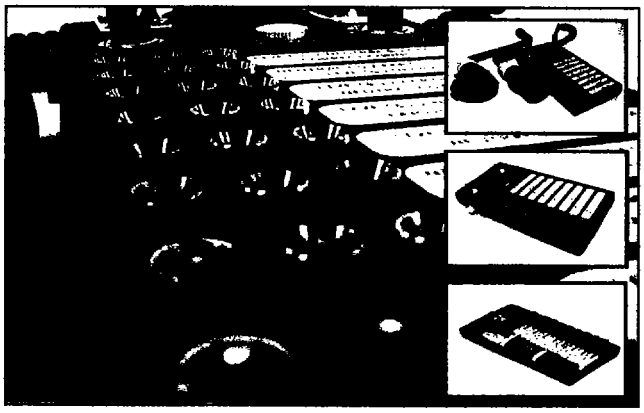
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TITLE

Electrical Continuity And Polarity Tester

ABSTRACT

The invention relates to the testing of portable electrical distribution boards and extension cables. All portable electrical distribution boards and extension cables must be tested for electrical continuity and polarity before they can be safely used. This is to identify any electrical faults which may result in electric shock and property damage. It is designed for testing portable DBs and extension cables without power required on the equipment to be tested. The tester incorporates a LED display and buzzer to inform the user of the relevant equipment status. Thus, the whole process becomes easier and safer to carry out.



BACKGROUND OF THE INVENTION

The present invention relates to the testing of electrical continuity and polarity in portable electrical distribution boards and extension cables for electrical faults.

Portable electrical distribution boards are widely used in the marine industry. They are mounting enclosures for multiple electrical circuit breakers and are typically found in central locations onboard vessels. Their primary function is to serve as the point at which electricity is distributed within a vessel. The externally mounted sockets (110V and 220V) allow users to plug and connect into the electrical power distribution for various purposes such as lighting and electrically powered tools. Circuit breakers inside a portable distribution board can be used to manually de-energize electrical circuits when the downstream wiring is being serviced.

An extension cable is a length of flexible electrical power cable with a plug on one end and a socket on the other end (usually of the same type as the plug). The plug and socket for different voltages (110V and 220V) are dissimilar in size and cannot be interchanged. This is to prevent connections to erroneous voltages.

The electrical continuity of a system is its ability to conduct an electric current. A system is characterized by its resistance, denoted as R. If R=0 Ω: the system is a perfect conductor; if R is infinite: the system is a perfect insulator. The lower the resistance of a system, the better its electrical continuity. The electrical polarity of an object refers to its physical alignment of the positive and negative ends (for DC) or its "Live", "Neutral" and "Earth" terminals (for AC).

A short circuit is an accidental low resistance connection between two nodes of an electrical circuit that are meant to be at different voltages or polarities. This results in an excessive electric current limited only by the internal impedance of the current source and potentially causes circuit damage, overheating, fire or explosion. This is usually the result of an electrical fault.

Consequently there is a need to test portable distribution boards and extension cables for any electrical faults before they are used. Testing for electrical continuity will prevent any open circuits, missing connections and short circuits. Testing for electrical polarity will prevent any incorrect connections which may lead to electrical fault and short circuit.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front perspective view of one embodiment of a fully assembled electrical continuity and polarity tester as disclosed in the present invention

Fig 2 is a single line diagram of an electrical continuity and polarity tester in accordance with various embodiments of the invention

DETAILED DESCRIPTION OF THE INVENTION

In this regard, the present invention provides an improved tester construction including a casing which houses a circuit board, LEDs, batteries, a buzzer and several pushbuttons. The plug-in for the Master Plug and the Test Plug/Socket are mounted externally to facilitate the connection of the relevant equipment to be tested. There are a total of three pushbuttons; the first is the test button which is depressed to check the electrical equipment connected to the Master Plug and the Test Plug/Socket. The Battery Check button is used to activate the battery meter to check remaining voltage left on the power source. Lastly, the LCD and Buzzer Test button is pressed to check that all the LEDs and buzzer is in order. Test status of the electrical equipment in question is listed beside the LED display for easy reference. The invention is powered by two 9V PP3 batteries connected in series. Unscrewing the back panel will allow the user to change the batteries.

With reference to Fig 2, for the first condition (Live/Neutral/Earth correct connection), when the test button is depressed, relays R1, R3, R5 and R6 will energize, the open contacts of R1 and R3 leading to the first set of LEDs GGG will close and light up the LED circuit. The close contacts of R1 and R3 will open to interlock GRR, GGR, GRG and RGG.

For the second condition (Neutral and Earth reverse connection, Live correct connection), relays R1, R5 and RB will energize, the open contacts of R1, R5 and RB will close. As a result, the second set of LEDs GRR will light up and the buzzer will sound. The close contact of R1 will open to interlock GRG.

For the third condition (Live and Neutral correct connection, Earth open circuit), relays R3, R5, R6 and RB will energize, the open contacts R3, R5, R6 and RB will close. The third set of LEDs GGR will light up and the buzzer will sound. The close contact of R3 will open to interlock GRG and RGG.

For the fourth condition (Live and Earth correct connection, Neutral open circuit), relay R5 and RB will energize, the open contact R5 and RB will close. The fourth set of LEDs GGR will light up and the buzzer will sound. The close contact of R3 will open to interlock GRG and RGG.

For the fifth condition (Neutral and Earth correct connection, Live open circuit), relay R6 and RB will energize, the open contacts R6 and RB will close. The fifth set of LEDs RGG will light up and the buzzer will sound.

For the sixth condition (Live and Neutral reverse connection, Earth correct connection), relays R2, R4, R4A and RB will energize, the open contacts R2, R4 and RB will close. The sixth set of LEDs RRG will light up and the buzzer will sound. The close contact of R4A will open to interlock RGG.

For the seventh condition (Live and Neutral reverse connection, Earth open circuit), relays R2 and RB will energize, the open contacts R2 and RB will close. The seventh set of LEDs RRR will light up and the buzzer will sound.

For the eighth condition (Live and Earth reverse connection, Neutral correct connection), relays R4, R4A, R6 and RB will energize, the open contacts R4, R6 and RB will close. The eighth set of LEDs RGR will light up and the buzzer will sound. The close contact of R4A will open to interlock RGG.

A battery test circuit was added to verify the voltage remaining on the battery power source. This is to prevent any interpretation inaccuracy should the voltage be insufficient to light up the test circuit. The battery test button is depressed to activate the voltage meter. If the meter falls into the red zone, the batteries should be changed to prevent any errors.

A buzzer and LED check circuit was implemented to ensure that both are working before testing can take place. When the buzzer and LED test button is depressed, relay RL will energize, electric current will flow into diodes D1, D2, D3, D4, D5, D6, D7, D8 and D9. All LEDs sets will light up and the buzzer will sound unless the invention has sustained damages. The open contact RL will close to bypass relay RB.

CLAIMS

What is claimed is:

1. A portable electrical continuity and polarity tester comprising: a casing (IP54) which houses a circuit board, twenty four LEDs assembly, 2 batteries connected in series, a buzzer and three pushbuttons; a battery powered circuit board with nine relays for circuit logic sequencing; plug-ins for Master Plug and Test Plug/Socket which are mounted externally.

2. A method for testing portable electrical distribution boards and extension cables, the method comprising: testing relevant electrical items without any external power source and indication of electrical fault.

3. The LED assembly of claim 1, wherein said light emitting diodes has an output color of red or green based on the result of the continuity and polarity test.

4. The circuit of claim 1, wherein the 8 sets of LEDs light up in accordance with the continuity and polarity test result with each set representing the relevant status conditions.