

Description

Field of the Invention

[0001] The present invention relates to shutters for electrical outlets and in particular for electrical devices with multiple input or output ports.

Background to the Invention

[0002] Electrical and electronic devices with input or output ports which are connected to a power supply present a source of danger of electrical shocks to users and are at risk of short circuits. This is particularly true of electrical or electronic devices with multiple input or output ports which allow the device to be used in different modes in which at any particular time only some of the ports are being used and which are compatible with different types of output lead. When the device is being used the power supply is inevitably on and only some of the input or output ports are being used. The remaining output ports will be energised and present a high risk of electric shock. Furthermore, when one particular mode is being used and leads from a previously used mode are still in the ports, the free ends of those leads in the now unused ports will be energised and present a high risk of electric shock.

[0003] There is therefore a need to provide a means for ensuring the safety of the operator of a multiple input/output port electrical or electronic device which does not rely simply on careful operation on the user's part.

[0004] Multi-output port electrical and electronic devices are also easy to short circuit if the leads are plugged into unused ports which are energised. They may contact a lead actually in use and short circuit the device.

Summary of the Invention

[0005] According to a first aspect of the present invention, there is provided a shutter arrangement for an electrical or electronic device comprising multiple input or output ports, the shutter arrangement preventing dangerous combinations of output ports being used simultaneously, wherein the shutter arrangement comprises a first shutter and a second shutter which cooperate with one another such that in a first position the first shutter covers a first port and a second port is exposed and in a second position the second shutter covers the second port and the first port is exposed, and a third shutter for covering a third port, the third shutter not being coupled to the first or second shutter, wherein when the third port is exposed the third shutter abuts the first or second shutter so as to prevent movement of the first and second shutter.

[0006] The shutter arrangement of the present invention therefore provides a means for automatically ensuring that when one output port is exposed for use at least

one of the other output ports is covered thereby preventing simultaneous use of both ports because such a combination is dangerous or prevents a risk of short circuit.

[0007] Preferably, the first shutter is mechanically coupled to the second shutter. Preferably, when an output lead is inserted into the second output port the shutter arrangement is prevented from exposing the first output port.

[0008] More preferably, the shutter arrangement includes a fourth shutter coupled to the third shutter, for covering a fourth port or a combination of ports.

[0009] The shutters may each cover a single port or a combination of ports. Different shutters may cover the same port. For example, the second shutter covers the second port in a second position but the third shutter may cover the second port and the third port when the second shutter is in the first position. Preferably, at least one of the shutters includes a protrusion that can be gripped by a user.

[0010] The shutter arrangement can be actuated by hand by sliding a shutter across a port to expose it or alternatively it can be actuated by the insertion of output lead.

[0011] According to a second aspect of the present invention, there is provided an electrical or electronic device including a shutter arrangement according to the first aspect of the invention.

Brief Description of the Drawings

[0012] An example of the present invention will now be described with reference to the accompanying drawings, in which;

Figure 1 shows the output face of an electronic device having multiple output ports with a shutter arrangement in accordance with the present invention in a first configuration;

Figure 2 shows the shutter arrangement shown in Figure 1 in a second configuration;

Figure 3 shows the shutter arrangement shown in Figure 1 in a third configuration;

Figure 4 shows an exploded view of the shutter arrangement from the front;

Figure 5 shows the shutter arrangement in an exploded view from behind;

Figure 6 shows an electronic device including the shutter arrangement shown in the preceding Figures.

Detailed Description

[0013] Figure 1 shows the output face of an electrical testing instrument with multiple output ports. As shown the output face includes three output ports for standard test leads, labelled PE (phase earth), N (neutral) and P (phase). There is also included a custom 3-way tri connector for a connection to a mains plug terminated lead,

labelled Test Lead and a custom 3-way tri connector for connection to a switched probe labelled Probe. Figure 6 shows the entire instrument in a perspective view.

[0014] The electrical test instrument shown in Figures 1-3 is a multi-functional installation tester incorporating an insulation resistance tester, continuity tester, residual current detection (RCD) tester, a loop tester etc.. Other devices to which the shutter arrangement of the present invention could be applied are discrete instruments such as a loop tester or an RCD tester.

[0015] There are three possible connection modes for the multi-functional tester shown in Figures 1-3. In a first mode as shown in Figure 1, an electrical test can be performed using the 3 standard test leads plugged in the 3 output ports PE, N and P. In a second mode as shown in Figure 2, a test can be formed with 2 standard test leads plugged into the PE and N sockets and a switch probe plugged into the probe socket. In a third mode as shown in Figure 3, a test can be formed using the test lead socket only.

[0016] The shutter arrangement is shown in Figure 1 in a first configuration, for use in the first mode in which the PE, N and P sockets are all exposed and the probe and test lead sockets are covered by the first and second shutters 1 and 2 respectively.

[0017] Figure 2 shows the shutter system in a position for the second mode in which the probe socket is exposed as are the PE and N sockets. The test lead shutter is in a closed position and the P socket is covered as a result of this configuration.

[0018] The third mode shown in Figure 3 uses the test lead socket only. Thus the test lead socket is exposed with the second shutter in a raised position and the first shutter covering the probe socket is in a closed position. The shutter system according to this example of the present invention allows any one of the 3 modes to be selected by the user at any time

[0019] Figure 4 shows an exploded view of the shutter arrangement which is shown in Figures 1 to 3. The output panel 5 is shown as in the preceding figures with openings for the PE, N and P sockets and larger openings for the probe and test lead sockets. The output face 5 can be made from a plastic material or any other suitable insulator. Also shown is a backing plate 6, which includes the actual sockets themselves with the metal connections which receive the output leads. Shutters 1 and 2 are shown and include tabs on the front for allowing the user to grip and move them as well as a moulded bar on their rear side which is adapted to fit into a slot on the backing plate 6 so as to guide the shutters relative to the backing plate in a vertical movement as shown. The shutters are ideally made of a rigid plastic material.

[0020] The shutters 1,2 are shaped such that they do not themselves interfere with the openings for the PE, N and P sockets in any position. However, located on the front face of the shutters are spigots 7a which are arranged to fit into slots on the additional shutters 3 and 4. Additional shutter 3 is arranged to cover the opening

for the P socket when the shutter 1 is in a raised position and expose the opening when the shutter 1 is in a closed position. Similarly, additional shutter 4 is arranged to cover the opening for the PE, N and P sockets when the shutter 2 is in a raised position and expose the openings when the shutter 2 is in a closed position. The slots on shutters 3 and 4 are located on their rear side as shown in Figure 5 and extend diagonally across the shutters such that the movement of the spigots 7a on shutters 1 and 2 in a vertical direction causes horizontal movement of the additional shutters 3 and 4. The additional shutters 3 and 4 are prevented from moving vertically by moulded bars on their front side which extend horizontally and fit into slots arranged on the back face of the output panel 5 as shown in Figure 5. The additional shutters 3 and 4 lie in the same plane as each other such that when additional shutter 4 is in its position covering the output terminals PE, N and P, additional shutter 3 cannot move across to cover terminal P as well.

[0021] It can be seen from this arrangement that when both shutters 1 and 2 are in their lowermost position the probe and test lead output ports are covered by shutters 1 and 2 respectively. When shutter 1 is raised to expose the probe output port the vertical movement of the shutter 1 causes the spigot to run in the slot on the rear face of additional shutter 3 so as to cause additional shutter 3 to move across to cover output port P. This corresponds to mode 2 in which the PE, N and probe output ports are open and the P and test lead ports are closed. In this position the shutter 2 covering the test lead output port is prevented from vertical movement as the additional shutter 3 abuts additional shutter 4 and prevents it from moving horizontally. This in turn prevents the shutter 2 from moving vertically owing to the spigot 7a located in the slot on the back of shutter 2. Thus there is no way that either the P output port or the test lead output port could receive an output lead or any other foreign body when the shutter 1 is in the raised position.

[0022] Similarly, when the shutter 1 is in the closed position and the shutter 2 subsequently moved to a raised position the action of the spigot 7a in the slot on the back of additional shutter 4 causes additional shutter 4 to move horizontally to cover all three of output ports PE, N and P. The shutter 1 is prevented from being raised to expose the probe output port in exactly the same fashion as described above with reference to the second mode owing to the abutment of additional shutters 3 and 4.

[0023] Different configurations of the shutters are possible if the device includes a different number of output ports or the output ports in a different spatial configuration. A mechanical arrangement of shutters which abut each other to prevent movement of one shutter when the other shutter is in an open position provides an elegant solution to the problem of safety in a multiple output port electronic device.

Claims

1. A shutter arrangement for an electrical or electronic device comprising multiple input or output ports, the shutter arrangement preventing dangerous combinations of output ports being used simultaneously, wherein the shutter arrangement comprises at first shutter (1) and a second shutter (3) which cooperate with one another such that in a first position the first shutter (1) covers a first port (5) and a second port (P) is exposed and in a second position the second shutter (3) covers the second port (P) and the first port (5) is exposed, and
a third shutter (4) for covering a third port (N, PE), the third shutter (4) not being coupled to the first or second shutter, wherein when the third port (N, PE) is exposed the third shutter (4) abuts the first or second shutter so as to prevent movement of the first and second shutter.

5
10
15
20
2. A shutter arrangement according to claim 1, wherein the first shutter (1) is mechanically coupled to the second shutter (3).
3. A shutter arrangement according to claim 1 or 2, wherein when an output lead is inserted into the second output port (P) the shutter arrangement is prevented from exposing the first output port (5).

25
4. A shutter arrangement according to any one of the preceding claims, wherein the shutter arrangement includes a fourth shutter (2) coupled to the third shutter (4) such that movement of the third shutter (4) causes the fourth shutter (2) to expose or cover a port.

30
35
5. A shutter arrangement according to any one of the preceding claims, wherein at least one shutter (4) covers a combination of ports.

40
6. A shutter arrangement according to any one of the preceding claims, wherein at least one of the shutters (1,2) includes a protrusion that can be gripped by a user.

45
7. An electrical or electronic device including a shutter arrangement in accordance to any one of the preceding claims.

50
55

Fig.1.

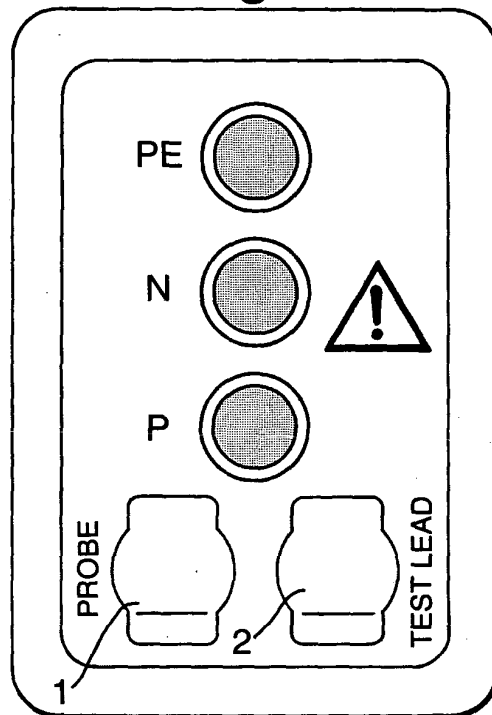


Fig.2.

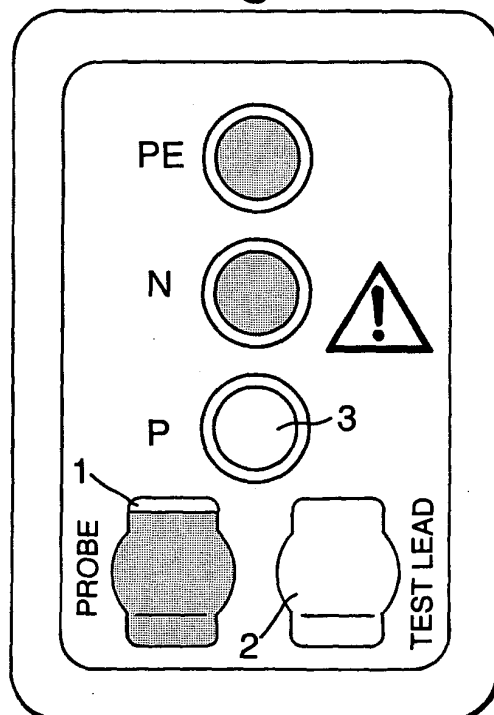


Fig.3.

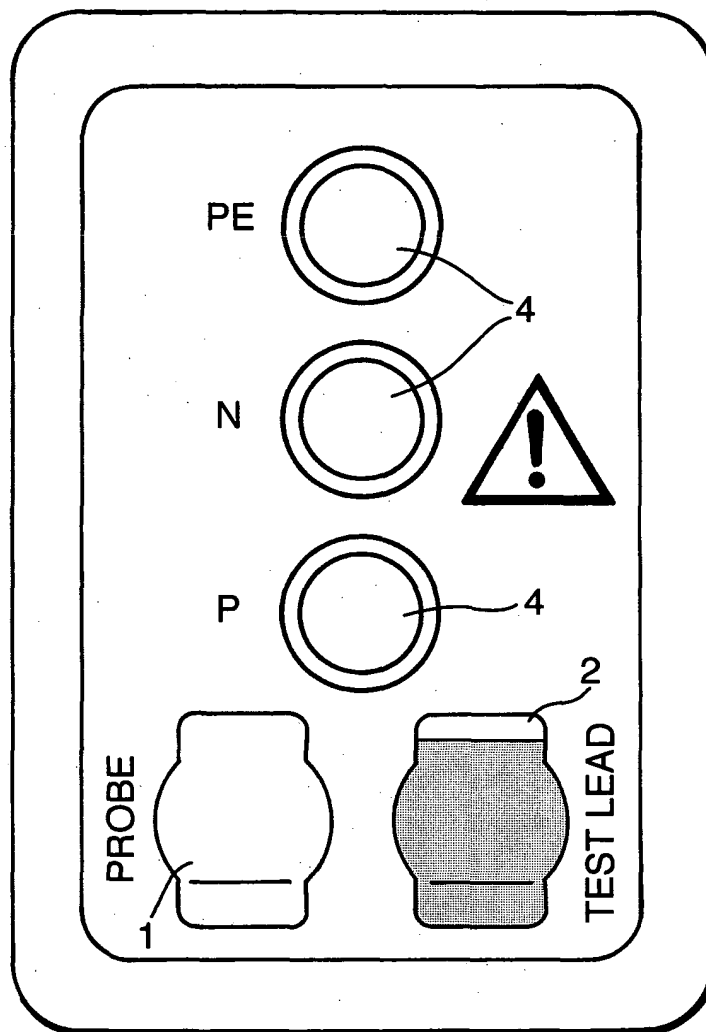


Fig.4.

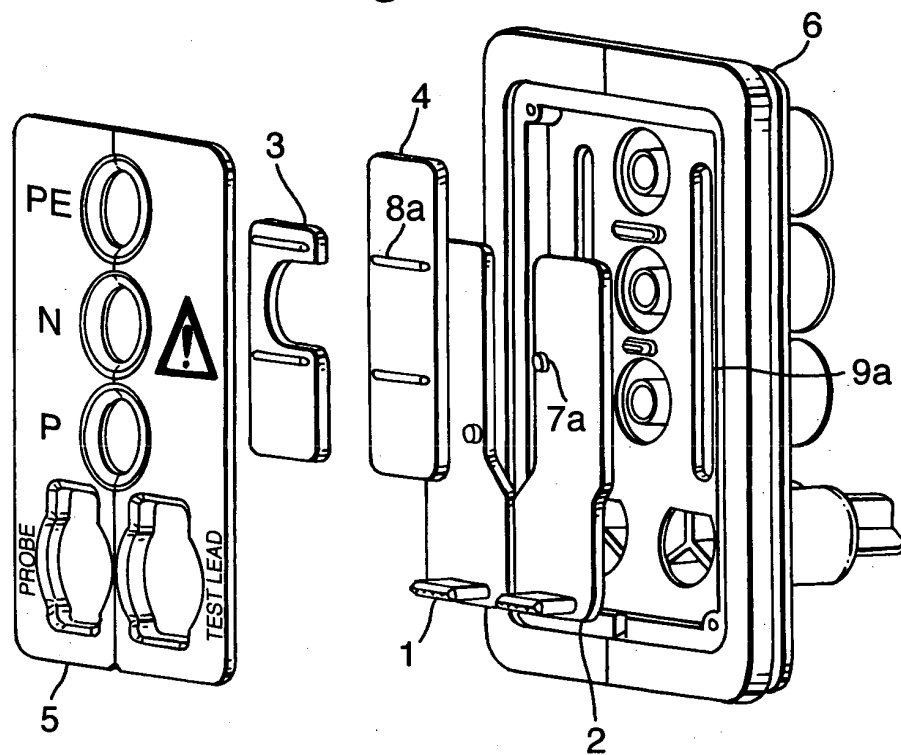


Fig.5.

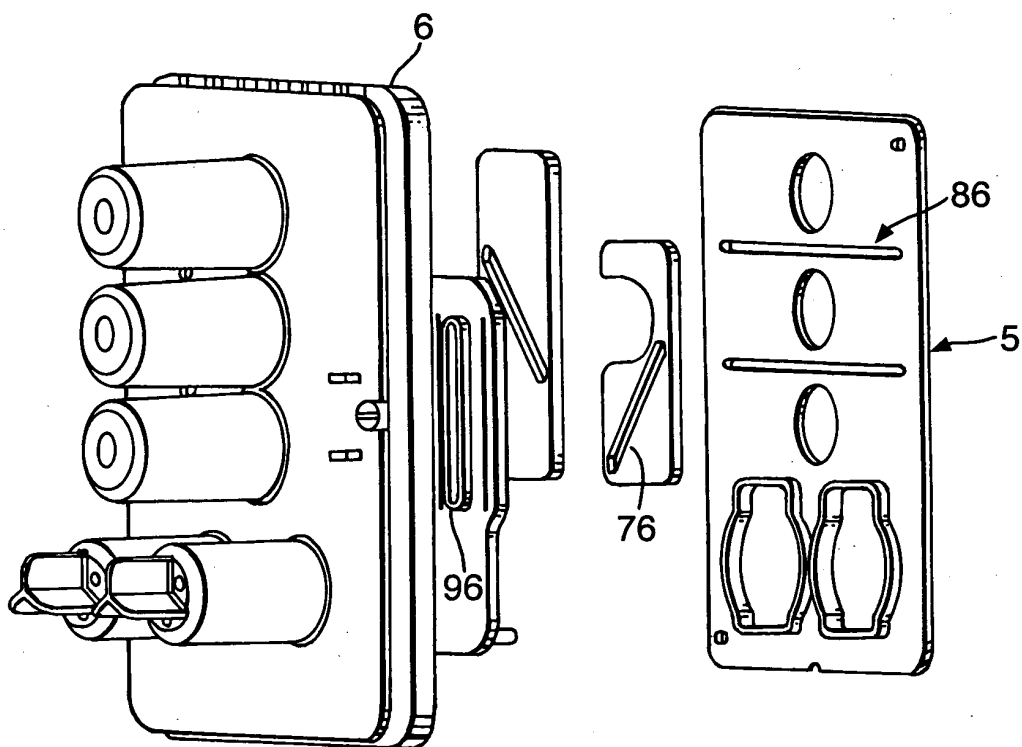


Fig.6.

