

Socket shutter mechanism

Technical Field

5 The present invention relates to electrical sockets, and more particularly to electrical sockets having a shutter assembly for shuttering electrical contacts in the socket.

Background of the Invention

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 It is desirable to only allow access to electrical contacts in a socket upon insertion of the correct plug for that socket. Socket shutter assemblies are well-known and are typically arranged to ensure the electrical contacts are covered unless or until the plug is inserted in the socket.

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 3-pin operated shutter assemblies (for example for BS 1363 plugs) provide especially high levels of safety, but existing designs of 3-pin operated shutter assemblies are relatively bulky and require a reasonably large thickness to accommodate the assembly. Other shutter assemblies, such as a 2-pin rotary shutter assembly, may enable the socket to be of thinner profile, but these do not necessarily offer the same level of protection conferred by a 3-pin operated shutter assembly.

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 It is desirable to have a 3-pin operated shutter assembly that can be accommodated in a relatively thin volume.

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Summary of the Invention

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 According to a first aspect of the invention, there is provided an electrical socket comprising a 3-pin operated shutter assembly, the shutter assembly comprising: a live/neutral shutter rotatably moveable between a shuttered

position for blocking access to live and neutral contacts in the socket, and an unshuttered position for allowing access to the live and neutral contacts, and a latch member operable between a latched configuration in which the latch member prevents rotation of the live/neutral shutter from the shuttered to the unshuttered position, and an unlatched configuration which allows rotation of the live/neutral shutter from the shuttered to the unshuttered position, wherein the latch member is operable from the latched to the unlatched configurations by insertion of the earth pin of a plug into the socket. The provision of a rotary live/neutral shutter assembly enables the assembly to be accommodated in a relatively thin volume, whilst the provision of the latch member to prevent rotation of the live/neutral shutter ensures that the contacts cannot be accessed unless or until the earth pin has been inserted into the socket. It will be appreciated that the latch member is operable by insertion of the earth pin of a plug. The live/neutral shutter is operable by insertion of the live and neutral pins of the plug. The shutter assembly is therefore 3-pin operated.

The latch member is preferably resiliently biased into the latched configuration. The latch member may be translatably moveable between the latched and the unlatched configurations. Such an arrangement has been found to facilitate a relatively compact shutter assembly. The latch member may be translatably moveable in a direction perpendicular to the direction of insertion of a plug into the socket. The latch member may be translatably moveable upwards (relative to the installed orientation of the socket) from the latched to the unlatched configuration. The latch member may be translatably moveable downwards (relative to the installed orientation of the socket) from the latched to the unlatched configuration.

The latch member may comprise a stop member. When the latch member is in the latched configuration, the stop member is preferably arranged to block rotation of the live/neutral shutter from the shuttered to the unshuttered position.

5 The stop member may protrude from the body of the latch member. When the latch member is in the unlatched position, the stop member is preferably remote from the live/neutral shutter so as not to block rotation of the live/neutral shutter from the shuttered to the unshuttered position. The
10 stop member is preferably integral with the latch member.

The latch member may comprise a first portion, the first portion being shaped such that when it is located adjacent the live/neutral shutter, rotation of the live/neutral shutter is prevented. The latch member may comprise a second portion,
15 the second portion being shaped such that when it is located adjacent the live/neutral shutter, rotation of the live/neutral shutter is enabled. The latch member may comprises an aperture in which the live/neutral shutter is received. The first and second portions of the latch member
20 may bound the aperture. The latch member may be moveable such that in the shuttered position the first portion is adjacent the live/neutral shutter, and in the unshuttered position the second portion is adjacent the live/neutral shutter. The first and second portions are preferably formed by an edge of
25 the latch member. The first and second portions may be interfaces.

The live/neutral shutter may also be moveable in a direction towards the back of the socket. Thus, the live/neutral shutter may be moveable in the direction of
30 insertion of a plug into the socket. Movement of the live/neutral shutter back into the socket may be effected by the pins (e.g. the live and neutral pins) of a plug being inserted into the socket. In such embodiments, the

live/neutral shutter is only rotatable between the shuttered and unshuttered position once it has been moved towards the back of the socket. Such an arrangement may ensure that the live/neutral shutter cannot rotate to the unshuttered position unless or until both the live and the neutral pins of a plug have begun to be inserted into the socket.

The live/neutral shutter may be moveable towards the back of the socket when the latch member is in the unlatched configuration. However, the live/neutral shutter is preferably not moveable towards the back of the socket when the latch member is in the latched configuration. Such an arrangement may provide additional protection against the live and/or neutral contacts being accidentally exposed, for example when a 2-pin plug is inserted with significant force (for example 30N or more). The latch member may be arranged, in the latched configuration, to prevent movement of the live/neutral shutter towards the back of the socket. The latch member may comprise a blocking member. When the latch member is in the latched configuration, the blocking member may be arranged to block movement of the live/neutral shutter towards the back of the socket. The blocking member is preferably integral with the latch member.

The live/neutral shutter preferably includes a spigot (preferably a central spigot) containing the axis about which the shutter is rotatable. The live/neutral shutter preferably comprises two oppositely extending arms for shuttering the live and neutral contacts. The arms preferably extend opposite sides of the spigot. The live/neutral shutter is preferably not moveable towards the back of the socket unless substantially equal forces are applied either side of the central spigot. Such an arrangement may prevent the insertion of only a single live or neutral pin operating the

live/neutral shutter, and instead requires both pins to be inserted to move the shutter.

According to a second aspect of the invention, there is provided a method of unshuttering an electrical socket, the method comprising the steps of: providing a live/neutral shutter rotatably moveable between a shuttered position for blocking access to live and neutral contacts in the socket, and an unshuttered position for allowing access to the live and neutral contacts, providing a latch member operable between a latched configuration in which the latch member prevents rotation of the live/neutral shutter from the shuttered to the unshuttered position, and an unlatched configuration which allows rotation of the live/neutral shutter from the shuttered to the unshuttered position, and inserting the earth pin of a plug into the socket to operate the latch member from the latched and the unlatched configurations. Any features described with reference to one aspect of the invention are equally applicable to any other aspect of the invention, and vice versa.

Description of the Drawings

Various embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings of which:

Figures 1a to 1e show a socket with a three-pin British Standard (BS) 1363 plug in progressively advancing stages of insertion;

Figure 2a is a perspective view of the shutter assembly showing the latch member in the latched configuration and the live/neutral shutter in the shuttered position;

Figure 2b is a perspective view of the shutter assembly showing the latch member in the unlatched configuration;

Figure 3a is a perspective view of the shutter assembly showing the latch member in the unlatched configuration;

5 Figure 3b is a perspective view of the shutter assembly showing the latch member in the unlatched position and the live/neutral shutter in the unshuttered configuration;

Figure 4a and 4b are cut-away drawings showing the socket of a second embodiment of the invention;

10 Figures 5a and 5b are perspective views of the latch member and live/neutral shutter of the second embodiment showing the components in the latched/shuttered configuration and the unlatch/unshuttered configuration respectively; and

15 Figures 6a to 6c are perspective views of parts of the shutter assembly in a third embodiment of the invention.

Detailed Description

20 Figures 1a to 1e show a one-gang switched socket 1 according to a first embodiment of the invention. The socket 1 is shown in both plan and side views, with a three-pin British Standard (BS) 1363 plug 2 in progressively advancing stages of insertion throughout Figures 1a-1e.

25 The socket 1 comprises a faceplate 3, switch module 5 and shutter mechanism 7. For these purposes, the faceplate 3 and module 5 are assumed to be largely conventional arrangements and are not discussed further.

30 The shutter mechanism 7 comprises a latch member 9 and a live/neutral shutter 11. The latch member 9 is slideably mounted for linear movement up and down the height of the socket, whereas the live/neutral shutter is rotatably moveable about a central spigot 12.

Figure 1a shows the scenario when no plug has been inserted into the socket. In this scenario, the latch member 9 is arranged to prevent rotation of the live/neutral shutter 11; this will be discussed in more detail with reference to
5 Figures 2 to 3b.

Once the plug 2 starts to be inserted into the socket (see Figure 1b), the earth pin 4 engages the chamfered surface 13 at the upper end of the latch member 9. This urges the latch member 9 upwards and away from the rotary live/neutral
10 shutter 11.

Referring now to Figure 1c, in the next stage, the live and neutral pins 6 of the plug (which are of identical length) simultaneously press on either side of the live/neutral shutter, thereby moving the live/neutral shutter 11 in the
15 direction of insertion of the plug, and compressing the coil spring 15 surrounding the spigot 12.

The upper surface of the live/neutral shutter 11 includes two oppositely-orientated ramped surfaces 17a,17b such that as the live and neutral pins are inserted, they urge the
20 live/neutral shutter 11 to rotate about the spigot 12 (Figure 1d). The preceding simultaneous pressing by the pins 6 (referred to in Figure 1c) enables this rotation to take place because it lifts the live/neutral shutter 11 above a step 25 in the moulded rear surface of the faceplate 3 that would otherwise prevent rotation of the live/neutral shutter (this
25 step is described in more detail with reference to Figures 2a and 2b).

As the plug continues to be inserted (Figure 1e) the live/neutral shutter 11 is further rotated to fully expose the
30 live and neutral contacts, which then receive the corresponding pins on the plug 2.

The socket of the present invention is especially advantageous because the contacts cannot be accessed unless

all three pins 4, 6 of the plug are inserted. Furthermore, the latch member 9, when in the latched configuration, prevents rotation of the live/neutral shutter 11. Since the earth pin 4 of the BS 1363 plug is longer than the live and neutral pins 6, the earth pin 4 of the plug (which operates the latch member from the latched to the unlatched configurations) must always have been inserted before the live/neutral shutter 11 becomes moveable.

The shutter assembly is described in more detail with reference to Figures 2a and 2b which are perspective cut-away views of the rear of the shutter assembly 9, 11 and the rear of the faceplate 3. The latch member 9 comprises a stop member 19 protruding from the lower edge of the latch member 9. When the latch member 9 is in the shuttered position, the stop member 19 abuts one of two symmetrical tabs 21 extending from the live/neutral shutter 11. The stop member 19 on the latch member 9 therefore prevents the live/neutral shutter 11 rotating to an unshuttered position unless or until the latch member 9 has been moved upwards. Such movement of the latch member 9 is only effected by insertion of the earth pin of the plug, and thus, the live/neutral shutter 11 cannot be unshuttered without insertion of the correct plug into the socket.

Figure 3a shows the moulded rear face of the faceplate 3 in some more detail. The faceplate 3 comprises two symmetrical ramped surfaces 23. The base of each ramp adjoins the faceplate rear surface at a small step 25. The step 25 is of sufficient height that the tabs 21 on the live/neutral shutter 11 abut the step 25 to prevent rotation of the shutter unless or until the live/neutral shutter 11 is pushed in the direction of insertion of the plug (i.e. parallel to axis of the spigot 12) thereby pushing the tabs 21 clear of the small step 25. The live/neutral shutter 11 is only pushed in this

way by the simultaneous action of the live and neutral pins being inserted, and thus, the live/neutral shutter cannot be unshuttered without insertion of the correct 3-pin plug into the socket. I only one live or neutral pin were to be
5 inserted, there would be an imbalance of forces on the live/neutral shutter 11 either side of the spigot 12. The live/neutral shutter is mounted in the socket such that this imbalance causes the shutter to pitch to one side and does not enable both the tabs 21 to be pushed clear of the respective
10 steps 25.

It is evident from above that this socket arrangement ensures that none of the contacts are unshuttered unless or until the correct BS 3-pin plug is inserted into the socket. The invention therefore provides a safe socket. In addition,
15 the provision of a rotary live/neutral shutter, enables the shutter assembly to be accommodated in a relatively small volume.

Figures 4a and 4b show a socket according to a second embodiment of the invention. This embodiment is the same as
20 the first embodiment except for the differences described below. Where like features are referred to, the same reference numerals are referred to but with the addition of '1' or '10' as appropriate.

The socket 101 comprises a latch member 109 and
25 live/neutral shutter 111. The live/neutral shutter 111 extends both opposing sides of a central spigot 112 and the upper surface of the live/neutral shutter includes ramps 117a, 117b for urging the live/neutral shutter 111 to rotate under the action of the plug insertion. The latch member 109
30 comprises a ramped surface 113 facing in the opposite direction to the ramped surface on the latch member of the first embodiment. Thus, when a plug is inserted (not shown),

the latch member 109 moves downwardly (rather than upwardly) and compresses the spring 129.

The live/neutral shutter 111 does not include any protruding tabs, and is instead received in an aperture 127 in the latch member 109. When the latch member 109 is in the latched position, the live/neutral shutter 111 is prevented from rotating by virtue of the interface between the live/neutral shutter 111 and the edges of the latch member aperture 127, whereas when the latch member 109 is in the unlatched position it allows the live/neutral shutter to rotate: Referring now to Figures 5a and 5b, the live/neutral shutter 111 comprises a bulbous spigot 112 formed of two concentric circular cylinders 131, 133 mounted on a base 135 comprising two opposing arcuate sections 137 and two opposing straight sections 139. When the latch member 109 is in the latched position (Figure 5a), the straight sections 139 are parallel to corresponding straight sections on the interior of the aperture 127 in the latch member 109. The live/neutral shutter 111 is therefore prevented from rotating when the latch member 109 is in the latched position. However, when the latch member is unlatched (Figure 5b), the two arcuate portions 141 are located around the base 135 of the spigot, thereby allowing the live/neutral shutter to freely rotate under the action of the live and neutral pins pressing on the ramped surfaces 117a, 117b.

Figures 6a and 6b show parts of a shutter assembly according to a third embodiment of the invention. Figure 6c shows the shutter assembly in combination with the faceplate (being shown in sectional-view). This embodiment is identical to the first embodiment except for the differences described below. Where like features are shown, the same reference numerals are referred to, but with the addition of '2' or '20' as appropriate.

The latch member 29 is identical to the latch member in the first embodiment except that the latch member 29 further comprises a blocking member 242 that, in the latched configuration, is arranged to extend beneath one of the tabs 221 of the live/neutral shutter 211. In the latched configuration (see Fig 6b and 6c) the latch member 29 is therefore arranged to prevent the downward movement of the live/neutral shutter (this downward direction being indicated by way of the large arrow in Figure 6c). This provides an additional way of preventing accidental access to the live/neutral contacts, especially where a 2-pin plug is inserted under a large force (e.g. 30N or more), which may otherwise be capable of distorting/moving the live/neutral shutter sufficiently to expose the contacts. Since the blocking member 242 is part of the latch member 29, the live/neutral shutter 211 is able to freely move backwards (towards the back of the socket) during normal 3-pin operations (i.e. once the earth pin has been inserted and the latch member moved upwards away from the tab 221).

Whilst the present invention has been described and illustrated with reference to particular embodiments, it will be appreciated by those of ordinary skill in the art that the invention lends itself to many different variations not specifically illustrated herein. For example the latch member may also comprise an earth shutter for shuttering the earth contact when in the latched configuration. Where in the foregoing description, integers or elements are mentioned which have known, obvious or foreseeable equivalents, then such equivalents are herein incorporated as if individually set forth. Reference should be made to the claims for determining the true scope of the present invention, which should be construed so as to encompass any such equivalents. It will also be appreciated by the reader that integers or

features of the invention that are described as preferable, advantageous, convenient or the like are optional and do not limit the scope of the independent claims.

Claims

1. An electrical socket comprising a 3-pin operated shutter assembly, the shutter assembly comprising:

5 a live/neutral shutter rotatably moveable between a shuttered position for blocking access to live and neutral contacts in the socket, and an unshuttered position for allowing access to the live and neutral contacts, and

10 a latch member operable between a latched configuration in which the latch member prevents rotation of the live/neutral shutter from the shuttered to the unshuttered position, and an unlatched configuration which allows rotation of the live/neutral shutter from the shuttered to the unshuttered position,

15 wherein the latch member is operable from the latched to the unlatched configurations by insertion of the earth pin of a plug into the socket, and wherein the latch member is translatably moveable between the latched and the unlatched configurations, and wherein the direction of translation is perpendicular to the direction of insertion of a plug into the
20 socket.

2. A socket according to claim 1 wherein the latch member comprises a stop member, and when the latch member is in the
25 latched configuration, the stop member is arranged to block rotation of the live/neutral shutter from the shuttered to the unshuttered position.

3. A socket according to claim 2 wherein when the latch member
30 is in the unlatched position, the stop member is remote from the live/neutral shutter so as not to block rotation of the live/neutral shutter from the shuttered to the unshuttered position.

4. A socket according to claim 1 wherein the latch member comprises a first portion, the first portion being shaped such that when it is located adjacent the live/neutral shutter, rotation of the live/neutral shutter is prevented.

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5. A socket according to claim 4, wherein the latch member comprises a second portion, the second portion being shaped such that when it is located adjacent the live/neutral shutter, rotation of the live/neutral shutter is enabled.

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6. A socket according to claim 5, wherein the latch member comprises an aperture in which the live/neutral shutter is received, the first and second portions of the latch member bounding the aperture.

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7. A socket according to any preceding claim, wherein the live/neutral shutter is also moveable in a direction towards the back of the socket.

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8. A socket according to claim 7, wherein the live/neutral shutter is only rotatable between the shuttered and unshuttered position once it has been moved towards the back of the socket.

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9. A socket according to any preceding claim, wherein the live/neutral shutter includes a spigot containing the axis about which the shutter is rotatable, and two oppositely extending arms for shuttering the live and neutral contacts.

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10. A socket according to claim 9 when dependent on claims 7 or 8, wherein the live/neutral shutter is not moveable towards the back of the socket unless substantially equal forces are applied either side of the central spigot.

11. A socket according to any of claims 7 to 10, wherein the live/neutral shutter is moveable in the direction towards the back of the socket when the latch member is in the unlatched configuration, but is not so moveable when the latch member is
5 in the latched configuration.

12. A socket according to claim 11, wherein the latch member comprises a blocking member, the blocking member being arranged, when the latch member is in the latch configuration,
10 to block movement of the live/neutral shutter towards the back of the socket

13. A method of unshuttering an electrical socket, the method comprising the steps of:
15 providing a live/neutral shutter rotatably moveable between a shuttered position for blocking access to live and neutral contacts in the socket, and an unshuttered position for allowing access to the live and neutral contacts,
providing a latch member operable between a latched
20 configuration in which the latch member prevents rotation of the live/neutral shutter from the shuttered to the unshuttered position, and an unlatched configuration which allows rotation of the live/neutral shutter from the shuttered to the
unshuttered position, wherein the latch member is translatably
25 moveable between the latched and the unlatched configurations, and wherein the direction of translation is perpendicular to the direction of insertion of a plug into the socket,
and inserting the earth pin of a plug into the socket to operate the latch member between the latched and the unlatched
30 configurations.