

"ELECTRICAL ADAPTOR" ✓

This invention relates to electrical adaptors for providing multiple socket outlets from a single mains electrical supply socket. The provided
5 socket outlets may be the same type as the supply socket, or a different type, or a mixture of the two.

Electrical adaptors of the type with which the present invention is concerned are well known, and examples are described in UK patents 2247363, 2273825 and 2288926.

10 The present invention seeks to provide an improved adaptor, in particular by means of an improved linkage between the socket outlets and the plug members which are used to engage the supply socket.

In accordance with the invention there is provided an electrical adaptor comprising a housing carrying external pins for entry into a supply
15 socket and a plurality of electrical socket outlets, connection means for electrically interconnecting said pins with each of said electrical socket outlets, said connection means comprising, for each of the live and neutral connections, a connection assembly comprising a link member made of
20 conductive material, and a contact assembly for each of said electrical socket outlets, the adaptor being characterised in that each of said contact assemblies comprises a plurality of contact elements arranged so as to be biased, in use, against the pin of a plug inserted into the socket outlet
concerned, and wherein at least one of said contact elements of all of the
25 contact assemblies is in one piece with said link member and said link member takes the form of a single unit extending from the contact
assemblies to one of said pins.

The connection of the link member to the appropriate pin may be effected in any convenient manner, such as rivetting, soldering or bolting. It will be seen that, apart from this inevitable joint, there are no joints,
30 rivetted or otherwise, between the external pins and at least one contact

element of each contact assembly. This gives improved reliability and is simpler and cheaper to produce.

Preferably, each said connection assembly is made from a single sheet of conductive material which is cut out and bent to form said link member and at least one contact element from each of the contact assemblies.

In a preferred embodiment, the contact assemblies are of two different types as follows:-

i) a first type in which each of the contact elements is in one piece with the link member;

ii) a second type in which one or more first contact elements are in one piece with the link member, and one or more second contact elements form part of a separate contact element sub-assembly, said sub-assembly being in electrical contact with said first contact element or elements.

Preferably, at least one of the contact elements in each contact assembly is formed with a flat portion where it bears against the plug pin, when inserted, thus increasing the area of contact between the contact element and the pin. This increased area of contact improves the electrical properties of the joint with the pin and also improves the grip which the contact assembly applies to the pin, so preventing the plug from wobbling about.

The individual socket outlets are provided with spring loaded shutters intended to cover the apertures for safety reasons.

Advantageously the springs are firmly located, preferably attached, at both ends. This improves shutter reliability in the long term by preventing the springs from becoming detached after prolonged use.

In order that the invention may be better understood, several embodiments will now be described by way of example only and with reference to the accompanying drawings in which:-

Figure 1 is an exploded view of an embodiment of an electrical adaptor according to the invention;

Figures 2 to 5 are side, front top and rear views respectively of the exterior of the adaptor of Figure 1;

Figures 6 and 7 are internal side and top views respectively, showing certain internal details;

5 Figure 8 is a section on the lines VIII-VIII of Figure 9;

Figure 9 is an underside view of the front body part of the adaptor;

Figure 10 is a view of the blank used to make one of the links; and

Figures 11 and 12 are views corresponding to Figures 3 and 4 respectively, illustrating alternative embodiments of the invention.

10 The adaptor comprises a housing made of plastics material, which housing comprises a front body part 1 and a rear body part 2 held together by screws 3 which pass through apertures 4 in the rear body part, and engage in blind bores 5 (Figure 9) in the front body part 1.

The rear body part carries pins 6, 7 and 8 which constitute the
15 electrical plug which, in use, enters the mains supply socket (not shown). Pin 6 is the earth pin and pins 7 and 8 are the live and neutral pins respectively. Pins 7 and 8 are provided with insulation at 9 to reduce the danger of electrocution when handling the adaptor.

The front body part carries a pair of standard 2-pin electrical socket
20 outlets 10,11. The particular socket outlets shown can cater for both round and flat pins. The front body part may also carry an optional neon display 12 which is shown in Figure 1, but omitted in Figure 3.

One further standard 2-pin electrical socket outlet 13 is carried on the top surface 14 of the adaptor. A similar socket outlet 15 is carried on
25 the underside surface 16. As can be seen in Figures 1 and 8, the apertures for the socket outlets 13,15 are formed partly in the front body part 1 and partly in the rear body part 2.

Lying behind each of the apertures forming the socket outlets 10, 11, 13 and 15 are electrical contact assemblies intended to electrically connect
30 to the pins of the plugs (not shown) when plugged in. There are thus eight

such electrical contact assemblies 16 to 23, two for each of the socket outlets 10, 11, 13 and 15 in the following configuration:-

Socket outlet 10: contact assembly 16 (live)
contact assembly 17 (neutral)

5 Socket outlet 11: contact assembly 18 (live)
contact assembly 19 (neutral)

Socket outlet 13: contact assembly 20 (live)
contact assembly 21 (neutral)

10 Socket outlet 15: contact assembly 22 (live)
contact assembly 23 (neutral)

The contact assemblies are electrically interconnected in two groups, one for the live and one for the neutral side of the mains. Each of the two groups is connected to an appropriate one of the pins 7 and 8. The electrical interconnections of each of the two groups are realised by a
15 respective link member 24 (live), 25 (neutral) which is made of electrically conductive material such as metal, preferably brass or copper. Each of the link members 24,25 is formed as a single sheet of metal which is shaped to the form shown in Figure 10, then bent to shape. Thus, each link member comprises a single integral unit and not two or more members
20 attached together by rivets or the like. Furthermore each link member is so shaped as to form, in whole or in part, all of the electrical contact assemblies with which it is associated. Each of the contact assemblies comprises a plurality, 3 in the example shown, of contact elements which bear against the pins of a plug inserted in the appropriate socket outlet and,
25 as a result, make electrical contact therewith. In the present invention, at least one of these contact elements is formed in one piece with the appropriate link member. The remaining contact element or elements may also be formed in one piece with the link member (preferred) or, if circumstances dictate, are formed as a separate member which is attached
30 to, for example by rivetting, or preferably simply bears against the link member.

Examples of the two types of contact assembly will now be described. The first type is exemplified by the contact assembly 22, but contact assemblies 20, 21 and 23 are of the same type. Contact assembly 22, which is the live contact assembly for socket outlet 15, comprises three
5 contact elements 26, 27 and 28 which bear against the live pin of any plug which is inserted into socket outlet 15. The contact elements 26, 27 and 28 each occupy one of three geometric planes mutually spaced apart by 90° to thereby define a square or rectangular bore, open on one side, for reception of the plug pin (not shown). As will be clear from Figure 6, the
10 elements 26 and 27 each have a flattened portion 29 extending axially of this bore, to provide an extended contact area with the pin. All of the elements 26, 27 and 28 are formed directly from the blank of metal, illustrated in Figure 10, and are thus in one piece with the link member 24. This is illustrated in Figure 10, as an example, where the references 26, 27
15 and 28 have been added to illustrate how they are formed from the blank. After shaping, the contact elements 26 and 27 are formed by folding the metal blank about the dotted line 30.

The second type of contact assembly is exemplified by contact assembly 19, although contact assemblies 16, 17 and 18 are constructed in
20 the same way. Contact assembly 19, which is the neutral contact assembly for socket outlet 11, comprises three contact elements 31, 32 and 33 which bear against the neutral pin of any plug which is inserted into the socket outlet 11. As before, the three contact elements 31, 32 and 33 each occupy one of three geometric planes mutually spaced apart by 90° to
25 thereby define a square or rectangular bore, open on one side, for reception of the plug pin (not shown). As will be clear from Figure 6, the elements 31 and 33 each have a flattened portion 29 intended for the same purpose as the corresponding flattened portions 29 on elements 26 and 27. As can be seen in Figure 1, only one of the elements, namely element 33 is
30 formed in one piece with the link member 25. Due to manufacturing constraints, it is not possible to form the elements 31 and 32 from the blank

shown in Figure 10; instead, these elements are formed on a separate sub-assembly 34 which is formed from a single sheet of metal which is cut out and bent to the shape illustrated in Figure 1. Thus, the sub-assembly 34 comprises a base surface 35, the two aforementioned contact elements 31 and 32 and an upstanding tag member 36. When fitted, the tag member 36 is in contact with the link member 25 such that the hole 37 in the tag member is in approximate registry with the hole 38 in the link member 25. Good electrical contact between the two is thus ensured.

Each of the link members 24,25 is of generally T-shape, with the contact assemblies all being formed by or on the head 40,41 of the T. The leg 42,43 of the T, which extends vertically downwards when seen in Figure 1, connects to the appropriate pin 7 or 8 (the earth pin 6 is not connected in this case). Both of legs 42 and 43 are bent at 90° at their bottom ends to form a short arm having formed therein a hole 44 which is used to join to the inner end of the appropriate pin 7 or 8. To this end, each of the pins 7 and 8 is equipped with a short stub 45 at its inner end which stub extends through the hole 44 and attaches thereto, for example by swaging the end of the stub 45.

Each of the link members 24,25 may be further formed with an optional laterally extending arm 46,47 which arms each support a short metal spring (not shown) which is housed in a respective cylindrical bore 48,49 formed as part of the inner ribbing of the front body part 1 (see Figure 9). The opposite end of these springs is connected to respective wires which pass to the neon 12. It will be understood that these components are not needed in the non-neon version of the adaptor.

The metal parts comprising the link bars 24,25 and contact assemblies 16 to 23 are primarily housed within and are wholly supported by, the rear body part 2. To this end, the interior of the rear body part is provided with various walls and ribs which act to locate and secure the metal parts. The layout of the metal parts with respect to the outside walls

of the housing is shown in Figures 6 and 7 in which, for clarity, much of the internal structure is omitted.

The internal structure of the rear body part 2 of the housing is best seen in Figure 1 and will be seen to comprise a pair of parallel walls 50,51 extending centrally along the length of body part 2, but stopping short at the end to provide accommodation for the shutters, as will be described. In addition transverse walls 52 to 57 from walls 50,51 extend outwards to the exterior walls of the body part 2. These walls, together with additional transverse walls 58 and 59, form four rectangular location pockets 60 to 63. These pockets are intended to receive the contact assemblies 16, 17, 18 and 19 respectively and, as such, are situated approximately in line with the four holes forming the socket outlets 10 and 11 in the front body part 1. The link member 25 is positioned on the facing side of the wall 51 near the top end of the wall, and slots 64 are formed in the lateral walls 52 to 59 in order to receive and locate the link member 25. The link member 24 is likewise located on the back side of the wall 50.

Formed in the walls 50 and 51 are shallow slots 65 which are positioned within respective location pockets 60 to 63. These slots extend vertically and are approximately the same depth and width as the corresponding dimension of the tags 36 forming part of each of the contact assemblies 16 to 19. During assembly of the adaptor, the contact sub-assemblies 34 for each of contact assemblies 16 to 19 are dropped into the appropriate pockets 60 to 63 so that the tags 36 locate into slots 65 and lie approximately flush with the surface of the appropriate wall 50/51. The link members 24 and 25 are fitted subsequently in such a way that the head 40/41 of each of the link members is positioned on the outside of the tag 36, the tag 36 thus being trapped in the slot 65 by the presence of the link member. This ensures that there is reliable electrical contact between the sub-assembly and the appropriate link member via its tag 36.

The sub-assemblies 34 are supported in their respective pockets 60 to 63 in such a way that the holes 37 and 38 approximately line up, this

being achieved by ribs (not visible) within the pockets 60 to 63. In addition, the pockets are dimensioned to securely retain the sub-assemblies in place so that, on the one hand, they cannot move more than is necessary to accommodate the normal insertion of the plug pins and, on the other hand, they are maintained in firm physical and electrical contact with the appropriate link member without the use of rivets.

Situated beyond each of the ends of the walls 50/51 is a respective rectangular slot 66,67 in which are slidably mounted respective shutters 68,69. These shutters are intended for closing off the socket outlets 13,15 respectively in the known manner. Each shutter is biased in an upwards direction, when seen in Figure 1, by a pair of coil springs 70. These coil springs are located at one end in sockets (not shown) on the inside of the rear body part 1 and at the other end in short pegs fitted to the underside of the shutters. As is conventional, the shutters have sloping faces 71 whereby they are pushed downwards when a plug is inserted.

Each of the rectangular slots in which the shutters slide is formed from a pair of walls 72 extending a short distance away from the outside wall in a direction parallel to walls 50/51, and a transverse wall 73. The fourth side of the slot is formed by the exterior wall of the rear body part 2.

Apart from the optional wiring for neon 12, discussed above, the front body part 1 of the housing does not carry any of the interconnecting metalwork, or contact assemblies. It does, however, carry a pair of shutter assemblies, one for each of the socket outlets 10 and 11.

The interior construction of the front body part 1 is shown in Figures 8 and 9. The front body part has the general shape of a shallow tray. In the tray are two rectangular enclosures, each formed of a straight wall 75 and a U-shaped wall 76. These enclosures are sized to receive, with a sliding fit, respective shutters 77,78 which are intended to cover the socket outlets 10 and 11 respectively. As before, the shutters are biased into their normal position by pairs of coil springs 79. Each spring is securely attached at each end so that, once assembled, the shutters hold their

position in the front body part even if this is separated from the remainder of the housing. To this end, each spring is attached, at the shutter end, to a peg forming part of the shutter itself and, at the housing end, is located in a respective aperture 80 formed in the appropriate wall 75. It will be seen
5 from Figure 9 that the apertures 80 are formed with a small projection 81 extending into the aperture so as to extend into the turns of the spring, thus trapping the spring and retaining it in place. This secure attachment of the shutter springs ensures that the springs do not work loose after repeated use. If this happens, the springs can move from their correct location,
10 whereafter they fail to function correctly.

Figures 11 and 12 illustrate alternative embodiments of the invention. Although described above in relation to an all 2-pin adaptor, the invention can equally be applied to adaptors in which the socket outlets are of other types, for example, 3-pin standard British, as shown in Figures 11
15 and 12. The adaptor may even provide a mixture of types of socket outlets, for example 3-pin and 2-pin in the same adaptor.

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CLAIMS

1. An electrical adaptor comprising a housing carrying external pins for entry into a supply socket and a plurality of electrical socket outlets,
5 connection means for electrically interconnecting said pins with each of said electrical socket outlets, said connection means comprising, for each of the live and neutral connections, a connection assembly comprising a link member made of conductive material, and a contact assembly for each of said electrical socket outlets, the adaptor being characterised in that
10 each of said contact assemblies comprises a plurality of contact elements arranged so as to be biased, in use, against the pin of a plug inserted into the socket outlet concerned, and wherein at least one of said contact elements of all of the contact assemblies is in one piece with said link member and said link member takes the form of a single unit extending
15 from the contact assemblies to one of said pins.
2. An electrical adaptor as claimed in claim 1 wherein each said connection assembly is made from a single sheet of conductive material which is cut out and bent to form said link member and at least one contact element from each of the contact assemblies.
- 20 3. An electrical adaptor in which the contact assemblies associated with each link member can be of two different types as follows:-
 - i) a first type in which each of the contact elements is in one piece with the link member;
 - ii) a second type in which one or more first contact elements are in
25 one piece with the link member, and one or more second contact elements form part of a separate contact element sub-assembly, said sub-assembly being in electrical contact with said first contact element or elements.
4. An electrical adaptor as claimed in claim 3 in which each said sub-assembly further comprises a tag member which locates in a slot in an
30 internal wall of said rear body part, and wherein a part of the corresponding link member passes across said slot in such a way as to physically trap

said tag, and hence said sub-assembly, in place, and also provide an electrical connection between the sub-assembly and the link member.

5 5. An electrical adaptor as claimed in claim 4 wherein each said sub-assembly is further supported by a pocket defined by internal walls of said rear body part, said pocket being dimensioned so as to locate said contact element in its correct position and support same against entry of a plug pin during use of the socket outlet concerned.

6. An electrical adaptor as claimed in any one of the preceding claims wherein at least one of the contact elements in each contact assembly is
10 formed with a flat portion where it bears against the plug pin, when inserted, thus increasing the area of contact between the contact element and the pin.

7. An electrical adaptor as claimed in any one of the preceding claims wherein each said socket outlet is provided with a spring-loaded shutter
15 assembly operable to close off the socket outlet when not in use, each said shutter assembly comprising a shutter and one or more springs for biasing said shutter to its normal position covering the socket outlet.

8. An electrical adaptor as claimed in claim 7 wherein the springs of said shutter assembly are physically located at both ends.

20 9. An electrical adaptor as claimed in claim 8 wherein the springs of said shutter assembly are attached at one end to the housing and at the other end to the shutter.

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