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(71) Applicant: **ADMAN/KELAND LIMITED**
Newburn Bridge Road
Blaydon Tyne & Wear NE21 4SD(GB)

(72) Inventor: **Kelly, Paul Raymond**
Quarry Hill Farm Church Lane
Bardsey Leeds(GB)
Inventor: **Viner, Peter c/o Design 4 (Plastics)**
5B.6 Thorp Arch Trading Estate
Wetherby, LS23 7BL West Yorkshire(GB)

(74) Representative: **Denmark, James**
c/o Bailey Walsh & Co. 5 York Place
Leeds LS1 2SD Yorkshire(GB)

(54) **Electrical plugs.**

(57) The present invention provides an electrical plug which will more usually be an integral part of an electrical device such as a transformer, rectifier or the like adapted to be plugged directly into an electrical power socket. The plug part of the device is constructed to be in two parts, the first part (C) being a support and forming part of the electrical device and having a plurality of apertures to receive different electrical pin arrangements, and the second part being a plate (D) supporting a pin arrangement, the second part being the part which dictates the type and rating of an electrical socket into which the device can be plugged. Thus, when the devices are constructed in the factory, they can be constructed with appropriate second parts to render the devices suitable for use in a particular country so that in producing a plurality of the devices for use in different countries only the second part need differ from device to device depending upon the country of use.

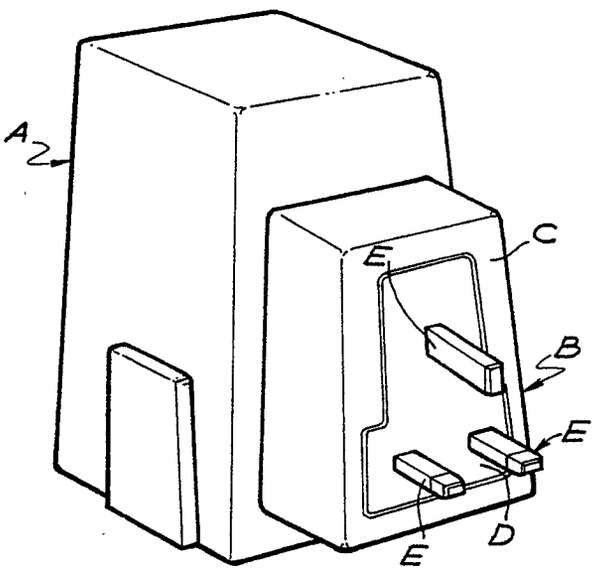

FIG. 1

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Electrical Plugs

This invention relates to electrical plugs, particularly but not exclusively to electrical plugs which form part of an electrical device or appliance whose operation requires the plugging in of the device into an electrical power source socket, such devices may comprise transformers, rectifiers, adaptors, and the like.

As is well known, electrical outlet sockets are different in shape and/or rating from country to country. Thus, electrical plugs in the United Kingdom are the so-called three pin 13 amp plugs comprising three pins respectively for providing an earth connection, a live connection and a neutral connection, whereas in Europe frequently plugs having only two round pins are used. In the United States, the electrical plugs comprise two flat pins arranged in parallel planes, whilst in Australia two flat pins arranged at an angle are provided on the electrical plugs. Consequently, it is difficult for a manufacturer of electrical devices and appliances to provide that his devices can be readily plugged in to electrical power supplies in a range of countries throughout the world without providing special plug fittings. The difficulty is substantially greater when the plug part is integral with the device, for example in the case where the plug is integral with an electrical device such as a battery charger, transformer and/or rectifier. Other devices such as heaters or insect repellers which are electrically operated may comprise a casing and the plug may be integral with that casing.

The present invention aims to provide an arrangement whereby a plug is constructed so that it can be readily constructed depending upon the country in which the plug is to be used, with the minimum interchange of parts.

According to the present invention there is provided an electrical plug comprising a primary member and a secondary member located on or in said primary member at one side thereof, said secondary member carrying a pin means for connecting the plug to an electrical power source, the number and arrangement of pin means carried by said secondary member being dictated by where the plug is to be used, said pin means extending through said primary member, so that they can be electrically coupled at the other side of said primary member, the primary member being capable of receiving at least one secondary member having a different pin means arrangement.

The secondary member preferably removably clips into the primary member and is located in a recess in said primary member.

The secondary member is preferably a flat plate of the same profile as the recess, and has clip legs which clip into slots in the primary member, and the primary and secondary members will preferably be composed of a plastics material.

The primary member may be a casing for an electrical device such as a transformer and/or rectifier.

The invention also provides primary member of the plug of the invention.

In order that the invention may be more readily understood, embodiments thereof will now be described, by way of example, reference being made to the accompanying drawings, wherein:-

Figure 1 is a perspective view of an electrical device having an integral plug;

Figure 1A is an isometric view of part of a primary member forming part of the device of Fig. 1;

Figure 2 is an underneath perspective view of a secondary member forming part of the device of Fig. 1;

Figure 3 is a perspective view, partly broken away, of the interior of the primary member of Figure 1 and showing the connection of the pins of the secondary member of Figure 2;

Figure 4 is a view similar to Figure 3 but showing the connection of pins of an alternative form of secondary member;

Figure 5 is a view similar to Figure 2 but showing an alternative form of secondary member;

Figure 6 shows different secondary members for different parts of the world; and

Figure 7 shows different pins for use in conjunction with the secondary members of Figure 6.

Referring to Fig. 1, an electrical device such as a transformer and/or rectifier used for example as an adaptor between an electrical power source and an electrical instrument, game, household appliance or the like comprises a casing A for the transformer and/or rectifier, and an integral plug B. The plug B has a primary member C which is integral with the casing A, and a secondary member D which is in the form of a plate which is removable from the primary member C. The plate D carries the electrical pins E whose function is to make electrical contact with the electrical power supply when the device shown in Fig. 1 is plugged into a suitable supply. In the arrangement shown in Fig. 1, the pins E are of a design and disposition suitable for connecting the device A to a United Kingdom electrical power supply socket insofar as three pins E are provided one of which forms an earth pin (or a dummy pin) and the other two

forming live and neutral pins. The earth pin when electrically conductive serves two functions, namely to open the socket to allow entry of the live and neutral pins, and to provide an electrical path to earth, but if the earth pin is a dummy and is non-conductive, then it simply performs the function of opening the socket to allow access of the live and neutral pins.

It is frequently the case that a manufacturer of the device shown in Fig. 1 requires to be able to send his devices to different parts of the world where they have different electrical supply sockets and which are different both in terms of rating and in design. The present invention simplifies such a manufacturers' task insofar as it provides that the secondary member D with the pins E is a separate part so that an alternative secondary member D can be fitted to the device and such alternative member having the correct electrical pin type and layout to enable the device to be coupled directly electrically to a power source socket of a particularly country.

Referring now to the remaining drawings, and firstly to Figure 1A, there is shown part of the primary member C by reference numeral 2. The primary member 2 has a shaped recess 4 which is adapted to receive any one of the secondary members 6, 8, 10, 12 of Figure 6, the selection of one of said secondary members being dependent upon the country in which the device is to be used. For example, the secondary member 6 (also D in Fig. 1) would be selected for use of the device in the United Kingdom, the secondary member 8 for use in Europe, the secondary member 10 for use in the Americas, and the secondary member 12 for use in Australasia.

It will be seen from Figures 1 and 6 that the secondary members are of identical outer profile such that any one of the secondary members may locate in the recess 4 of the primary member 2, but it will be noticed that the pin arrangements of the secondary members differ and are determined by the country in which the device is tobe used.

Referring again to Figure 1A, it will be seen that the primary member 2 is provided with through slots 14, 16, 18, 20, and 22 through which may pass lugs or legs of the secondary members so as to secure the primary and secondary members together. The primary member 2 is also provided with pin slots 24 and 26 for the passage therethrough of the inboard ends of the "live" and "neutral" pins of the secondary member 6, through bores 28 and 30 for the passage therethrough of the inboard ends of the "live" and "neutral" pins of the secondary members 8, 10, or 12, a through bore 29 for three-pin versions of the secondary members 10 and 12, and a through bore 32 for accommodating a spigot or peg depending from the interior face of the secondary members.

Thus, the shape of the primary member recess and the shape of the secondary members are common, the secondary members having differing pin arrangements to suit differing locations of use of the device.

The primary member 2 and the secondary members 6, 8, 10, 12 will be composed of a synthetic plastics material or of rubber or synthetic rubber.

Referring now to Figure 2 which shows the secondary member 6 of Figure 6 in detail, the secondary member 6 is a flat member having depending lugs 40, 42, 44, 46, and 48 which are adapted to pass through the slots 14, 16, 18, 20, and 22 of the primary member so as to hold the secondary member captive relative to the primary member, the ends of the lugs engaging the face 2A on the underside of the primary member 2. The secondary member 6 is also provided with a spigot or peg 50 which passes through the bore 32 as additional stability of the primary and secondary members, the co-operation between the spigot or peg 50 and the bore 32 being either a simple push fit or with locking if necessary.

The secondary member 6 is provided with outwardly extending sheaths or shrouds 52 and 54 for the "live" and "neutral" pins 56 and 58 respectively, said sheaths or shrouds preferably being moulded integrally with the body of the secondary member. The secondary member preferably also has a dummy earth pin formed integrally therewith. As will be seen, the pins 56 and 58 have enlarged contact ends 56A and 58A which, when the pins are in their operative positions - see pin 58 - sit on the ends of their respective sheaths, the inboard ends of the pins projecting downwardly through slots or slits 60 and 62 in the body of the secondary member and thence through the slots 24 and 26 of the primary member 2. The pins are of cruciform shape at the junctions of their shorter and contact ends 56B, 58B, this resulting in an enhancement in the strength of the pins, and providing a quick connection means whereby electrical terminals may be clipped to the ends to hold the pins captive and provide electrical connectors for the electrical components in the device. No.soldering is required.

Figure 3 shows how pins 56 and 58 may be held captive to the primary member 2 and secondary member 4, the latter having been omitted for the sake of clarity. The figure shows the lugs 40, 42, 44, 46, and 48 engaging the face 2Aof the primary member 2 and the spigot or peg 50 protruding into the primary member. Each of the pins

56 and 58 is secured in position by means of an electrical terminal clip, two such clips being indicated by reference numerals 64 and 66, the choice of clips being determined by the connection of the pins to the compartments inside the device. Where the device is to include a printed circuit board (PCB) - a fragment of which is indicated by reference numeral 90 - two of the clips 66, which are adapted to be connected to the PCB, will be used to secure the pins in position, whereas if the device is to be used with a transformer - a fragment of which is indicated by reference numeral 92 - two of the clips 64, which are adapted to be connected to the transformer will be used for securing the pins in position.

The clip 64 has two generally parallel portions 68 and 70 connected together by an intermediate portion 72, each of the parallel portions having elongate slots 74 and 76 respectively therein, the slot 74 being formed so as to be suitable for engagement with and retention of a connection 92A of the transformer 92, the slot 76 serving to retain the pin 56 in position with the inboard, crucifix form, end 56B thereof engaging the clip 64. The pin 58 would be retained using an identical clip.

The clip 66 again has two generally parallel portions 78 and 80 connected together by a longer intermediate portion 82, each of the parallel portions having slots 84, 86 to serve the same purposes as the slots in the clip 64, the slot 84 in this case being for engagement and retention of a connection 90A of the PCB 90.

Thus when the primary member 2 and the secondary member 6 are clipped together with the body of the secondary member located in the recess 4 of the primary member, there is provided an electrical power plug which is integral with an electrical device such as a transformer or a printed circuit board as in the embodiments described and which can be changed readily to such another power supply.

In the embodiment of the secondary member described, no use is made of the through bores 28, 29 and 30 of the primary member, these being concealed when the body of the secondary member is located in the recess 4 in the primary member.

Provision may be made in the secondary member 6 for the incorporation of an accessible fuse. Thus the primary member may be divided out or punched out in order to accommodate and to give access to such a fuse.

Referring now to Figure 4, which shows the secondary member 8 with its pins 94 may be connected to the primary member to adapt the plug for use in Europe. The inboard ends 94 A of the pins 94 (best seen in Figure 7) are retained by clips 96 and 98 depending upon the use of the device and the coupling slot 95 and 96 are in the same locations in the coupling slots 84 and 74 in the previously described embodiment so that the PCB and transformer can be electrically connected without modification. Retention of the pins in this embodiment is by means of push-type gripping terminals 96A and 98A which simply frictionally engage the inboard ends 94A -which project through the bores 28 and 30 of the primary member 2 - of the pins 94, the terminals used again depending upon the end use of the device. In all other respects the assembly is as described with reference to Figure 3.

In Figs. 3 and 4, it will be seen that the interior surface of the primary is shown as being flat, but such surface may be provided with a "ski-slope" arrangement between the spigot or peg 50 and the pin slots 24 and 26 so as to give a location and mechanical fixing for the clips which retain the pins in position.

From Figure 6, it will be seen that the contact ends 94B of the pins 94 extend from a boss 8A which protrudes from the face of the body of the secondary member 8. The base 8A of the secondary member 8 may be in the position indicated by the dotted line, instead of the full line position.

The secondary member of Figure 5 which corresponds to the secondary member 10 of Figure 6, and which carries the pins 100 of Fig. 7 for the Americas arranged as shown in Figure 6 - is provided with generally square recesses 104 for accommodating the generally square portions 100A of the pins, the pins themselves extending through slots 106 in the body of the secondary member, spigots 100B passing through the bores 28 and 30 and being engaged by terminal clips 96 or 98 as shown in Figure 4. In this embodiment, the portions 100A of the pins will be trapped between the bodies of the primary and secondary members. The arrangement for these pins is similar to that described with reference to Fig. 5, but the pins 102 are angled according to the Australian specification.

Where the secondary members 10 and 12 are provided with a third pin - as shown dotted in Figure 6 - such pin would be arranged similarly to that described with reference to Figure 2.

The invention thus provides an electrical plug which can readily be adapted for use in different countries which is of considerable advantage where the plug is integral with an electrical device or appliance, and thus provides easier and less expensive manufacturing costs.

It is not envisaged that an electrical device with an integral plug according to the invention be provided with interchangeable secondary portions so as to make the device universally adaptable, although this could be done, but rather the device would be fitted with the appropriate secondary

member and pins depending upon where it was to be used. Additionally the principles of the invention may be applied to plugs which are separate from the electrical appliances and devices with which they are to be used, and this specification is intended to cover such application.

Finally, it will be appreciated that a device according to the invention may be applied to a 2-pin plug for use in the United Kingdom, in which case the "earth" pin would be dispensed with and use made of some of the bores or slits or slots in the primary member.

Claims

1. An electrical plug comprising a primary member and a secondary member located on or in said primary member at one side thereof, said secondary member carrying a pin means for connecting the plug to an electrical power source, the number and arrangement of the pin means carried by said secondary member being dictated by where the plug is to be used, said pin means extending through said primary member so that they can be electrically coupled at the other side of said primary member, the primary member being capable of receiving at least one secondary member having a different pin means arrangement.

2. A plug according to Claim 1, wherein the secondary member removably clips into the primary member and is located in a recess in said primary member.

3. A plug according to Claim 2, wherein the primary member is a flat plate having clip legs which clip into slots in the primary member.

4. A plug according to Claim 2 or 3, wherein the pin means are held captive to said other side of the primary member by means of electrical terminal clips.

5. A plug according to Claim 4, wherein said electrical terminal clips have connection locations for connection of the clips to electrical components at particular locations.

6. A plug according to Claim 5, wherein regardless of the secondary member and pin means arrangement utilised, said terminal clips present said coupling locations at said particular points for coupling to the electrical components.

7. A plug according to any preceding claim, wherein the plug is integral with an electrical device such as a transformer, rectifier or the like having a casing, and said primary member is integral with said casing.

8. A plug according to any preceding claim, wherein the primary member is provided with a plurality of apertures to accommodate a plurality of required pin means arrangements.

9. An electrical plug substantially as hereinbefore described with reference to the accompanying drawings.

10. A primary member of the plug according to any one of the preceding claims.

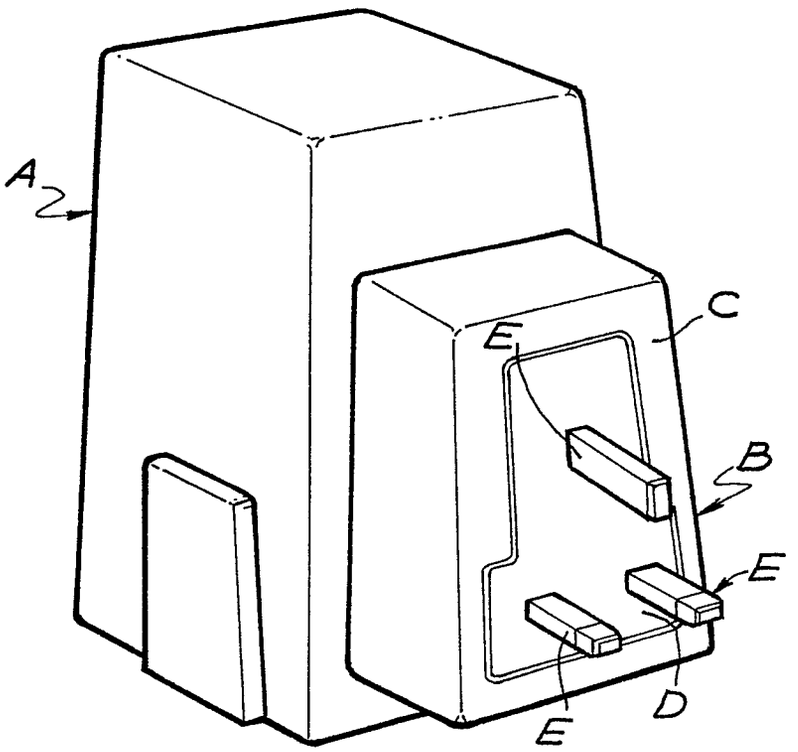


FIG. 1

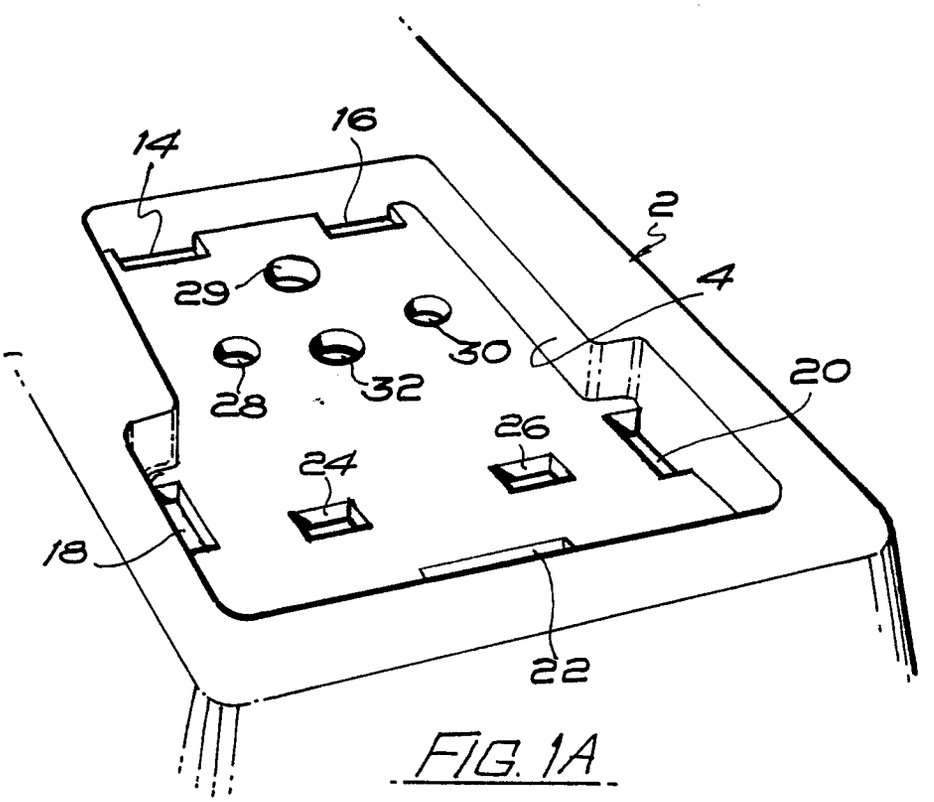


FIG. 1A

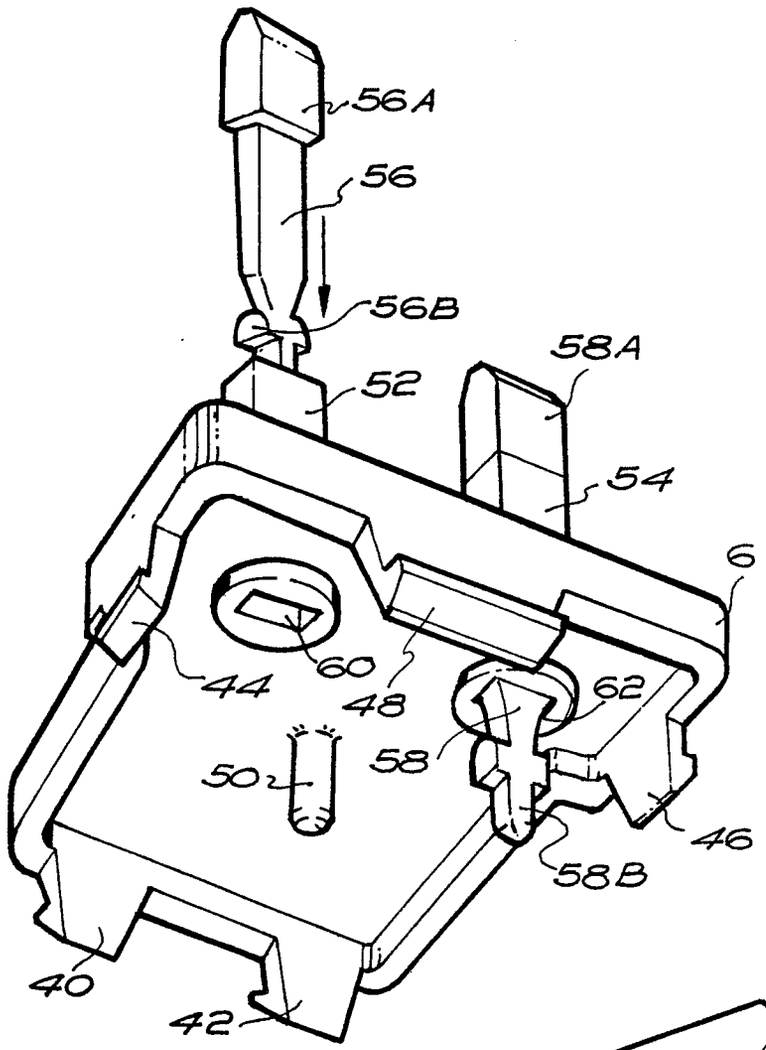

56A
56
56B
52
58A
54
6
60
44
48
62
58
50
46
58B
40
42

FIG. 2

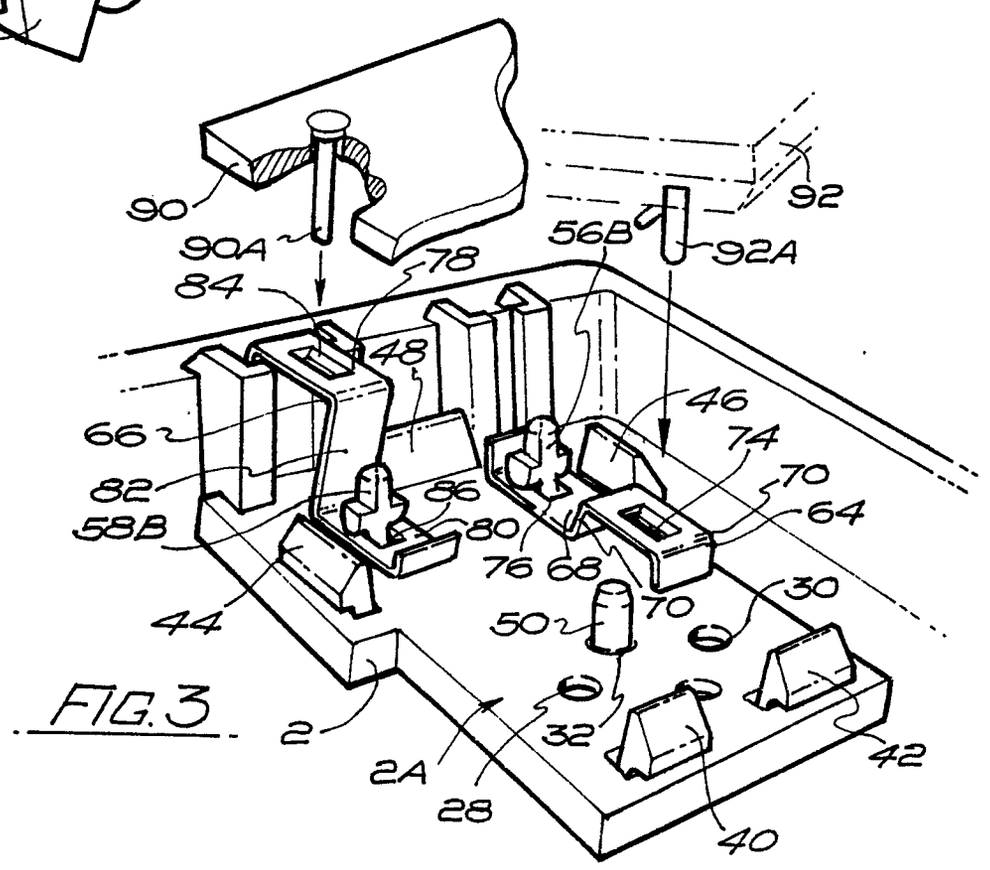

90
90A
78
84
56B
92
92A
48
46
66
74
82
86
70
64
58B
80
76
68
44
70
50
30
32
42
2
2A
28
40

FIG. 3

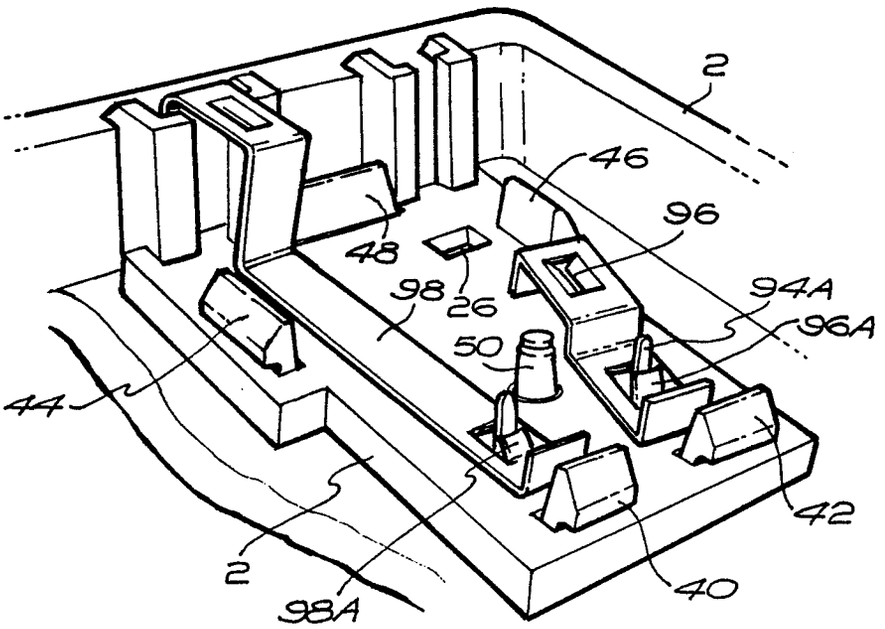
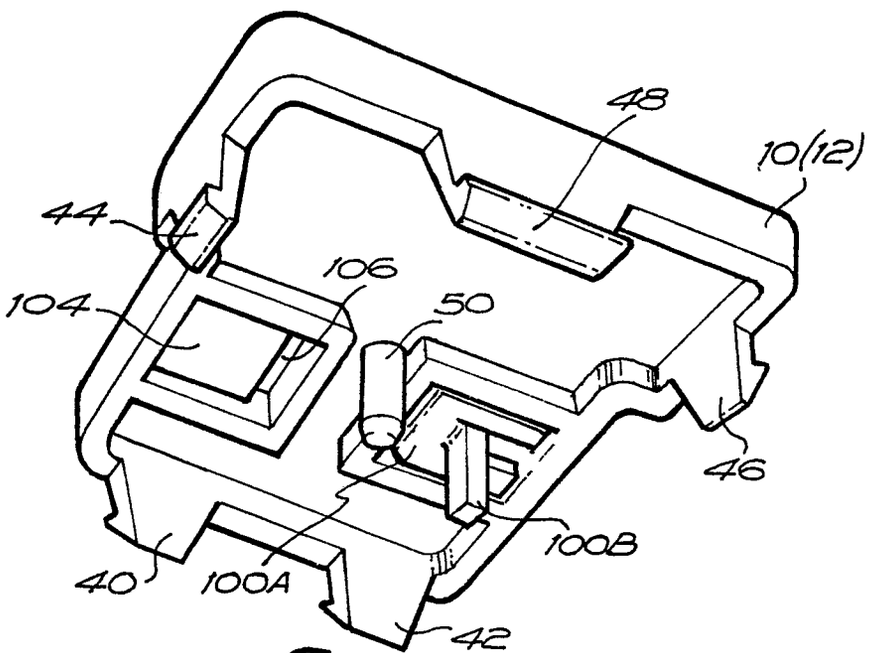

2
46
96
48
98
26
94A
96A
50
44
42
2
98A
40

FIG.4


48
10(12)
44
106
104
50
46
100B
40
100A
42

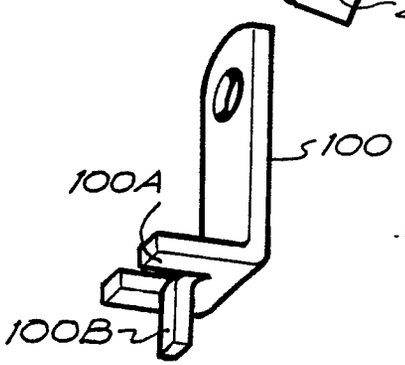

100
100A
100B

FIG.5

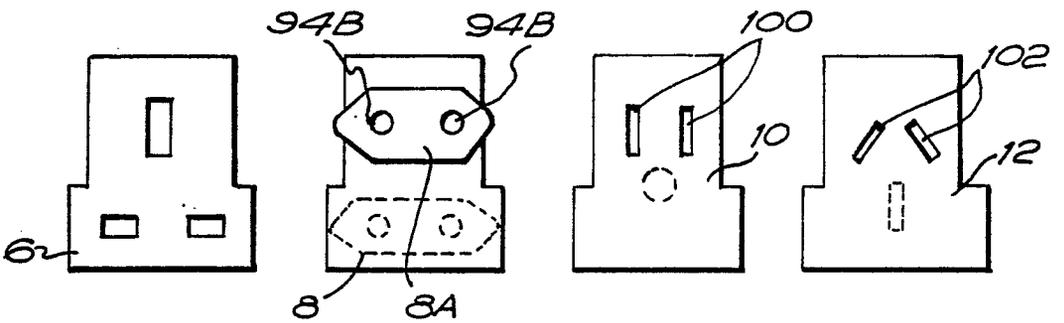

94B
94B
100
102
10
12
6
8
8A

FIG. 6

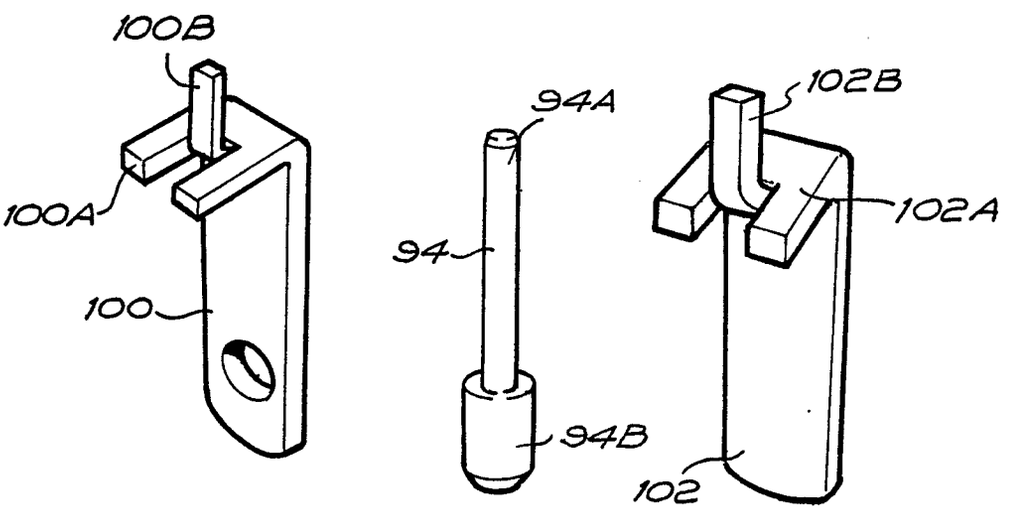

100B
100A
100
94A
94
94B
102B
102A
102

FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87 11 1807

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-2 930 019 (H. HUBBELL) * column 5, lines 31-40; column 6, lines 44-72; figures 21-25 *	1	H 01 R 31/06 H 01 R 13/66
A	GB-A-2 097 202 (CORABELMENT AG) * page 1, lines 119-125; figures 3, 8, 9 *	1,3	
A	EP-A-0 085 802 (CORABELMENT AG) * page 2, line 8 - page 3, line 2; figures 5A-5D *	1,7	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

H 01 R 31/00
H 01 R 13/00
H 01 R 19/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	02-11-1987	LEOUFFRE M.

CATEGORY OF CITED DOCUMENTS

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