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(54) Pivotal power supply plug device

(57) A compact rotary power supply plug corresponding to 200 V of the European and U. S. standards and formed with reduced number of parts into a simple structure can be provided. A plug supporting piece (10) is pivotably provided on one end of an insertion plug storing recess (3) provided at a surface of a housing (1). Insertion plugs (11,11) made of a metal conductive material are supported at the plug supporting piece (10) and projected therefrom. A contact (19) in electrical connection with each insertion plug (11) is provided at the bottom surface (10b) of the plug supporting piece (10). Each contact (19) is contacted to a connection terminal (20) in the housing (1) when the plug supporting piece (10) is upraised together with the insertion plugs (11, 11). The insertion plugs (11, 11) are pushed down together with the plug supporting piece (10) and stored into the recess (3). The housing (1) includes a housing main body (1a) and a housing lid body (1b) fitted with one another, half bodies (12b, 12b) of bearings (12, 12) provided on both sides of the recess (3) for rotatably supporting the shaft (10a, 10a) of the plug supporting piece (10), projection pieces (13, 13) for the bearings on both sides of the main body and the other half bodies (12a, 12a) of the bearings provided at the tip ends of the projection pieces (13, 13). The plug storing recess (3) is provided at an outer surface of the lid body (1b). The housing main body (1a) is fitted with the lid body (1b) for joining both half bodies of the bearings to form the bearings (12, 12).

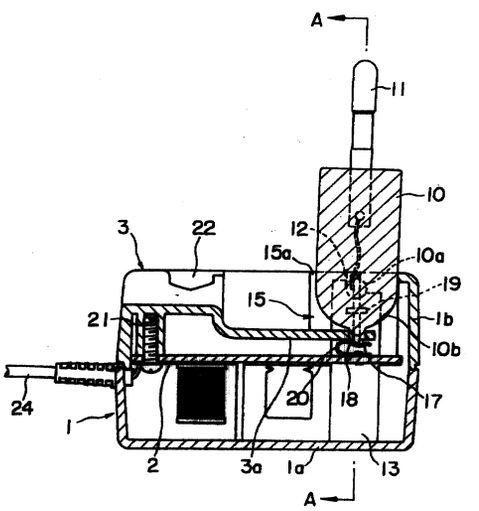


Fig. 1

EP 1 162 703 A2

Description

[0001] The present invention mainly relates to a pivotal power supply plug device for use in an AC charger or the like for charging a storage battery type portable electronic appliance from an AC power supply, and more specifically, to a pivotal power supply plug device having an insertion plug stored in the recessed portion of the housing and allowing the plug to project for insertion into a receptacle in use.

[0002] Conventional AC chargers used to charge a storage battery for a portable electronic appliance such as cellular phones and notebook type personal computers and mainly connected to a power supply of 200 V based on the European standards have the following structure. As shown in Fig. 6, a plug supporting piece 102 is integrally formed with a housing 101, and round rod type, insertion plugs 103, 103 project as they are supported by the plug supporting piece 102.

[0003] The device thus having insertion plugs projecting from the housing plug in a fixed manner could be bulky as a whole and inconvenient for carrying. However, most of these round rod type plugs typically have integrally formed insertion plugs projecting from the housing.

[0004] Meanwhile, as a device disclosed by Japanese Patent Laid-Open Application No. Hei. 6-68930, for example, various kinds of pivotal power supply plug devices have been developed and used for AC chargers according to the Japanese standards. In such a device, a pair of insertion plugs having a rectangular plate shape are integrally held by a plug supporting piece, and the plug supporting piece is pivotably supported at the housing. The insertion plugs are pushed down together with the supporting piece into a plug storing recess formed at the outer surface of the housing when they are not in use. The plugs are upraised in the direction to project perpendicularly to the housing when they are in use.

[0005] Note however that the conventional pivotal power supply plug device of this type according to the Japanese standards cannot be used as they are as a power supply plug device corresponding to 200 V according to the European and U.S. standards.

[0006] A conventional pivotal power supply plug device has a complicated attachment structure to the housing of a plug supporting piece and a complicated connection structure between the insertion plugs and electronic circuitry in the housing, so that the number of parts is large, and their size should be disadvantageously large.

[0007] The present invention is directed to a solution to the problems associated with the conventional devices, and it is an object of the present invention to provide a pivotal power supply plug device having a compact and simple structure corresponding to the European and U.S. standards of 200 V and formed with a reduced number of parts.

[0008] The present invention is directed to a solution to the problems associated with the conventional device described above. In order to achieve the primary object, a pivotal power supply plug device according to the present invention is composed of a housing; an insertion plug storing recess provided at a surface of the housing; a plug supporting piece pivotably supported on one end side of the recess; insertion plugs made of a conductive metal material supported at and projecting from the plug supporting piece; and contacts in electrical connection with the respective insertion plugs and provided at a bottom surface of the plug supporting piece. The contacts are contacted to respective connection terminals in the housing when the plug supporting piece is upraised together with the insertion plugs, and the insertion plugs are pushed down and stored into the recess together with the plug supporting piece. In the construction, the housing includes a housing main body, a housing lid body, half bodies of bearings provided on both sides of the recess for rotatably supporting shafts of the plug supporting piece, projection pieces for the bearings on both sides of the main body and the other half bodies of the bearings provided at the respective tip ends of the projection pieces. The housing main body and the housing lid body are fitted with one another. The plug storing recess is provided at an outer surface of the lid body. The housing main body is fitted with the lid body for joining both half bodies of the bearings to complete the bearings.

[0009] The above-described device preferably has the following features. More specifically, shaft introduction grooves through which the shafts projecting on both ends of the plug supporting piece can pass may be provided on both sides of the plug storing recess, and one end of the shaft introduction grooves may be in communication with the bearing half body on the lid body side through an opening provided at the front surface of the lid body at the other end of the grooves. A surface of the plug supporting piece opposite to the plug projection surface may be formed into a semi-cylindrical surface around the pivotal center of the plug supporting piece, and the bottom surface of the recess may be extended to a position in close proximity to the semi-cylindrical surface of the plug supporting piece. An electronic circuit device for an AC charger may be stored in the housing main body, terminals in contact with the respective contacts on the back surface of the plug supporting piece may be fixed to a printed circuit board in the circuit device. Moreover, the insertion plug may have a round rod shape.

[0010] In the accompanying drawings;

Fig. 1 is a vertical sectional side view of an example of an AC charger to which a pivotal power supply plug device according to the present invention is applied;

Fig. 2 is an exploded perspective view thereof;

Fig. 3 is a partially cross sectional view of a bearing portion in the device shown in Fig. 1;

Fig. 4 is a cross sectional view taken along line A-A in Fig. 1;

Fig. 5 is a cross sectional view taken along line B-B in Fig. 4; and

Fig. 6 is a perspective view of a conventional device.

[0011] An embodiment of the present invention will be now described in conjunction with the accompanying drawings.

[0012] Figs. 1 to 5 show a pivotal type power supply plug device according to one embodiment of the present invention.

[0013] According to the embodiment, in a power supply plug device for 200 V, round rod shaped insertion plugs are pivotably supported at a housing. The reference numeral 1 represents the housing in the drawings.

[0014] The housing 1 is formed into a hollow box shape by fitting a housing main body 1a and a lid body 1b with one another.

[0015] A so-called AC charger circuit to convert an AC power supply of 200 V to a DC power supply of 6V for supplying to a battery in a cellular phone or the like is held on a substrate 2 and stored in the housing main body 1a.

[0016] A plug storing recess 3 is integrally formed at the lid body 1b in a shape with the outer surface of the lid body being depressed. A plug supporting piece 10 made of insulating synthetic resin is pivotably stored within one end of the recess 3. The round rod shaped insertion plugs 11 have their proximal end sides integrally buried in the plug supporting piece 10 and projected therefrom.

[0017] At both ends of the plug supporting piece 10, shafts 10a, 10a are integrally provided at the rotation center of the plug supporting piece 10 and project therefrom. The shafts are pivotally supported by bearings 12, 12 provided at both end portions of the recess 3.

[0018] The bearings 12 each include a pair of bearing half bodies 12a, 12b having an approximately semi-circular shape provided on the sides of the housing main body 1a and of the lid body 1b, respectively. One bearing half body 12a is formed at the tip end of a bearing projection piece 13 projecting from the housing main body 1a, while the other bearing half body 12b is formed under a bearing bracket piece 14 projecting horizontally to the opening edge on both side portions of the recess 3 on the one end side in the lid body 1b. The housing main body 1a and the lid body 1b are fitted with one another so that the bearing projection piece 13 is inserted into the lid body 1b, and both half bodies 12a and 12b are joined with one another to form the circular bearing 12.

[0019] At the inner surface on both sides of the recess 3 in the lid body 1b, shaft introduction grooves 15 are formed, and one end of each shaft introduction groove 15 is open at the surface of the lid body and the other end thereof is in communication with the bearing half body 12b. Thus, the shaft 10a on both ends of the plug supporting piece 10 can be inserted under the bearing bracket piece 14 from the open portion 15a of the shaft introduction groove 15 on the surface side of the lid body and can be adjusted to the lower part of the bearing half body 12b.

[0020] The plug supporting piece 10 is set into the recess 3 as the shaft 10a is thus adjusted to the bearing half body 12b. Then, the lid body 1b and the housing main body 1a are fitted, which causes the bearing projection piece 13 on the main body to be inserted into the lid body 1b. Then, the bearing half body 12a on the tip end thereof is adjusted to the other bearing half body 12b from the lower side of the shaft 10a, and the bearing 12 supporting the shaft 10a is assembled. Thus, the assembling operation for the plug supporting piece 10 to the housing 1 is completed.

[0021] The bottom surface 10b of the plug supporting piece 10 on the opposite side to the plug projection portion is formed into a semi-cylindrical surface around the rotation center of the shafts 10a, 10a. The bottom plate portion 3a of the recess 3 has its end extended to a position under the plug supporting piece 10, and has its upper surface substantially in contact with the bottom surface 10b.

[0022] A window hole 16 through which the bearing projection piece 13 projecting at the housing main body 1a is passed is provided on both sides of the end of the bottom plate portion 3a.

[0023] A fall protection projection 17 is provided in the center of the bottom surface 10b of the plug supporting piece 10, and the projection 17 is engaged with a projection engagement window 18 formed at the end of the bottom plate portion 3a of the recess 3, which keeps the insertion plug in the upright state with respect to the housing 1 and from falling.

[0024] At the bottom surface 10b of the plug supporting piece 10, in a position extended from the buried rear end of the insertion plugs, contacts 19, 19 in electrical connection with the plugs are provided in a projecting manner. Meanwhile, on the surface of the substrate 2 for the AC charger circuit stored in the housing main body 1a, a connection terminal 20 of a plate spring is fixed at a position of the plug supporting piece 10 corresponding to each contact 19. The insertion plugs are pivoted in the upright direction together with the plug supporting piece 10, so that each contact 19 is elastically contacted into the contact terminal 20.

[0025] The substrate 2 is fixed by a screw 21 at a position to block the opening of the lid body 1b. The lid body 1b and the housing main body 1a are fitted with one another, so that electronic parts for each circuit fixed at the substrate 2 are stored in the housing main body 1a.

[0026] The plug storing recess 3 has a wide portion formed to have a depth and a width corresponding to the outer shape of the plug supporting piece 10 and a narrow portion narrower and shallower than the wide portion and having a depth and a width corresponding

to the length and width of both insertion plugs 11. These wide portion and the narrow portion are formed in a continuous arrangement, and the entire plug supporting piece 10. The insertion plugs 11 are stored into the plug storing recess 3 as the insertion plugs 11 are pushed down to be parallel to the upper surface of the housing.

[0027] On both sides of the narrow portion in the plug storing recess 3, a pair of plug engagement projections 22, 22 facing to the central side of the open edge portion are integrally provided. When the insertion plugs are pushed down into the recess 3, the engagement projections 22, 22 elastically deform the insertion plugs to be pressed in, which restricts the operation of the insertion plugs 11 in the uprising direction, and the storing state in the recess 3 is maintained.

[0028] A power supply output cord guiding window 23 is formed at the housing main body 1a, and an electrical cord 24 for DC power supply output extends outward from the window.

[0029] In the pivotal power supply plug device as described above, the insertion plugs 11 are pushed down into the recess 3 together with the plug supporting piece 10 when the device is not in use, and the projecting of the plugs is leveled, which makes the device into a less bulky, easy-to-carry form. In use, the insertion plugs 11 are pulled up from the recess 3 and pivoted in the uprising direction around the shafts 10a, 10a, and the projection 17 for protecting falling which projects from the plug supporting piece 10 is engaged with the projection engagement window 18 provided at the bottom plate portion 3a of the recess 3 to maintain the upright state. At the same time, each contact 19 elastically contacts the connection terminal 20 on the substrate 2 to establish electrical connection with the AC charger circuit.

[0030] At the end of the bottom plate portion 3a of the plug storing recess 3, the semi-cylindrical bottom surface 10b of the plug supporting piece 10 is always in the close proximity to a position substantially in contact therewith, the gap connecting the part to expose an electrically active line in the housing 1 is appropriately blocked, and therefore no special part for blocking the gap is necessary.

[0031] As in the foregoing, according to the present invention a pivotal power supply plug device according to the present invention is composed of a housing; an insertion plug storing recess provided at a surface of the housing; a plug supporting piece pivotably supported on one end side of the recess; insertion plugs made of a conductive metal material supported at and projecting from the plug supporting piece; and contacts in electrical connection with the respective insertion plugs and provided at a bottom surface of the plug supporting piece. The contacts are contacted to respective connection terminals in the housing when the plug supporting piece is upraised together with the insertion plugs, and the insertion plugs are pushed down and stored into the recess together with the plug supporting piece. In the construction, the housing includes a housing main body, a housing lid body, half bodies of bearings provided on both sides of the recess for rotatably supporting shafts of the plug supporting piece, projection pieces for the bearings on both sides of the main body and the other half bodies of the bearings provided at the respective tip ends of the projection pieces. The housing main body and the housing lid body are fitted with one another. The plug storing recess is provided at an outer surface of the lid body. The housing main body is fitted with the lid body for joining both half bodies of the bearings to complete the bearings. Therefore, the plug supporting piece is provided with integrally formed insertion plugs, shafts and contacts, and as the shaft portion is adjusted to the half bodies of the bearing on both sides of the plug storing recess, the housing lid body can be fitted to the housing main body in order to incorporate the insertion plugs, which alleviates the assembling operation.

[0032] Furthermore, according to the present invention, in the above described device, shaft introduction grooves through which the shafts projecting on both ends of the plug supporting piece can pass may be provided on both sides of the plug storing recess, and one end of the shaft introduction grooves may be in communication with the bearing half body on the lid body side through an opening provided at the front surface of the lid body at the other end of the grooves. Therefore, the plug supporting piece having integrally formed plugs can be incorporated in the housing lid body from the outer side opening of the plug storing recess, so that an opening for inserting the plug supporting piece is not necessary at the bottom surface of the plug storing recess. Therefore, parts to block the gap connecting to the inside and outside of the housing are not necessary, which reduces the number of necessary parts, so that the thickness of the entire housing can be reduced.

[0033] In addition, in the device as described above, a surface of the plug supporting piece opposite to the plug projection surface is formed into a semi-cylindrical surface around the pivotal center of the plug supporting piece, and the bottom surface of the recess is extended to a position in close proximity to the semi-cylindrical surface of the plug supporting piece. Therefore, the back surface of the pivoting plug supporting piece and the bottom surface of the recess are always in the close proximity, so that the gap connecting to the inside of the housing can be readily set to a size equal to or lower than a prescribed specification.

[0034] Furthermore, according to the present invention, in the above described device, an electronic circuit device for an AC charger is stored in the housing main body, terminals in contact with the contacts on the back surface of the plug supporting piece is fixed to a printed circuit board in the circuit device. Thus, a compact and convenient-to-carry AC charger having foldable plugs can be implemented.

[0035] In addition, according to the present invention, in the above described device, the insertion plug has a round rod shape, so that the device can be used as a

power supply plug device corresponding to 200 V according to the European standards.

Claims

1. A pivotal power supply plug device, comprising :

a housing (1);
an insertion plug storing recess (3) provided at a surface of the housing (1);
a plug supporting piece (10) pivotably supported on one end side of the recess (3);
insertion plugs (11, 11) made of a conductive metal material supported at and projecting from the plug supporting piece (10); and
contacts (19, 19) in electrical connection with the respective insertion plugs (11, 11) and provided at a bottom surface of the plug supporting piece (10),
the contacts (19. 19) being contacted to respective connection terminals (20, 20) in the housing when the plug supporting piece (10) is upraised together with the insertion plugs (11, 11), the insertion plugs (11, 11) being pushed down and stored into said recess(3) together with the plug supporting piece (10), said device **characterised in that**
said housing (1) comprises :

a housing main body (1a);
a housing lid body (1b), said housing main body (1a) and said housing lid body (1b) being fitted with one another, said plug storing recess (3) being provided at an outer surface of said lid body (1b);
half bodies (12b, 12b) of bearings (12, 12) provided on both sides of the recess (3) for rotatably supporting shafts (10a, 10a) of the plug supporting piece (10);
projection pieces (13, 13) for the bearings (12, 12) on both sides of said main body (1a); and
the other half bodies (12a, 12a) of said bearings (12, 12) provided at the respective tip ends of the projection pieces (13, 13),
said main body (1a) being fitted with the lid body (1b) for joining both half bodies (12a, 12a, 12b, 12b) of said bearings (12, 12) to complete the bearings (12, 12).

2. The pivotal power supply plug device according to claim 1, wherein shaft introduction grooves (15, 15) through which the projecting shafts (10a, 10a) provided on both ends of the plug supporting piece (10) can pass are provided on both sides of the plug storing recess (3), and one end of the shaft introduction grooves (15, 15) is in communication with the bearing half body (12b)on the lid body side through an opening provided at the front surface of the lid body (1b) at the other end of the grooves (15, 15).

3. The pivotal power supply plug device according to claim 1 or 2, wherein a surface of the plug supporting piece (10) on the opposite side to the plug projection surface is formed into a semi-cylindrical surface around the pivotal center of the plug supporting piece (10), and the bottom surface of said recess (3) is extended to a position in close proximity of the semi-cylindrical surface of said plug supporting piece (10).

4. The pivotal power supply plug device according to any one of claims 1 to 3, wherein an electronic circuit device for an AC charger is accommodated in the housing main body (1a), terminals in contact with the respective contacts (19, 19) on the back surface of the plug supporting piece are fixed to a printed circuit board in said circuit device.

5. The pivotal power supply plug device according to any one of claims 1 to 4, wherein each insertion plug (11) has a round rod shape.

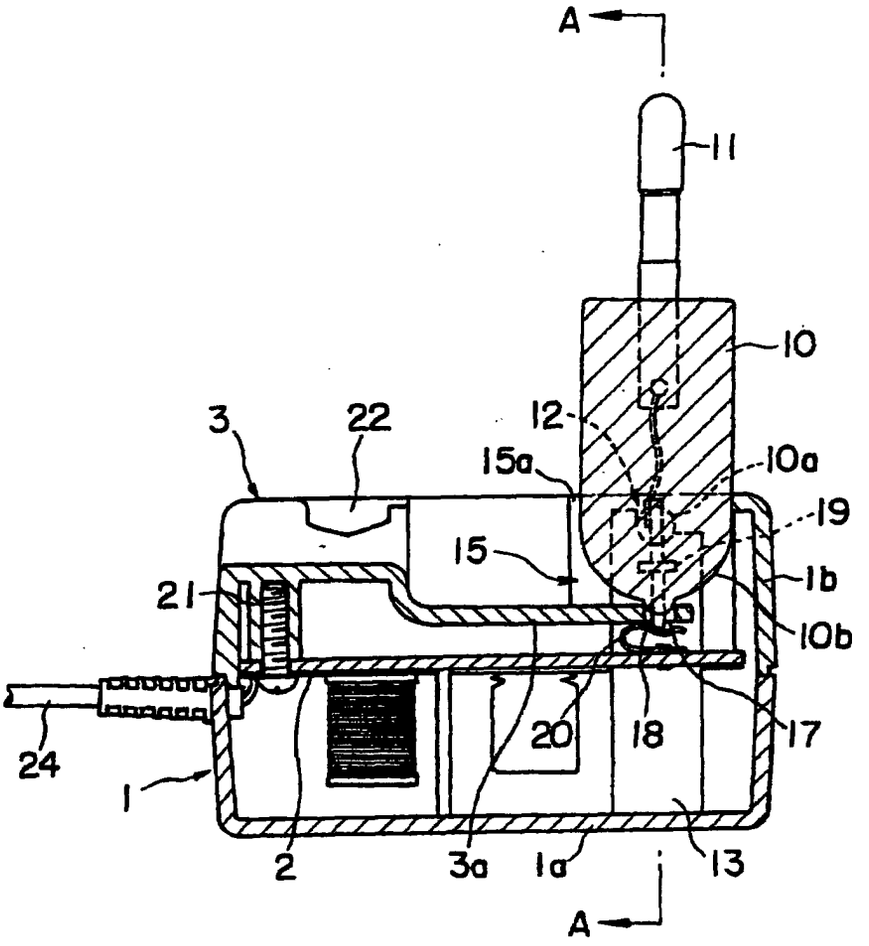
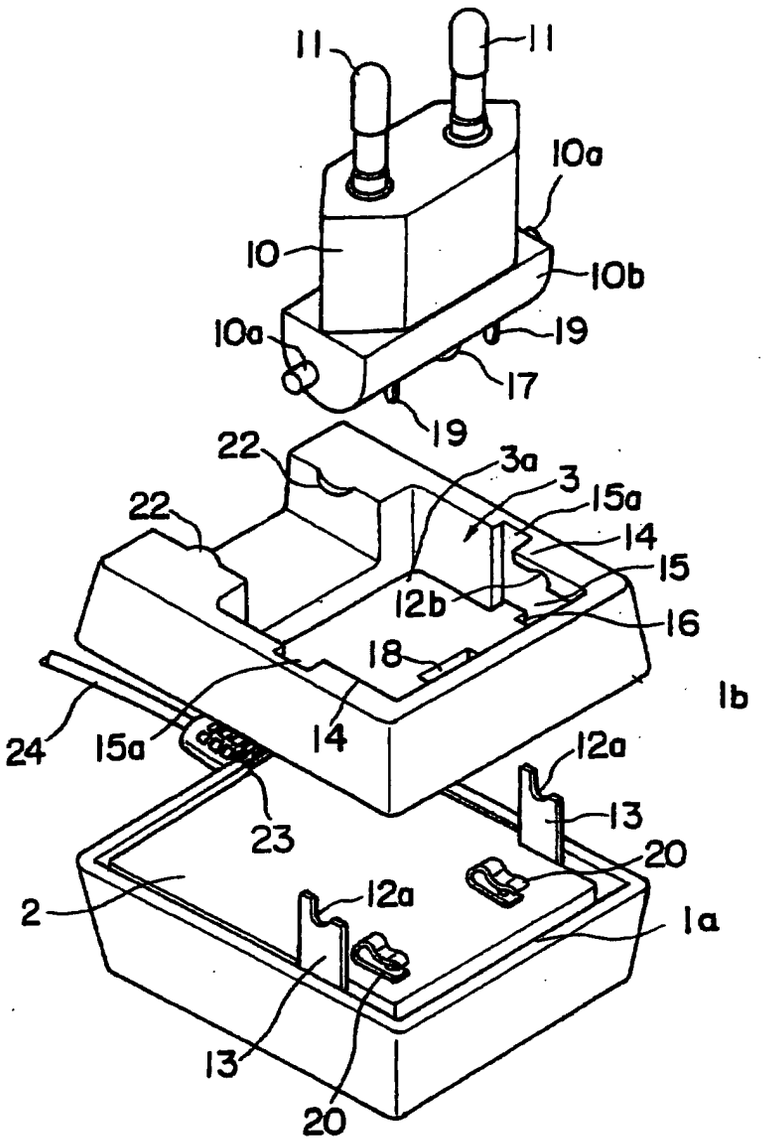


Fig. 1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10a
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10b
10a
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3a
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15a
22
14
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12b
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12a
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23
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2
12a
1a
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20

Fig. 2

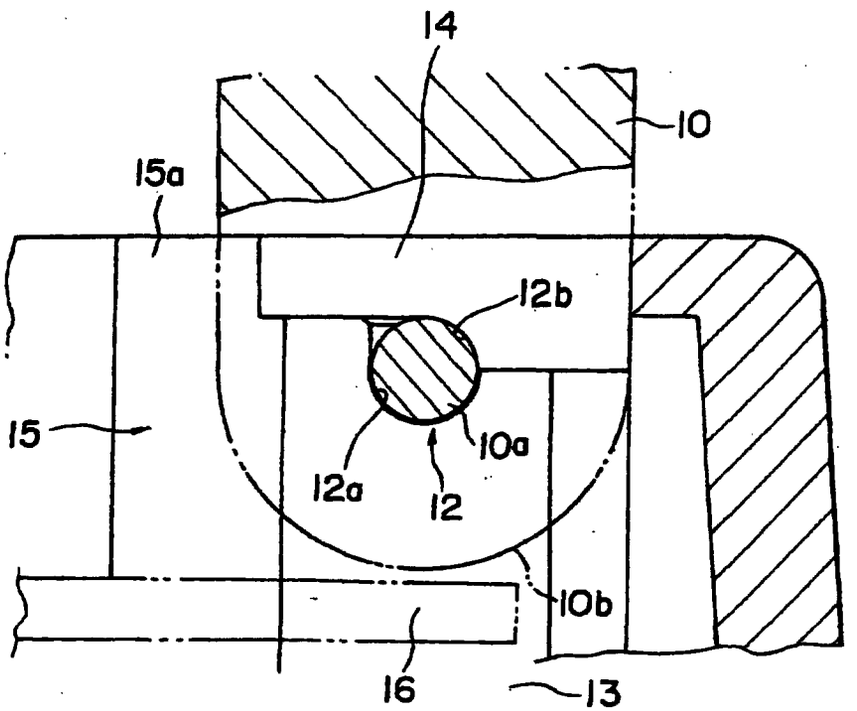

Fig. 3

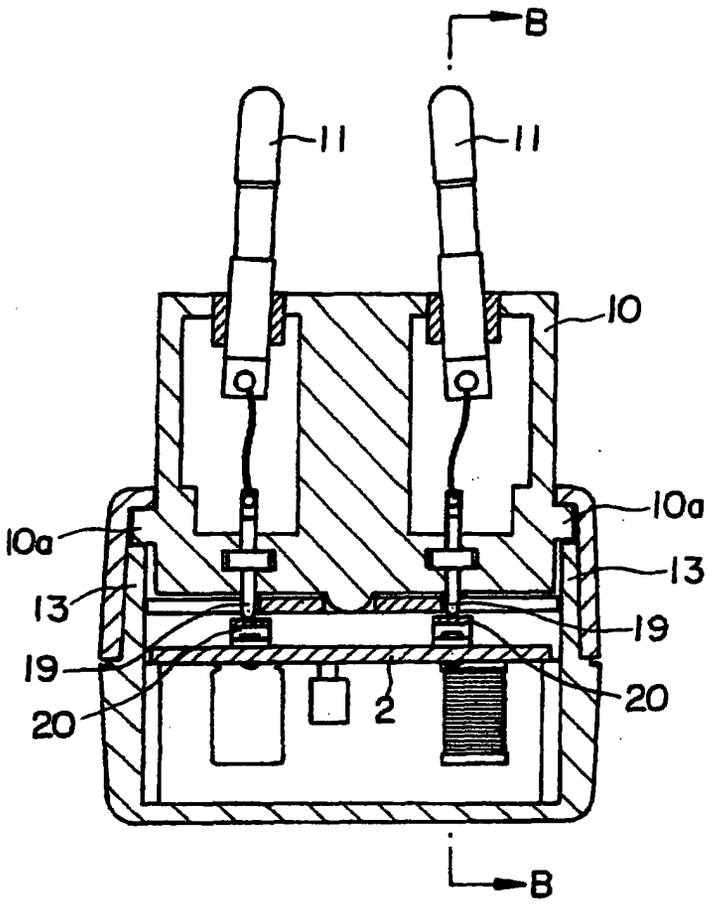

Fig. 4

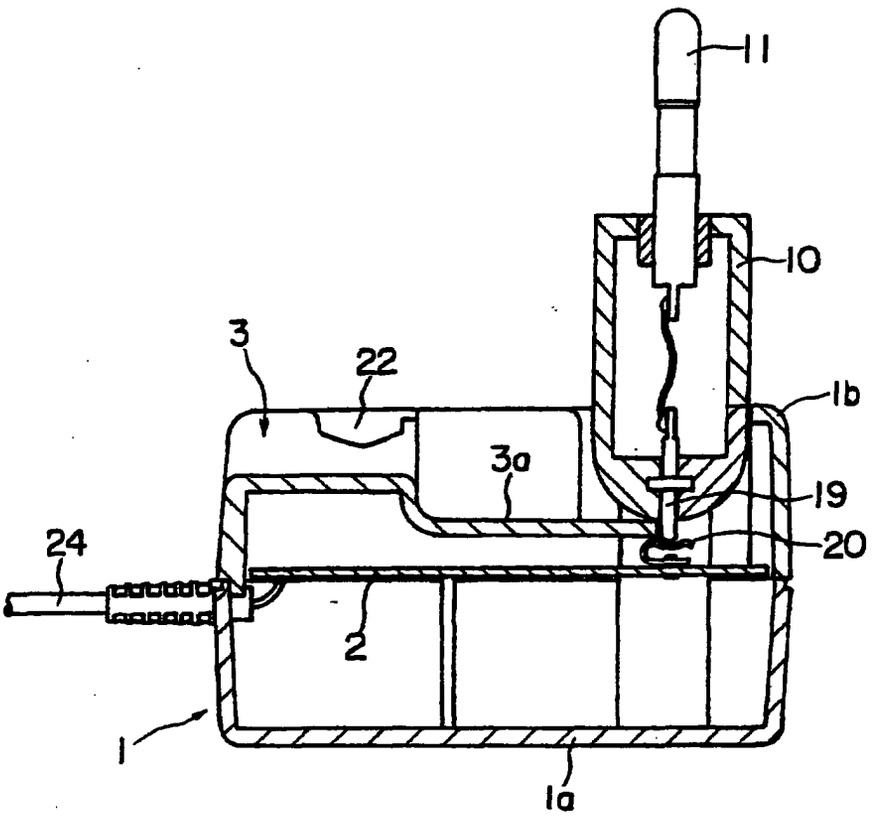

Fig. 5

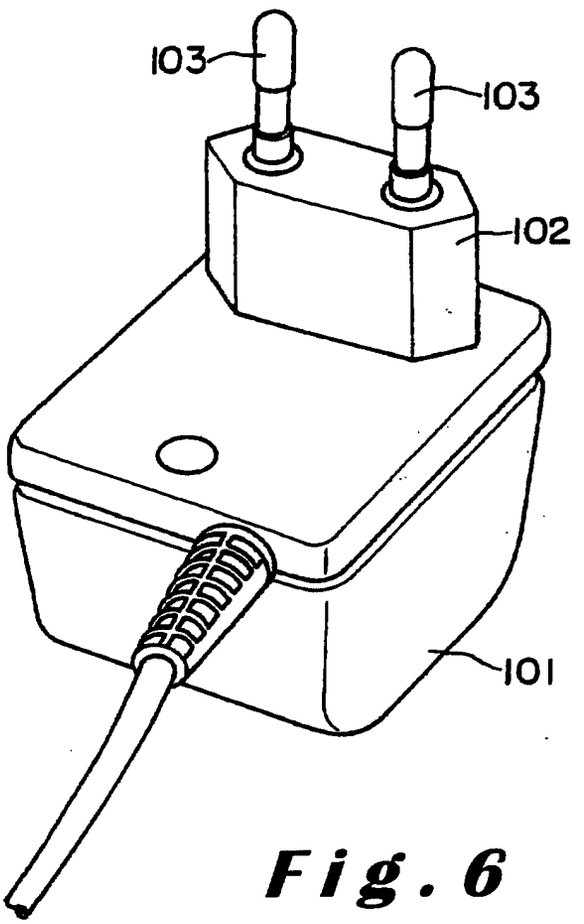

Fig. 6