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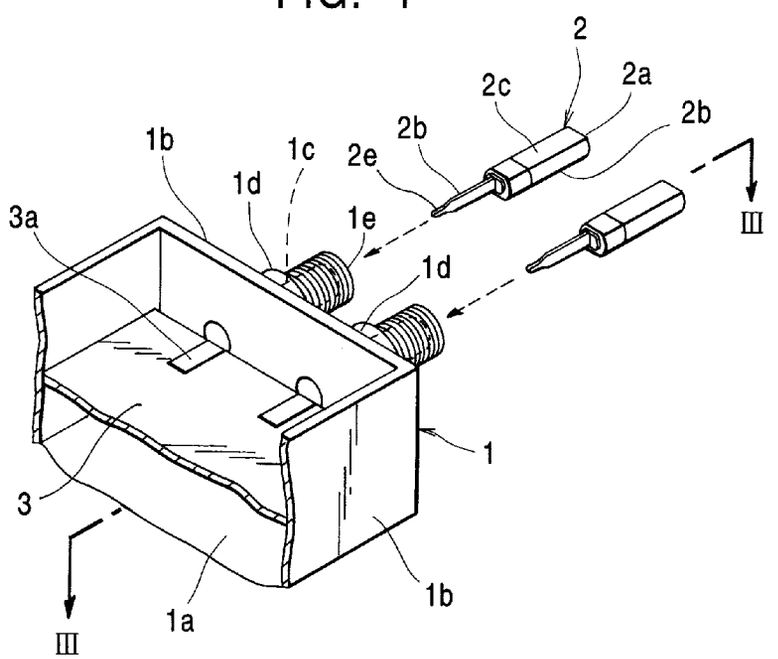
(54) Electronic device comprising a printed board and a receptacle connector with a center contact connected to the board

(57) An electronic device with a receptacle connector, including a frame member (1) provided with a shell; a printed board (3) with a solder land (3a); and a center contact (26) with a tabular contact terminal. A through hole (lc) is formed in the shell so as to extend through the frame member, and the printed board is disposed within the frame member. The center contact is press-fitted to the through hole in order to make the contact terminal protrude within the frame member such that the tabular surface of the contact terminal is positioned substantially perpendicular to the solder land. When the contact terminal of the center contact of the receptacle connector is soldered onto the printed board, in order to widen the soldering area, it is desirable that the land surface of the solder land and the opposing tabular surface be set perpendicular to each other.

FIG. 1



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Description

The present invention relates to an electronic device with a receptacle connector, which is suitable for use in, for example, a satellite reception down converter.

Fig. 5 is a perspective view of the main portion of a conventional electronic device with receptacle connectors. Fig. 6 is an exploded perspective view of the main portion of the receptacle connectors of the conventional electronic device.

The frame member 10 of the electronic device, shown in Figs. 5 and 6, is formed by die casting a metallic material into a rectangular or box-like shape. The frame member 10 has a bottom wall 10a, side walls 10b extending upward from the four sides of the bottom wall 10a, with a plurality of cylindrical holder 10c being integrally formed with one of the side walls 10b. The inside wall of each holder 10c has a tapped hole 10d extending through the frame member 10.

The printed board 12 is rectangular in shape, and has placed on the front and back surfaces thereof an electronic part (not shown), such as an integrated circuit, a coil, or a chip. Two solder lands 12a, for example, are formed on one of the ends of the printed board 12. The printed board 12 is provided at a predetermined location within the frame member 10 by, for example, using a screw or a solder (neither of which is shown).

The solder lands 12a of the printed board 12 provided within the frame member 10 are provided at the locations on the printed board 12 opposing the tapped holes 10d of the holders 10c.

Each receptacle connector 11 includes a cylindrical, metallic shell 11a, and a tabular, metallic center contact 11c, which is provided in its associated shell 11a such that part of each center contact 11c extends exteriorly from one end of its associated shell 11a.

Each shell 11a has threaded portions 11d and 11e, formed along the outer peripheral surface thereof, and a hexagonal flange 11b, formed at the center portion of the threaded outer peripheral surface.

Although not shown in the figures, contact terminals are formed in their corresponding shells 11a so as to be integral with the center contacts 11c. These contact terminals are formed so that they can be connected with center contacts of a plug connector (not shown).

The threaded portions 11d of the receptacle connectors 11 are screwed into the tapped holes 10d of their corresponding holders 10c such that such that the respective flanges 11b contact with the top surfaces of their corresponding holders 10c. When the threaded portions 11d are being screwed into their corresponding tapped holes 10d, their corresponding center contacts 11c are also screwed into the tapped holes 10d. With the threaded portions 11d screwed into the tapped holes 10d, the center contacts 11c of the receptacle connectors 11 protrude into the frame member 10 so as to oppose their corresponding solder lands 12a on the printed board 12.

The solder lands 12a on the printed board 12 and the corresponding center contacts 11c of their corresponding receptacle connectors 11 are connected together by using a solder (not shown) or the like.

In the conventional electronic device, however, affixing of the receptacle connectors 11 to the frame member 10 requires screwing of the threaded portions 11d of the shells 11a of the receptacle connectors 11 into the tapped holes 10d of the holders 10c, which screwing requires time to complete.

When the tabular center contacts 11c of the receptacle connectors 11 are soldered onto the printed board 12, a large area is required for the soldering. Therefore, it is desirable that the solder surfaces of the solder lands 12a and the opposing tabular surfaces of the center contacts 11c be set perpendicular to each other. In this case, however, since the receptacle connectors 11 are affixed to the frame member 10 by screwing the threaded portions 11d into the holders 10c of the frame member 10, each opposing tabular surface may become tilted with respect to the land surface of its associated solder land 12a, depending on the screwing positions of the threaded portions 11d.

When an opposing tabular surface is tilted, the solder does not flow to the tilted portion of the threaded portion 11d, so that a large area for soldering cannot be provided. Therefore, the solder land 12a and the center contact 11c cannot be sufficiently soldered together, and time is required for completing the soldering.

To overcome the above-described problems, it is an object of the present invention to provide an electronic device with a receptacle connector, which is cheap to produce, and has a short soldering time and a large soldering area.

To this end, according to the present invention, there is provided an electronic device with a receptacle connector, comprising:

a frame member formed by die casting, the frame member having a shell of the receptacle connector integrally formed therewith;
a center contact retained by an insulation capable of being very firmly inserted into the shell, the center contact having a tabular contact terminal; and
a printed board placed within the frame member, the printed board having a connecting land;
wherein the contact terminal is disposed substantially perpendicular to the connecting land of the printed board in a widthwise direction of the tabular contact terminal.

Although not exclusive, the electronic device with a receptacle connector may further comprise a positioning portion, provided at the insulating member, for restricting the amount of insertion and rotational angle with respect to the shell, and a retainer portion provided at the shell in correspondence with the positioning portion provided at the insulation.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is an exploded perspective view of the main portion of an electronic device in accordance with the present invention.

Fig. 2 is an exploded view of the main portion of the receptacle connectors of the electronic device in accordance with the present invention.

Fig. 3 is a sectional view of the electronic device taken along line 3-3 of Fig. 1.

Fig. 4 is a sectional view of the main portion of the receptacle connector of the electronic device in accordance with the present invention.

Fig. 5 is a perspective view of the main portion of a conventional electronic device.

Fig. 6 is an exploded perspective view of the main portion of the receptacle connectors of the conventional electronic device.

Figs. 1 to 4 are views showing the electronic device of the present invention. Fig. 1 is an exploded perspective view of the main portion of the electronic device. Fig. 2 is an exploded view of the main portion of the receptacle connectors. Fig. 3 is a sectional view taken along line 3-3 of Fig. 1. Fig. 4 is a sectional view of the main portion of the receptacle connector.

As shown in Figs. 1 to 4, the frame member 1 of a high-frequency electronic device, formed by die-casting a metallic material into a rectangular box-like shape, has a bottom wall 1a, side walls 1b, and, for example, two cylindrical shells 1d. The side walls 1b extend upward from the four peripheral sides of the bottom wall 1a, and the cylindrical shells 1d are formed integrally with one of the peripheral sides 1b, each having a through hole 1c at the center thereof extending into the frame member 1 and a threaded portion le at one end of the outer peripheral surface thereof.

The inside surface of each through hole 1c is an oval-shaped surface in cross section. Although not shown, the oval-shaped surface has a pair of opposing flat surface portions, which are previously provided above and below each other and substantially parallel to the bottom wall 1a of the frame member 1.

The printed board 3 is rectangular in shape, and includes an electronic part (not shown), such as an integrated circuit, a coil, or a chip. The printed board 3 has, for example, two rectangular solder lands 3a at one end thereof.

The printed board 3 is placed within the frame member 1, by, for example, using a screw or a solder (neither of which is shown), in such a way as to be positioned parallel to the bottom wall 1a of the frame member 1. The solder lands 3a of the printed board 3, placed within the frame member 1, are formed so as to oppose their corresponding through holes 1c.

Conductor portions 2 each have an insulation 2a, formed by molding an insulation material, and a tabular center contact 2b, composed of a metallic plate. Each center contact 2b is provided in its associated insulation 2a, by integrally molding it therewith or by incorporating it therein, such that one end of a contact terminal 2e of each center contact 2b protrudes out from one end of its associated insulation 2a. Each contact terminal 2e is tabular in shape. In each insulation 2a, each contact terminal 2e is integrally formed with its associated center contact 2b. Each contact terminal 2e is formed so that it can be connected to a plug connector (not shown).

Each insulation 2a is oval-shaped in cross section, and includes a flat top surface portion 2c and an opposing flat bottom surface portion 2d, which are formed above and below and parallel to each other.

The top and bottom surfaces 2c and 2d of the insulations 2a are formed in correspondence with the oval-shaped, flat top and bottom surfaces of the through holes 1c. The tabular contact terminals 2e are positioned by retainer portions corresponding to the top and bottom surfaces of their corresponding through holes 1c and positioning portions at the top and bottom surfaces 2c and 2d of their corresponding insulations 2a. The tabular surfaces of each of the contact terminals 2e are disposed perpendicular to the top and bottom surfaces 2c and 2d of their corresponding insulations 2a.

The insulation 2a of each conductor portion 2 is press-fitted into the through hole 1c of its associated shell 1d by following the shape thereof. As shown in Fig. 4, when each insulation 2a is press-fitted into its associated through hole 1c, each contact terminal 2e protrudes into the frame 1, and opposes its associated solder land 3a on the printed board 3 disposed within the frame 1. Here, the tabular surface of each contact terminal 2e is positioned perpendicular to the land surface of its associated solder land 3a. The solder lands 3a on the printed board 3 and the contact terminals 2e of the conductor portions 2 are soldered together.

As can be understood from the foregoing description, each receptacle connector comprises shell 1d and center contact 2b of conductor portion 2, wherein the conductor portions 2 are press-fitted to through holes 1c in corresponding shells 1d.

In other words, connection is achieved by connecting a center contact of a plug connector (not shown) to contact terminals of the center contacts 2b of each receptacle connector, and engaging clamping metal fittings of the plug connector to threaded portions le at the outer peripheral surfaces of the shells 1d.

In the above-described embodiment, although the center contacts 2b of the conductor portions 2 and the land surfaces of the solder lands 3a on the printed board 3 disposed within the frame member 1 were positioned by using a structure composed of the aforementioned oval-shaped cross-section insulations 2a, and the top and bottom surfaces of each of the oval-shaped through holes 1c, serving as positioning portions and formed parallel to each other, other structures may also be used for positioning them. For example, another structure may be used, in which the insulations 2a of the conduc-

tors 2, which have flat portions formed by cutting part of the insulations 2a or which have a polygonal shape, serve as positioning sections; and through holes 1c, having retainer portions, are formed in correspondence with the shape of the insulations 2a serving as the positioning portions. Obviously, any structure may used as long as the structure allows the tabular surfaces of the contact terminals 2e of the conductor portions 2 to be set perpendicular to the land surfaces of their corresponding solder lands 3a.

In addition, the form of the printed board 3 with solder land portions 3a formed thereon are not limited to the form described in the above-described embodiment, so that other forms may be used in other embodiments. For example, rectangular cutouts may be formed in the solder lands 3a. The center contacts 2b are inserted into the cutouts such that the tabular surfaces of the contact terminals 2e are disposed perpendicular to the land surfaces formed around the cutouts, followed by soldering of the solder lands 3a and the contact terminals 2e.

Further, although in the above-described embodiment the tabular surfaces of the contact terminals 2e were positioned with respect to the solder lands 3a by retaining the center contacts 2b by the insulations 2a, and press-fitting and engaging the insulations 2a to and with the through holes 1c, other methods may be used in other embodiments.

For example, obviously, retainer members, made of an insulation material, may be previously and integrally formed (for example, by insert molding) with the inside portions of the through holes 1c in the frame member 1. Here, slit-shaped through holes are formed in the center of each retainer member so that they are perpendicular to the bottom wall 1a of the frame member 1. The tabular center contacts 2b are directly press-fitted to their respective through holes in order to position the tabular surfaces of the contact terminals 2e perpendicular to their respective solder lands 3a.

As can be understood from the foregoing description, in the electronic device of the present invention, the tabular center contacts 2b of the receptacle connectors are positioned and press-fitted to their respective through holes 1c, formed in the shells 1d formed integrally with the frame member 1, such that the tabular surfaces of the contact terminals 2e are disposed perpendicular to their respective solder lands 3a on the printed board 3.

Therefore, the center contacts 2b can be mounted to the frame member 1 in a short time, since the center contacts 2b only need to be press-fitted to the frame member 1. In addition, since the tabular surfaces of the center contacts 2b can be easily positioned perpendicular to their respective solder lands 3a on the printed board 3, the soldering surface areas become fixed and largest, allowing the soldering to be stably performed.

In addition, according to the present invention, in the electronic device with a receptacle connector, the center contacts 2b of the receptacle connector are provided in their respective insulations 2a, made of an insulating material, so that the center contacts 2b can be easily mounted to the frame member 1 by just press-fitting the insulations 2a to their corresponding through holes 1c in the frame member 1. Therefore, it is possible to produce an electronic device with a receptacle connector at a low cost.

Claims

1. An electronic device with a receptacle connector, comprising:

   a frame member formed by die casting, said frame member having a shell of said receptacle connector integrally formed therewith;
   a center contact retained by an insulation capable of being very firmly inserted into said shell, said center contact having a tabular contact terminal; and
   a printed board placed within said frame member, said printed board having a connecting land;
   wherein said contact terminal is disposed substantially perpendicular to said connecting land of said printed board in a widthwise direction of said tabular contact terminal.

2. An electronic device with a receptacle connector according to Claim 1, further comprising a positioning portion, provided at said insulating member, for restricting the amount of insertion and rotational angle with respect to said shell, and a retainer portion provided at said shell in correspondence with said positioning portion provided at said insulating member.

FIG. 1

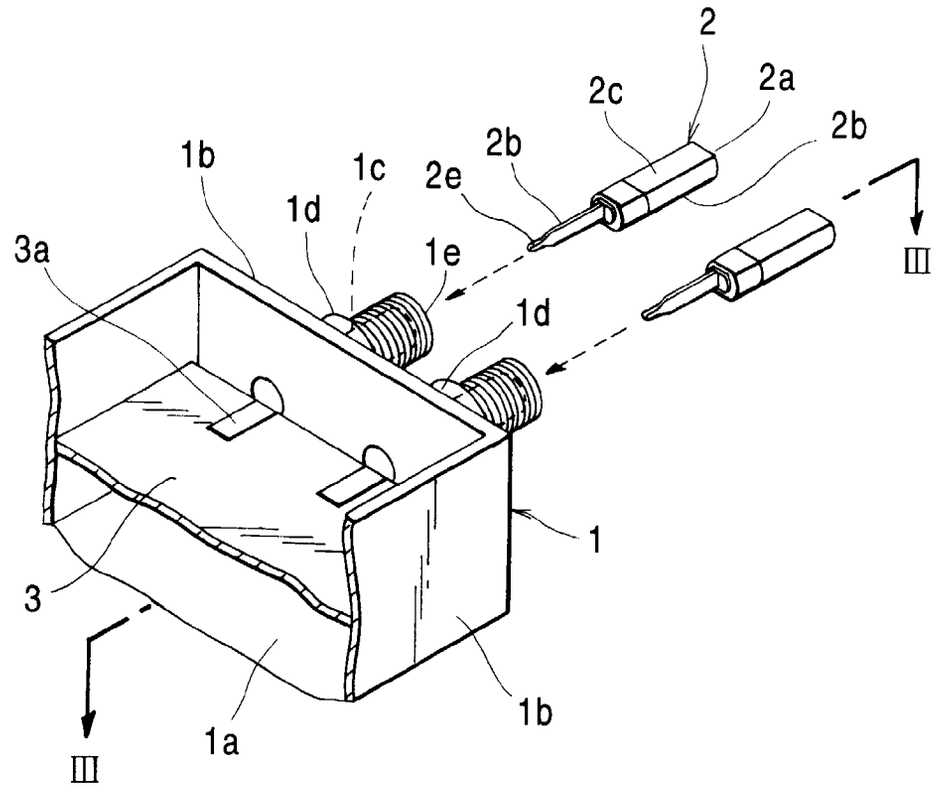

2
2c
2a
2b
2b
1b
1c
2e
1d
3a
1e
III
1d
1
3
1b
1a
III

FIG. 2

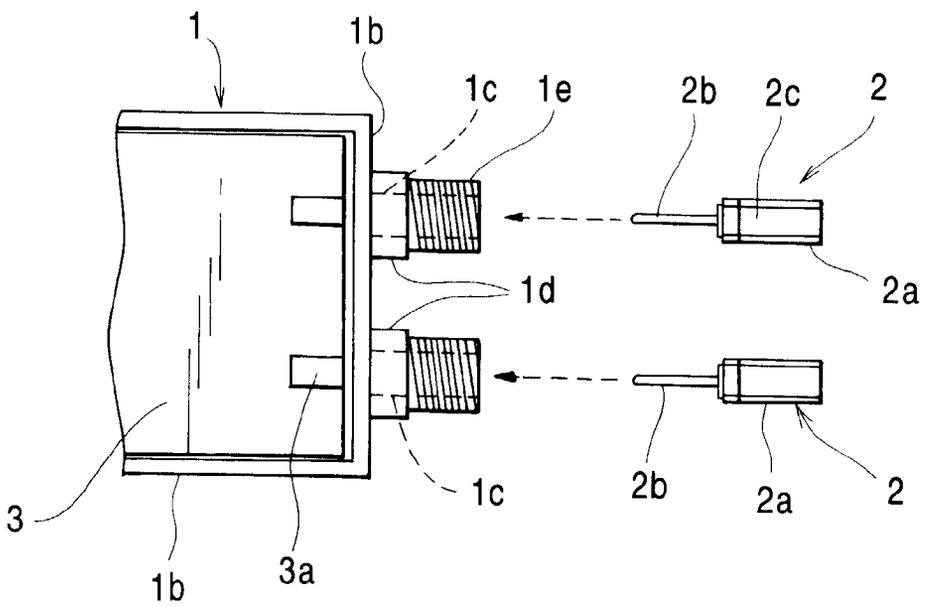

1
1b
1c
1e
2b
2c
2
2a
1d
3
1c
2b
2a
2
1b
3a

FIG. 3

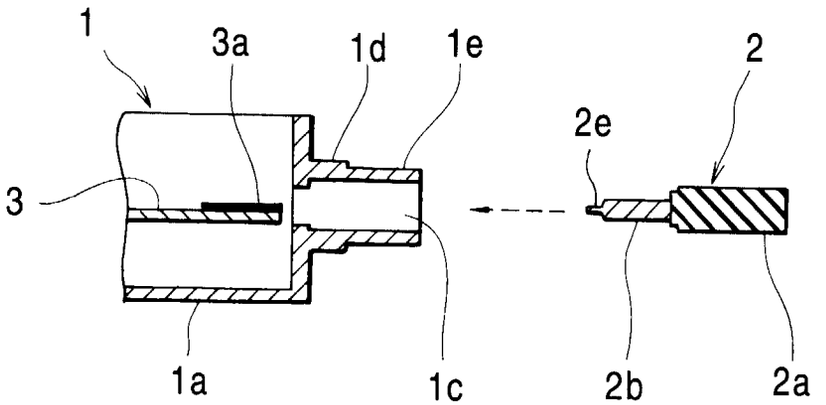


FIG. 4

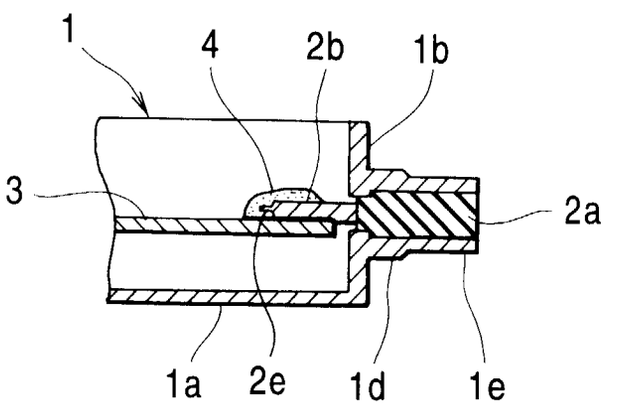


FIG. 5
PRIOR ART

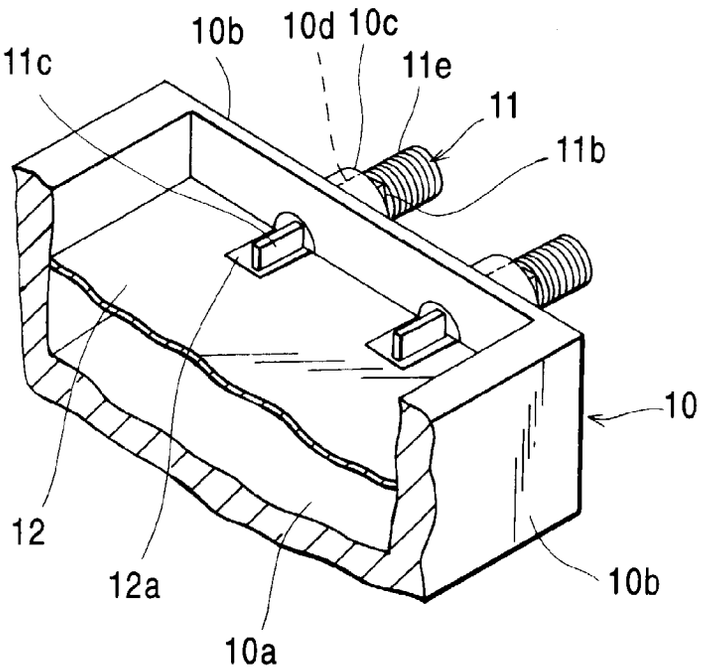
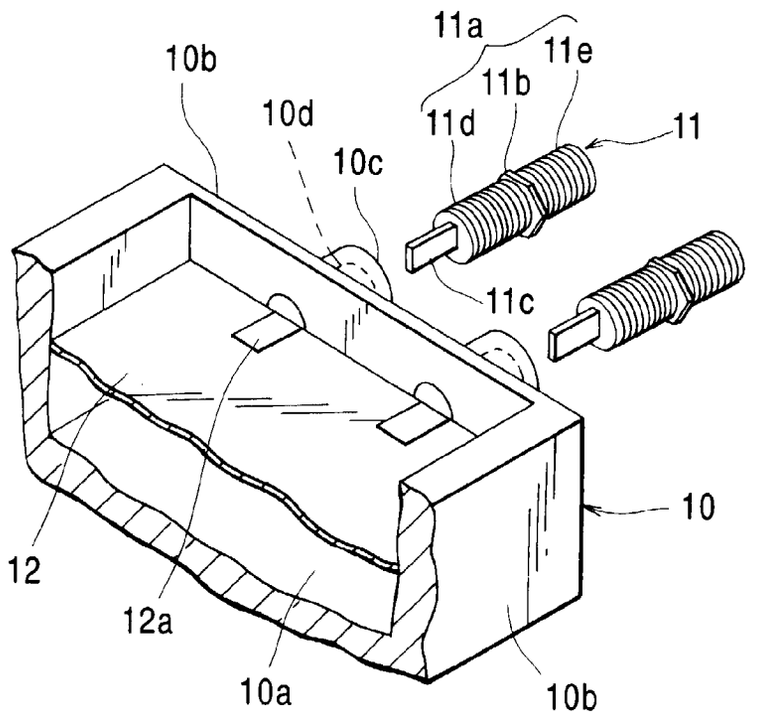


FIG. 6
PRIOR ART



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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 3890

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.6)
X	US 4 999 592 A (KANDA MINORU ET AL) 12 March 1991 * column 2, line 47 - column 4, line 56; figures 1,5 *	1,2	H05K9/00 H01P5/08
Y	* column 4, line 22 - column 4, line 56; figures 1,5 *	1,2	
Y	DE 196 49 433 A (ALPS ELECTRIC CO LTD) 5 June 1997 * column 1, line 31 - column 1, line 42; figures 1-5 *	1,2	
A	US 5 613 859 A (BELLANTONI JOHN V ET AL) 25 March 1997 * the whole document *	1,2	
A	PATENT ABSTRACTS OF JAPAN vol. 008, no. 127 (E-250), 14 June 1984 & JP 59 039101 A (FUJITSU KK), 3 March 1984, * abstract *	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A,P	GB 2 318 690 A (ALPS ELECTRIC CO LTD) 29 April 1998 * the whole document *	1,2	H05K H01P H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	30 September 1998	Torti, C

CATEGORY OF CITED DOCUMENTS

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