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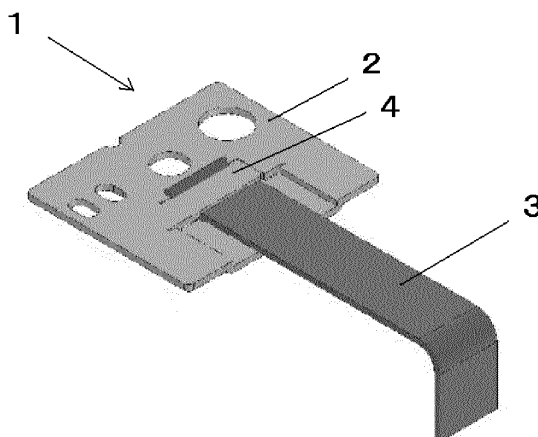
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(54) **TERMINAL STRIP CIRCUIT**

(57) The present invention provides a terminal plate circuit wherein the reliability of the electrical connection state between the terminal plate and the rectangular wire is enhanced by the simple method without using any independent component. The present invention is a terminal plate circuit including a terminal plate and a rectangular wire, characterized in that the terminal plate includes a cutout which has been formed by pushing out

a material of a part of the terminal plate from one side to the other side in such a manner as not to be completely separated from the terminal plate; in that the rectangular wire extends on the terminal plate in tight contact therewith, then passes under the cutout, and finally, emerges above the terminal plate again; and in that the surface of the rectangular wire is sandwiched between the edge of the cutout and the edge of the terminal plate existing around the cutout.

[Fig. 1]



Description

Patent Document 1: WO 2009/081508

Technical Field of the Invention

Disclosure of the Invention

[0001] The present invention relates to a terminal plate circuit being able to securely hold an electrical connection state between a terminal plate and a rectangular wire even in a severe environment such as within a terminal box for solar cell panel.

5 Problem that the Invention is to Solve

Background Art

[0008] The present invention has been devised under such a circumstance of the background art, and an object thereof is to provide a terminal plate circuit in which the reliability of an electrical connection state between a terminal plate and a rectangular wire is enhanced by a simple method without using any independent component.

[0002] Conventionally, in order to connect a rectangular wire electrically to a terminal plate in a terminal plate circuit, it has been carried out by providing an opening, through which the rectangular wire penetrates, in the terminal plate, inserting the rectangular wire through this opening from upper side or lower side, contacting the terminal plate with the rectangular wire electrically, and soldering or welding the contacting part.

Means for Solving the Problem

[0003] However, in a case where the terminal plate circuit is used within a terminal box for solar cell panel, the electrical connection state between the terminal plate and the rectangular wire must be maintained for an extremely long period of time in the severe environment, so that the reliability has not been sufficient by a connection method implemented by only soldering or welding of the aforementioned background art.

[0009] As a result of an earnest study by the inventors of the present application in order to achieve the above object, they have found that by forming a cutout by pushing out a material of a part of a terminal plate from one side to the other side, and further, by allowing a rectangular wire to pass under the cutout so that the surface of the rectangular wire is sandwiched between the edge of the cutout and the edge of the terminal plate, the reliability of an electrical connection state between the terminal plate and the rectangular wire can be readily enhanced in a simple method without using any independent component, and finally, they have reached the completion of the present invention.

[0004] On the other hand, as a method for enhancing the reliability of the electrical connection state between the terminal plate and the rectangular wire, fixing the rectangular wire to the terminal plate with use of a screw and thereafter soldering or welding the fixed part has been carried out conventionally; however, fixation with a screw involves formation of a screw hole and a work of mounting the screw, so that the manufacturing processes become complex and hence the above method is not desirable.

[0010] Specifically, the present invention provides a terminal plate circuit including a terminal plate and a rectangular wire, characterized in that the terminal plate includes a cutout which has been formed by pushing out a material of a part of the terminal plate from one side to the other side in such a manner as not to be completely separated from the terminal plate; in that the rectangular wire extends on the terminal plate in tight contact therewith, then passes under the cutout, and finally, emerges above the terminal plate again; and in that the surface of the rectangular wire is sandwiched between the edge of the cutout and the edge of the terminal plate existing around the cutout.

[0005] In view of this, the applicant has already proposed a terminal plate circuit, in which a pressing member capable of sandwiching an end of a terminal plate presses a rectangular wire against the terminal plate, so as to enhance the reliability of an electrical connection state between the terminal plate and the rectangular wire (cf. Patent Document 1).

[0011] In a preferred embodiment of the terminal plate circuit of the present invention, a part of the terminal plate in tight contact with the rectangular wire before the rectangular wire passes under the cutout has a depressed shape compared with remaining part of the terminal plate.

[0006] The terminal plate circuit disclosed in Patent Document 1 can remarkably enhance the reliability of the connected part between the terminal plate and the rectangular wire. However, the pressing member is independently needed, and therefore, there was a space to further improve this terminal plate circuit in terms of management of manufacturing processes.

[0012] In another preferred embodiment of the terminal plate circuit of the present invention, the rectangular wire is bent to be placed on the cutout in tight contact therewith after the rectangular wire emerges above the terminal plate again.

Prior Art Document

[0013] In a further preferred embodiment of the terminal plate circuit of the present invention, a part where the rectangular wire and the terminal plate contact with each other and/or the surroundings thereof are soldered or welded.

Patent Document

[0014] In a more preferred embodiment of the terminal plate circuit of the present invention, the terminal plate

[0007]

circuit is used within a terminal box for solar cell panel.
Advantages of the Invention

[0015] The terminal plate circuit of the present invention includes the cutout which has been formed by pushing out the material of a part of the terminal plate from one side to the other side, in which the rectangular wire is allowed to pass under the cutout so that the surface of the rectangular wire is sandwiched between the edge of the cutout and the edge of the terminal plate around the cutout. Thus, it is possible to enhance the reliability of the electrical connection state between the terminal plate and the rectangular wire by the simple configuration without using any independent component. Consequently, the terminal plate circuit of the present invention is suitable for a terminal box for solar cell panel which is used in severe outdoor environment.

Brief Descriptions of Drawings

[0016]

[Fig. 1] Fig. 1 is a perspective outline view of the first embodiment of a terminal plate circuit of the present invention.

[Fig. 2] Fig. 2 is a sectional outline view of the first embodiment of the terminal plate circuit of the present invention.

[Fig. 3] Fig. 3 is a perspective outline view of the second embodiment of a terminal plate circuit of the present invention.

[Fig. 4] Fig. 4 is a sectional outline view of the second embodiment of the terminal plate circuit of the present invention.

[Fig. 5] Fig. 5 is a perspective outline view of the third embodiment of a terminal plate circuit of the present invention.

[Fig. 6] Fig. 6 is a sectional outline view of the third embodiment of the terminal plate circuit of the present invention.

Best Mode for Carrying Out the Invention

[0017] The embodiments of the terminal plate circuit of the present invention will now be illustrated with reference to the drawings hereinafter, but the present invention is not limited thereto.

(First Embodiment)

[0018] Fig. 1 is a perspective outline view showing the first embodiment of a terminal plate circuit of the present invention. Fig. 2 is a sectional outline view of the terminal plate circuit of Fig. 1. As is obvious from FIGS. 1 and 2, a terminal plate circuit 1 includes a terminal plate 2 and a rectangular wire 3. The terminal plate 2 includes a cutout 4 which has been formed by pushing out a material of a part of the terminal plate from lower side to upper side. The cutout 4 is not completely separated from the

terminal plate 2, and allows the rectangular wire 3 to pass thereunder.

[0019] The rectangular wire 3 is guided near the terminal plate 2 so as to supply a current generated at, for example, a solar cell panel. As shown in FIGS. 1 and 2, the rectangular wire 3 extends on the terminal plate 2 in tight contact therewith, passes under the cutout 4, and finally, emerges above the terminal plate 2. At this time, the surface of the rectangular wire 3 (specifically, a surface of a part of the rectangular wire 3 which is to go under the cutout 4 and a surface of a part of the rectangular wire which is to emerge above the terminal plate through lower side of the cutout 4) is sandwiched between the edge of the cutout 4 and the edge of the terminal plate 2 existing around the cutout 4. This sandwich state can be achieved by slightly raising the cutout 4 from the terminal plate 2 to allow the rectangular wire 3 to pass from upper side of the terminal plate 2 to lower side of the cutout 4 and emerge above the terminal plate 2, and subsequently, by lowering and pressing the cutout 4 against the terminal plate 2 to the original position. This sandwich structure more enhances the electrical connection state between the terminal plate 2 and the rectangular wire 3 than that in the conventional art because there are at least two sandwich parts.

[0020] Although the cutout 4 is required to have such a shape and a size as to allow the rectangular wire 3 to extend from upper side of the terminal plate 2, via lower side of the cutout 4, to upper side of the terminal plate 2 again, it may be formed into any shape and in any size within a realistic range unless it is completely separated from the terminal plate 2. For example, the cutout 4 may be partly cut off or may be divided into a plurality of parts. The important thing herein is that the cutout 4 which is not completely separated from the terminal plate 2 presses the surface of the rectangular wire 3 in such a manner as to sandwich the rectangular wire 3 between the edge of the cutout 4 and the edge of the terminal plate 2 around the cutout 4, so as to securely establish the electrical connection state between the terminal plate 2 (or the cutout 4) and the rectangular wire 3.

[0021] The rectangular wire 3 used in the terminal plate circuit 1 of the present invention may be appropriately selected from conventionally known ones. The terminal plate 2 should be preferably enlarged as shown in Figs. 1 and 2 in order to enhance the function for cooling a diode to be mounted thereon in the case where the terminal plate 2 is used within a terminal box for solar cell panel. As shown in FIGS. 1 and 2, a part of the terminal plate 2 with which the rectangular wire 3 is brought into tight contact before passing under the cutout 4 preferably has a depressed shape compared with remaining part of the terminal plate 2. This is for enabling the rectangular wire 3 to readily pass under the cutout 4 and for securing the sandwich state. Although the other constituent components used in the terminal plate circuit 1 are not described in detail here, conventionally known constituent components may be appropriately adopted.

[0022] In the terminal plate circuit 1 of the present invention, in addition to that the rectangular wire 3 is sandwiched between the cutout 4 of the terminal plate 2 and the terminal plate 2 around the cutout 4 as described above, the part and/or the surroundings where the terminal plate 2 and the rectangular wire 3 are brought into electric contact with each other may be soldered or welded, whereby it is possible to achieve the firmer electrical connection state between the terminal plate 2 and the rectangular wire 3.

(Second Embodiment)

[0023] Fig. 3 is a perspective outline view showing the second embodiment of a terminal plate circuit of the present invention. Fig. 4 is a sectional outline view of the terminal plate circuit of Fig. 3. In the above first embodiment, the cutout 4 of the terminal plate 2 has a rectangular shape, wherein one side is continuous to the terminal plate 2. The second embodiment is largely different from the first embodiment in that a cutout 4 of a terminal plate 2 has a U shape, wherein both ends of the U-shaped cutout 4 are continuous to the terminal plate 2, and further, a rectangular wire 3 is surrounded by the U-shaped cutout 4. This structure in the second embodiment is advantageous in that the cutout 4 uniformly presses the surface of the rectangular wire 3 against the edge of the terminal plate 2 with ease. The other configurations are basically identical to each other between the first and second embodiments without any substantial difference.

(Third Embodiment)

[0024] Fig. 5 is a perspective outline view showing the third embodiment of a terminal plate circuit of the present invention, and Fig. 6 is a sectional outline view of the terminal plate circuit of Fig. 5. The principal differences between the above first embodiment and the third embodiment are the shape of a cutout 4 of a terminal plate 2 and the path of a rectangular wire 3 near the cutout 4. Specifically, the third embodiment is largely different from the first embodiment in that the rectangular cutout 4 is located at a slightly higher position than the surface of the terminal plate 2, and the rectangular wire 3 passes under the cutout 4, emerges above the terminal plate 2 and then is bent to be placed on the cutout 4 in close contact therewith. With the above configuration in the third embodiment, there is an advantage that the rectangular wire 3 hardly slips even if it is pulled. The other configurations are basically identical to each other between the first and third embodiments without any substantial difference.

Industrial Applicability

[0025] The terminal plate circuit of the present invention can enhance the reliability of the electrical connection state between the terminal plate and the rectangular

wire by the simple method without using any independent component, and therefore, it can be suitably used for a terminal box for solar cell panel which is exposed to a severe environment.

Explanation of Reference Number

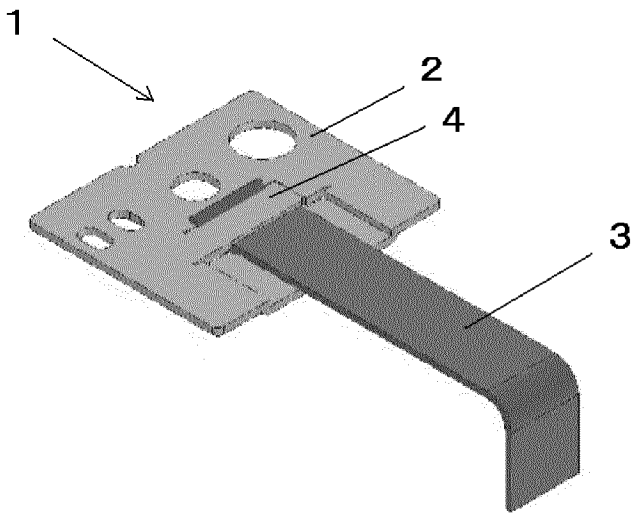
[0026]

1: terminal plate circuit
2: terminal plate
3: rectangular wire
4: cutout

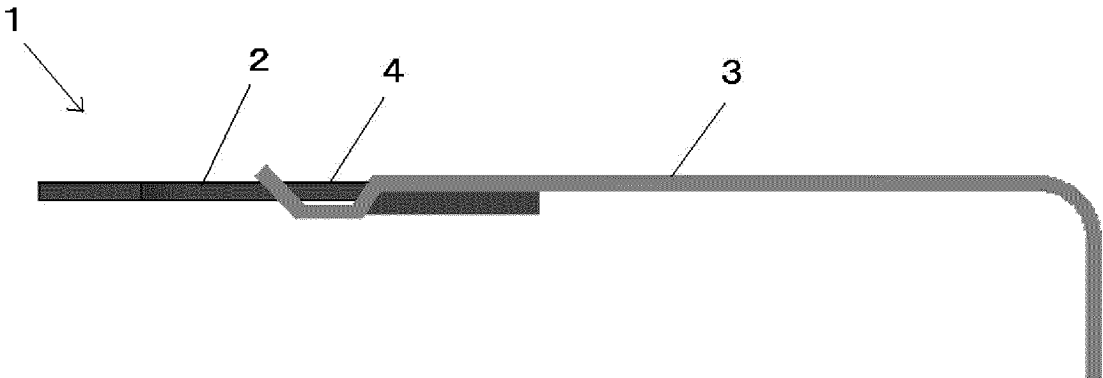
Claims

1. A terminal plate circuit including a terminal plate and a rectangular wire, **characterized in that** the terminal plate includes a cutout which has been formed by pushing out a material of a part of the terminal plate from one side to the other side in such a manner as not to be completely separated from the terminal plate; **in that** the rectangular wire extends on the terminal plate in tight contact therewith, then passes under the cutout, and finally, emerges above the terminal plate again; and **in that** the surface of the rectangular wire is sandwiched between the edge of the cutout and the edge of the terminal plate existing around the cutout.
2. The terminal plate circuit according to claim 1, wherein a part of the terminal plate in tight contact with the rectangular wire before the rectangular wire passes under the cutout has a depressed shape compared with remaining part of the terminal plate.
3. The terminal plate circuit according to claim 1 or 2, wherein the rectangular wire is bent to be placed on the cutout in tight contact therewith after the rectangular wire emerges above the terminal plate again.
4. The terminal plate circuit according to any one of claims 1 to 3, wherein a part where the rectangular wire and the terminal plate contact with each other and/or the surroundings thereof are soldered or welded.
5. The terminal plate circuit according to any one of claims 1 to 4, wherein the terminal plate circuit is used within a terminal box for solar cell panel.

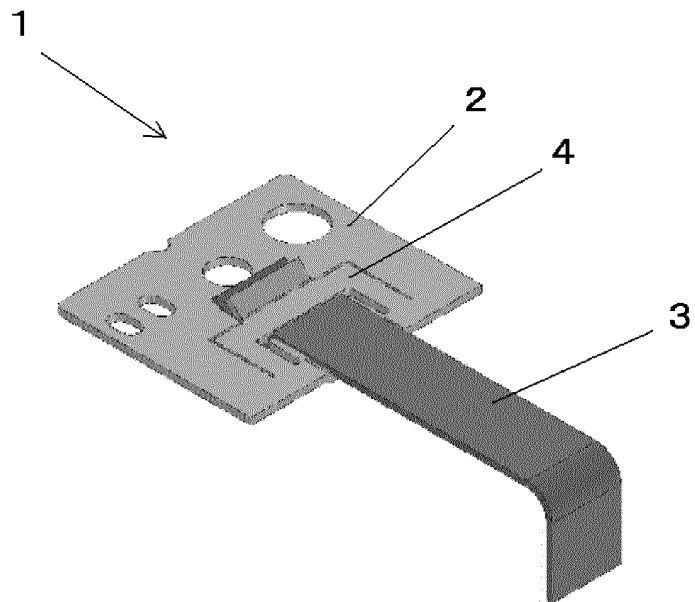
[Fig. 1]



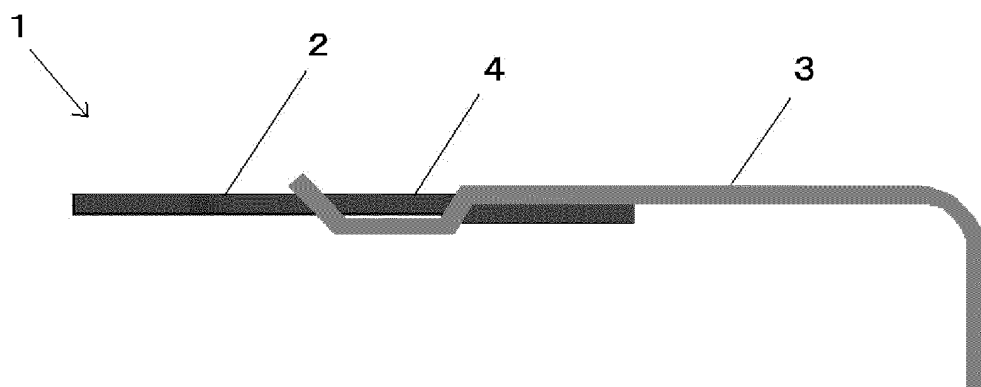
[Fig. 2]



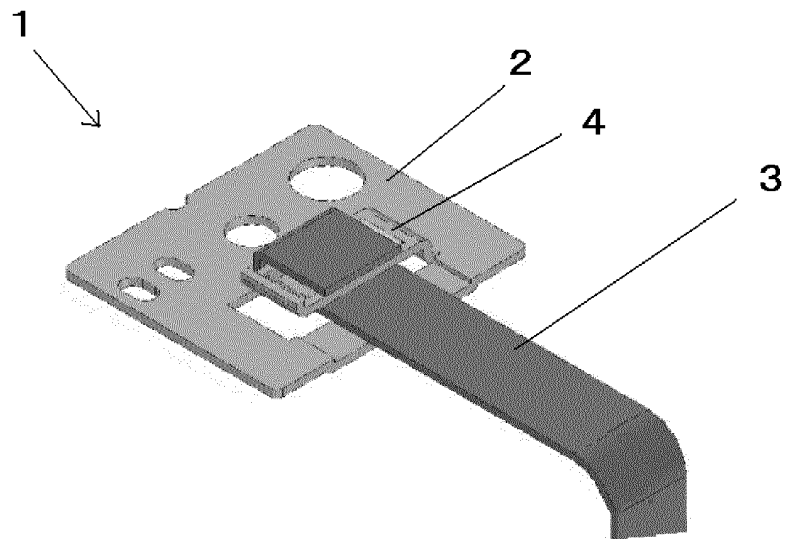
[Fig. 3]



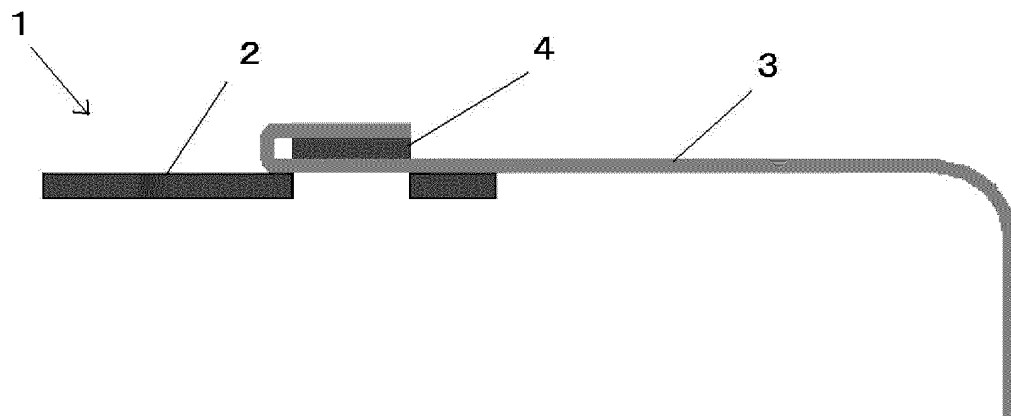
[Fig. 4]



[Fig. 5]



[Fig. 6]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/002536

A. CLASSIFICATION OF SUBJECT MATTER H01R4/02 (2006.01) i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H01R4/02		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009/081508 A1 (Onamba Co., Ltd.), 02 July 2009 (02.07.2009), entire text; all drawings & EP 2149932 A1	1-5
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 128810/1989 (Laid-open No. 66193/1991) (Nichifu Terminal Industries Co., Ltd.), 27 June 1991 (27.06.1991), entire text; fig. 1 to 4, 7 (Family: none)	1-5
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 April, 2010 (28.04.10)		Date of mailing of the international search report 18 May, 2010 (18.05.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/002536

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 106417/1989 (Laid-open No. 44864/1991) (Showa Electric Wire & Cable Co., Ltd.), 25 April 1991 (25.04.1991), specification, page 4, line 17 to page 5, line 5; fig. 1 to 2 (Family: none)	3

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2009081508 A [0007]