(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 961 856 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
09.06.2010 Bulletin 2010/23

(51) Int Cl.:
D06F 37/28 *(2006.01)* ***D06F 39/14*** *(2006.01)*

(21) Application number: **07103015.9**

(22) Date of filing: **23.02.2007**

(54) **Electrical appliance with an improved door mechanism**

Elektrisches Gerät mit verbessertem Türmechanismus

Appareil électrique avec mécanisme de porte amélioré

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(43) Date of publication of application:
27.08.2008 Bulletin 2008/35

(73) Proprietor: **Electrolux Home Products Corporation N.V.**
1930 Zaventem (BE)

(72) Inventors:
- **Del Pos, Maurizio**
  33170 Pordenone (IT)
- **Pezzutto, Alberto**
  31045 Motta di Livenza (IT)
- **Filippetti, Mario**
  33030 Campoformido (IT)
- **Reid, Nicola**
  33170 Pordenone (IT)
- **Esteve, Jerome**
  33080 Porcia (IT)
- **Bodet, Marie-Josephe**
  33170 Pordenone (IT)
- **Maiero, Marco**
  33033 Codroipo Udine (IT)
- **Ohlson, Otto**
  554 48 Jönköping (SE)
- **Fox, Nick**
  33080 Roveredo in Piano (IT)
- **Östlund, Pelle**
  33170 Pordenone (IT)

(74) Representative: **Baumgartl, Gerhard Willi et al**
AEG Hausgeräte GmbH
Group Intellectual Property
90327 Nürnberg (DE)

(56) References cited:
EP-A- 1 595 992
EP-A1- 1 333 118
DE-U1- 29 905 081
US-A- 2 960 778

EP 1 961 856 B1

Printed by Jouve, 75001 PARIS (FR)

Description

TECHNICAL FIELD

[0001] The present invention relates to an electrical appliance with an improved door mechanism.

[0002] The present invention may be used to particular advantage in a washing machine, to which the following description refers purely by way of example.

BACKGROUND ART

[0003] Household and professional appliances have a common structure: a work environment in which the material to be processed (e.g. fabrics to be washed, food to be cooked, dishes to be washed, etc.) is loaded by the user through a loading/unloading opening; work components for the appliance to function (e.g. washing means or a heater to heat the environment); a cabinet housing both the work environment and the work components; and a door, which is supported by the cabinet and closes the loading/unloading opening of the work environment to allow access to the work environment (door open) and to isolate the work environment from the external environment (door closed).

[0004] At present almost all door mechanisms comprise a hinge, which is located either on the side of the door (as in washing machines) or on the bottom of the door (as in dishwashers or ovens) and allows the door to rotate about a fixed axis of rotation. Although convenient in terms of simplicity and cost, these door mechanisms can be troublesome when the space around the machine is tiny (e.g. small apartments, kitchens or bathrooms), as the whole door is rotated about a fixed axis of rotation, regardless of the location of the machine or door. In other words, a door hinged to rotate about a fixed axis of rotation requires a large amount of space in front of the appliance when the door is open (as in an oven) or being open (as in a washing machine or in a tumble dryer).

[0005] EP1333118A1 discloses a front-loading electrical household appliance comprising a supporting and containing structure with a front wall having a loading opening closed by a door. The door is connected to the front wall by two closing links located near two opposite sides of the door and connected rotatably, by a first end, to the door and, by a second end, to the front wall to cause the door to move from the closed position to a sliding position; two tracks formed in the door and in sliding connection with said first ends of the closing links cause the door to slide parallel to the front wall from the sliding position to the open position.

[0006] From DE 299 05 081 U1 an oven is known, the housing thereof being shaped in a cylindrical way. An oven door is provided, the door having the shape of a portion of a cylinder barrel having the same centerline as the cylindrical oven housing. The door is rotatably arranged at the oven housing. While rotating the door is closing or unclosing an access opening arranged in the cylindrical oven housing.

DISCLOSURE OF INVENTION

[0007] It is an object of the present invention to provide an electrical appliance with an improved door mechanism, designed to eliminate the aforementioned drawbacks, and which is cheap and easy to implement.

[0008] According to the present invention, there is provided an electrical appliance with an improved door mechanism, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic side view of a portion of an electrical appliance (in particular a washing machine) in accordance with the present invention and with a door in a closed position;

Figures 2-4 show a schematic side view of the Figure 1 electrical appliance at different steps in the opening of the door;

Figure 5 shows a schematic side view of the door of the Figure 1 electrical appliance;

Figure 6 shows a schematic front view of part of a casing of the Figure 1 electrical appliance; and

Figure 7 shows a schematic section view along line VII-VII of the Figure 6 casing.

PREFERRED EMBODIMENTS OF THE INVENTION

[0010] Number 1 in Figure 1 indicates as a whole an electrical appliance (in particular a washing machine) comprising a casing 2 resting on a floor on a number of feet (not shown). Casing 2 supports a work environment 3 (in particular a revolving drum defining a wash tub) in which the material to be processed (i.e. fabrics to be washed) is loaded/unloaded by the user through a loading/unloading opening 4. Access to loading/unloading opening 4 of work environment 3 is closed by a door 5 supported by casing 2.

[0011] As shown in Figures 2-7, connecting means 6 are provided for connecting door 5 to casing 2, so that door 5 can be moved between a closed position and an open position.

[0012] Connecting means 6 comprise two guides 7 (only one shown in Figure 7) formed on casing 2, both the same shape and located on two opposite sides of casing 2; two trolleys 8 (only one shown in Figures 2-6 and 7), each of which slides along a respective guide 7; two guides 9 (only one shown in Figure 5) formed on door 5, both the same shape and located on two opposite sides of door 5; and two trolleys 10 (only one shown in Figures 2-5 and 7), each of which slides along a respective guide

9. The two guides 9 are the same shape as guides 7. The two guides 9 may, of course, differ in shape from the two guides 7, but only to a minor extent, since all the guides 7 and 9 guide the movement of the same rigid object: door 5.

[0013] In a different embodiment not shown, connecting means 6 comprise only one guide 7 formed on casing 2, only one trolley 8 sliding along guide 7, only one guide 9 formed on door 5, and only one trolley 10 sliding along guide 9.

[0014] As shown in Figures 5 and 7, each guide 7, 9 has a curved first portion 11, along which the respective trolley 8, 10 slides when door 5 nears the closed position; and a second portion 12, which is longer than first portion 11, and is tangent to first portion 11 at a point of connection 13 to first portion 11.

[0015] In a preferred embodiment shown in the attached Figures, first portion 11 has a variable radius, which increases from the closed position to the point of connection 13 to second portion 12, so that first portion 11 has a maximum radius at the point of connection 13 to second portion 12. In a different embodiment not shown, first portion 11 has a fixed radius.

[0016] In a preferred embodiment shown in the attached Figures, second portion 12 is also curved and has a fixed radius; however, in a different embodiment, second portion 12 may also have a variable radius. Preferably, the two portions 11 and 12 of each guide 7, 9 have different centers, and first portion 11 has a smaller radius than second portion 12. In a preferred embodiment shown in the attached Figures, for each guide 7, 9, at the point of connection 13 between first portion 11 and second portion 12, the two portions 11 and 12 are horizontal, whereas, away from the point of connection 13 between first portion 11 and second portion 12, the two portions 11 and 12 are directed downwards, so as to push door 5 into the open position or closed position by force of gravity.

[0017] In a different embodiment not shown, second portion 12 is straight.

[0018] Generally speaking, guides 9, being formed on door 5, should be more or less the same shape as door 5. Thus, when door 5 is curved (as in the attached Figures) guides 9 are also curved and preferably have the same center as door 5; and, when door 5 is flat, guides 9 are also substantially straight or tend towards a straight shape.

[0019] As shown in Figures 5 and 7, each trolley 8 is hinged to door 5 to rotate with respect to door 5 about an axis of rotation 14 perpendicular to the relevant guide 7; and each trolley 10 is hinged to casing 2 to rotate with respect to casing 2 about an axis of rotation 15 perpendicular to the relevant guide 9.

[0020] As shown in the opening sequence in Figures 2-4, door 5 is guided by guides 7 and 9, which allow two combined movements: door 5 moves initially out of its closed position, and then slides down to allow access to work environment 3. The first part of the movement of door 5 is guided by first portions 11 of guides 7 and 9; during the first part of the movement of door 5, each trolley 8 slides along first portion 11 of the relevant guide 7, while each second trolley 10 mainly rotates with respect to casing 2 about the relevant axis of rotation 15. The second part of the movement of door 5 is guided by second portions 12 of guides 7 and 9; during the second part of the movement of door 5, each trolley 8 slides along second portion 12 of the relevant guide 7, while each second trolley 10 slides along second portion 12 of the relevant guide 9.

[0021] In other words, during the first part of the movement of door 5, door 5 moves substantially away (perpendicularly) from casing 2, at least up to a point at which the space requirements for door 5 to move parallel to casing 2 no longer interfere with casing 2; whereas, during the second part of the movement of door 5, door 5 moves substantially parallel to casing 2.

[0022] Electrical appliance 1 may comprise locking means for keeping door 5 in the closed position; and braking and/or damping means for attenuating the sliding movement of door 5 between the closed position and the open position.

[0023] In the embodiment shown in the attached Figures, guides 7 and 9 are located on both casing 2 and door 5 (guides 7 on casing 2, and guides 9 on door 5). In a different embodiment not shown, guides 7 and 9 are located either on door 5 only, or on casing 2 only.

[0024] Electrical appliance 1 as described above has numerous advantages, by being easy to implement and allowing door 5 to open without too much space needed for the movement of door 5, thus being suitable for small living environments.

[0025] Though particularly advantageous for a washing machine, the above connecting means 6 of door 5 also apply to any other kind of electrical appliance, such as a drier, washer-drier, refrigerator, conventional oven, microwave oven, or dishwasher.

Claims

1. An electrical appliance (1) comprising:

a casing (2);

a work environment (3) supported inside the casing (2) and having a loading/unloading opening (4);

a door (5) supported by the casing (2) to close the loading/unloading opening (4) of the work environment (3); and

connecting means (6) for connecting the door (5) to the casing (2) so that the door (5) can be moved between a closed position and an open position, and comprising at least one first guide (7) formed on the casing (2) or on the door (5), at least one first trolley (8) sliding along the first guide (7) and connected to the door (5) or to the

casing (2), at least one second guide (9) formed on the door (5) or on the casing (2) and the same shape as the first guide (7), and at least one second trolley (10) sliding along the second guide (9) and connected to the casing (2) or to the door (5);
the electrical appliance (1) being **characterised in that** each guide (7, 9) has a curved first portion (11), along which the respective trolley (8, 10) slides when the door (5) nears the closed position; and a second portion (12), which is longer than the first portion (11), and is tangent to the first portion (11) at a point of connection (13) to the first portion (11) with the second portion (12) being curved and having a center different from the center of the first portion (11) or with the second portion being straight.

2. An electrical appliance (1) as claimed in Claim 1, wherein the first portion (11) has a fixed radius.

3. An electrical appliance (1) as claimed in Claim 1, wherein the first portion (11) has a variable radius which increases from the closed position to the point of connection (13) to the second portion (12), so that the first portion (11) has a maximum radius at the point of connection (13) to the second portion (12).

4. An electrical appliance (1) as claimed in Claim 1, 2 or 3, wherein, away from the point of connection (13) to the second portion (12), the first portion (11) is directed downwards, so as to push the door (5) into the closed position by force of gravity.

5. An electrical appliance (1) as claimed in any of the Claims 1 to 4, wherein, for each guide (7, 9), the first portion (11) has a smaller radius than the second portion (12).

6. An electrical appliance (1) as claimed in any of the Claims 1 to 5, wherein the second portion (12) has a fixed radius.

7. An electrical appliance (1) as claimed in any of the Claims 1 to 5, wherein the second portion (12) has a variable radius.

8. An electrical appliance (1) as claimed in any of Claims 1 to 7, wherein, for each guide (7, 9), at the point of connection (13) between the first portion (11) and the second portion (12), the two portions (11, 12) are horizontal, whereas, away from the point of connection (13) between the first portion (11) and the second portion (12), the two portions (11, 12) are directed downwards, so as to push the door (5) into the open position or closed position by force of gravity.

9. An electrical appliance (1) as claimed in any of Claims 1 to 8, wherein the connecting means (6) comprise two first guides (7) located on two opposite sides of the casing (2); two first trolleys (8) sliding along the first guides (7); two second guides (9) located on two opposite sides of the door (5); and two second trolleys (10) sliding along the second guides (9).

10. An electrical appliance (1) as claimed in any of Claims 1 to 9, wherein the first trolley (8) is hinged to the door (5) to rotate with respect to the door (5) about an axis of rotation perpendicular to the first guide (7).

11. An electrical appliance (1) as claimed in any of Claims 1 to 10, wherein the second trolley (10) is hinged to the casing (2) to rotate with respect to the casing (2) about an axis of rotation perpendicular to the second guide (9).

Patentansprüche

1. Elektrogerät (1), das Folgendes umfasst:

ein Gehäuse (2);
ein Arbeitsumfeld (3), das im Gehäuse (2) getragen wird und eine Lade-/Entladeöffnung (4) aufweist;
eine Tür (5), die von dem Gehäuse (2) getragen wird und zum Schließen der Lade-/Entladeöffnung (4) des Arbeitsumfelds (3) dient; und
Verbindungsmittel (6) zum Verbinden der Tür (5) mit dem Gehäuse (2), so dass die Tür (5) zwischen einer geschlossenen Stellung und einer offenen Stellung bewegt werden kann, welche mindestens eine erste auf dem Gehäuse (2) oder der Tür (5) gebildete Führung (7), mindestens ein erstes Laufwerk (8), das entlang der ersten Führung (7) gleitet und mit der Tür (5) oder dem Gehäuse (2) verbunden ist, mindestens eine zweite Führung (9), die auf der Tür (5) oder dem Gehäuse (2) gebildet ist und dieselbe Form wie die erste Führung (7) aufweist, und mindestens ein zweites Laufwerk (10), das entlang der zweiten Führung (9) gleitet und mit dem Gehäuse (2) oder der Tür (5) verbunden ist, umfassen;

wobei das Elektrogerät (1) **dadurch gekennzeichnet ist, dass** jede Führung (7, 9) einen gekrümmten ersten Abschnitt (11) aufweist, den entlang das entsprechende Laufwerk (8, 10) gleitet, wenn sich die Tür (5) der geschlossenen Stellung nähert; und einen zweiten Abschnitt (12), der länger ist als der erste Abschnitt (11) und zum ersten Abschnitt (11) an einem Verbindungspunkt (13) mit dem ersten Ab-

schnitt (11) eine Tangente bildet, wobei der zweite Abschnitt (12) gekrümmt ist und einen Mittelpunkt aufweist, der sich vom Mittelpunkt des ersten Abschnitts (11) unterscheidet, oder wobei der zweite Abschnitt gerade ist.

2. Elektrogerät (1) gemäß Anspruch 1, wobei der erste Abschnitt (11) einen festen Radius aufweist.

3. Elektrogerät (1) gemäß Anspruch 1, wobei der erste Abschnitt (11) einen variablen Radius aufweist, der von der geschlossenen Stellung bis zum Verbindungspunkt (13) zum zweiten Abschnitt (12) zunimmt, so dass der erste Abschnitt (11) am Verbindungspunkt (13) zum zweiten Abschnitt (12) einen maximalen Radius aufweist.

4. Elektrogerät (1) gemäß Anspruch 1, 2 oder 3, wobei in Entfernung vom Verbindungspunkt (13) zum zweiten Abschnitt (12) der erste Abschnitt (11) abwärts gerichtet ist, so dass die Tür (5) durch die Schwerkraftwirkung in die geschlossene Stellung gedrückt wird.

5. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 4, wobei der erste Abschnitt (11) für jede Führung (7, 9) einen kleineren Radius aufweist als der zweite Abschnitt (12).

6. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 5, wobei der zweite Abschnitt (12) einen festen Radius aufweist.

7. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 5, wobei der zweite Abschnitt (12) einen variablen Radius aufweist.

8. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 7, wobei für jede Führung (7, 9) am Verbindungspunkt (13) zwischen dem ersten Abschnitt (11) und dem zweiten Abschnitt (12) die beiden Abschnitte (11,12) horizontal sind, wohingegen in einer Entfernung vom Verbindungspunkt (13) zwischen dem ersten Abschnitt (11) und dem zweiten Abschnitt (12) die zwei Abschnitte (11, 12) abwärts gerichtet sind, um die Tür (5) durch Schwerkraftwirkung in die offene Stellung oder die geschlossene Stellung zu drücken.

9. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 8, wobei die Verbindungsmittel (6) zwei erste Führungen (7) umfassen, die auf zwei gegenüber liegenden Seiten des Gehäuses (2) angeordnet sind; ferner zwei erste Laufwerke (8), welche die ersten Führungen (7) entlang gleiten; zwei zweite Führungen (9), die auf zwei gegenüber liegenden Seiten der Tür (5) angeordnet sind; und zwei zweite Laufwerke (10), welche die zweiten Führungen (9) entlang gleiten.

10. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 9, wobei das erste Laufwerk (8) an der Tür (5) so aufgehängt ist, dass es im Verhältnis zur Tür (5) um eine senkrecht zur ersten Führung (7) stehende Rotationsachse rotiert.

11. Elektrogerät (1) gemäß einem der Ansprüche 1 bis 10, wobei das zweite Laufwerk (10) am Gehäuse (2) so aufgehängt sind, dass es im Verhältnis zum Gehäuse (2) um eine senkrecht zur zweiten Führung (9) stehende Rotationsachse rotiert.

Revendications

1. Appareil électrique (1) comprenant :

un boîtier (2) ;
un environnement de travail (3) supporté à l'intérieur du boîtier (2) et ayant une ouverture de chargement / déchargement (4) ;
une porte (5) supportée par le boîtier (2) pour fermer l'ouverture de chargement / déchargement (4) de l'environnement de travail (3) ; et
des moyens de raccordement (6) pour raccorder la porte (5) au boîtier (2) de sorte que la porte (5) peut être déplacée entre une position fermée et une position ouverte, et comprenant au moins un premier guide (7) formé sur le boîtier (2) ou sur la porte (5), au moins un premier chariot (8) coulissant le long du premier guide (7) et raccordé à la porte (5) ou au boîtier (2), au moins un second guide (9) formé sur la porte (5) ou sur le boîtier (2) et ayant la même forme que le premier guide (7), et au moins un second chariot (10) coulissant le long du second guide (9) et raccordé au boîtier (2) ou à la porte (5) ;
l'appareil électrique (1) étant **caractérisé en ce que** chaque guide (7, 9) a une première partie incurvée (11), le long de laquelle le chariot (8, 10) respectif coulisse lorsque la porte (5) se rapproche de la position fermée, et une seconde partie (12) qui est plus longue que la première partie (11) et est tangente à la première partie (11) au niveau d'un point de raccordement (13) par rapport à la première partie (11) avec la seconde partie (12) qui est incurvée et ayant un centre différent du centre de la première partie (11) ou avec la seconde partie qui est droite.

2. Appareil électrique (1) selon la revendication 1, dans lequel la première partie (11) a un rayon fixe.

3. Appareil électrique (1) selon la revendication 1, dans lequel la première partie (11) a un rayon variable qui augmente de la position fermée en passant par le

point de raccordement (13) jusqu'à la seconde partie (12), de sorte que la première partie (11) a un rayon maximum au niveau du point de raccordement (13) jusqu'à la seconde partie (12).

4. Appareil électrique (1) selon la revendication 1, 2 ou 3, dans lequel à distance du point de raccordement (13) jusqu'à la seconde partie (12), la première partie (11) est dirigée vers le bas, afin de pousser la porte (5) dans la position fermée par la force de gravité.

5. Appareil électrique (1) selon l'une quelconque des revendications 1 à 4, dans lequel, pour chaque guide (7, 9), la première partie (11) a un plus petit rayon que la seconde partie (12).

6. Appareil électrique (1) selon l'une quelconque des revendications 1 à 5, dans lequel la seconde partie (12) a un rayon fixe.

7. Appareil électrique (1) selon l'une quelconque des revendications 1 à 5, dans lequel la seconde partie (12) a un rayon variable.

8. Appareil électrique (1) selon l'une quelconque des revendications 1 à 7, dans lequel, pour chaque guide (7, 9), au niveau du point de raccordement (13) entre la première partie (11) et la seconde partie (12), les deux parties (11, 12) sont horizontales, alors qu'à distance du point de raccordement (13) entre la première partie (11) et la seconde partie (12), les deux parties (11, 12) sont dirigées vers le bas, afin de pousser la porte (5) dans la position ouverte ou la position fermée par la force de gravité.

9. Appareil électrique (1) selon l'une quelconque des revendications 1 à 8, dans lequel les moyens de raccordement (6) comprennent deux premiers guides (7) situés sur deux côtés opposés du boîtier (2) ; deux premiers chariots (8) coulissant le long des premiers guides (7) ; deux seconds guides (9) situés sur deux côtés opposés de la porte (5) ; et deux seconds chariots (10) coulissants le long des deux guides (9).

10. Appareil électrique (1) selon l'une quelconque des revendications 1 à 9, dans lequel le premier chariot (8) est articulé par rapport à la porte (5) afin de tourner par rapport à la porte (5) autour d'un axe de rotation perpendiculaire au premier guide (7).

11. Appareil électrique (1) selon l'une quelconque des revendications 1 à 10, dans lequel le second chariot (10) est articulé par rapport au boîtier (2) afin de tourner par rapport au boîtier (2) autour d'un axe de rotation perpendiculaire au second guide (9).

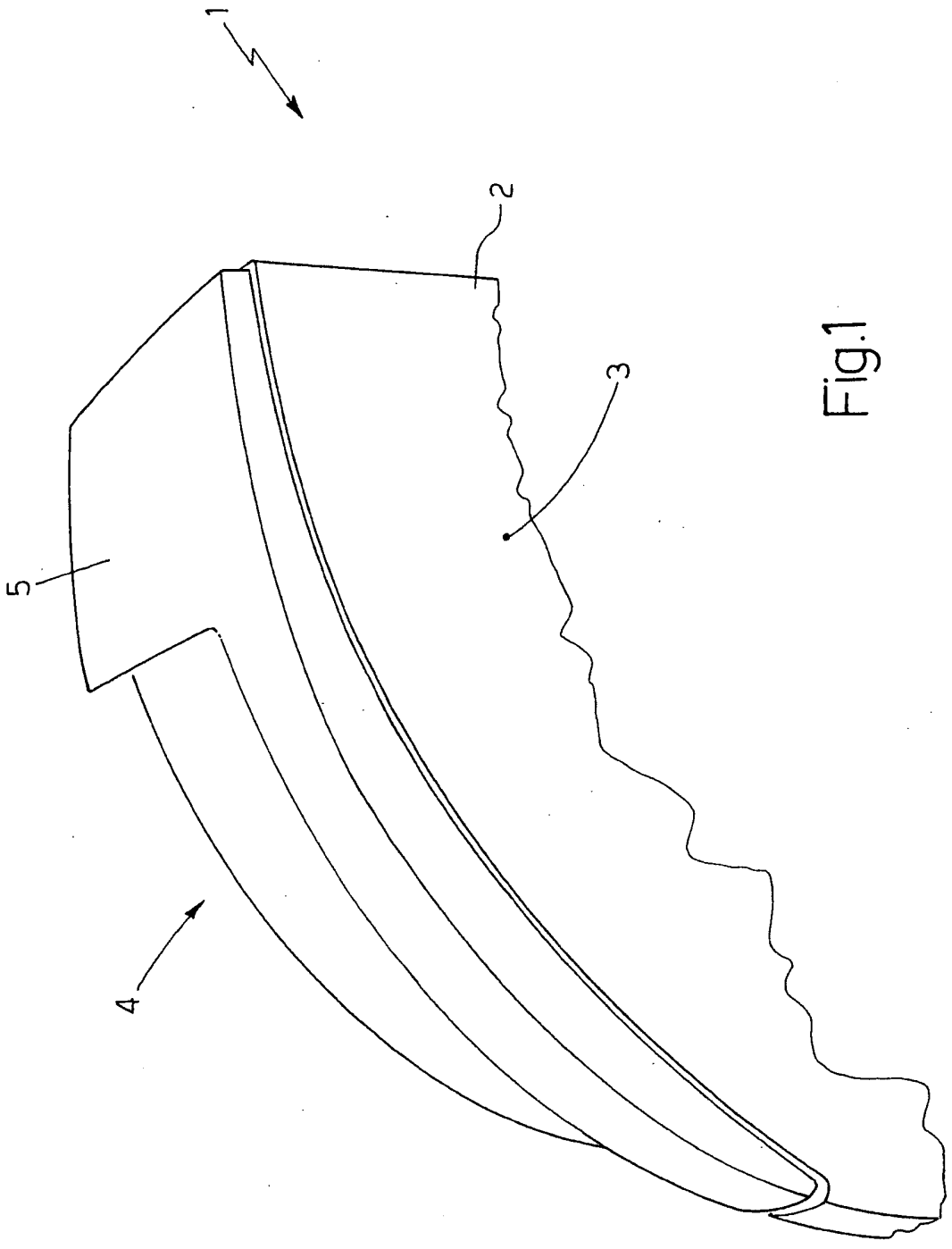

Fig.1

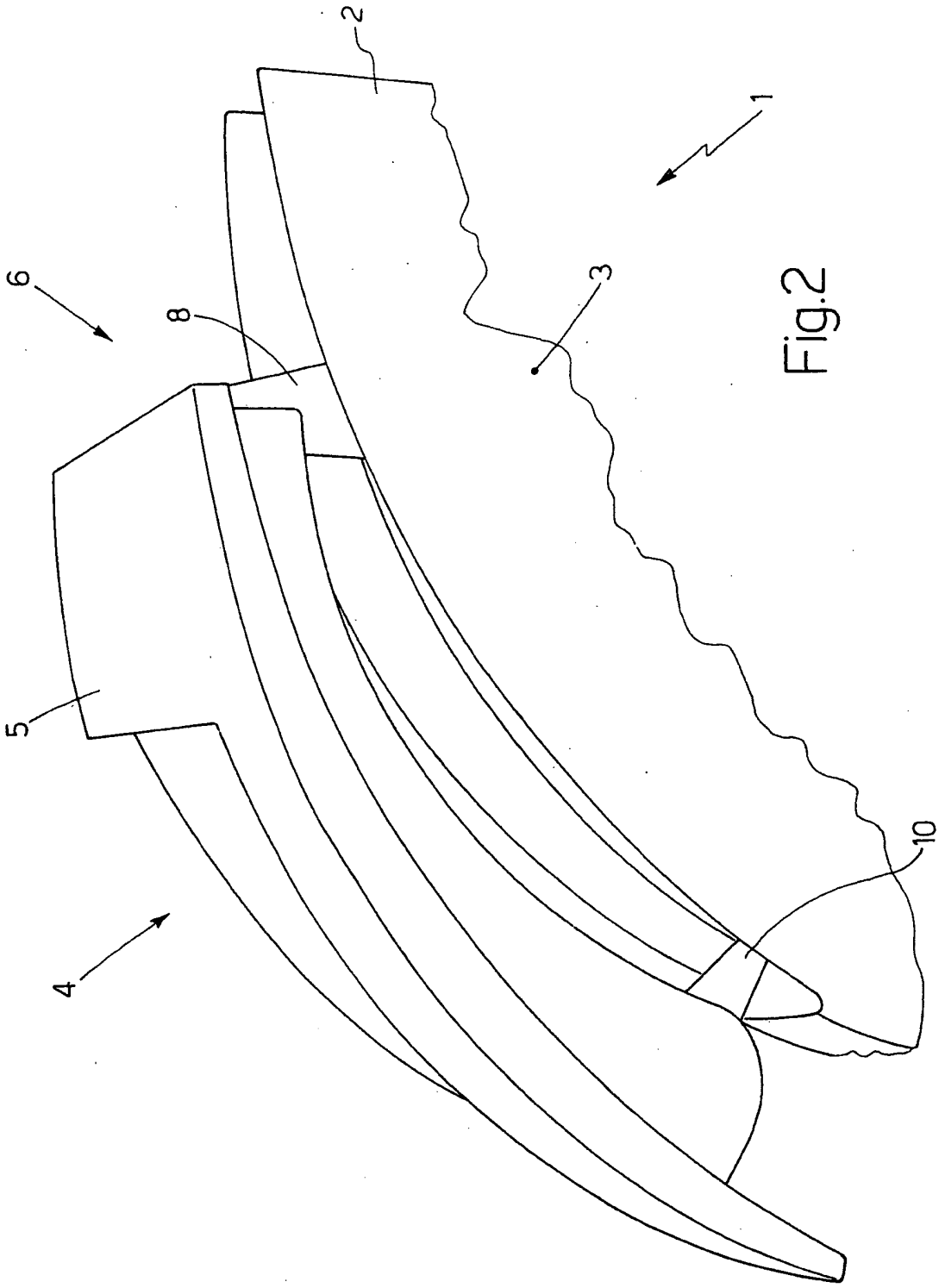

Fig.2

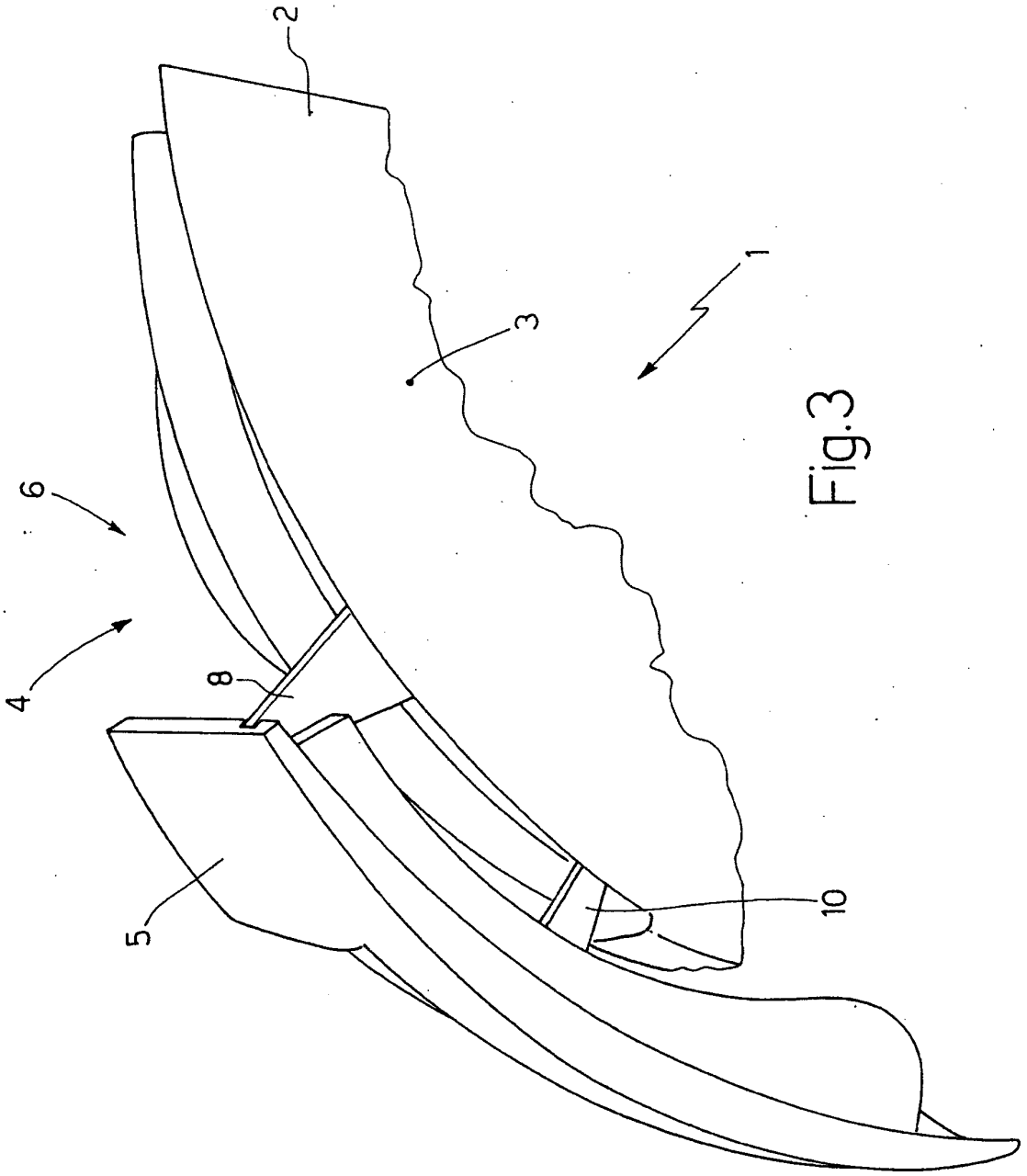

Fig.3

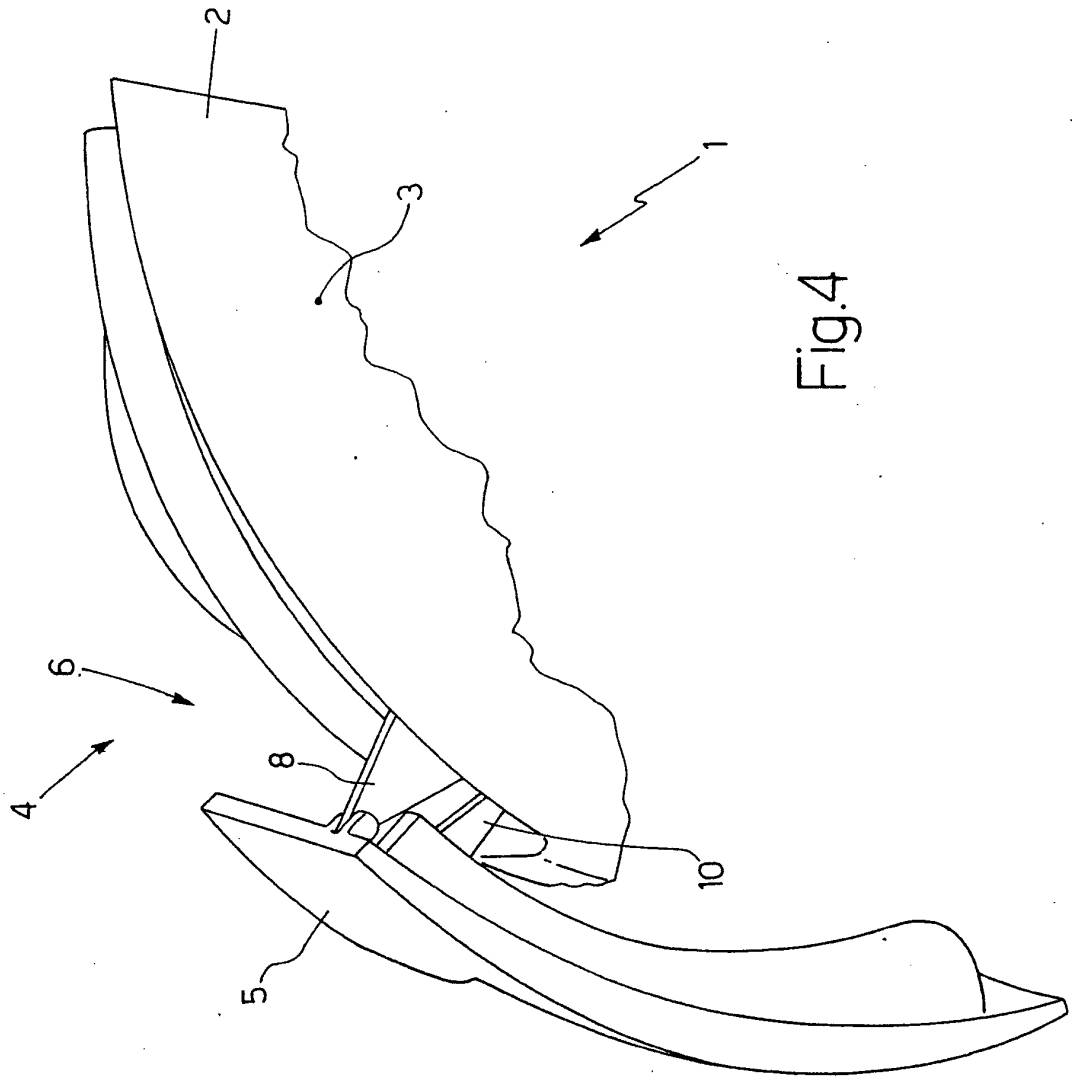

Fig.4

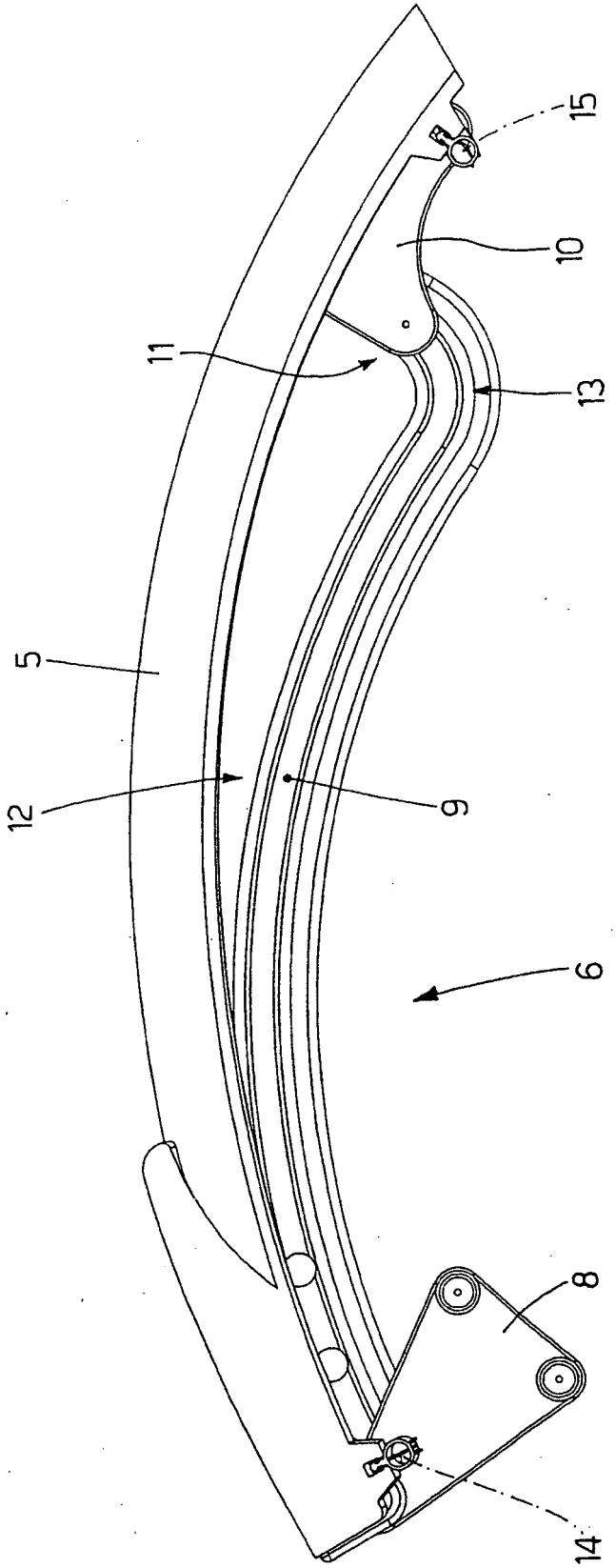

Fig.5

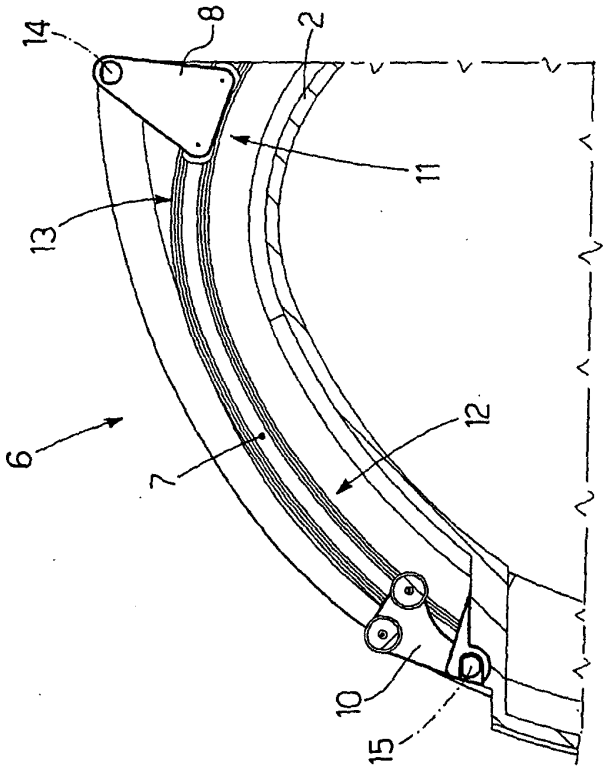

Fig.7

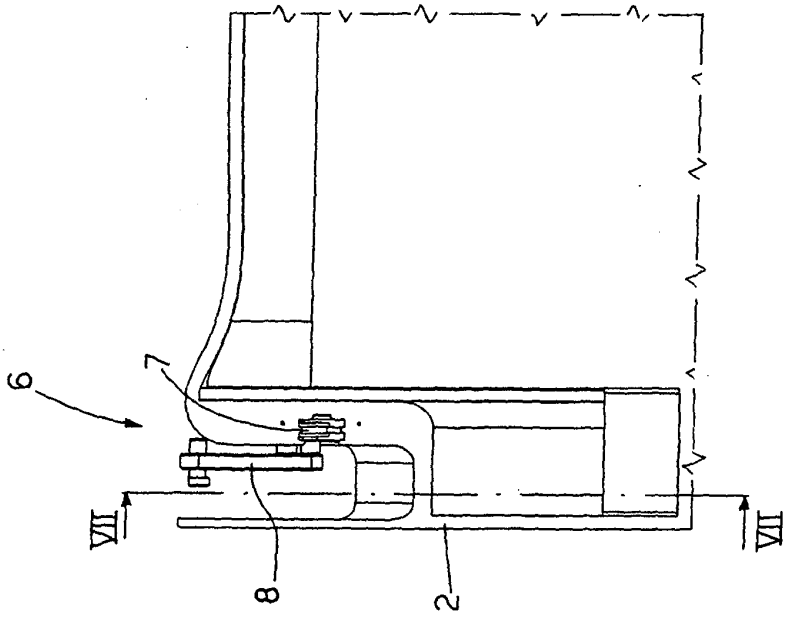

Fig.6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1333118 A1 **[0005]**
- DE 29905081 U1 **[0006]**