



(12) **EUROPEAN PATENT APPLICATION**

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

(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**

(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
Designated Extension States:
AL BA HR MK RS

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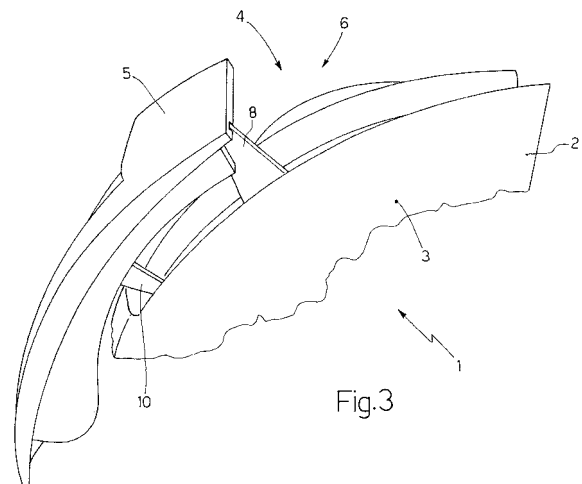
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(54) **Electrical appliance with an improved door mechanism**

(57) An electrical appliance (1) having: 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 having at least one first guide (7) formed on the casing (2), at least one first trolley (8) sliding along the first guide (7) and connected to the door (5), at least one second guide (9) formed on the door (5) 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); 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).



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.

DISCLOSURE OF INVENTION

[0006] It is an object of the present invention to provide an electrical appliance with an improved door mechanism, designed to eliminate the aforementioned draw-

backs, and which is cheap and easy to implement.

[0007] 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

[0008] 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

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] In a different embodiment not shown, second portion 12 is straight.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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), at least one first trolley (8) sliding along the first guide (7) and connected to the door (5), at least one second guide (9) formed on the door (5) 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);
- the electrical appliance (1) being **characterized 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 posi-

tion; 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).

2. An electrical appliance (1) as claimed in Claim 1, wherein the first portion (11) has a fixed radius. 5
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). 10
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. 20
5. An electrical appliance (1) as claimed in any of Claims 1 to 4, wherein the second portion (12) is also curved. 25
6. An electrical appliance (1) as claimed in Claim 5, wherein the two portions (11, 12) of each guide (7, 9) have different centers.
7. An electrical appliance (1) as claimed in Claim 5 or 6, wherein, for each guide (7, 9), the first portion (11) has a smaller radius than the second portion (12). 30
8. An electrical appliance (1) as claimed in Claim 5, 6 or 7, wherein the second portion (12) has a fixed radius. 35
9. An electrical appliance (1) as claimed in Claim 5, 6 or 7, wherein the second portion (12) has a variable radius. 40
10. An electrical appliance (1) as claimed in any of Claims 5 to 9, 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. 45 50
11. An electrical appliance (1) as claimed in any of Claims 1 to 4, wherein the second portion (12) is straight. 55
12. An electrical appliance (1) as claimed in any of Claims 1 to 11, 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).

13. An electrical appliance (1) as claimed in any of Claims 1 to 12, 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).
14. An electrical appliance (1) as claimed in any of Claims 1 to 13, 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).

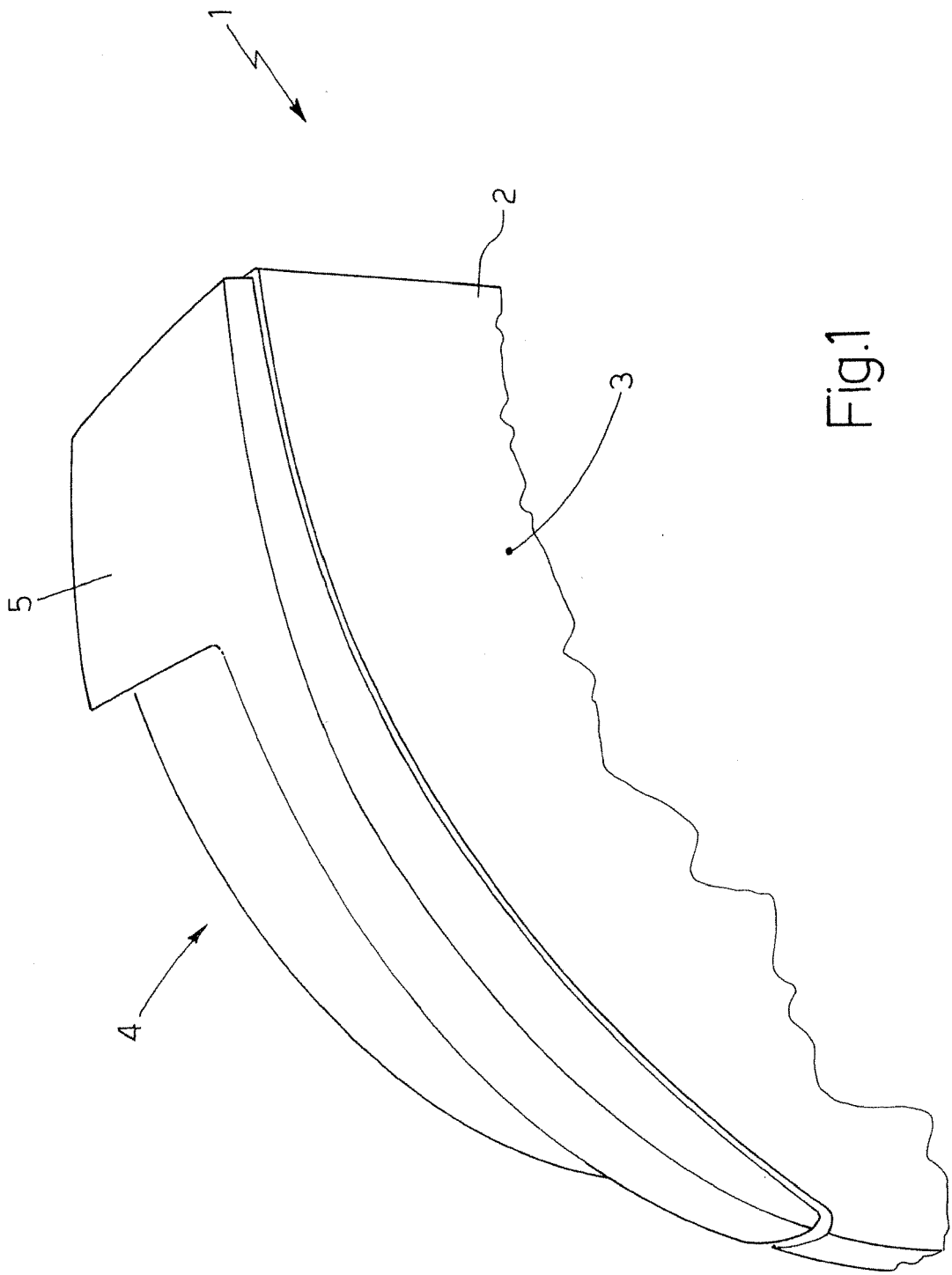


Fig.1

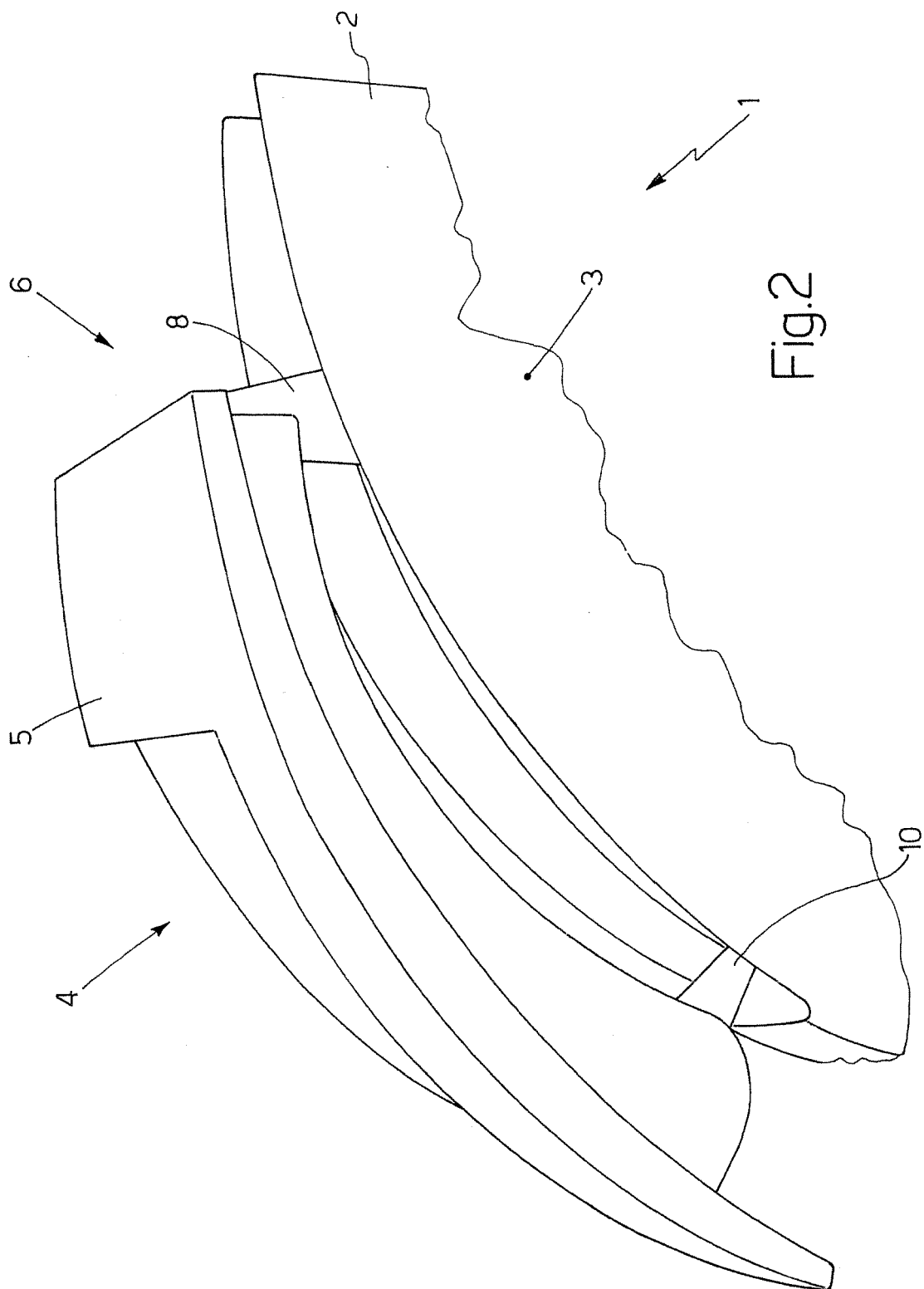
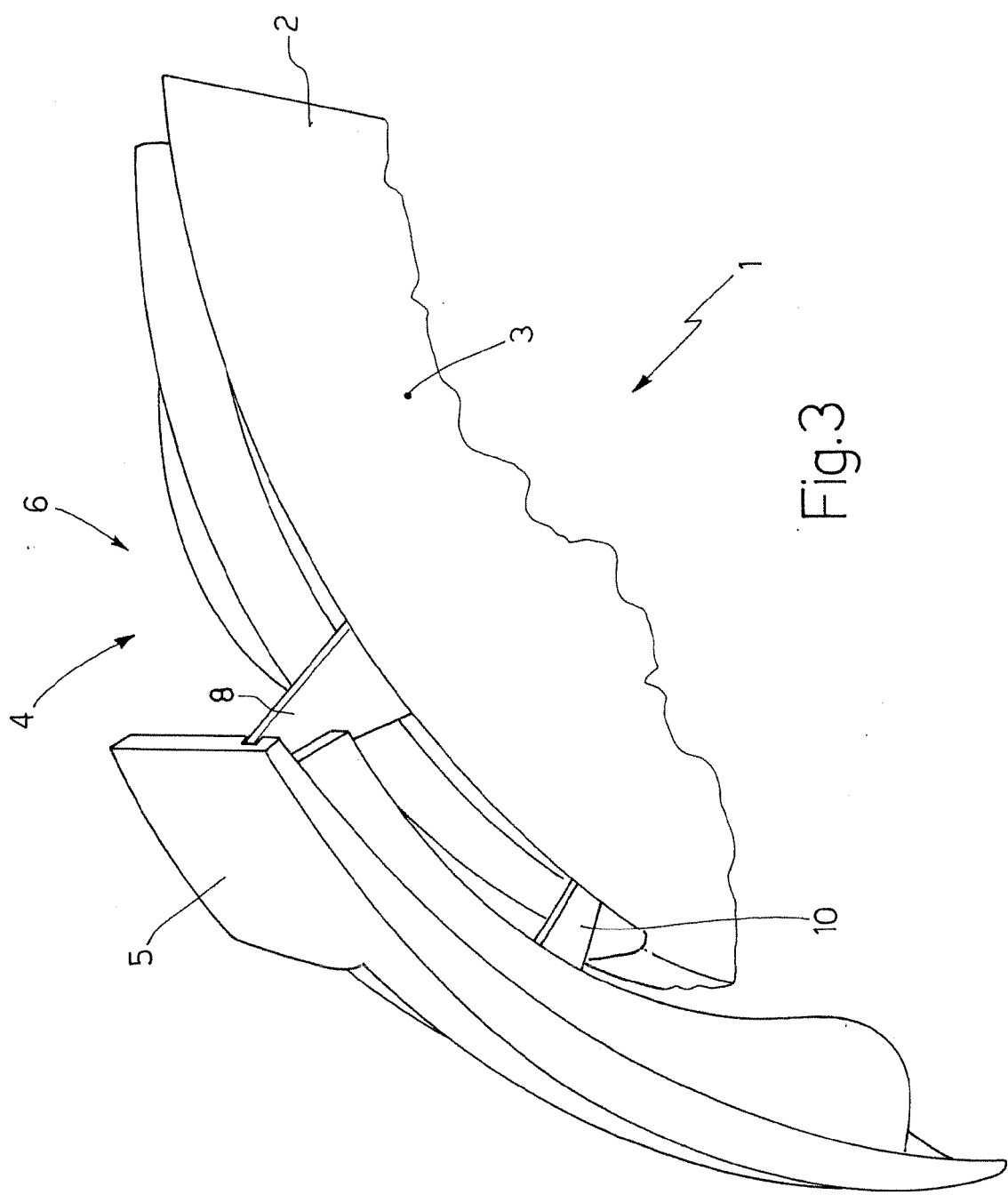
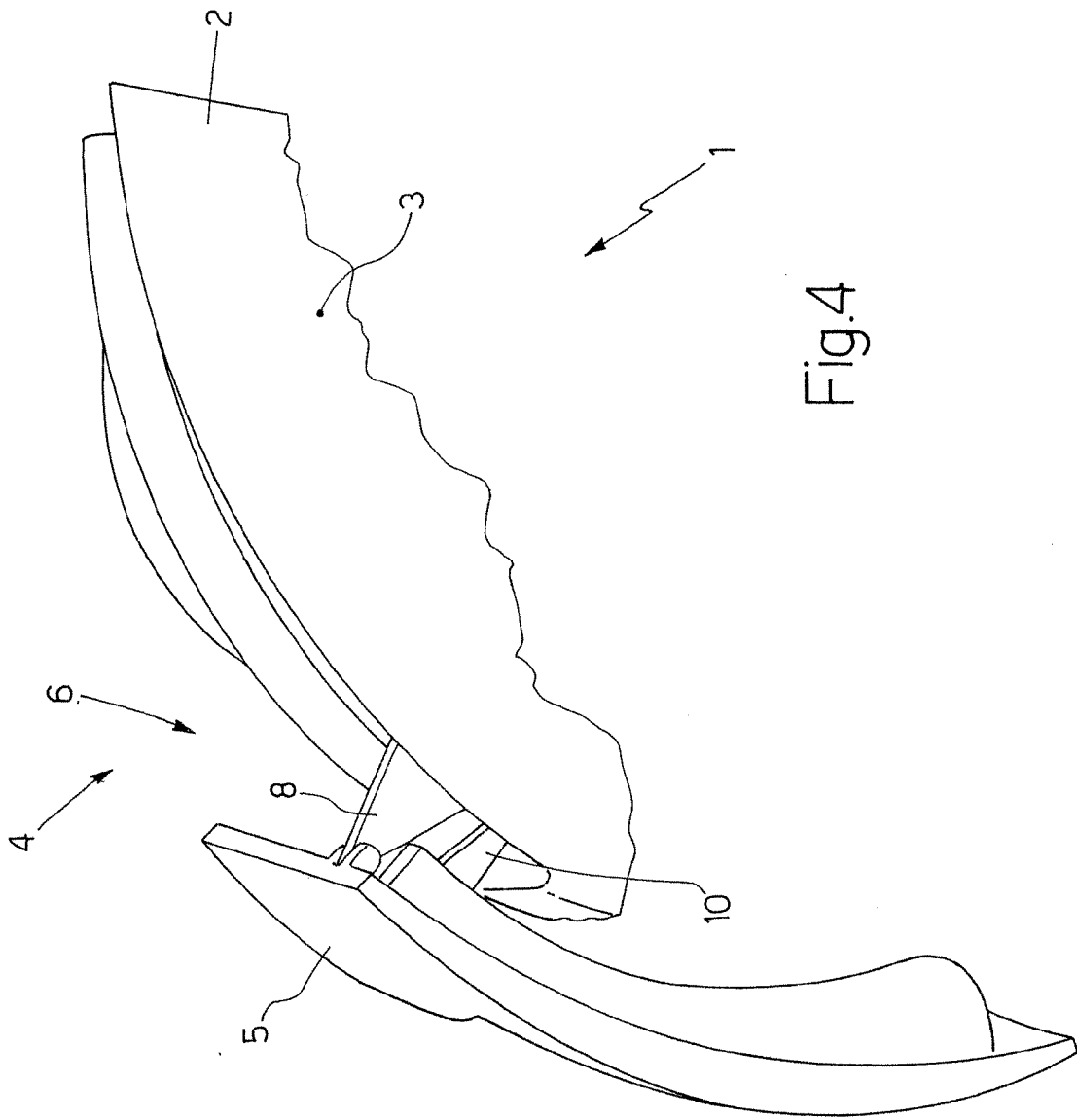


Fig.2





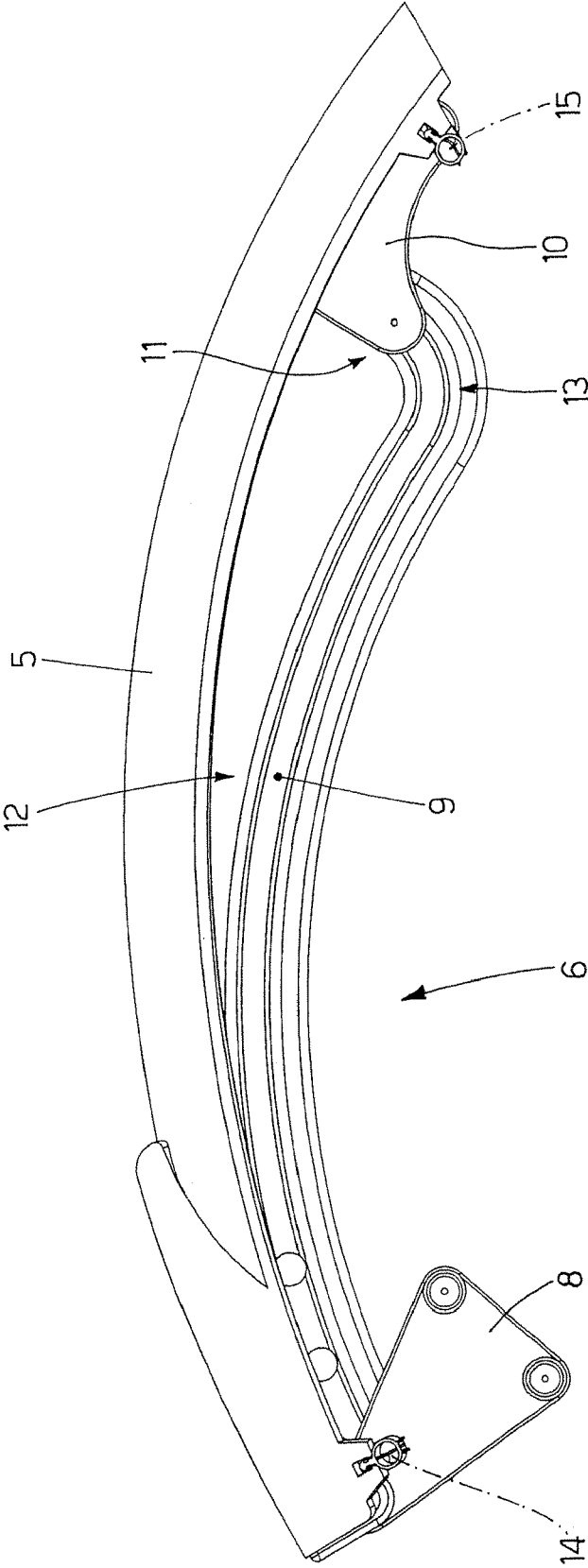


Fig.5

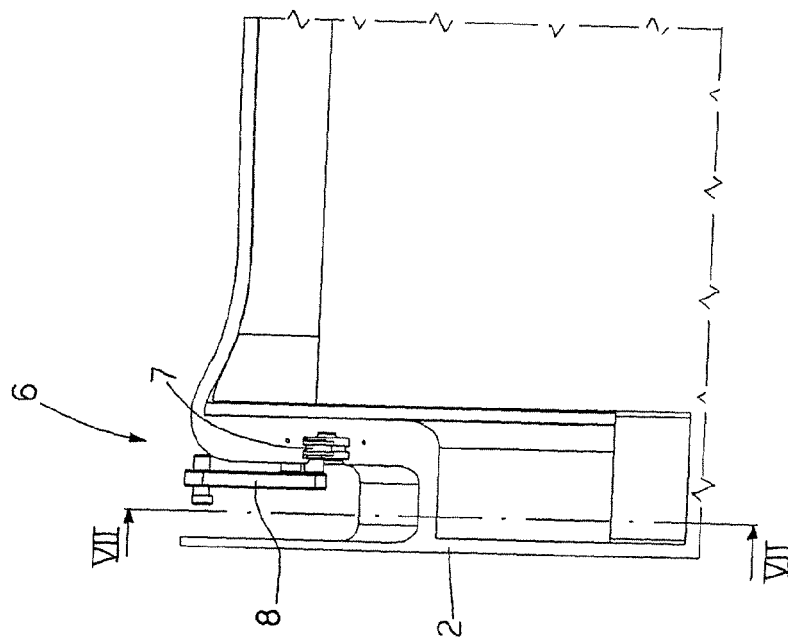


Fig.6

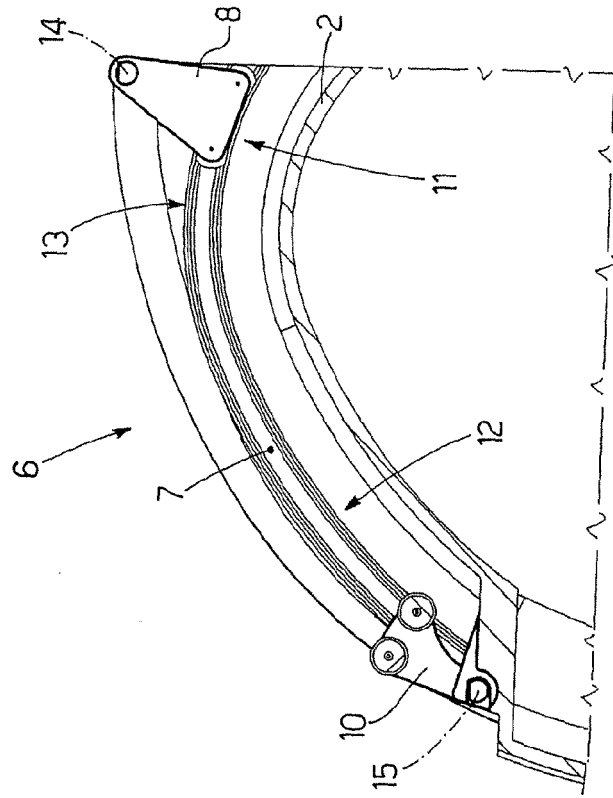


Fig.7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 10 3015

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 July 2007	Examiner Hannam, Martin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 10 3015

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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24-07-2007

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REFERENCES CITED IN THE DESCRIPTION

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