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(54)

Built-in domestic appliance with decorative panel applied to the door

(57)

In a built-in domestic appliance with a door (12) hinged along its bottom side and provided with a front decorative panel (11) applied to the appliance through a mounting system including a sliding coupling between the panel (11) and the door (12) with sliding direction orthogonal to the rotation axis of the door (12), the panel

(11) rotates around a mobile fulcrum (10) located on a lever (3) rotating in a vertical plane under the action of a rotating bracket (2) secured to the door (12) so as to achieve an automatic upward and downward sliding of the panel (11) during the opening and closing of the door (12) respectively.

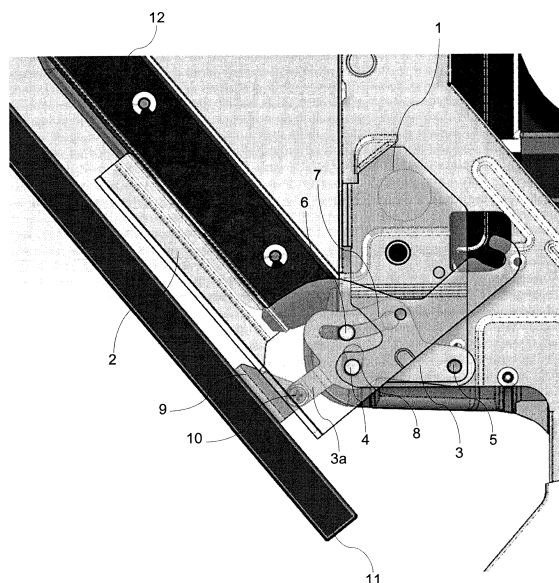


Fig.7

Description

[0001] The present invention relates to built-in domestic appliances having the door lined with a decorative panel, and in particular to domestic appliances in which the panel slides with respect to the door. Reference will be made hereafter to a dishwasher while it is clear that what is said applies to any other domestic appliance having a similar door hinged along its bottom side, e.g. a washing machine.

[0002] This type of decorative panel is known to be used to camouflage a built-in appliance so that it blends with the kitchen furniture. This is achieved by applying to the door of said appliance, by various means, a panel having the same appearance of the other doors. In this way there is no visible element allowing to distinguish the appliance from the other members which make up the kitchen, its controls being accessible only when the door is open. Examples of panel mounting systems including a sliding coupling between the panel and the door are disclosed, for instance, in EP 744152 and EP 1529482.

[0003] However, the presence of this panel poses a particular problem when it is installed with an underlying plinth in common with the rest of the furniture, i.e. when the bottom edge of the dishwasher panel is located adjacent (typically at about 3 mm) to the top edge of the plinth. In fact in this case the panel would interfere with the latter when the dishwasher door is opened and the panel retracts in the space behind the plinth.

[0004] To overcome this problem without having to cut the plinth there are presently provided mounting systems that make the panel slide upwards during the door opening in order to avoid the interference with the plinth, typically by means of a variable fulcrum hinge as illustrated in EP 1364609 in the name of the applicant.

[0005] EP 1875850 discloses another solution devised by the applicant in which the panel is mounted through a sliding coupling between the panel and the door with sliding direction orthogonal to the rotation axis of the door, and the panel is also pivoted to the machine frame through a telescopic rod connected by a kinematic chain to the door hinge so as to achieve an automatic sliding of the panel.

[0006] EP 1894509 discloses a further solution of the applicant similar to the preceding one in which instead of the telescopic rod there is an articulated lever system always connected by a kinematic chain to the door hinge so as to achieve an automatic sliding of the panel. In both solutions the panel rotates around a fulcrum fixed on the frame, the sliding being obtained by changing the length of the connection between the panel and the fulcrum.

[0007] EP 2407723 discloses on the other hand a solution characterized by the presence of a slide longitudinally sliding along a guide formed in a rotating bracket integral with the door, the decorative panel being secured to said slide whose movement is determined by the rotation of the rotating bracket through a driving mechanism

that can be of different kinds.

[0008] All prior art solutions have a quite complicated structure which is therefore rather expensive and unreliable, and they do not guarantee a smooth operation especially in the case of fast movement of the door.

[0009] Therefore the object of the present invention is to provide a domestic appliance provided with a mounting system for the decorative panel that overcomes the above-mentioned drawbacks. This object is achieved by means of a domestic appliance in which the panel is pivoted on a lever rotating in a vertical plane under the action of a rotating bracket secured to the door so as to rotate around a mobile fulcrum and to obtain an automatic upwards and downwards sliding of the panel. Other advantageous features are recited in the dependent claims.

[0010] The main advantage of the domestic appliance with the panel mounting system according to the present invention stems from the structural simplicity of said mounting system, which results in greater strength, reliability and smoothness at a lower cost. Furthermore, this system is compact in size and easy to mount on the domestic appliance.

[0011] These and other advantages and features of the domestic appliance according to the present invention will be evident to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the attached drawings, wherein:

Fig.1 is an internal perspective view showing the moving mechanism for the decorative panel of a dishwasher according to the invention, at a position corresponding to the door in an almost closed position;

Fig.2 is an external perspective view of the mechanism of Fig. 1;

Fig.3 is a front view of the mechanism of Fig. 1;

Fig.4 is a top plan view of the mechanism of Fig. 1;

Fig.5 is a see-through side view of the mechanism of Fig.1 mounted on a dishwasher according to the invention, with the door in the closed position;

Figs.6-9 are views similar to the preceding one with the door opened at about 20°, 40°, 60° and 70° respectively;

Fig.8 is a view similar to the preceding one with the door fully open at about 88°; and

Fig.11 is a diagrammatic side view showing the sequence of positions taken by the decorative panel during the door movement.

[0012] With reference to figures 1 to 4, there is seen that a moving mechanism for the decorative panel of a dishwasher according to the invention essentially consists of three elements only, namely a support bracket 1, secured to the machine frame, on which there are pivoted for rotation in a vertical plane a rotating bracket 2, secured to the machine door, and a lever 3 secured to the decorative panel. The left mechanism will be illustrated in the following, while being clear that a specularly

symmetrical mechanism is provided on the right side of the dishwasher.

[0013] More specifically, the rotating bracket 2 is substantially L-shaped and is pivoted on the outside of the support bracket 1 through a horizontal pin 4 located in the proximity of the angle between the two sides of the L, as well as in the proximity of the bottom front corner of the support bracket 1. The rotating bracket 2 is further secured to the door through a plate 2a formed on the vertical side of the L and extending in a vertical plane to the inside of the support bracket 1. Said plate 2a is provided with holes 2b for fixing screws, while the horizontal side of the L is intended to act as an end stop in combination with a catch 1a formed on the front side of the support bracket 1.

[0014] It should be noted that all definitions about top/bottom, front/rear, horizontal/vertical, etc. are given with reference to the mechanism mounted on the dishwasher and with the door in the closed position.

[0015] Lever 3 is internally pivoted on the support bracket 1 through a horizontal pin 5 located in the proximity of its rear end, as well as in the proximity of the bottom rear corner of the support bracket 1. The rotation of lever 3 around pin 5 is controlled by the rotating bracket 2 through a peg 6 that slidably engages a curved slot 7 formed in the top portion of lever 3 with an upward concavity. Lever 3 is also provided with an oval opening 8 formed at pin 4 in order to prevent interference therewith during the door movement.

[0016] As better shown in the other figures, peg 6 is located above and behind pin 4, i.e. at a position which is higher and more to the rear, and engages slot 7 passing in a recess formed in the front side of the support bracket 1.

[0017] Finally, lever 3 carries a plate 9, provided with holes 9a, rotatably mounted through a screw 10 at the end of the front portion 3a of lever 3, said portion 3a being shaped so as to terminate at a position to the inside of the rotating bracket 2.

[0018] It should be noted that the above-illustrated arrangement of the elements is preferable yet not indispensable, since a person skilled in the art could easily make the necessary modifications to reverse the arrangement by pivoting the rotating bracket 2 on the inside of the support bracket 1 and lever 3 on the outside. Moreover, opening 8 could be absent if lever 3 were shaped to prevent interference with pin 4 or the latter were located at a position not causing interference. Similarly, the sliding connection between the rotating bracket 2 and lever 3 could be reversed by forming slot 7 on the bracket and arranging peg 6 on the lever, or it could even be made with elements mechanically equivalent to peg 6 and slot 7 such as a wheel rolling along a guiding groove.

[0019] With reference to Fig.5, there is seen that a dishwasher according to the present invention includes a decorative panel 11 applied to door 12 so as to slide vertically, for example through hooks arranged on the back of panel 11 that engage corresponding slots formed in door 12,

as described in the above-mentioned European publications to which reference is made for further details.

[0020] Door 12 is mounted on the dishwasher frame through screws introduced in holes 2b of the rotating bracket 2, which is pivoted through pin 4 to the support bracket 1 secured to the frame. The vertical sliding of the decorative panel 11 is controlled by the mechanism through plate 9, which is secured to the back of panel 11 through screws introduced in holes 9a. In this position of closed door, pin 4 is located at the top of opening 8 and peg 6 is about at $\frac{1}{4}$ of slot 7 (measured from the rear).

[0021] The simple and effective operation of the present mounting system for the panel is readily understood from the description above with the help of figures 6 to 10 that show the various phases of the opening movement.

[0022] Starting from the position of Fig.5, in the initial phase of the opening of door 12, illustrated in Fig.6, the rotation of bracket 2 around pin 4 causes an upward rotation of lever 3, around pin 5, through peg 6 that rises and advances to the center of slot 7. The rising of lever 3 causes in turn, through the rotatable plate 9, the upward sliding of the decorative panel 11, which rotates around the mobile fulcrum 10, with respect to door 12 that rotates around the fixed fulcrum 4.

[0023] In the second phase of the opening, illustrated in Fig.7, lever 3 continues to rotate upwards around pin 5 and reaches the maximum height, with pin 4 located at the bottom of opening 8 and peg 6 at about $\frac{3}{4}$ of slot 7. As a consequence, panel 11 continues its sliding movement with respect to door 12 driven by plate 9.

[0024] In the third phase of the opening, illustrated in figures 8 and 9, lever 3 starts to rotate downwards around pin 5 but since door 12 is already opened more than 45° , the advancing of peg 6 towards the front end of slot 7 results in a further sliding of panel 11 on door 12.

[0025] When door 12 is completely open at an almost horizontal position, as shown in Fig.10, lever 3 has returned to the initial position of Fig.5 yet with plate 9 substantially horizontal. Furthermore, the rotating bracket 2 has reached in abutment against catch 1a of the support bracket 1 and peg 6 has reached the front end of slot 7. Obviously, when the door is closed the mechanism operates in reverse taking panel 11 and door 12 back to the starting position illustrated in Fig.5.

[0026] The effectiveness of the above-described mechanism is schematically illustrated in Fig.11 where the sequence of the positions taken by the bottom edge of panel 11 shows how it never moves below the closed door starting position, whereby there is no interference with the underlying plinth (not shown) adjacent thereto. This figure further shows how the mechanism can be useful also for mounting a decorative panel 11' of greater height in the absence of the underlying plinth. In such a case, in fact, the sliding movement performed by the mechanism is used to prevent the interference of panel 11' with the dishwasher base 13 without having to modify the latter in order to receive the oversize panel.

[0027] It is clear that the above-described and illustrated embodiment of the domestic appliance according to the invention is just an example susceptible of various modifications. In particular, in addition to the above-mentioned variations, other changes in the coupling and arrangement of the elements can be made as long as the automatic movement of the panel during the opening and closing movement of the door is retained. For example, to the detriment of the ease of mounting, the support bracket 1 could be dispensed with by mounting the rotating bracket 2 and lever 3 directly on the machine frame.

Claims

1. A built-in domestic appliance with a door (12) hinged along its bottom side and provided with a front decorative panel (11) applied to the appliance through a mounting system including a sliding coupling between the panel (11) and the door (12) with sliding direction orthogonal to the rotation axis of the door (12), **characterized in that** the panel (11) rotates around a mobile fulcrum (10) located on a lever (3) rotating in a vertical plane under the action of a rotating bracket (2) secured to the door (12) so as to achieve an automatic upward and downward sliding of the panel (11) during the opening and closing of the door (12) respectively.
2. A built-in domestic appliance according to claim 1, **characterized in that** the rotating bracket (2) and the lever (3) are pivoted on a support bracket (1) secured to the domestic appliance frame, preferably with the rotating bracket (2) on the outside and the lever (3) on the inside of said support bracket (1).
3. A built-in domestic appliance according to claim 1 or 2, **characterized in that** the rotating bracket (2) drives the lever (3) through a peg (6) that slidably engages a curved slot (7) with an upward concavity.
4. A built-in domestic appliance according to claim 2 or 3, **characterized in that** the rotating bracket (2) is substantially L-shaped and is pivoted on the support bracket (1) through a horizontal pin (4) located in the proximity of the angle between the two sides of the L.
5. A built-in domestic appliance according to claims 3 and 4, **characterized in that** the peg (6) is located above and behind the pin (4) when the door (12) is closed.
6. A built-in domestic appliance according to claim 4 or 5, **characterized in that** the rotating bracket (2) is provided with a plate (2a) formed on the vertical side of the L and provided with holes (2b) for fixing it to the door (12), said plate (2a) extending in a vertical plane to the inside of the support bracket (1).
7. A built-in domestic appliance according to any of claims 2 to 6, **characterized in that** the lever (3) is pivoted on the support bracket (1) through a horizontal pin (5) located in the proximity of its rear end.
8. A built-in domestic appliance according to any of claims 4 to 7, **characterized in that** the lever (3) is provided with an oval opening (8) formed at the pin (4) and suitable to prevent interference therewith during the movement of the door (12).
9. A built-in domestic appliance according to any of the preceding claims, **characterized in that** the decorative panel (11) is pivoted on the lever (3) through a plate (9), provided with holes (9a) for fixing it to the panel (11), rotatably mounted at the end of the front portion (3a) of the lever (3), said front portion (3a) being preferably shaped so as to terminate at a position to the inside of the rotating bracket (2).
10. A built-in domestic appliance according to any of the preceding claims, **characterized in that** the sliding coupling is achieved through a plurality of hooks arranged on the back of the panel (11) and engaged in corresponding slots formed in the door (12), within which the sliding can take place.

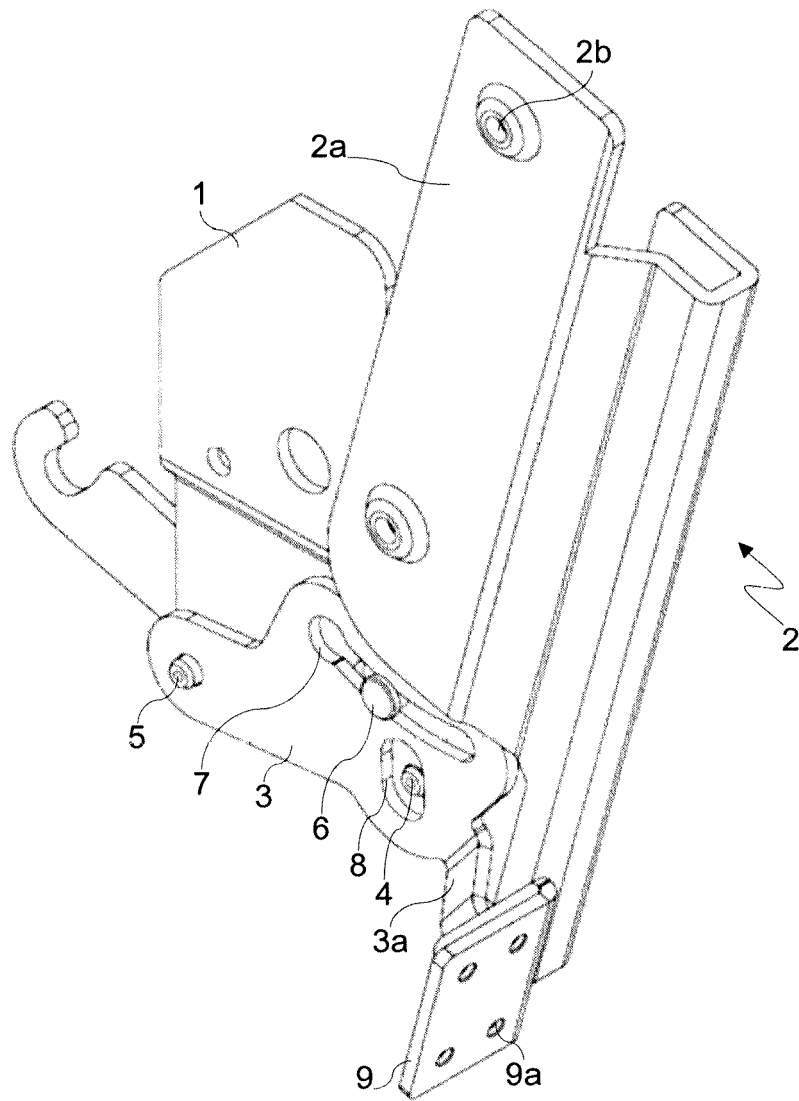


Fig.1

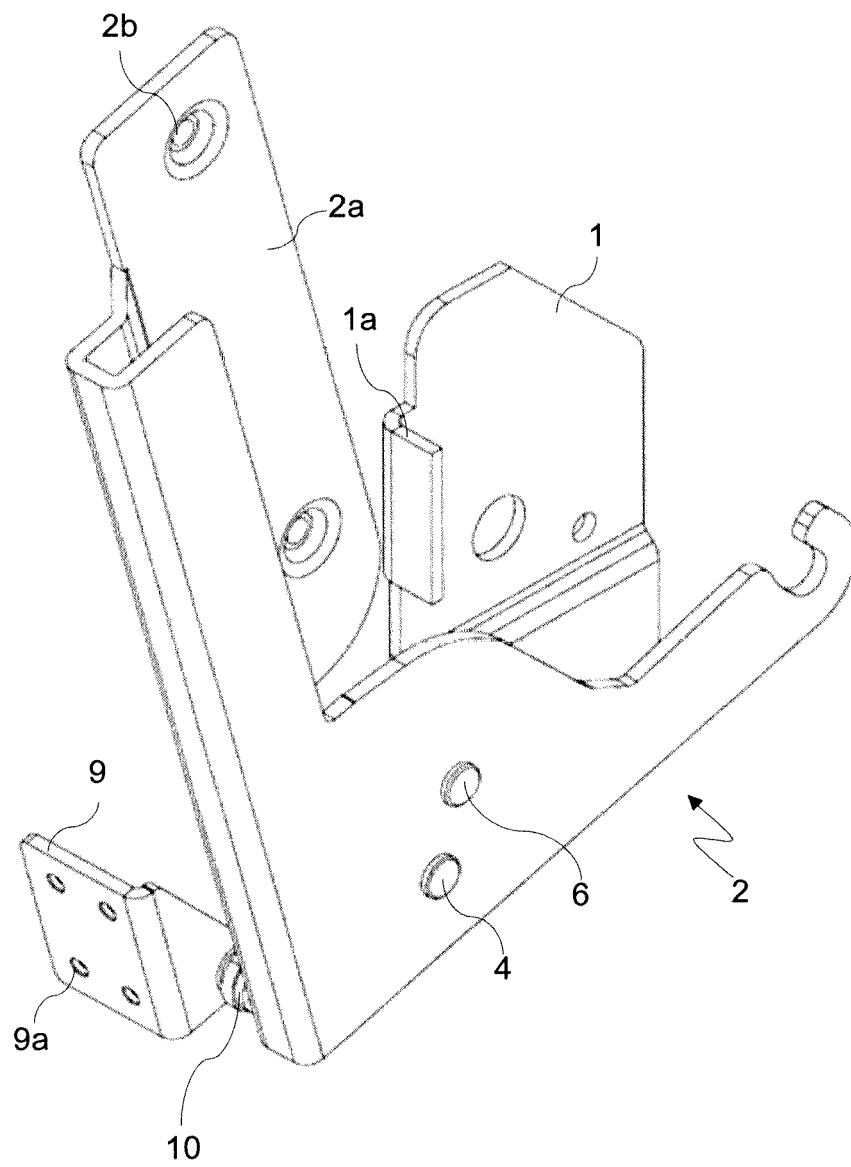


Fig.2

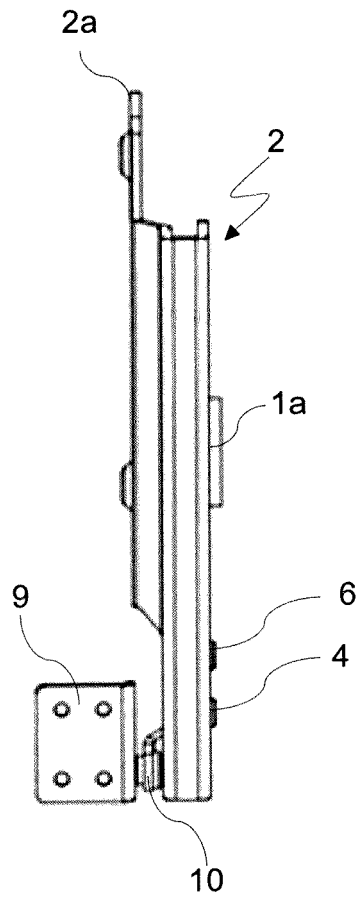


Fig.3

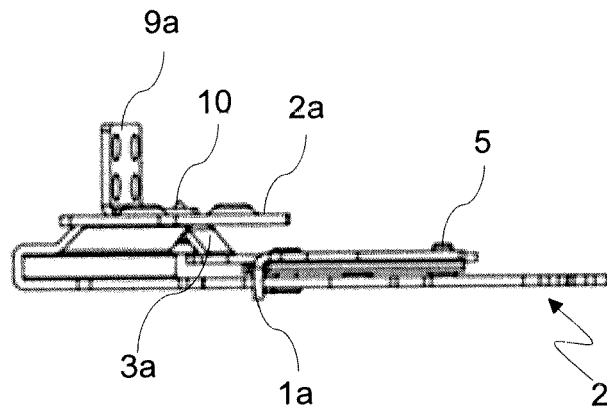


Fig.4

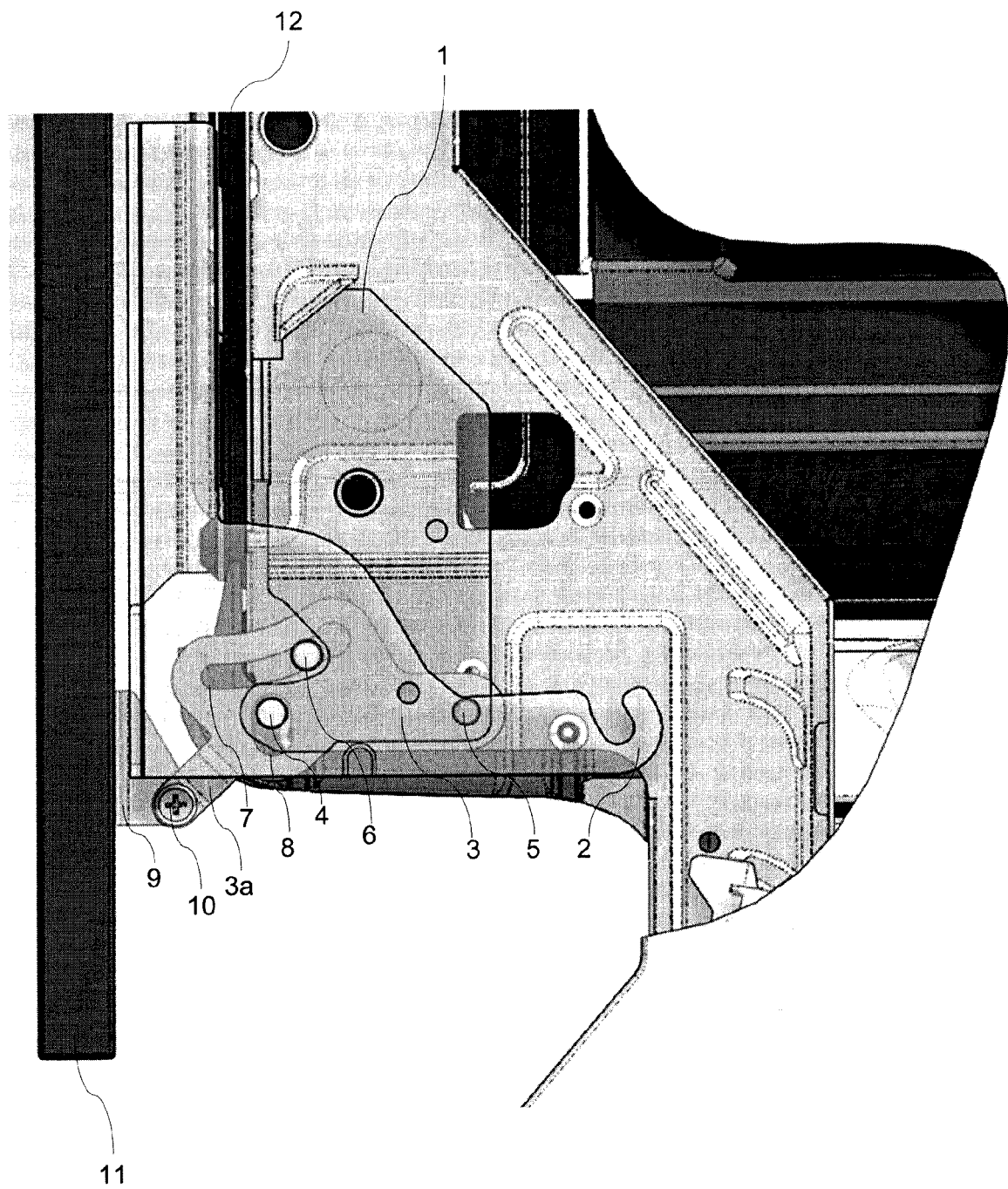


Fig.5

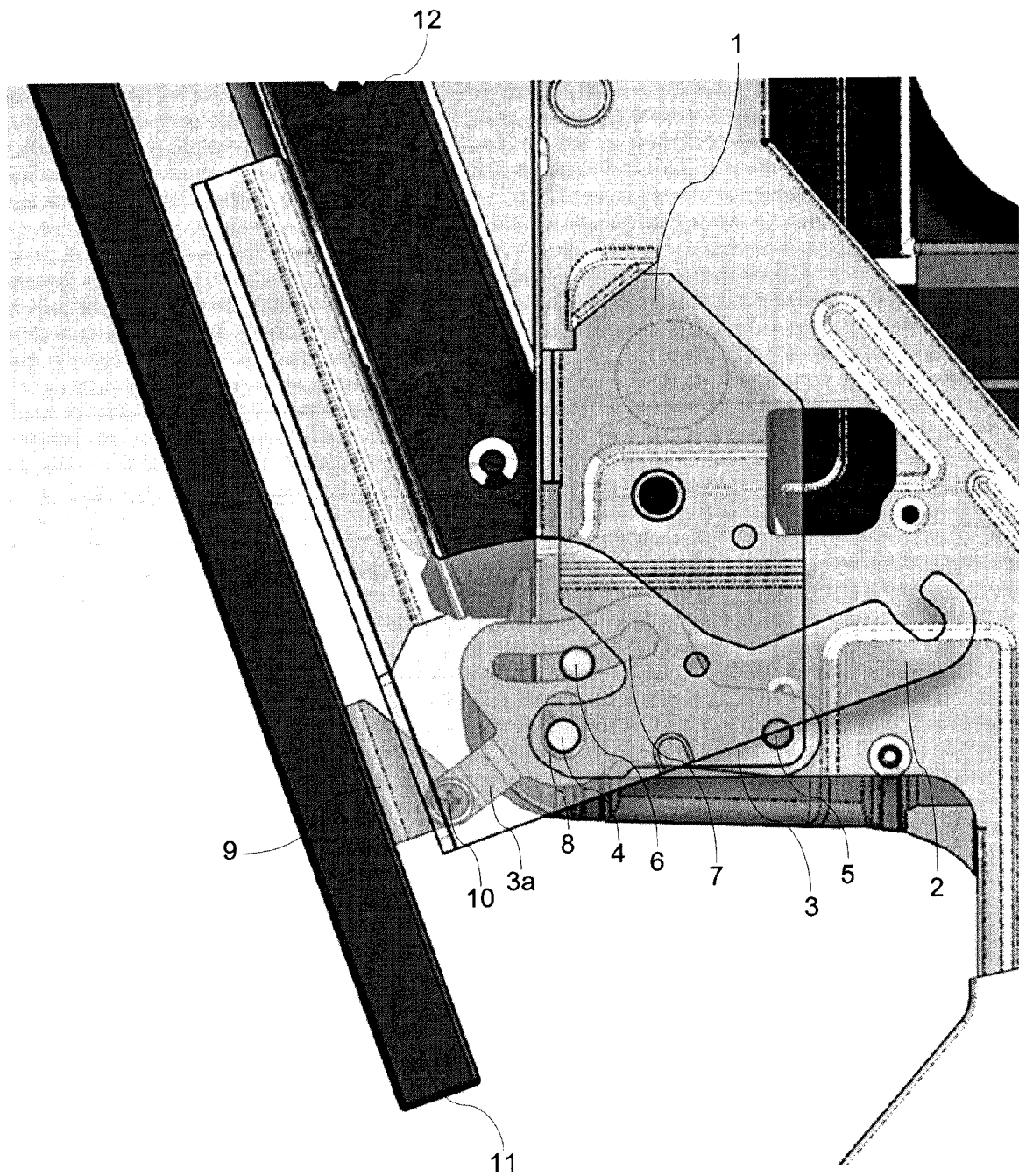


Fig.6

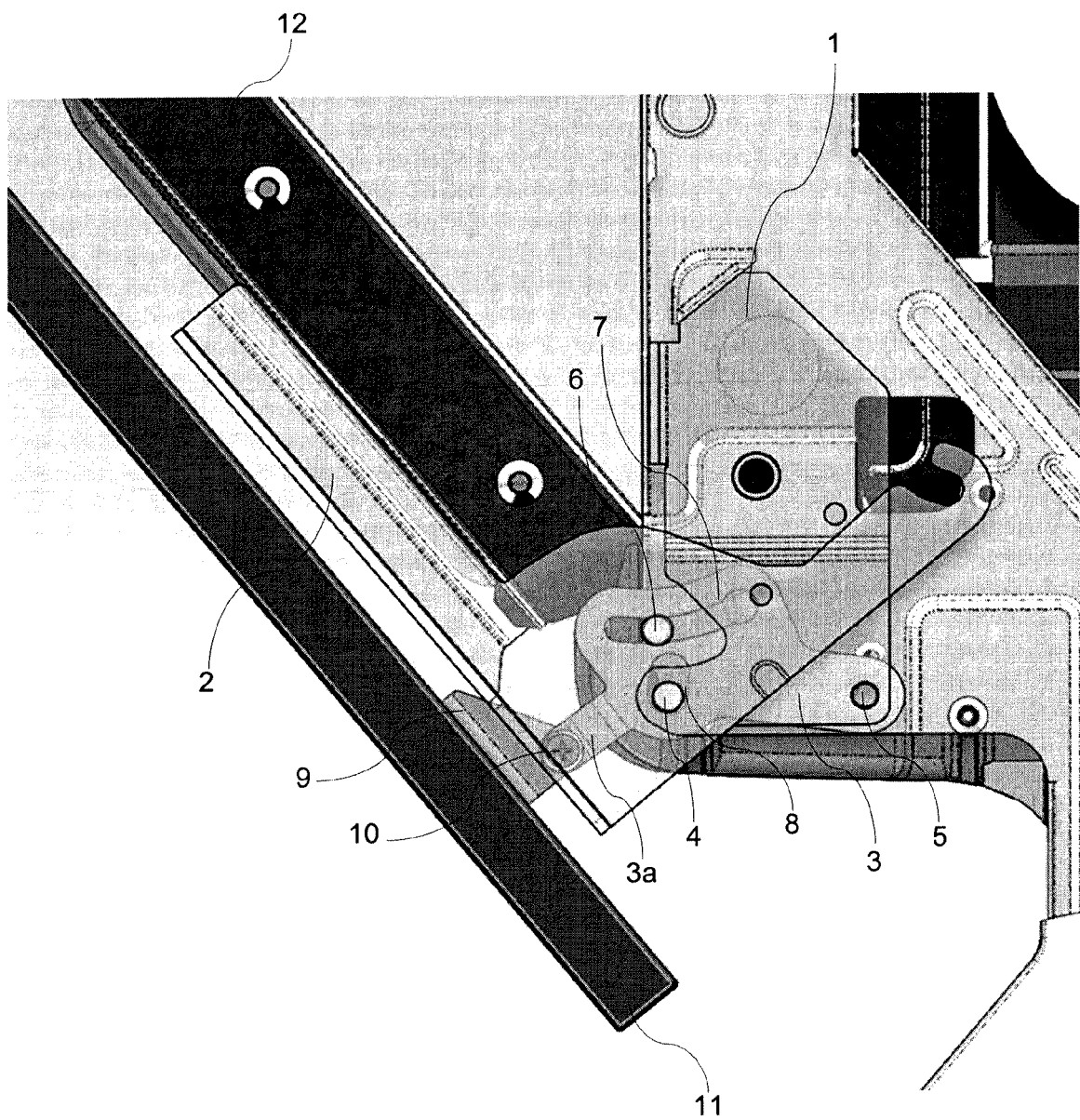


Fig.7

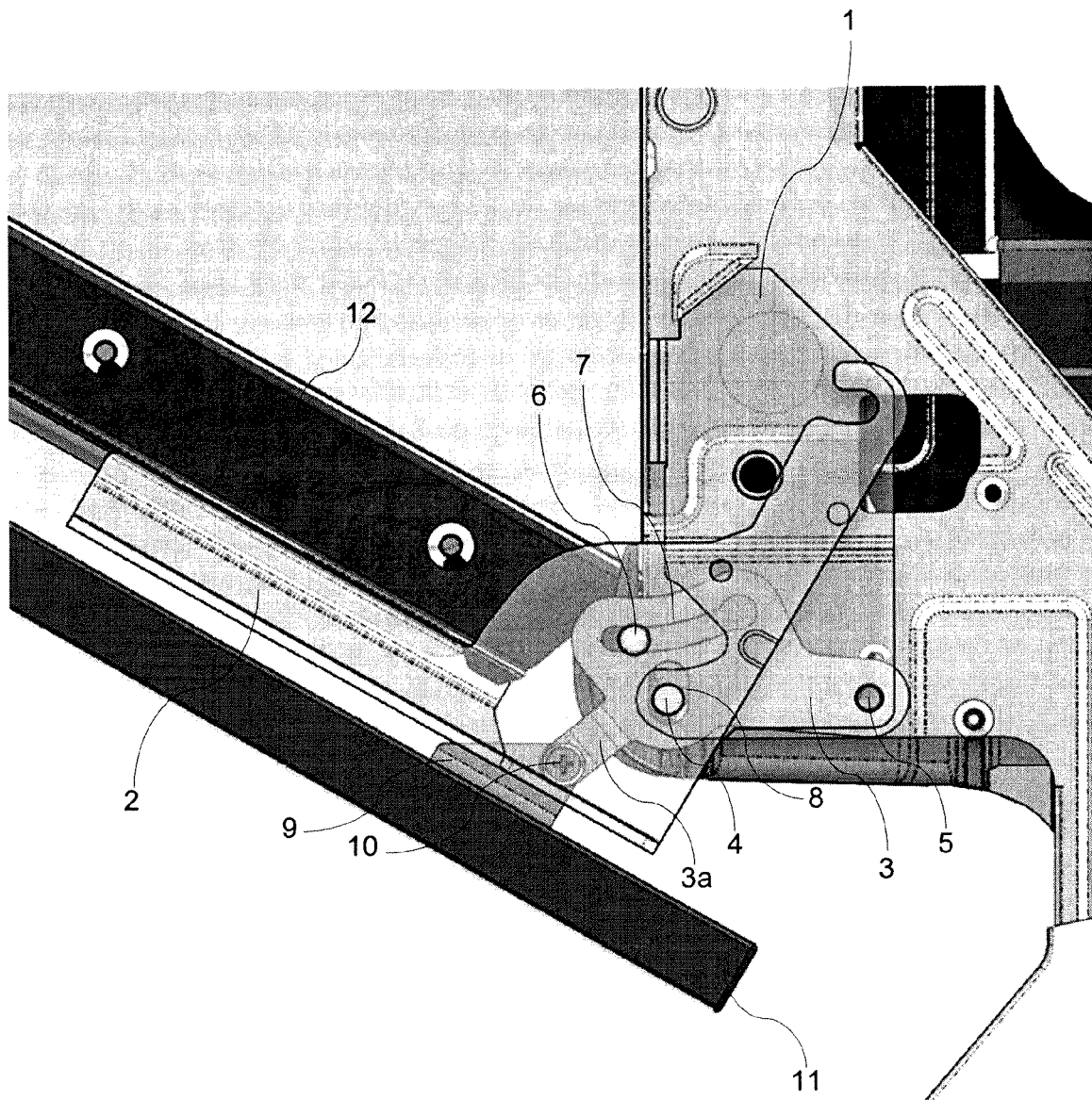


Fig.8

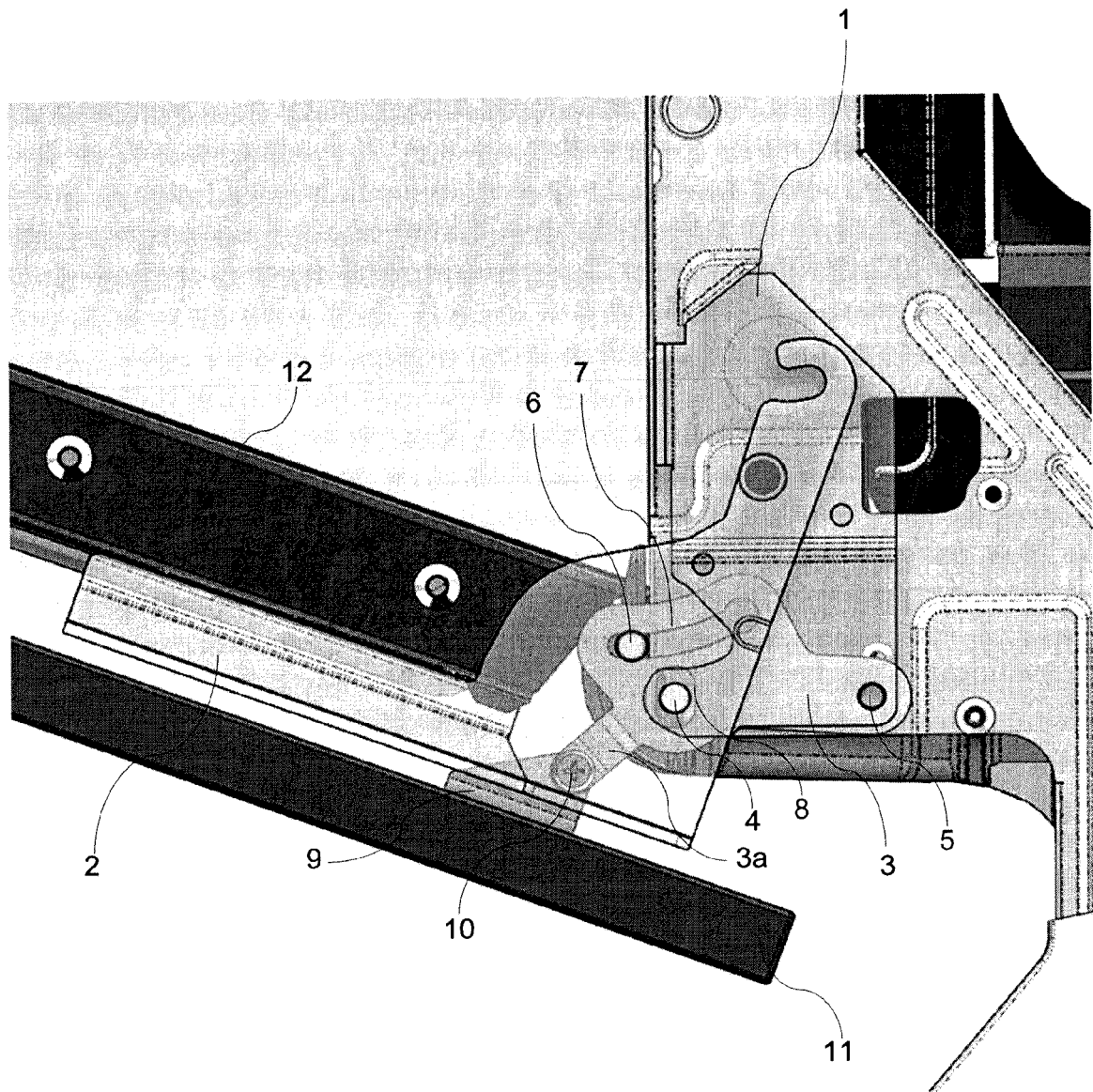


Fig.9

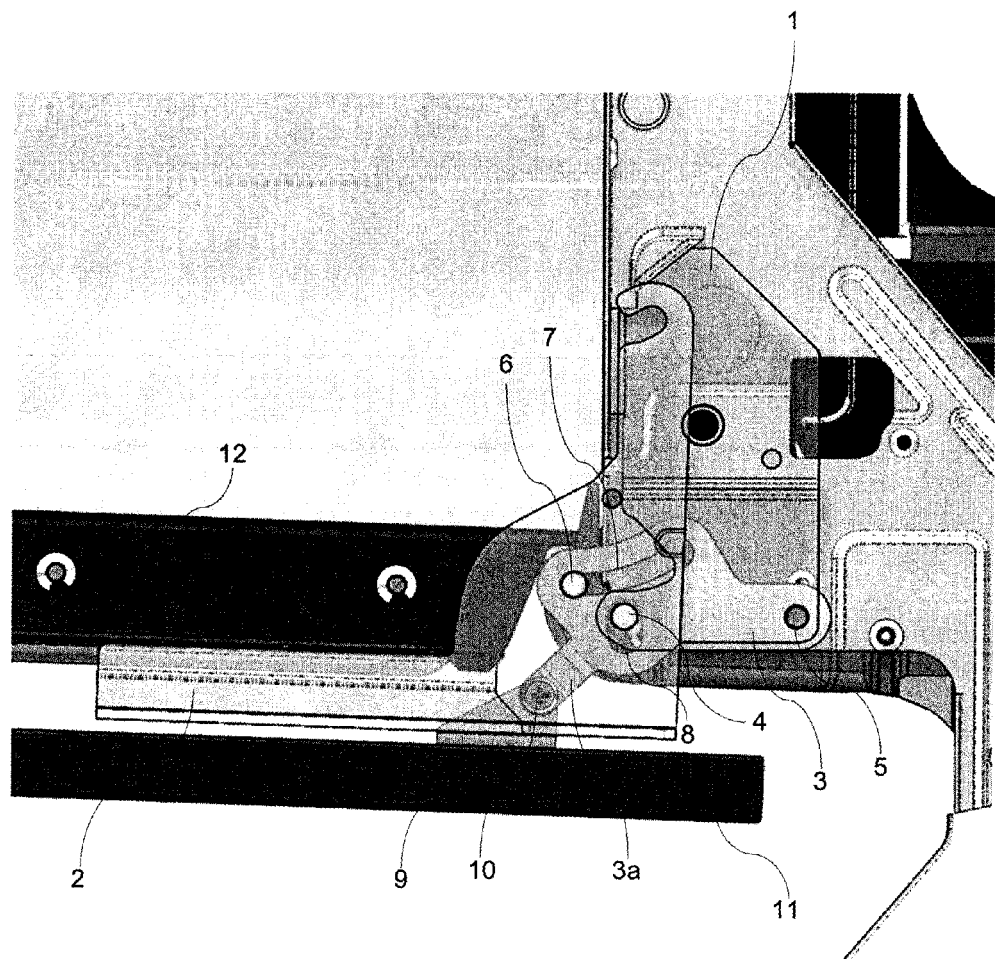


Fig.10

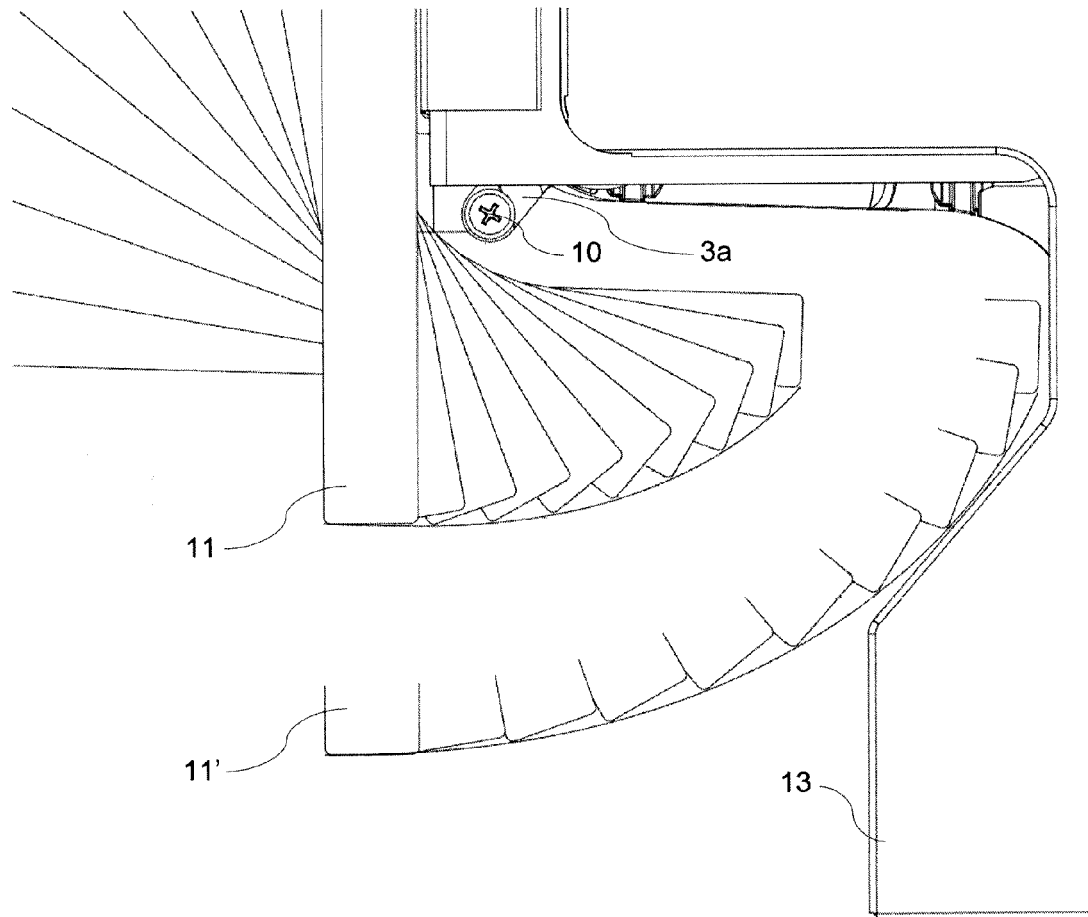


Fig.11



EUROPEAN SEARCH REPORT

Application Number
EP 13 42 5156

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 2 407 723 A1 (ELECTROLUX HOME PROD CORP [BE]) 18 January 2012 (2012-01-18) * paragraph [0043] - paragraph [0052]; figures 5A-5C *	1-7,9,10	INV. A47L15/42 E05D3/02 E05F17/00 E05D3/18 E05D11/00
X,D	EP 1 875 850 A1 (BONFERRARO SPA [IT]) 9 January 2008 (2008-01-09) * claims 1-5; figures 1-3 *	1,2,4,9,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L E05D E05F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 April 2014	Examiner Guillaume, Geert
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 42 5156

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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28-04-2014

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2407723	A1	18-01-2012	NONE
EP 1875850	A1	09-01-2008	NONE

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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