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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 domestic 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) is directly pivoted on the domestic appliance frame or on an element integral therewith so as to rotate around a fixed fulcrum (4) located at a position forward of and below a fixed fulcrum (5) of 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.

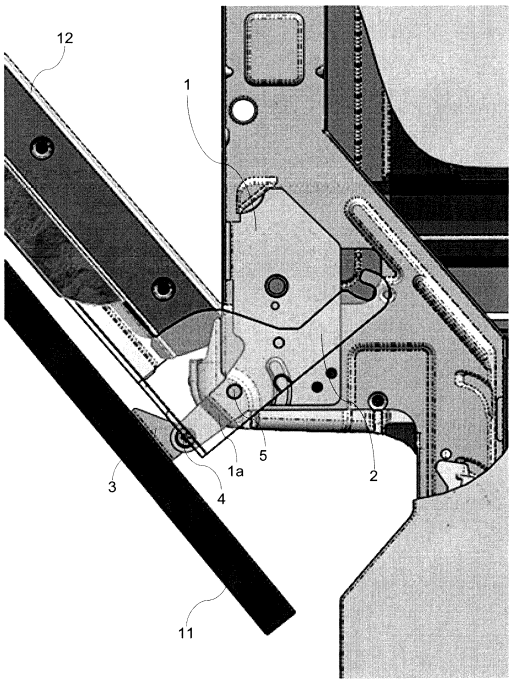

Fig.7

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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 has a height greater than the standard height of 720 mm, since this would result in the interference of the panel with the dishwasher base at the end of the door opening, i.e. the door could not open completely to 90°.

[0004] To overcome this problem there are presently dishwashers specifically manufactured with more room in the lower portion in order to be able to receive higher panels. However this solution has the double drawback of reducing the room available inside the machine to house the members arranged in the lower portion of the dishwasher, as well as the need to manufacture a specific version only for the markets where higher panels are used.

[0005] Another type of solution is that of providing mounting systems that make the panel slide upwards during the door opening in order to avoid the interference with the dishwasher base, typically by means of a variable fulcrum hinge as illustrated in EP 1364609 in the name of the applicant.

[0006] 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.

[0007] 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.

[0008] 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.

[0009] All these prior art solutions allow the mounting of higher panels on the same machines produced for the application of standard panels, without requiring to make any modification to the base of the machine, but they 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.

[0010] The above-mentioned EP 1529482 discloses another solution devised by the applicant in which the panel mounting system still includes a sliding coupling between the panel and the door with sliding direction orthogonal to the rotation axis of the door, and said coupling further includes a spring suitable to push the panel toward said rotation axis. In this case the panel is not pivoted on the machine frame and has such a height as to come into contact at its bottom end with the dishwasher base at the end of the door opening. Although this mounting system has an extreme structural simplicity which makes it cheap and reliable, it also does not guarantee a smooth operation especially in the case of fast movement of the door.

[0011] In fact the panel must be provided with protections over its bottom end to favour its grazing the dishwasher base at the end of the door opening, when due to the push received from the base it starts to slide upward with respect to the door compressing the spring and thus allowing to reach the complete opening (obviously when the door is closed the push of the spring takes the panel back to the rest position as soon as the interference zone is cleared). Such a grazing operation is clearly noisy and not at all smooth, especially in the case of fast movement, it can result in jamming and it can cause friction wear of the grazing parts.

[0012] 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 mounting system still includes a sliding coupling between the panel and the door with sliding direction orthogonal to the rotation axis of the door, but the panel is directly pivoted on the machine frame so as to rotate around a fixed fulcrum located at a position forward of and below a fixed fulcrum of the door thus obtaining an automatic upward and downward sliding of the panel with respect to the door during the opening and closing of the latter respectively. Other advantageous features are recited in the dependent claims.

[0013] The main advantage of the domestic appliance

with the panel mounting system according to the present invention stems from the 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.

[0014] 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.10 is a view similar to the preceding one with the door fully open at about 88°;
Fig.11 is a diagrammatic side view showing the sequence of positions taken by the decorative panel during the door movement; and
Fig.12 is a diagrammatic side view showing the geometrical parameters of the mechanism.

[0015] 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 two elements only, namely a support bracket 1, secured to the machine frame, on which there is pivoted for rotation in a vertical plane a rotating bracket 2 secured to the machine door. 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.

[0016] More specifically, the fixed bracket 1 has a substantially rectangular shape but at the bottom front corner has an elongated "leg" 1a extending downward and forward at an angle of about 45° with respect to the horizontal. A plate 3, provided with holes 3a, is rotatably mounted through a screw 4 at the front end of leg 1a of bracket 1, said leg 1a being shaped so as to terminate at a position to the inside of the rotating bracket 2.

[0017] The rotating bracket 2 is substantially L-shaped and is pivoted on the outside of the support bracket 1 through a horizontal pin 5 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 from where leg 1a extends. 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 1b formed on the front side of the support bracket 1.

[0018] 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. Moreover, 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 properly shaping leg 1a as a consequence.

[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 5 on the support bracket 1 secured to the frame. The vertical sliding of the decorative panel 11 is controlled by the support bracket 1 through plate 3, which is secured to the back of panel 11 through screws introduced in holes 3a.

[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 various phases of the opening movement and the progressive decrease of the distance between the bottom edge of panel 11 and the bottom edge of the rotating bracket 2 from value *d* in Fig.5 to value *d'* in Fig.10 (i.e. the upward sliding of panel 11 with respect to door 12).

[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 5 causes the rotation of panel 11 around the fixed fulcrum 4 through the rotating plate 3, which results in the upward sliding of the decorative panel 11 with respect to door 12 that rotates around the fixed fulcrum 5 that is spaced from fulcrum 4 along leg 1a.

[0023] In the subsequent phases of the opening, illustrated in figures 7 to 9, panel 11 continues its sliding movement with respect to door 12 due to the different positions of the respective fixed rotation fulcrums 4 and 5. When door 12 is completely open at an almost horizontal position, as shown in Fig.10, plate 3 is substantially horizontal and the rotating bracket 2 has reached in abutment against catch 1b of the support bracket 1. Obvious-

ly, when the door is closed a reverse movement takes panel 11 and door 12 back to the starting position illustrated in Fig.5.

[0024] The effectiveness of the above-described mechanism is schematically illustrated also in Fig.11 where the sequence of the positions taken by the bottom edge of panel 11 shows how it avoids the interference with the dishwasher base 13, which on the contrary would occur (dash line arc) if panel 11 were to rotate around pin 5 together with door 12 as shown in EP 1529482.

[0025] Finally, Fig.12 shows the angle α formed with the horizontal by the line connecting the two fixed fulcrums 4 and 5, said angle being preferably equal to half the maximum opening angle of the door and therefore set at $45\pm5°$. In the preferred case of $\alpha=45°$, the vertical distance b between the two fulcrums 4, 5 is equal to half the sliding travel of panel 11 with respect to door 12, and in any case within the above-mentioned angular range said distance b is equal to $50\pm10\%$ of said sliding travel.

[0026] 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 directly on the machine frame on which also plate 3 would be directly pivoted.

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 domestic 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) is directly pivoted on the domestic appliance frame or on an element integral therewith so as to rotate around a fixed fulcrum (4) located at a position forward of and below a fixed fulcrum (5) of 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, a line connecting the two fixed fulcrums (4, 5) forming an angle (α) of $45\pm5°$ with respect to the horizontal and the vertical distance (b) between said fixed fulcrums (4, 5) being equal to $50\pm10\%$ of the sliding travel of the panel (11).

2. A built-in domestic appliance according to claim 1, **characterized in that** the panel (11) is pivoted at the end of a leg (1a) extending downward and forward from a support bracket (1) secured to the domestic appliance frame.

3. A built-in domestic appliance according to claim 2, **characterized in that** the rotating bracket (2) is pivoted on the support bracket (1).

4. A built-in domestic appliance according to claim 2 and 3, **characterized in that** the rotating bracket (2) is pivoted on the outside of the support bracket (1) and the leg (1a) is shaped so as to terminate at a position to the inside of the rotating bracket (2).

5. A built-in domestic appliance according to claim 3 or 4, **characterized in that** the rotating bracket (2) is substantially L-shaped and is pivoted on the support bracket (1) through a horizontal pin (5) located in the proximity of the angle between the two sides of the L.

6. A built-in domestic appliance according to claim 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 the preceding claims, **characterized in that** the decorative panel (11) is pivoted through a plate (3), provided with holes (3a) for fixing it to the panel (11), which is rotatably mounted on the domestic appliance frame or on the support bracket (1) through a screw (4).

8. 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.

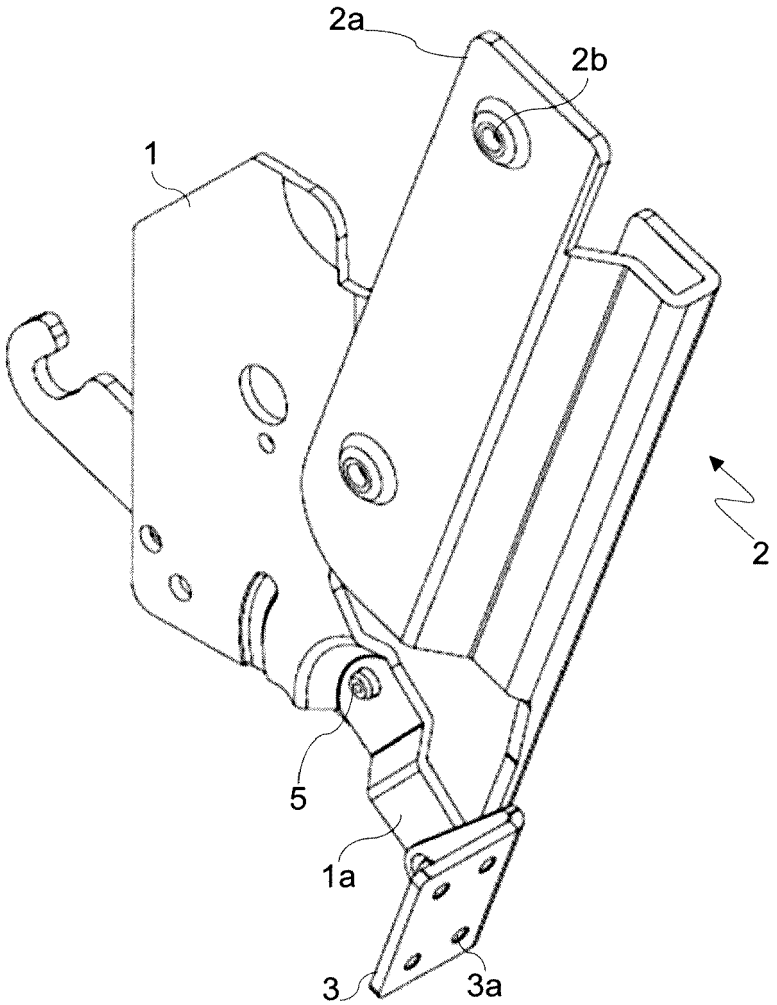

Fig.1

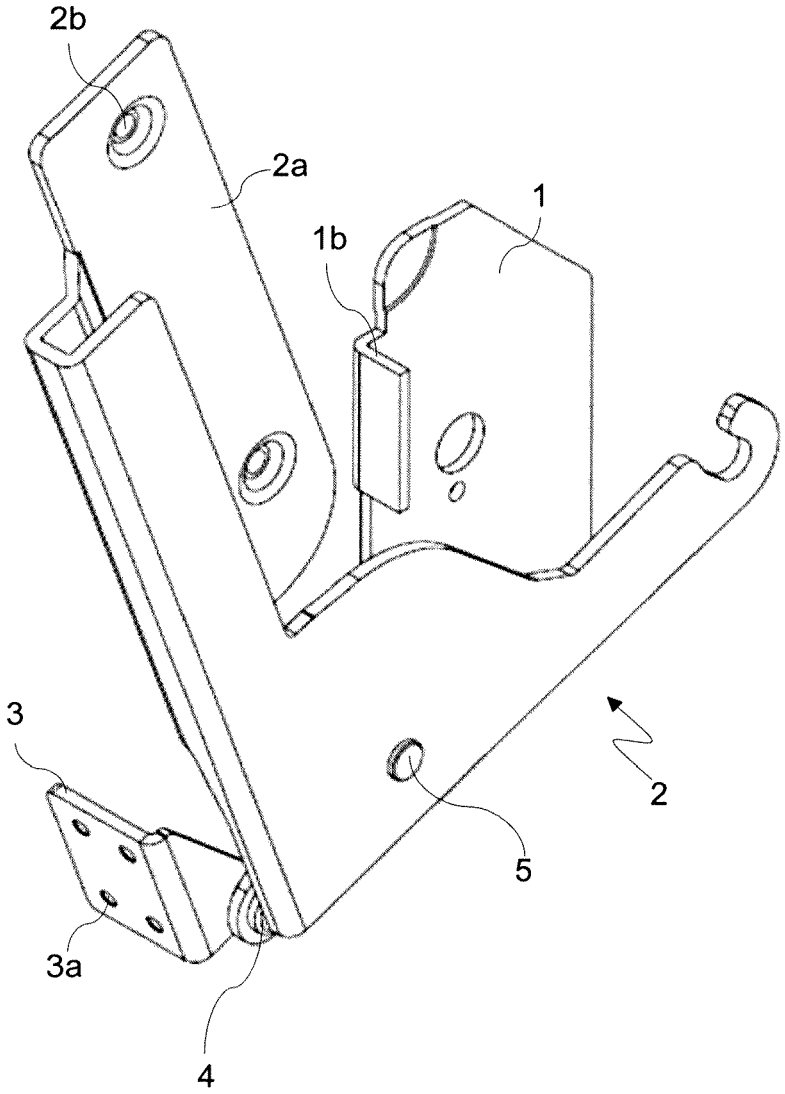

Fig.2

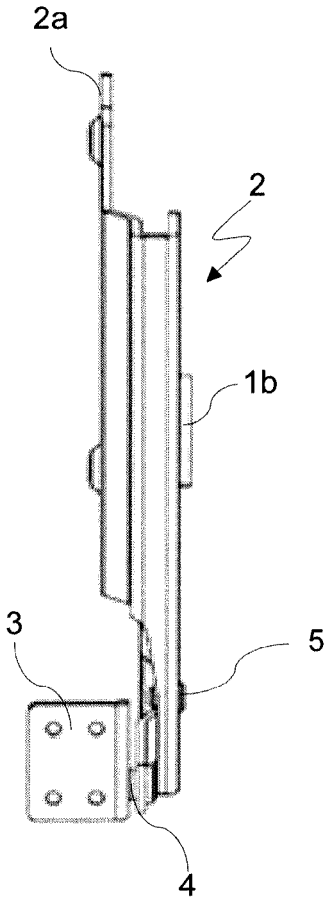

Fig.3

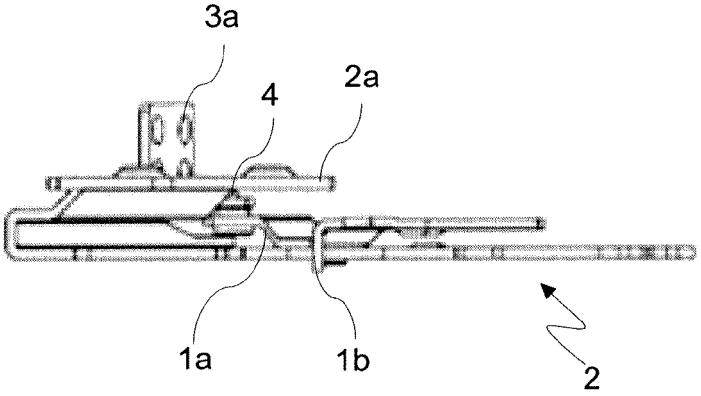

Fig.4

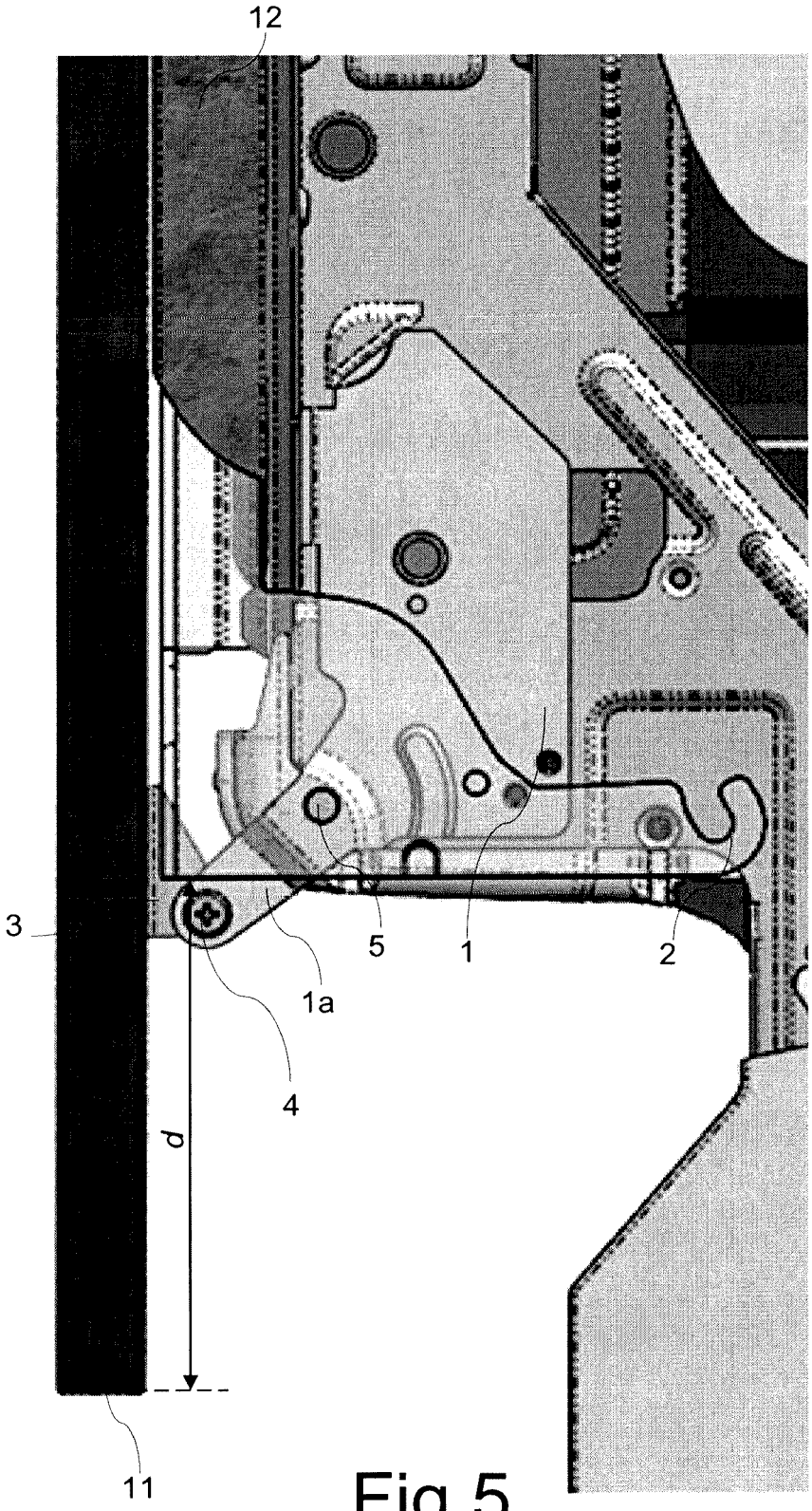

Fig.5

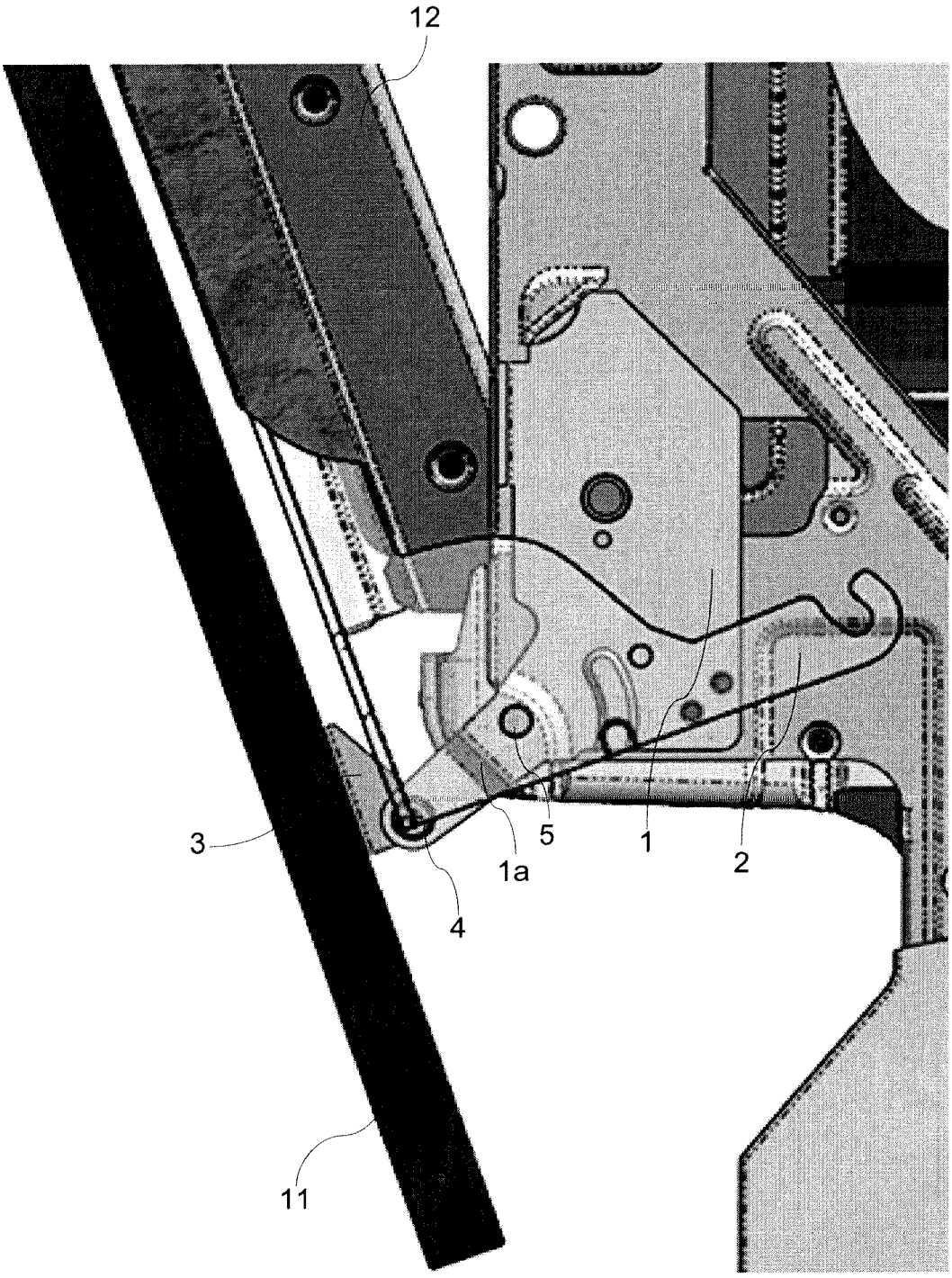

Fig.6

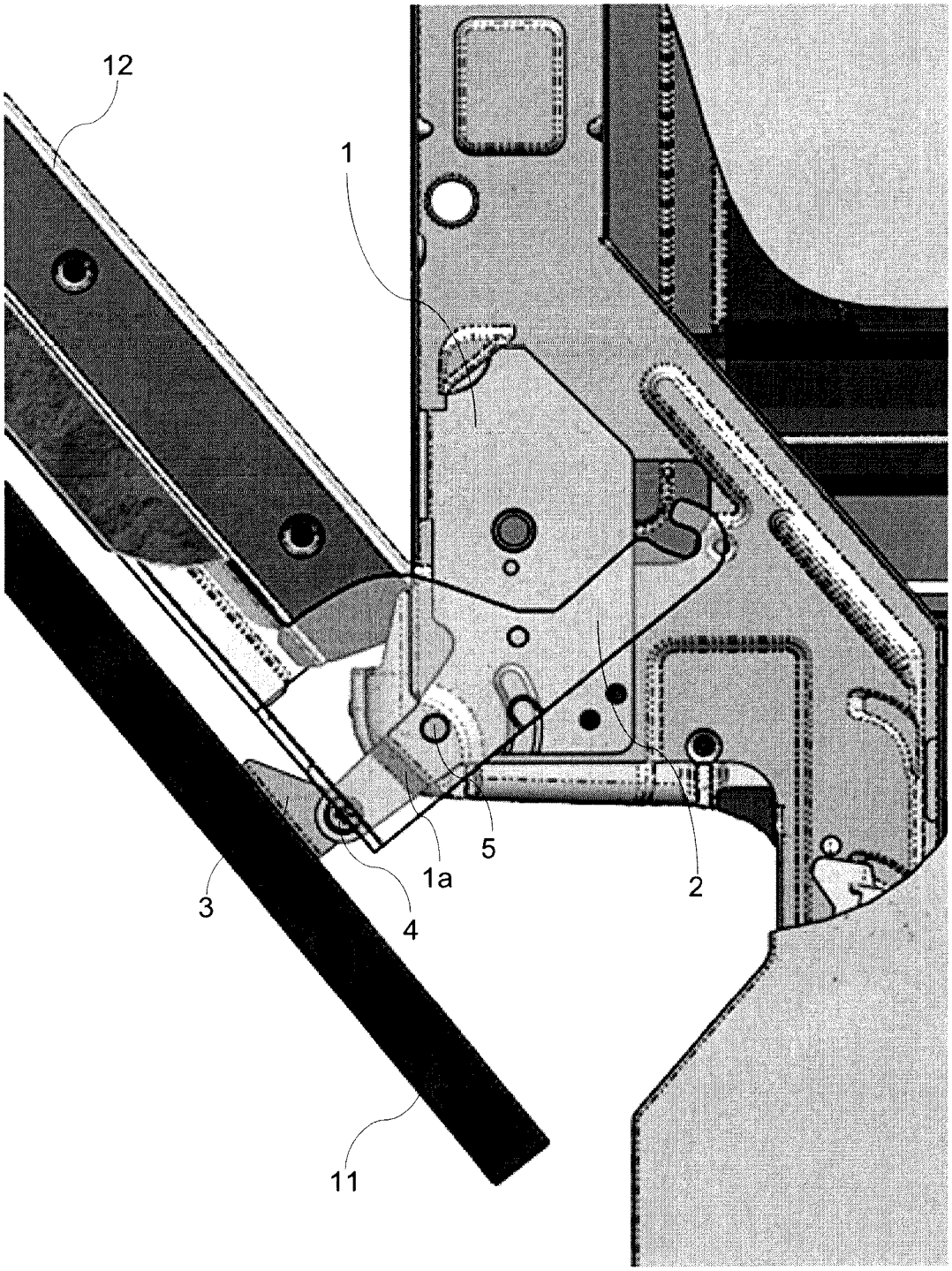

Fig.7

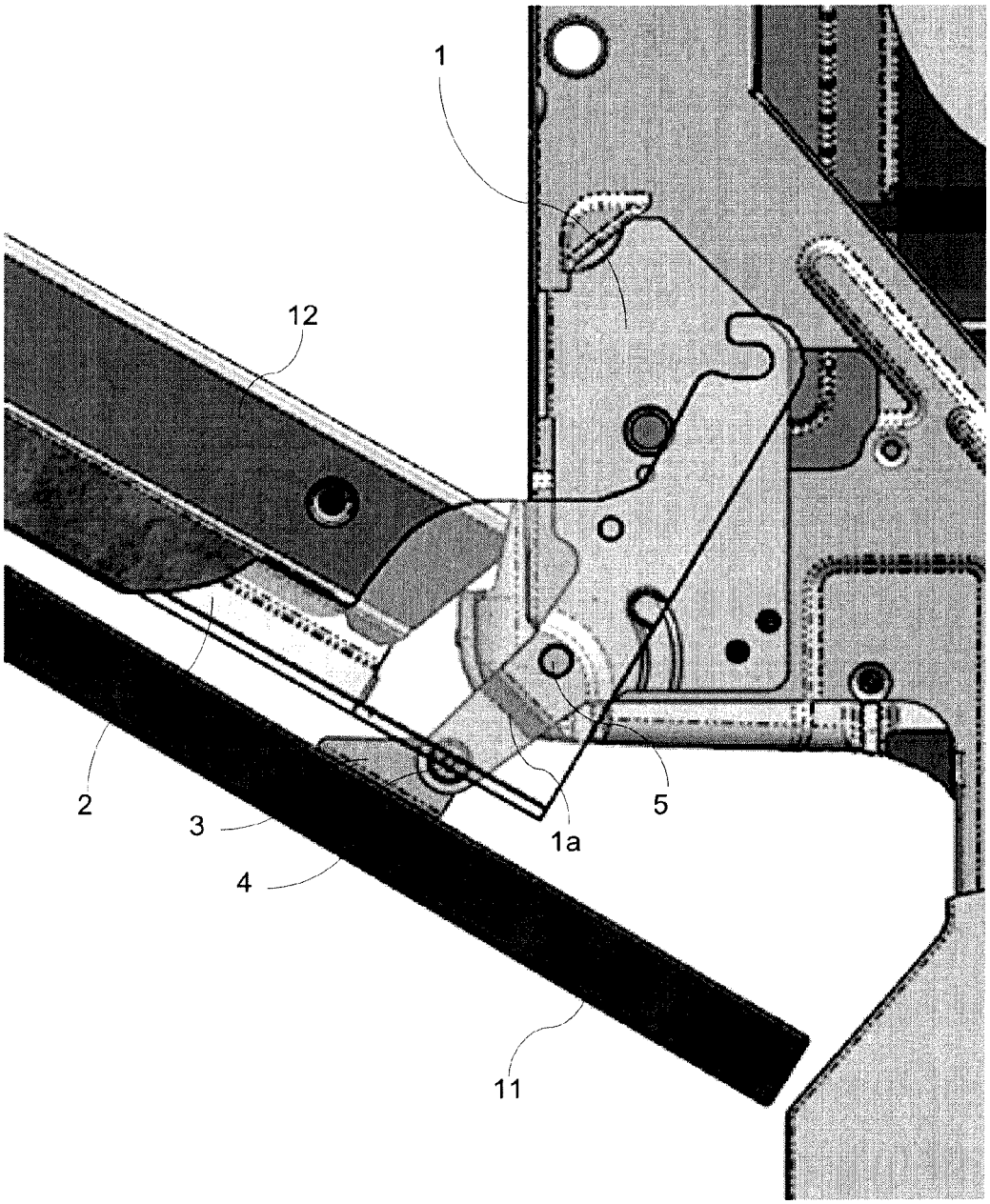

Fig.8

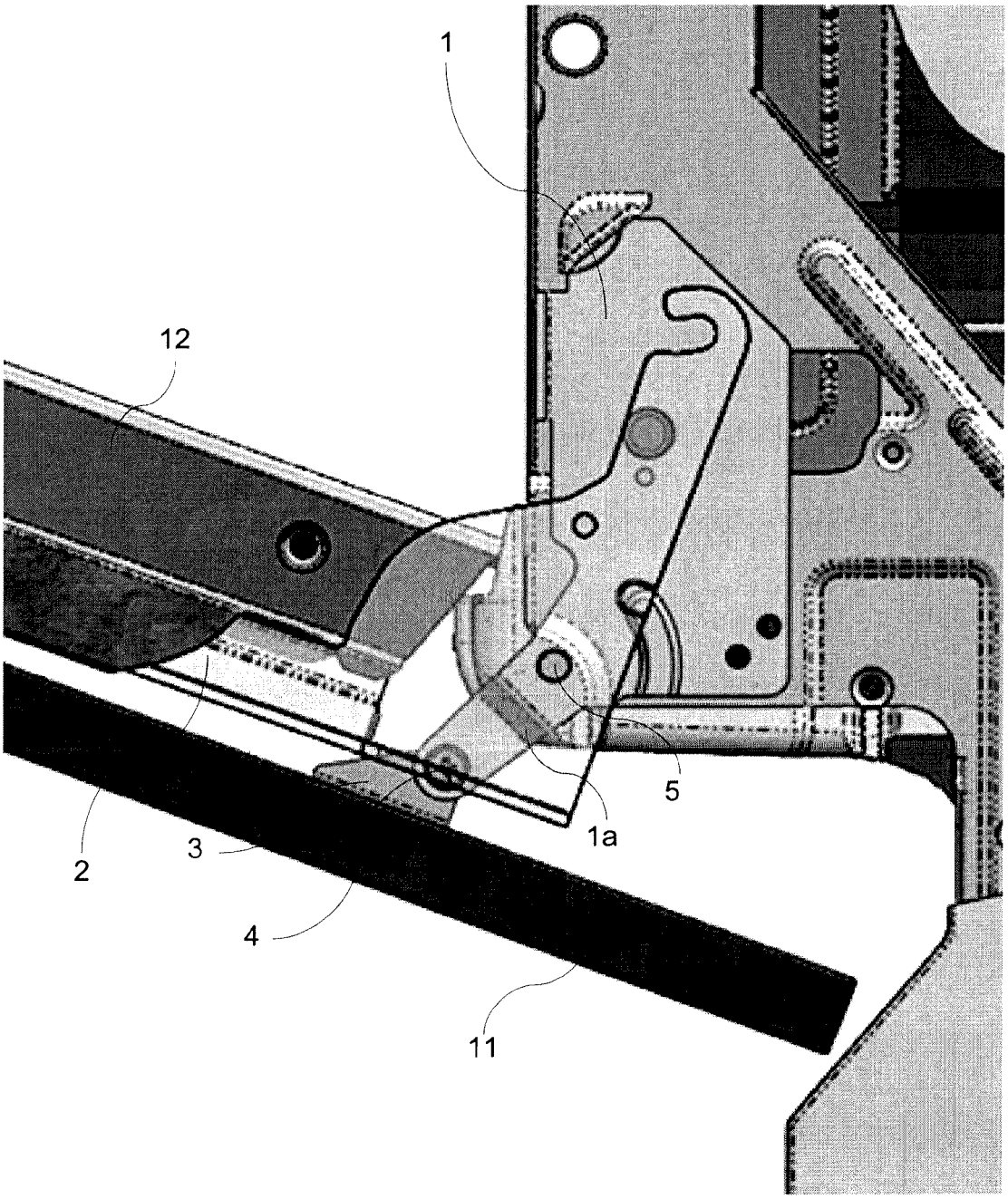

Fig.9

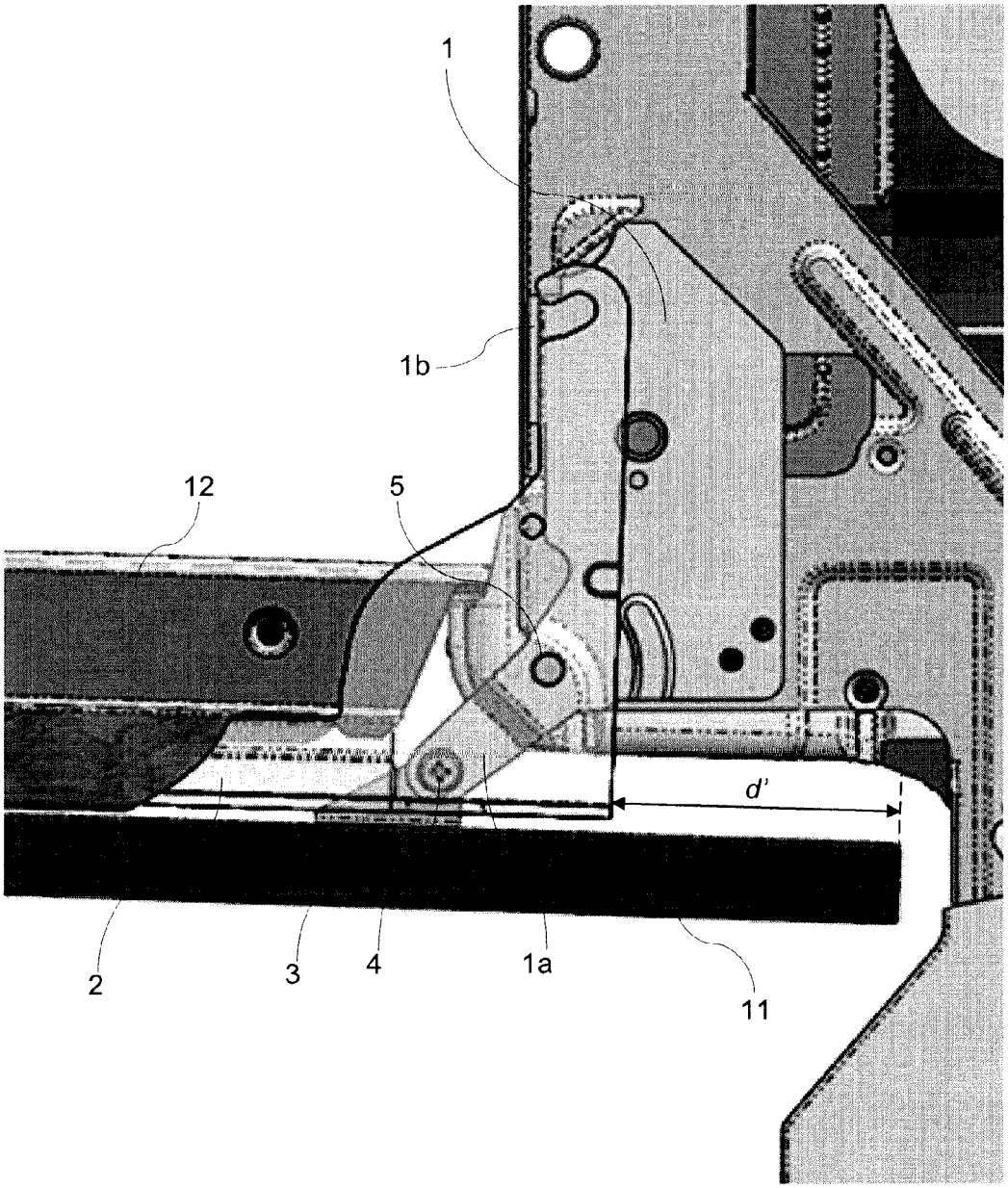

Fig.10

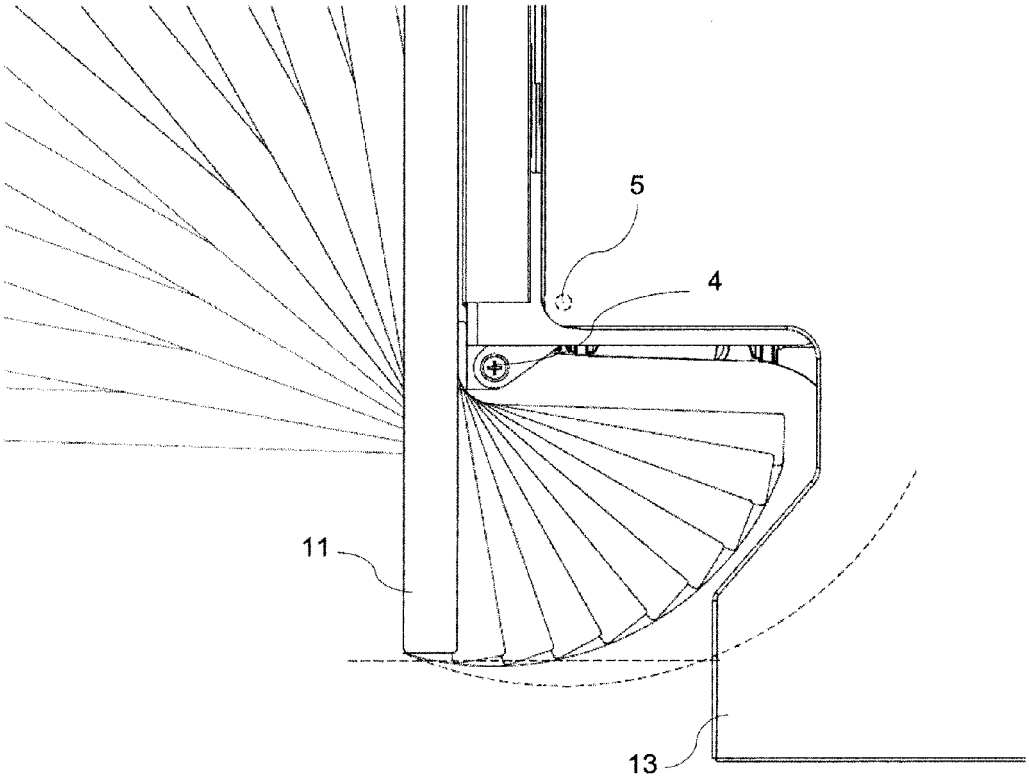

Fig.11

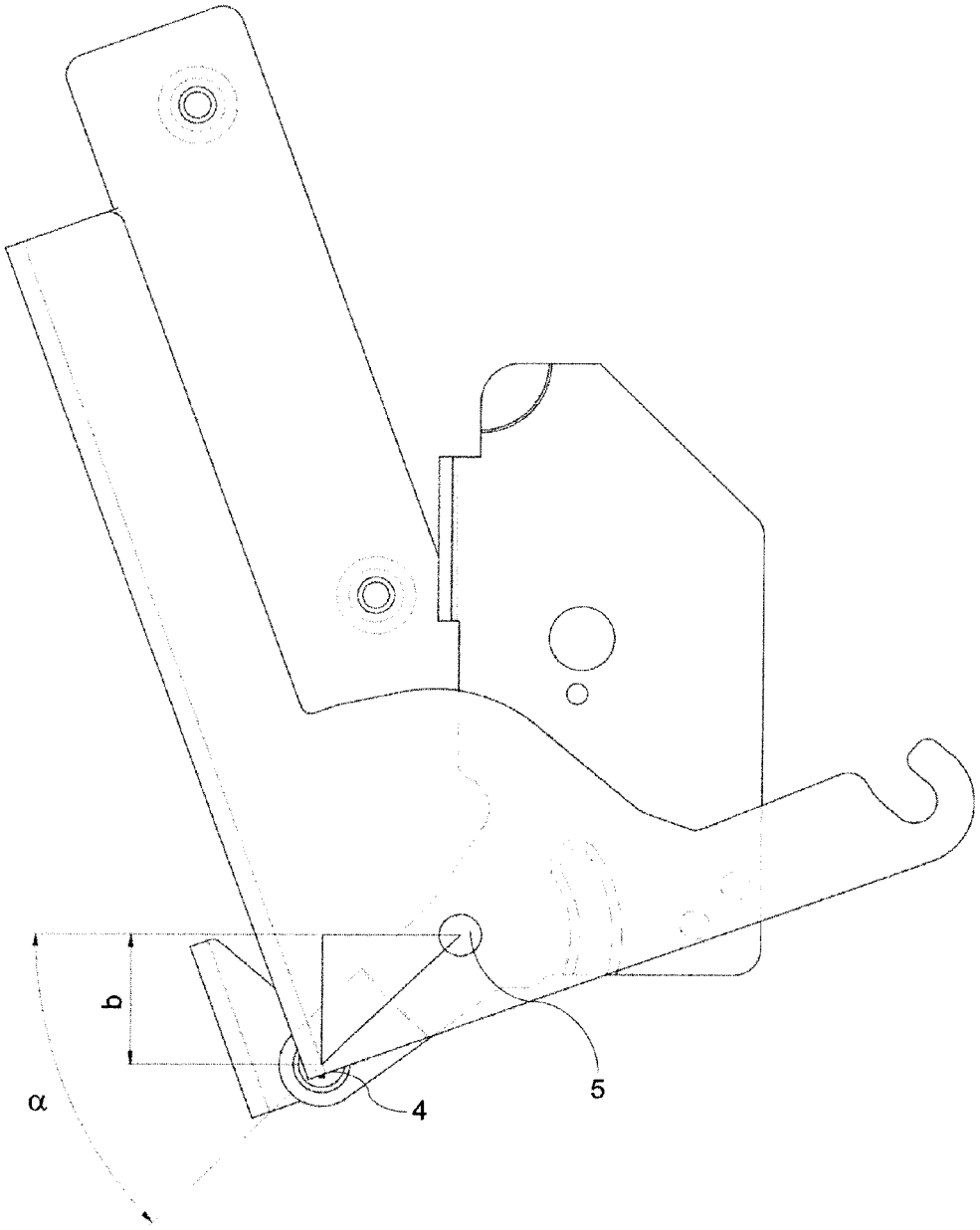

Fig.12

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EUROPEAN SEARCH REPORT

Application Number
EP 14 42 5012

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 093 360 A1 (WHIRLPOOL CO [US]) 26 August 2009 (2009-08-26) * the whole document *	1-8	INV. A47L15/42
A	EP 0 046 314 A1 (SMEG ELETTRODOMESTICI [IT]) 24 February 1982 (1982-02-24) * the whole document *	1-8	
A,D	EP 1 894 509 A1 (BONFERRARO SPA [IT]) 5 March 2008 (2008-03-05) * the whole document *	1-8	
A,D	EP 1 875 850 A1 (BONFERRARO SPA [IT]) 9 January 2008 (2008-01-09) * the whole document *	1-8	

TECHNICAL FIELDS SEARCHED (IPC)
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 April 2014	Jezierski, Krzysztof

CATEGORY OF CITED DOCUMENTS

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30-04-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2093360 A1	26-08-2009	EP 2093360 A1	26-08-2009
		WO 2009103627 A1	27-08-2009
EP 0046314 A1	24-02-1982	AU 7350881 A	23-09-1982
		DE 3170399 D1	13-06-1985
		EP 0046314 A1	24-02-1982
		ES 259985 U	16-03-1982
		IT 1129242 B	04-06-1986
EP 1894509 A1	05-03-2008	AT 460112 T	15-03-2010
		EP 1894509 A1	05-03-2008
		ES 2341181 T3	16-06-2010
EP 1875850 A1	09-01-2008	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 744152 A **[0002]**
- EP 1529482 A **[0002] [0010] [0024]**
- EP 1364609 A **[0005]**
- EP 1875850 A **[0006]**
- EP 1894509 A **[0007]**
- EP 2407723 A **[0008]**