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(54) **Built-in domestic appliance with front decorative panels**

(57) In a built-in domestic appliance with a door (9) hinged along its bottom side, provided with a top front decorative panel (11) and with a bottom front decorative panel (12) arranged flush with the top panel (11), the bottom panel (12) is mounted through a system including: a plate (4) to which an upper rod (2) and a lower rod (3) are pivotally connected (A', B'), the other ends of said rods (2, 3) being pivotally connected (A, B) to a support (1) secured to the base (10) of the appliance; a horizontal rod (8) comprising a forward end pivotally connected (C) to a bar (6) integral with the door and vertically oriented when the door is closed, and a rearward end guided by a guiding member (D) secured to the appliance; a push lever (5), pivotally connected (G) to said support (1), comprising a downwardly directed portion in which a slot (15) is formed, as well as an upwardly directed portion carrying at its distal end a roller (16) that abuts against the rear of the lower rod (3) when the door is closed; and a connecting rod (7) pivotally connected (E, F) to a lower portion of the horizontal rod (8) and to a bottom extension (2') of the upper rod (2), the slot (15) slidingly receiving the pin (F) that connects the connecting rod (7) to the upper rod (2). This allows to achieve a smooth movement of the mechanism and to use any mounting system for the top panel (11) applied to the door (9) so that no difficulty results in the installation inside the furniture nor in the lowering of the top panel with the door closed even if the bottom panel (12) is flush with the top panel (11), which can even be shorter than the door (9) so as to be able to use a bottom panel (12) of standard height.

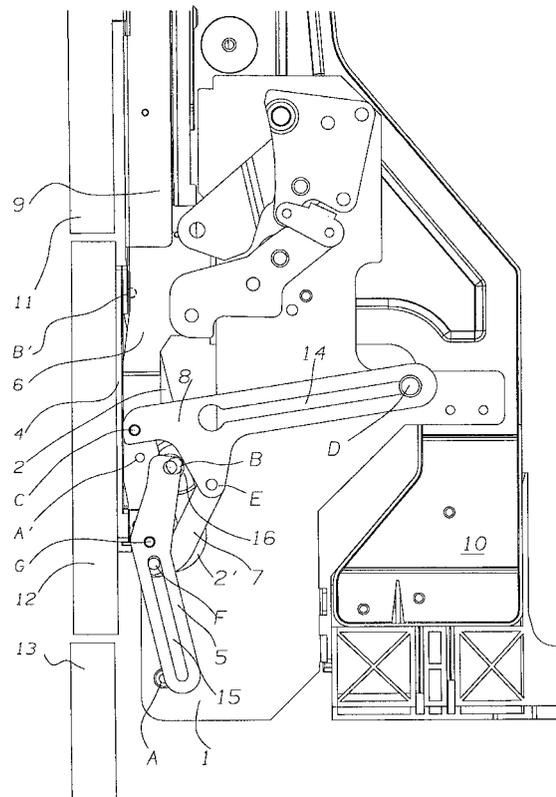


FIG. 1

Description

[0001] The present invention relates to built-in domestic appliances lined with decorative panels, and in particular to domestic appliances installed in kitchen furniture which completely encloses them (so-called "fully integrated"). Reference will be made hereafter to a dishwasher while it is clear that what is said applies to any other domestic appliance with similar decorative panels, e.g. a washing machine.

[0002] This type of decorative panels 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 top 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.

[0003] Moreover, below the panel applied to the door there is a plinth which acts as complementary bottom panel to maintain the continuity of the lining while allowing the opening of the door.

[0004] However, the presence of these panels poses particular problems in the case of installation inside a piece of furniture, i.e. when the dishwasher rests on a shelf or on the bottom of the furniture and is placed flush with the side walls thereof. In fact in this case the top panel must also cover the front edge of said side walls, same as normally occurs with the other doors. But in this way it would interfere with the walls when the dishwasher door is opened and the panel moves back into the space behind the plinth.

[0005] An example of a top panel moving back in the space behind the plinth is shown in the European application EP-1169963, relating to a mounting system for the bottom panel or plinth that prevents the interference between the two panels in the initial phase of the door opening. This known system leaves the plinth in the same initial vertical position also when the door is completely open, and in the present invention its function of preventing the interference between the two panels is carried out by the "variable fulcrum" hinges of the door. However, such a system does not prevent the interference between the top panel and the side walls.

[0006] The solutions presently available to prevent such an interference are only those of forming a recess in the side walls or of hinging the panel directly to the piece of furniture which contains the dishwasher. In the first case it is required to carry out a significant work of furniture adaptation to form in the sides the space for receiving the panel when the door is opened. In the second case it is necessary to mount a spacer on the bottom of the furniture and to find the exact hinging level for a smooth operation of the panel. Moreover, the plinth cannot be applied and must be replaced by an underlying element, such as the front face of a bottom drawer, to cover the spacer and the hinges mounted thereon.

[0007] In both cases these additional workings make the installation long and costly, and moreover the direct mounting on the furniture causes a further drawback. In fact the presence of the spacer on the furniture bottom makes complicated to pull the dishwasher out of the furniture if need arises for a maintenance intervention, since it is necessary to take away and then put back in place the spacer on the furniture as well as the panel on the dishwasher door.

[0008] In order to overcome these drawbacks the applicant has already devised a mounting system with upward sliding of the top panel with respect to the door upon opening (European application EP-1364609). However also this solution is not completely satisfying since it is not applicable to doors where the control panel is permanently visible, and therefore projects over the panel, neither allows the lowering of the panel with the door closed because the panel is secured to the machine base at its bottom.

[0009] The problem of lowering the panel is dealt with by the applicant also in the European application EP-1366703 with specific reference to the presence of the plinth flush with the top panel. In this case the mounting system of the top panel is carried only by the door and allows the lowering even with the door closed. The drawback still remains however that the panel must be of greater height than the door to allow the complete opening at 90° of the latter, which otherwise would interfere with the underlying plinth, whereby the plinth must have a limited height and it is not possible to use for it a bottom panel of standard height.

[0010] In order to overcome also these drawbacks the applicant has already devised a mounting system of the bottom panel or plinth in which the plinth is mounted through a parallelogram hinge secured to the base of the machine itself, preferably through a height-adjustable support, and controlled through a bar integral with the door so as to incline the plinth forward upon opening of the door (European application EP-1380250). However even this solution is not completely satisfactory in that the mechanism described in said application causes a quite sharp movement of the plinth, with a consequent non-negligible, mechanical stress of the mechanism.

[0011] Therefore the object of the present invention is to provide a domestic appliance provided with a mounting system of the bottom panel or plinth which overcomes the aforementioned drawbacks.

[0012] This object is achieved by means of a domestic appliance in which the plinth is mounted through a system as recited in claim 1.

[0013] The main advantage of the domestic appliance with the plinth mounting system according to the present invention is the much "softer" movement of the plinth, which results in advantages as to silence and reliability.

[0014] Furthermore this domestic appliance obviously retains the advantages of the above-mentioned previous mechanism, such as the possibility of using any

mounting system for the top panel applied to the door, so that no difficulty results in the installation inside the furniture, nor in the lowering of the top panel with the door closed to check the cycle phase and/or to discharge air through a suitable top grid during the drying phase.

[0015] A further advantage of this solution is that of being able to use as plinth also panels of standard height, typically 18 cm, since it is no longer necessary that the top panel is higher than the door. In particular, the invention is applied to reduced-height dishwashers housed in a space of the furniture usually intended to house drawers, or shelves or an oven.

[0016] 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 a partial see-through side view of a dishwasher according to the invention, showing in detail the mounting and moving system of the bottom panel in the closed door condition;

Fig.2 is a view similar to the preceding one showing an initial phase of the door opening, at an angle of about 5°;

Fig.3 is a view similar to the preceding one showing an intermediate phase of the door opening, at an angle of about 18°;

Fig.4 is a view similar to the preceding one showing an advanced phase of the door opening, at an angle of about 55°; and

Fig.5 is a view similar to the preceding one with the door fully open at about 90°.

[0017] With reference to figs.1 and 2, there is seen that a domestic appliance according to the present invention is provided with a mounting and moving system of a bottom panel 12 which clearly results arranged flush between the decorative panel 11 of door 9 and a panel 13 of the underlying piece of furniture (e.g. the front face of a drawer).

[0018] This system includes a support 1, secured in the front portion of the base 10 of the domestic appliance, on which are pivoted an upper rod 2 and a lower rod 3 (not visible in fig.1) of a parallelogram hinge, through respective pins B and A. The forward ends of these rods 2, 3 are also connected through respective pins B', A' to a plate 4 which carries the bottom panel 12, and a return spring (not illustrated) is arranged between the lower rod 3 and base 10.

[0019] On support 1, through a relevant pin G, there is also pivoted a lever 5 extending downward into a portion where a slot 15 is formed, as well as upward into a portion that carries at its distal end a low-friction push member, preferably a roller 16.

[0020] Support 1 also carries a horizontal rod 8 that is pivoted at the forward end through a pin C to a bar 6

integral with door 9, while at the rear end it is guided by a pin D, secured to support 1, sliding within a slot 14.

[0021] The horizontal rod 8 is also connected to the upper rod 2 through a connecting rod 7 pivoted between a pin E, located in the lower portion of rod 8, and a pin F located at the bottom end of a bottom extension 2' of rod 2 extending below pin B. Said pin F connecting rods 2 and 7 also slides within slot 15 of lever 5.

[0022] In the closed door position illustrated in fig.1, roller 16 abuts against the rear of the lower rod 3 close to the top pin A'. Moreover, in said position, bar 6 and lever 5 are substantially vertical and pin C is at the lowest point of his movement path, well below pin D.

[0023] The simple and effective operation of the present mounting and moving system for panel 12 is readily understood from the description above with the help of figs.3-5.

[0024] At the beginning of the opening, door 9 (thanks to "variable fulcrum" hinges) performs a rototranslational movement that prevents at the beginning of the opening the interference between panel 11 and the underlying panel 12 (fig.2). The door opening movement, through bar 6 and pin C, causes the rising and rearward translation of the horizontal rod 8 on the fixed pin D, while determining a counter-clockwise rotation of the push lever 5 around pin G, due to the sliding of pin F within slot 15, and a traction on the connecting rod 7 through pin E. This results in a push of roller 16 on the lower rod 3 to help the initial movement of panel 12, said push being limited to the first 5°-10° of the opening.

[0025] The traction on rod 7 causes in turn, through pin F, a counter-clockwise rotation of the upper rod 2, which together with the push of lever 5 produces a forward movement of panel 12. In this way panel 12 performs a rototranslational movement along the path allowed by rods 2 and 3, and in particular while rod 2 is directly driven by rod 7, rod 3 is "pulled" by the movement of panel 12.

[0026] This calculated movement of panel 12 allows the advancing and rearward inclination thereof without interference either with the overlying panel 11 or the underlying panel 13.

[0027] When the complete opening of door 9 is reached (fig.5), rods 2, 3 have taken a downwardly inclined position bringing panel 12 to an advanced and lowered position in which there is no interference with panel 11. It should also be noted that the lower rod 3 is shaped so as to avoid interference with the underlying panel 13, since the straight connection line between pins A, A' is lower than the top edge of said panel.

[0028] Furthermore, in said position, pin F abuts against the bottom end of slot 15, acting as an end stop, and pin C is at the highest point of his movement path, just above pin D.

[0029] In the reverse closing movement, in order to facilitate the raising of panel 12 provided by the push of rod 8 on rod 2, through rod 7 and extension 2', also the return spring (not shown) arranged between the lower

rod 3 and base 10 cooperates.

[0030] From the above figures it is clear that in no phase of the movement the top panel 11 or the bottom panel 12 move closer to the dishwasher or mutually interfere, or interfere with the underlying panel 13, whereby there is no problem of interference with the furniture sides. Furthermore, since the whole mounting system is secured to the dishwasher, the latter can be easily pulled out of the furniture for maintenance, if any, without requiring the removal of any member of the furniture.

[0031] 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, the exact shape and arrangement of the levers and pins can be somewhat changed according to specific needs, as long as the above-described type of movement of panel 12 is retained.

Claims

1. A built-in domestic appliance with a door (9) hinged along its bottom side, provided with a top front decorative panel (11) applied to said door and with a bottom front decorative panel (12) arranged flush with said top front decorative panel (11), said bottom panel (12) being applied to the appliance through a mounting system including a plate (4) to which an upper rod (2) and a lower rod (3) are pivotally connected (A', B'), the other ends of said rods (2, 3) being pivotally connected (A, B) to a support (1) secured to the base (10) of the appliance, **characterized in that** the mounting system further comprises:

a) a horizontal rod (8) comprising a forward end pivotally connected (C) to a bar (6) integral with the door and vertically oriented when the door is closed, and a rearward end guided by a guiding member (D) secured to the appliance;

b) a push lever (5), pivotally connected (G) to said support (1), comprising a downwardly directed portion in which a slot (15) is formed, as well as an upwardly directed portion carrying at its distal end a low-friction push member, which abuts against the rear of the lower rod (3) when the door is closed; and

c) a connecting rod (7) pivotally connected (E, F) to a lower portion of the horizontal rod (8) and to a bottom extension (2') of said upper rod (2), said slot (15) slidingly receiving the pin (F) that connects the connecting rod (7) to the upper rod (2).

2. A built-in domestic appliance according to claim 1, **characterized in that** the low-friction push member arranged at the end of the push lever (5) is a roller

(16).

3. A built-in domestic appliance according to claim 1 or 2, **characterized in that** the door opening movement causes the rising and rearward translation of the horizontal rod (8) that is guided by a pin (D) secured to the support (1) and engaged in a slot (14).

4. A built-in domestic appliance according to one of the preceding claims, **characterized in that** it further includes a return spring arranged between the lower rod (3) and the base (10).

5. A built-in domestic appliance according to one of the preceding claims, **characterized in that** the lower rod (3) is shaped to pass higher than the connection line between the pins (A, A') connecting it to the plate (4) and the support (1).

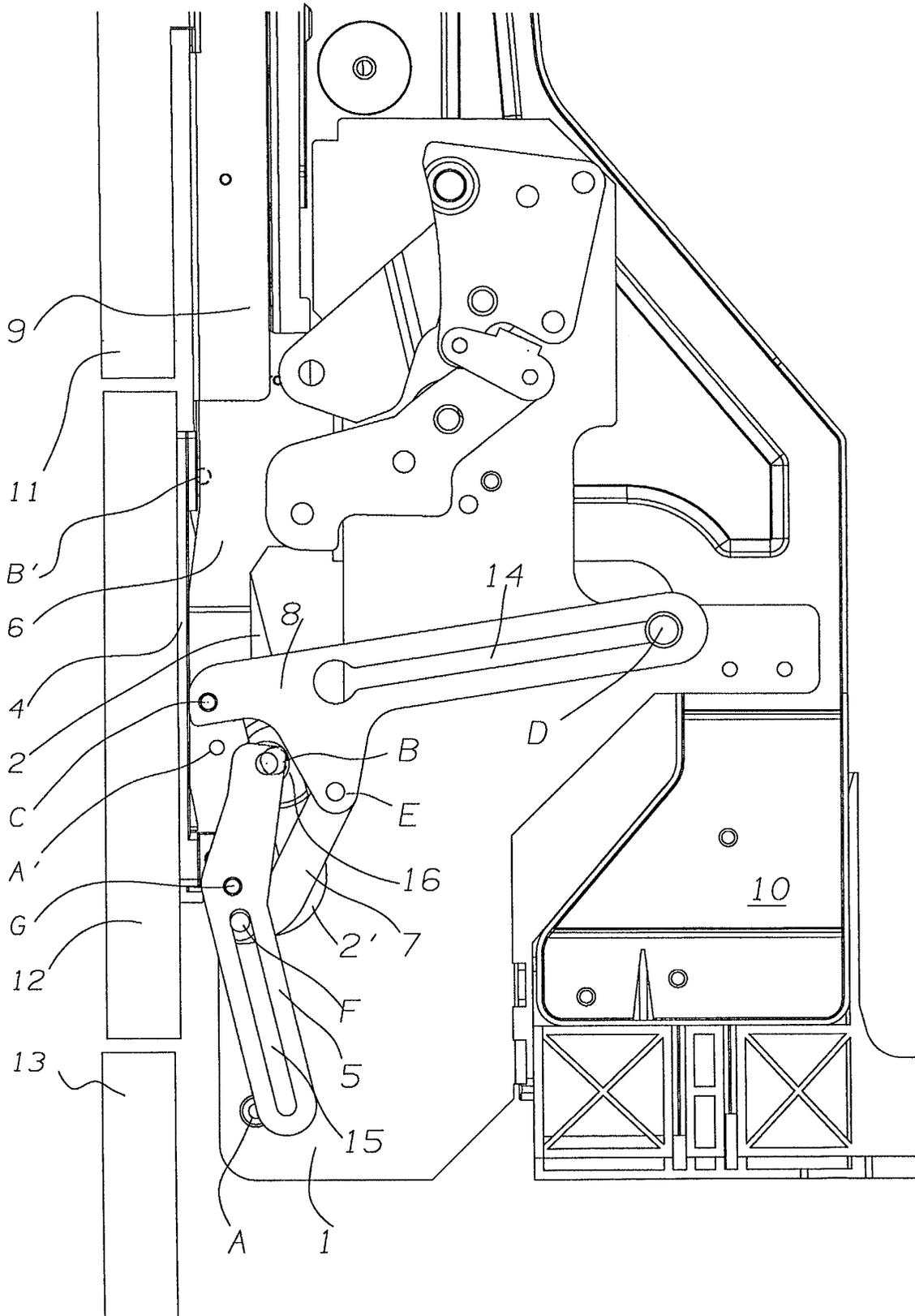


FIG. 1

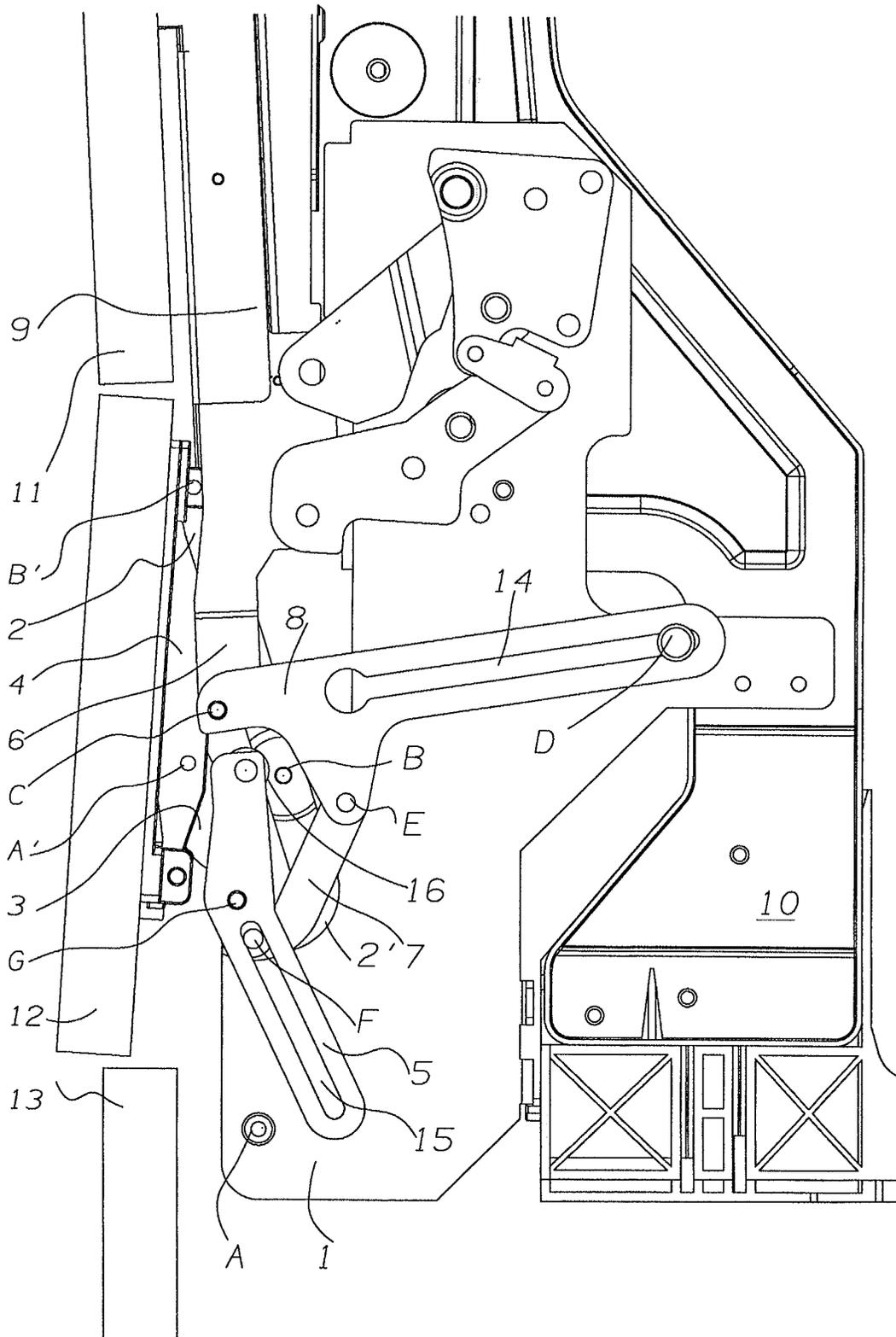


FIG. 2

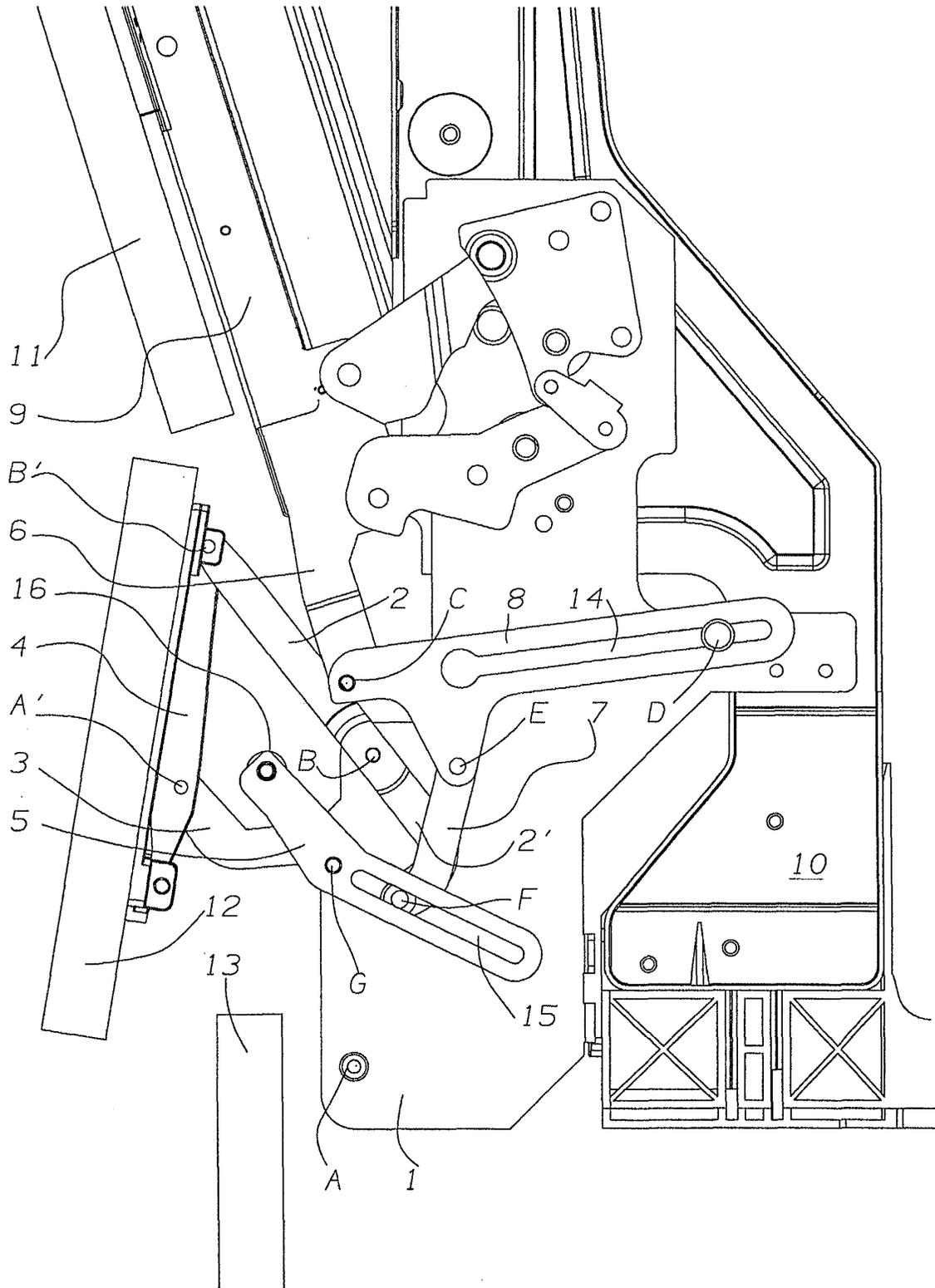


FIG. 3

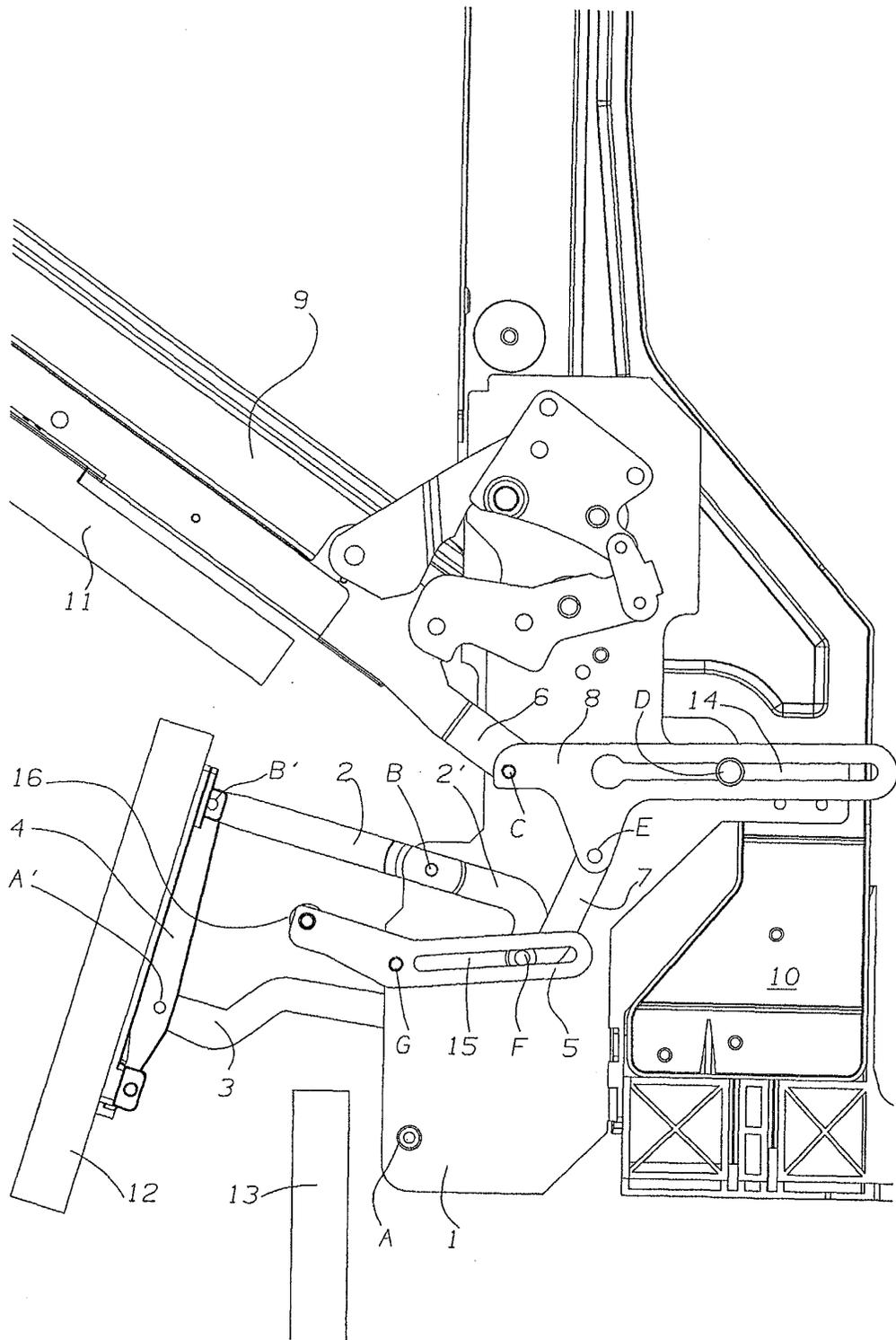


FIG. 4

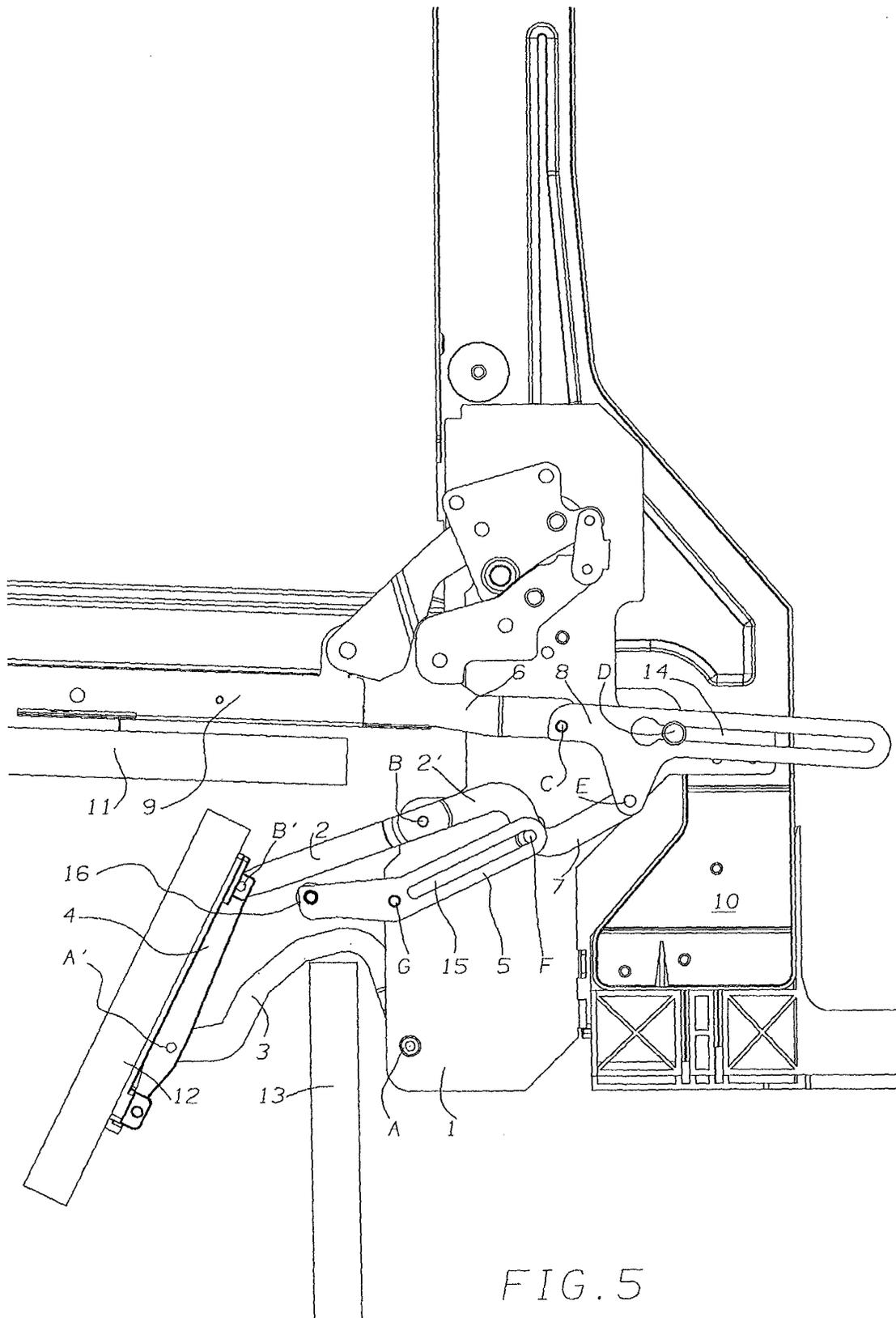


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A47B A47L
Place of search		Date of completion of the search	Examiner
MUNICH		29 July 2004	MacCormick, D
CATEGORY OF CITED DOCUMENTS		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 04 42 5132

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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29-07-2004

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