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(11)

**EP 1 702 550 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:

**20.09.2006 Bulletin 2006/38**

(51) Int Cl.:

**A47L 15/42** <sup>(2006.01)</sup>

**F24C 15/02** <sup>(2006.01)</sup>

(21) Application number: **05425067.5**

(22) Date of filing: **11.02.2005**

(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 MC NL PL PT RO SE SI SK TR**

Designated Extension States:

**AL BA HR LV MK YU**

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(54) **Panel moving system for a built-in appliance or the like, with anti-crushing functionality**

(57) A panel (2) moving system, for built-in appliances or the like, includes a parallelogram hinge comprising a lower rod and an upper rod, said rods being pivoted on a fixed support through respective fixed pins (A, B) while their forward ends are connected through respective mobile pins (A', B') to a plate that carries said panel (2), as well as a driving bar (7) pivoted (I) to one of said rods to transmit the motion to the system, said rod that receives the motion from the driving bar (7) being made up of a rear part (4) connected to the latter and secured on the fixed support through one of the fixed pins (A, B), and of a forward mobile part (5) connected to the fixed part (4) through a pin (H) and a spring (6) arranged between the rear end of the mobile part (5) and the fixed part (4). In this way, there is achieved a substantial reduction in the crushing of the fingers that could be in the chinks (X, Y) that form between the panel and the elements adjacent thereto, said crushing being determined by properly adjusting the return spring (6) that connects the two parts (4, 5) of the articulated rod.

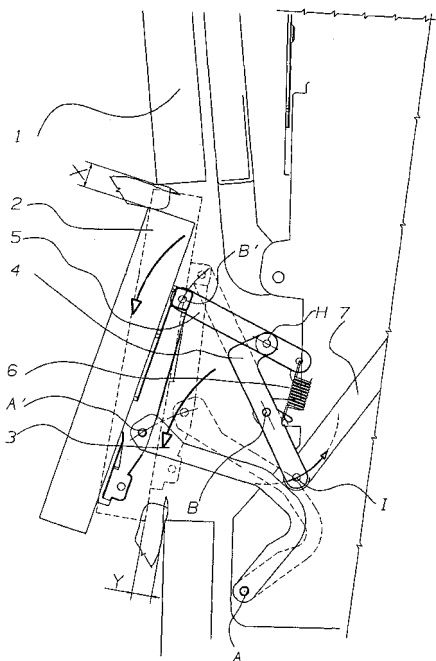


FIG. 1

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## Description

**[0001]** The present invention relates to a panel moving system, provided with an anti-crushing functionality suitable to prevent or at least substantially reduce the risk of finger crushing during the movement of the panel. Specific reference will be made hereafter to a decorative panel for a built-in domestic appliance, and in particular to a domestic appliance installed in kitchen furniture which completely encloses it (so-called "fully integrated"), while it is clear that what is said applies to any other similar application of a panel that is moved flush with other adjacent elements.

**[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 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. Examples of mounting and moving systems of the bottom panel or plinth, in which the plinth is mounted through a parallelogram hinge secured to the base of the machine itself and driven through a bar integral with the door, are disclosed in the published European application EP-1380250, and in the yet unpublished European applications n.03425504.2 and n.04425132.0 all in the name of the applicant.

**[0004]** Although functional, these solutions are not completely satisfying since the systems described in these applications determine, during the closure movement, a risk of crushing the fingers in the chinks that form between the panel and the adjacent elements. This risk depends in particular on the length of the system driving bar and on the presence of corners along the edges of the panel and of the elements adjacent thereto.

**[0005]** Therefore the object of the present invention is to provide a panel moving system which overcomes the aforementioned drawback.

**[0006]** This object is achieved by means of a system in which the panel is mounted through a parallelogram hinge and the rod receiving the motion from the driving bar is divided into two elements connected by a spring.

**[0007]** The main advantage of the moving system according to the present invention is the substantial reduction in finger crushing, which can be determined by properly adjusting the return spring that connects the two parts of the articulated rod.

**[0008]** A further advantage of this solution is that of being able to be applied as a replacement for any type of known moving system, since it only implies the replacement of a rigid rod with an articulated rod provided with a return spring, without significant changes neither in cost nor in size.

**[0009]** These and other advantages and features of the moving system according to the present invention will be evident to those skilled in the art from the following detailed description of two embodiments thereof, with reference to the attached drawings, wherein:

Fig.1 is a diagrammatic side view of a moving system according to the invention in which the driving bar is connected to the upper rod; and

Fig.2 is a view similar to the preceding one showing a second embodiment in which the driving bar is connected to the lower rod.

**[0010]** With reference to fig. 1, there is seen that a moving system according to the invention carries a decorative panel 2 arranged flush between a decorative panel 1 of the door of a dishwasher and a panel of an underlying piece of furniture (e.g. the front face of a drawer).

**[0011]** This system includes a parallelogram hinge comprising a lower rod 3, shaped so as to climb over the underlying panel, and an upper rod that is in turn made up of parts 4 and 5. These rods are pivoted on the base of the dishwasher through respective fixed pins A and B, while their forward ends are connected through respective mobile pins A' and B' to a plate that carries panel 2. A driving bar 7 is pivoted through a pin I to the upper rod to transmit the motion to the system.

**[0012]** The novel aspect of the system according to the present invention is in having the "driving" rod, in this case the upper rod, articulated in that it is made up of parts 4 and 5 pivoted through pin H and connected by a return spring 6.

**[0013]** More specifically, the rear part 4 of the rod is secured on the machine through pin B, while the forward part 5 is mobile and is in turn connected to the rear part 4 through pin H and spring 6 that is arranged between the rear end of the mobile part 5 and the fixed part 4.

**[0014]** In this way, during the closure of the door illustrated in fig.1, the crushing of the fingers both at position X over panel 2 and at position Y under panel 2 (in broken lines) is greatly reduced because the presence of an obstacle causes the rotation of the mobile part 5 around pin H with a corresponding extension of spring 6. In order to prevent the failure of the spring, there is preferably provided an end stop (not illustrated) that limits the rotation of the mobile part 5, yet guaranteeing a space X or Y of at least 12,5 mm.

**[0015]** Obviously, a similar operation of the moving system is also possible when the driving is achieved through the

lower rod, as shown in fig.2.

[0016] The structure of the system is in fact similar, with a parallelogram hinge comprising an upper rod 8 and a lower rod made up of parts 9 and 10. These rods are pivoted on the base of the dishwasher through respective pins C and D, while their forward ends are connected through respective pins C' and D' to a plate that carries panel 2. A driving bar 12 is pivoted through a pin L to the lower rod to transmit the motion to the system.

[0017] Since the "driving" rod in this case is the lower rod, it is said rod that is articulated since it is made up of parts 9 and 10 pivoted through pin E and connected by a return spring 11.

[0018] More specifically, the rear part 9 of the rod is secured on the machine through pin D, while the forward part 10 is mobile and is in turn connected to the rear part 9 through pin E and spring 11 that is arranged between the rear end of the mobile part 10 and the fixed part 9.

[0019] In this way the crushing of the fingers both at position X and at position Y is greatly reduced thanks to the rotation of the mobile part 10 around pin E with a corresponding extension of spring 11.

[0020] Finally, it is evident that if both the upper and lower rods are "driving" rods they both have to be articulated.

[0021] It is clear that the above-described and illustrated embodiment of the moving system 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 2 with the specific anti-crushing functionality is retained.

## Claims

1. A panel (2) moving system, including a parallelogram hinge comprising a lower rod and an upper rod, said rods being pivoted on a fixed support through respective fixed pins (A, B; C, D) while their forward ends are connected through respective mobile pins (A', B'; C', D') to a plate that carries said panel (2), at least one driving bar (7; 12) being pivoted (I; L) to at least one of said rods to transmit the motion to the system, **characterized in that** said at least one rod that receives the motion from said at least one driving bar (7; 12) is made up of a rear part (4; 9) connected to the latter and secured on said fixed support through one of said fixed pins (A, B; C, D), and of a forward mobile part (5; 10) connected to said fixed part (4; 9) through a pin (H; E) and a spring (6; 11) arranged between the rear end of said mobile part (5; 10) and said fixed part (4; 9).
2. A panel moving system according to claim 1, **characterized in that** it further includes at least one end stop that limits the rotation of the mobile part (5; 10).
3. A panel moving system according to claim 2, **characterized in that** the position of the end stop guarantees both at a position (X) over the panel (2) and at a position (Y) under the panel (2) a space of at least 12,5 mm between said panel (2) and the elements adjacent thereto.
4. A built-in domestic appliance with a door hinged along its bottom side, provided with a top front decorative panel (1) applied to said door and with a bottom front decorative panel (2) arranged flush with said top front decorative panel (1), **characterized in that** said bottom panel (2) is applied to the appliance through a moving system according to one of the preceding claims.

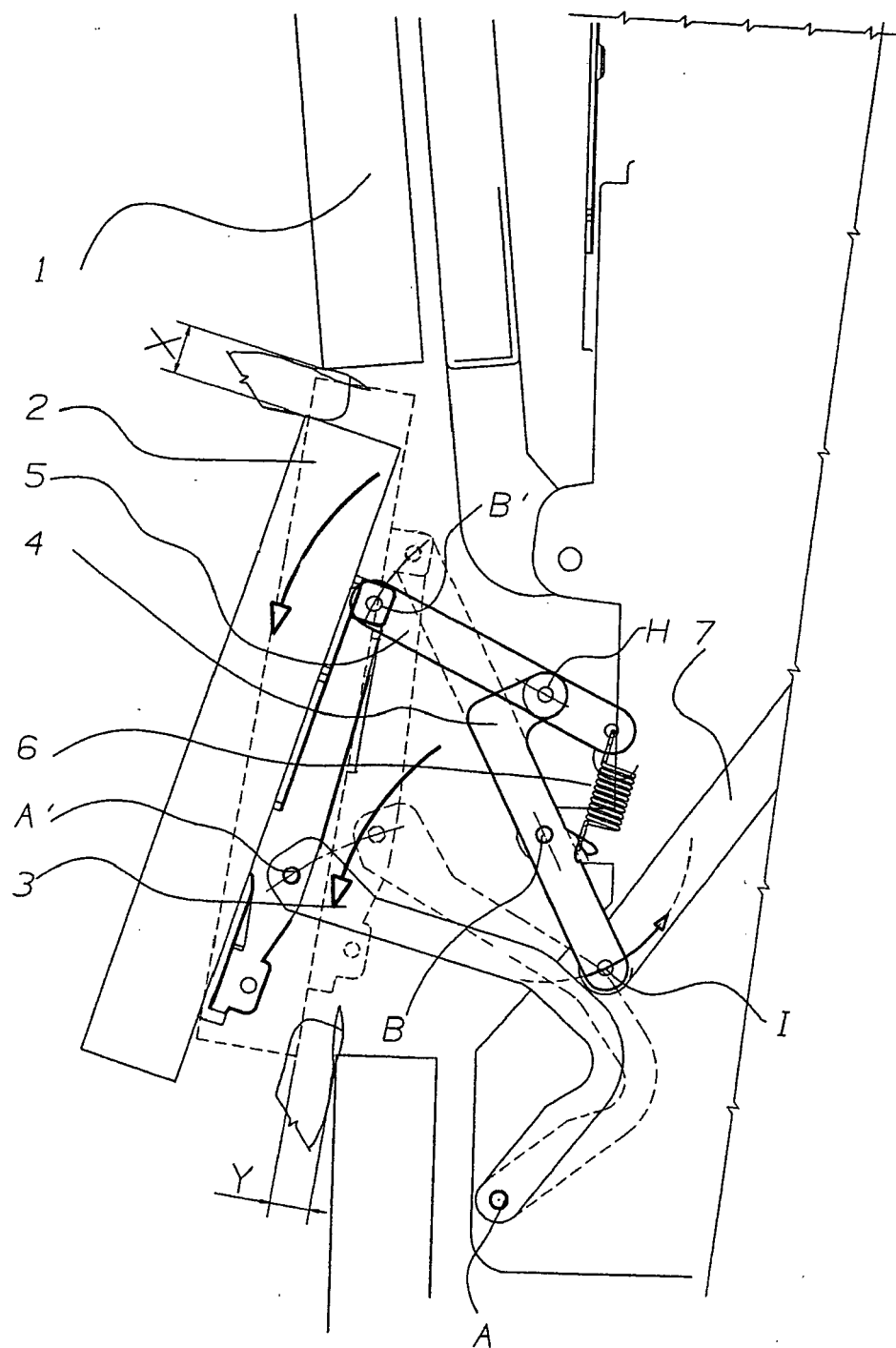


FIG. 1

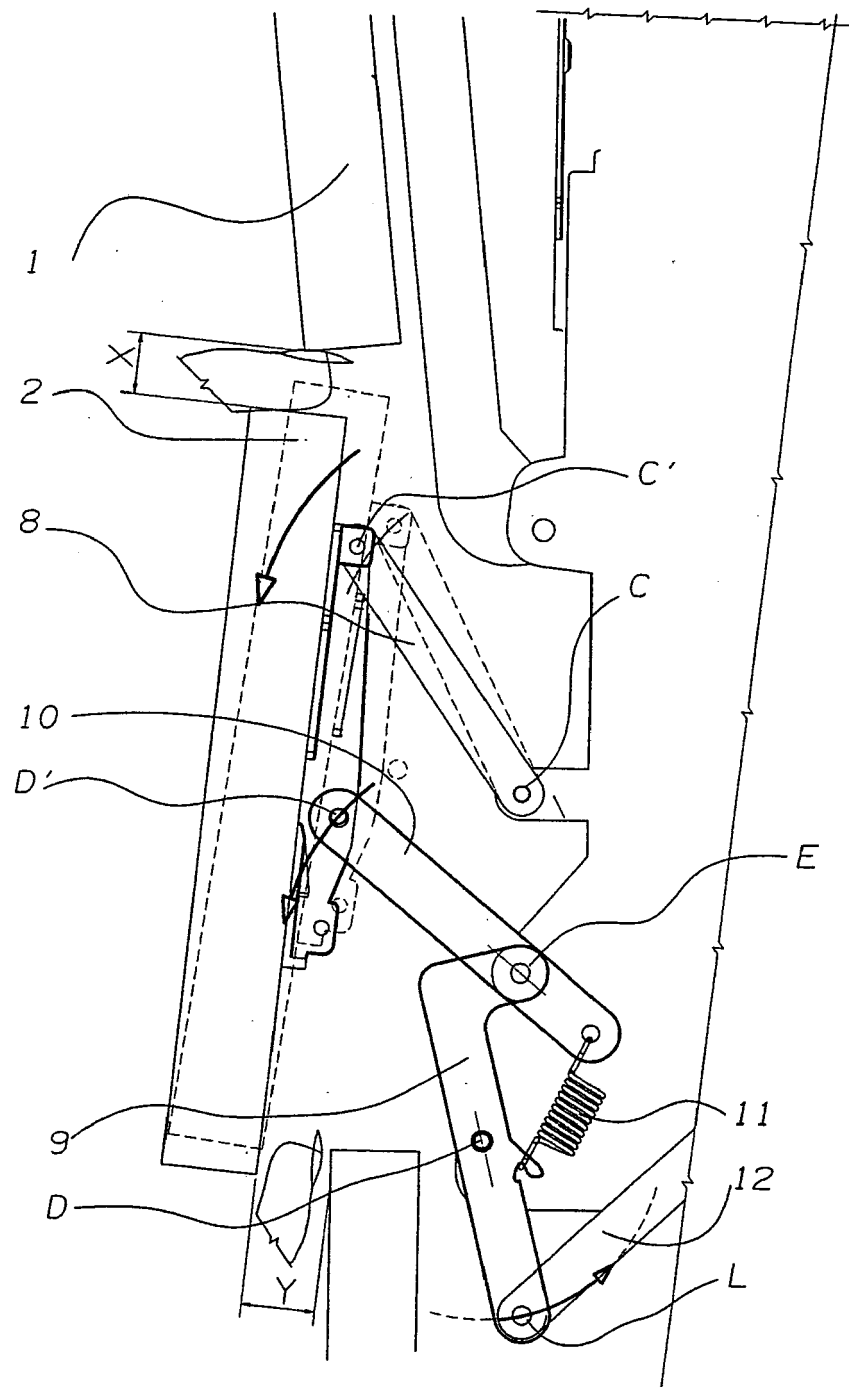


FIG. 2



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# EUROPEAN SEARCH REPORT

Application Number  
EP 05 42 5067

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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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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A47L E05D F24C
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>8 November 2005</b>	Examiner <b>Di Renzo, R</b>
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  
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EP 05 42 5067

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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08-11-2005

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