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(54) Dishwasher with automatic door-opening device

(57) A dishwasher with a bottom-hinged door closed by a pull lock (1) is provided with an automatic door-opening device that includes an opening mechanism consisting of a pair of pushers (2) driven by springs (3) having a force sufficient to overcome the resistance of the pull lock (1), as well as a control mechanism (7, 8) mobile between a retention position in which the pushers (2) are retracted within suitable housings (4) so as to allow the door to be closed (Fig. 3), and a release position in which the springs (3) have pushed the pushers (2) outside the housings (4) so as to cause the opening of the door (Fig. 2).

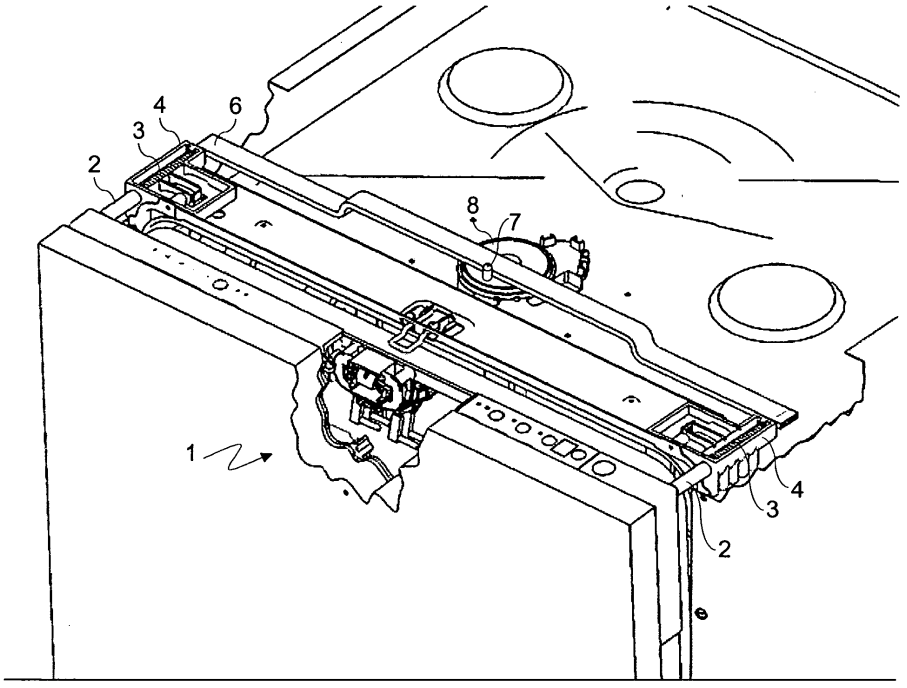

Fig.2

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Description

[0001] The present invention relates to dishwashers, and in particular to dishwasher provided with a device for the automatic opening of the door.

[0002] It is known that the opening of a dishwasher door can take place by means of different types of mechanism such as a lever lock, which requires the unlocking of a lever prior to opening the door, or a pull lock that only requires to pull the door with an adequate force in order to open it by overcoming the resistance of the pull lock. Furthermore, there are also dishwashers provided with devices for automatically opening the door thanks, for example, to an unlocking coil that acts on a lever system like in EP 1935313, or to a rack and pinion system that acts as a linear actuator like in EP 1733675.

[0003] The automatic door opening may be useful at the end of the wash cycle to show the user that the cycle is over, in particular in built-in dishwashers where the control/display panel is not visible when the door is closed, and also in some steps of the wash cycle to enhance the dishwasher performance, in particular in the drying step as disclosed in the above-mentioned application EP 1733675.

[0004] However, pior art automatic opening devices are quite complicated and consequently rather expensive and unreliable.

[0005] Therefore the obj ect of the present invention is to provide a dishwasher provided with an automatic door-opening device which overcomes the above-mentioned drawbacks. This obj ect is achieved by means of a pull lock dishwasher provided with an automatic door-opening device comprising an opening mechanism consisting of one or more pushers driven by relevant resilient members having a force sufficient to open the door, as well as a pushers control mechanism mobile between a retention position and a release position according to the commands received from the dishwasher control unit.

[0006] The main advantage of the dishwasher according to the present invention is therefore that of having an automatic door-opening device which is extremely simple and consequently reliable and inexpensive.

[0007] A further advantage of this dishwasher is that the operation of said device is very simple to be controlled by the control unit.

[0008] These and other advantages and characteristics of the dishwasher according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 is a front perspective view, with some parts removed, of a dishwasher provided with an automatic door-opening device according to the present invention, in the condition of closed door;

Fig.2 is a view similar to the preceding one with the open door at the end of the door opening by the automatic device; and

Fig.3 is a view similar to the preceding one with the open door and the opening mechanism returned to the retention position in order to allow to close the door.

[0009] Referring to Fig.1, there is seen that a dishwasher according to the present invention conventionally includes a bottom-hinged door that is kept closed by means of a pull lock 1.

[0010] The novel aspect of the present dishwasher is the door-opening device comprising a pair of pushers 2 located at the top corners of the door, perpendicularly thereto, and driven by a pair of coil springs 3 respectively arranged behind pushers 2 and compressed within suitable housings 4 secured on the dishwasher body.

[0011] Pushers 2 are slidably arranged in said housings 4 so as to project through the front side of the latter, and their movements are guided also by a pair of rods 5 that extend backwards from pushers 2 and are slidably arranged in housings 4 so as to project through the rear side of the latter. Springs 3 are slidably introduced on rods 5, which are connected through a horizontal crossbar 6 that assures a balanced operation of the opening mechanism.

[0012] Due to the push of springs 3 transmitted to crossbar 6 through pushers 2 and rods 5, the horizontal crossbar 6, in the retention position illustrated in Fig.1, is kept in contact with a vertical peg 7 of a horizontal rotating disk 8 that acts as a control mechanism operatively connected to the dishwasher control unit (not shown). In this condition, pushers 2 are retracted within housings 4 and they do not act on the door, which can be opened and closed manually.

[0013] The simple and effective operation of the automatic opening device of the dishwasher according to the present invention will be readily understood from the description given above.

[0014] As shown in Fig.2, when the dishwasher control unit activates the pushers control mechanism causing a first 180° rotation of disk 8, clockwise or counter-clockwise is irrelevant, the forward movement of peg 7 allows springs 3 to push the pushers 2 outside housings 4. Since springs 3 have a force greater than the force required to unlock the pull lock 1, the push of pushers 2 causes the opening of the door.

[0015] Disk 8 then completes its rotation by returning to the retention position illustrated in Fig.3 through a second 180° rotation, whereby the backwards movement of peg 7 causes, through crossbar 6 and rods 5, the retraction of pushers 2 within housings 4 so as to allow the door to be subsequently closed.

[0016] It should be noted that the two steps of the rotation of disk 8 could be separated by a time interval or they could be consecutive, i.e. disk 8 could perform a continuous complete rotation. Alternatively, disk 8 could return to the retention position by performing the second rotation in the direction opposite to the first rotation.

[0017] It is clear that the above-described and illustrat-

ed embodiment of the dishwasher according to the invention is just an example susceptible of various modifications. In particular, the exact shape and arrangement of the members could be changed according to specific manufacturing needs, e.g. by using a different number of pushers arranged at different positions (starting from a single pusher at a central position), or by using mechanical equivalents of the above-described members such as a different type of resilient members with respect to springs 3, a different type of actuator for the control mechanism with respect to disk 8 with peg 7 and so on, as long as the general structure of the automatic opening device with the resilient members opening mechanism combined with the mobile actuator control mechanism is retained.

Claims

1. Dishwasher with bottom-hinged door comprising a device for the automatic opening of said door, said device being controlled by a control unit of said dishwasher, **characterized in that** said door is kept closed by a pull lock (1) and **in that** the automatic opening device includes an opening mechanism that consists of one or more pushers (2) driven by resilient members having a force sufficient to overcome the resistance of said pull lock (1), as well as a control mechanism for said pushers (2) that is mobile between a retention position and a release position according to the commands received from said dishwasher control unit.

2. Dishwasher according to the preceding claim, **characterized in that** the opening mechanism includes a pair of pushers (2) located at the top corners of the door, perpendicularly thereto, and driven by a pair of coil springs (3) respectively arranged behind said pushers (2) and compressed within housings (4) secured on the dishwasher body, the pushers (2) being slidably arranged in said housings (4) so as to project through the front side of the latter.

3. Dishwasher according to the preceding claim, **characterized in that** a pair of rods (5) extend backwards from the pushers (2) and are slidably arranged in the housings (4) so as to project through the rear side of the latter, the coil springs (3) being slidably introduced on said rods (5).

4. Dishwasher according to the preceding claim, **characterized in that** the rods (5) are connected through a horizontal crossbar (6).

5. Dishwasher according to the preceding claim, **characterized in that** the horizontal crossbar (6) frontally rests against a vertical peg (7) of a horizontal rotating disk (8) that acts as a control mechanism operatively connected to the dishwasher control unit.

6. Dishwasher according to the preceding claim, **characterized in that** the disk (8) performs a first 180° rotation to take the control mechanism from the retention position to the release position, in which the springs (3) have pushed the pushers (2) outside the housings (4) so as to cause the opening of the door.

7. Dishwasher according to the preceding claim, **characterized in that** the disk (8) performs a second 180° rotation to take the control mechanism from the release position to the retention position, in which the rods (5) have retracted the pushers (2) within the housings (4) so as to allow the door to be closed.

8. Dishwasher according to the preceding claim, **characterized in that** the disk (8) performs the second 180° rotation in a continuos manner after the first 180° rotation and in the same direction.

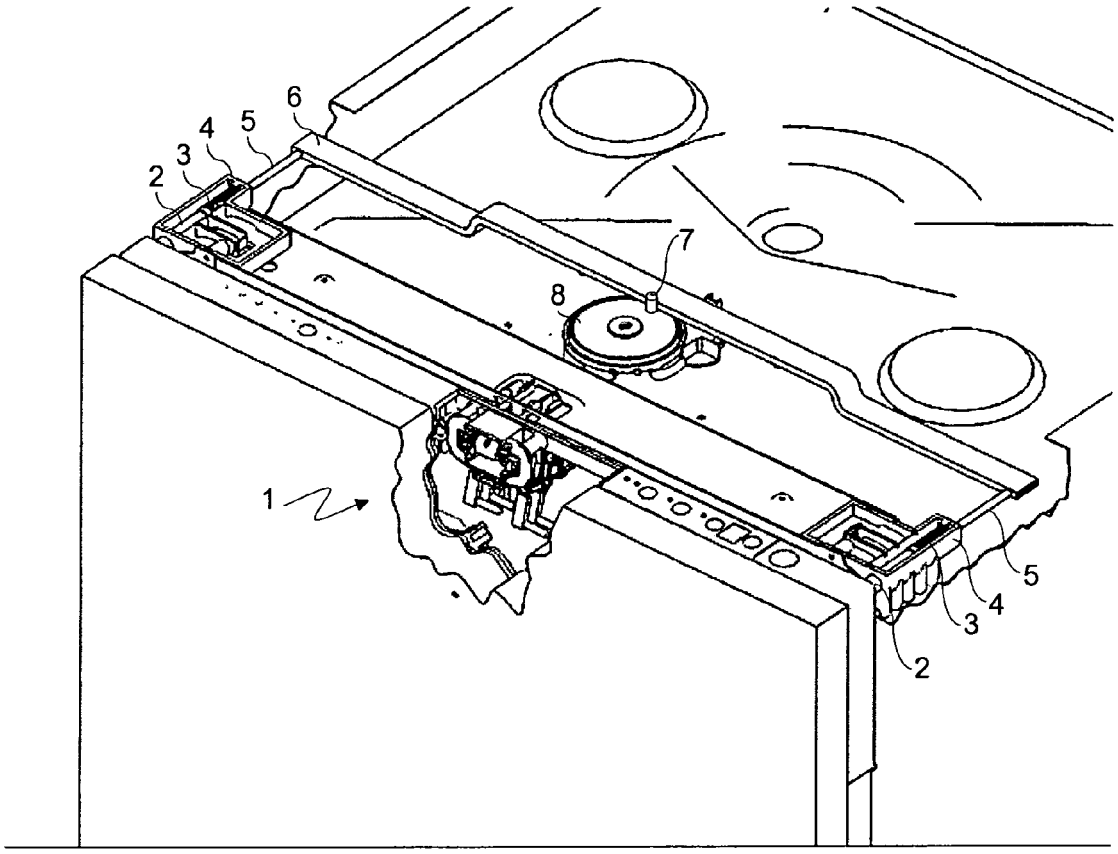

Fig.1

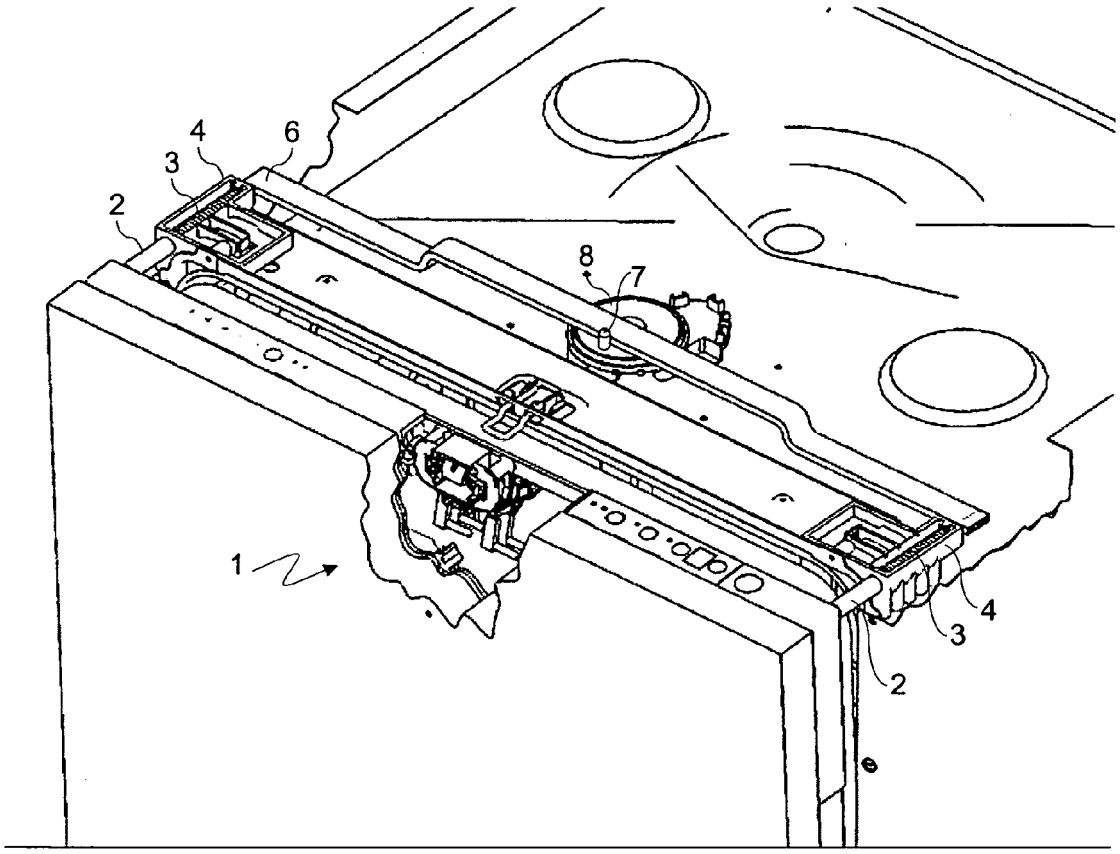

Fig.2

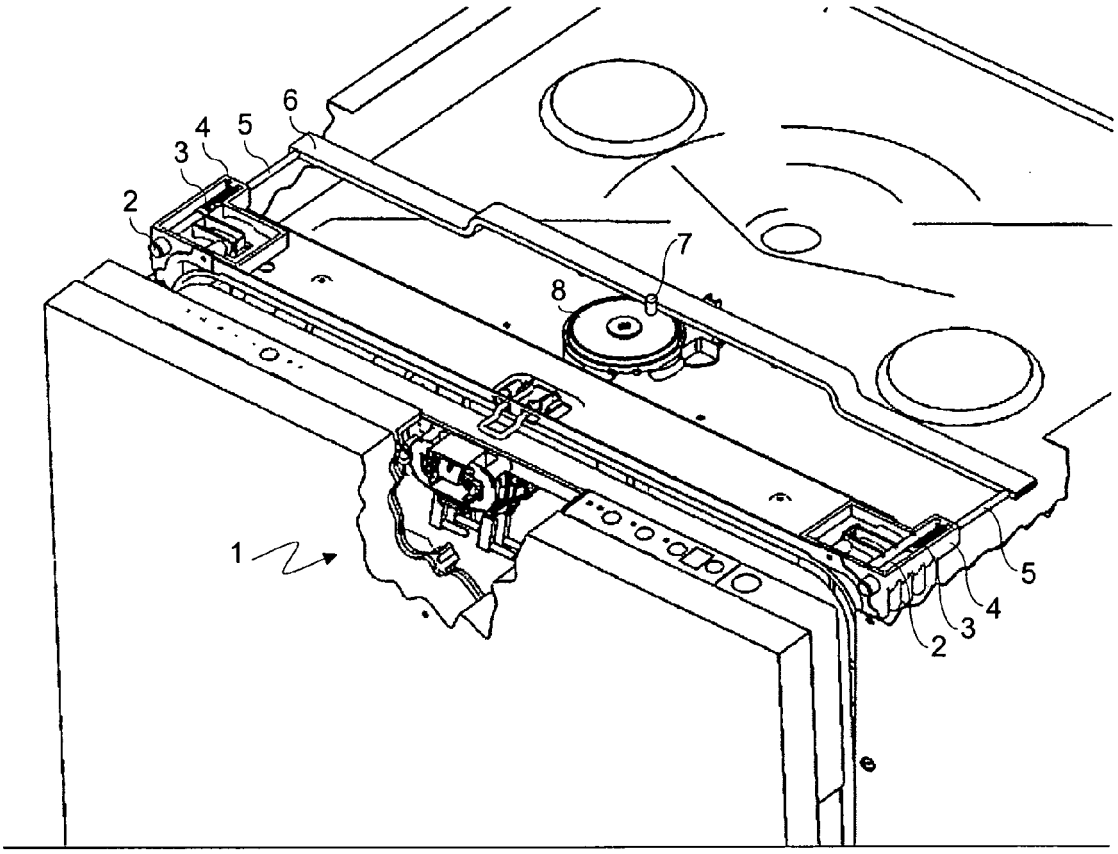

Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5016

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

A47L
D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 June 2009	Baumgärtner, Ruth

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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REFERENCES CITED IN THE DESCRIPTION

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- EP 1733675 A **[0002] [0003]**