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# (54) WASHING MACHINE

(57) Washing machine (100) including a machine body (10) provided with an opening (11) for putting clothes into the washing machine (100) and taking clothes out of the washing machine (100); a door cover (20) provided at a top of the machine body (10) to cover the opening (11), and including a frame strip (21) as a pivot shaft, the pivot shaft being provided with driving mounting parts (22) at right and left portions thereof, respectively; the washing machine (100) further includes a driving assembly (50) including a driving motor (30) and a bearing member, wherein the bearing member is mounted within the driving mounting parts (22) of the door cover (20) and is connected with the driving motor (30), and the driving assembly (50) is adapted to drive the door cover (20) to open around the frame strip (21) as the pivot shaft via the bearing member.

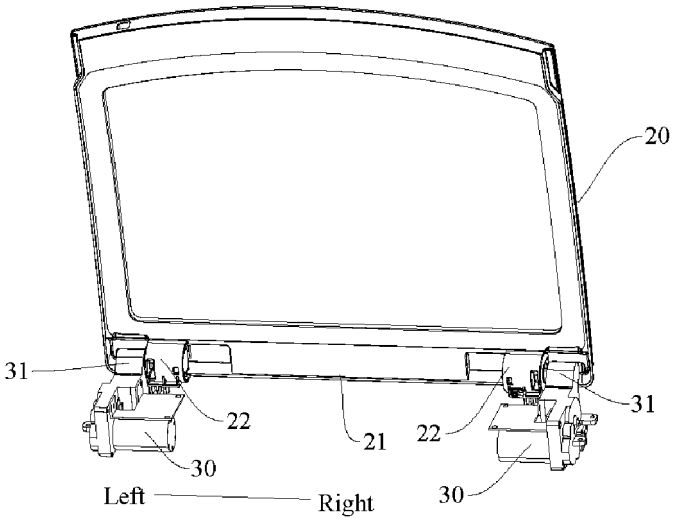


Fig. 4

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## Description

### FIELD

**[0001]** The present disclosure relates to a washing machine.

### BACKGROUND

**[0002]** For the first time, a simple electric door driven by a motor is provided by the present applicant in Chinese application No. 201520365984.3. Compared with manual door opening, electric door opening driven by the motor is an improvement which more meets the needs of the users.

**[0003]** In the simple electric door, a driving motor is mounted close to the center of the door or window and connected to a frame at a center of the door or window, output shaft of a motor is fitted into a groove of the frame at the center of the door or window, and a left and right dampers are respectively disposed at a left and right ends of the door or window. In this solution, it is difficult to make sure the output shaft of the motor, the left damper and the right damper to be coaxial, thus electric door opening has a poor effect, and is prone to appear a blocking phenomenon.

### SUMMARY

**[0004]** Embodiments of the present disclosure seek to solve at least one of the problems existing in the related art to at least some extent.

**[0005]** Accordingly, an object of the present disclosure is to provide a washing machine. The washing machine is provided with an improved electric door opening structure, which may at least to some extent improve the electric door opening effect and avoid a blocking phenomenon as door opening.

**[0006]** The washing machine according to the present disclosure includes: a machine body provide with an opening for putting clothes into the washing machine and taking clothes out of the washing machine; a door cover provided at a top of the machine body to cover the opening, and including a frame strip as a pivot shaft, the pivot shaft being provided with driving mounting parts at right and left portions thereof, respectively; a driving assembly including a driving motor and a bearing member, wherein the bearing member is mounted within the driving mounting part of the door cover and connected with the driving motor, and the driving assembly is adapted to drive the door cover to open around the frame strip as a the pivot shaft via the bearing member.

**[0007]** For the problem existing in a washing machine in the prior art that a left damper, a right damper and a motor of the washing machine can not to be ensured to be coaxial, the present disclosure makes sure the driving motor, the bearing member and the driving mounting part to be coaxial via connecting the driving motor and the bearing member, and fixing the bearing member within the driving mounting part, thus enabling the driving motor to drive the door cover to open more smoothly, and avoiding the blocking phenomenon.

**[0008]** In addition, the washing machine according to embodiments of the present disclosure may further have additional characteristics as follows:

In some embodiments of the present disclosure, the bearing member is a one-way bearing including an inner shaft part connected with the driving motor and an outer ring part fixedly mounted within the driving mounting part of the frame strip.

**[0009]** In some embodiments of the present disclosure, the driving assembly includes a first driving motor, a second driving motor, a first one-way bearing and a second one-way bearing, and the first driving motor and the first one-way bearing fitting with each other are positioned at a left rear corner of the top of the machine body, and the second driving motor and the second one-way bearing fitting with each other are positioned at a right rear corner of the top of the machine body.

**[0010]** In some embodiments of the present disclosure, the machine body includes a machine part and a worktable disposed on the machine part, the opening is formed in the worktable, the machine part is provided with a receptacle for accommodating the driving motor at a top thereof.

**[0011]** In some embodiments of the present disclosure, two ends of the driving mounting part along an axial direction are opened, the one-way bearing is accommodated within the driving mounting part, and the inner shaft part of the one-way bearing is configured to extend outwardly from an end of the driving mounting part.

**[0012]** In some embodiments of the present disclosure, the outer ring part of the one-way bearing is provided with a positioning step for positioning the driving mounting part.

**[0013]** In some embodiments of the present disclosure, the outer ring part of the one-way bearing is provided with an elastic projection for elastically pressing against an inner wall surface of the driving mounting part.

**[0014]** In some embodiments of the present disclosure, the driving motor is provided with a driving shaft hole, and the inner shaft part is at least partially inserted into the driving shaft hole.

**[0015]** In some embodiments of the present disclosure, the driving motor is provided with an upwardly-extending ear, and the driving shaft hole is formed within the ear.

**[0016]** In some embodiments of the present disclosure, the ear is configured to abut against an end surface of the driving mounting part.

**[0017]** In some embodiments of the present disclosure, the driving motor is a speed reducer.

**[0018]** Additional aspects and advantages of embodiments of present disclosure will be given in part in the

following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present disclosure.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0019]** These and other aspects and advantages of embodiments of the present disclosure will become apparent and more readily appreciated from the following descriptions made with reference to the drawings, in which:

Fig. 1 is a schematic view of a washing machine according to an embodiment of the present disclosure, in which an opening is closed by a door cover;
Fig. 2 is a perspective view of a washing machine according to an embodiment of the present disclosure, in which a door cover closes an opening;
Fig. 3 is a perspective view of a washing machine according to an embodiment of the present disclosure, in which a door cover is opened to expose the opening;
Fig. 4 is a schematic assembly view of a door cover, a driving motor and a bearing member of a washing machine according to an embodiment of the present disclosure;
Fig. 5 is an exploded view of a door cover, a driving motor and a bearing member of a washing machine according to an embodiment of the present disclosure; and
Fig. 6 is a schematic view of a driving motor and a bearing member of a washing machine according to an embodiment of the present disclosure.

**[0020]** Reference signs:

washing machine 100; opening 11; machine part 12; worktable 13; door cover 20; frame strip 21; driving mounting part 22; driving motor 30; ear 31; one-way bearing 40; inner shaft part 41; outer ring part 42; positioning step 43; elastic projection 44; driving assembly 50

## DETAILED DESCRIPTION

**[0021]** Reference will be made in detail to embodiments of the present disclosure. The embodiments described herein with reference to drawings are explanatory, illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions.

**[0022]** In the specification, it is to be understood that terms such as "central," "longitudinal," "lateral," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," "clockwise," and "counterclockwise" should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present disclosure be constructed or operated in a particular orientation. In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with "first" and "second" may comprise one or more of this feature. In the description of the present disclosure, "a plurality of" means two or more than two, unless specified otherwise.

**[0023]** In the present disclosure, unless specified or limited otherwise, the terms "mounted," "connected," "coupled," "fixed" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements, which can be understood by those skilled in the art according to specific situations.

**[0024]** In the present disclosure, unless specified or limited otherwise, a structure in which a first feature is "on" or "below" a second feature may include an embodiment in which the first feature is in direct contact with the second feature, and may also include an embodiment in which the first feature and the second feature are not in direct contact with each other, but are contacted via an additional feature formed therebetween. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right or obliquely "on," "above," or "on top of" the second feature, or just means that the first feature is at a height higher than that of the second feature; while a first feature "below," "under," or "on bottom of" a second feature may include an embodiment in which the first feature is right or obliquely "below," "under," or "on bottom of" the second feature, or just means that the first feature is at a height lower than that of the second feature.

**[0025]** A washing machine 100 according to embodiments of the present disclosure will be described below with reference to Fig. 1 to Fig. 6.

**[0026]** The washing machine 100 according to embodiments of the present disclosure may include: a machine body 10, a door cover 20 and a driving assembly 50. As shown in Fig. 3, the machine body 10 is provide with an opening 11 for putting clothes into the washing machine and taking clothes out of the washing machine, the door cover 20 is provided at a top of the machine body 10 to cover the opening 11, and including a frame strip 21 as a pivot shaft, the pivot shaft is provided with driving mounting parts 22 at right and left portions thereof, respectively. When the washing machine 100 is not working, the door cover 20 covers the opening 11 for preventing a foreign matter from entering an inside of the washing

machine 100, thus at least protecting the washing machine 100 to some extent. When the washing machine 100 is working, the door cover 20 covers the opening 11 for ensuring the washing machine 100 to work regular. When the door cover 20 is opened to expose the opening 11, user can put clothes into the washing machine to wash, or take out the clothes after being washed to dry.

**[0027]** As shown in Fig. 4 and Fig. 5, the driving assembly 50 includes a driving motor 30 and a bearing member, and drives the door cover 20 to open around the pivot shaft of the door cover 20 via the bearing member, the driving assembly 50 are mounted respectively to the mounting part 22 at right and left portions of the frame strip 21 (in specific, it could be that the bearing member is mounted within the mounting part 22). It should be appreciated that, the driving motor 30 can drive the bearing member movement when it works, as the bearing member is mounted within the mounting part 22, the door cover 20 and the bearing member move synchronously, that is, the driving motor 30 can make the door cover 20 to open to expose the opening 11 via driving the bearing member. As shown in Fig. 3 to Fig. 5, the mounting part 22 is disposed to the frame strip 21 at a rear end of the door cover 20, thus making the door cover 20 rotate with the frame strip 21 at the rear end of the door cover 20 as the pivot shaft. As shown in Fig. 3 to Fig. 5, the mounting part 22 is disposed to a rear part of the door cover (that is, a rear frame strip), thus making the door cover 20 rotate with the rear frame strip as the pivot shaft. Through making the bearing member to be connected with the driving motor 30 and fixed within the mounting part 22, thus ensuring the driving motor 30, the bearing member and the mounting part 22 to be coaxial, making the driving motor 30 to drive the door cover 20 to open more smoothly, and avoiding a blocking phenomenon. Alternatively, the driving motor 30 can be a speed reducer. Through disposing the driving assembly 50 at right and left portions of the frame strip 21, thereby enabling the door cover 20 to rotate stable relative to the machine body 10, further enabling the door cover 20 to reliably open and close the opening 11, and improving the performance of the washing machine 100. Moreover, the door cover 20 can be driven by a stronger driving force by disposing the driving assembly 50 at right and left portions of the frame strip 21.

**[0028]** When the door cover 20 closes the opening 11, the driving motor 30 can drive the door cover 20 to rotate around the frame strip 21 to close the opening 11 via the bearing member. It should be understood that, at this time, a rotation direction of the driving motor 30 is opposite to a rotation direction of the driving motor 30 opening door cover 20. In some embodiments, the machine body 10 of the washing machine 100 may be provided with a control button for opening or closing the door cover 20. The control button may be connected with the driving motor 30, and the user only needs to press the control button to realize the motion of opening or closing the door cover 20, thus further improving an automation degree of the washing machine 100 and user experience.

**[0029]** During closing the door cover, the washing machine 100 may accelerate to complete the closing process of the door cover 22 via further depressed by the human, as specifically described in the following.

**[0030]** Accordingly, the washing machine 100 according to embodiments of the present disclosure can automatically open the door cover 20 via the driving assembly 50 to realize a function of electric door opening, thus improving the automation degree of the washing machine 100 and user experience. Moreover, the bearing member is connected with the driving motor 30 and fixed within the mounting part 22, thus ensuring the driving motor 30, the bearing member and the mounting part 22 to be coaxial, making the driving motor 30 to drive the door cover 20 to open more smoothly, and avoiding the blocking phenomenon.

**[0031]** In some preferred embodiments of the present disclosure, as shown in Fig. 6, the bearing member is a one-way bearing 40 including an inner shaft part 41 connected with the driving motor 30 and an outer ring part 42 fixedly mounted within the mounting part 22 of the frame strip 21. When the driving motor 30 drives the one-way bearing 40 to open the door cover 20, the inner shaft part 41 and the outer ring part 42 move in the same direction, so that the outer ring part 42 may drive the door cover 20 to rotate around the frame strip 21, so as to enable the door cover 20 to open the opening 11. When the driving motor 30 drives the bearing member to close the door cover 20, the driving motor 30 drives the inner shaft part 41 to rotate, and the door cover 20 associated with the outer ring part 42 moves downwardly under the effect of its own gravity to close the opening 11. The difference between the technical effect achieved using the one-way bearing in the electric door of the present disclosure and the technical effect achieved without using the one-way bearing in the related art will be described in detail as follows.

**[0032]** In the related art, when the door cover is only driven by the driving motor without any one-way bearing, if the driving motor is driven to rotate to a first direction, the door cover follows to rotate to the first direction and the first direction is set to be a direction of opening the door cover; if the driving motor is driven to rotate to a second direction, the door cover follows to rotate to the second direction and the second direction is set to be a direction of closing the door cover.

**[0033]** However, when the driving motor 30 according to embodiments of the present disclosure drives the door cover 20 via the one-way bearing 40, if the driving motor 30 is driven to rotate to the first direction, the door cover 20 follows to rotate to the first direction and the first direction is set to be a direction of opening the door cover; if the driving motor 30 is driven to rotate to the second direction, the one-way bearing 40 and the inner shaft part 41 connected to the driving motor 30 rotate to the second direction, the one-way bearing 40 and the outer ring part 42 connected to the door cover 20 will not rotate if the

door cover 20 is not mounted. However, as the door cover 20 is mounted to the outer ring part 42, then the outer ring part 42 follows the inner shaft part 41 to rotate to the second direction under the gravity of the door cover 20, so that the door cover 20 connected to the outer ring part 42 falls down or becomes closed under the gravity of the door cover 20. If there is an obstacle such as human hand or foreign object during the closing process of the door cover 20, despite the inner shaft part 41 of the one-way bearing 40 rotates under the drive of the driving motor 30, the outer ring part 42 may stop rotating because of the effect of the one-way bearing 40, and thus the door cover 20 connected to the outer ring part 42 may stop falling or be stopped, which prevents the problem of the hand of the user being clamped by the door cover 20, thus improving use safety of the washing machine 100. Once the door cover 20 is no more obstructed by the hand or foreign object, it will continue to fall down under the gravity effect to complete the motion of closing the door cover. Therefore, the use of the one-way bearing 40 on the driving motor 30 can prevent the problem of clamping hands.

**[0034]** Obviously, during the closing process of the door cover 20, if human hand presses further, the door cover 20 will be closed faster under pressure.

**[0035]** It should be noted that, the one-way bearing 40 and the driving motor 30 are coupled to be used, which is used for the electric door of the washing machine for the first time, and solves the problem of hands being clamped by the electric door.

**[0036]** Alternatively, as shown in Fig. 4 and Fig. 5, the driving assembly 50 includes a first driving motor, a second driving motor, a first one-way bearing and a second one-way bearing, wherein the first driving motor and the first one-way bearing fitting with the first driving motor are positioned at a left rear corner of the top of the machine body 10, and the second driving motor and the second bearing member fitting with the second driving motor are positioned at a right rear corner of the top of the machine body 10, the first and the second driving motors synchronously drive the door cover 20 to open around the pivot shaft of the door cover 20 via the corresponding one-way bearings. Wherein as the first and the second driving motors synchronously drive the corresponding one-way bearings, thus enabling the door cover 20 to reliably rotate around the frame strip 21, and improving the performance of the washing machine 100.

**[0037]** Alternatively, as shown in Fig. 3, the machine body 10 includes a machine part 12 and a worktable 13 disposed on the machine part 12, the opening 11 is formed in worktable 12, the machine part 12 is provided with a receptacle (not shown) for accommodating the driving motor 30 at a top thereof. The receptacle may recess toward an inside of the machine part 12. That is, the driving motor 30 is disposed in the machine body 10, and the problem of accommodating the driving motor 30 may be solved via providing the receptacle, thus enabling the driving motor 30 to be disposed reasonable. It should be noted that, the control button may be disposed at the worktable 13 to facilitate the operation of the user.

**[0038]** In some specific embodiments of the present disclosure, as shown in Fig. 4 and Fig. 5, two ends of the mounting part 22 along an axial direction are opened, the one-way bearing 40 is accommodated within the mounting part 22, and the inner shaft part 41 of one-way bearing 40 extends outwardly from an end of the mounting part 22. By accommodating the entire one-way bearing 40 within the mounting part 22, it is possible to improve the reliability of mounting the one-way bearing 40 to the door cover 20. A portion of the inner shaft part 41 extending outwardly from an end of the mounting part 22 may be connected to the driving motor 30.

**[0039]** Alternatively, as shown in Fig. 6, the outer ring part 42 of the one-way bearing 40 may be provided with a positioning step 43 for positioning the mounting part 22 and an elastic projection 44 for elastically pressing against an inner wall surface of the mounting part 22. By providing the positioning step 43 and the elastic projection 44, the one-way bearing 40 may be detachably mounted in the mounting part 22, so as to facilitate the mounting and dismounting the one-way bearing 40, and to maintain and replace the one-way bearing 40 in the later period. Moreover, by providing the elastic projection 44, the mounting difficulty of mounting the one-way bearing 40 into the mounting part 22 may be reduced, and the mounting stability of the one-way bearing 40 in the mounting part 22 may be improved. Specifically, the positioning step 43 and the elastic projection 44 can be spaced apart in an axial direction of the outer ring part 42 (that is, a left-right direction shown in Fig. 6), in which each mounting part 22 is provided with a first groove engaged with the positioning step 43 and a second groove engaged with the elastic projection 44.

**[0040]** Alternatively, the driving motor 30 is provided with a driving shaft hole (not shown), and the inner shaft part 41 is at least partially inserted into the driving shaft hole. The driving motor 30 is provided with an upwardly-extending ear 31, and the driving shaft hole is formed within the ear 31. That is, the inner shaft part 41 is extended into the ear 31 to fit with the driving shaft hole, so that the driving motor 30 is connected to the inner shaft part 41. As shown in Fig. 4, the ear 31 can be abutted against an end surface of the mounting part 22. Specifically, the ear 31 can be attached against an end surface of the mounting part 22 from which a portion of the inner shaft part 41 extends out, and by abutting the ear 31 against the end surface of the end of the mounting part 22, the driving motor 30 may fit with the one-way bearing 40 steadily, and the structure may be compact, which may further save space and improve the space utilization efficiency of the washing machine 100.

**[0041]** Reference throughout this specification to "an embodiment," "some embodiments," "one embodiment", "another example," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connec-

tion with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases such as "in some embodiments," "in one embodiment", "in an embodiment", "in another example," "in an example," "in a specific example," or "in some examples," in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

**[0042]** Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

## Claims

**1.** A washing machine, comprising:

a machine body provided with an opening for putting clothes into the washing machine and taking clothes out of the washing machine;
a door cover provided at a top of the machine body to cover the opening, and including a frame strip as a pivot shaft, the pivot shaft being provided with driving mounting parts at right and left portions thereof, respectively;
a driving assembly including a driving motor and a bearing member, wherein the bearing member is mounted within the driving mounting part of the door cover and connected with the driving motor, and the driving assembly is adapted to drive the door cover to open around the frame strip as the pivot shaft via the bearing member.

**2.** The washing machine according to claim 1, wherein the bearing member is a one-way bearing, said one-way bearing comprising an inner shaft part connected with the driving motor and an outer ring part fixedly mounted within the driving mounting part of the frame strip.

**3.** The washing machine according to claim 2, wherein the driving assembly includes a first driving motor, a second driving motor, a first one-way bearing and a second one-way bearing, and the first driving motor and the first one-way bearing fitting with each other are positioned at a left rear corner of the top of the machine body, and the second driving motor and the second one-way bearing fitting with each other are positioned at a right rear corner of the top of the machine body.

**4.** The washing machine according to claim 1, wherein the machine body comprises a machine part and a worktable disposed on the machine part, the opening is formed in the worktable, and the machine part is provided with a receptacle for accommodating the driving motor at a top thereof.

**5.** The washing machine according to claim 2, wherein two ends of the driving mounting part along an axial direction are opened, the one-way bearing is accommodated within the driving mounting part, and the inner shaft part of the one-way bearing is configured to extend outwardly from an end of the driving mounting part.

**6.** The washing machine according to claim 2, wherein the outer ring part of the one-way bearing is provided with a positioning step for positioning the driving mounting part.

**7.** The washing machine according to claim 2 or 6, wherein the outer ring part of the one-way bearing is provided with an elastic projection for elastically pressing against an inner wall surface of the driving mounting part.

**8.** The washing machine according to claim 2, wherein the driving motor is provided with a driving shaft hole, and the inner shaft part is at least partially inserted into the driving shaft hole.

**9.** The washing machine according to claim 8, wherein the driving motor is provided with an upwardly-extending ear, and the driving shaft hole is formed within the ear.

**10.** The washing machine according to claim 9, wherein the ear is configured to abut against an end surface of the driving mounting part.

**11.** The washing machine according to claim 1, wherein the driving motor is a speed reducer.

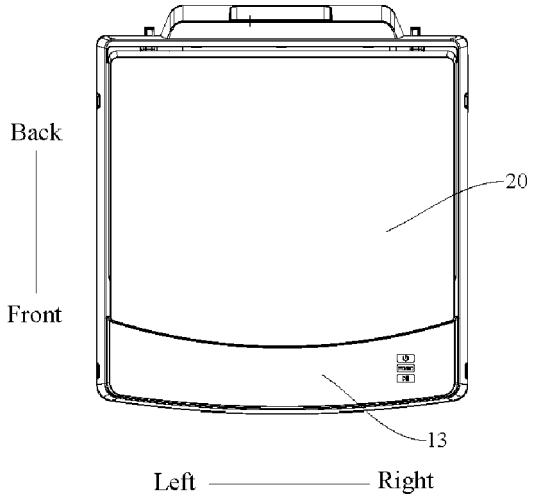
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Fig. 1

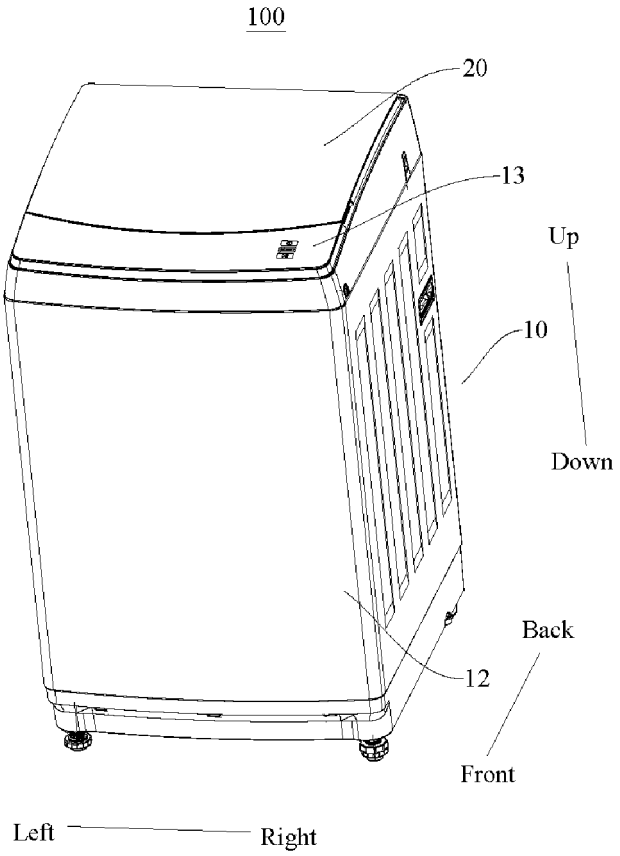
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Fig. 2

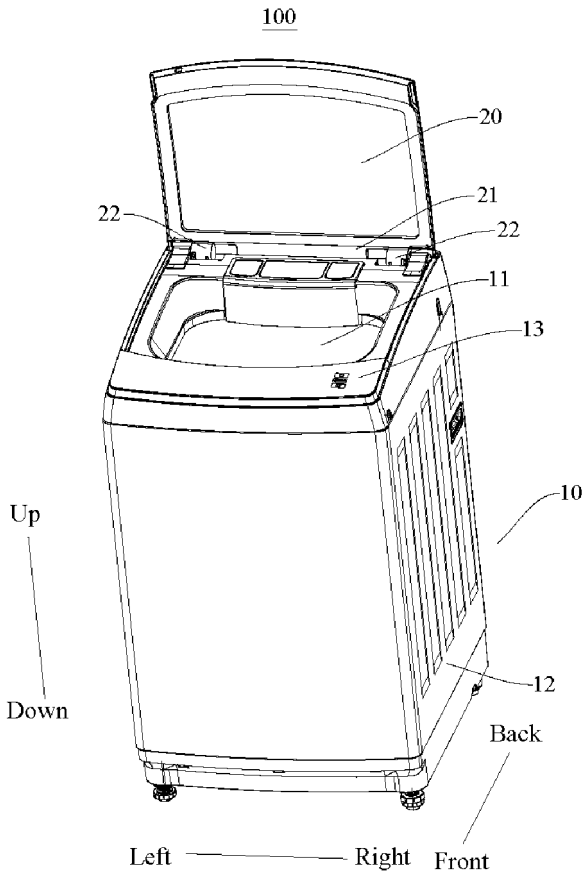


Fig. 3

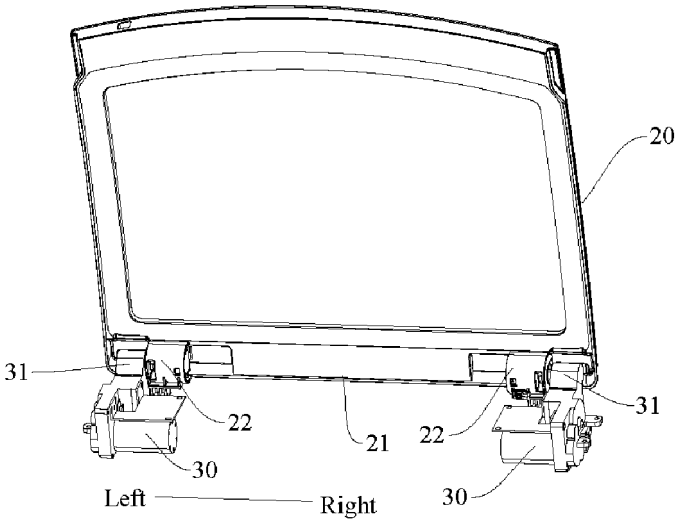
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Fig. 4

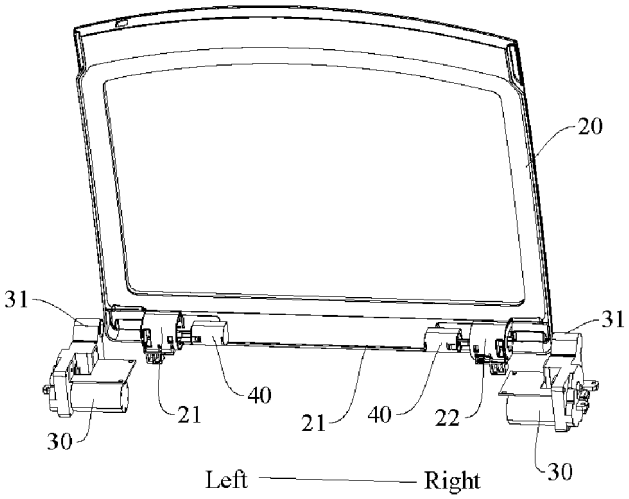
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Fig. 5

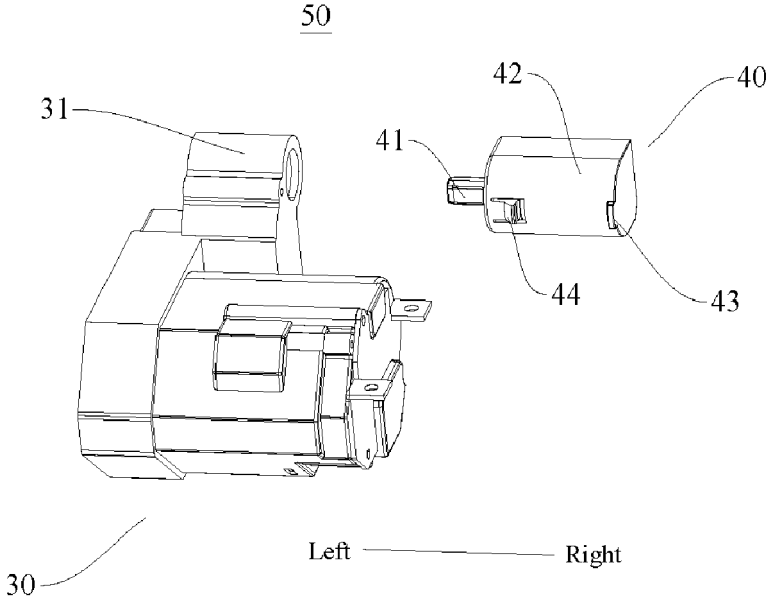


Fig. 6

Europäisches Patentamt
European Patent Office
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# EUROPEAN SEARCH REPORT

Application Number
EP 16 16 6617

## 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<br>Y | JP H06 86896 A (TOSHIBA CORP)<br>29 March 1994 (1994-03-29)<br>* paragraphs [0001], [0009] - [0012]; claims; figures * | 1-8,11<br>9,10 | INV.<br>D06F39/14<br><br>ADD.<br>D06F23/04 |
| Y<br>A | US 5 903 120 A (SHIN JEONG-SOO [KR])<br>11 May 1999 (1999-05-11)<br>* column 10, line 52 - column 11, line 7; claims; figures 13,14 * | 9,10<br>1-8,11 | |
| A | US 2011/062837 A1 (KIM DONGYOON [KR] ET AL) 17 March 2011 (2011-03-17)<br>* paragraphs [0002], [0003], [0016] - [0018], [0037] - [0075]; claims; figures * | 1-11 | |

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 18 October 2016 | Clivio, Eugenio |

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 16 6617

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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18-10-2016

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