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(54) **DRIVING MOTOR ASSEMBLY FOR ELECTRIC DOOR OF WASHING MACHINE**

(57) A driving motor assembly for an electric door of a washing machine is provided. The electric door includes a door body (20), and the driving motor assembly includes: a motor (33); and a reduction gearbox (32) having an anti-slip gear mechanism (50), the gear mechanism including a first ring gear (51), a second ring gear (52) and a plurality of anti-slip teeth (53) disposed in a common shaft, and the plurality of anti-slip teeth being coupled with the first ring gear rigidly, in which the second ring gear is associated with one of the motor and the door body, the first ring gear is associated with the other one of the motor and the door body, and the first ring gear is adapted to slip with respect to the second ring gear via the plurality of anti-slip teeth.

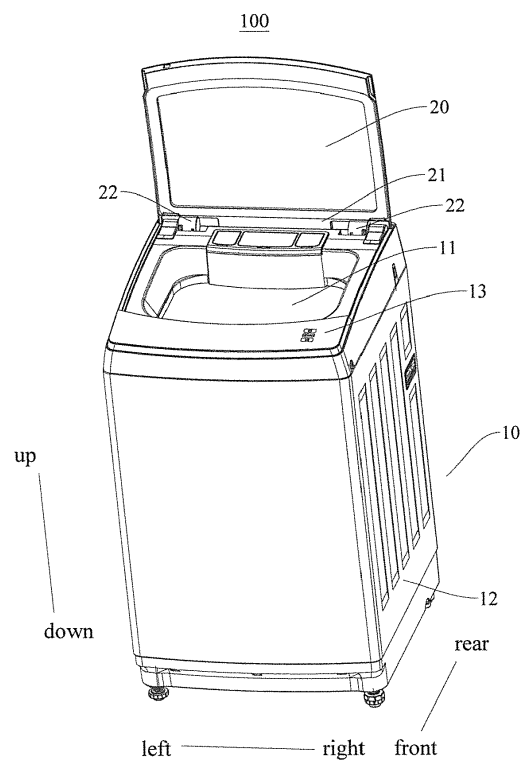


Fig. 3

Description

FIELD

[0001] Embodiments of the present invention generally relate to a field of a washing machine, and more particularly, to a driving motor assembly for an electric door of 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 relatively meets the needs of users.

[0003] In this simple electric door, the driving motor and a damper are respectively disposed in different positions at a door frame to perform a driving. In the electric door, a kind of condition occurs frequently, that is, in a process of electrically opening the door, the user closes the door downward suddenly, which often causes damage to the motor.

SUMMARY

[0004] Embodiments of the present invention 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 invention is to provide a driving motor assembly for an electric door of a washing machine, which is provided with an improved driving motor configuration so as to prevent a reverse incorrect operation for opening or closing an electric door from causing damage to the motor, in which the reverse incorrect operation for opening or closing a door body of the electric door occurs while a motor is driving the door body.

[0006] Embodiment of the present invention provides a driving motor assembly for an electric door of a washing machine, the electric door including a door body, wherein the driving motor assembly includes: a motor; and a reduction gearbox having an anti-slip gear mechanism, the gear mechanism including a first ring gear, a second ring gear and a plurality of anti-slip teeth disposed in a common shaft, and the plurality of anti-slip teeth being rigidly coupled with the first ring gear, in which the second ring gear is associated with one of the motor and the door body, the first ring gear is associated with the other one of the motor and the door body, and the first ring gear is adapted to slip with respect to the second ring gear via the plurality of anti-slip teeth.

[0007] With the driving motor assembly for the electric door of the washing machine according to embodiments of the present invention, by providing the anti-slip gear mechanism in the reduction gearbox, the first ring gear and the second ring gear can slip with respect to each

other, so that the motor is prevented from being damaged, usage safety of the motor is improved, a working life of the motor is lengthened and usability of the washing machine provided with the motor is enhanced.

[0008] In some embodiments, the plurality of anti-slip teeth is spaced apart from each other, and each of the plurality of anti-slip teeth has an elastic head adapted to extend from the common shaft to abut against an inner wall surface of the second ring gear.

[0009] In some embodiments, the plurality of anti-slip teeth is integrally molded with the first ring gear.

[0010] In some embodiments, the second ring gear of the anti-slip gear mechanism is connected with the motor and the first ring gear of the anti-slip gear mechanism is associated with the door body.

[0011] In some embodiments, a radius of the first ring gear is less than a radius of the second ring gear.

[0012] In some embodiments, the motor and the reduction gearbox are disposed in a same side.

[0013] In some embodiments, an output hole is provided in the driving motor assembly.

[0014] In some embodiments, the output hole of the driving motor assembly is connected with the door body via a one-way bearing.

[0015] Additional aspects and advantages of embodiments of present invention 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 invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] These and other aspects and advantages of embodiments of the present invention will become apparent and more readily appreciated from the following descriptions made with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view of a washing machine according to an embodiment of the present invention, in which a port is closed by a door body;

Fig. 2 is a perspective view of a washing machine according to an embodiment of the present invention, in which a door body closes a port;

Fig. 3 is a perspective view of a washing machine according to an embodiment of the present invention, in which a door body is opened to expose a port;

Fig. 4 is a schematic assembly view of a door body, a driving motor assembly and a one-way bearing of a washing machine according to an embodiment of the present invention;

Fig. 5 is an exploded view of a door body, a driving motor assembly and a one-way bearing of a washing machine according to an embodiment of the present

invention;

Fig. 6 is a schematic view of a driving motor assembly and a one-way bearing of a washing machine according to an embodiment of the present invention;

Fig. 7 is a perspective view of an anti-slip gear mechanism of a driving motor assembly for an electric door of a washing machine according to an embodiment of the present invention; and

Fig. 8 is a front view of an anti-slip gear mechanism of a driving motor assembly for an electric door of a washing machine according to an embodiment of the present invention.

[0017] Reference numerals:

Washing machine 100;
Cabinet 10; port 11; cabinet body 12; worktable 13;
Door body 20; frame 21 of door body 10; bearing
mounting portion 22;
Driving motor assembly 30; ear 31; reduction gear-
box 32; motor 33; output hole 34; One-way bearing
40; inner shaft portion 41; outer ring portion 42;
Anti-slip gear mechanism 50; first ring gear 51; sec-
ond ring gear 52; anti-slip tooth 53; elastic head 54;
groove 55.

DETAILED DESCRIPTION

[0018] Reference will be made in detail to embodiments of the present invention. The embodiments described herein with reference to drawings are explanatory, illustrative, and used to generally understand the present invention. The embodiments shall not be construed to limit the present invention. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions.

[0019] A washing machine 100 according to embodiments of the present invention will be described in the following with reference to Figs. 1 to 6.

[0020] The washing machine 100 according to embodiments of the present invention includes: a cabinet 10, a door body 20, a driving motor assembly 30 and a one-way bearing 40. As shown in Fig. 3, the cabinet 10 is provided with a port 11 for putting in and taking out laundry, the door body 20 is disposed at a top of the cabinet 10 and configured to close the port 11, and a bearing mounting portion 22 is provided at a frame 21 of the door body 20. As shown in Figs. 1 and 2, the door body 20 can close the port 11. When the washing machine 100 is working, the door body 20 closes the port 11 to ensure that the washing machine 100 works normally. Alternatively, when the washing machine 100 is not working, the door body 20 closes the port 11 to prevent foreign objects from entering into the interior of the washing machine

100 through the port 11, so as to protect the washing machine 100 to at least some extent. As shown in Fig. 3, the door body 20 can be opened to expose the port 11, after clothes have been washed by the washing machine 100, the door body 20 may be opened to expose the port 11, so as to take out the clothes for drying.

[0021] As shown in Figs. 4 and 5, the one-way bearing 40 has a first end fixedly mounted in a bearing mounting portion 22 at the door body 20 and a second end connected with the driving motor assembly 30, so that the driving motor 30 can drive the door body 20 to rotate around a portion of the frame 21 of the door body 20 via the one-way bearing 40 so as to open the door body 20, and thus a configuration in which the portion of the frame 21 of the door body 20 serves as a pivot is simple and is easy to operate. As shown in Figs. 3 to 5, the bearing mounting portion 22 is disposed at a rear portion of the frame 21 of the door body 20 (i.e., a rear frame bar of the frame 21), so that the door body 20 can rotate around the rear bar of the frame 21. By connecting the driving motor electric assembly 30 with the one-way bearing 40 and fixing the one-way bearing 40 at the bearing mounting portion 22, coaxiality of the driving motor assembly 30, the one-way bearing 40 and the bearing mounting portion 22 are ensured, so that the driving motor assembly 30 drives the door body 20 to open more smoothly, thus avoiding the door body 20 from getting stuck. Optionally, the driving electric assembly 30 may be a reduction motor assembly.

[0022] When the port 11 needs to be closed by the door body 20, the driving motor assembly 30 may drive the door body 20 to rotate around the portion of the frame 21 via the one-way bearing 40 so as to close the port 11.

[0023] In some embodiments, the cabinet 10 of the washing machine 100 may be provided with a control button for opening and closing the door body 20. The control button is connected with the driving motor assembly 30, and a user only needs to press the control button to realize a motion of opening or closing the door body 20, thus further improving an automation degree of the washing machine 100 and experiences of the user.

[0024] In some embodiments, as shown in Fig. 6, the one-way bearing 40 includes an inner shaft portion 41 connected to the driving motor assembly 30 and an outer ring portion 42 fixedly mounted within the bearing mounting portion 22 at the frame 21 of the door body 20.

[0025] In the related art, when the door body 20 is only driven by the driving motor assembly 30 without any one-way bearing 40, if the driving motor assembly 30 is driven to rotate in a first direction, the door body 20 also rotates in the first direction, in which the first direction is set to be a direction of opening the door body 20; if the driving motor assembly 30 is driven to rotate in a second direction, the door body 20 also rotates in the second direction, in which the second direction is set to be a direction of closing the door body 20.

[0026] However, when the driving motor assembly 30 according to embodiments of the present invention drives

the door body 20 via the one-way bearing 40, if the driving motor assembly 30 is driven to rotate in a first direction, the door body 20 rotates in the first direction, in which the first direction is set to be a direction of opening the door body 20; if the driving motor assembly 30 is driven to rotate in a second direction, the inner shaft portion 41 of the one-way bearing 40 connected to the driving motor assembly 30 rotates in the second direction, and the outer ring portion 42 of the one-way bearing 40 connected to the door body 20 will not rotate if the door body 20 is not mounted. However, the door body 20 is mounted to the outer ring portion 42 herein, under the gravity of the door body 20, the outer ring portion 42 rotates in the second direction following the inner shaft portion 41, so that the door body 20 coupled to the outer ring portion 42 falls down or becomes closed under its own gravity.

[0027] Optionally, as shown in Figs. 4 and 5, only one driving motor assembly 30 and one one-way bearing 40 are provided in a left and rear corner or a right and rear corner at a top of the cabinet 10. As shown in Fig. 4, both the driving motor assembly 30 and the one-way bearing 40 are disposed in the left and rear corner at the top of the cabinet 10. In an embodiment of the present invention, by providing only one driving motor assembly 30 and one one-way bearing 40, an automatic opening of the door body 20 of the washing machine 100 can be achieved, so that the washing machine 100 has a simple configuration and a low cost.

[0028] Optionally, as shown in Fig. 3, the cabinet 10 includes a cabinet body 12 and a worktable disposed on the cabinet body 12. The port 11 for taking out and putting in laundry is provided in the worktable 13, and a receiving space 14 configured to receive the driving motor assembly 30 is provided at a top of the cabinet body 12. The receiving space 14 may be depressed towards an inner side of the cabinet body 12, i.e., the driving motor assembly 30 may be disposed in the cabinet 10. By providing the receiving space 14, a problem of placing the driving motor assembly 30 is solved, so that the driving motor assembly 30 can be disposed in the cabinet 10 reasonably. It should be noted that the control button may be disposed at the worktable 13 for convenient operations of the user.

[0029] In some specific embodiments of the present invention, as shown in Figs. 4 and 5, two axial ends of the bearing mounting portion 22 are opened respectively, the one-way bearing 40 is received in the bearing mounting portion 22 completely, and the inner shaft portion 41 of the one-way bearing 40 extends out of an end of the bearing mounting portion 22. Since the one-way bearing 40 is received in the bearing mounting portion 22 completely, the one-way bearing 40 can be mounted at the door body 20 stably and reliably. The inner shaft portion 41 extends out of the bearing mounting portion 22 and is connected with the driving motor assembly 30.

[0030] Preferably, an output hole 34 may be provided in the driving motor assembly 30. The output hole 34 of the driving motor assembly 30 may be connected with

the door body 20 via the one-way bearing 40. In a preferred embodiment of the present invention, the driving motor assembly 30 may be provided with an ear 31 extending upward, and the output hole 34 may be provided in the ear 31. That is, the inner shaft portion 41 extends an interior of the ear 31 to be fitted with the output hole 34, so that the driving motor assembly 30 is connected with the inner shaft portion 41 of the one-way bearing 40. As shown in Fig. 4, the ear 31 is attached to an end surface of an end of the bearing mounting portion 22 at the door body 20. Specifically, the ear 31 may be attached to the end surface of the end of the bearing mounting portion 22, at which end, the inner shaft portion 41 extends out of the bearing mounting portion 22. By attaching the ear 31 to the end surface of the end of the bearing mounting portion 22, the driving motor assembly 30 is fitted with the one-way bearing 40 stably, so that a compact configuration is provided, the space is further saved and a space utilization of the washing machine 100 is improved.

[0031] The driving motor assembly 30 for the electric door of the washing machine according to embodiments of the present invention will be described in the following with reference to Figs. 6 to 8.

[0032] As shown in Fig. 6, the driving motor assembly 30 for the electric door of the washing machine according to embodiments of the present invention may include a motor 33 and a reduction gearbox 32. As shown in Fig. 7 and 8, the reduction gearbox 32 has an anti-slip gear mechanism 50 and the anti-slip gear mechanism 50 includes a first ring gear 51, a second ring gear 52 and a plurality of anti-slip teeth 53. The first ring gear 51, the second ring gear 52 and the plurality of anti-slip teeth 53 are disposed in a common shaft, and the plurality of anti-slip teeth 53 is rigidly coupled with the first ring gear 51. The second ring gear 52 is associated with one of the motor 33 and the door body 20, the first ring gear 51 is associated with the other one of the motor 33 and the door body 20, and the first ring gear 51 is adapted to slip with respect to the second ring gear 52 via the plurality of anti-slip teeth 53. In other words, the second ring gear 52 may be associated with the motor 33, or the second ring gear 52 may be associated with the door body 20, in which when the second ring gear 52 is associated with the door body 20, the first ring gear 51 is associated with the motor 33; when the second ring gear 52 is associated with the motor 33, the first ring gear 51 is associated with the door body 20. It should be noted that the anti-slip gear mechanism including the first ring gear 51, the second ring gear 52 and the plurality of anti-slip teeth 53 disposed in the common shaft is reliable and has a simple configuration and a stable transmission.

[0033] An operation principle of the driving motor assembly 30 for the electric door of the washing machine according to a preferred embodiment of the present invention will be described in the following, by an example in which the second ring gear 52 is associated with the motor 33 and the first ring gear 51 is associated with the

door body 20. Similar to above settings of opening and closing the door body 20 by the driving motor assembly 30 in the washing machine 100, the first direction is set to be direction of opening the door body 20 and the second direction is set to be the direction of closing the door body 20.

[0034] If the door body 20 is pressed downward (for example, in a misuse condition) while the motor 33 is driving the door body 20 to open, i.e., if the door body 20 is pressed downward when the motor 33 is driven to rotate in the first direction and the second ring gear 52 associated with the motor 33 rotates in the first direction, the first ring gear 51 associated with the door body 20, which is rotating in the first direction to open the door body 20, stops to rotate in a reverse direction (i.e., the second direction) under an effect of a sudden external force, and the plurality of anti-slip teeth 53, which is integrally and rigidly coupled with the first ring gear 51 and abuts against the second ring gear 52, is compressed and deformed, so that the plurality of anti-slip teeth 53 breaks away from the second ring gear 52 and thus the second ring gear 52 and the first ring gear 51 rotate in the opposite directions, thereby preventing the motor 33 from being damaged, enhancing the use safety of the motor 33, lengthening the working life of the motor 33 and improving the usability of the washing machine 100 provided with the motor 33. If the door body 20 is opened at a faster speed suddenly while the motor 33 is driving the door body 20 to open, the first ring gear 51 suddenly changes to rotating at the faster speed from rotating in a same speed with that of the second ring gear 52, so that the plurality of anti-slip teeth 53, which is integrally and rigidly coupled with the first ring gear 51 and abuts against the second ring gear 52, breaks away from the second ring gear 52, and thus the second ring gear 52 and the first ring gear 51 rotate at different speeds in the same direction, thereby preventing the motor 33 from being damaged, enhancing the use safety of the motor 33, lengthening the working life of the motor 33 and improving the usability of the washing machine 100 provided with the motor 33.

[0035] Likewise, when the motor 33 drives the door body 20 to close, conditions are the same as described above, and thus the motor 33 is also prevented from being damaged. With the motor assembly 30 for the electric door of the washing machine according to embodiments of the present invention, by providing the anti-slip gear mechanism 50 in the reduction gearbox 32, the second ring gear 52 and the first ring gear 51 can slip with respect to each other, so that the motor 33 is prevented from being damaged, the usage safety of the motor 33 is improved, the working life of the motor 33 is lengthened and the usability of the washing machine 100 provided with the motor 33 is enhanced.

[0036] In some embodiments, as shown in Figs. 7 and 8, the plurality of anti-slip teeth 53 may be spaced apart from each other. As shown in Figs. 7 and 8, the plurality of anti-slip teeth 53 is evenly spaced apart from each in

a circumferential direction of the first ring gear 51. Each of the plurality of anti-slip teeth 53 has an elastic head 54 adapted to extend from the common shaft to abut against an inner wall surface of the second ring gear 52. As shown in Figs. 7 and 8, a plurality of grooves 55 may be provided in the inner wall surface of the second ring gear 52 and spaced from each other in a circumferential direction of the second ring gear 52, and the elastic head 54 may be received in the groove 55. Without the external force (i.e., when the driving motor assembly 30 drives the door body 20 of the washing machine 100 to open and close), the motor 33 drives the second ring gear 52 to rotate. Since the plurality of anti-slip teeth 53 is rigidly coupled with the first ring gear 51 and received in the grooves 55, the first ring gear 51 may rotate together with the second ring gear 52 synchronously so as to drive the one-way bearing 40 to open and close the door body 20. With the external force, the elastic head 54 is deformed elastically to be extruded out of the groove 55, so that the elastic head 54 can be removed out of the groove 55. Without the limitation of the groove 55, the elastic head 54 returns to an original state and enters a next adjacent groove 55. Thus, when the external force is removed, the elastic head 54 still is in the groove 55, and the motor 33 still can drives the door body 20 to open and close via the anti-slip gear mechanism 50.

[0037] Optionally, the plurality of anti-slip teeth 53 may be integrally molded with the first ring gear 51. Thus, the structural stability of the plurality of anti-slip teeth 53 and the first ring gear 51 is great and the difficulty of mounting the plurality of anti-slip teeth 53 with the first ring gear 51 is reduced, so that the configuration of the anti-slip gear mechanism 50 is simple and stable.

[0038] Optionally, the motor 33 and the reduction gearbox 32 may be disposed in a same side, which further saves space, improves the space utilization of the washing machine 100 and facilitates mounting other parts of the washing machine 100.

[0039] Preferably, a radius of the first ring gear 51 is less than a radius of the second ring gear 52. Thus, it is convenient for the plurality of anti-slip teeth 53 to abut against an inner circumferential wall of the second ring gear 52. Moreover, since the first ring gear 51 is rigidly coupled with the plurality of anti-slip teeth 53, it is also convenient for the plurality of anti-slip teeth 53 to slip with respect to the inner circumferential wall of the second ring gear 52.

[0040] In the specification, unless specified or limited otherwise, relative terms such as "central", "longitudinal", "lateral", "front", "rear", "right", "left", "inner", "outer", "lower", "upper", "horizontal", "vertical", "above", "below", "up", "top", "bottom", "inner", "outer", "clockwise", "anti-clockwise" as well as derivative thereof (e.g., "horizontally", "downwardly", "upwardly", etc.) 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 oper-

ated in a particular orientation.

[0041] 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. Thus, features limited by "first" and "second" are intended to indicate or imply including one or more than one these features. In the description of the present disclosure, "a plurality of" relates to two or more than two.

[0042] In the description of the present disclosure, unless specified or limited otherwise, it should be noted that, terms "mounted," "connected" and "coupled" may be understood broadly, such as permanent connection or detachable connection, electronic connection or mechanical connection, direct connection or indirect connection via intermediary, inner communication or interaction between two elements. Those having ordinary skills in the art should understand the specific meanings in the present disclosure according to specific situations.

[0043] In the description of the present disclosure, a structure in which a first feature is "on" a second feature may include an embodiment in which the first feature directly contacts the second feature, and may also include an embodiment in which an additional feature is formed between the first feature and the second feature so that the first feature does not directly contact the second feature, unless otherwise specified. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right "on," "above," or "on top of" the second feature, and may also include an embodiment in which the first feature is not right "on," "above," or "on top of" the second feature, or just means that the first feature has a sea level elevation larger than the sea level elevation of the second feature. While first feature "beneath," "below," or "on bottom of" a second feature may include an embodiment in which the first feature is right "beneath," "below," or "on bottom of" the second feature, and may also include an embodiment in which the first feature is not right "beneath," "below," or "on bottom of" the second feature, or just means that the first feature has a sea level elevation smaller than the sea level elevation of the second feature.

[0044] 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 connection with the embodiment or example is included in at least one embodiment or example of the present invention. 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 invention. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodi-

ments or examples.

[0045] 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 invention, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present invention.

Claims

1. A driving motor assembly (30) for an electric door of a washing machine (100), the electric door comprising a door body (20), wherein the driving motor assembly (30) comprises:

a motor (33); and
a reduction gearbox (32) having an anti-slip gear mechanism (50), the gear mechanism comprising a first ring gear (51), a second ring gear (52) and a plurality of anti-slip teeth (53) disposed in a common shaft, and the plurality of anti-slip teeth (53) being rigidly coupled with the first ring gear (51),

wherein the second ring gear (52) is associated with one of the motor (33) and the door body (20), the first ring gear (51) is associated with the other one of the motor (33) and the door body (20), and the first ring gear (51) is adapted to slip with respect to the second ring gear (52) via the plurality of anti-slip teeth (53).

2. The driving motor assembly (30) according to claim 1, wherein the plurality of anti-slip teeth (53) is spaced apart from each other, and each of the plurality of anti-slip teeth (53) has an elastic head (54) adapted to extend from the common shaft to abut against an inner wall surface of the second ring gear (52).
3. The driving motor assembly (30) according to claim 1 or 2, wherein the plurality of anti-slip teeth (53) is integrally molded with the first ring gear (51).
4. The driving motor assembly (30) according to one of claims 1 to 3, wherein the second ring gear (52) of the anti-slip gear mechanism (50) is connected with the motor (33) and the first ring gear (51) of the anti-slip gear mechanism (50) is associated with the door body (20).
5. The driving motor assembly (30) according to one of claims 1 to 4, wherein a radius of the first ring gear (51) is less than a radius of the second ring gear (52).
6. The driving motor assembly (30) according to one

of claims 1 to 5, wherein the motor (33) and the reduction gearbox (32) are disposed in a same side.

7. The driving motor assembly (30) according to claim 6, wherein an output hole (34) is provided in the driving motor assembly (30). 5
8. The driving motor assembly (30) according to claim 7, wherein the output hole (34) of the driving motor assembly (30) is connected with the door body (20) via a one-way bearing (40). 10

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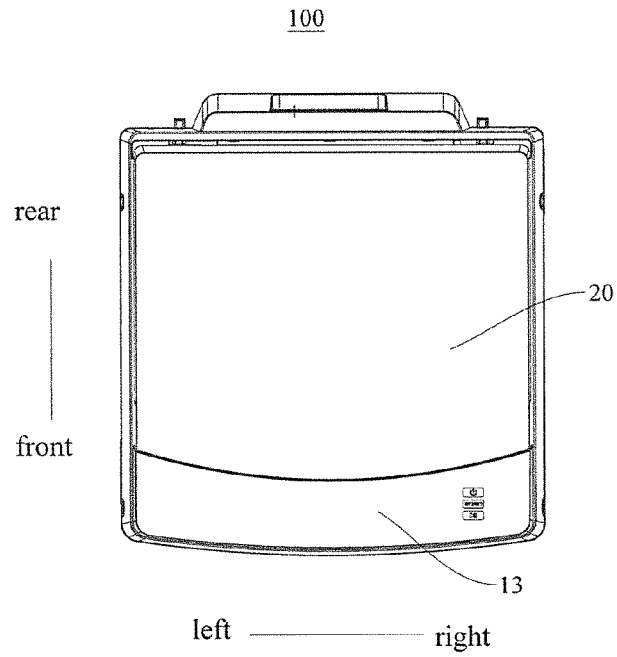


Fig. 1

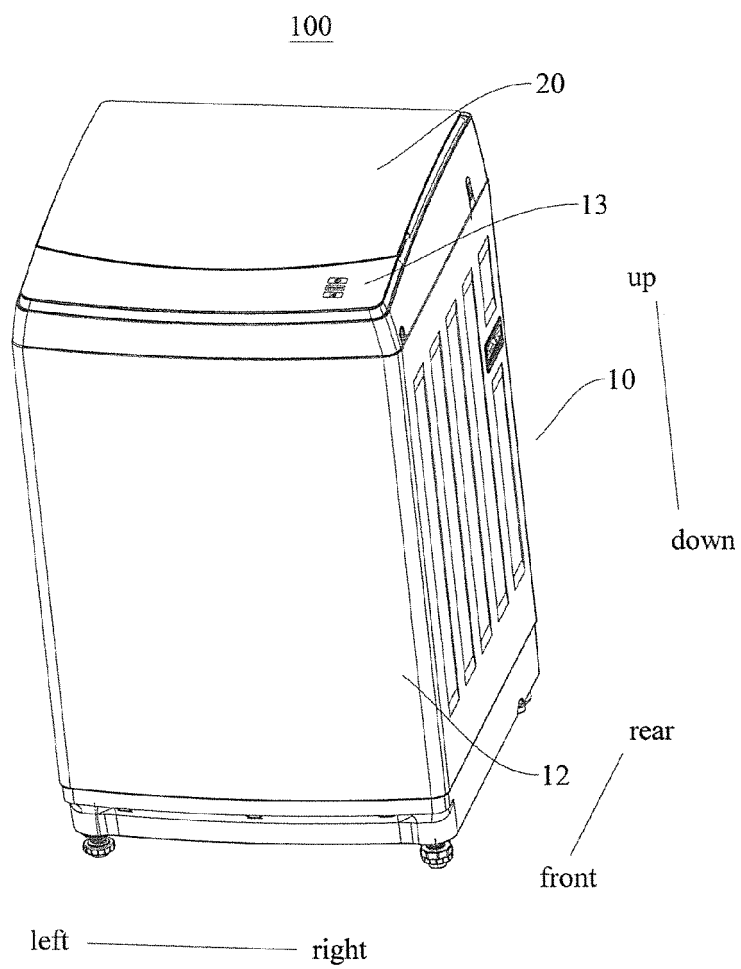


Fig. 2

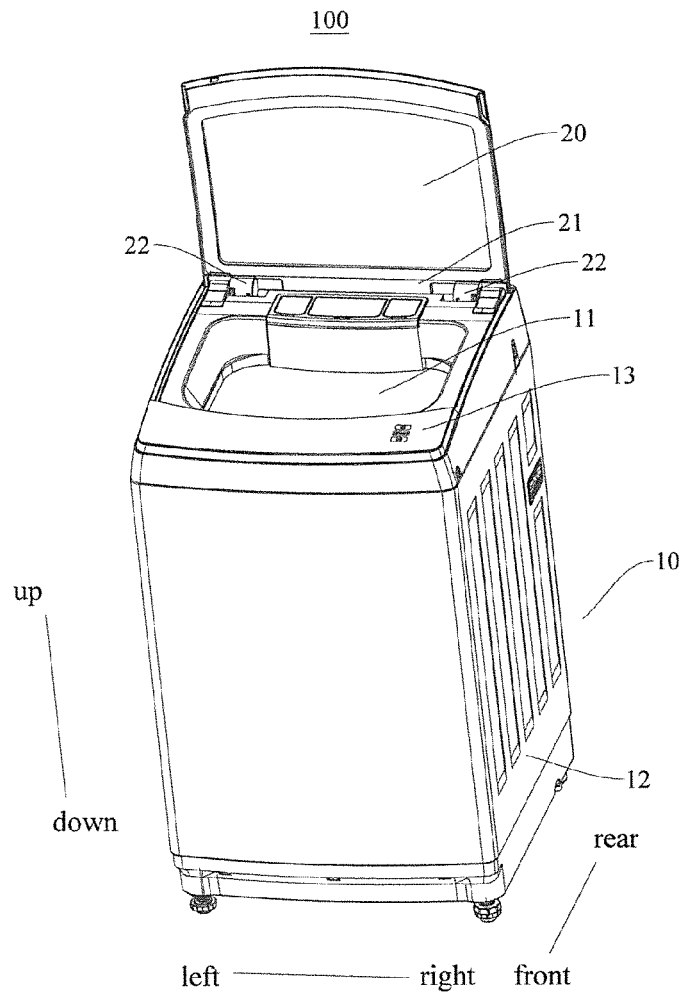


Fig. 3

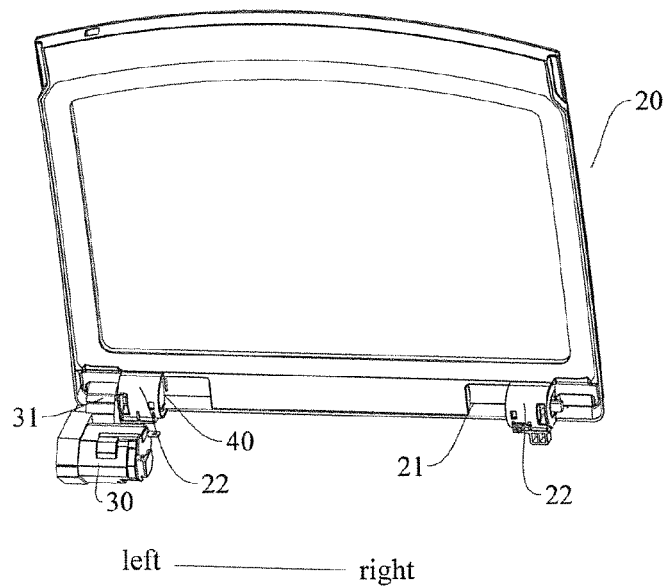


Fig. 4

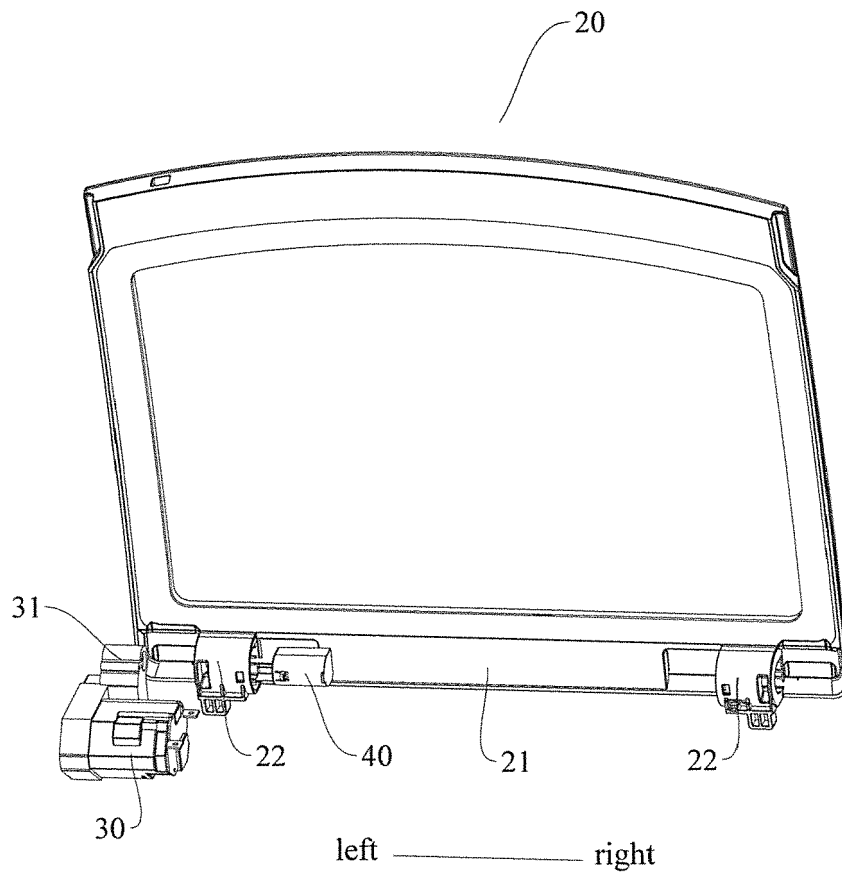


Fig. 5

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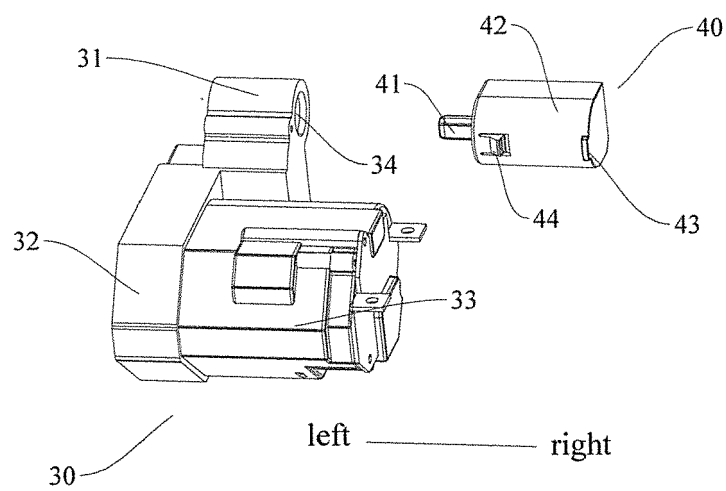


Fig. 6

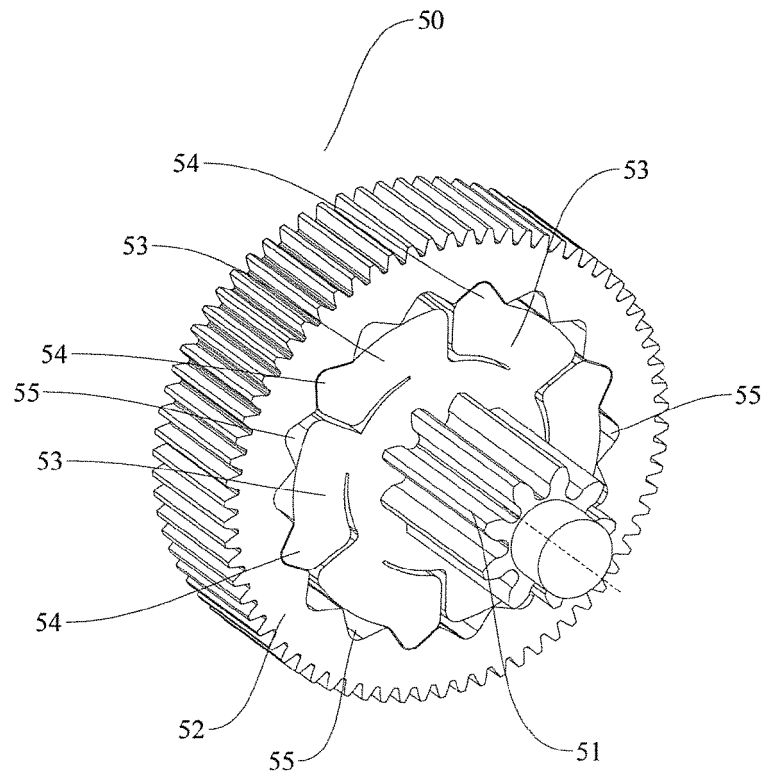


Fig. 7

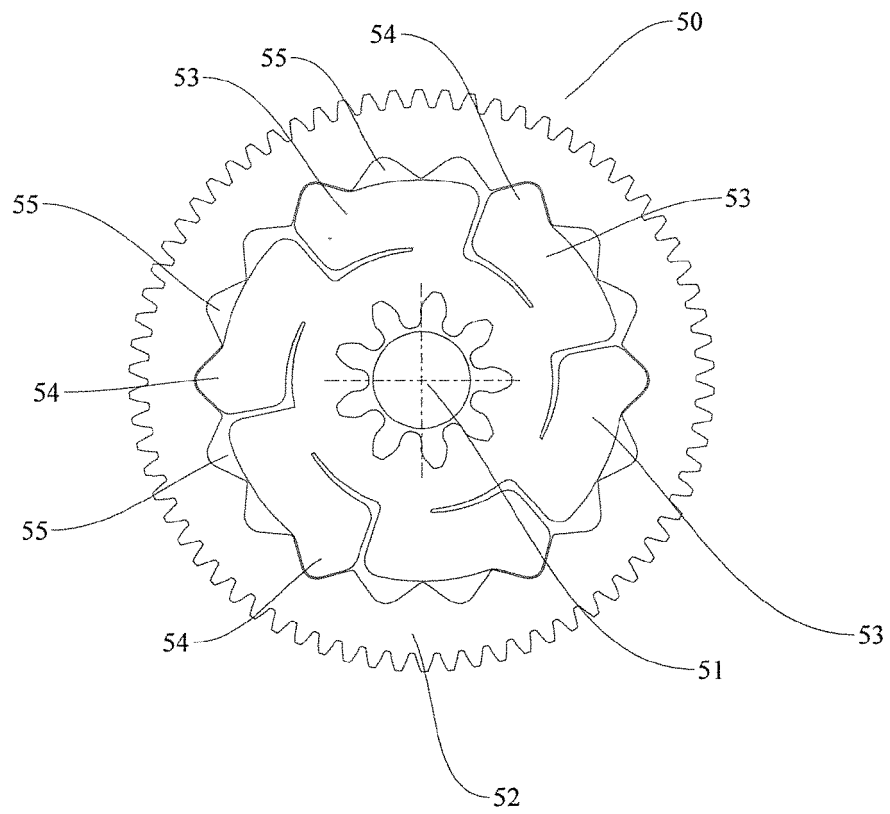


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 16 16 6979

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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	US 5 870 787 A (CHOI SSI CHOL [KR]) 16 February 1999 (1999-02-16) * the whole document *	1-8	INV. D06F39/14 D06F23/04 F24C15/02 A47L15/42
A	JP H06 86896 A (TOSHIBA CORP) 29 March 1994 (1994-03-29) * figures 1, 4 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F F24C A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 December 2016	Examiner Diaz y Diaz-Caneja
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 16 6979

5

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The members are as contained in the European Patent Office EDP file on
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02-12-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5870787 A	16-02-1999	CN 1156195 A	06-08-1997
		JP 2895455 B2	24-05-1999
		JP H09164292 A	24-06-1997
		US 5870787 A	16-02-1999
JP H0686896 A	29-03-1994	NONE	

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EPO FORM P0459

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Patent documents cited in the description

- CN 201520365984 [0002]