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(54) WASHING MACHINE WITH DETECTION DEVICE FOR LAUNDRY STUCK IN DOOR BODY

(57) A washing machine with a detection device for laundry stuck in a door body, the washing machine comprising: a box body; an outer tub; a window gasket (30); a door body (12), which can open and close a laundry feeding port (111) and which is hinged to a front plate (11); and a detection device (40), which is used for detecting whether a piece of laundry is stuck between the door body (12) and the window gasket (30), wherein the front end of the window gasket (30) is provided with a first assembly groove (31); the front plate (11) is provided with a first groove (112), which is recessed backward; and a first groove wall (1121), which is on the side of the first groove (112) that is close to the laundry feeding port (111), is assembled with the first assembly groove (31). By providing the detection device (40) for detecting whether a piece of laundry is stuck between the door body (12) and the window gasket (30), detection can be carried out before the washing machine starts to wash, thereby facilitating discovering laundry being stuck in time, thus preventing laundry from being damaged due to the rotation of an inner tub after a piece of laundry is stuck. By means of the arrangement of the first groove (112), the sealing connection assembly between the front plate (11) and the window gasket (30) can be realized, which facilitates improvement of the structural strength of the laundry feeding port (111), and facilitates forming a space for arrangement of the detection device (40) and forming an avoidance for a front detection member (41).

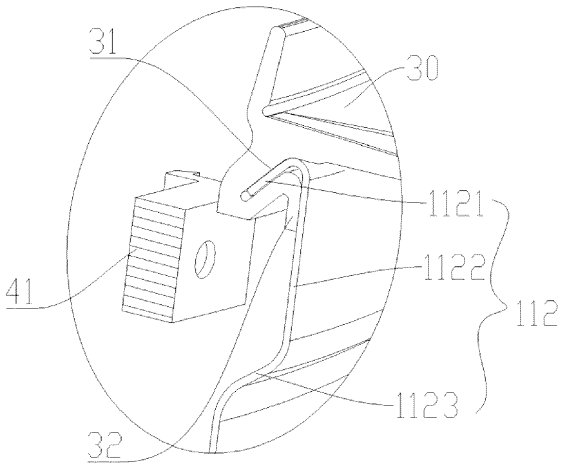

Fig.6

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Description

Technical field

[0001] The present invention belongs to the technical field of washing machines, and specifically relates to a washing machine with a detection device designed to identify clothing trapped in the door assembly.

Background

[0002] A drum washing machine comprises a housing, an outer drum, and an inner drum provided in the housing. During the laundry process, the inner drum rotates within the outer drum. A clothing inlet is provided on the front panel of the housing, and a door hinged on the front panel, which opens and closes the clothing inlet. Between the front panel of the housing and the outer drum, there is a sealing window gasket. Specifically, the front part of the window gasket is sealed and fixed at the clothing inlet on the front panel, while the rear part of the window gasket is sealed and fixed at the front opening of the outer drum.

Technical Problem

[0003] During the laundry process, users often unintentionally place clothing on the window gasket. After closing the door, the clothing becomes trapped between the door and the window gasket or, in other words, between the door and the front panel. This situation is not easily detected, leading to continuous pulling and stretching of the clothing during the washing or spinning process. In severe cases, it may result in tearing and damage to the clothing, and even adds additional load to the motor.

Summary

[0004] To solve the problem in the prior art, the present invention proposes a washing machine equipped with a detection device to identify clothing trapped in the door assembly. The device is capable of detecting whether there is clothing trapped between the door and the window gasket, thereby reducing damage to clothing caused by clothing trapping.

[0005] To achieve the above objectives, the present invention employs the following technical solutions: a washing machine with a clothing-trapping detection device comprises:

a housing having a front panel with a clothing inlet;
an outer drum located inside the housing;
a window gasket sealingly connected between the front panel and the outer drum;
a door assembly hinged to the front panel, which is capable of opening and closing the clothing inlet; and
a detection device for identifying whether clothing is trapped between the door assembly and the window gasket;
a first assembly groove is formed at a front end of the window gasket, a rearward first recess is formed on the front panel, a first groove wall of the first recess close to the clothing inlet matches the first assembly groove; the detection device is positioned between the door assembly and the first recess.

[0006] Furthermore, the detection device has a front detection element fixed to the inside of the door assembly, and the front detection element is located in front of the first recess.

[0007] Furthermore, the door assembly is provided with a first assembly groove and the front detection element is located at the first assembly groove.

[0008] Furthermore, the front detection element is an optical sensor, which is configured to identify whether clothing is trapped by whether receiving a feedback signal within a measuring distance.

[0009] Furthermore, the measuring distance of the optical sensor is set as the distance from a light emission point of the optical sensor along the optical path direction to the rear groove wall of the first recess or to the window gasket.

[0010] Furthermore, the detection device includes a rear detection element fixed to the inside of the first recess; the front detection element has a telescopic column that can extend forward and backward; in a closed state of the door assembly and in the absence of clothing trapping, the telescopic column contacts the rear detection element.

[0011] Furthermore, a protective block is provided in the first recess with an opening; the rear detection element is located within the opening and a rear end of the front detection element can extend into the opening.

[0012] Furthermore, the front end of the protective block is positioned behind the vertical plane where the end face of the window gasket at.

[0013] Furthermore, the first groove wall is inclined outwardly in a direction away from the center of the clothing inlet, and the angle between the first groove wall and the rear groove wall of the first recess is 40° to 50°.

[0014] Furthermore, the window gasket has an extension edge extending downward along the open end of the outer wall of the first assembly groove, and the extension edge fits against the rear groove wall of the first recess.

[0015] Furthermore, when the front detection element and the rear detection element come into contact, an electrical signal is triggered to determine whether clothing is trapped between the front detection element and the rear detection element.

[0016] Furthermore, the rear detection element is a reed switch, and a magnetic element is provided inside the telescopic column, and the distance between the reed switch and the magnetic element is configured to identify whether clothing is trapped.

[0017] Furthermore, before the washing program, the

washing machine initiates the detection device to detect whether there is clothing being trapped.

[0018] Furthermore, multiple detection devices are installed on the washing machine.

[0019] Furthermore, a backward-facing second groove is provided on the front panel, and a protrusion matching the second groove is located on the inside of the door body. The clothing inlet is formed on the rear groove wall of the second groove.

[0020] Furthermore, a circular first groove is provided on the rear groove wall of the second groove.

[0021] Furthermore, the first groove and the second groove are coaxially arranged.

[0022] Furthermore, the second groove is coaxially arranged with the clothing inlet.

[0023] Furthermore, the first groove, which is on the side away from the window seal, is parallel to the second groove wall and first groove wall.

Beneficial Effects

[0024] To address the problems in the prior art, the present invention provides a washing machine equipped with a detection device to identify whether there is clothing trapped between the door and the window gasket. This device aims to identify clothing trapped in the door assembly, enabling timely detection before the washing machine commences its washing cycle and reducing the risk of damage caused by clothing trapping.

Detailed Description of the Drawings

[0025] In order to provide a clearer explanation of the technical solutions in the embodiments of the present invention, a brief introduction to the accompanying drawings required for the embodiments will be presented below. It is evident that the drawings described below represent some embodiments of the present invention. For those skilled in the art, additional drawings can be obtained based on these drawings without the need for creative effort.

Fig.1 is a schematic diagram of the structure of a first embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention.

Fig.2 is an exploded schematic diagram of the structure shown in Fig.1.

Fig.3 is an enlarged schematic diagram of region A in Fig.2.

Fig.4 is a structural schematic diagram at the front panel.

Fig.5 is a sectional view after removing the door assembly from Fig.1.

Fig.6 is an enlarged schematic diagram of region B in Fig.5.

Fig.7 is a schematic diagram of the structure of a second embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention.

Fig.8 is an enlarged schematic diagram of region C in Fig.7.

Fig.9 is a structural schematic diagram from another angle in Fig.7.

Fig.10 is an enlarged schematic diagram of region D in Fig.9.

Fig.11 is a sectional view after removing the door assembly in Fig.7.

Fig.12 is an enlarged schematic diagram of region E in Fig.11.

Fig.13 is a structural schematic diagram under clothing-trapping conditions in Fig.12.

Fig.14 is a schematic diagram of the structure of a second embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention.

Fig.15 is an enlarged schematic diagram of region F in Fig.14.

Fig.16 is a structural schematic diagram under clothing-trapping conditions in Fig.15.

Detailed Description of the Invention

[0026] To clarify the purpose, technical solutions, and advantages of the embodiments of the present invention, the following will provide a clear and complete description of the technical solutions in conjunction with the accompanying drawings.

[0027] In the description of the present invention, it is important to note that terms such as "up," "down," "left," "right," etc., indicating directions or positional relationships, are based on the positional relationships shown in the drawings. In the normal operating state of the washing machine, the side closer to the user is referred to as the "front," and the opposite side is referred to as the "rear." These terms are used for ease of description and simplification and do not imply that the indicated devices or components must have specific orientations, constructions, and operations. Therefore, they should not be understood as limitations on the present invention. Additionally, terms like "first," "second," "third" are used for descriptive purposes and do not indicate relative impor-

tance; features labeled with "first," "second" may include one or more of those features explicitly or implicitly. In this description, "multiple" means two or more, unless explicitly specified otherwise.

[0028] In the present invention, unless otherwise specified and limited, terms such as "installation," "connection," "link," "fixation," and similar terms are broadly understood. For example, they can refer to fixed connections, detachable connections, or integral connections; mechanical or electrical connections; direct or indirect connections through an intermediate medium; connections within two components or interaction relationships between two components. For those skilled in the art, the specific meanings of these terms in the context of the present invention can be understood based on the specific situation.

[0029] Referring to Fig.1 to Fig.6, a first embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention is shown. The washing machine is used to detect whether clothing is trapped between the door assembly and the front panel, comprising: a housing, an outer drum, a window gasket 30, and a detection device 40. The housing has a front panel 11 with a clothing inlet 111; in the figures, only a front flange of the outer drum is shown, and the front and rear portions of the outer drum are not shown. The window gasket 30 is sealingly connected between the front panel 11 and the outer drum. The door assembly 12 can open and close the clothing inlet 111, and it is hinged to the front panel 11. The detection device 40 is used to detect whether there is clothing trapped between the door assembly 12 and the window gasket 30, indicating whether the clothing is trapped inside the door assembly 12. A first assembly groove 31 is provided at a front end of the window gasket 30, and a rearward first recess 112 is provided on the front panel 11. The first recess 112 is arranged outside the clothing inlet 111, defining the position closer to the clothing inlet 111 as the inner. The first recess 112 has a first groove wall 1121 on one side near the clothing inlet 111, which is assembled with the first assembly groove 31. The first groove wall 1121 is located inside the first assembly groove 31, and the first recess 112 forms a circular structure. The detection device 40 is positioned between the door assembly 12 and the first recess 112. Specifically, the detection device 40 includes a front detection element 41 fixed on the inner side of the door assembly 12, and the front detection element 41 is located in front of the first recess 112.

[0030] In the present embodiment, the detection device 40 is used to detect whether clothing is trapped between the door assembly 12 and the window gasket 30. By detecting before the washing machine starts washing, it is advantageous to promptly discover any clothing being trapped, thus avoiding damage to the clothing caused by the rotation of the inner drum after clothing entrapment. The first recess 112 is set up to achieve a sealed connection assembly between the front panel 11 and the window gasket 30, enhancing the structural strength at the clothing inlet 111. This arrangement is conducive to providing space for the installation of the detection device 40 and facilitating avoidance of the front detection element 41.

[0031] As shown in Fig.6, when clothing entrapment occurs at the detection device 40, the clothing is trapped between the door assembly 12 and the window gasket 30. After clothing entrapment, a portion of the clothing is located between the front detection element 41 and the rear groove wall 1122 of the first recess 112. By detecting whether there are obstacles or foreign objects between the front detection element 41 and the rear groove wall 1122 of the first recess, it can be determined whether clothing entrapment has occurred. Since a single front detection element 41 can only detect whether clothing entrapment has occurred in its vicinity, for increased accuracy, multiple detection devices 40 can be installed on the washing machine.

[0032] For clothing entrapment detection, the detection device 40 can use various detection devices. In the present embodiment, the front detection element 41 is an optical sensor. Detection is performed by identifying whether the feedback signal is received within the measuring distance of the optical sensor. In the case of clothing entrapment at the detection device 40, when the light emitted by the front detection element 41 is obstructed by the clothing within the measuring distance, indicating clothing entrapment, the feedback signal is triggered. If no clothing entrapment is detected, the emitted light reaches the target within the measuring distance without obstruction, and no feedback signal is received.

[0033] Specifically, the measuring distance of the optical sensor is set as the distance along the light path from the light-emitting point of the optical sensor to the rear groove wall 1122 of the first recess 112 or to the window gasket 30. The light emitted by the optical sensor can travel rearward parallel to the axial direction of the outer drum or can travel inward in the backward direction. Depending on the travel path of the optical sensor's light, the measuring distance can be set as the travel distance of the light to the rear groove wall 1122 of the first recess 112 or to the window gasket 30. If the emitted light travels to the rear groove wall 1122 of the first recess 112, the measuring distance is the travel distance of the light from the emission point to the rear groove wall 1122 of the first recess 112. If the emitted light travels to the window gasket 30, the measuring distance is the travel distance of the light from the emission point to the window gasket 30.

[0034] It should be configured to active the clothing entrapment detection after the door is closed and the washing machine is powered up. If clothing entrapment is found, the door assembly 20 should be opened for examination and handling. If no clothing entrapment is found, the selection of the washing program can proceed.

[0035] In the present embodiment, the first groove wall 1122 is inclined outward away from the center of the clothing inlet, enhancing stability after assembly with the

first assembly groove 31, which also aligns with the direction of inclination of the window glass 13 of the door assembly 12 at the clothing inlet 111, helping to seal the window gasket 30 between the window glass 13 and the first groove wall 1122. The preferred angle between the first groove wall 1121 and the rear groove wall 1122 of the first recess 112 is set to be 40° to 50°, and more preferably, the angle is set to 45°.

[0036] The window gasket 30 has an extension edge 32 extending downward along the open end of the outer wall of the first assembly groove 31. The extension edge 32 fits against the rear groove wall 1122 of the first recess 112, enhancing the sealing between the window gasket 30 and the first recess 112 and the firmness after assembly. The extension edge 32 is located on the front side of the rear groove wall 1122 so that when the front detection element 41 is an optical sensor, the light can travel to the extension edge 32.

[0037] A rearward second recess 113 is provided on the front panel 11, and a protrusion matching the second recess 113 is provided on the inner side of the door assembly 12, contributing to the sealed closure between the door assembly 12 and the front panel 11. A rear groove wall of the second recess 113 is opened with the clothing inlet 111 opening. An annular first recess 112 is provided on the rear groove wall of the second recess 113, and the first recess 112 and the second recess 113 are coaxially arranged. The second recess 113 is coaxial with the clothing inlet 111. The first groove wall 1123 of the first recess 112 on the side away from the window gasket 30 is parallel to the first groove wall 1121, thereby enhancing the structural strength at the first recess 112. Moreover, it helps to form a larger space for installing the detection device 40.

[0038] Fig.7 to Fig.13 depicts a second embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention. The main difference between this embodiment and the first embodiment lies in the different detection device 40, employing a distinct detection structure. However, other structures can remain the same as the first embodiment.

[0039] A washing machine with a clothing-trapping detection device is designed to detect whether clothing is trapped between the door assembly and the front panel. It includes a housing, an outer drum, a window gasket 30, and a detection device 40. The housing has a front panel 11 with a clothing inlet 111; in the figures, only the front flange of the outer drum is shown, and the front and rear portions of the outer drum are not shown. The window gasket 30 is sealingly connected between the front panel 11 and the outer drum. The door assembly 12 can open and close the clothing inlet 111 and is hinged to the front panel 11. The detection device 40 is used to detect whether there is clothing trapped between the door assembly 12 and the window gasket 30, indicating whether clothing is trapped inside the door assembly 12. A first assembly groove 31 is provided at a front end of the window gasket 30, and a rearward first recess 112 is provided on the front panel 11. The first recess 112 is arranged outside the clothing inlet 111, defining the position closer to the clothing inlet 111 as the inner. The first recess 112 has a first groove wall 1121 on one side near the clothing inlet 111, which is assembled with the first assembly groove 31. The first groove wall 1121 is located inside the first assembly groove 31, forming a circular structure for the first recess 112. The detection device 40 has a front detection element 41 fixed on the inner side of the door assembly 12, and the front detection element 41 is located in front of the first recess 112.

[0040] In the present embodiment, the detection device 40 is used to detect whether clothing is trapped between the door assembly 12 and the window gasket 30. By detecting before the washing machine starts washing, it is advantageous to promptly discover any clothing being trapped, thus avoiding damage to the clothing caused by the rotation of the inner drum after clothing entrapment. The first recess 112 is set up to achieve a sealed connection assembly between the front panel 11 and the window gasket 30, enhancing the structural strength at the clothing inlet 111. This arrangement is conducive to providing space for the installation of the detection device 40 and facilitating avoidance of the front detection element 41.

[0041] When clothing entrapment occurs at the detection device 40, clothing is trapped between the door assembly 12 and the window gasket 30. After clothing entrapment, a portion of the clothing is positioned between the front detection element 41 and the rear groove wall 1122 of the first recess 112. By detecting whether there are obstacles or foreign objects between the front detection element 41 and the rear groove wall 1122 of the first recess, it can be determined whether clothing entrapment has occurred. As a single front detection element 41 can only detect entrapment in its vicinity, for increased accuracy, multiple detection devices 40 can be installed on the washing machine.

[0042] In the present embodiment, the detection device 40 also includes a rear detection element 42 fixed inside the first recess 112. The front detection element 41 has a telescopic column that can extend forward and backward, and the telescopic column can extend into the first recess 112. In the closed state of the door assembly 12, and when there is no clothing entrapment, the telescopic column is in contact with the rear detection element 42. In the presence of clothing entrapment at the detection device 40, there is clothing between the telescopic column and the rear detection element 42, creating a separation.

[0043] In the present embodiment, the front detection element 41 and the rear detection element 42 trigger an electrical signal upon contact to determine whether clothing is trapped between them. If the trigger signal occurs, there is no clothing entrapment; if not triggered, there is clothing entrapment. To further increase the accuracy of detection and avoid the situation where clothing is trapped between the front detection element 41 and the

rear detection element 42 causing a trigger signal, it is configured to increase the distance between the front detection element 41 and the rear detection element 42 in the presence of clothing entrapment. A protective block 43 is provided inside the first recess 112, and a receiving opening 431 is opened on the protective block 43. The rear detection element 42 is located inside the receiving opening 431, and the rear end of the front detection element 41 can extend into the receiving opening 431. In the presence of clothing entrapment, clothing is trapped between the front detection element 41 and the front end of the receiving opening 431, preventing the front detection element 41 from extending into the receiving opening 431. This ensures that the front detection element 41 and the rear detection element 42 do not contact, maintaining a larger distance and avoiding the occurrence of a trigger signal. In the absence of clothing entrapment, the front detection element 41 extends into the receiving opening 431 and contacts the rear detection element 42 to trigger the electrical signal. The front end surface of the protective block 43 is positioned behind the vertical plane where the end face of the window gasket 30 is located, protecting the protective block 43 and preventing it from being touched.

[0044] It should be configured to active the clothing entrapment detection after the door is closed and the washing machine is powered up. If clothing entrapment is found, the door assembly 20 should be opened for examination and handling. If no clothing entrapment is found, the selection of the washing program can proceed.

[0045] In the present embodiment, the first groove wall 1122 is inclined outward away from the center of the clothing inlet, enhancing stability after assembly with the first assembly groove 31, which also aligns with the direction of inclination of the window glass 13 of the door assembly 12 at the clothing inlet 111, helping to seal the window gasket 30 between the window glass 13 and the first groove wall 1122. The preferred angle between the first groove wall 1121 and the rear groove wall 1122 of the first recess 112 is set to be 40° to 50°, and more preferably, the angle is set to 45°.

[0046] The window gasket 30 has an extension edge 32 extending downward along the open end of the outer wall of the first assembly groove 31. The extension edge 32 fits against the rear groove wall 1122 of the first recess 112, enhancing the sealing between the window gasket 30 and the first recess 112 and the firmness after assembly. The extension edge 32 is located on the front side of the rear groove wall 1122 so that when the front detection element 41 is an optical sensor, the light can travel to the extension edge 32.

[0047] A rearward second recess 113 is provided on the front panel 11, and a protrusion matching the second recess 113 is provided on the inner side of the door assembly 12, contributing to the sealed closure between the door assembly 12 and the front panel 11. A rear groove wall of the second recess 113 is opened with the clothing inlet 111 opening. An annular first recess 112 is provided on the rear groove wall of the second recess 113, and the first recess 112 and the second recess 113 are coaxially arranged. The second recess 113 is coaxial with the clothing inlet 111. The first groove wall 1123 of the first recess 112 on the side away from the window gasket 30 is parallel to the first groove wall 1121, thereby enhancing the structural strength at the first recess 112. Moreover, it helps to form a larger space for installing the detection device 40.

[0048] Fig.14 to Fig.16 illustrates a third embodiment of the washing machine with a clothing-trapping detection device proposed by the present invention. The main difference between this embodiment and the second embodiment lies in the different detection device 40, employing a distinct detection structure. However, other structures can remain the same as the second embodiment.

[0049] A washing machine with a clothing-trapping detection device is designed to detect whether clothing is trapped between the door assembly and the front panel. It includes a housing, an outer drum, a window gasket 30, and a detection device 40. The housing has a front panel 11 with a clothing inlet 111; in the figures, only the front flange of the outer drum is shown, and the front and rear portions of the outer drum are not shown. The window gasket 30 is sealingly connected between the front panel 11 and the outer drum. The door assembly 12 can open and close the clothing inlet 111 and is hinged to the front panel 11. The detection device 40 is used to detect whether there is clothing trapped between the door assembly 12 and the window gasket 30, indicating whether clothing is trapped inside the door assembly 12. A first assembly groove 31 is provided at a front end of the window gasket 30, and a rearward first recess 112 is provided on the front panel 11. The first recess 112 is arranged outside the clothing inlet 111, defining the position closer to the clothing inlet 111 as the inner. The first recess 112 has a first groove wall 1121 on one side near the clothing inlet 111, which is assembled with the first assembly groove 31. The first groove wall 1121 is located inside the first assembly groove 31, forming a circular structure for the first recess 112. The detection device 40 has a front detection element 41 fixed on the inner side of the door assembly 12, and the front detection element 41 is located in front of the first recess 112.

[0050] In the present embodiment, the detection device 40 is used to detect whether clothing is trapped between the door assembly 12 and the window gasket 30. By detecting before the washing machine starts washing, it is advantageous to promptly discover any clothing being trapped, thus avoiding damage to the clothing caused by the rotation of the inner drum after clothing entrapment. The first recess 112 is set up to achieve a sealed connection assembly between the front panel 11 and the window gasket 30, enhancing the structural strength at the clothing inlet 111. This arrangement is conducive to providing space for the installation of the detection device 40 and facilitating avoidance of the front detection ele-

ment 41.

[0051] When clothing entrapment occurs at the detection device 40, clothing is trapped between the door assembly 12 and the window gasket 30. After clothing entrapment, a portion of the clothing is positioned between the front detection element 41 and the rear groove wall 1122 of the first recess 112. By detecting whether there are obstacles or foreign objects between the front detection element 41 and the rear groove wall of the first recess 112, it can be determined whether clothing entrapment has occurred. As a single front detection element 41 can only detect entrapment in its vicinity, for increased accuracy, multiple detection devices 40 can be installed on the washing machine.

[0052] In the present embodiment, the detection device 40 also includes a rear detection element 42 fixed inside the first recess 112. The front detection element 41 has a telescopic column that can extend forward and backward, and the telescopic column can extend into the first recess 112. In the closed state of the door assembly 12, and when there is no clothing entrapment, the telescopic column is in contact with the rear detection element 42. In the presence of clothing entrapment at the detection device 40, there is clothing between the telescopic column and the rear detection element 42, creating a separation.

[0053] In the present embodiment, the rear detection element 42 is a reed switch and a magnetic component 412 that matches the reed switch is provided inside the telescopic column 411. Clothing entrapment is determined based on the distance between the reed switch and the magnetic component 412. When the telescopic column 411 is in contact with the rear detection element 42, the distance between the reed switch and the magnetic component 412 is D1; in the presence of clothing entrapment, the distance D2 between the reed switch and the magnetic component 412 is definitely greater than D1.

[0054] In order to further increase the accuracy of the detection and to avoid that the distance between the reed switch and the magnetic member 412 does not change much when clothing is trapped between the front detection element 41 and the rear detection element 42, especially when the clothing is thin, it should be ensured that, in the presence of clothing entrapment, the distance between the front detection element 41 and the rear detection element 42 is increased.

[0055] A protective block 43 is provided inside the first recess 112, and a receiving opening 431 is opened on the protective block 43. The rear detection element 42 is located inside the receiving opening 431, and a rear end of the front detection element 41 can extend into the receiving opening 431. In the presence of clothing entrapment, clothing is trapped between the front detection element 41 and the front end of the receiving opening 431, preventing the front detection element 41 from extending into the receiving opening 431. This ensures that the front detection element 41 and the rear detection element 42 do not contact, maintaining a larger distance. In the absence of clothing entrapment, the front detection element 41 extends into the receiving opening 431 and contacts the rear detection element 42. The distance between the reed switch and the magnetic component 412 is D1. The distance between the front end of the receiving opening 431 and the front end of the rear detection element 42 is D3. In the presence of clothing entrapment, the distance D2 between the reed switch and the magnetic component 412 is greater than D1 and less than or equal to the sum of D1 and D3.

[0056] It should be configured to active the clothing entrapment detection after the door is closed and the washing machine is powered up. If clothing entrapment is found, the door assembly 20 should be opened for examination and handling. If no clothing entrapment is found, the selection of the washing program can proceed.

[0057] In the present embodiment, the first groove wall 1122 is inclined outward away from the center of the clothing inlet, enhancing stability after assembly with the first assembly groove 31, which also aligns with the direction of inclination of the window glass 13 of the door assembly 12 at the clothing inlet 111, helping to seal the window gasket 30 between the window glass 13 and the first groove wall 1122. The preferred angle between the first groove wall 1121 and the rear groove wall 1122 of the first recess 112 is set to be 40° to 50°, and more preferably, the angle is set to 45°.

[0058] The window gasket 30 has an extension edge 32 extending downward along the open end of the outer wall of the first assembly groove 31. The extension edge 32 fits against the rear groove wall 1122 of the first recess 112, enhancing the sealing between the window gasket 30 and the first recess 112 and the firmness after assembly. The extension edge 32 is located on the front side of the rear groove wall 1122 so that when the front detection element 41 is an optical sensor, the light can travel to the extension edge 32.

[0059] A rearward second recess 113 is provided on the front panel 11, and a protrusion matching the second recess 113 is provided on the inner side of the door assembly 12, contributing to the sealed closure between the door assembly 12 and the front panel 11. A rear groove wall of the second recess 113 is opened with the clothing inlet 111 opening. An annular first recess 112 is provided on the rear groove wall of the second recess 113, and the first recess 112 and the second recess 113 are coaxially arranged. The second recess 113 is coaxial with the clothing inlet 111. The first groove wall 1123 of the first recess 112 on the side away from the window gasket 30 is parallel to the first groove wall 1121, thereby enhancing the structural strength at the first recess 112. Moreover, it helps to form a larger space for installing the detection device 40.

[0060] The above embodiments are only used to illustrate the technical solution of the present invention, not to limit it. Although the present invention has been described in detail with reference to the above embodi-

ments, for those skilled in the art, it is still possible to modify the technical solution recorded in the above embodiments or replace some technical features with equivalent ones. These modifications or replacements do not depart from the spirit and scope of the technical solution required by the present invention.

Claims

1. A washing machine with a clothing-trapping detection device, **characterized in that** it comprises:

   a housing having a front panel with a clothing inlet;
   an outer drum (20) located inside the housing;
   a window gasket (30) sealingly connected between the front panel and the outer drum (20);
   a door assembly (12) hinged to the front panel, which is capable of opening and closing the clothing inlet; and
   a detection device for identifying whether clothing is trapped between the door assembly (12) and the window gasket (30);
   a first assembly groove (31) is formed at a front end of the window gasket (30), a rearward first recess (112) is formed on the front panel, a first groove wall (1121) of the first recess (112) close to the clothing inlet matches the first assembly groove (31);
   the detection device is positioned between the door assembly (12) and the first recess (112).

2. The washing machine according to claim 1, **characterized in that** the detection device has a front detection element (41) fixed to the inside of the door assembly (12), and the front detection element (41) is located in front of the first recess (112).

3. The washing machine according to claim 2, **characterized in that** the front detection element (41) is an optical sensor which is configured to identify whether clothing is trapped by whether receiving a feedback signal within a measuring distance.

4. The washing machine according to claim 3, **characterized in that** the measuring distance of the optical sensor is set as the distance from a light emission point of the optical sensor along the optical path direction to the rear groove wall (1122) of the first recess (112) or to the window gasket (30).

5. The washing machine according to claim 2, **characterized in that** the detection device includes a rear detection element (42) fixed to the inside of the first recess (112); the front detection element (41) has a telescopic column (411) that can extend forward and backward; in a closed state of the door assembly (12) and in the absence of clothing trapping, the telescopic column (411) contacts the rear detection element (41).

6. The washing machine according to claim 5, **characterized in that** a protective block (43) is provided in the first recess (112) with an opening (431); the rear detection element (42) is located within the opening (431) and a rear end of the front detection element (41) can extend into the opening (431).

7. The washing machine according to claim 5, **characterized in that** when the front detection element (41) and the rear detection element (42) come into contact, an electrical signal is triggered to determine whether clothing is trapped between the front detection element (41) and the rear detection element (42).

8. The washing machine according to claim 5, **characterized in that** the rear detection element (42) is a reed switch, and a magnetic element (412) is provided inside the telescopic column (411), and the distance between the reed switch and the magnetic element (412) is configured to identify whether clothing is trapped.

9. The washing machine according to any one of claim 1 to 8, **characterized in that** the first groove wall (1121) is inclined outwardly in a direction away from the center of the clothing inlet, and the angle between the first groove wall (1121) and the rear groove wall (1122) of the first recess (112) is 40° to 50°。

10. The washing machine according to any one of claim 1 to 8, **characterized in that** the window gasket (30) has an extension edge (32) extending downward along the open end of the outer wall of the first assembly groove (31), and the extension edge (32) fits against the rear groove wall (1122) of the first recess (112).

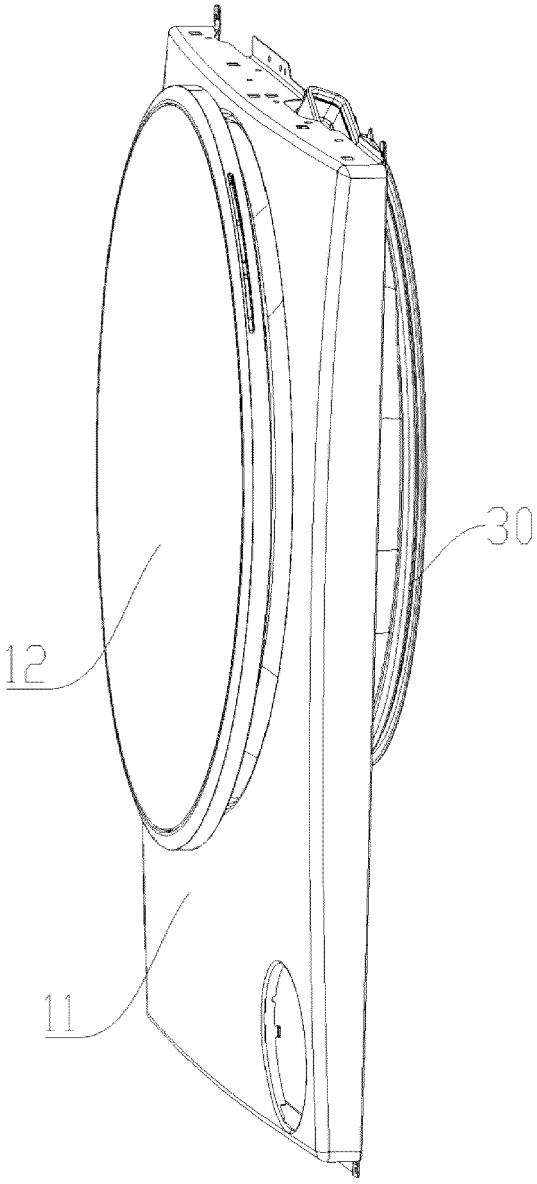

Fig.1

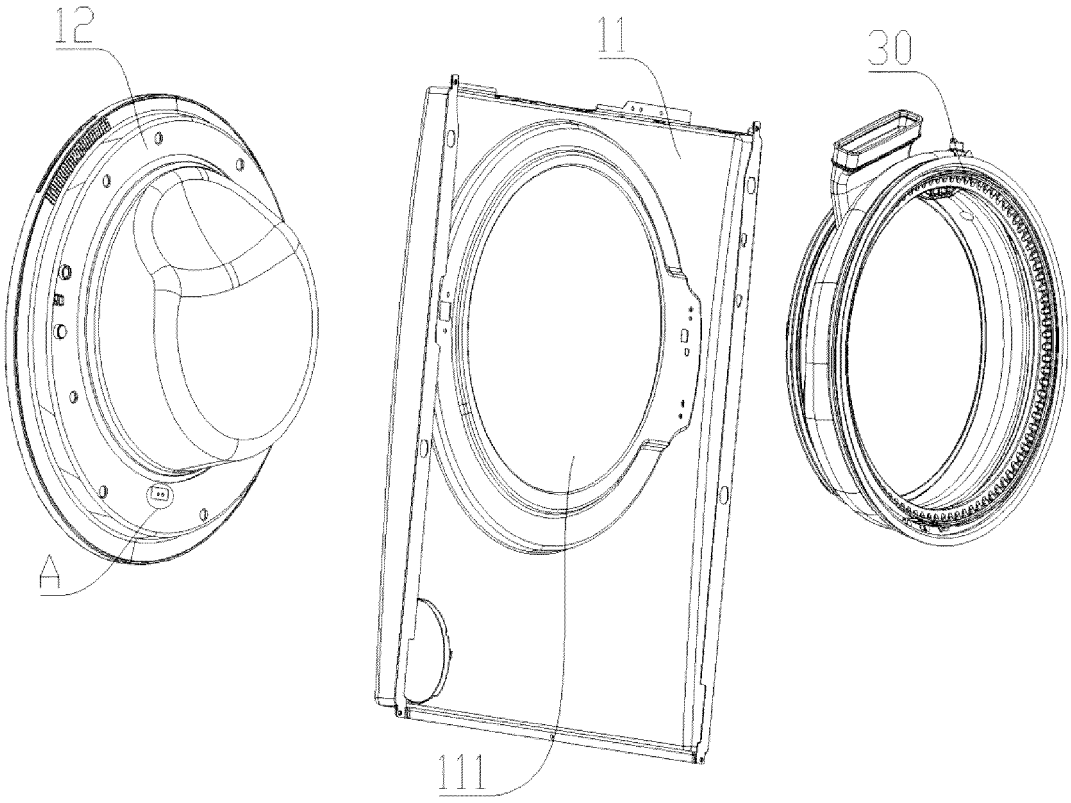

Fig.2

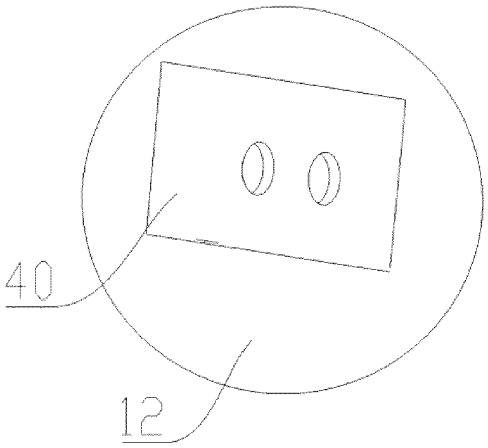

Fig.3

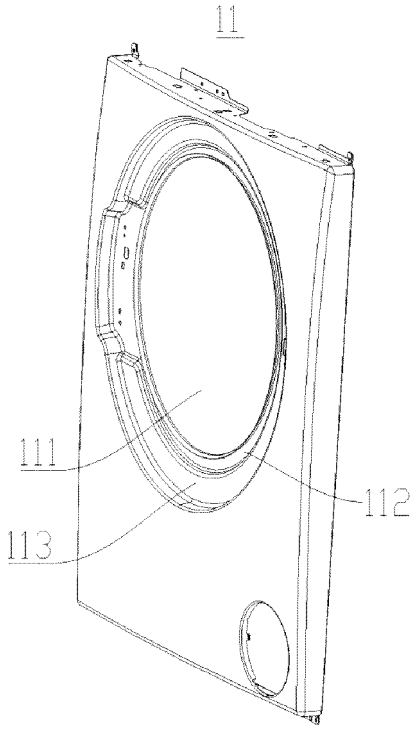

Fig.4

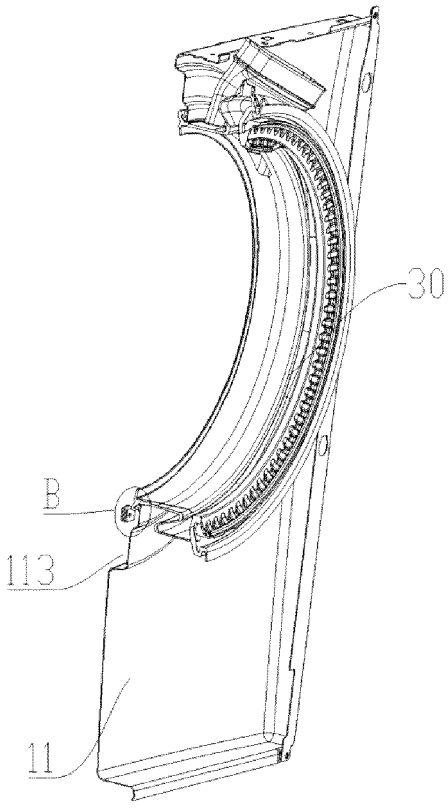

Fig.5

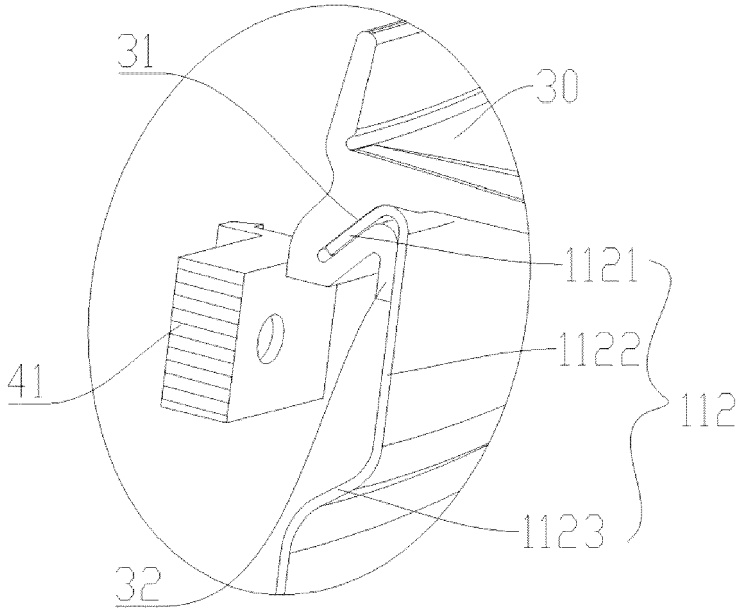

Fig.6

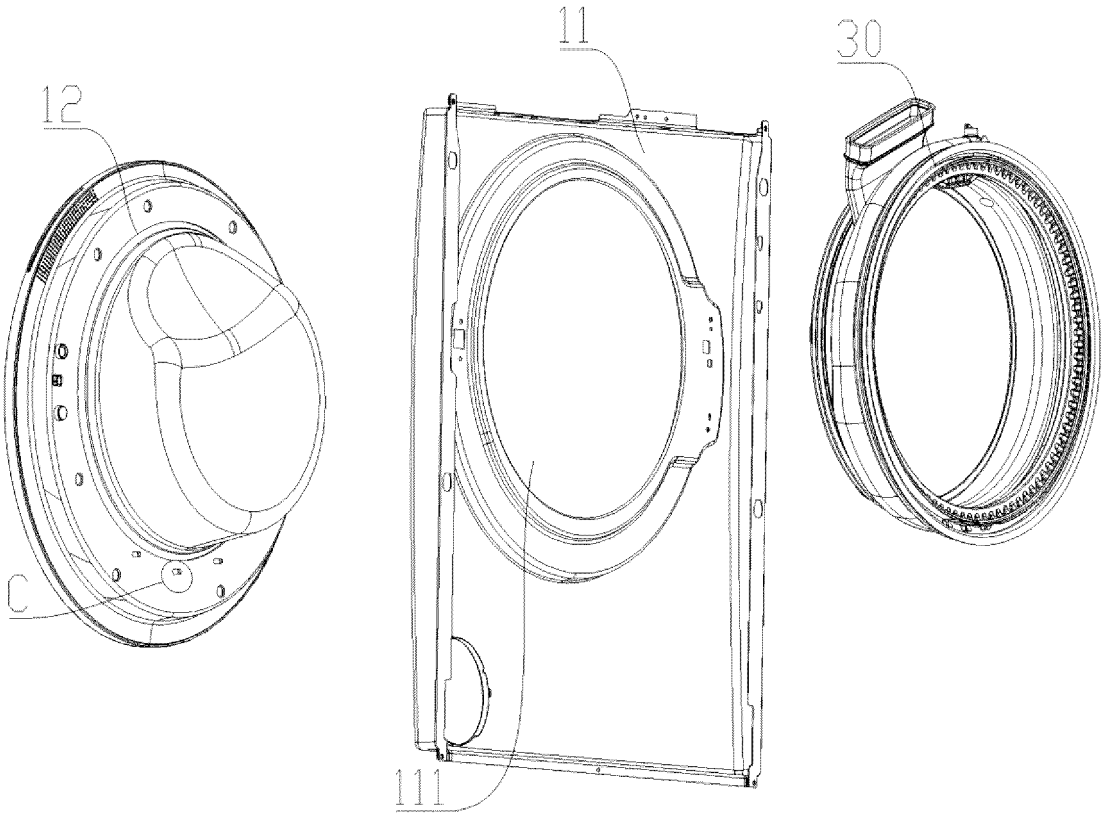

Fig.7

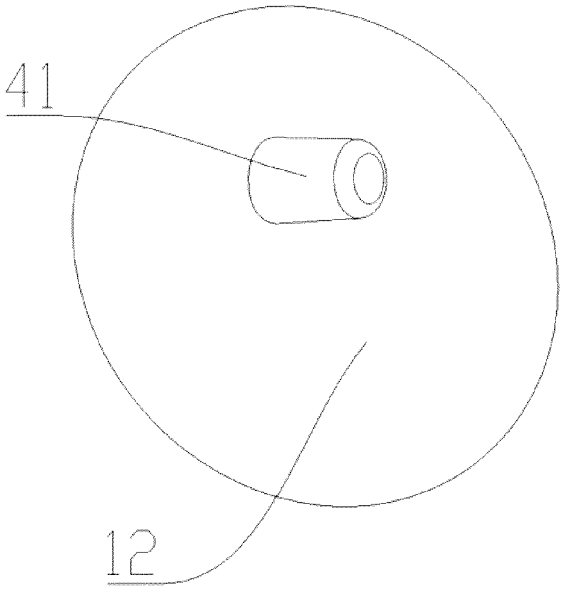

Fig.8

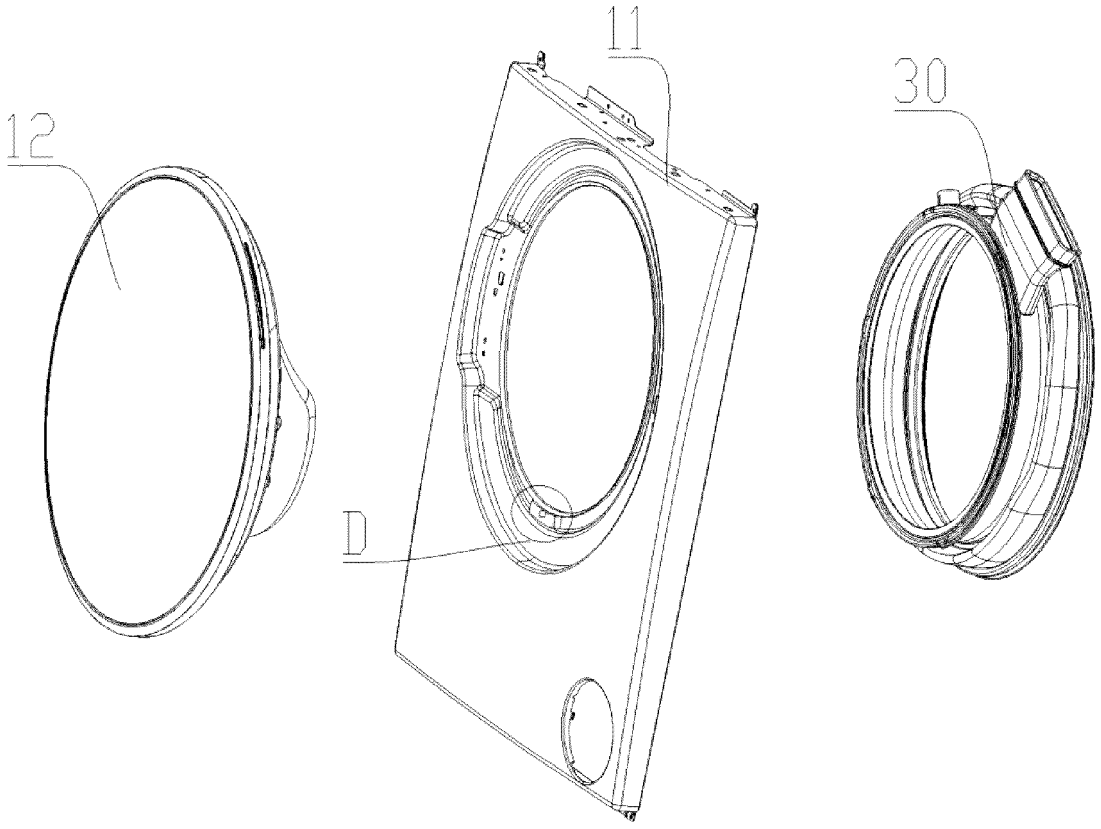

Fig.9

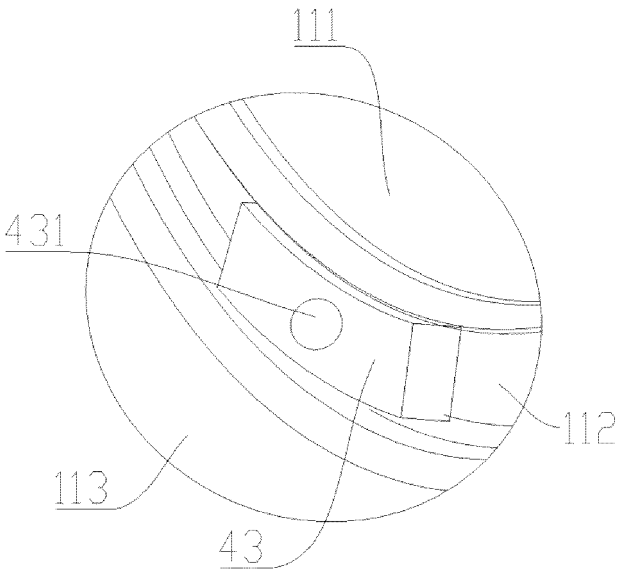

Fig.10

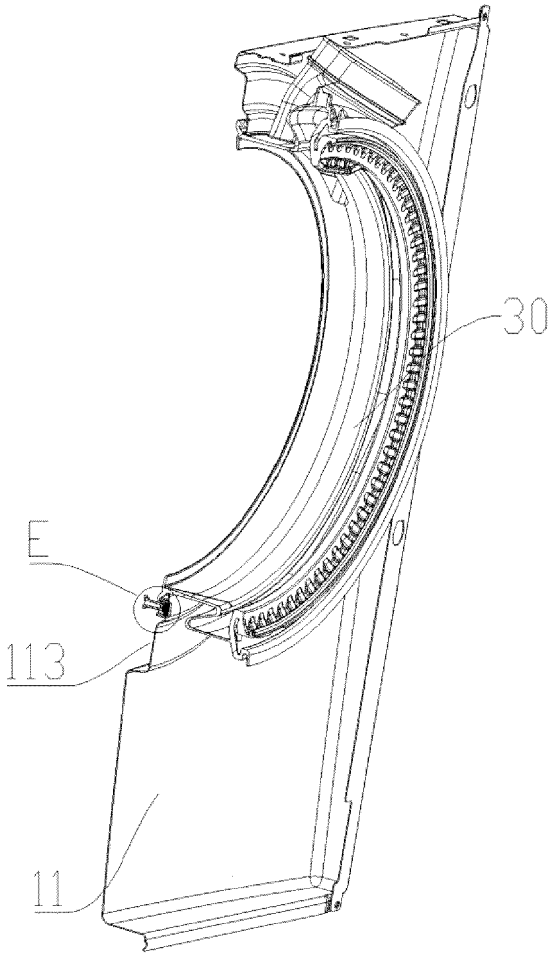

Fig.11

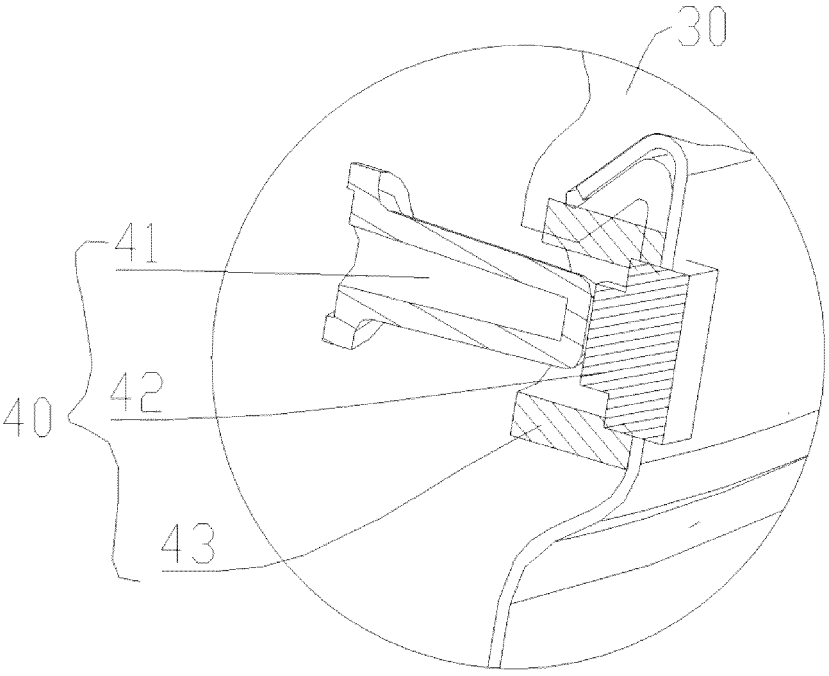

Fig.12

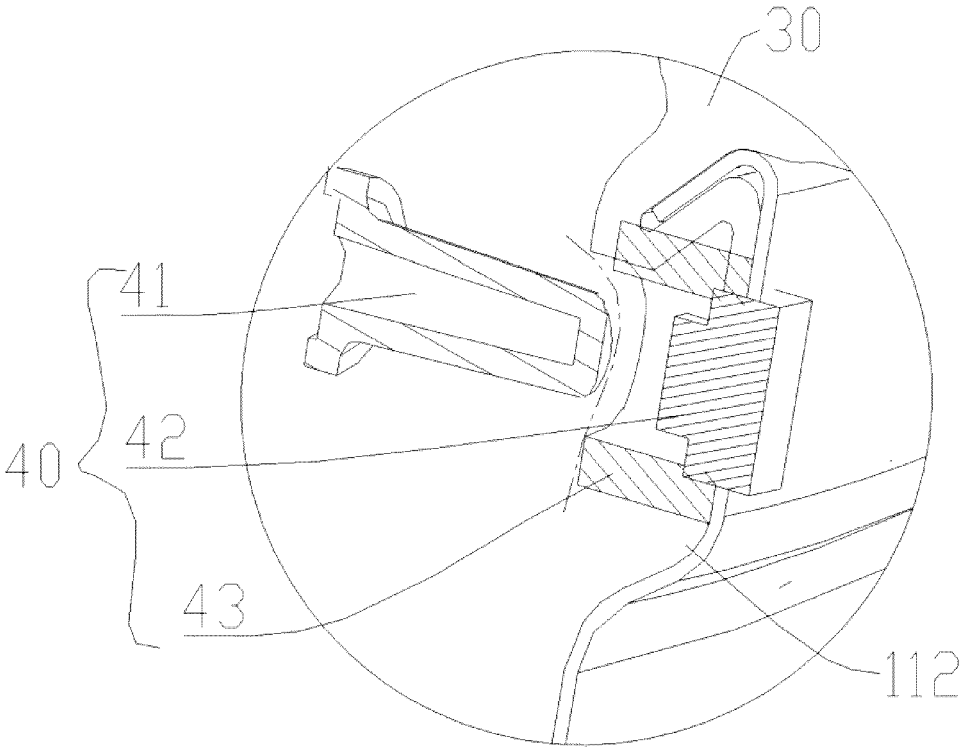

Fig.13

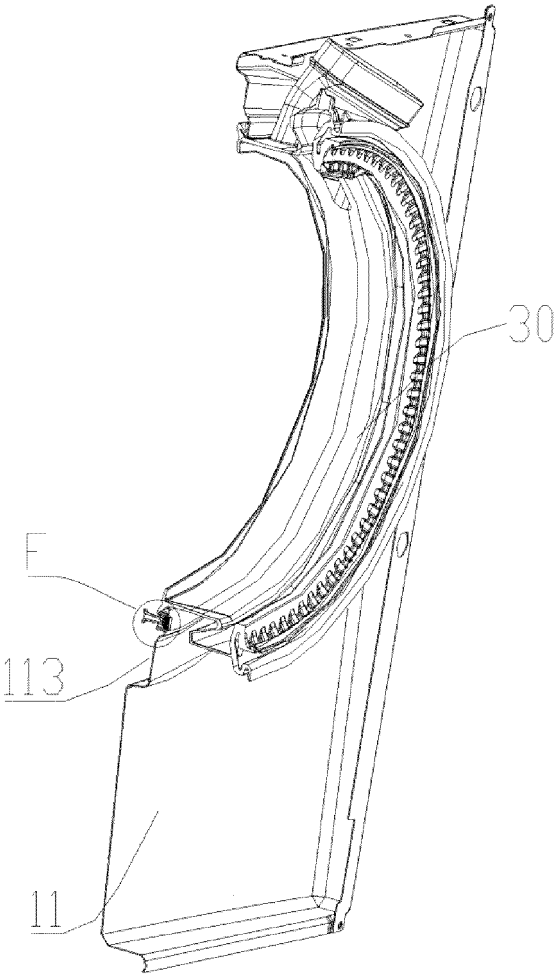

Fig.14

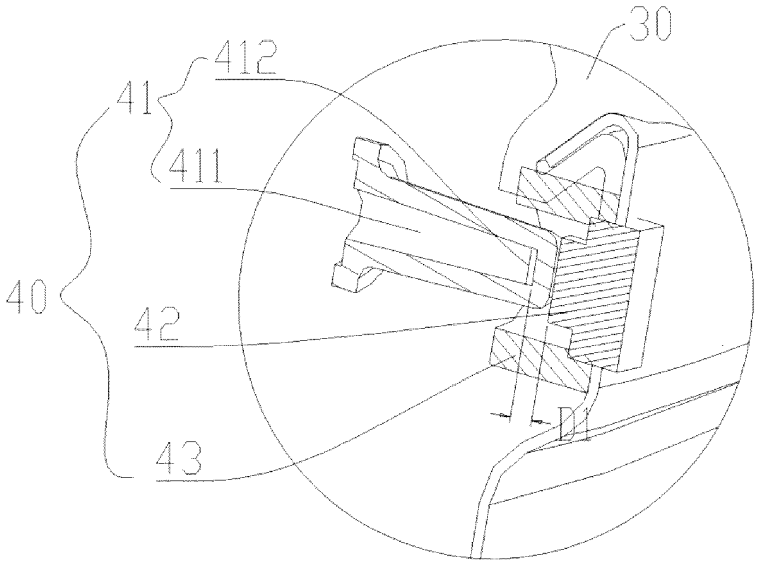

Fig.15

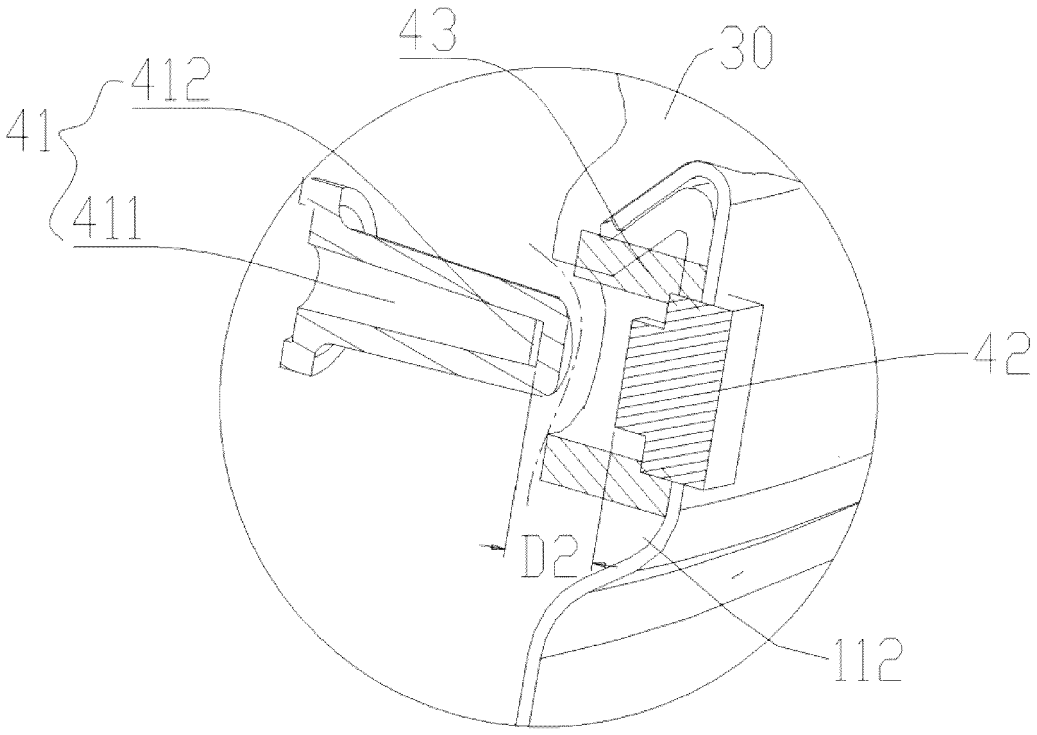

Fig.16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/113050

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/14(2006.01)i; D06F 34/14(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: 重庆海尔洗衣机有限公司, 夹, 卷, 布, 衣服, 衣物, 洗涤物, 检测, 传感器, 感应, 窗垫, 光感, 磁性, door, open, clothes, clamp, detect, signal, laundry

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113718479 A (HEFEI HAIER DRUM WASHING MACHINE CO., LTD.) 30 November 2021 (2021-11-30) description, paragraphs 31-61, and figures 1-16	1-10
X	CN 109898297 A (BSH ELECTRICAL APPLIANCES (JIANGSU) CO., LTD. et al.) 18 June 2019 (2019-06-18) description, paragraphs 20-33, and figures 1-2	1-4
Y	CN 109898297 A (BSH ELECTRICAL APPLIANCES (JIANGSU) CO., LTD. et al.) 18 June 2019 (2019-06-18) description, paragraphs 20-33, and figures 1-2	5-10
Y	CN 108060558 A (RINNAI CORPORATION) 22 May 2018 (2018-05-22) description, paragraphs 48-58, and figures 1-6	5-8
Y	KR 20080018451 A (LG ELECTRONICS INC.) 28 February 2008 (2008-02-28) description, pages 3-4, and figures 1-3	9-10
A	CN 112342726 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD. et al.) 09 February 2021 (2021-02-09) entire document	1-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 2022	**24 November 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/113050

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 107541896 A (BSH ELECTRICAL APPLIANCES (JIANGSU) CO., LTD. et al.) 05 January 2018 (2018-01-05) entire document	1-10
A	EP 3741907 A1 (WHIRLPOOL CORP.) 25 November 2020 (2020-11-25) entire document	1-10
A	CN 104846587 A (HAIER GROUP CORPORATION et al.) 19 August 2015 (2015-08-19) entire document	1-10

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/113050

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	113718479	A	30 November 2021	None			
CN	109898297	A	18 June 2019	None			
CN	108060558	A	22 May 2018	KR	20180051400	A	16 May 2018
				JP	2018075144	A	17 May 2018
				HK	1250761	A1	11 January 2019
KR	20080018451	A	28 February 2008	None			
CN	112342726	A	09 February 2021	None			
CN	107541896	A	05 January 2018	None			
EP	3741907	A1	25 November 2020	None			
CN	104846587	A	19 August 2015	CN	104846587	B	29 January 2019

Form PCT/ISA/210 (patent family annex) (January 2015)