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(72) Inventors:
• **LI, Songhui**
Qingdao, Shandong 266736 (CN)
• **GAO, Shang**
Qingdao, Shandong 266736 (CN)
• **CHEN, He**
Qingdao, Shandong 266736 (CN)
• **LIU, Zhenhua**
Qingdao, Shandong 266736 (CN)

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(74) Representative: **Casalonga**
Casalonga & Partners
Bayerstraße 71/73
80335 München (DE)

(71) Applicant: **Hisense (shandong) Refrigerator Co., Ltd.**
Qingdao, Shandong 266736 (CN)

(54) **WASHING MACHINE**

(57) A washing machine, comprising an inner drum (100), an outer drum (200), and a drying assembly (300). A condensation cavity (400) is formed between a rear wall of the inner drum (100) and a rear wall of the outer drum (200). The drying assembly (300) comprises a heating air duct (310) and a fan (320) and a heating apparatus (330) provided inside the heating air duct (310). One end of the heating air duct (310) is in communication with an air outlet (410) of the condensation cavity (400), and the other end is in communication with an air outlet (120) of

the inner drum (100). The fan (320) draws a gas inside the inner drum (100) into the condensation chamber (400) for condensation, and, after directing the gas into the heating air duct (310) for heating by the heating apparatus (330), draws same into the (100) to form a loop in order to dry clothing. A position on the interior of the rear wall of the outer drum (200) near to the air outlet (410) of the condensation cavity (400) is indented away from the inner drum (100) to form an expansion cavity (220).

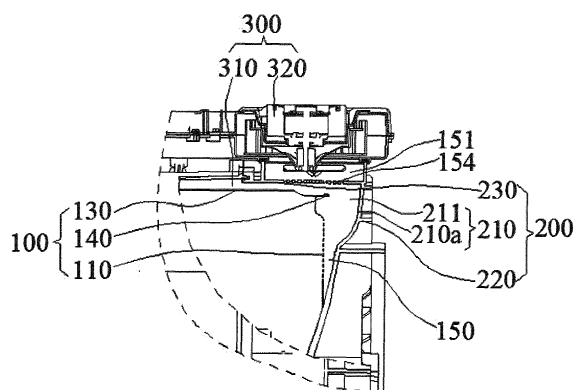


FIG. 2

Description

[0001] This application claims priority to Chinese Application No. 201811301815.8, filed on November 2, 2018, titled "DRYING AND WASHING MACHINE", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present application relates to the technical field of washing machines, and in particular, to a washing machine.

BACKGROUND

[0003] With the progress of society and the development of science and technology, people's requirements on the quality of life are getting higher and higher. Meanwhile, people's requirements on washing machines, as common household appliances, are getting higher and higher. Therefore, functions of washing machines are becoming increasingly comprehensive and diversified, and dimensions of washing machines are becoming increasingly small. Washing machines capable of drying the washed laundry are very popular since they can be better adapted to rainy and humid weather, and can shorten later airing time of the laundry. Moreover, the demand for the ultra-thin washing machine has increased significantly in the market.

[0004] Therefore, achieving the maximum washing volume in a small body is also an important direction in the development of washing machines.

SUMMARY

[0005] Embodiments of the present application provide a washing machine to solve a problem of poor drying effect caused by poor gas-liquid separation due to the fact that most of the moist air is not subjected to a condensation process in an existing ultra-thin washing machine.

[0006] In order to achieve the above purpose, embodiments of the present application provide a washing machine, including an inner tub, an outer tub and a drying assembly. A condensation cavity is formed between a rear wall of the inner tub and a rear wall of the outer tub. The drying assembly includes a heating air duct, and a fan and a heating device that are disposed in the heating air duct. One end of the heating air duct is communicated with an air outlet of the condensation cavity, and another end of the heating air duct is communicated with an air inlet of the inner tub. The fan is used for pumping air in the inner tub into the condensation cavity for condensation, and guiding the air into the heating air duct to be heated by the heating device and then discharged into the inner tub to form circulation, so as to dry laundry in the inner tub. A position, proximate to the air outlet of the condensation cavity, of an inner side face of the rear wall

of the outer tub is recessed in a direction away from the inner tub to form an enlarged cavity.

[0007] In the washing machine provided by the embodiments of the present application, an enlarged cavity recessed in the direction away from the inner tub is formed at the inner side face of the rear wall of the outer tub. The enlarged cavity enlarges a sectional area of the condensation cavity proximate to the air outlet of the condensation cavity, and reduces airflow resistance of this portion of the condensation cavity. As a result, the moist air may easily enter the condensation cavity for condensation process, which reduces the amount of moist air without condensation process that escapes from dehydration holes in the side wall of the inner tub to an inner surface of the rear wall of the outer tub, and thus improves a condensing efficiency. After the moist air entering the condensation cavity is subjected to condensation process, air and water in the moist air may be well separated, and the dried air continues to enter the heating air duct to be heated by a heating device and then is pumped into the inner tub to form circulation. In this way, the drying time is shortened and the drying effect is enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] In order to describe technical solutions in the embodiments of the present application or in the prior art more clearly, accompanying drawings to be used in the description of the embodiments or the prior art will be briefly described below. Obviously, the accompanying drawings to be described below are merely accompanying drawings of some embodiments of the present disclosure, and a person of ordinary skill in the art can obtain other drawings according to these drawings without paying any creative effort.

FIG. 1 is a schematic structural diagram of a washing machine disclosed in the prior art 1;

FIG. 2 is a sectional view of a portion of a structure in which a drying assembly is disposed on an outer tub in a washing machine, in accordance with embodiments of the present application;

FIG. 3 is a schematic diagram illustrating a three-dimensional structure in which a drying assembly is disposed on an outer tub in a washing machine, in accordance with embodiments of the present application;

FIG. 4 is a top view of a drying assembly disposed on an outer tub in a washing machine, in accordance with embodiments of the present application;

FIG. 5 is a schematic diagram illustrating a portion of a structure in which a drying assembly is disposed on a cabinet in a washing machine, in accordance with embodiments of the present application;

FIG. 6 is a sectional view of a portion of a structure in which a drying assembly is disposed on a cabinet in a washing machine, in accordance with embodiments of the present application;

FIG. 7 is a top view of a drying assembly disposed on a cabinet in a washing machine, in accordance with embodiments of the present application;
 FIG. 8 is a side view of a drying assembly disposed on a cabinet in a washing machine, in accordance with embodiments of the present application;
 FIG. 9 is a schematic structural diagram of an outer tub in a washing machine, in accordance with embodiments of the present application;
 FIG. 10 is a sectional view taken along the A-A line in FIG. 4 (without bearing water retaining ribs);
 FIG. 11 is a sectional view taken along the A-A line in FIG. 4 (with a bearing water retaining rib);
 FIG. 12 is a partially enlarged view of a spray device in a washing machine, in accordance with embodiments of the present application;
 FIG. 13 is a schematic structural diagram of a rear cover of an outer tub in a washing machine, in accordance with embodiments of the present application;
 FIG. 14 is a schematic structural diagram of a rear cover of an outer tub in a washing machine, in accordance with another embodiment of the present application;
 FIG. 15 is a schematic structural diagram of a filter screen cleaning spray head in a washing machine, in accordance with embodiments of the present application;
 FIG. 16 is a sectional view taken along the B-B line in FIG. 15;
 FIG. 17 is a schematic diagram of a circulating air path of a condensed airflow in a washing machine, in accordance with embodiments of the present application;
 FIG. 18 is a schematic structural diagram of a sealing member in a washing machine, in accordance with embodiments of the present application;
 FIG. 19 is a schematic structural diagram of a portion of a heating air duct in a washing machine, in accordance with embodiments of the present application;
 FIG. 20 is a schematic structural diagram of a temperature limiter disposed on a heating air duct in a washing machine, in accordance with embodiments of the present application; and
 FIG. 21 is a schematic structural diagram of a temperature limiter disposed on a heating air duct in a washing machine, in accordance with another embodiment of the present application.

DETAILED DESCRIPTION

[0009] Technical solutions in embodiments of the present application will be described clearly and completely below with reference to accompanying drawings in the embodiments of the present application. Obviously, the described embodiments are merely some but not all embodiments of the present application. All other em-

bodiments obtained by a person of ordinary skill in the art on the basis of the embodiments of the present application without paying any creative effort shall be included in the protection scope of the present application.

[0010] In the description of the present application, it will be understood that orientations or positional relationships indicated by terms "center", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", etc. are based on orientations or positional relationships shown in the drawings, which is merely to facilitate and simplify the description of the present application, but not to indicate or imply that the referred devices or elements must have a particular orientation, or must be constructed or operated in a particular orientation. Therefore, these terms should not be construed as limitations to the present application.

[0011] In the description of the present application, it will be noted that term "installed", "communicated" or "connected" is to be understood broadly unless otherwise clearly defined and restricted. For example, it may be a fixed connection, a detachable connection, or an integral connection; and it may be a direct connection, an indirect connection through an intermediate medium, or internal communication between two elements. Specific meanings of the above terms in the present application may be understood by those skilled in the art according to specific situations.

[0012] A conventional washing machine with a drying function, e.g., a washing machine disclosed in the prior art 1, as shown in FIG. 1, mainly includes a machine body 01, a tub 02 and a drying assembly. The drying assembly is mainly composed of a drying duct 03, a fan motor 04, a heater 05, and a condenser structure 06. An air outlet of the drying duct 03 is communicated with a front opening portion of the tub 02, an air suction port of the drying duct 03 is connected to the condenser structure 06, and the other end of the condenser structure 06 is communicated with a rear of the tub 02, so that the tub 02 and the drying assembly form a circulating air path, and the circulating air path is powered by the fan motor 04. Air is heated by the heater 05 and is blown into an interior of the tub 02, and the hot air takes away moisture in the laundry after coming in contact with the laundry in a drum, thereby drying the laundry in the tub 02. The hot air takes away moisture in the laundry and converts into moist air, and the moist air is condensed and cooled by the condenser structure 06 to separate air from water in the moist air; and then the air enters the circulating air path to continue to participate in the drying process, and the water is discharged.

[0013] In order to achieve small body dimensions of an existing ultra-thin washing machine, it is common practice to remove the condenser structure in the conventional washing machine. For example, the prior art CN103797174B discloses a laundry treating machine. The laundry treating machine may include a tub, a drum, an air supply device, a lint filter, a filter cleaning device, and a cooling water supply device. The cooling water

supply device supplies cooling water to an inner rear surface of the tub, so that the moist air in the circulating air path is condensed on the inner rear surface of the tub. That is, the inner rear surface of the tub is a condensation region.

[0014] After the hot air provided by the air supply device comes in contact with the laundry in the drum, the hot air takes away the moisture in the laundry and becomes moist air. There are two paths for the moist air to leave. One path is that the moist air passes through dehydration holes in a rear wall of the drum and reaches the inner rear surface of the tub, and this part of moist air is able to come in contact with condensed water on the inner rear surface of the tub to separate the air from the water, and dried air is sucked by the air supply device and enters the drum again. The other path is that the moist air passes through dehydration holes in a side wall of the drum and reaches an inner side surface of the tub, this part of moist air is basically not condensed, but is sucked by the air supply device and enters the drum again. That is, the moist air frequently enters the drum to come in contact with the laundry in the drum. However, in an actual process, the moist air coming out of the dehydration holes in the side wall of the drum occupies most of moist air, which causes problems of long drying time and poor drying effect.

[0015] Embodiments of the present application provide a washing machine, referring to FIG. 2, including an inner tub 100, an outer tub 200 and a drying assembly 300. A condensation cavity 400 is formed between a rear wall 110 of the inner tub and a rear wall 210 of the outer tub. Referring to FIGS. 3 and 6, the drying assembly 300 includes a heating air duct 310, and a fan 320 and a heating device 330 that are disposed in the heating air duct 310. One end of the heating air duct 310 is communicated with an air outlet 410 of the condensation cavity, and the other end of the heating air duct 310 is communicated with an air inlet 120 of the inner tub. The fan 320 pumps air in the inner tub 100 into the condensation cavity 400 for condensation, guides the air into the heating air duct 310 to be heated by the heating device 330, and then pumps the air into the inner tub 100 to form circulation, so as to dry the laundry. A position, proximate to the air outlet 410 of the condensation cavity, on an inner side face of the rear wall 210 of the outer tub is recessed in a direction away from the inner tub 100 to form an enlarged cavity 220.

[0016] In the washing machine provided by the embodiments of the present disclosure, the enlarged cavity 220 recessed in the direction away from the inner tub 100 is formed at the inner side face of the rear wall 210 of the outer tub. The enlarged cavity 220 enlarges a sectional area of a portion of the condensation cavity 400 proximate to the air outlet 410 of the condensation cavity, and reduces airflow resistance of this portion of the condensation cavity 400. As a result, the moist air may easily enter the condensation cavity 400 for condensation process, which reduces the amount of moist air without con-

densation process that escapes from dehydration holes in a side wall 130 of the inner tub to a side wall 230 of the outer tub, and thus improves the condensation efficiency. The moist air entering the condensation cavity 400 performs a heat exchange with the condensed water. After condensation process, air and water in the moist air may be well separated, and the dried air continues to enter the heating air duct 310 to be heated by the heating device 330, and then is pumped into the inner tub 100 to form circulation. In this way, the drying time is shortened and the drying effect is enhanced.

[0017] The inner tub 100 is a core component for laundry in the washing machine, and is in motion for a long time. In order to ensure performance and strength of the inner tub 100, in the existing technology, the inner tub 100 is formed by connecting the rear wall 110 of the inner tub (i.e., a rear flange of the inner tub 100) and the side wall 130 of the inner tub (i.e., a rim of the inner tub 100). Thus, as shown in FIG. 2, a flanging edge 140 is inevitably formed around the rear of the inner tub 100. The existing flanging edge 140 reduces a gap between this portion of the inner tub 100 and the outer tub 200, i.e., reduces a sectional area of this portion of the condensation cavity 400, thereby increasing airflow resistance to the moist air entering the condensation cavity 400. Since the air flows more easily in a direction with low resistance, the moist air is more likely to flow out through the dehydration holes in the side wall 130 of the inner tub to the side wall 230 of the outer tub. That is, the moist air basically fails to be subjected to the condensation process, and then enters the heating air duct 310 through the air outlet 410 of the condensation cavity. The air outlet 410 of the condensation cavity is located on an upper side of the flanging edge 140, and a partial region of the air outlet 410 is located in a region above a region between the flanging edge 140 and the rear wall 210 of the outer tub. In this way, the condensation effect of moist air is directly affected. Moist air that is not subjected to condensation process repeatedly enters circulating air to come in contact with the laundry in the inner tub 100, which causes the problems of long drying time and poor drying effect. However, the enlarged cavity 220 is provided at a position corresponding to the flanging edge 140, that is, the sectional area of this portion of the condensation cavity 400 is enlarged. As a result, the airflow resistance to the moist air entering the condensation cavity 400 is reduced to promote the moist air to enter the condensation cavity 400, which is conducive to improving the condensation efficiency, shortening the drying time and enhancing the drying effect.

[0018] Forming the enlarged cavity 220 through the rear wall 210 of the outer tub may be implemented in a variety of manners. In one implementation, an overall thickness of the rear wall 210 of the outer tub may be kept unchanged, and the rear wall 210 of the outer tub locally protrudes outwards to form the enlarged cavity 220. In another implementation, as shown in FIG. 2, since some reinforcing ribs 240 exist between an exterior of

the rear wall 210 of the outer tub and a machine body, a space may be vacated by shortening the reinforcing ribs 240 to form the enlarged cavity 220. The enlarged cavity 220 of such an implementation makes full use of a space of the machine body occupied by part of the original reinforcing ribs 240 on the outside of the rear wall 210 of the outer tub. Therefore, dimensions of the machine body are not increased.

[0019] Further, it is also possible to increase a volume of the enlarged cavity 220 by recessing the rear wall 110 of the inner tub towards an inside of the inner tub 100 at a position proximate to the flanging edge 140. Correspondingly, the sectional area of this portion of the condensation cavity 400 is increased, and the airflow resistance to the moist air entering the condensation cavity 400 is reduced, thereby improving the condensation effect, and finally enhancing the drying effect.

[0020] Furthermore, it is also possible to reduce resistance to the airflow entering the condensation cavity 400 by recessing the side wall 130 of the inner tub towards the inside of the inner tub 100 at a position corresponding to the air outlet 410, so as to promote the moist air to more easily enter the condensation cavity 400 for condensation process, thereby improving the condensation effect and finally enhancing the drying effect.

[0021] When the drying process continues, since no strong heat dissipation device is provided outside the outer tub 200, and the outer tub is adjacent to a motor and is affected by heat generated by the motor, a temperature inside the outer tub 200 gradually rises. An inner surface 211 of the rear wall of the outer tub is a region where the condensation process mainly occurs. In order to increase a contact area between the moist air and the condensed water, referring to FIGS. 11 and 12, a spray device 500 is provided in the condensation cavity 400, and the spray device 500 includes a spray head 510. The spray head 510 is disposed on the top of the rear wall 210 of the outer tub, and the spray head 510 sprays condensed water onto the inner surface 211 of the rear wall of the outer tub. The spray head 510 is located on the top, so that the condensed water may be fully dispersed on the inner surface 211 of the rear wall of the outer tub from top to bottom as much as possible. In this way, the contact area between the moist air and the condensed water is increased, and further the condensation efficiency is improved. The spray head 510 sprays the condensed water to the top of the rear wall 210 of the outer tub. On the one hand, the condensed water is used in a main region for condensation process, which may improve the condensation efficiency while saving water; and on the other hand, if the condensed water is sprayed randomly, the condensed water may be sprayed on the rear wall 110 of the inner tub, which may prevent the moist air from passing through the dehydration holes in the rear wall 110 of the inner tub. That is, the amount of moist air that reaches the condensation cavity 400 for condensation process is reduced, thereby weakening the condensation effect, and further affecting the drying time and the drying

effect.

[0022] The current technological production level is relatively developed, and the spray head 510 may be integrally formed with the rear wall 210 of the outer tub. By reducing the number of parts, the product cost may be reduced, and the product assembly time may be shortened.

[0023] Preferably, as shown in FIG. 12, the number of water outlets 511 of the condensed water spray head may be set to two, specifically, a water outlet 511a of the spray head and a water outlet 511b of the spray head. The water outlet 511a of the spray head and the water outlet 511b of the spray head have opposite water outlet directions, and both spray condensed water tightly against the inner surface 211 of the rear wall of the outer tub along a direction parallel to the rear wall 210 of the outer tub. First, the water outlet 511a of the spray head and the water outlet 511b of the spray head have the opposite water outlet directions, so that distribution of the condensed water on the inner surface 211 of the rear wall of the outer tub may be better taken into account comprehensively; in addition, the spray head 510 sprays the condensed water tightly against the inner surface 211 of the rear wall of the outer tub along the direction parallel to the rear wall 210 of the outer tub, which may reduce the amount of condensed water splashed into a region in the condensation cavity 400 except for the inner surface 211 of the rear wall of the outer tub, thereby improving the condensation efficiency while avoiding water waste.

[0024] It can be understood that, in order to facilitate installation of the inner tub 100 into the outer tub 200, as shown in FIGS. 4 and 9, the outer tub 200 includes an outer tub front cover 250 and an outer tub rear cover 260. In this way, the inner tub 100 may be first assembled to the outer tub rear cover 260 through a bearing, and then the outer tub front cover 250 is connected to the outer tub rear cover; in addition, a sealing ring is provided at a joint between the outer tub front cover 250 and the outer tub rear cover 260. In this way, it may be ensured that the outer tub 200 has a good sealing performance and is not likely to leak water and air.

[0025] During a drying process, small impurities such as lint and flocks may be produced from the laundry. These small impurities are easily sucked into the heating air duct 310, and then are attached to fan blades of the fan 320 and heating pipes of the heating device 330. If the fan blades absorb too many impurities, performance reduction or even failure of the fan 320 is caused, thereby affecting the drying efficiency; and if too many impurities are adhered to the heating pipes, a scorching smell or even a hidden danger of fire is easily caused. Therefore, if these impurities are not removed in time, a service life of the product may be shortened, and even potential safety hazards are brought to users. In order to reduce the occurrence of the above situation, referring to FIG. 2, the air outlet 410 of the condensation cavity is provided in the side wall 230 of the outer tub. In order to reduce parts,

the air outlet 410 of the condensation cavity and the side wall 230 of the outer tub are integrally formed. Referring to FIG. 9, a filter screen 600 is provided in the air outlet 410 of the condensation cavity, and the filter screen 600 may filter small impurities such as lint to prevent excessive lint from attaching to the heating air duct 310 to block the heating air duct 310, thereby increasing the circulation efficiency. In addition, the filter screen 600 may be implemented in a variety of manners. In one implementation, the filter screen 600 may be integrally formed with the side wall 230 of the outer tub. In addition to having the effect brought by reducing the parts, in the above solution that the rear wall 210 of the outer tub is locally thinned to form the enlarged cavity 220, the filter screen 600 and the side wall 230 of the outer tub are integrally formed, which may increase a strength of the thinned portion of the rear wall 210 of the outer tub to prevent the rear wall 210 of the outer tub from being locally deformed. Of course, in other implementations, the filter screen 600 may also be produced separately and then installed in the air outlet 410 of the condensation cavity, and this implementation has an advantage of low requirements on a production process.

[0026] However, in a case where too many small impurities are accumulated on the filter screen 600, the small impurities are likely to adhere together and fall off as agglomeration of the small impurities increases, and then enter the inner tub 100 along the circulating air path and adhere to the rear wall 110 of the inner tub and the side wall 130 of the inner tub. As a result, in addition to adhering to the laundry to affect the cleaning effect of the laundry, the small impurities also hinder outflow of the moist air, thereby affecting the drying effect of the laundry. Therefore, as shown in FIG. 14, a filter screen cleaning spray head 700 may be provided at the filter screen 600, and the filter screen cleaning spray head 700 is used for washing the filter screen 600. Since the spray head 510 is disposed on the top of the rear wall 210 of the outer tub, in order to facilitate the return of air to the circulating air path and prevent the fan 320 from sucking back the condensed water, the air outlet 410 of the condensation cavity is generally disposed at a position slightly lower than the top of the outer side wall of the outer tub 200 in actual situations, that is, the air outlet 410 of the condensation cavity is slightly inclined downwards. Correspondingly, the filter screen 600 also has a downward inclined angle, and thus the filter screen cleaning spray head 700 is designed to have a circular arc-shaped structure. As shown in FIGS. 15 and 16, cleaning water sprayed by a cleaning spray head with this structure will flow downwards along the filter screen 600, which may clean a large area of the filter screen 600 while saving product materials. The water outlet of the filter screen cleaning spray head 700 may be processed into a circular arc-shaped water outlet, a plurality of small holes, or other forms according to actual needs. Of course, in another implementation of the filter screen cleaning spray head 700, the filter screen cleaning spray head 700 may also

be designed to have a fan-shaped duckbill structure. In addition, the filter screen cleaning spray head 700 may share a water inlet valve with a main water inlet pipe, or may be connected to a water inlet valve separately. For spray washing of the filter screen 600, if the filter screen cleaning spray head 700 shares a water inlet valve with the main water inlet pipe, the filter screen may be washed in a washing period. In a drying period, when the filter screen is blocked by too many impurities, a power of the fan 320 is decreased. In this case, a control panel of the fan 320 may output a signal to an upper computer, and the washing machine controls the water inlet valve to feed water for spraying after receiving the signal to clean the filter screen 600. If the filter screen cleaning spray head 700 is connected to a water inlet valve separately, it may be controlled separately according to actual needs.

[0027] The drying assembly 300 in the washing machine may be implemented in a variety of manners. In one implementation, as shown in FIG. 3, the drying assembly 300 may be connected to the outer tub 200, and an air inlet of the heating air duct 310 is connected to the air outlet 410 of the condensation cavity in a sealing manner, e.g., in a clamping manner. That is, the heating air duct 310 in the drying assembly 300 is closely attached to the outer tub 200, which may correspondingly shorten the heating air duct 310, so that a path of the heated air in the heating air duct 310 is shortened to reduce heat loss in this process, and further the drying time is shortened, the energy is saved and the product cost is reduced. It can be understood that, the heating air duct 310 is fixed to the top of the side wall 230 of the outer tub through screws, and such an arrangement is conducive to the return of the dry air to the circulating air path. The air inlet of the heating air duct 310 is communicated with the air outlet 410 of the condensation cavity, and an air outlet of the heating air duct 310 is communicated with the air inlet 120 of the inner tub. Therefore, in order to enhance air tightness in an entire air circulating process, referring to FIG. 14, a sealing member 800 may be provided between the air inlet of the heating air duct 310 and the air outlet 410 of the condensation cavity, and a specific structure of the sealing member 800 is shown in FIG. 18. In another implementation, as shown in FIG. 5, the washing machine further includes a cabinet 900, and the drying assembly 300 may be installed on the cabinet 900. The drying assembly 300 is fixed on the cabinet 900 through a cabinet rear wall screw 910, a front upper reinforcement screw 920 and a front plate screw 930, and is integrated with the cabinet 900. Compared to arranging the drying assembly 300 on the outer tub 200, though such an arrangement increases a length of the heating air duct 310, it has good versatility and has little effect on a balance system of the entire washing machine. Both the inner tub 100 and the outer tub 200 move in a process of treating laundry, especially in a process of washing laundry, that is, the outer tub 200 and the drying assembly 300 move relative to each other. Therefore, in order to maintain a good connection state between the outer tub

200 and the drying assembly 300, the air inlet of the heating air duct 310 is communicated with the air outlet 410 of the condensation cavity through a flexible pipe 411. As shown in FIGS. 6, 7 and 8, the flexible pipe 411 may be a corrugated pipe, or other flexible pipes 411 with a certain deformation amount in its length direction. When the outer tub 200 and the drying assembly 300 move relative to each other, the flexible pipe 411 may be deformed, i.e., stretched or compressed. Therefore, in order to balance an air pressure inside a ventilation pipeline between the air inlet of the heating air duct 310 and the air outlet 410 of the condensation cavity with an external air pressure, referring to FIG. 13, an air pressure balance pipe 412 may be provided on the ventilation pipeline.

[0028] In a process of drying the laundry in the inner tub 100, a circulating air path of a condensed airflow is shown in FIG. 17. First, airflow is blown out from the fan 320, enters the heating air duct 310, is heated by the heating device 330, and is guided from the air inlet 120 of the inner tub to the inner tub 100. Then, the airflow passes through the laundry and takes away moisture in the laundry to form moist air, and the moist air passes through the dehydration holes in the rear wall 110 of the inner tub, enters the condensation cavity 400 for condensation process, and then is converted into dry air and water. Finally, the dry air enters the heating air duct 310 from the air outlet 410 of the condensation cavity for circulation.

[0029] Referring to FIG. 10, water guiding rib(s) 270 are provided on the inner surface 211 of the rear wall of the outer tub, and the water guiding rib(s) 270 are used for dispersing and guiding the condensed water sprayed to the inner surface 211 of the rear wall of the outer tub. There are a plurality of water guiding ribs 270, specifically including a first water guiding rib 271, a second water guiding rib 272 and a third water guiding rib 273 that are arranged at intervals in a radial direction of the rear wall 210 of the outer tub. The first water guiding rib 271 is adjacent to the spray head 510, and plays a role of diverting the condensed water sprayed from the spray head 510 from the beginning; and the second water guiding rib 272 is located in an outer layer and has a gap, so that the condensed water flowing along the second water guiding rib 272 located in the outer layer may flow to the third water guiding rib 273 located in an inner layer. The water guiding ribs 270 are distributed on the inner surface 211, serving as a condensation region, of the rear wall of the outer tub, and the water guiding ribs 270 may enable the condensed water to be uniformly distributed on the inner surface 211 of the rear wall of the outer tub, which increases a contact area between the moist air and the condensed water, and is conducive to a full and uniform contact of the two. Therefore, the moist air may be rapidly separated into dry air and water, which improves the condensation efficiency, and the dry air may enter the circulating air path as soon as possible to continue to participate in the drying process, thereby shortening the drying time and improving the drying effect.

[0030] The inner tub 100 is rotatably provided in the outer tub 200, and the rear wall 110 of the inner tub and the rear wall 210 of the outer tub are connected through a bearing. The bearing needs to move frequently. In order to ensure reliability of the bearing and prolong a service life of the bearing, as shown in FIG. 11, a bearing water retaining rib 280 is provided on the inner surface 211 of the rear wall of the outer tub and is located around a bearing of the inner tub 100. A height of the bearing water retaining rib 280 in an axial direction of the inner tub 100 is greater than height(s) of the water guiding ribs 270 in the axial direction of the inner tub 100. With such an arrangement, the bearing water retaining rib 280 may block condensed water dispersed and guided by the water guiding ribs 270, thereby protecting the bearing.

[0031] Correspondingly, as shown in FIGS. 10 and 11, an anti-suck-back water retaining rib 290 is provided on the inner surface 211 of the rear wall of the outer tub and is located around the air outlet 410 of the condensation cavity. The anti-suck-back water retaining rib 290 is used for preventing the condensed water from entering the heating air duct 310. The anti-suck-back water retaining rib 290 has a protective effect on the fan 320 and prevents the fan 320 from water inflow to cause failure. The fan 320 may be a brushless direct current (BLDC) fan 320, which has the advantages of high rotating speed, large air volume, low power consumption, etc., so that the number of airflow cycles per unit time may be increased, the drying time is greatly shortened, and the drying efficiency is improved.

[0032] In order to prevent the heating device 330 from heating the air to an excessively high temperature, a temperature limiter 340 is generally provided on the heating air duct 310. As shown in FIGS. 3 and 7, the temperature limiter 340 can detect heat of a housing of the heating air duct 310. When the heat of the housing of the heating air duct 310 is greater than an upper limit value, the temperature limiter 340 turns off the heating device 330. The temperature limiter may be set in a variety of manners. In one arrangement manner, referring to FIG. 21, a through hole 311 is provided in the outer housing of the heating air duct 310, so that a temperature sensing portion of the temperature limiter 340 at its bottom surface directly passes through the through hole 311 to extend into an interior of the air duct, and the temperature limiter 340 and the housing of the heating air duct 310 are sealed by a rubber gasket. An advantage of such an arrangement is that the temperature limiter 340 may directly sense a temperature of airflow, and thus the sensitivity is high; and a disadvantage of such an arrangement is that the temperature limiter 340 is sealed in the through hole 311 of the housing by the gasket, which may cause a risk of sealing failure. Moreover, with the drying of the machine for a long time, impurities such as lint and limescale will attach to the temperature sensing portion of the temperature limiter 340 at its bottom surface, which causes the sensitivity of the temperature limiter 340 to be decreased. In another arrangement manner, referring to

FIGS. 19 and 20, the housing of the heating air duct 310 is able to conduct heat, and a blind groove 312 is provided at a position, proximate to the heating device 330, of the exterior of the housing of the heating air duct 310. The temperature limiter 340 is provided in the blind groove 312, and the temperature sensing portion of the temperature limiter 340 at its bottom surface is in contact with a surface of the housing. That is, the temperature limiter 340 senses the temperature of the housing. Although a certain delay exists, the delay problem may be solved by adjusting parameters, and temperature uniformity of the housing is good. In this way, a sealing problem is avoided and the sealing cost is reduced. Preferably, in order to correct the detected data and reserve for backup, there may be a plurality of temperature limiters 340. Referring to FIG. 19, for example, two temperature limiters 340 are provided on the heating air duct 310.

[0033] In the description of the specification, specific features, structures, materials or characteristics may be combined in any suitable manner in any one or more embodiments or examples.

[0034] The foregoing descriptions are merely specific implementation of the present application, but the protection scope of the present application is not limited thereto, and changes or replacements that any person skilled in the art could readily conceive of within the technical scope disclosed by the present application shall be within the protection scope of the present application. Therefore, the protection scope of the present application shall be subject to the protection scope of the claims.

Claims

1. A washing machine, **characterized by** comprising an inner tub, an outer tub and a drying assembly;

a condensation cavity being formed between a rear wall of the inner tub and a rear wall of the outer tub;

the drying assembly comprising a heating air duct, and a fan and a heating device that are disposed in the heating air duct, one end of the heating air duct being communicated with an air outlet of the condensation cavity, and another end of the heating air duct being communicated with an air inlet of the inner tub;

the fan being used for pumping air in the inner tub into the condensation cavity for condensation, and guiding the air into the heating air duct to be heated by the heating device and then discharged into the inner tub to form circulation, so as to dry laundry in the inner tub; and

a position, proximate to the air outlet of the condensation cavity, on an inner side face of the rear wall of the outer tub is recessed in a direction away from the inner tub to form an enlarged cavity.

2. The washing machine according to claim 1, **characterized in that** a flanging edge is formed at a junction of a side wall of the inner tub and the rear wall of the inner tub, the flanging edge extends in a direction proximate to the rear wall of the outer tub, the air outlet of the condensation cavity is located on an upper side of the flanging edge, and a partial region of the air outlet is located in a region above a region between the flanging edge and the rear wall of the outer tub.
3. The washing machine according to claim 2, **characterized in that** the rear wall of the inner tub is recessed towards an inside of the inner tub at a position proximate to the flanging edge.
4. The washing machine according to claim 3, **characterized in that** the side wall of the inner tub is recessed towards the inside of the inner tub at a position corresponding to the air outlet.
5. The washing machine according to claim 1, **characterized in that** a spray device is provided in the condensation cavity, and the spray device comprises a spray head; the spray head is disposed on a top of the rear wall of the outer tub, and the spray head sprays condensed water onto an inner surface of the rear wall of the outer tub.
6. The washing machine according to claim 5, **characterized in that** the spray head is integrally formed with the rear wall of the outer tub.
7. The washing machine according to any one of claims 1 to 6, **characterized in that** the air outlet of the condensation cavity is disposed in a side wall of the outer tub, a filter screen is provided in the air outlet of the condensation cavity, and the filter screen is integrally formed with the side wall of the outer tub.
8. The washing machine according to any one of claims 1 to 6, **characterized in that** the drying assembly is connected to the outer tub, and an air inlet of the heating air duct is connected to the air outlet of the condensation cavity in a sealing manner.
9. The washing machine according to any one of claims 1 to 6, **characterized in that** water guiding rib(s) are provided on an inner surface of the rear wall of the outer tub, and the water guiding rib(s) are used for dispersing and guiding condensed water sprayed onto the inner surface of the rear wall of the outer tub.
10. The washing machine according to claim 9, **characterized in that** there are a plurality of water guiding ribs, and the plurality of water guiding ribs are arranged at intervals in a radial direction of the rear wall of the outer tub, and a water guiding rib located

in an outer layer has a gap, so that condensed water flowing along the water guiding rib located in the outer layer is capable of flowing to a water guiding rib located in an inner layer.

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11. The washing machine according to claim 10, **characterized in that** a bearing water retaining rib is provided on the inner surface of the rear wall of the outer tub and is located around a bearing of the inner tub, and a height of the bearing water retaining rib in an axial direction of the inner tub is greater than height(s) of the water guiding ribs in the axial direction of the inner tub. 10
12. The washing machine according to any one of claims 1 to 6, **characterized in that** an anti-suck-back water retaining rib is provided on an inner surface of the rear wall of the outer tub and is located around the air outlet of the condensation cavity, and the anti-suck-back water retaining rib is used for preventing condensed water from entering the heating air duct. 15 20
13. The washing machine according to any one of claims 1 to 6, **characterized in that** a housing of the heating air duct is a heat conductive housing, a blind groove is provided at a position, proximate to a heating device, of an exterior of the housing of the heating air duct, and a temperature limiter is provided in the blind groove; the temperature limiter is capable of detecting heat of the housing of the heating air duct, and when the heat of the housing of the heating air duct is greater than an upper limit value, the temperature limiter turns off the heating device. 25 30

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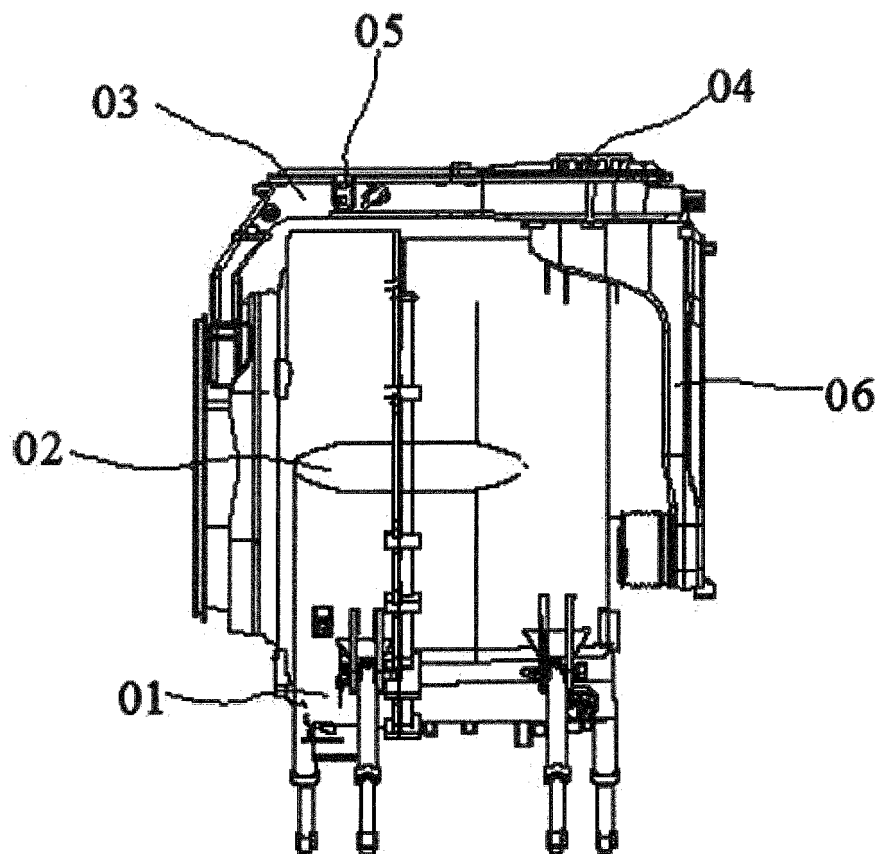


FIG. 1

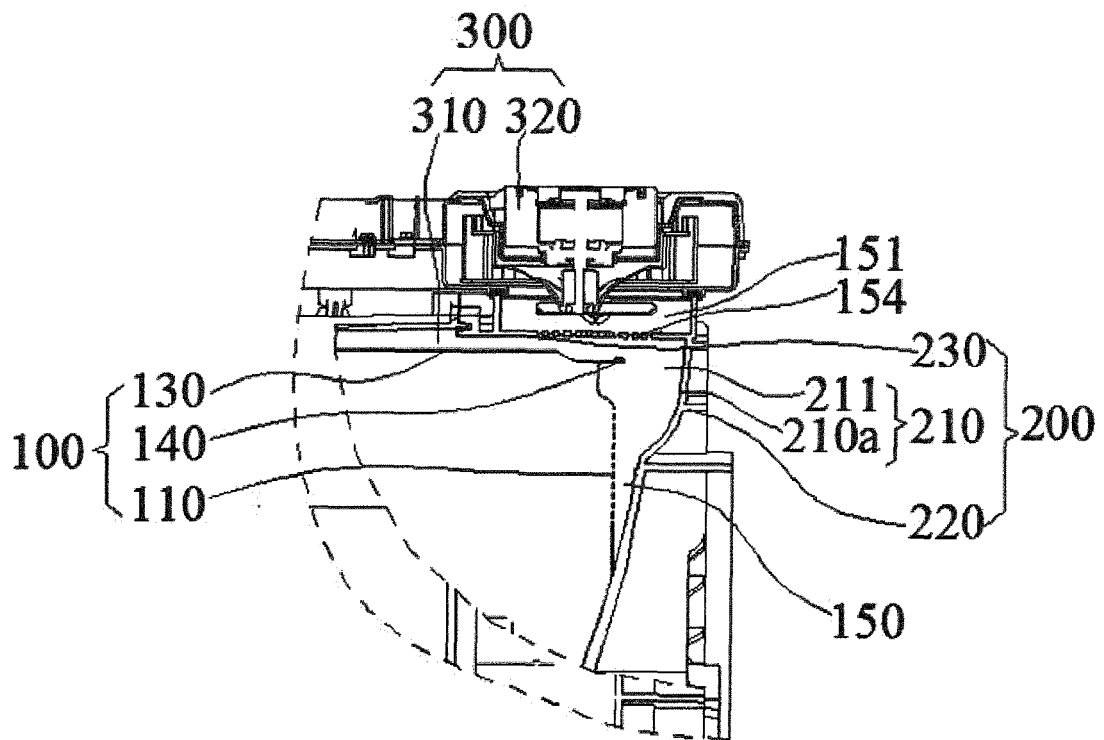


FIG. 2

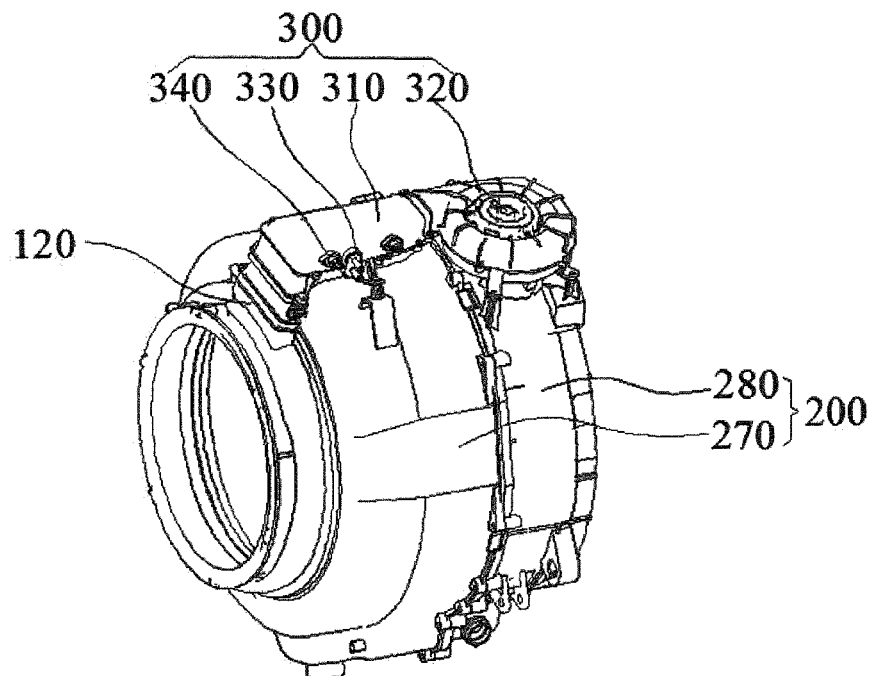


FIG. 3

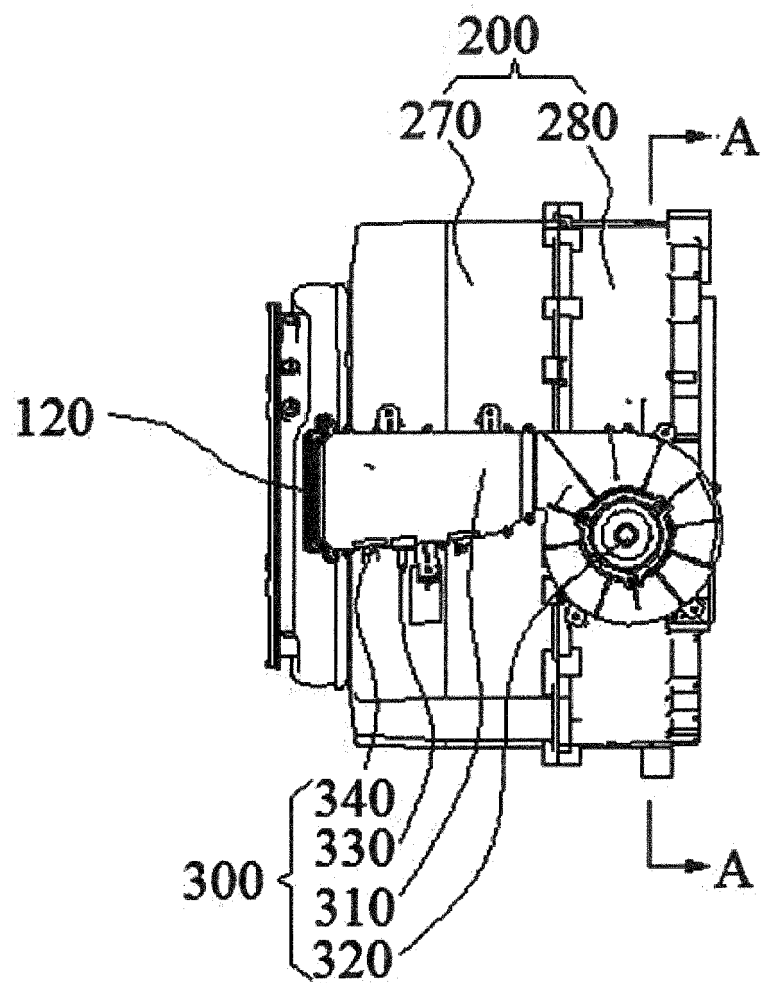


FIG. 4

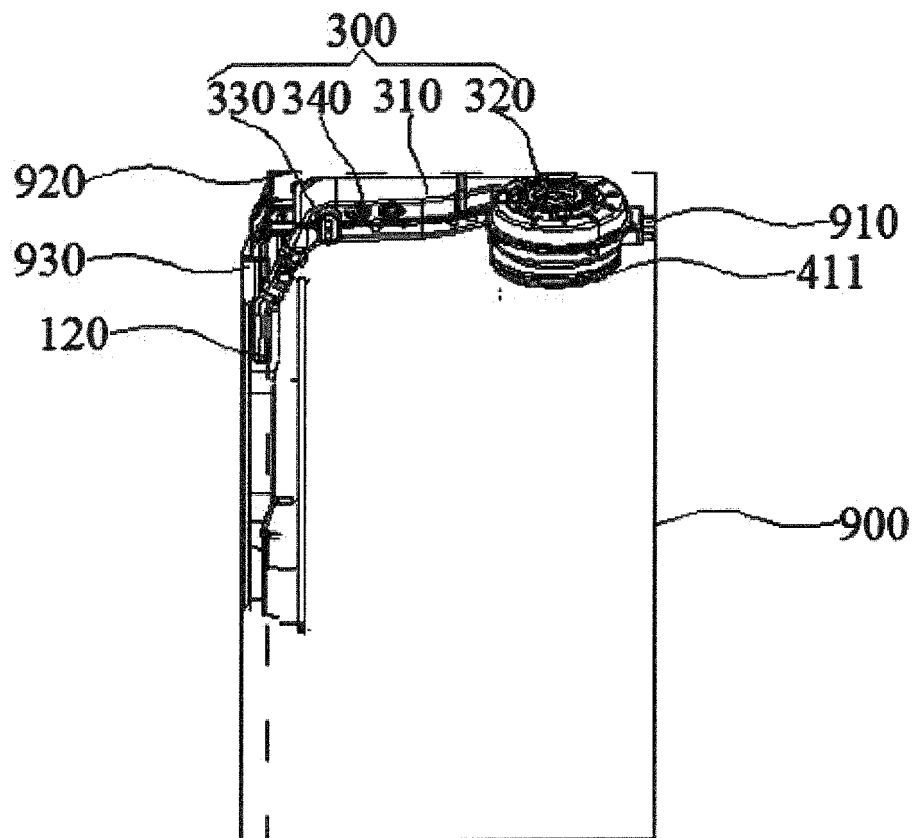


FIG. 5

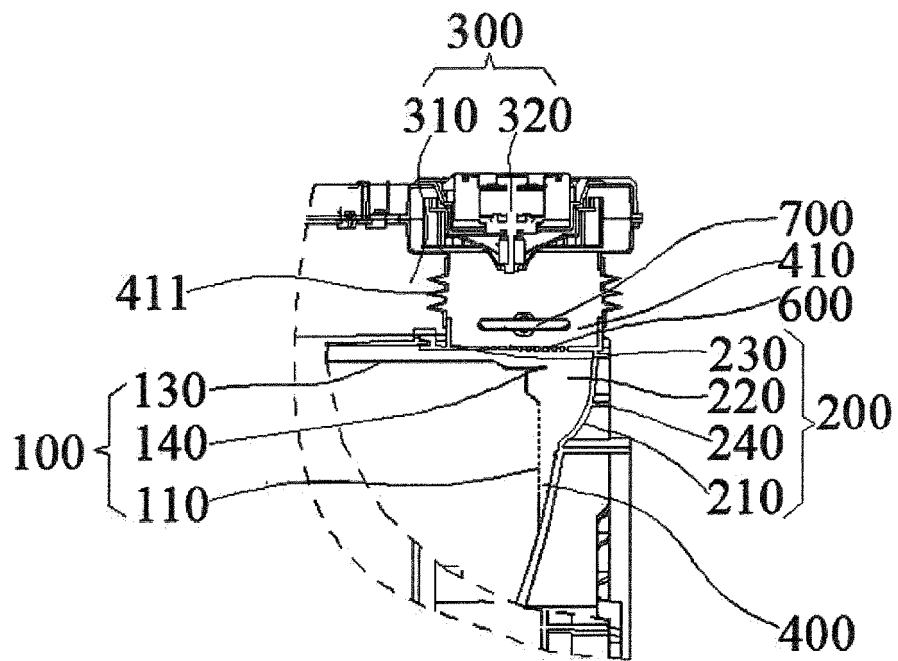


FIG. 6

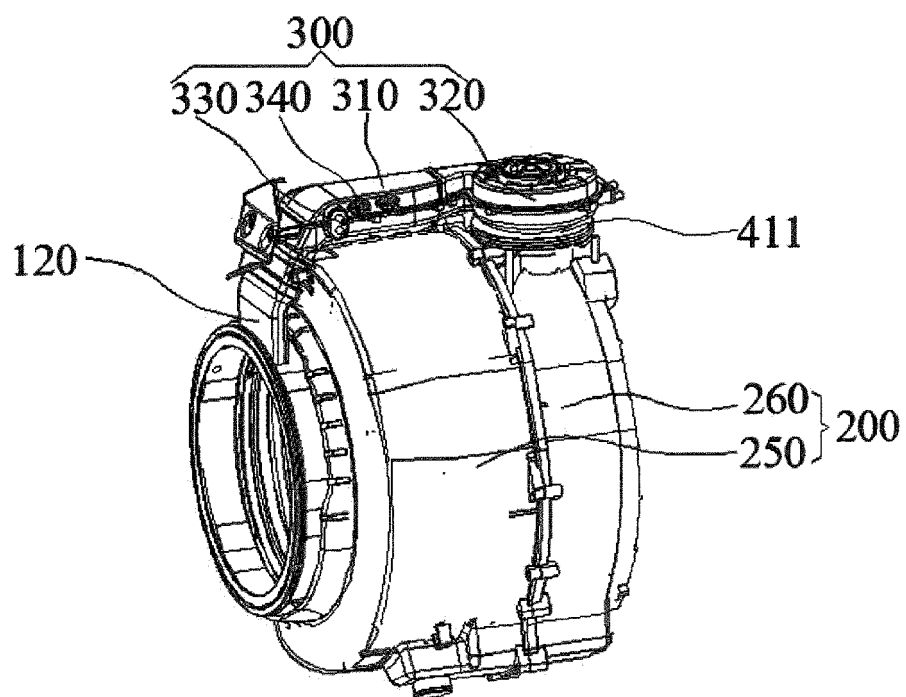


FIG. 7

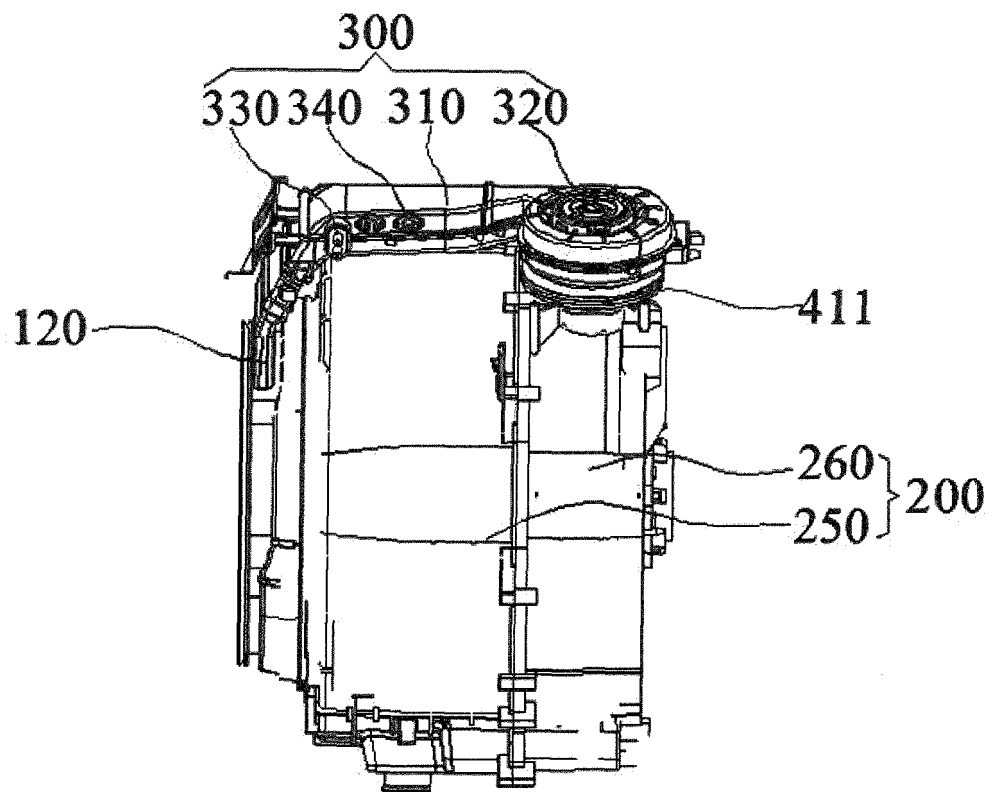


FIG. 8

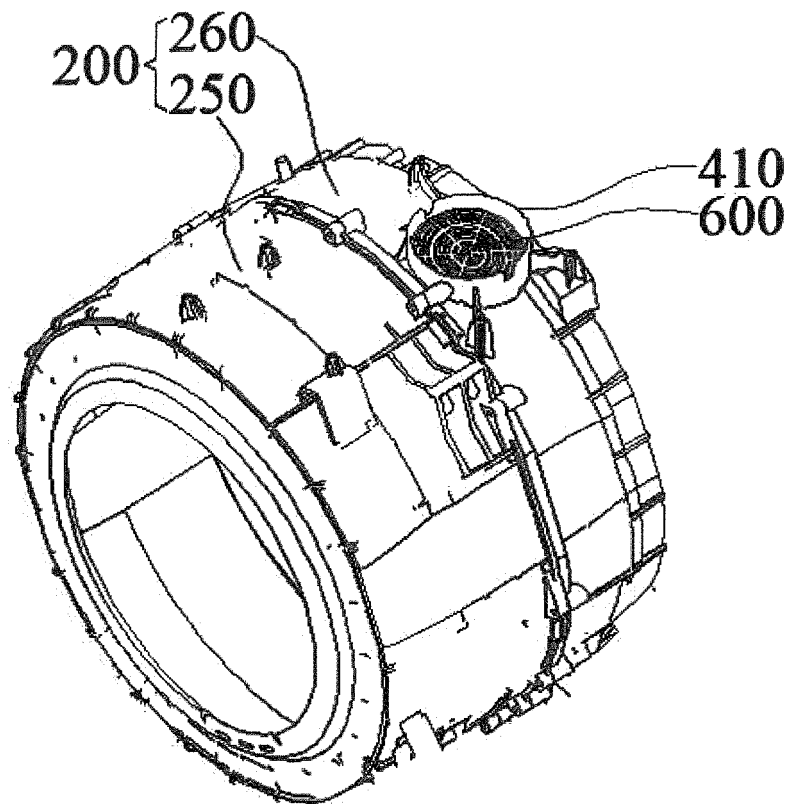


FIG. 9

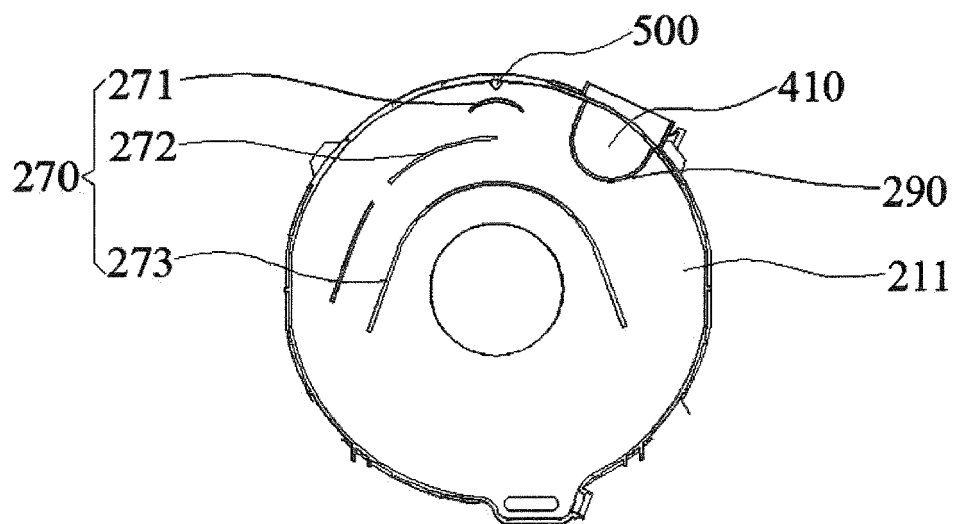


FIG. 10

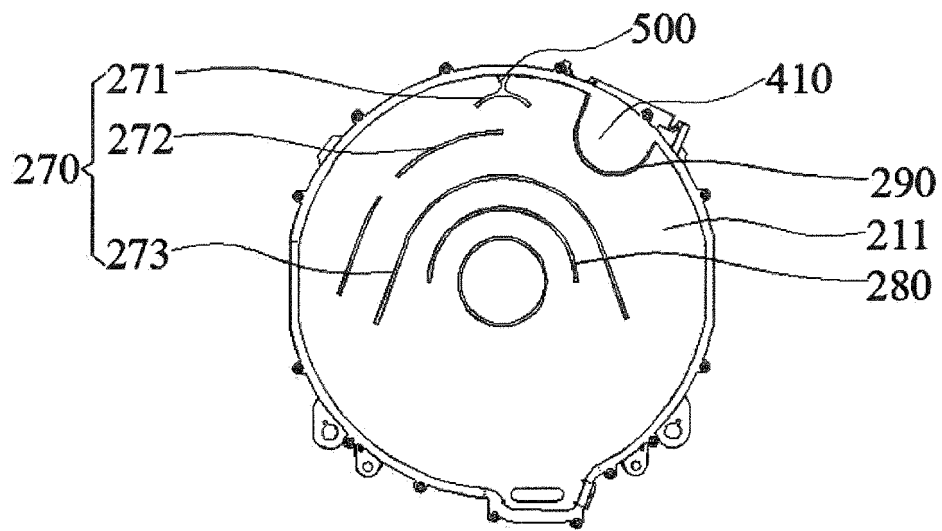


FIG. 11

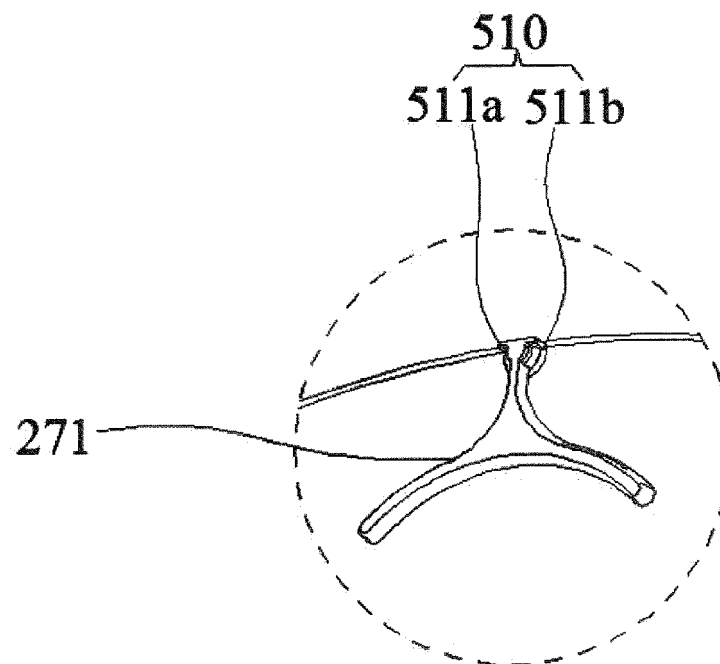


FIG. 12

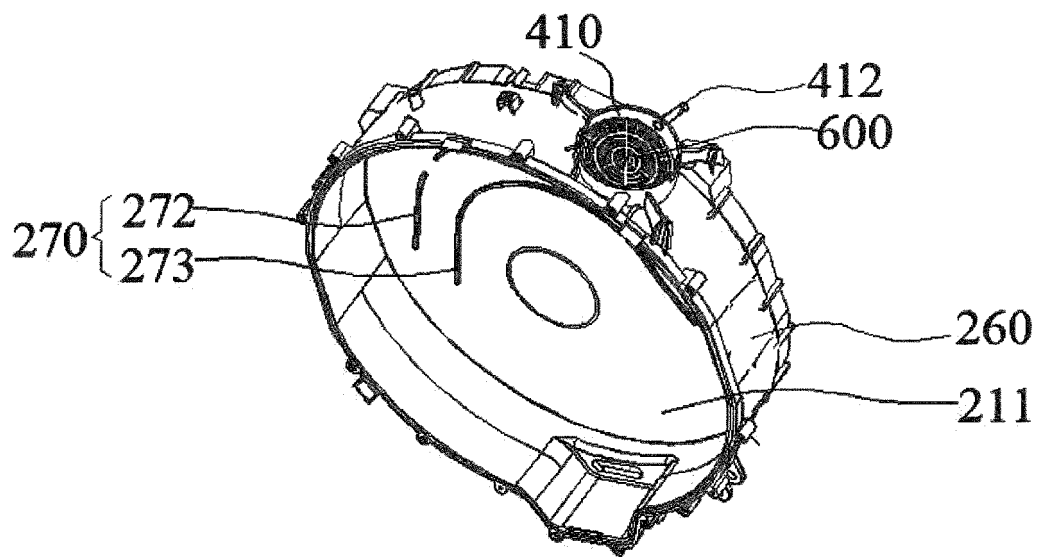


FIG. 13

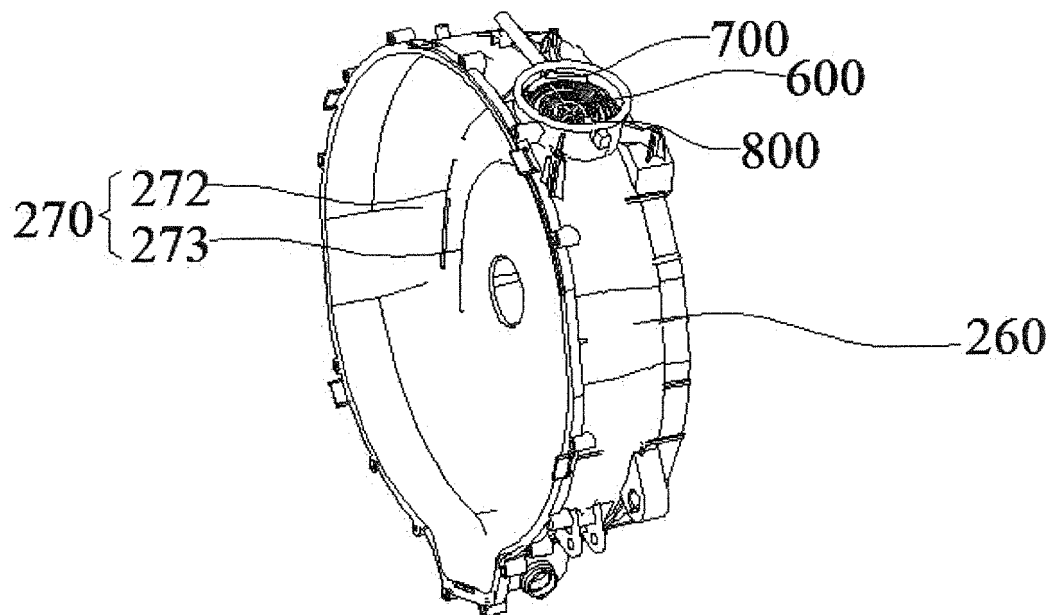


FIG. 14

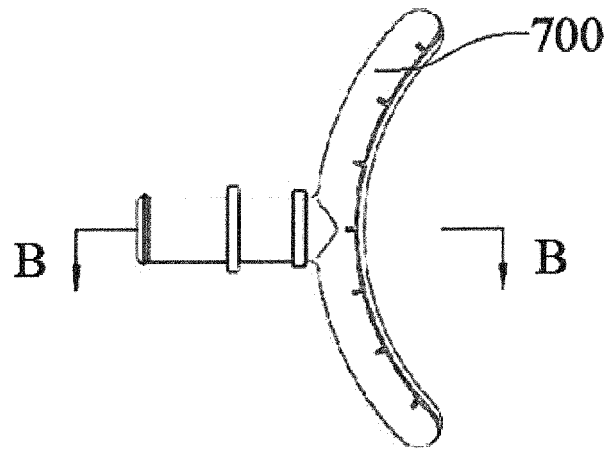


FIG. 15

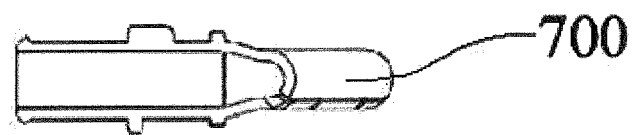


FIG. 16

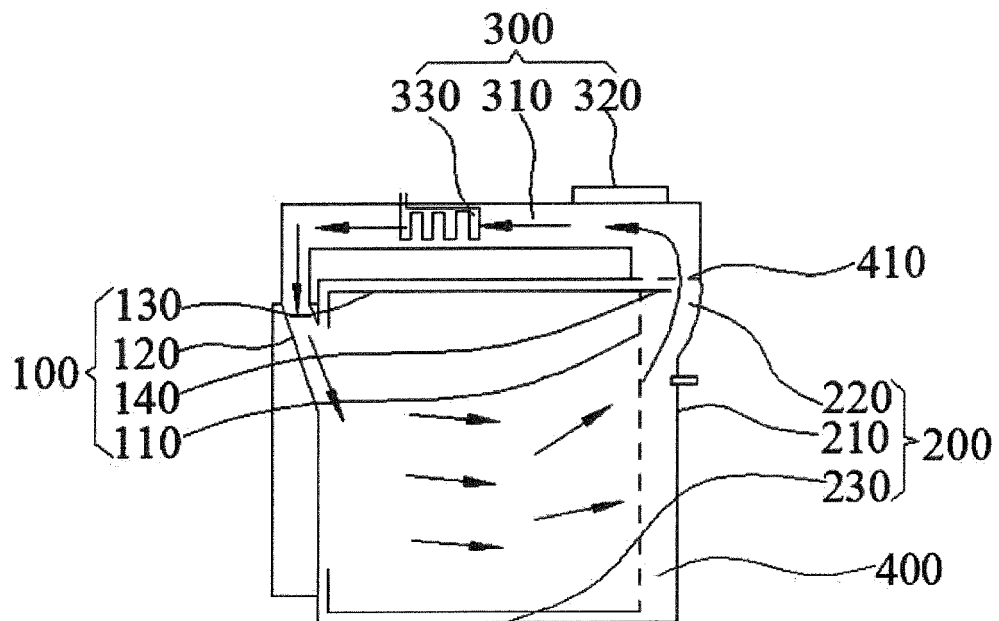


FIG. 17

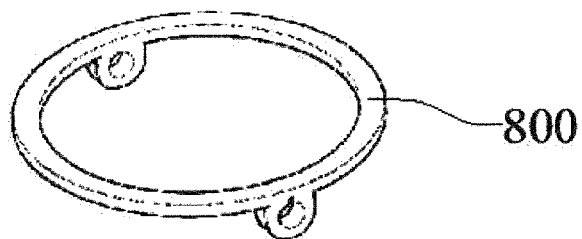


FIG. 18

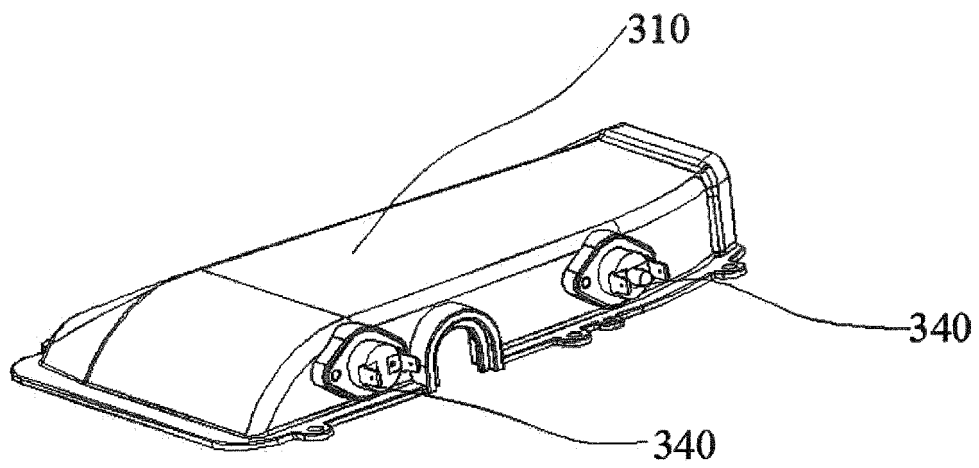


FIG. 19

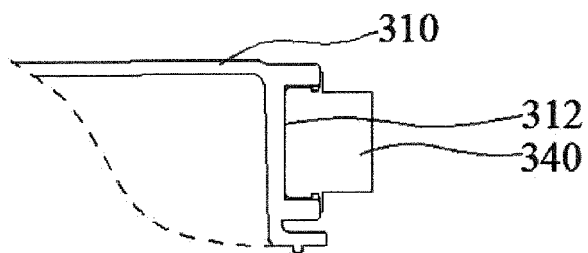


FIG. 20

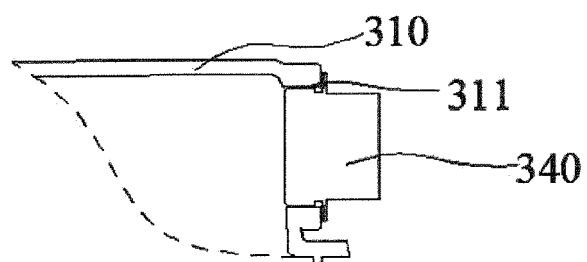


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/112891

A. CLASSIFICATION OF SUBJECT MATTER

D06F 25/00(2006.01)i; D06F 58/24(2006.01)i; D06F 58/22(2006.01)i; D06F 58/26(2006.01)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, WPI, EPODOC, CNKI: 海信, 洗衣机, 烘干, 冷凝, 桶, 筒, 接触面积, 凹陷, 突出, 凸出, 风机, 加热, 喷头, 过滤, 挡水, 温度, Laundry, wash+, dry+, cool+, condens+, contact w area, notch, groove?, recess+, protrud+, fan+, heat+, nozzle? , spray+, jet+, filt+, temperature

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 109267286 A (HISENSE (SHANDONG) REFRIGERATOR CO., LTD.) 25 January 2019 (2019-01-25) claims 1-13	1-13
PX	CN 109554901 A (HISENSE (SHANDONG) REFRIGERATOR CO., LTD.) 02 April 2019 (2019-04-02) description, paragraphs 34-52, and figures 1-21	1-13
Y	CN 103726279 A (SUZHOU SAMSUNNG ELECTRONICS CO., LTD. et al.) 16 April 2014 (2014-04-16) description, paragraphs 50-55, and figures 1-4	1-13
Y	CN 103590216 A (SAMSUNG ELECTRONICS CO., LTD.) 19 February 2014 (2014-02-19) description, paragraphs 84-167, and figures 1-26	1-13
A	CN 104342899 A (SUZHOU SAMSUNNG ELECTRONICS CO., LTD. et al.) 11 February 2015 (2015-02-11) entire document	1-13

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

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“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

03 January 2020

Date of mailing of the international search report

22 January 2020

Name and mailing address of the ISA/CN

China National Intellectual Property Administration
No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing
100088
China

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/112891

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 105648718 A (HISENSE (SHANDONG) REFRIGERATOR CO., LTD.) 08 June 2016 (2016-06-08) entire document	1-13
A	JP 2017104500 A (SAMSUNG ELECTRONICS CO., LTD.) 15 June 2017 (2017-06-15) entire document	1-13

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2019/112891

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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CN	109554901	A	02 April 2019	None			
CN	103726279	A	16 April 2014	None			
CN	103590216	A	19 February 2014	US	9695541	B2	04 July 2017
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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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