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

(72) Inventors:
• **WANG, Meiyang**
Qingdao, Shandong 266736 (CN)
• **ZHOU, Xiaodong**
Qingdao, Shandong 266736 (CN)
• **ZHANG, Peng**
Qingdao, Shandong 266736 (CN)
• **ZHANG, Shudong**
Qingdao, Shandong 266736 (CN)
• **LI, Yajing**
Qingdao, Shandong 266736 (CN)
• **ZHANG, Jian**
Qingdao, Shandong 266736 (CN)
• **LIU, Tiwei**
Qingdao, Shandong 266736 (CN)
• **YAN, Junwang**
Qingdao, Shandong 266736 (CN)
• **YANG, Shuailing**
Qingdao, Shandong 266736 (CN)

(74) Representative: **Zaboliene, Reda**
Metida
Business center Vertas
Gyneju str. 16
01109 Vilnius (LT)

(54) **REFRIGERATOR**

(57) The present disclosure provides a refrigerator, including a storage compartment and a door opening or closing the storage compartment. A vacuum sealing device is disposed on the door. The vacuum sealing device includes an upper support and a lower support opposite to each other and a vacuumization assembly. The lower support is detachably connected to the door; opening cavities are formed on mutually-opposed surfaces of the upper support and/or the lower support; the upper support can move close to or away from the lower support under the drive of a driving device; the upper supports

moves close to the lower support until the upper support and the lower support are butt-joined, and the opening cavities sealingly form a vacuumization region by sealing portions; the vacuumization assembly is in communication with the vacuumization region through a pipe to perform vacuumization or depressurization for the vacuumization region. The refrigerator of the present disclosure can perform vacuum sealing treatment for storage bags holding food materials and perform vacuumization preservation for food materials in various compartments of the refrigerator, expanding the preservation scope. The

lower support of the vacuum sealing device can be dis-mounted for cleaning, facilitating user operation.

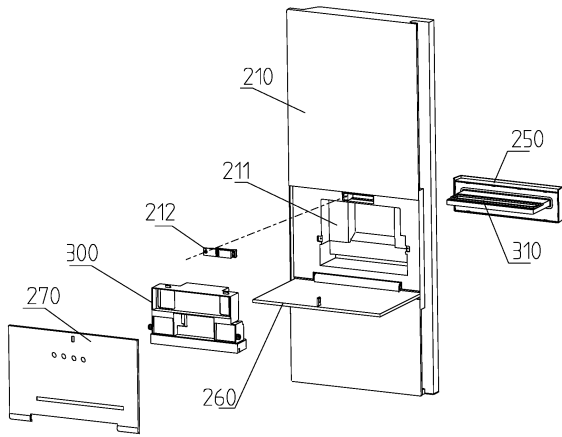


FIG.3

Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Applications No. 201910447697.X, 201920774302.2, 201910448238.3, 201920773601.4, 201910447702.7, 201920773590.X, 201910447696.5, 201920773585.9, 201910448237.9, 201920774300.3, 201910448236.4, 201920773589.7, 201910447688.0, 201920773583.X, 201811457088.4, titled as REFRIGERATOR, filed on May 27, 2019, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of household appliances and in particular to a refrigerator.

BACKGROUND

[0003] In recent years, people have an increasing requirement for food material preservation along with increasing awareness of health. Refrigerator is the commonest household appliance for preservation of food materials. Therefore, the food material preservation storage becomes a technical need to be met in the field of refrigerators.

[0004] At present, various manufacturers launch different preservation technologies for food material preservation storage. For example, with vacuum preservation technology, the condition of food spoilage under vacuum takes change. Firstly, in a vacuum environment, it is difficult for microorganisms and various promoting enzymes to survive and the microorganisms will take a long time to grow. Secondly, under vacuum, oxygen in a container will decrease significantly, various chemical reactions cannot be completed, and foods will not be oxidized, so that the foods can be preserved for long.

[0005] Currently, in the vacuum preservation technology applied to refrigerators, a sealing drawer is provided inside the refrigerator. A miniature vacuum pump is disposed outside the drawer to perform vacuumization treatment for the drawer, so that the drawer maintains in a negative pressure state, thereby realizing preservation of food materials in the drawer. The preservation manner has the following limitations: 1. the vacuum pump will take up a partial storage space of a refrigerating compartment because the vacuumization treatment is to be performed by the vacuum pump; 2. the preservation manner requires sealing for the drawer, otherwise vacuum state cannot be formed inside the drawer, and thus higher requirements are proposed for the forming and assembly process of the drawer; 3. the preservation manner can only perform preservation for the food materials in the drawer and have no preservation effect on those food materials in other regions of the refrigerator.

SUMMARY

[0006] In order to solve the technical problem of poor preservation effect of the existing refrigerators, the present disclosure provides a low-cost refrigerator which does not take storage space and can perform preservation for food materials in all regions.

[0007] In order to solve the technical problem above, the present disclosure provides a refrigerator including a storage compartment and a door opening or closing the storage compartment. The door is provided with a vacuum sealing device including an upper support and a lower support corresponding to each other in position and a vacuumization assembly. The lower support is detachably connected to the door; opening cavities are opened on mutually-facing surfaces of the upper support and /the lower support; the upper support may be moved close to or away from the lower support under the drive of a driving device; the upper support moves close to the lower support until the upper support is butt-joined with the lower support, and the opening cavities sealingly form a vacuumization region by sealing portions. The vacuumization assembly is in communication with the vacuumization region through a pipe so as to perform vacuumization or depressurization for the vacuumization region.

[0008] The technical solution of the present disclosure has the following technical effect compared with the prior art.

[0009] In the present disclosure, the vacuum sealing device is provided on the door of the refrigerator to perform vacuum sealing treatment for a storage bag holding food materials that is to be placed into the refrigerator. Compared with existing vacuum drawer, the vacuum sealing device of the present disclosure may perform vacuumization preservation treatment for food materials stored in different types of compartments of the refrigerator, expanding the scope of preservation. In addition, the lower support in the vacuum sealing device can be dismantled from the door. In this way, food residues pumped into the lower support during the vacuumization process can be cleaned easily by users, improving the user experience and increasing the degree of intelligence of the refrigerator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The preferred examples of the present disclosure will be described below with accompanying drawings to help understanding the object and advantages of the present disclosure.

FIG. 1 is a structural schematic diagram of a refrigerator according to example 1 of the present disclosure.

FIG. 2 is a structural schematic diagram of a refrigerating door according to example 1 of the present disclosure.

FIG. 3 is an exploded diagram of a refrigerating door according to example 1 of the present disclosure.

FIG. 4 is a side sectional diagram of a vacuum sealing device according to the present disclosure.

FIG. 5 is a structural schematic diagram along a forward direction and reverse direction of an upper support of a vacuum sealing device according to the present disclosure.

FIG. 6 is a schematic diagram of assembly of an upper support, a driving device and a vacuumization assembly in a vacuum sealing device according to the present disclosure.

FIG. 7 is an exploded diagram of an upper support, a driving device and a vacuumization assembly in a vacuum sealing device according to the present disclosure.

FIG. 8 is a diagram of connection relationship of an upper support in a vacuum sealing device and a filtering container according to the present disclosure.

FIG. 9 is a diagram of connection relationship of an upper support in a vacuum sealing device and a filtering net according to the present disclosure.

FIG. 10 is an exploded diagram of an upper support, a heating device and a sealing ring according to the present disclosure.

FIG. 11 is a partial sectional view of connection of an upper support and a heating device according to the present disclosure.

FIG. 12 is a schematic diagram of connection relationship of an upper support in an initial position and a driving device according to the present disclosure.

FIG. 13 is a schematic diagram of connection relationship of an upper support in a descending position and a driving device according to the present disclosure.

FIG. 14A is a structural schematic diagram of a lower support, a small insulation door and a door in a locked state according to example 1 of the present disclosure.

FIG. 14B is a structural schematic diagram of a lower support, a small insulation door and a door in an unlocked state according to example 1 of the present disclosure.

FIG. 14C is a structural schematic diagram of dismounting a lower support and a small insulation door from a door according to example 1 of the present disclosure.

FIG. 15 is a structural schematic diagram along a forward direction and a reverse direction of a small insulation door and a lower support in an assembled state according to example 1 of the present disclosure.

FIG. 16 is an exploded view of a small insulation door, a lower support and a locking hook assembly according to example 1 of the present disclosure.

FIG. 17 is a structural schematic diagram of mounting a locking hook assembly onto the small insulation door according to example 1 of the present disclosure.

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FIG. 18 is a partial sectional view of mounting a locking hook assembly onto the small insulation door according to example 1 of the present disclosure.

FIG. 19 is a perspective diagram of a lower hook according to example 1 of the present disclosure.

FIG. 20 is a structural schematic diagram of forward and reverse structures of an upper hook according to example 1 of the present disclosure.

FIG. 21A is a structural schematic diagram of a lower support, a small insulation door and a door in a locked state according to example 2 of the present disclosure.

FIG. 21B is a structural schematic diagram of dismounting a lower support and a small insulation door from a door according to example 2 of the present disclosure.

FIG. 22 is an exploded view of a small insulation door, a lower support and a locking hook assembly according to example 2 of the present disclosure.

FIG. 23A is a structural schematic diagram of a lower support, a small insulation door and a door in a locked state according to example 3 of the present disclosure.

FIG. 23B is a structural schematic diagram of a small insulation door and a door in an unlocked state according to example 3 of the present disclosure.

FIG. 23C is a structural schematic diagram of dismounting a lower support and a small insulation door from a door according to example 3 of the present disclosure.

FIG. 24 is a structural schematic diagram of a refrigerator according to example 4 of the present disclosure.

FIG. 25 is an exploded view of a refrigerating door according to example 4 of the present disclosure.

FIG. 26 is a structural schematic diagram of a refrigerator according to example 5 of the present disclosure.

FIG. 27 is an exploded view of a refrigerating door according to example 5 of the present disclosure.

FIG. 28 is an exploded view of a lower support according to example 5 of the present disclosure.

FIG. 29A is a structural schematic diagram of a lower support and a door in a locked state according to example 5 of the present disclosure.

FIG. 29B is a structural schematic diagram of a lower support dismounted from a door according to example 5 of the present disclosure.

FIG. 30A is a structural schematic diagram of a lower support and a door in a locked state according to example 6 of the present disclosure.

FIG. 30B is a structural schematic diagram of a lower support dismounted from a door according to example 6 of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0011] The technical solution of the present disclosure will be clearly and fully described below in combination with accompanying drawings. In the description of the present disclosure, it is to be understood that orientations or positional relationships indicated by terms such as "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inside", "outside", are based on orientations or positional relationships shown in the drawings and are used only for convenience and simplification of descriptions of the present disclosure, rather than indicate or imply that the indicated apparatus or element shall have a specific orientation and be configured or operated in a specific orientation. Thus, the terms shall not be understood as limiting of the present disclosure. In addition, the terms "first", "second" and "third" are used only for descriptions and shall not be understood as indicating or implying relative importance.

[0012] In the descriptions of the present disclosure, it is noted that the terms "mounting" "connection" and "coupling" shall be understood in a broad sense, for example, it may be a fixed connection, or a detachable connection, or integrated connection; or direct connection or an indirect connection through an intermediate medium, or may be internal communication between two elements. Those skilled in the art may understand the specific meanings of the above terms in the present disclosure according to the specific situations.

[0013] Furthermore, the below-described technical features involved in different examples of the present disclosure may be combined with each other as long as they do not constitute conflict.

Example 1

[0014] FIG. 1 is a perspective diagram of a specific example of a refrigerator according to the present disclosure. With reference to FIG. 1, the refrigerator 1 of the example has an approximate cuboid shape. The external appearance of the refrigerator 1 is defined by a storage compartment 100 defining a storage space and a plurality of doors 200 disposed in the storage compartment 100. By referring to FIG. 2, the door 200 includes a door housing 210 located at an outer side of the storage compartment 100, a door inner liner 220 at an inner side of the storage compartment 100, an upper end cover 230, a lower end cover 240, and an insulation layer located among the door housing 210, the door inner liner 220, the upper end cover 230, and the lower end cover 240. Generally, the insulation layer is formed by filling with foaming materials.

[0015] The storage compartment 100 has an open box body. The storage compartment 100 is vertically divided into a lower freezing compartment 100A and an upper refrigerating compartment 100B. Each of the partitioned spaces may have an independent storage space. Specifically, the freezing compartment 100A is at the lower

part of the storage compartment 100 and may be selectively covered by a drawer-type freezing compartment door A. The space above the freezing compartment 100A is divided into a left side and a right side to form the refrigerating compartment 100B respectively. The refrigerating compartment 100B may be selectively closed or opened by a refrigerating door 200B pivotably mounted on the refrigerating compartment 100B.

[0016] As shown in FIGS. 3 and 4, a vacuum sealing device 300 is provided on the door 200 of the refrigerator to perform vacuumization and plastic sealing for storage bags. The vacuum sealing device 300 may be disposed on a freezing door 200A or may be disposed on a refrigerating door 200B. Because the refrigerating door 200B is located above, the vacuum sealing device 300 is generally preferably disposed on the refrigerating door 200B so as to meet the use habit of users.

[0017] FIGS. 4-17 are an example of the vacuum sealing device 300. In this example, as shown in FIG. 4, the vacuum sealing device 300 includes a lower support 310, provided with a first opening cavity 311; and an upper support 320 provided with a second opening cavity 321. The upper support 320 may be moved close to or away from the lower support 310 under the drive of a driving device 340. After the upper support 320 moves close to the lower support 310 to be in place, the first opening cavity 311 and the second opening cavity 321 are butt-joined and sealed up to form a vacuumization region 301. The above vacuum sealing device 300 locks and unlocks the lower support 310 and the upper support 320 by controlling automatic ascent and descent of the driving device 340, thereby realizing automatic vacuum sealing and improving the degree of intelligence of the refrigerator.

[0018] Specifically, as shown in FIG. 4, in order to improve the sealing of the vacuumization region 301, sealing portions for sealing the vacuumization region 301 are disposed on the opposing surfaces of the lower support 310 and the upper support 320. Specifically, a first sealing groove 313 is disposed on the periphery of the first opening cavity 311 of the lower support 310 and a second sealing groove 323 is disposed on the periphery of the second opening cavity 321 of the upper support 320. The first sealing groove 313 and the second sealing groove 323 are opposed in position and internally provided with a sealing ring 350 respectively. The two sealing rings 350 of the first sealing groove 313 and the second sealing groove 323 seal the vacuumization region 301 inside, realizing reliable sealing of the vacuumization region 301.

[0019] Specifically, as shown in FIG. 5, the first opening cavity 311 or the second opening cavity 321 is internally provided with a limiting portion to limit an inserting position of a storage bag inserted into the vacuumization region 301, thereby preventing an opening position of the storage bag protruding out of the vacuumization region 301. Specifically, the limiting portion is a limiting rib 322 disposed in the first opening cavity 311 or the second opening cavity 321, a height of the limiting rib 322 is greater than a depth of the first opening cavity 311 or the sec-

ond opening cavity 321, and a length of the limiting rib 322 is slightly lower than that of the first opening cavity 311 or the second opening cavity 321. When the user inserts the storage bag into the vacuumization region 301, the limiting rib 322 may block the storage bag from being further inserted inwardly. In other examples, an in-place detection device may also be disposed on the vacuumization region 301. Specifically, a microwave sensor or an infrared sensor may be adopted to detect the presence and absence of the storage bag inserted into the vacuumization region 301, further send a signal indicating whether the storage bag is in place to a controller. The controller may control the vacuum pump to start according to the in-place signal. By disposing the in-place detection device, whether the storage bag is in place is detected automatically and the controller further automatically controls the vacuum pump to be switched on and off.

[0020] The vacuum sealing device 300 further includes a vacuumization assembly 330. As shown in FIGS. 6 and 7, the vacuumization assembly 330 includes a vacuum pump 331 communicating with the vacuumization region 301 through a pipe 335. Further, a pressure detection device 332 and a pressure relief device 333 are disposed on the pipe 335. The pressure detection device 332 is specifically a pressure sensor for detecting a pressure of the vacuumization region 301, and the pressure relief device 333 is specifically an electric pressure relief valve for releasing the pressure of the vacuumization region 301 when the valve is opened. When a user performs vacuumization sealing, the vacuum pump 331 is started to perform vacuumization treatment for the vacuumization region 301. When the pressure detection device 332 detects that the pressure of the vacuumization region 301 reaches a set negative pressure value, the controller controls the vacuum pump 331 to stop. The vacuum degree of the vacuumization region 301 can be controlled by disposing the pressure sensor, and the vacuum pump 331 can be switched on and off based on the detection value of the pressure sensor, thereby guaranteeing the vacuumization effect. After the vacuumization and sealing operations are completed, the above electric pressure relief valve may be started to automatically control the pressure relief of the vacuumization region 301, thereby facilitating taking out the storage bag by users. In order to prevent foreign matters in the vacuumization region 301 entering the vacuum pump 331 through the pipe 335, a filtering protection device is also disposed on the pipe 335. In an example, as shown in FIG. 8, the filtering protection device is specifically a filtering container 334 series-connected with the pipe 335. An inlet and an outlet are disposed on an upper end of the filtering container 334, the inlet is in communication with the vacuumization region 301 through the pipe and the outlet is in communication with the vacuum pump 331 through the pipe. The foreign matters in the vacuumization region 301 enter the filtering container 334 through the pipe 335 and are trapped at the bottom of the filtering container

334, avoiding entry of the foreign matters into the vacuum pump 331. In order to clean the filtering container 334 easily, the filtering container 334 specifically includes a tank body with an opening and an upper cover detachably connected to the tank body. The inlet and the outlet are disposed on the upper cover. During cleaning, the tank body may be dismounted, thereby avoiding the problem of poor sealing of the pipe 335 caused by frequent mounting and dismounting of the pipe 335.

[0021] In another example, as shown in FIG. 9, the filtering protection device is a filtering net 336 disposed on the pipe 335. Specifically, for ease of mounting and dismounting, the filtering net 336 is disposed at a vent 324 at the connection position of the upper support 320 and the pipe 335. The user may perform mounting/dismounting or cleaning for the filtering net 336 from the lower side by moving the upper support 320 to a highest position.

[0022] One connection hole of the vacuumization region 301 connecting with the pipe 335 may be disposed. Of course, in order to prevent vacuumization failure caused by plugging of the connection hole by the foreign matters in the vacuumization region 301 in a case of single connection hole, two or more connection holes may be disposed to connect with the pipe 335 respectively. The pipes 335 are parallel-disposed to connect with a main pipe through a three-way or multi-way connector. The pressure sensor and the electronic pressure relief valve are disposed on the main pipe.

[0023] As shown in FIG. 4, the vacuum sealing device 300 further includes an insulation cushion 360 and a heating device 370 mutually opposed for performing plastic sealing treatment for the storage bag after vacuumization. The insulation cushion 360 and the heating device 370 are located in a sealing zone 302 at an outer side of the vacuumization region 301. Specifically, the heating device 370 is mounted in a groove of a lower surface of the upper support 320. The insulation cushions 360 are mounted in grooves of upper surfaces of the upper support 320 and the lower support 310. When the upper support 320 moves to form the sealed vacuumization region 301 with the lower support 310, the insulation cushion 360 in the sealing zone 302 abuts against the heating device 370. After vacuumization is completed, the storage bag may be quickly sealed by the heating device 370 in the sealing zone 302. After the heating device 370 works for a set time length, the driving device 340 is controlled to drive the upper support 320 to move upward so that the user may pull out the storage bag to complete the plastic sealing.

[0024] More specifically, as shown in FIGS. 10 and 11, the heating device 370 includes a heating wire 371. A heat conducting plate 373 is disposed at a lower side of the heating wire 371 to expand the heating area of the heating wire 371 so that the plastic sealing area of the storage bag is expanded to realize tight sealing. The heating wire 371 extends along a length direction of the upper support 320 and bends upward at both sides of

the upper support 320. The free end of the heating wire 371 extending to an upper side of the upper support 320 is fixed at the upper support 320 through an insulation plate 372. Specifically, the insulation plate 372 is made of insulation material and shaped into a bending plate wrapped around the heating wire 371, thereby avoiding external exposure of the heating wire 371. Further, the two free ends of the heating wire 371 are connected, through a spring 375, to two conducting wires leading from a connection terminal 374. With the spring 375, the heating wire 371 can be always maintained in tensioned state so that the heating wire 371 has a higher flatness. The heat conducting plate 373 at the lower side of the heating wire 371 is in close contact with the storage bag. Thus, the problem of loose contact and incomplete sealing at a particular position due to non-flatness of the heating wire 371 is avoided.

[0025] In the above vacuum sealing device, the driving device 340 may be an electric driving device or an air pressure driving device. Because of large occupation space of the air pressure driving device, the electric driving device is adopted as the driving device 340 in this example. Specifically, as shown in FIGS. 7, 12 and 13, the driving device 340 includes a motor 341 and a transmission mechanism. The transmission mechanism is used to convert a rotational movement of the motor into a rectilinear movement, and an output end of the transmission mechanism is connected with the upper support. The transmission mechanism includes a first gear 342 fixedly connected to an output shaft of the motor and a second gear 343 meshed with the first gear 342, a third gear 344 fixedly connected with the second gear 343 and an output rack 345 meshed with the third gear 344. A pin hole is disposed at a lower side of the output rack 345, and the upper support 320 and the output rack 345 are connected through a pin shaft 346 inserted into the pin hole. Through the transmission mechanism, the rotation of the motor 341 is converted into up and down movement of the upper support 320.

[0026] Specifically, as shown in FIG. 7, a connection plate 347 is disposed between the upper support 320 and the driving device 340. The connection plate 347 is thread-connected with the upper support 320, and a guide groove 3471 is formed on the connection plate 347. A lower end of the output rack is plugged into the guide groove 3471, and an elongated pin hole is disposed at the guide groove 3471 and the lower end of the output rack 345 respectively. The pin shaft 346 is inserted through the pin holes of the guide groove 3471 and the output rack 345. There is a clearance between a lower end surface of the output rack 345 and a groove bottom of the guide groove 3471 and an elastomer 348 is disposed in the clearance.

[0027] As shown in FIG. 12, at an initial position, the upper support 320 is at the highest position. During a pressing stage, as shown in FIG. 13, the driving device 340 brings the upper support 320 to move down. In order to ensure tight mating of the lower support 310 and the

upper support 320, a set rotation stroke of the motor is generally taken as an in-place determination signal. Thus, by disposing the elastomer 348 between the output rack 345 and the guide groove 3471, the upper support 320 is enabled to move downward to be in contact with the lower support 310 and then the output rack 345 can continue moving a distance downwardly. Thus, the elastomer 348 is compressed to prevent stalling of the motor, thereby providing protection for the motor 341 and maintaining the pressing force stable.

[0028] During a vacuumization stage, a sealed vacuumization region 301 is formed between the lower support 310 and the upper support 320, and the upper support 320 moves downward under the action of atmospheric pressure due to decrease of air pressure. At this time, due to existence of the elongated pin hole, the output rack 345 keeps stationary when the upper support 320 moves downward, thereby providing protection for the entire driving device 340.

[0029] In order to accurately control the movement of the upper support 320 and further determine whether the upper support 320 moves to be in place, the vacuumization region 301 is enabled to form a sealed space. In an example, the motor 341 is a stepping motor 341 and whether the upper support 320 moves to be in place can be determined by detecting the rotational stroke of the stepping motor 341. In another example, a microswitch is disposed at the lower support 310 or the upper support 320. After the upper support 320 moves to be in place and then triggers the microswitch, the controller controls the driving device 340 to be stopped and locked at a current position according to a feedback signal of the microswitch.

[0030] One driving device 340 may be disposed. The output gear is located in a middle region of the upper support 320. In this case, it causes an edge area of the upper support 320 and the lower support 310 to be loosely attached, resulting in air leakage of the vacuumization region 301. Thus, in order to provide sealing of the vacuumization region 301, the driving devices 340 are disposed at both sides of the upper support 320 respectively. Correspondingly, one connection plate 347 is disposed, two guide grooves 3471 are disposed on the connection plate 347, and two output racks 345 protrude into the guide grooves 3471 respectively.

[0031] Specifically, as shown in FIGS. 6 and 7, the driving device 340 and the vacuumization assembly 330 are both mounted on a mounting base 305 at the upper side of the upper support 320. A vent 324 is opened at the upper support 320 to communicate with the vacuumization assembly 330. Three cavities are disposed at a side of the mounting base 305, and the cavities include a vacuum pump mounting cavity 3051 at the middle position, and driving device mounting cavities 3052 at right and left sides. In order to guarantee entire aesthetics of external surface of the door 200 of the refrigerator and ease of application of the vacuum sealing device 300, as shown in FIG. 3, a mounting cavity 211 recessed inwardly

is disposed on the door housing 210. The driving device 340 is connected with the upper support 320 and then connected to the mounting base 305 through a screw. The vacuumization assembly 330 is connected with the vent 324 on the upper support 320 and then mounted to the mounting base 305. In this way, one assembly is formed and then entirely mounted into the mounting cavity 211 by inserting a screw through two support lugs at both sides of the mounting base 305. Thus, modularized assembly is realized for various parts with no part exposed out of the external surface, realizing good entirety of the device.

[0032] When the user performs plastic sealing for a storage bag, especially powder-like foods such as flour or liquid or the like by use of the vacuum sealing device 300, the powder or liquid may enter the vacuumization region 301 during vacuumization and finally accumulate in the first opening cavity 311 of the lower support 310. Therefore, in order to help the user to clean the food residues in the lower support 310, the lower support 310 is detachably mounted relative to the door 200.

[0033] The lower support 310 may be mounted on the door 200 in several manners. In this example, as shown in FIGS. 14A-14C, the lower support 310 may be detachably mounted on the door 200 from an inner side of the door 200 (i.e. a side with an inner liner). Because the heat insulation of the door 200 of the refrigerator must be ensured, a small insulation door 250 is disposed at an inner side portion of the lower support 310 facing the storage compartment 100. As shown in FIG. 14C, a mounting hole 201 communicating inside with outside is disposed on the door 200, and the lower support 310 and the small insulation door 250 are inserted into the mounting hole 201 from the inner side of the door 200, thereby realizing dismounting cleaning of the lower support 310 and insulation performance of the door 200 at the same time.

[0034] In an example, as shown in FIG. 15, the lower support 310 and the small insulation door are integrally formed. As shown in FIGS. 15 and 16, the lower support 310 and the small insulation door 250 are formed by a first housing 251 and a second housing 252 with opening cavity structures and an insulation piece disposed between the first housing 251 and the second housing 252. The first housing 251 and the second housing 252 are snap-fitted. The first housing 251 is provided with an extension arm 2511 along a direction away from the second housing 252, and the lower support 310 is formed on the extension arm 2511. The first opening cavity 311 is an open groove formed on an upper side of the extension arm 2511, and a first sealing groove 313 is formed on the periphery of the open groove.

[0035] In order to further ensure the insulation performance of the door 200 and avoid cold leakage occurring from a clearance between the mounting hole 201 and the small insulation door 250, as shown in FIGS. 15 and 16, a small door gasket 253 is disposed between the small insulation door 250 and the door inner liner 220.

Specifically, a support arm 2512 is disposed at the position of the first housing 251 mated with the door inner liner 220 where the size of the support arm 2512 is greater than that of the mounting hole 201. A mounting groove surrounding the mounting hole 201 is disposed on the support arm 2512, and the small door gasket 253 is mounted in the mounting groove.

[0036] Specifically, in order to guarantee the small insulation door 250 is reliably fixed on the door 200, a locking device 400 is disposed between the small insulation door 250 and the door inner liner 220. The locking device 400 is used to lock or unlock the small insulation door 250 on or from the door 200.

[0037] As shown in FIGS. 14A-14C, 16 and 17, the locking device 400 includes a locking hook assembly disposed on the small insulation door 250 and a locking groove 221 disposed on the door inner liner 220. The locking hook assembly includes a locking hook inserted through the small insulation door 250. The locking hook may switch between a first position and a second position. When switching to the first position, the locking hook may be mated with the locking groove 221 to realize the locking of the small insulation door 250 and when switching to the second position, may be separated from the locking groove 221 to realize unlocking of the small insulation door 250.

[0038] Specifically, in order to improve the reliability of the locking device 400, two locking grooves 221 and two locking hooks are disposed respectively. The locking grooves 221 are located at upper and lower sides of the mounting hole 201. As shown in FIGS. 17-20, the locking hook assembly includes an upper locking hook 420 and a lower locking hook 410 and a reset spring 430. As shown in FIG. 19, the lower locking hook 410 includes a hooking portion 414 mated with the locking groove 221 at the lower side, a hinging portion 412 rotatably connected with the small insulation door 250 and a handle portion 411 at the lower side of the small insulation door 250. The handle portion 411 and the hooking portion 414 are located at both sides of the hinging portion 412 respectively. The lower locking hook 410 further includes a lower connection portion 413 connecting with the upper locking hook 420, where the lower connection portion 413 extends above the handle portion 411. Specifically, an end of the lower connection portion 413 is formed into a T-shaped protrusion 4131. As shown in FIG. 20, the upper locking hook 420 includes a hooking portion 421 mated with the locking groove 221 at the upper side and an upper connection portion 423 connecting with the lower locking hook 410. Specifically, a lower end of the upper connection portion 423 is formed into an open groove structure 4231. The T-shaped protrusion 4131 is inserted into the open groove 4231 to realize connection of the upper locking hook 420 and the lower locking hook 410. The reset spring 430 is disposed between the upper locking hook 420 and an upper end surface of the small insulation door 250. More specifically, a connection shaft 422 is formed on the upper locking hook 420 and the

reset spring 430 is sleeved on the connection shaft 422.

[0039] As shown in FIG. 17, a guide positioning portion is formed on an inner surface of the second housing 252, and the upper connection portion 423 is fitted on the guide positioning portion. The upper locking hook 420 may slide along the guide positioning portion. Specifically, the guide positioning portion is a snapping hook 2521 formed on the inner surface of the second housing 252. The snapping hooks 2521 are located at left and right sides of the upper connection portion 423 and extend a distance up and down, and the upper connection portion 423 is fitted between the two snapping hooks 2521.

[0040] In an initial state, the upper locking hook 420 and the lower locking hook 410 are in the first position under the elastic force of the reset spring 430 to realize the locking of the small insulation door 250 and the door inner liner 220. When the user moves the lower locking hook 410 by hand, the lower locking hook 410 rotates around the hinging portion 412, the hooking portion 414 moves downward to separate from the locking groove 221 at the lower side, and at the same time, the connection portion push up the upper locking hook 420 to move upward so that the upper locking hook 420 separates from the locking groove 221 at the upper side. In this way, the upper locking hook 420 and the lower locking hook 410 are in the second position to realize the unlocking of the small insulation door 250 and the door inner liner 220.

[0041] In order to ensure the external aesthetics of the door 200 of refrigerator, as shown in FIGS. 1 and 2, a bar table door 260 is disposed in the region of the refrigerator door 200 where the vacuum sealing device 300 is located. A lower end of the bar table door 260 is hinged with the door 200 and the bar table door 260 can be flipped to the position where it is perpendicular to the surface of the door housing 210. An upper end of the bar table door 260 is connected with the door housing 210 through a first push ejection switch 212. With the disposal of the bar table door 260 structure, in the state of the bar table door 260 being opened, the storage bag holding foods can be put on the bar table door 260 and then is subjected to vacuum sealing treatment, thereby facilitation operation of users. When the bar table door 260 is closed, the external aesthetics of door 200 can be ensured.

[0042] The inner side of the bar table door 260 further includes an operation panel 270 covered on the outer side of the mounting cavity. An inserting hole 271 is formed on the operation panel 270, and a lower surface of the inserting hole 271 is flushed with an upper surface of the first opening cavity 311. In this case, the vacuum sealing device 300 can be entirely hidden at the rear side of the operation panel 270. When performing vacuum plastic sealing, the user may directly insert the opening of the storage bag from the inserting hole 271 of the operation panel 270, and directly extend it to the upper surface of the first opening cavity 311. When the upper support 320 moves downward, the opening of the storage

bag can be placed in the vacuumization region 301. Specifically, the operation panel 270 is detachably connected to the door housing 210. A display control device 272 is further disposed on the operation panel 270. The display control device 272 includes an indicating device for displaying a working state of the vacuum sealing device 300 and a control button for controlling the vacuum sealing device 300 to stop or start. The user may determine whether to pull out the storage bag according to the working state of the vacuum sealing device 300 indicated by the display control device 272.

[0043] When applying the vacuum sealing device 300, the user may insert the storage bag to be sealed through the inserting hole 271 on the operation panel 270. After the storage bag is inserted to be in place (the storage bag abuts against the limiting rib 322), the user may trigger a start button on the operation panel 270 to start the motor 341 so as to control the upper support 320 to descend until the upper support 320 moves to be in place (sealing the vacuumization region 301) and then control the vacuum pump 331 to start so as to perform vacuumization treatment for the vacuumization region 301. The storage bag is vacuumized through the opening of the storage bag in the vacuumization region 301. When the pressure sensor detects a pressure value reaches the set negative pressure value, the vacuum pump 331 is controlled to stop and the heating device 370 is started to work at the same time. After the heating device 370 works for a set time, the electric pressure relief valve is controlled to start, and then the linear motor 341 is controlled to start to control the upper support 320 to ascend until the first opening cavity 311 separates from the second opening cavity 321. The display control device 272 on the operation panel 270 indicates the user can pull out the storage bag. In this way, the vacuum sealing of the storage bag is completed.

Example 2

[0044] The structure of example 2 is basically same as that of the example 1 except the connection manner of the lower support 310 and the small insulation door 250. Specifically, in this example, as shown in FIGS. 21A and 21B, the lower support 310 is detachably connected to the small insulation door 250. As shown in FIG. 22, the small insulation door 250 is formed of the first housing 251 and the second housing 252 with opening cavity structures and the insulation piece disposed between the first housing 251 and the second housing 252. The first housing 251 is snap-fitted with the second housing 252, the extension arm 2511 is disposed on the first housing 251 along a direction away from the second housing 252, and the lower support 310 is detachably connected to the extension arm 2511.

[0045] Specifically, a first limiting portion extending upward is formed on an end of the extension arm 2511, a second limiting portion mated with the first limiting portion is formed on a lower side of the lower support 310, and

the first limiting portion and the second limiting portion are mated to position the lower support 310 on the extension arm 2511. More specifically, the first limiting portion is a limiting plate and the limiting portion is a baffle plate formed on the bottom of the lower support 310 and extending downwardly. The baffle plate is inserted into the inner side of the limiting plate to mount the lower support 310 to the extension arm 2511, thus avoiding the problem of poor sealing of the vacuumization region caused by horizontal movement of the lower support 310.

[0046] In order to further guarantee the heat insulation of the door 200 and avoid cold leakage occurring from the clearance between the mounting hole 201 and the small insulation door 250, the small door gasket 253 is disposed between the small insulation door 250 and the door inner liner 220. Specifically, the support arm 2512 is disposed at the position of the first housing 251 mated with the door inner liner 220, and the size of the support arm 2512 is greater than that of the mounting hole 201. A mounting groove surrounding the mounting hole 201 is disposed on the support arm 2512 and the small door gasket 253 is mounted in the mounting groove.

[0047] Specifically, in order to guarantee the small insulation door 250 can be reliably fixed on the door 200, the locking device 400 is disposed between the small insulation door 250 and the door inner liner 220.

[0048] As shown in FIG. 22, the locking device 400 includes a locking hook 440 hinged at the bottom of the small insulation door 250. The middle of the locking hook 440 is provided with a hinging shaft for connecting with the small insulation door 250 to connect with the small insulation door 250. The locking device further includes a locking groove formed on the door inner liner 220 to mate with the locking hook and a reset torsion spring 450 sleeved on the hinging shaft. One support leg of the reset torsion spring is abutted against the small insulation door 250 and the other support leg is abutted against the locking hook 440. In an initial state, the torsional force of the reset torsion spring 450 enables the locking hook 450 to be in the first position so that the small insulation door 250 can be mounted on the door.

[0049] Specifically, in order to improve the aesthetics of the small door, a mounting recess is formed on the bottom of the small door and the locking hook is mounted into the mounting recess. FIGS. 21A and 21B show a process of dismounting the small insulation door 250 and the lower support 310. When the small insulation door 250 and the lower support 310 are mounted on the door 200, the locking hook is mated with the locking groove to realize the locked state of the small insulation door 250. When the small insulation door 250 and the lower support 310 are to be dismounted, the locking hook is moved away from the locking groove, the locking device 400 is in an unlocked state, and the small insulation door 250 and the lower support 310 can be pulled out. After the lower support 310 is removed from the small insulation door 250, cleaning can be performed for the lower support 310. In this example, the lower support 310 is

detachably connected to the small insulation door 250, facilitating cleaning the lower support 310.

Example 3

[0050] The structure of the example 3 is basically same as that of the example 1 except the connection manner of the lower support 310, the small insulation door 250 and the door 200.

[0051] As shown in FIGS. 23A-23C, the lower support 310 and the small insulation door 250 are disposed independent from each other. The lower side of the mounting hole 201 is provided with a limiting portion limiting the lower support 310 to be in place, one end of the lower support 310 is abutted against the limiting portion and the other end is abutted against the small insulation door 250. In this case, the small insulation door 250 can be mounted to the door 200 by use of the locking device 400 of example 1 or 2.

Example 4

[0052] The structure of the example 4 is basically same as that of the example 1 except the structure of the area of the door 200 where the vacuum sealing device 300 is located.

[0053] Specifically, in this example, as shown in FIGS. 24 and 25, in order to ensure the external aesthetics of the door 200 of the refrigerator and avoid exposure of the vacuum sealing device 300 at the outer side of the door 200, an auxiliary door plate 280 is disposed at the area of the door 200 where the vacuum sealing device 300 is located. The auxiliary door plate 280 has a width identical with that of other area of the door 200. The auxiliary door plate 280 is connected to the area by snap fitting or bonding. A surface of the auxiliary door plate 280 is flushed with the surface of other area of the door 200. An inserting hole 281 is formed on the auxiliary door plate 280 and a lower surface of the inserting hole is flushed with the upper surface of the first opening cavity 311. When performing vacuum plastic sealing, the user may directly insert the opening of the storage bag from the inserting hole 281 of the auxiliary door plate 280 and directly extend it to the upper surface of the first opening cavity 311. When the upper support 320 moves downward, the opening of the storage bag can be placed in the vacuumization region 301. A display control device 282 is further disposed on the auxiliary door plate 280. The display control device 282 includes an indicating device for displaying a working state of the vacuum sealing device 300 and a control button for controlling the vacuum sealing device 300 to stop or start. The user may determine whether to pull out the storage bag according to the working state of the vacuum sealing device 300 indicated by the indicating device.

Example 5

[0054] The structure of the example 5 is basically same as that of the example 1 except the manner of mounting the lower support 310 to the door 200.

[0055] Specifically, as shown in FIGs. 26-29, in this example, the lower support 310 is detachably mounted to the door 200 from the outer side of the door 200.

[0056] More specifically, the lower support 310 is detachably connected to the door 200 by push ejection. As shown in FIGS. 27 and 28, a connection surface of the lower support 310 connecting with the door 200 is provided with a second push ejection switch 380. The second push ejection switch 380 includes a push ejection lock 381, and a lock catch 382. A groove for receiving the lock catch 382 is disposed on an inner side surface of the lower support 310 and the push ejection lock 381 is fixed on the outer side surface of the door 200.

[0057] As shown in FIG. 29A, when the lower support 310 is pressed along a direction perpendicular to the door 200, the push ejection lock 381 is fitted with the lock catch 382, and the lower support 310 is mounted on the door 200. As shown in FIG. 29B, when the lower support 310 is pressed again, the push ejection lock 381 releases the lock catch 382 so that the lower support 310 is dismounted from the door 200. In this way, the user may perform cleaning for the lower support 310 separately, facilitating user operation.

Example 6

[0058] The structure of the example 6 is basically same as that of the example 5 except the manner of mounting the lower support 310 on the door 200.

[0059] Specifically, in this example, as shown in FIGS. 30A and 30B, the lower support 310 is detachably mounted to the door 200 from the outer side of the door 200.

[0060] More specifically, the lower support 310 is detachably connected to the door 200 by snap fitting. A first fitting portion 391 and a second fitting portion 392 mutually mated are formed respectively on the lower support 310 and the door 200. The first fitting portion 391 is formed on the lower surface of the lower support 310 and specifically is a bending hook. The second fitting portion 392 is fixedly connected to a front side surface of the door 200. The lower support 310 moves close to the door 200 until the first fitting portion 391 and the second fitting portion 392 are mated, realizing the mounting of the lower support 310. During dismounting, the lower support 310 is pulled outwardly, and the first fitting portion 391 and the second fitting portion 392 are separated due to elastic deformation. Thus, the user can perform separate cleaning for the lower support 310, facilitating user operation.

[0061] Obviously, the above examples are only used to clearly describe the present disclosure rather than limit the present disclosure. Those skilled in the prior art may make different types of other changes or modifications based on the above descriptions. All examples are not

necessarily or cannot be exhausted herein. All apparent changes or modifications derived herein still fall within the scope of protection of the present disclosure.

Claims

1. A refrigerator, comprising:

a storage compartment;
a door opening or closing the storage compartment, wherein a vacuum sealing device is disposed on the door, and the vacuum sealing device comprises:

an upper support and a lower support opposite to each other, wherein opening cavities are formed on mutually-opposed surfaces of the upper support and/or the lower support; when the upper support and the lower support are butt-joined, the opening cavities sealingly form a vacuumization region by sealing portions; the lower support is detachably mounted to the door;
a driving device configured to drive the upper support close to or away from the lower support;
a vacuumization assembly in communication with the vacuumization region through a pipe to perform vacuumization or depressurization for the vacuumization region.

2. The refrigerator according to claim 1, wherein a mounting hole communicating inside with outside is formed on the door, the lower support and a small insulation door are disposed in the mounting hole, and the small insulation door is at an inner side of the door.

3. The refrigerator according to claim 2, wherein the small insulation door and the lower support are integrally formed.

4. The refrigerator according to claim 3, wherein the lower support and the small insulation door are formed of a first housing and a second housing with opening cavities and an insulation piece disposed between the first housing and the second housing; the first housing is snap-fitted with the second housing, the first housing is provided with an extension arm along a direction away from the second housing, and the lower support is formed on the extension arm.

5. The refrigerator according to claim 2, wherein the lower support is detachably connected to the small insulation door.

6. The refrigerator according to claim 3, wherein the lower support and the small insulation door are formed of the first housing and the second housing with opening cavities and the insulation piece disposed between the first housing and the second housing; the first housing is snap-fitted with the second housing, the first housing is provided with an extension arm along a direction away from the second housing, and the lower support is formed on the extension arm. 5
7. The refrigerator according to claim 2, wherein a small door gasket is disposed between the small insulation door and a door inner liner.
8. The refrigerator according to claim 2, wherein a locking device is disposed between the small insulation door and the door inner liner, and the locking device is used to lock the small insulation door to the door. 10
9. The refrigerator according to claim 7, wherein the locking device comprises: 15
 - a locking hook assembly disposed on the small insulation door and a locking groove disposed on the door inner liner;
 - wherein the locking hook assembly comprises a locking hook inserted through the small insulation door, the locking hook switches between a first position and a second position, and the locking hook, when in the first position, is mated with the locking groove to lock the small insulation door, and when in the second position, is separated from the locking groove to unlock the small insulation door. 20
10. The refrigerator according to claim 1, wherein the lower support is detachably mounted to the door from an outer side of the door. 25
11. The refrigerator according to claim 10, wherein the lower support is detachably connected to the door through a second push ejection switch, or the lower support is detachably connected to the door by snap-fitting. 30
12. The refrigerator according to claim 1, wherein the vacuum sealing device further comprises an insulation cushion disposed at one of the lower support and the upper support; and a heating device disposed at the other of the lower support and the upper support, wherein the insulation cushion and the heating device are opposed to each other. 35
13. The refrigerator according to claim 1, wherein the vacuumization assembly comprises a vacuum pump in communication with the vacuumization region through a pipe; a pressure detection device and a pressure relief device are further disposed on the pipe, the pressure detection device is used to detect the pressure of the vacuumization region, and the pressure relief device is controlled to release the pressure of the vacuumization region. 40
14. The refrigerator according to claim 13, wherein the driving device comprises a motor and a transmission mechanism, the transmission mechanism is used to convert a rotational movement of the motor into a rectilinear movement and an output end of the transmission mechanism is connected with the upper support. 45
15. The refrigerator according to claim 13, wherein the driving device and the vacuumization assembly are mounted in one mounting base, a mounting cavity recessed inwardly is disposed at the door housing, and the mounting base and the upper support are mounted into the mounting cavity. 50
16. The refrigerator according to claim 15, wherein a bar table door is disposed at an area of the outer side of the door where the vacuum sealing device is located, a lower end of the bar table door is hinged with the door, and an upper end of the bar table door is connected with the door housing through a first push ejection switch. 55
17. The refrigerator according to claim 16, wherein an inner side of the bar table door further includes an operation panel covered on an outer side of the mounting cavity, an inserting hole applicable for inserting a storage bag to be inserted is formed on the operation panel, a display control device is further disposed on the operation panel and the display control panel comprises an indicating device for displaying a working state of the vacuum sealing device.
18. The refrigerator according to claim 17, wherein an auxiliary door plate is disposed at an area of the door where the vacuum sealing device is located, a surface of the auxiliary door plate is flushed with a surface of the door housing, an inserting hole applicable for inserting a storage bag to be inserted is formed on the auxiliary door plate, a display control device is further disposed on the auxiliary door plate and the display control device comprises an indicating device for displaying a working state of the vacuum sealing device.

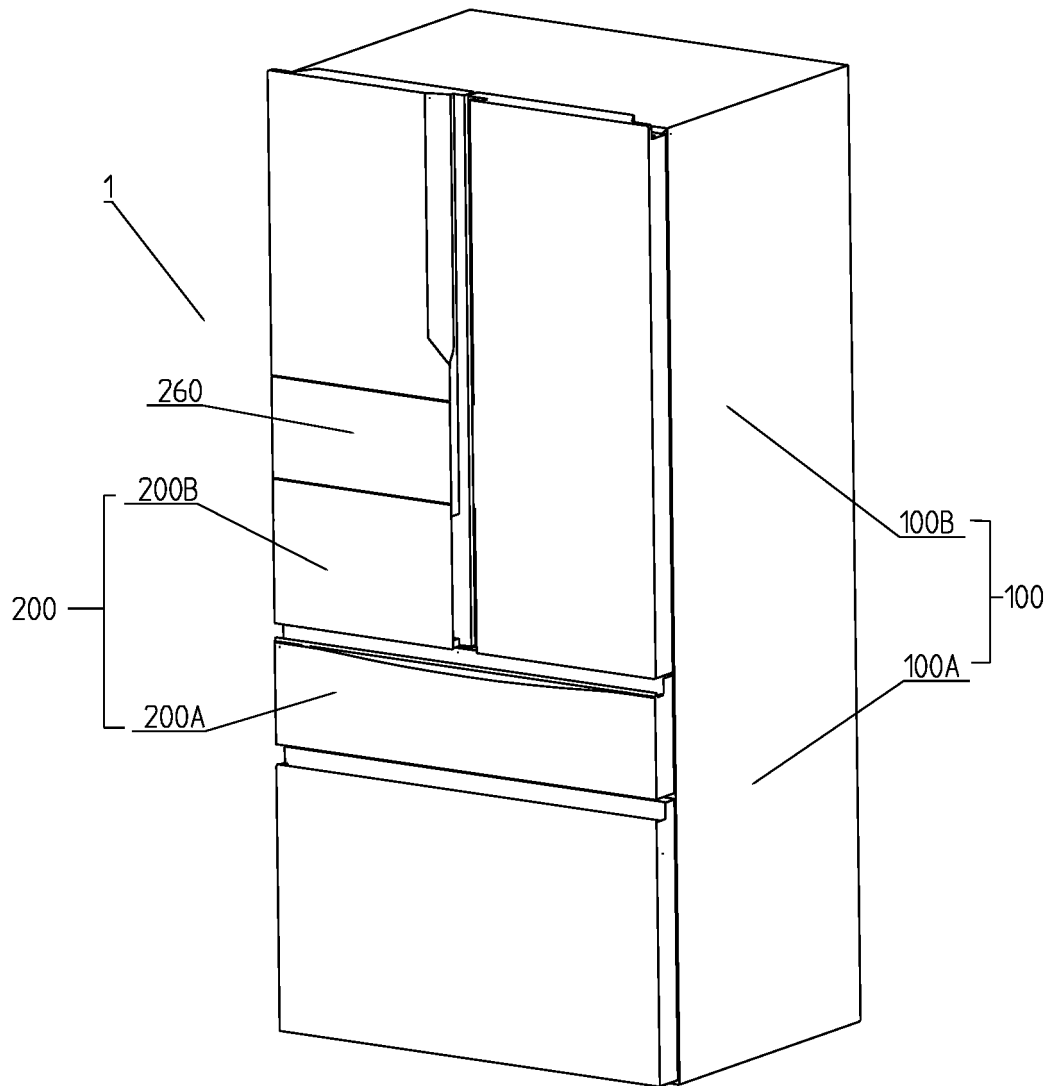


FIG.1

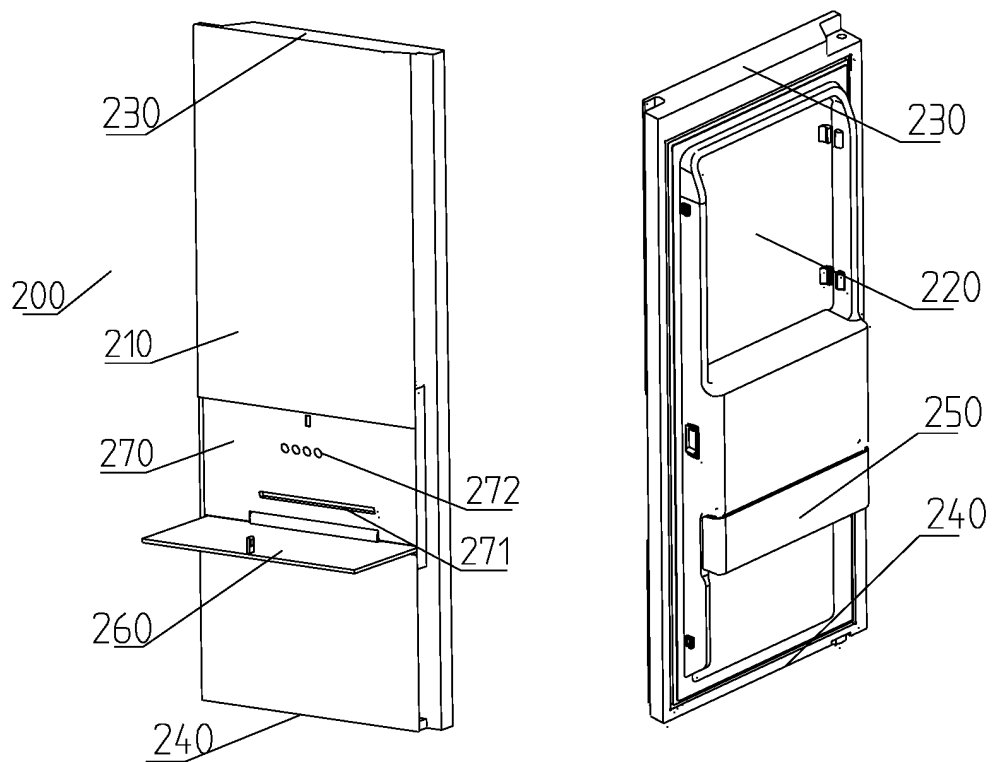


FIG.2

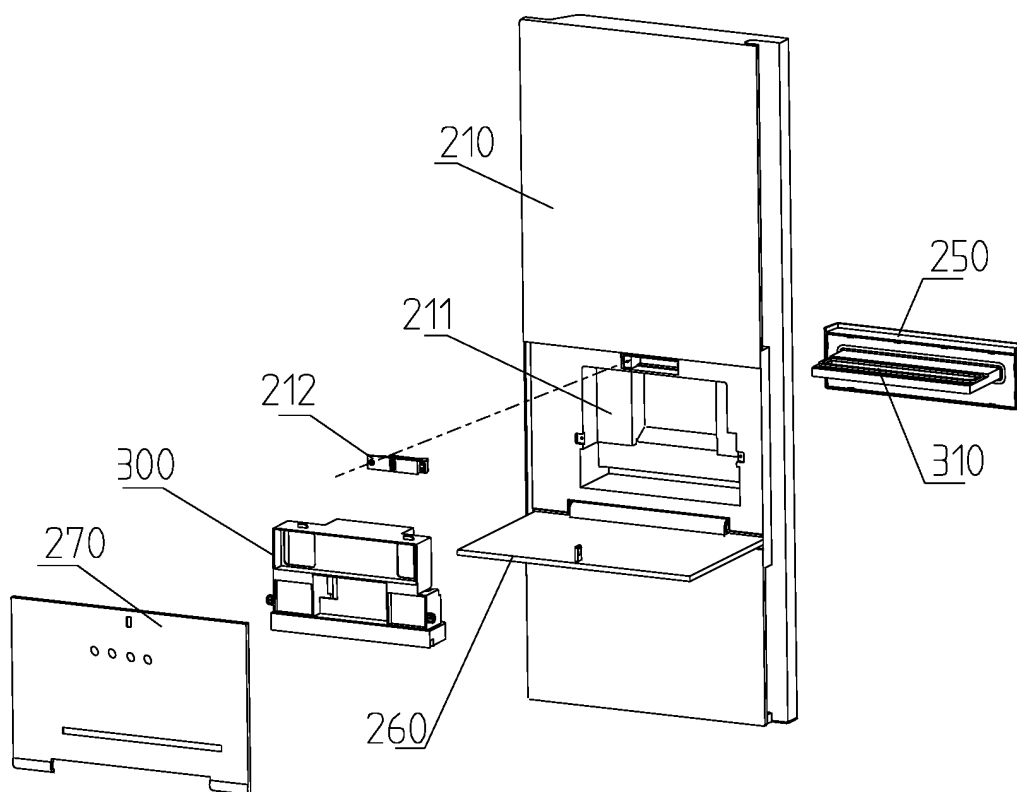


FIG.3

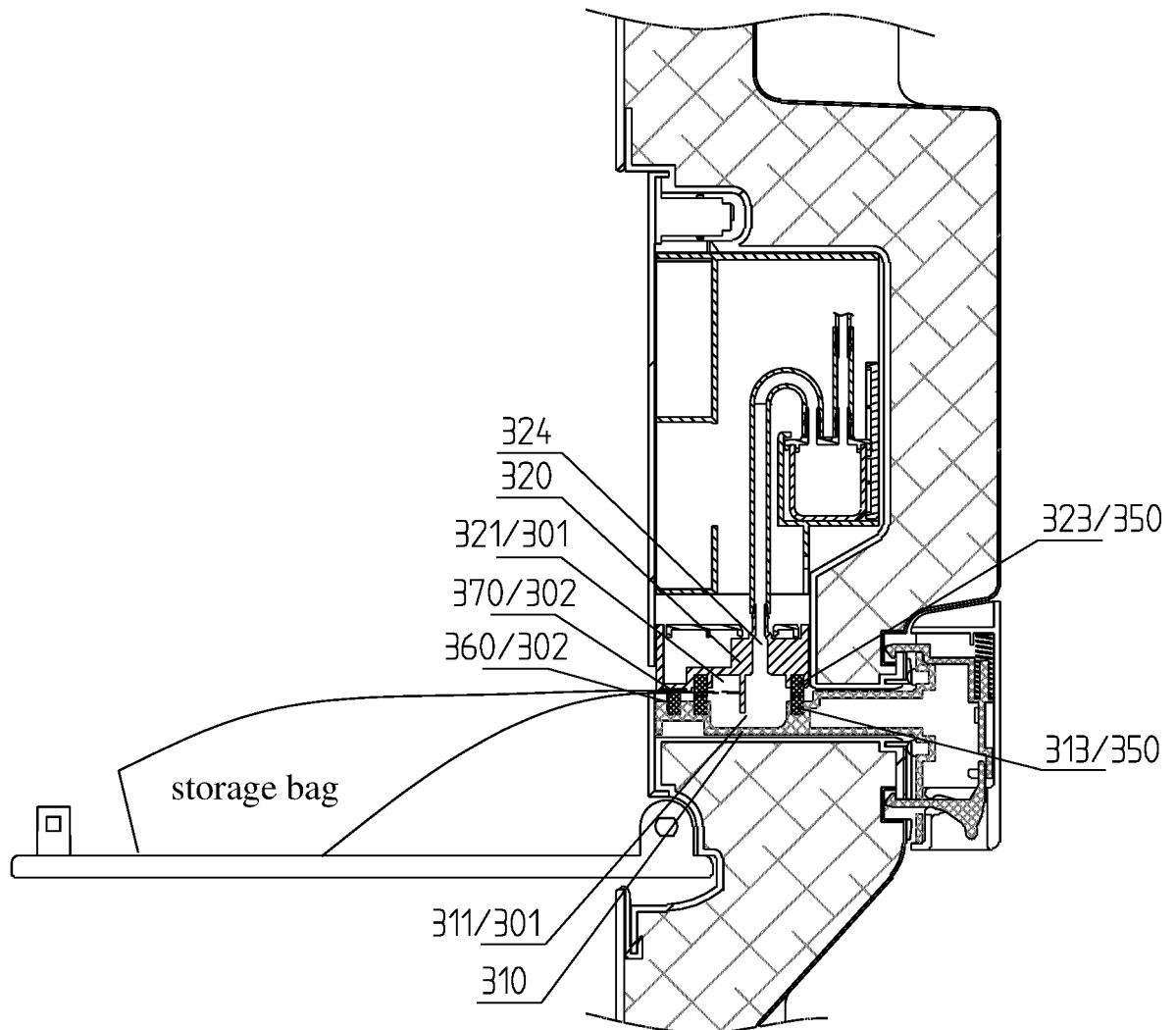


FIG.4

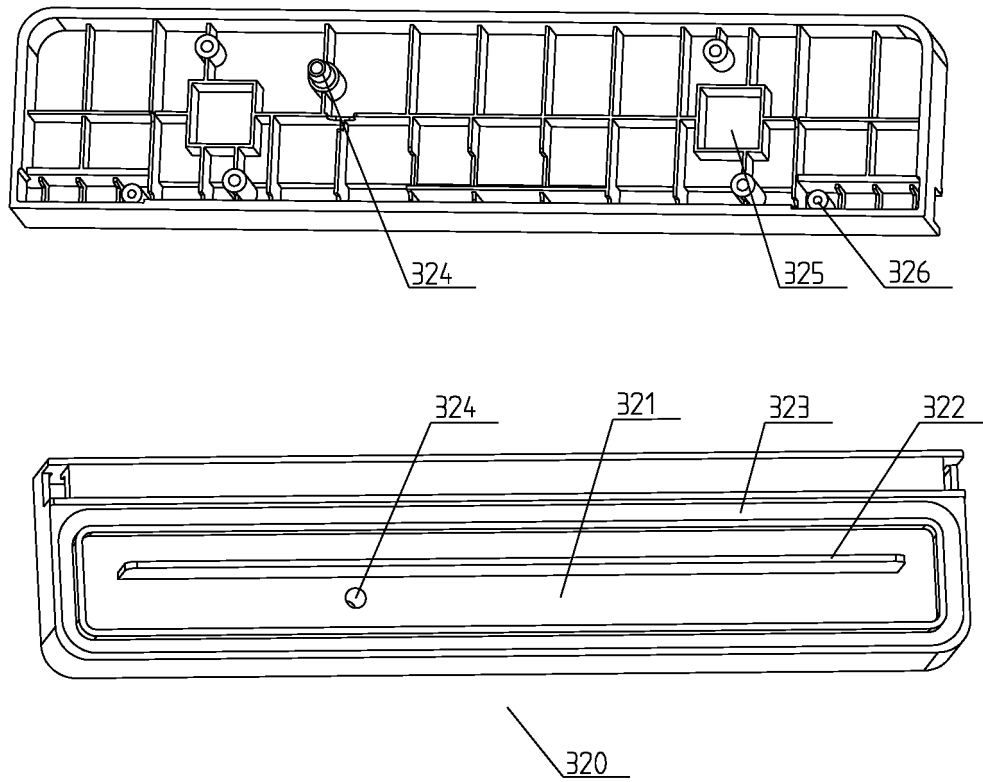


FIG. 5

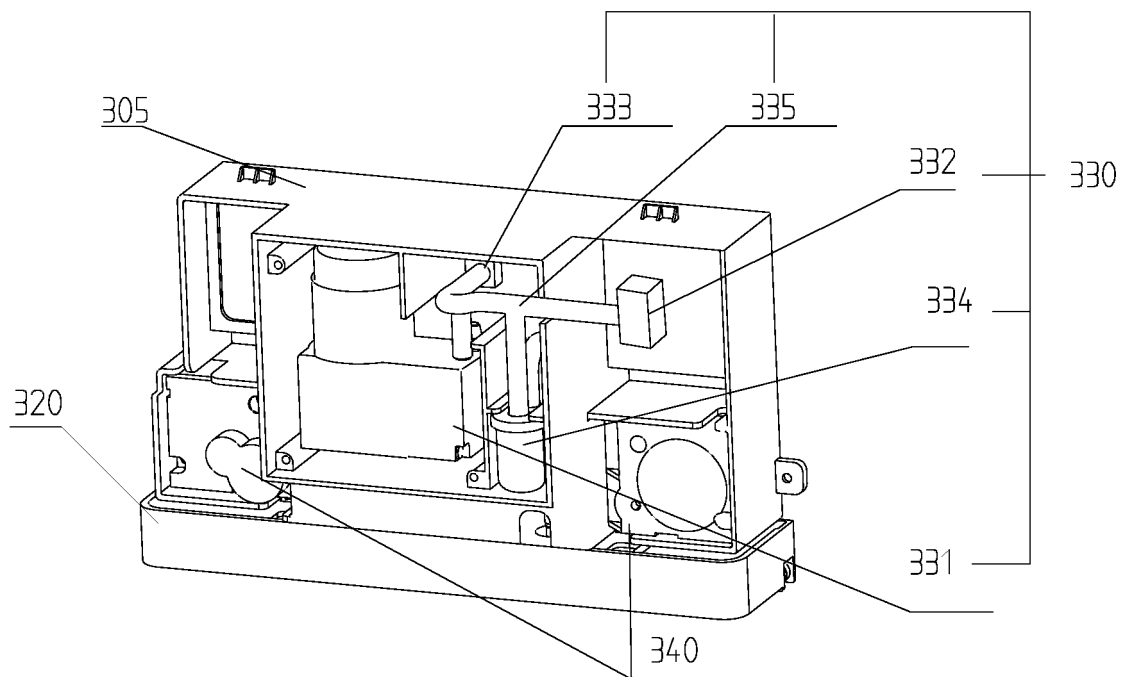


FIG. 6

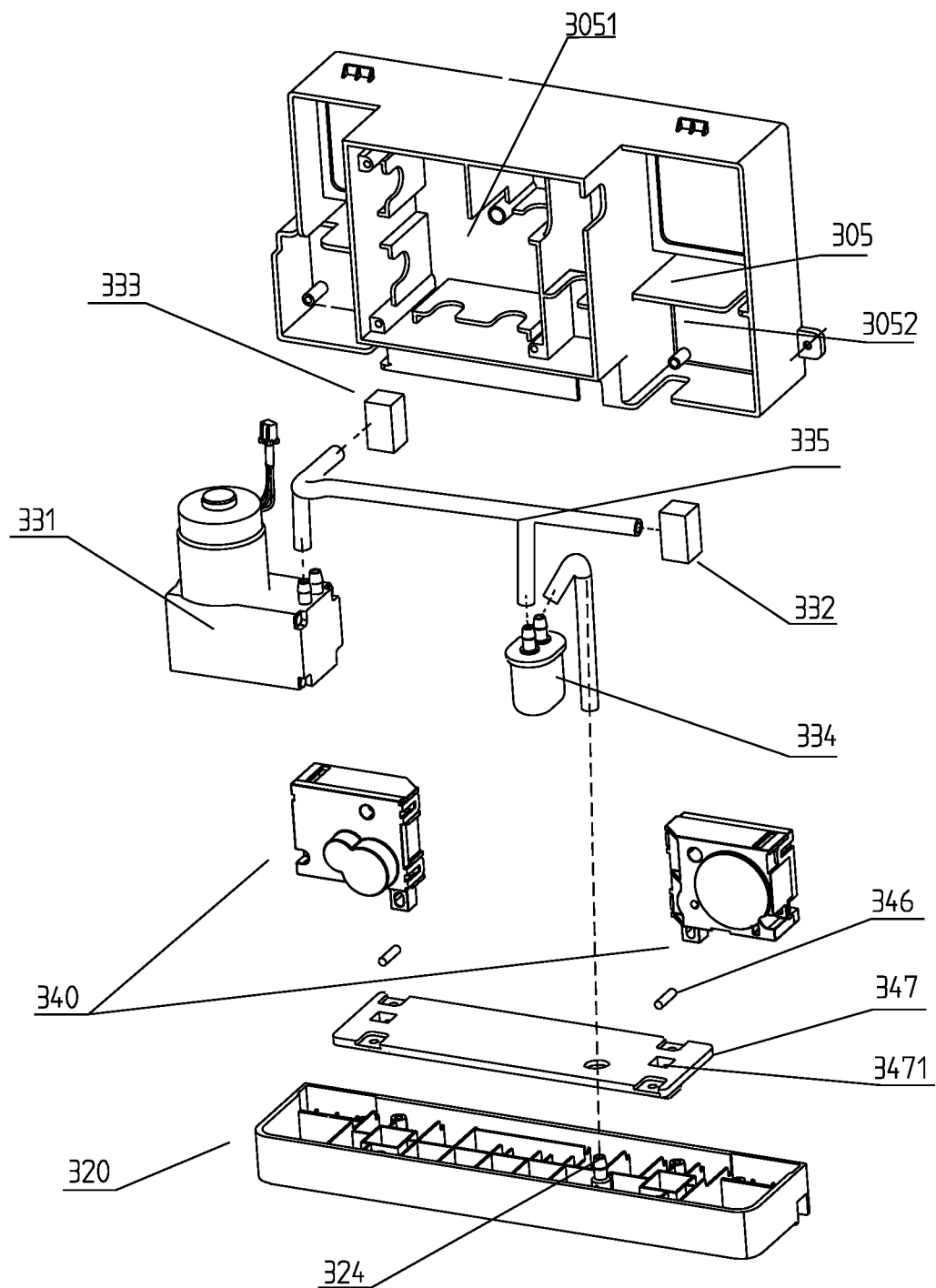


FIG.7

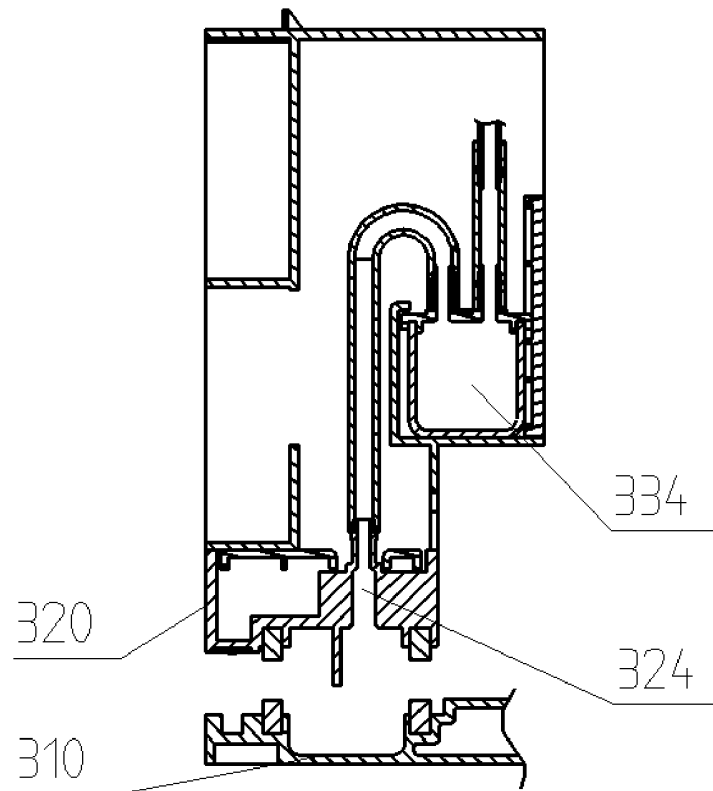


FIG. 8

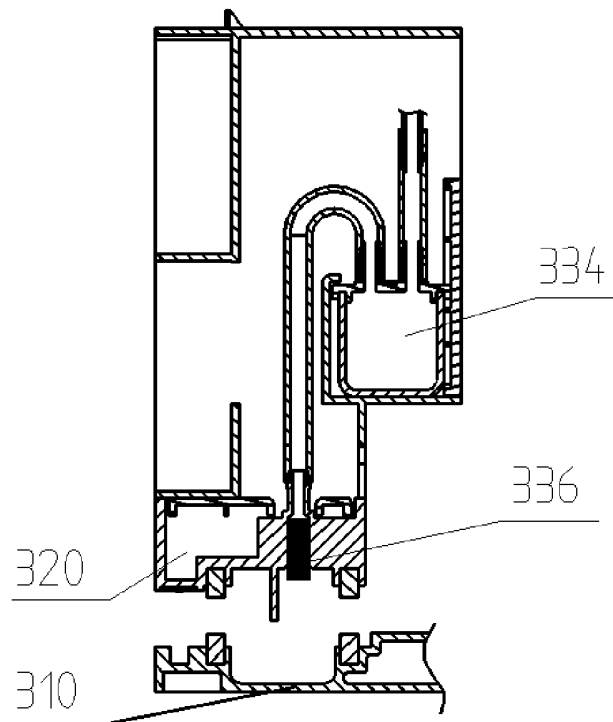


FIG. 9

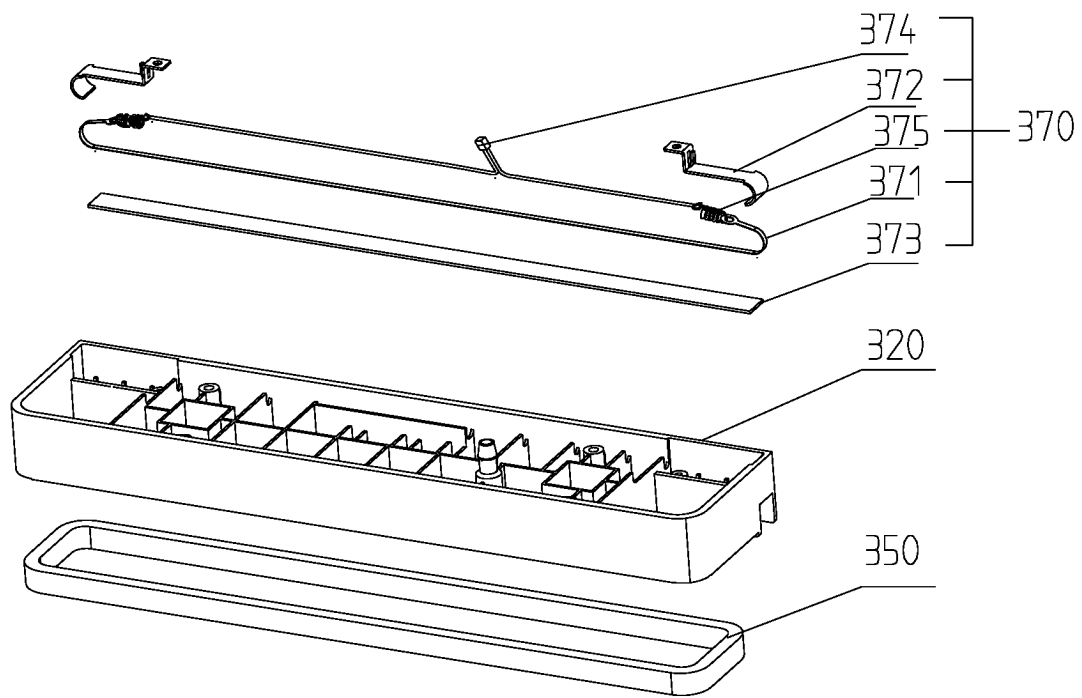


FIG. 10

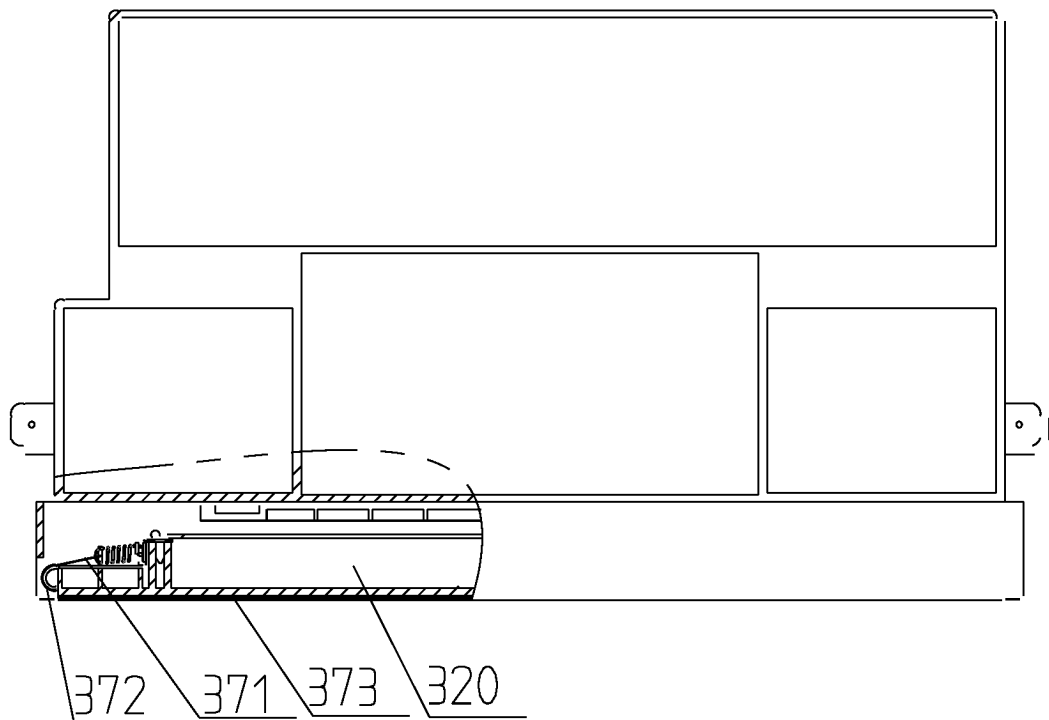


FIG. 11

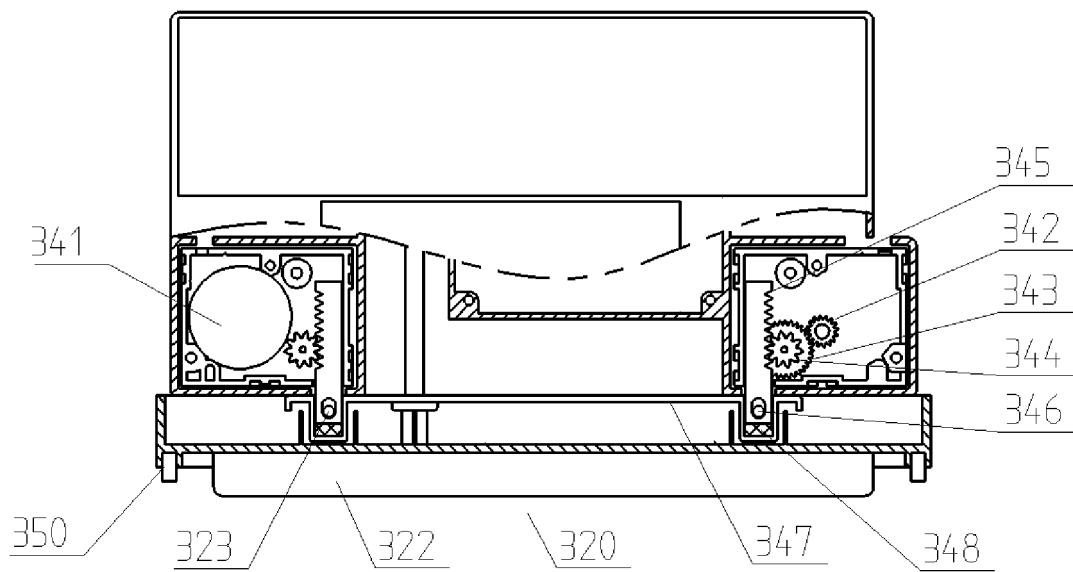


FIG. 12

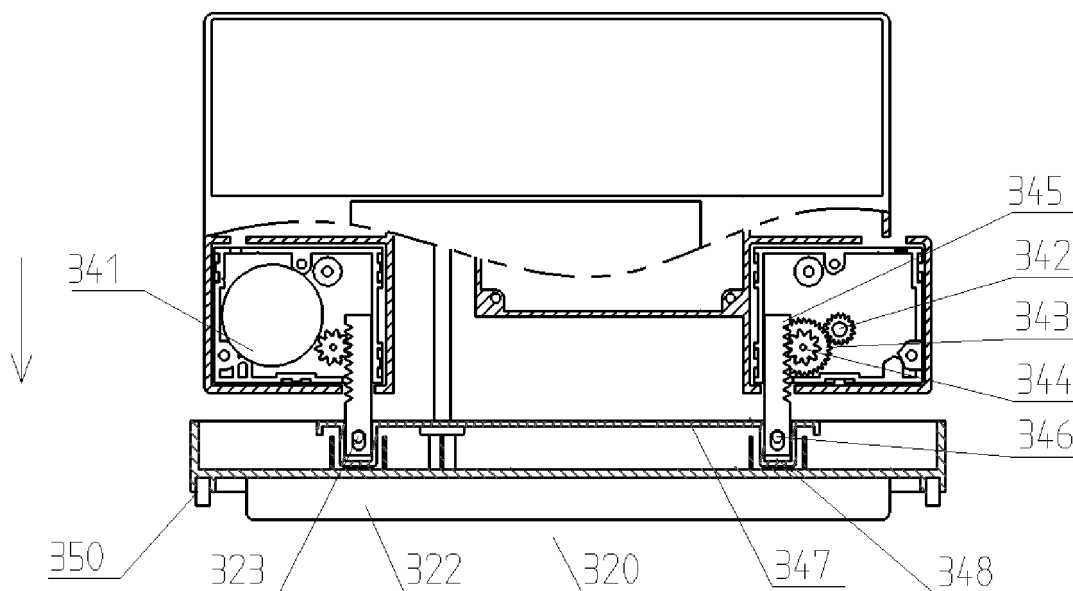


FIG. 13

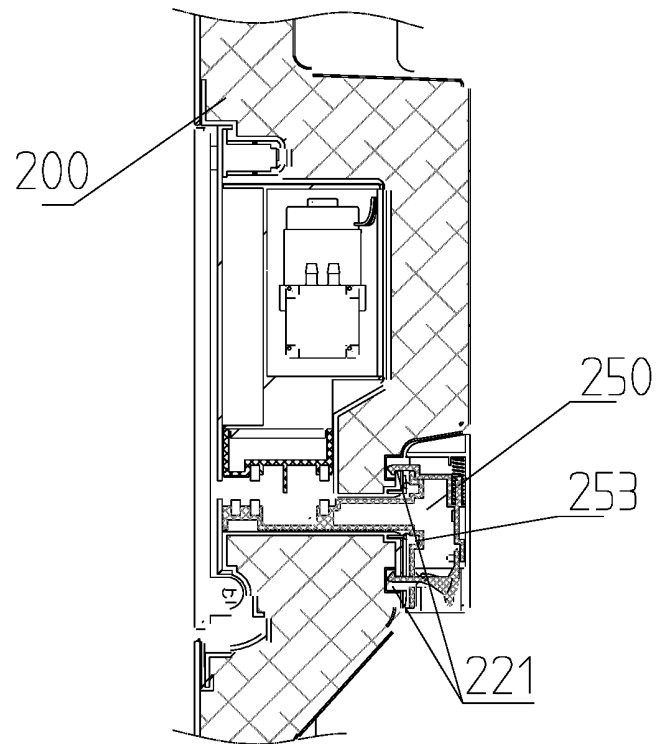


FIG. 14A

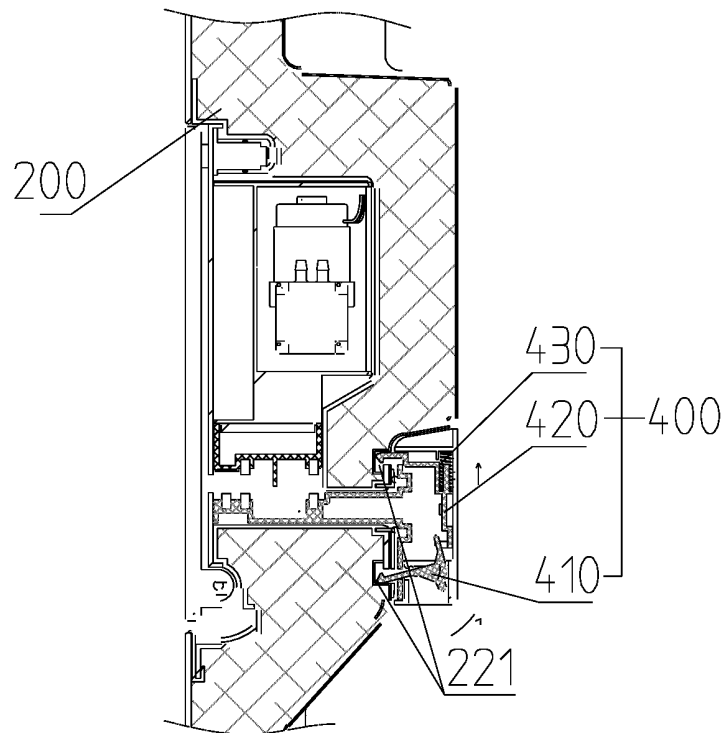


FIG. 14B

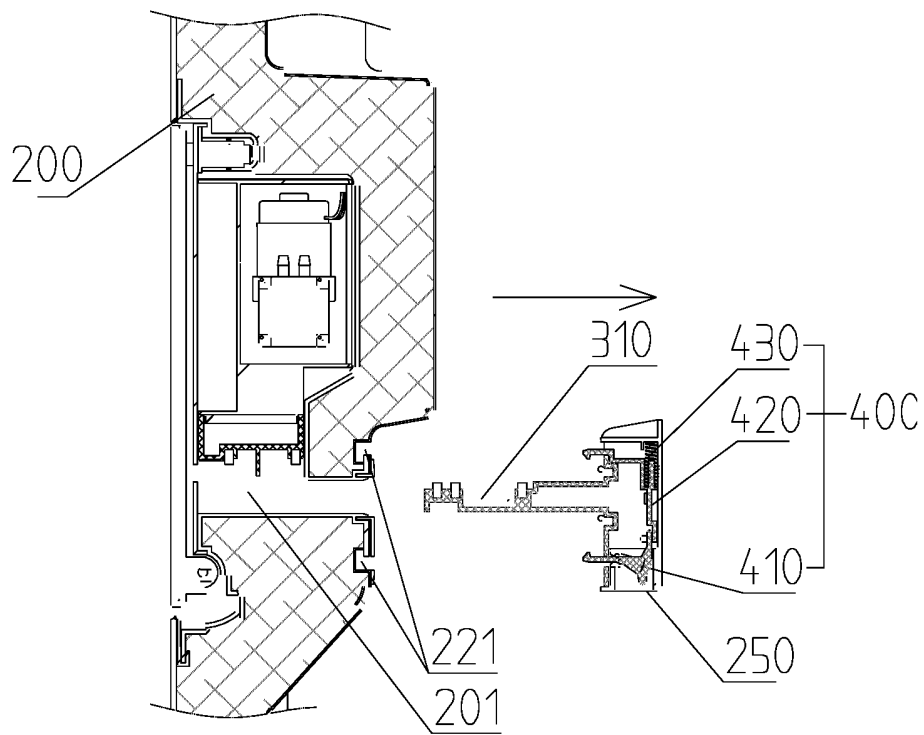


FIG. 14C

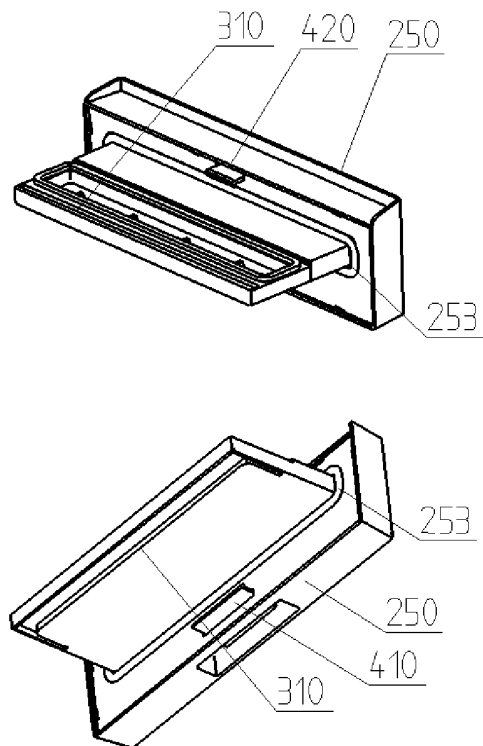


FIG. 15

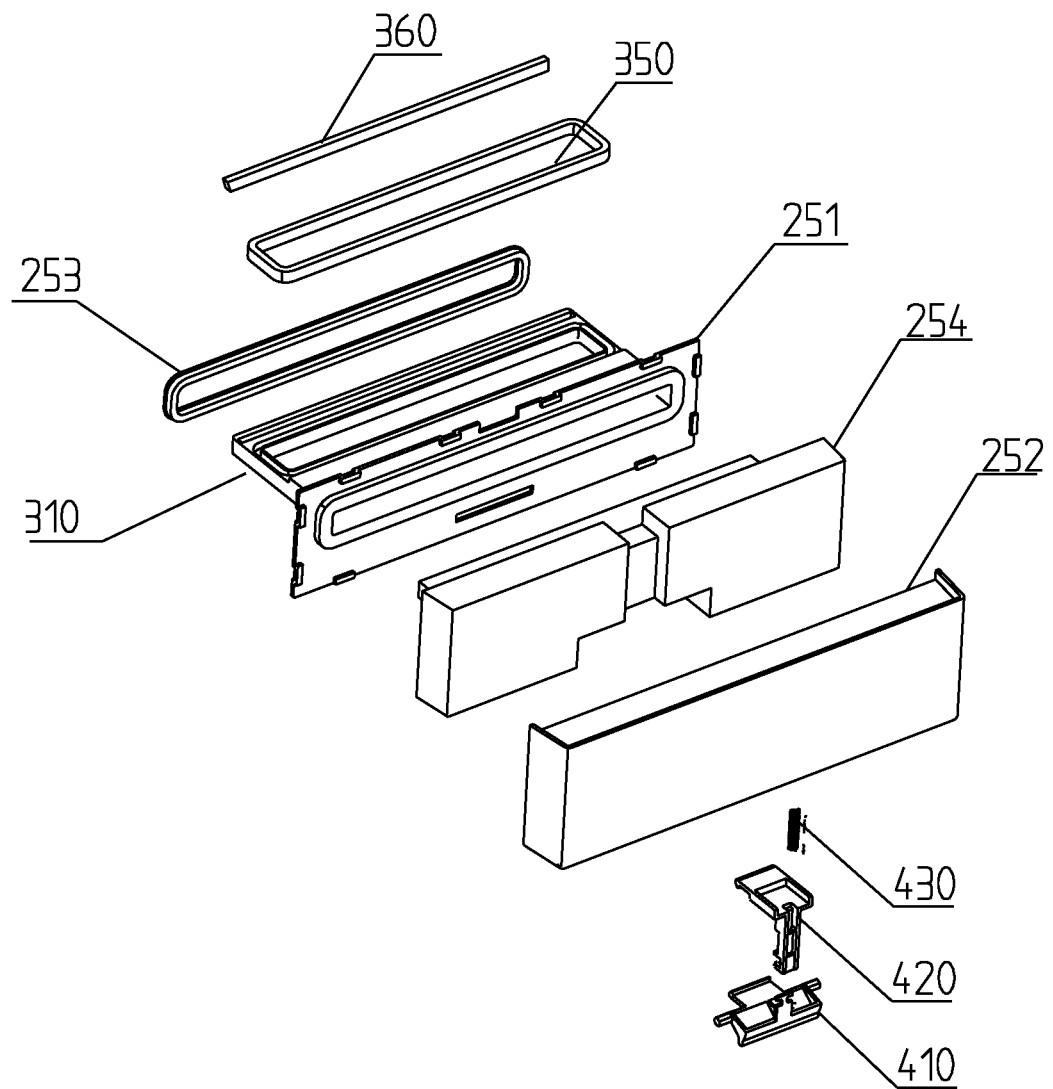


FIG.16

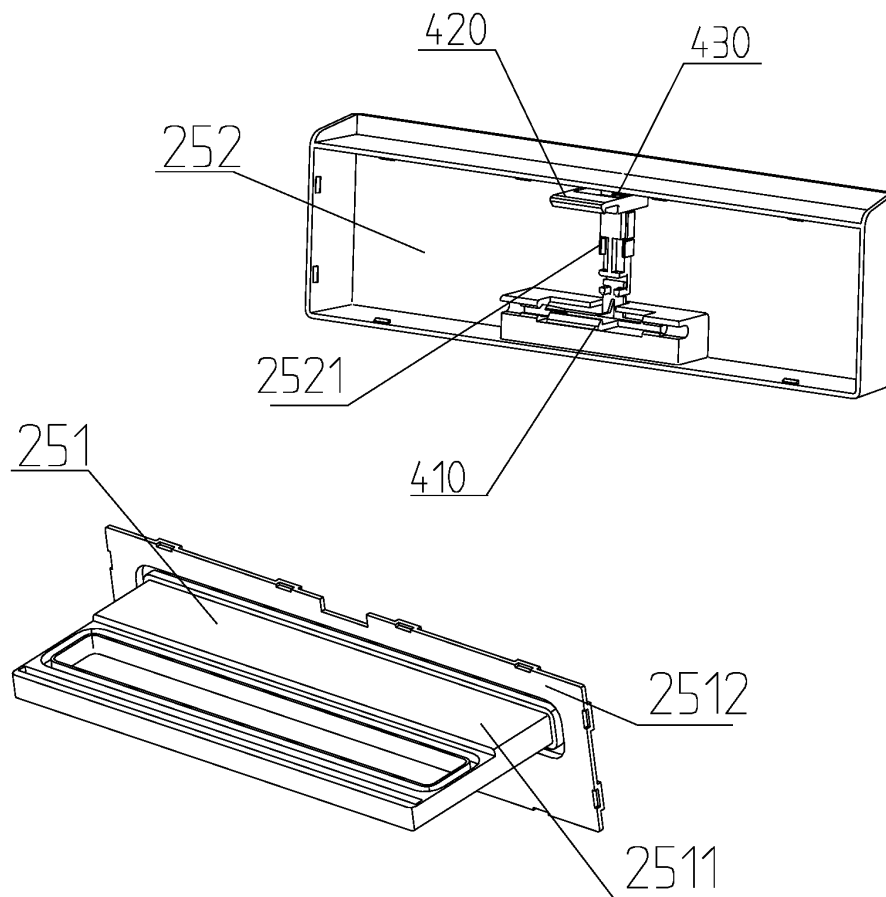


FIG. 17

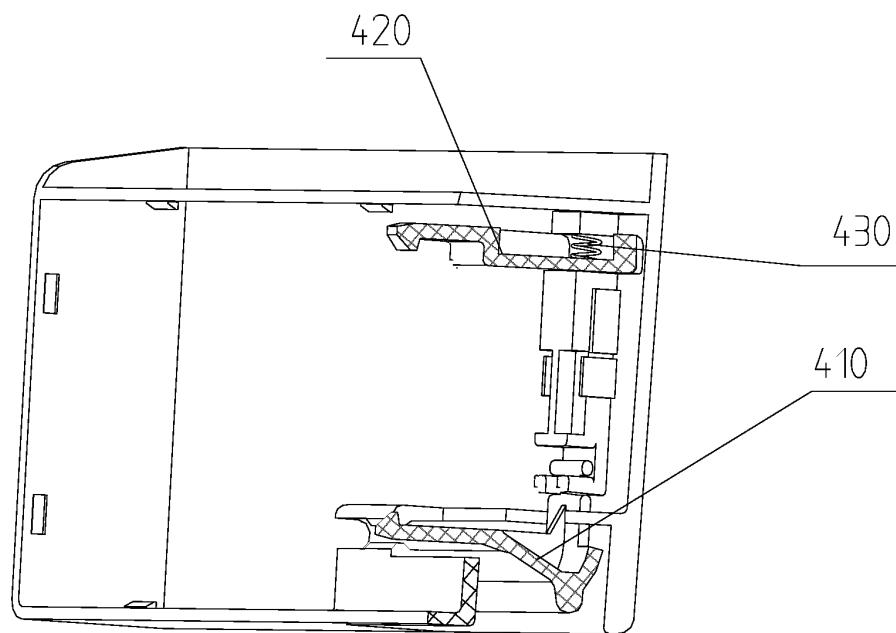


FIG. 18

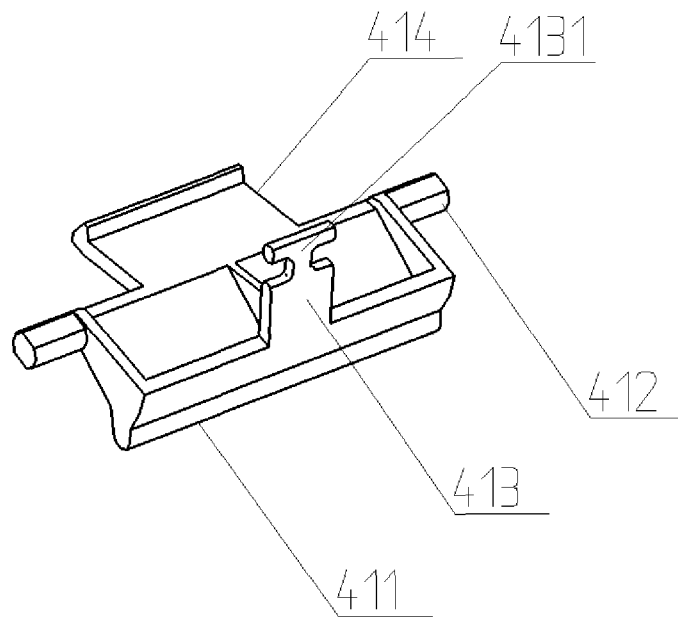


FIG.19

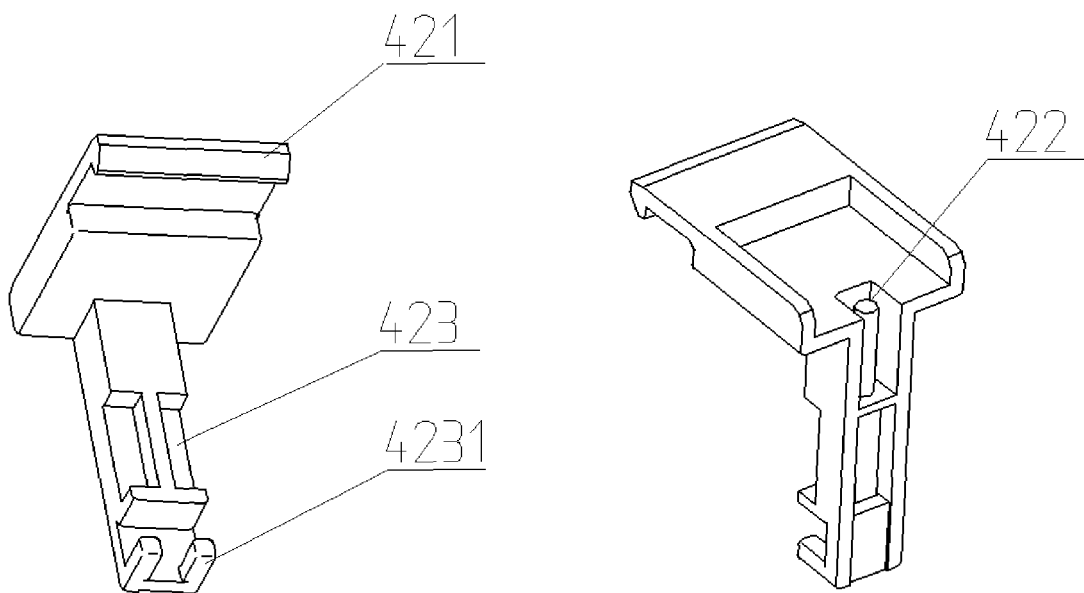


FIG.20

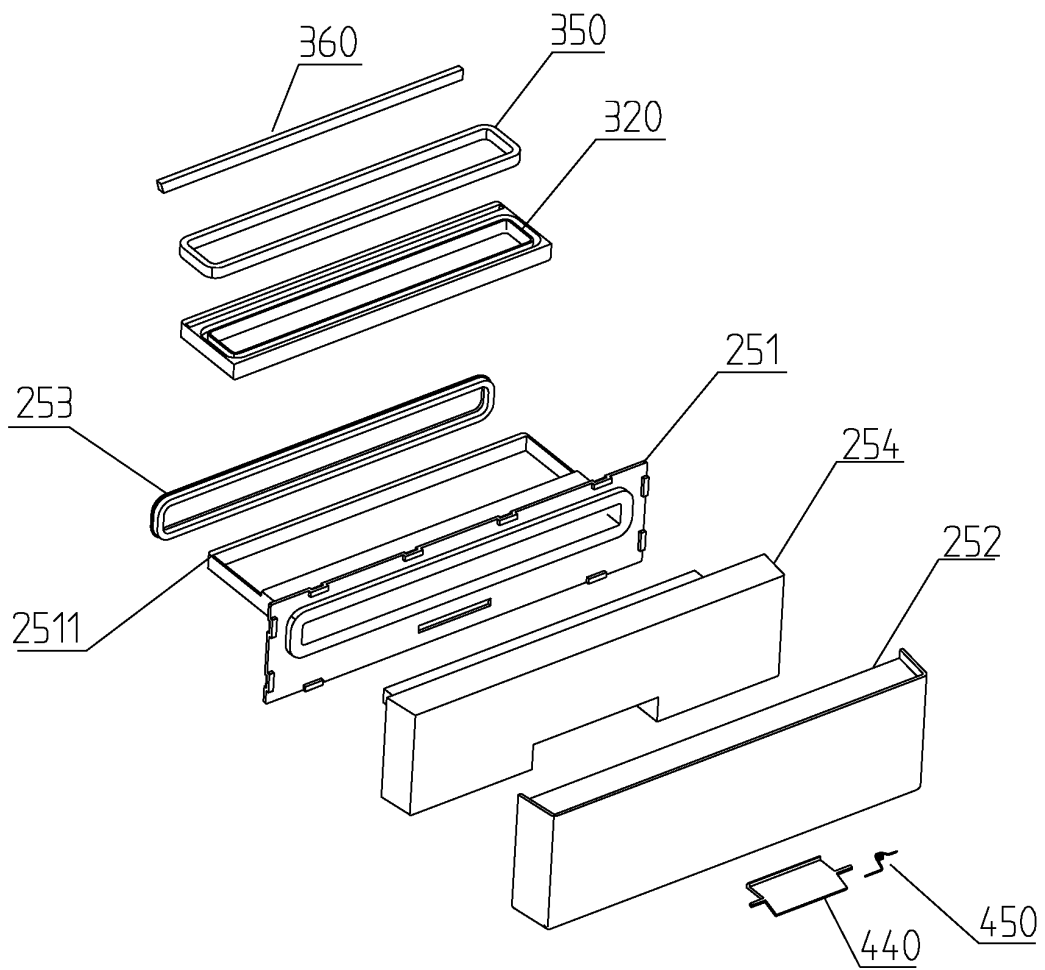
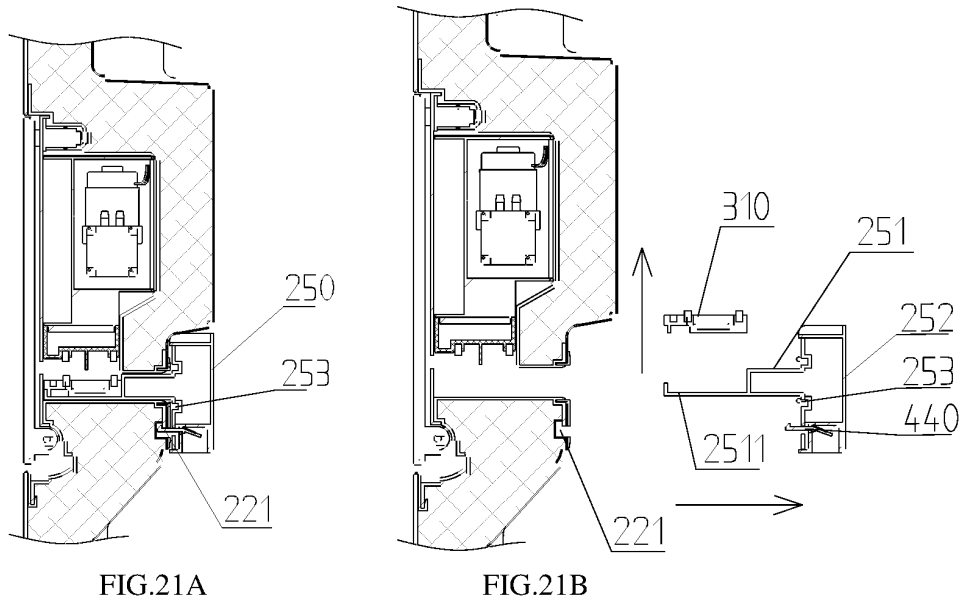


FIG. 22

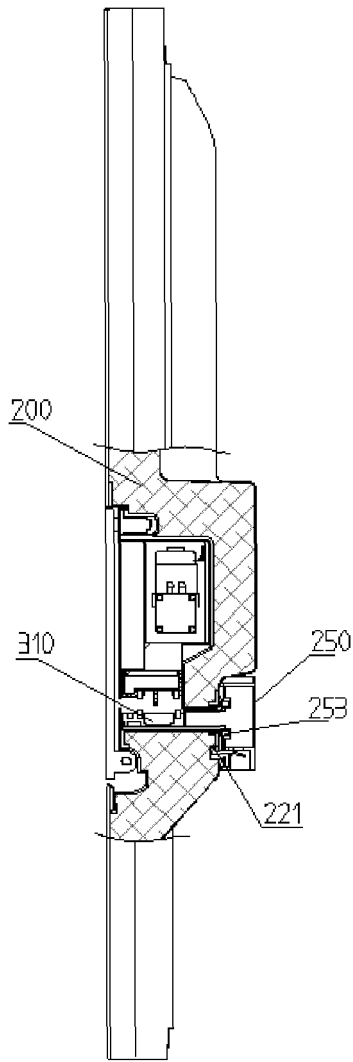


FIG. 23A

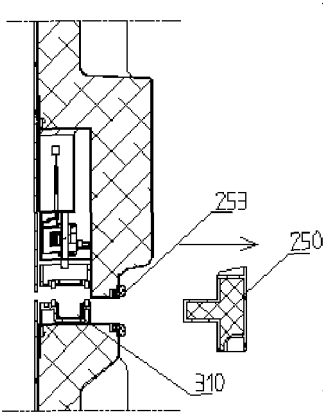


FIG. 23B

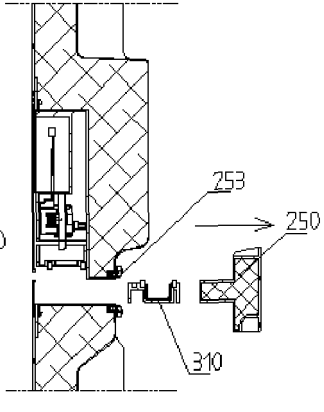


FIG. 23C

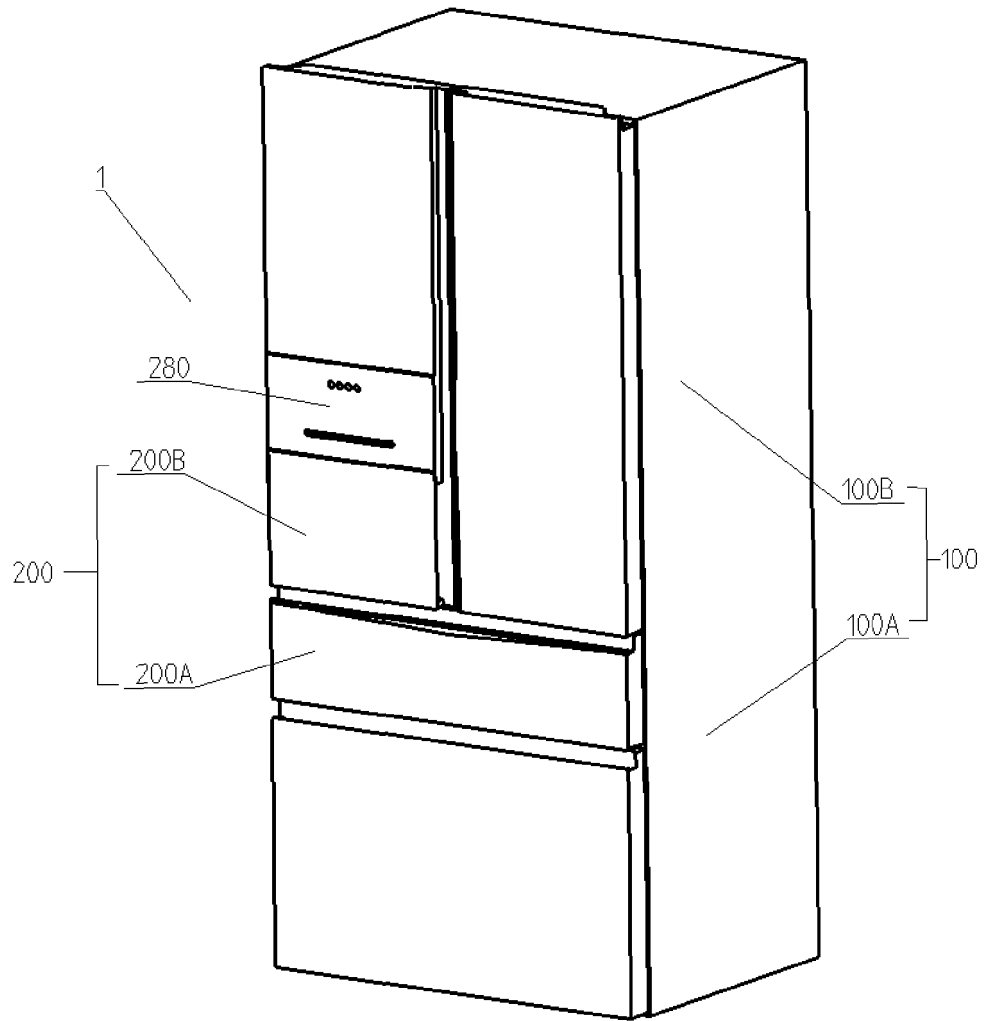


FIG. 24

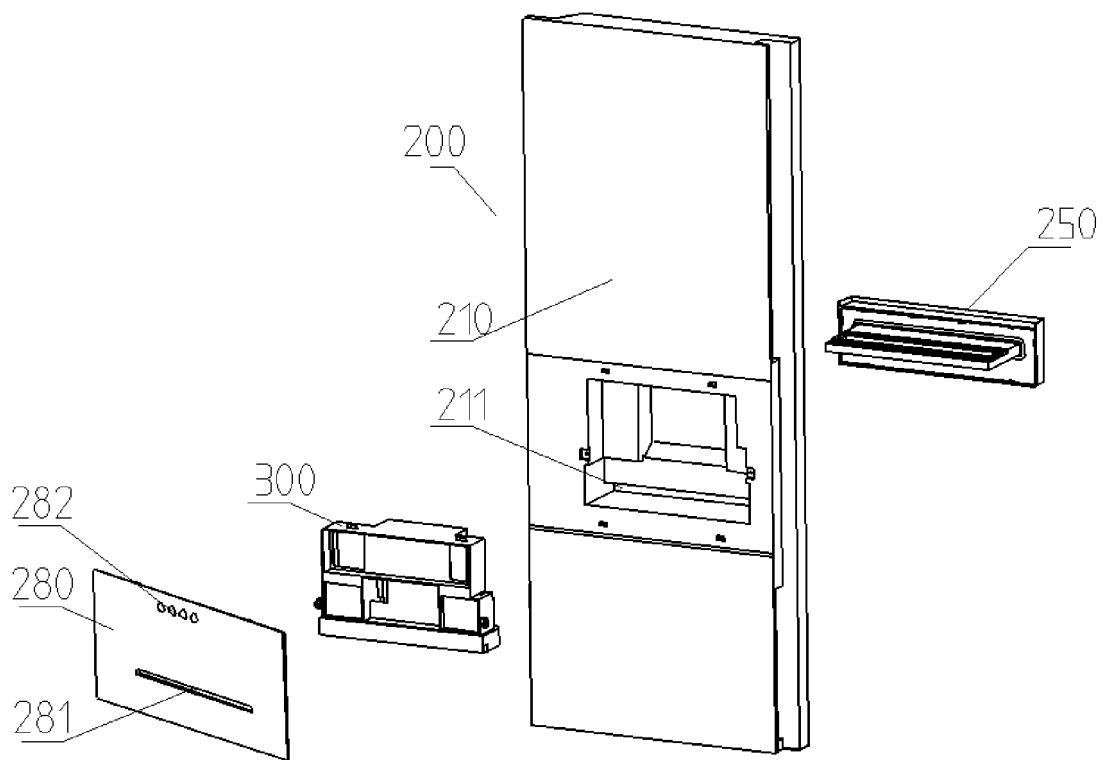


FIG. 25

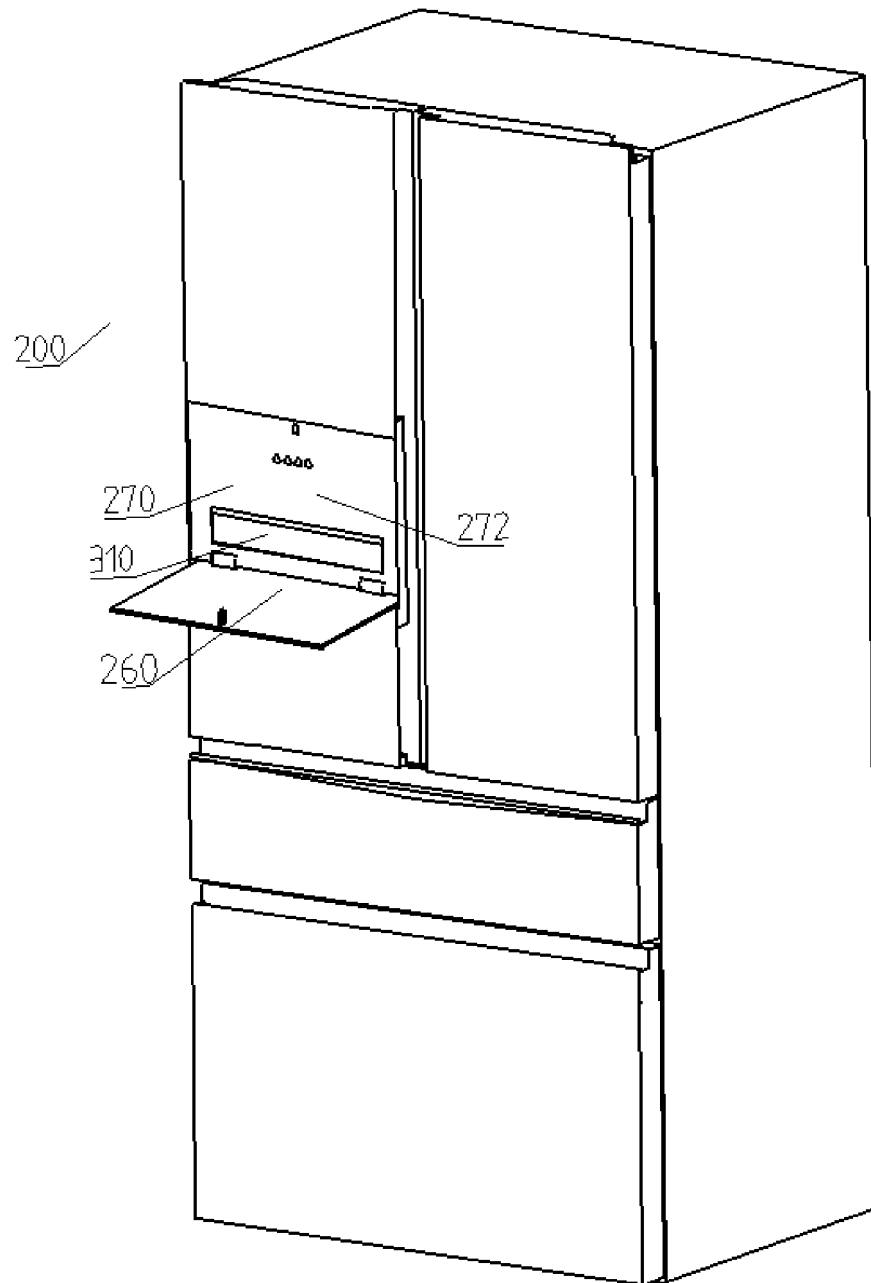


FIG. 26

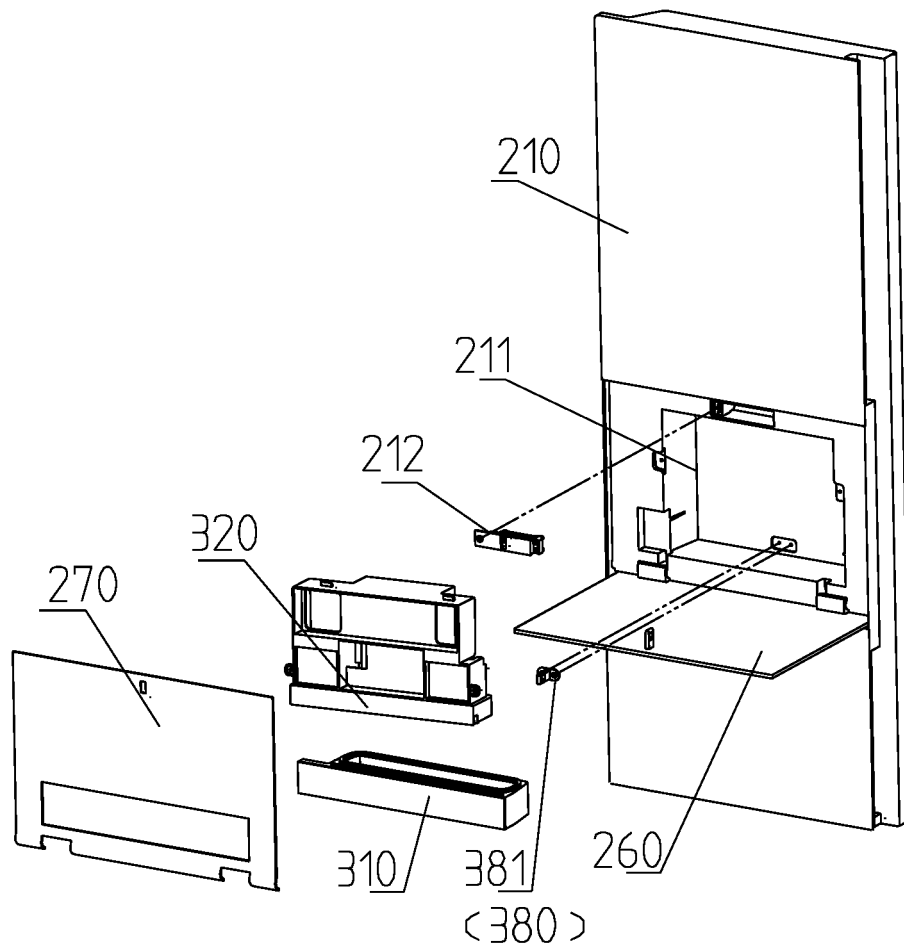


FIG. 27

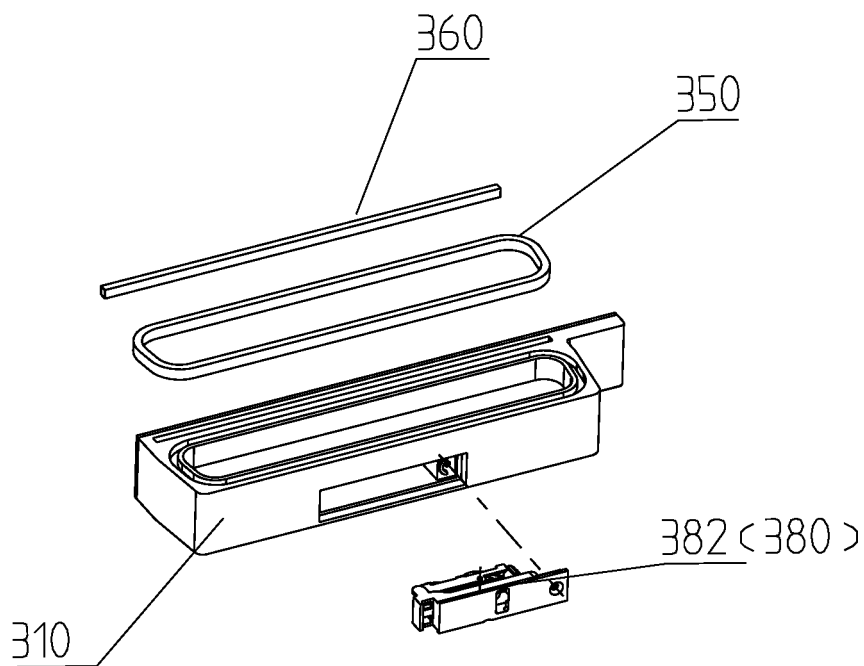


FIG. 28

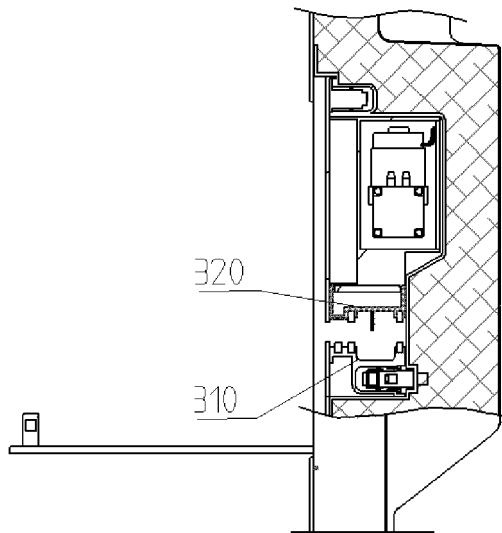


FIG. 29A

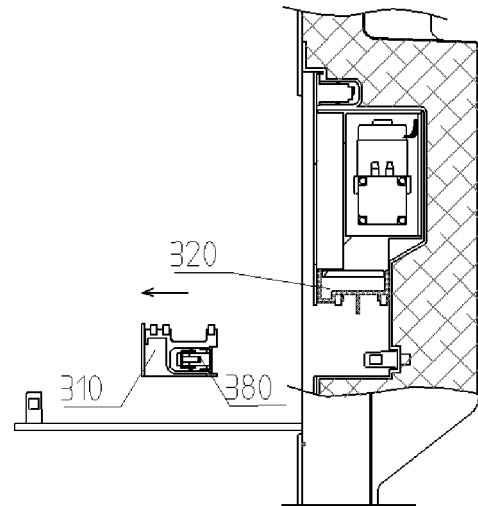


FIG. 29B

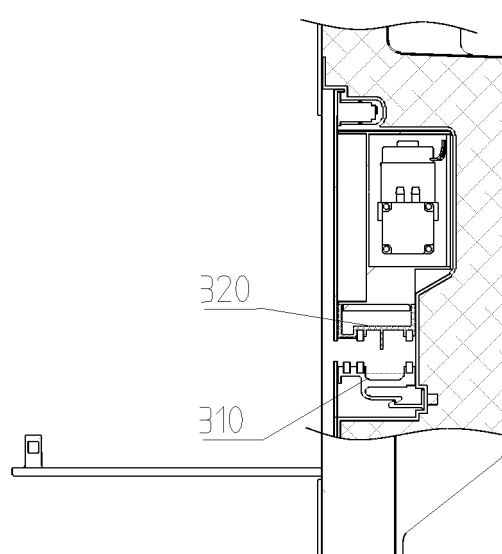


FIG. 30A

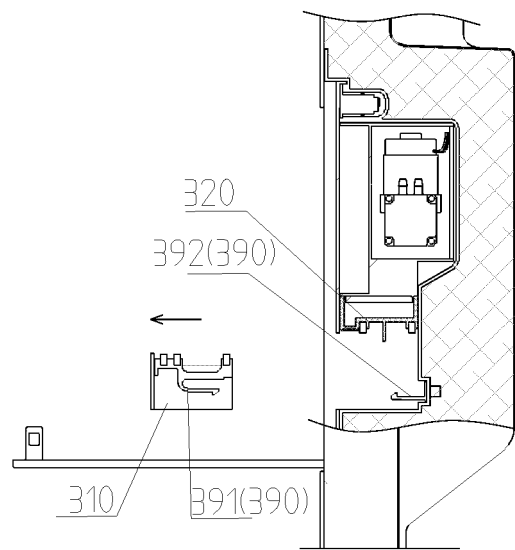


FIG. 30B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/076691

5	A. CLASSIFICATION OF SUBJECT MATTER F25D 23/12(2006.01)i; B65B 31/04(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F25D; B65B Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, CNABS, CNKI, SIPOABS, DWPI: 冰箱, 门, 真空, 泵, 封装, 可拆, 驱动, 支座, 清理, 清扫, 残渣, 残留, refrigerator, door, vacuum, seal, pump, detachable, drive, support, clean, residue		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	A	CN 106895650 A (QINGDAO HAIGAO DESIGN MANUFACTURE CO., LTD.) 27 June 2017 (2017-06-27) description, paragraphs [0049]-[0079], and figures 1-3	1-18,
25	A	CN 106895630 A (QINGDAO HAIGAO DESIGN & MANUFACTURING CO., LTD.) 27 June 2017 (2017-06-27) entire document	1-18,
	A	CN 106895631 A (QINGDAO HAIGAO DESIGN & MANUFACTURING CO., LTD.) 27 June 2017 (2017-06-27) entire document	1-18,
30	A	CN 207450356 U (DONGGUAN BONSEN ELECTRONICS CO., LTD.) 05 June 2018 (2018-06-05) entire document	1-18,
	A	CN 205525152 U (JIANGSU JIBAILI FOOD CO., LTD.) 31 August 2016 (2016-08-31) entire document	1-18
35	A	CN 207565913 U (SHENZHEN BURUJIANMIAN RESTAURANT MANAGEMENT CO., LTD.) 03 July 2018 (2018-07-03) entire document	1-18
	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
40	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "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		
45			
50	Date of the actual completion of the international search 15 May 2020		Date of mailing of the international search report 22 May 2020
55	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/CN2020/076691

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006090427 A1 (HAU, J. A. et al.) 04 May 2006 (2006-05-04) entire document	1-18

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/076691

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 106895650 A	27 June 2017	CN 106895650 B	26 November 2019
CN 106895630 A	27 June 2017	CN 106895630 B	26 November 2019
CN 106895631 A	27 June 2017	CN 106895631 B	26 November 2019
CN 207450356 U	05 June 2018	None	
CN 205525152 U	31 August 2016	None	
CN 207565913 U	03 July 2018	None	
US 2006090427 A1	04 May 2006	US 7331163 B2	19 February 2008

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

REFERENCES CITED IN THE DESCRIPTION

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