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(54) **ICE-CRUSHING DEVICE AND REFRIGERATOR**

(57) The present invention discloses an ice-crushing device and a refrigerator. The ice-crushing device comprises: an ice storage box; an ice-crushing module provided at a bottom of the ice storage box and comprising an ice blade shaft and several movable ice blades and several stationary ice blades mounted on the ice blade shaft, the ice-crushing module being communicated with the ice storage box through an ice outlet at the bottom of the ice storage box; a driving mechanism disposed on a side of the ice-crushing module and at least used to drive the movable ice blades to rotate relative to the stationary ice blades; wherein the driving mechanism comprises a motor and a first transmission unit and a second transmission unit driven by the motor, an ice-agitating rod is disposed in the ice storage box, the first transmission unit drives the movable ice blades to rotate relative to the stationary ice blades, the second transmission unit drives the ice-agitating rod to rotate, and a rotation axis of the first transmission unit is arranged parallel to a rotation axis of the second transmission unit.

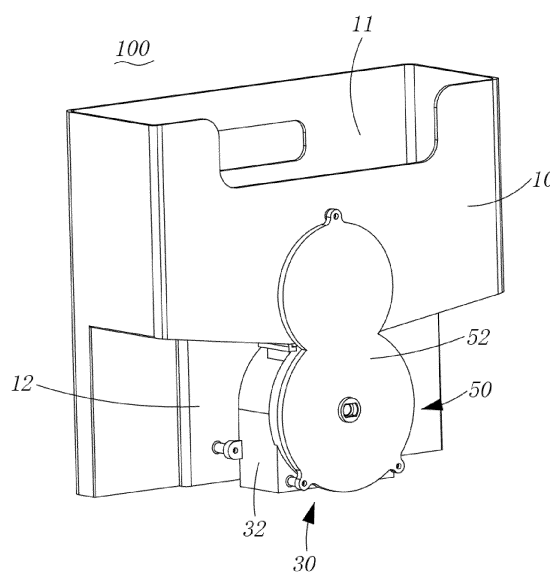


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to household appliance, and particularly to an ice-crushing device and a refrigerator.

BACKGROUND

[0002] With constant development of science and technology and continuous improvements of people's living standards, functions of household appliance also increase to meet people's requirements for increasing life quality, for example, an ice maker is added to a refrigerator. The ice maker of the refrigerator comprises an ice-making device and an ice-crushing device, wherein the ice-making device prepares ice cubes, and then the ice cubes store in a barrel-shaped container, for use by people. Meanwhile, to facilitate use, those skilled in the art set an ice-providing manner of the refrigerator as an ice-crushing mode and an ice cube mode. People use crushed ice in the ice-crushing mode, whereas they use complete ice cubes in the ice cube mode.

[0003] In the prior art, the ice-crushing mode and the ice cube mode are generally achieved by disposing an ice-crushing blade assembly in the barrel-shaped container. The ice-crushing blade assembly comprises a stationary ice blade and a movable ice blade, wherein an end of the stationary ice blade is movably disposed through a rotation shaft of the ice-crushing blade assembly, and an end of the movable ice blade is fixedly disposed through the rotation shaft of the ice-crushing blade assembly so that the rotation shaft brings the ice blade to rotate. When the rotation shaft rotates forward (namely, rotates towards the stationary ice blade), and when the movable ice blade staggers with the stationary ice blade, the ice-crushing blade assembly shears the ice cubes into pieces, which is the ice-crushing mode. When the rotation shaft rotates reversely, the ice-crushing blade assembly only functions to agitate the ice cubes nearby the ice blade and allow the ice cubes to slide out of an outlet of the barrel-shaped container, which is the ice cube mode. In addition, an ice-agitating rod is usually disposed on the rotation shaft and driven by the rotation shaft to rotate to prevent the ice cubes in the ice barrel from adhering together.

[0004] However, if the ice-agitating rod cannot effectively agitate the adhered ice cubes apart, subsequent ice crushing will be affected, and even the adhered ice cubes stay in the ice barrel in a long period of time so that the ice-crushing device cannot be used.

[0005] In view of the above problems, the prior art needs to be further improved.

SUMMARY

[0006] An object of the present invention is to provide

an ice-crushing device and a refrigerator, so that use of the ice-crushing device and the refrigerator is made more reliable.

[0007] To achieve one of the above objects of the invention, the present invention provides an ice-crushing device, comprising:

an ice storage box;

an ice-crushing module provided at a bottom of the ice storage box and comprising an ice blade shaft and several movable ice blades and several stationary ice blades mounted on the ice blade shaft, the ice-crushing module being communicated with the ice storage box through an ice outlet at the bottom of the ice storage box;

a driving mechanism disposed on a side of the ice-crushing module and at least used to drive the movable ice blades to rotate relative to the stationary ice blades;

wherein the driving mechanism comprises a motor and a first transmission unit and a second transmission unit driven by the motor, an ice-agitating rod is disposed in the ice storage box, the first transmission unit drives the movable ice blades to rotate relative to the stationary ice blades, the second transmission unit drives the ice-agitating rod to rotate, and a rotation axis of the first transmission unit is arranged parallel to a rotation axis of the second transmission unit.

[0008] As a further improvement of the embodiment of the present invention, the ice-crushing module comprises a housing, the ice blade shaft is disposed in the housing, the ice storage box comprises an ice storage portion forming an ice storage cavity, and an extension wall extending from one side of the ice storage portion to the bottom, and the housing is fixed on the extension wall.

[0009] As a further improvement of the embodiment of the present invention, the first transmission unit comprises a first gear driven by the motor, the second transmission unit comprises a second gear meshing with the first gear, the first gear drives the movable ice blades to rotate relative to the stationary ice blades, and the second gear drives the ice-agitating rod to rotate.

[0010] As a further improvement of the embodiment of the present invention, the first transmission unit further comprises a rotating bucket fixed relative to the first gear, the rotating bucket is disposed in the housing of the ice-crushing module, the movable ice blades are fixed relative to the rotating bucket, the rotating bucket is provided two openings radially opposite to each other, and the rotating bucket rotates to a position where the two openings correspond to the ice outlet so that the ice gets out.

[0011] As a further improvement of the embodiment of the present invention, the second transmission unit further comprises a turntable disposed on the ice storage box, the turntable is fixed concentrically with the second gear, and the ice-agitating rod is eccentrically connected to the turntable.

[0012] As a further improvement of the embodiment of the present invention, a recess is formed on the outer side of the ice storage box, and the second gear is accommodated in the recess.

[0013] As a further improvement of the embodiment of the present invention, the ice-crushing device further comprises a gear cover covering outer sides of the first gear and the second gear, and the gear cover is connected to the ice storage box and the ice-crushing module.

[0014] As a further improvement of the embodiment of the present invention, the housing is provided with an ice inlet butted with the ice outlet, a guide groove is provided on an outer side of the ice outlet, a guide block is provided on the outer side of the ice inlet, and the guide block is caught in the guide groove.

[0015] As a further improvement of the embodiment of the present invention, a baffle is further provided outside the ice outlet, and the ice-crushing module abuts against the baffle.

[0016] To achieve one of the above objects of the present invention, an embodiment of the present invention provides a refrigerator, wherein the refrigerator comprises a cabinet, a door body for opening or closing the cabinet, and the ice-crushing device according to any of the above embodiments, the ice-crushing device being disposed at the cabinet or door body.

[0017] An advantageous effect of the present invention as compared with the prior art lies in that in the technical solution of the present invention, since the rotation axis for crushing ice cubes and the rotation axis for agitating ice cubes are arranged separate, the ice cubes may be effectively agitated and prevented from adhesion, thereby making the use of the ice-crushing device more reliable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a perspective view of an ice-crushing device in a preferred embodiment of the present invention; FIG. 2 is a perspective view of the ice-crushing device in FIG. 1 from another perspective; FIG. 3 is an exploded view of the ice-crushing device in FIG. 1; FIG. 4 is a front view of the ice-crushing device in FIG. 1; FIG. 5 is a cross-sectional view taken along line A-A in FIG. 4; FIG. 6 is a cross-sectional view taken along line B-B in FIG. 5; FIG. 7 is a perspective view of an ice storage box of the ice-crushing device in FIG. 1; FIG. 8 is a perspective view of a housing of an ice-crushing module of the ice-crushing device in FIG. 1.

DETAILED DESCRIPTION

[0019] The present invention will be described in detail in conjunction with embodiments shown in the figures. However, these embodiments are not intended to limit the present invention. Structural, methodological and function variations made by those having ordinary skill in the art according to these embodiments all are included in the protection scope of the present invention.

[0020] A first preferred embodiment provided by the present invention discloses a refrigerator. The refrigerator comprises a cabinet (not shown) and a door body (not shown) for opening or closing the cabinet. The cabinet defines a storage compartment. The number and structure of storage compartments can be configured according to different needs. The storage compartment usually comprises a refrigerating chamber and a freezing chamber.

[0021] As shown in FIG. 1 through FIG. 8, the refrigerator further comprises an ice-crushing device 100, which is disposed at the cabinet or the door body. The ice-crushing device 100 comprises an ice storage box 10, an ice-crushing module 30 provided at a bottom of the ice storage box, and a driving mechanism 50 provided on a side of the ice-crushing module 30. The ice-crushing module 30 comprises an ice blade shaft 31 and several movable ice blades 311 and several stationary ice blades mounted on the ice blade shaft 31. The bottom of the ice storage box 10 is provided with an ice outlet 111. The ice-crushing module 30 is communicated with the ice storage box 10 through the ice outlet 111. Ice cubes fall through the ice outlet 111 into the ice-crushing module 30, the movable ice blades 311 rotate relative to the stationary ice blades 312 to crush the ice cubes and discharge the crushed ice or directly discharge the ice cube. The driving mechanism 50 is at least used to drive the movable ice blades 311 to rotate relative to the stationary ice blades 312.

[0022] The driving mechanism 50 comprises an ice-delivering motor (not shown), and a first transmission unit and a second transmission unit driven by the ice-delivering motor. An ice-agitating rod 13 is disposed in the ice storage box 10, the first transmission unit drives the movable ice blades 311 to rotate relative to the stationary ice blades 312, the second transmission unit drives the ice-agitating rod 13 to rotate, and a rotation axis of the first transmission unit and a rotation axis of the second transmission unit are arranged non-co-axially, and arranged parallel in the present embodiment. The separate arrangement of the ice-agitating rod 13 and the ice blade shaft 31 facilitates sufficient agitation of the ice cubes and thereby prevent the ice cubes from adhering.

[0023] Specifically, the ice storage box 10 is roughly in the shape of a rectangular parallelepiped, and comprises an ice storage portion forming an ice storage cavity 11 and an extension wall 12 extending from one side of the ice storage portion to the bottom. The extension wall 12 may be a hollow structure with a front layer and rear

layer. The ice-crushing module 30 comprises a housing 32, the ice blade shaft 31, the movable ice blades 311 and the stationary ice blades 312 are all arranged in the housing 32, and the housing 32 is fixed on the extension wall 12. In this way, the ice-crushing module 30 is located under the ice storage box 10, and it may be arranged with its periphery not exceeding an outer contour of the ice storage box 10, which facilitates the installation of the ice-crushing device 30 in the refrigerator. In the present embodiment, the housing 32 of the ice-crushing module 30 is fixed on the extension wall 12 of the ice storage box 10 by screw connection, the extension wall 12 is provided with a pillar, a screw hole is provided on the pillar, a positioning protrusion protrudes out of the outer side of the housing 32, and the screw passes through the positioning protrusion and extends into the screw hole to fix the housing 32 to the extension wall 12.

[0024] The first transmission unit comprises a first gear 501 driven by the ice-crushing motor, the second transmission unit comprises a second gear 502 meshing with the first gear 501, the first gear 501 drives the movable ice blades 311 to rotate relative to the stationary ice blades 312, and the second gear 502 drives the ice-agitating rod 13 to rotate. Through gear meshing, ice crushing and ice agitation are carried out at the same time, and the speed of ice crushing and ice agitation may also be set different according to needs. For example, the number of teeth of the first gear 501 is greater than the number of teeth of the second gear 502, so that the rotation speed of the second gear 502 is greater than the rotation speed of the first gear 501, thereby increasing the ice-agitating speed and preventing the ice cubes from adhering.

[0025] In the present embodiment, the first transmission unit further comprises a rotating bucket 35 fixed relative to the first gear 501, the rotating bucket 35 is disposed in the housing 32 of the ice-crushing module 30, the movable ice blades 311 are fixed relative to the rotating bucket 35, the rotating bucket 35 is provided two openings 351 radially opposite to each other, and the rotating bucket 35 rotates to a position where the two openings 351 correspond to the ice outlet 111 so that the ice gets out. That is to say, the movable ice blades 311 are driven by the rotating bucket 35 to rotate, and the ice blade shaft 31 and the stationary ice blades 312 are all fixed relative to the housing 32. An edge of an end face of the first gear 501 is provided with a plurality of grooves at an interval, and an edge of the rotating barrel 35 is provided with a plurality of protrusions 352 matching the plurality of grooves. The protrusions 352 are inserted into the grooves so that the rotating bucket 35 is fixed to the first gear 501. The other edge of the rotating bucket 35 may be rotatably supported on a backing plate 34 arranged in the housing 32 to avoid rotational wear between the rotating bucket 35 and the housing 32. A circumferential wall of the rotating bucket 35 is provided with two catch grooves 353. Certainly, one catch groove may be provided. An outer rim of the movable ice blade 311 is

caught in the catch groove 353 so that the movable ice blade 311 is fixed relative to the rotating bucket 35. The movable ice blade 311 is sleeved around the ice blade shaft 31, and is clearance fitted with the ice blade shaft 31 so that the rotation of the movable ice blade 311 does not affect the ice blade shaft 311. The stationary ice blade 312 is fixed relative to the ice blade shaft 31. Under the action of the rotating bucket 35, the movable ice blade 311 is made rotate relative to the stationary ice blade 312. Certainly, it is also possible that the first gear drives the ice blade shaft to rotate, and the ice blade shaft drives the movable ice blade to rotate.

[0026] Since the movable ice blade 311 and the stationary ice blade 312 are each set in a shape with teeth on one side and no teeth on the other side, the toothed side of the movable ice blade 311 rotates relative to the toothed side of the stationary ice blades 312 to crush ice. As such, when the two openings 351 correspond to the ice outlet 111, crushed ice can be discharged from the opening at the bottom. The toothless side of the movable ice blade 311 rotates relative to the toothless side of the stationary ice blades 312 to directly discharge the ice cubes out of the ice storage box 10 to meet different needs of users. Different functions may be achieved by controlling the ice-delivering motor to rotate forward or reverse.

[0027] Further, the second transmission unit further comprises a turntable 503 disposed on the ice storage box 10, the turntable 503 is fixed concentrically with the second gear 502, and the ice-agitating rod 13 is eccentrically connected to the turntable 503 to achieve agitation of ice cubes in a larger range. The turntable 503 has a turntable shaft, and the turntable shaft is fixed concentrically with the second gear 502, and the turntable 503 may be disposed in the ice storage cavity 11 to facilitate driving the ice-agitating rod 13 to rotate. A recess 15 is formed on the outer side of the ice storage box 10, and the second gear 502 is accommodated in the recess 15. The recess 15 forms a projection in the ice storage cavity 11, and a circular groove is provided on the projection, and the turntable 503 may be partially accommodated in the circular groove to increase the compactness of the overall structure.

[0028] In addition, the ice-crushing device 100 further comprises a gear cover 52 covering the outer sides of the first gear 501 and the second gear 502, and the gear cover 52 is connected to the ice storage box 10 and the ice-crushing module 30. Certainly, the gear cover 52 may also be fixed on the outer sides of the ice storage box 10 and the housing 32 of the ice-crushing module 30 by means of screw connection.

[0029] In order to facilitate the installation between the ice-crushing module 30 and the ice storage box 10, the housing 32 of the ice-crushing module 30 is provided with an ice inlet 36 butted with the ice outlet 111 of the ice storage box 10, a guide groove 112 is provided on the outer side of the ice outlet 111, a guide block 362 is provided on the outer side of the ice inlet 36, and the guide

block 362 is caught in the guide groove 112 to guide the housing 32 of the ice-crushing module 30 to be installed to the bottom of the ice storage box 10. In addition, a baffle 113 is further provided outside the ice outlet 111, and the ice-crushing module 30 abuts against the baffle 113 to limit the position of the ice-crushing module 30 upon installation.

[0030] In the present embodiment, the driving mechanism 50 comprises the ice-delivering motor (not shown) and a gear transmission mechanism driven by the ice-delivering motor. Certainly, the driving mechanism may also include other transmission structures, such as a belt transmission mechanism, a chain transmission mechanism, and worm-worm gear. The gear mechanism is not limited to a spur gear, and may also be a helical gear, a herringbone gear, a curved gears, etc.

[0031] It should be understood that although the description is described according to the embodiments, not every embodiment only comprises one independent technical solution, that such a description manner is only for the sake of clarity, that those skilled in the art should take the description as an integral part, and that the technical solutions in the embodiments may be suitably combined to form other embodiments understandable by those skilled in the art.

[0032] The detailed descriptions set forth above are merely specific illustrations of feasible embodiments of the present invention, and are not intended to limit the scope of protection of the present invention. All equivalent embodiments or modifications that do not depart from the art spirit of the present invention should fall within the scope of protection of the present invention.

Claims

1. An ice-crushing device, comprising:

an ice storage box;
an ice-crushing module provided at a bottom of the ice storage box and comprising an ice blade shaft and several movable ice blades and several stationary ice blades mounted on the ice blade shaft, the ice-crushing module being communicated with the ice storage box through an ice outlet at the bottom of the ice storage box;
a driving mechanism disposed on a side of the ice-crushing module and at least used to drive the movable ice blades to rotate relative to the stationary ice blades;
wherein the driving mechanism comprises a motor and a first transmission unit and a second transmission unit driven by the motor, an ice-agitating rod is disposed in the ice storage box, the first transmission unit drives the movable ice blades to rotate relative to the stationary ice blades, the second transmission unit drives the ice-agitating rod to rotate, and a rotation axis of

the first transmission unit is arranged parallel to a rotation axis of the second transmission unit.

2. The ice-crushing device according to claim 1, wherein the ice-crushing module comprises a housing, the ice blade shaft is disposed in the housing, the ice storage box comprises an ice storage portion forming an ice storage cavity, and an extension wall extending from one side of the ice storage portion to the bottom, and the housing is fixed on the extension wall.
3. The ice-crushing device according to claim 1, wherein the first transmission unit comprises a first gear driven by the motor, the second transmission unit comprises a second gear meshing with the first gear, the first gear drives the movable ice blades to rotate relative to the stationary ice blades, and the second gear drives the ice-agitating rod to rotate.
4. The ice-crushing device according to claim 3, wherein the first transmission unit further comprises a rotating bucket fixed relative to the first gear, the rotating bucket is disposed in the housing of the ice-crushing module, the movable ice blades are fixed relative to the rotating bucket, the rotating bucket is provided two openings radially opposite to each other, and the rotating bucket rotates to a position where the two openings correspond to the ice outlet so that the ice gets out.
5. The ice-crushing device according to claim 3, wherein the second transmission unit further comprises a turntable disposed on the ice storage box, the turntable is fixed concentrically with the second gear, and the ice-agitating rod is eccentrically connected to the turntable.
6. The ice-crushing device according to claim 3, wherein a recess is formed on the outer side of the ice storage box, and the second gear is accommodated in the recess.
7. The ice-crushing device according to claim 3, wherein the ice-crushing device further comprises a gear cover covering outer sides of the first gear and the second gear, and the gear cover is connected to the ice storage box and the ice-crushing module.
8. The ice-crushing device according to claim 2, wherein the housing is provided with an ice inlet butted with the ice outlet, a guide groove is provided on an outer side of the ice outlet, a guide block is provided on the outer side of the ice inlet, and the guide block is caught in the guide groove.
9. The ice-crushing device according to claim 8, wherein a baffle is further provided outside the ice outlet,

and the ice-crushing module abuts against the baffle.

10. A refrigerator, wherein the refrigerator comprises a cabinet, a door body for opening or closing the cabinet, and the ice-crushing device according to any of claims 1-9, the ice-crushing device being disposed at the cabinet or door body.

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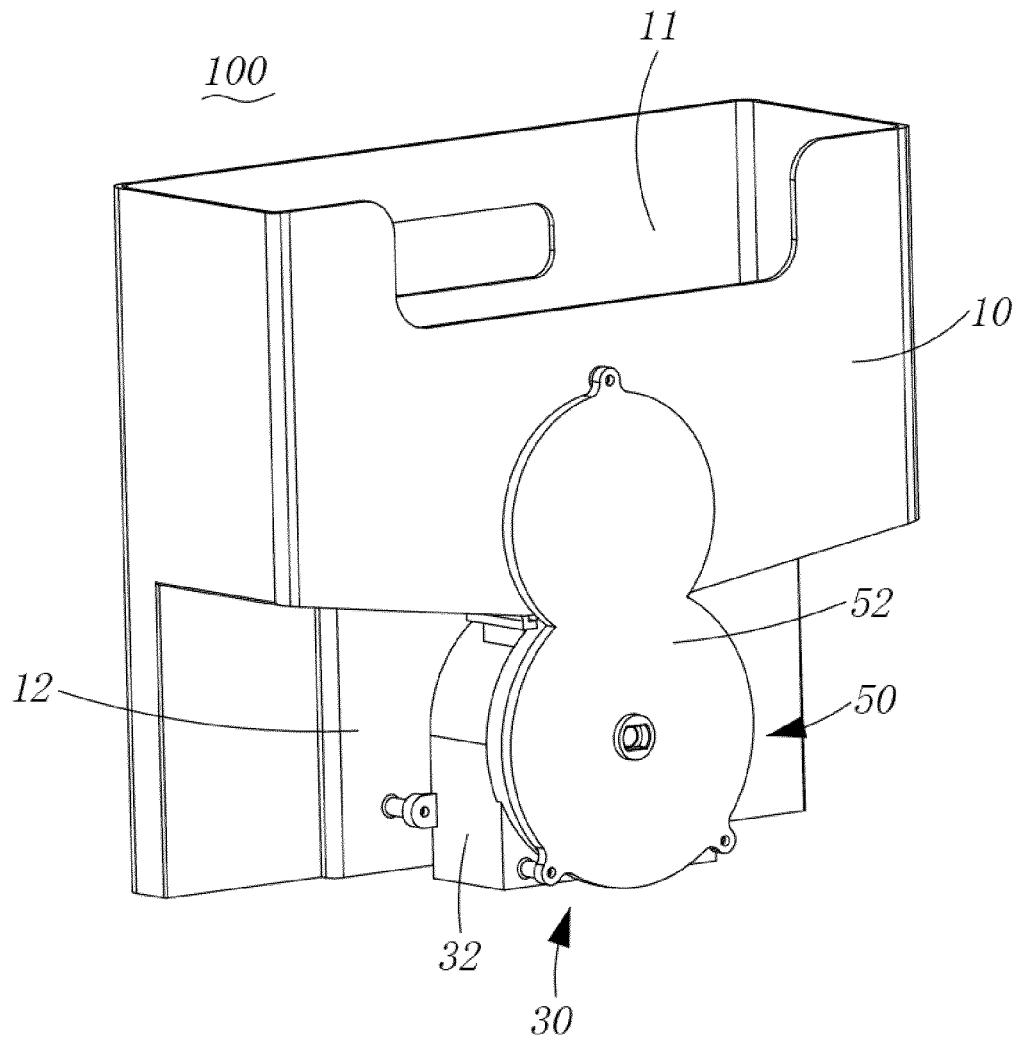


FIG. 1

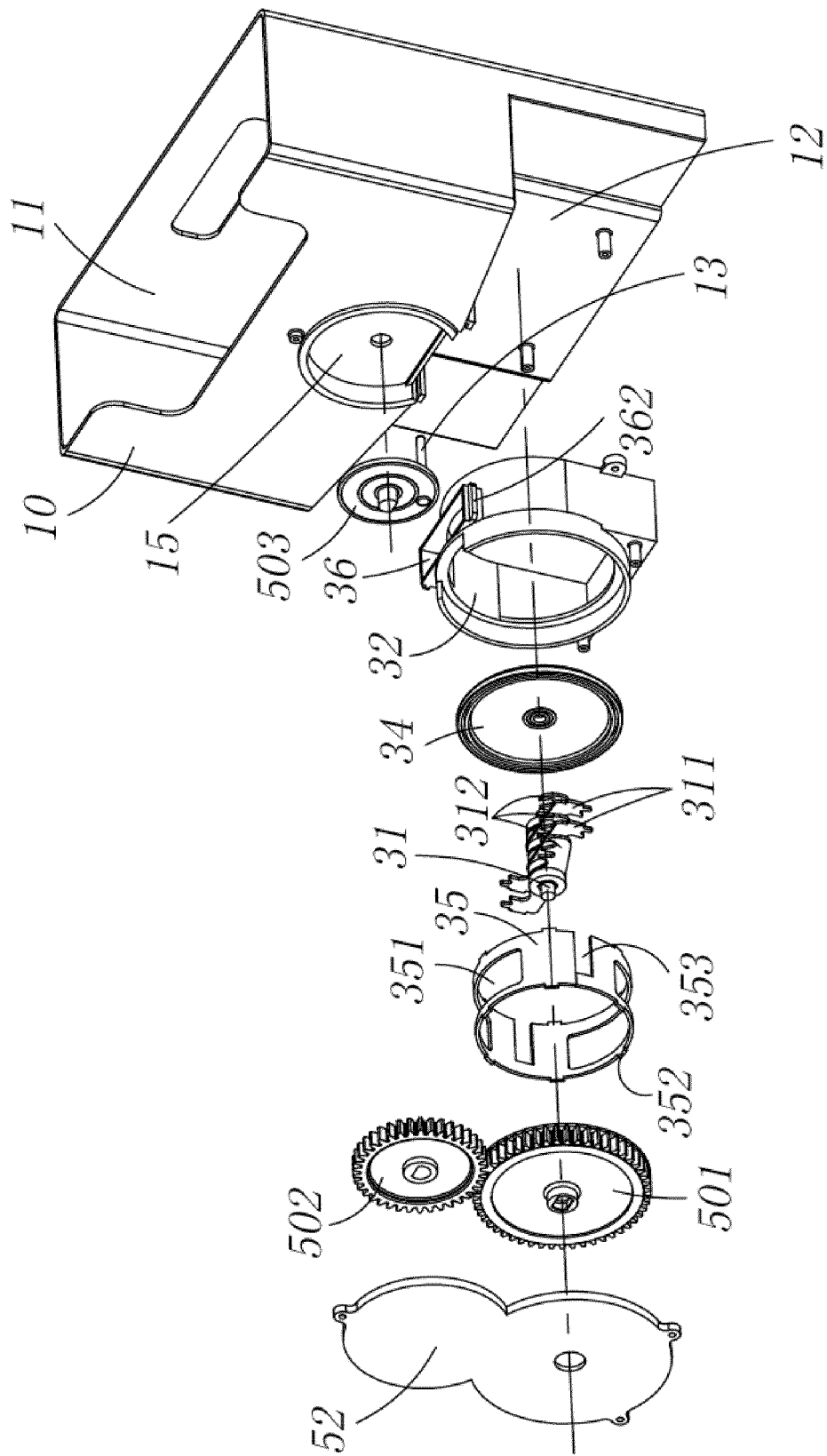


FIG.2

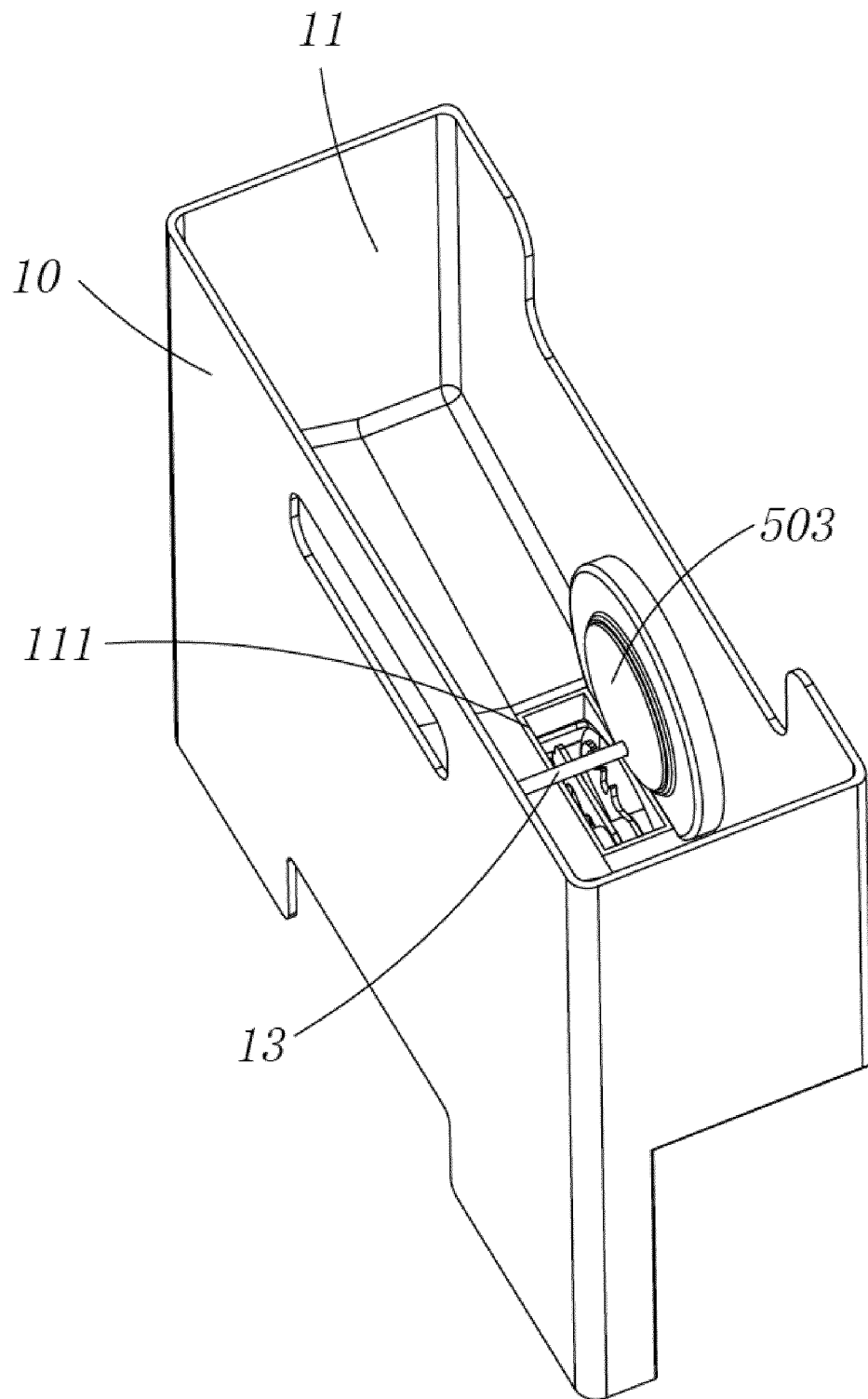


FIG. 3

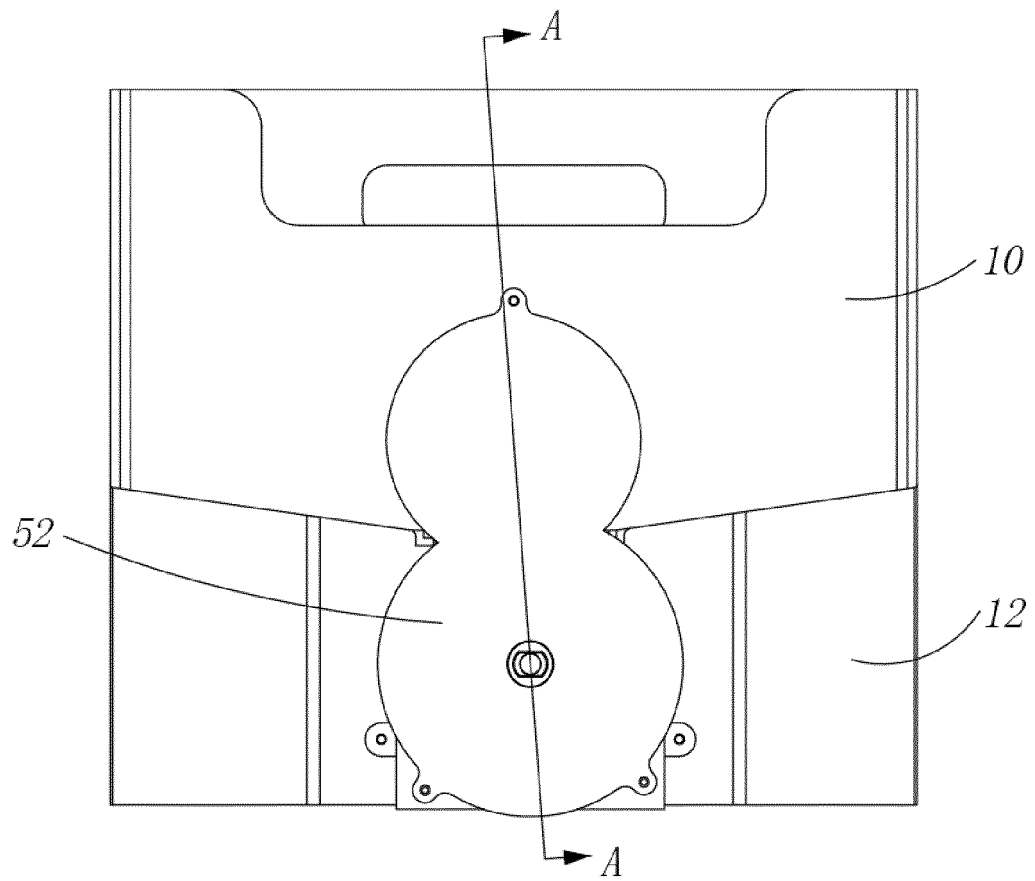


FIG. 4

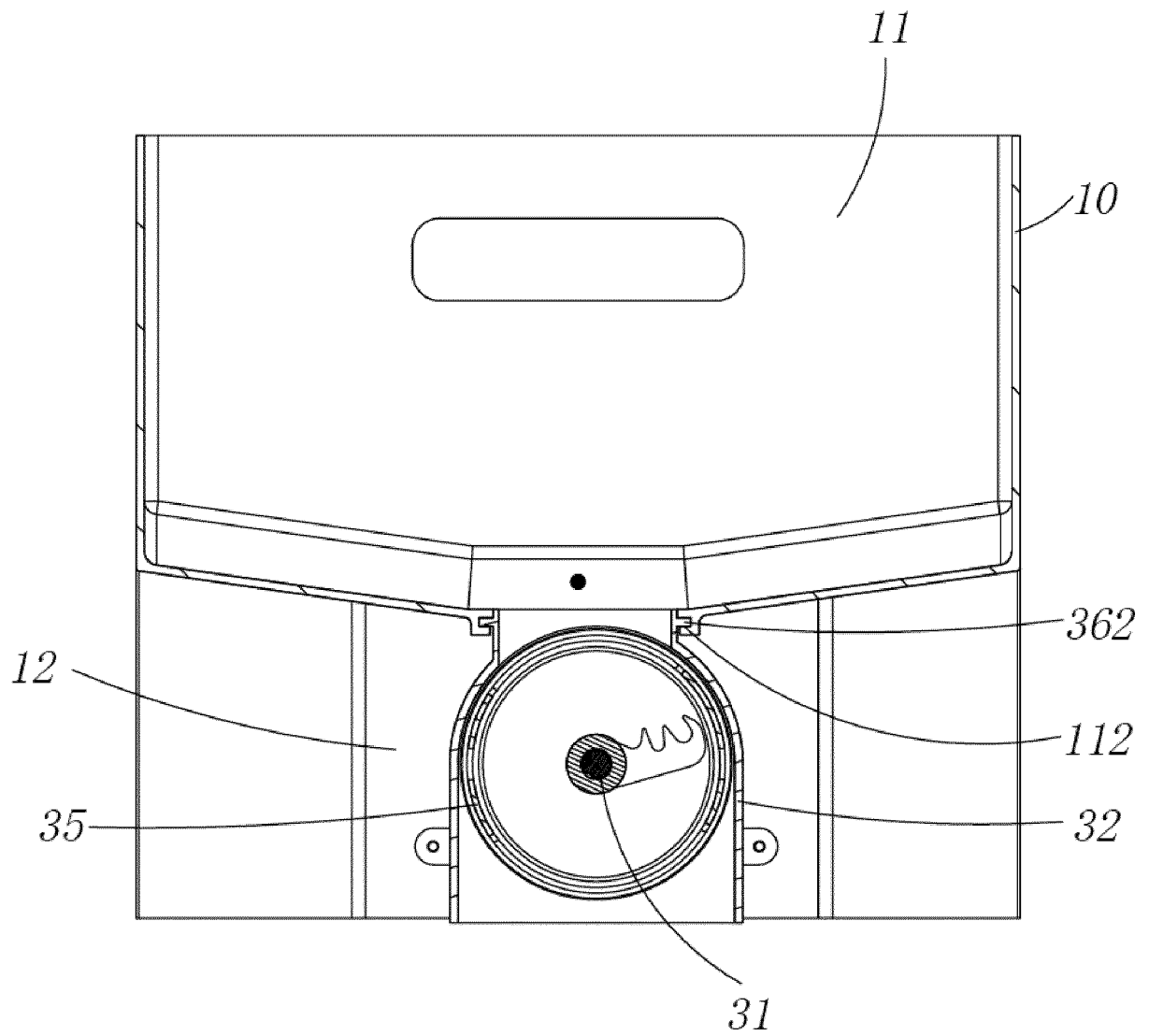


FIG. 6

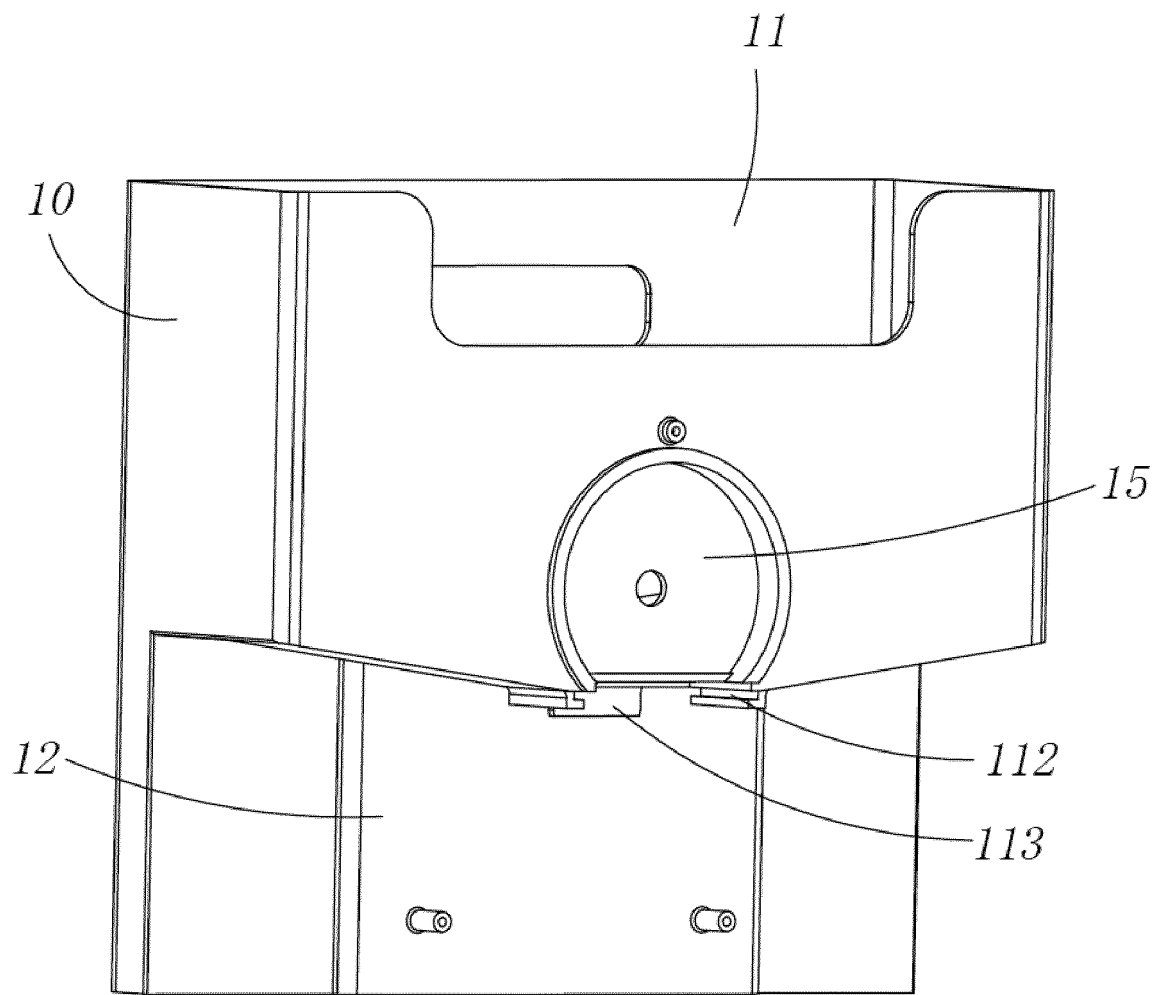


FIG. 7

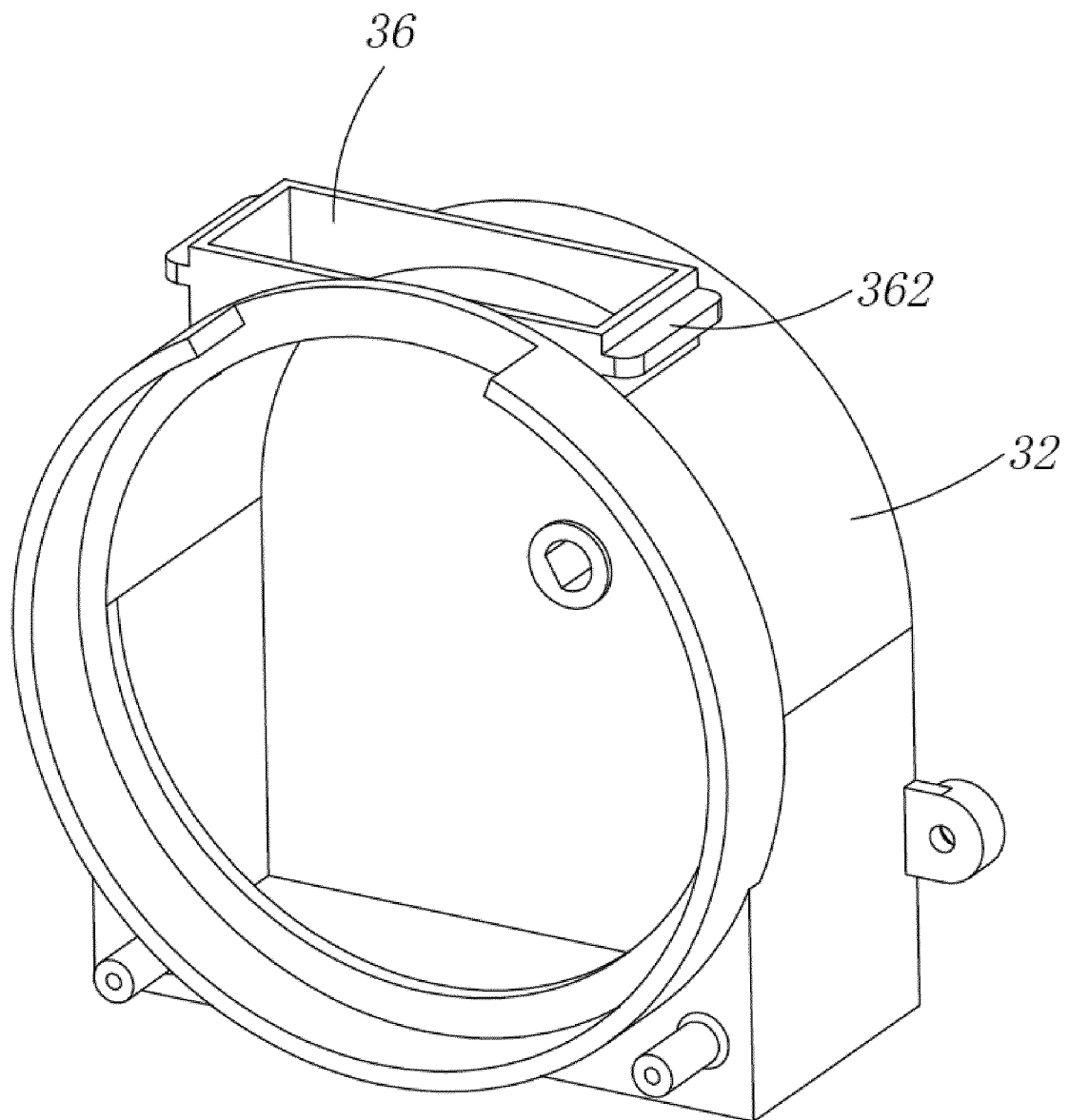


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/100726

A. CLASSIFICATION OF SUBJECT MATTER

F25C 5/04(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)

F25C5/04; F25D11/00; F25D23/12; F25D5/00

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)

CNABS, CNTXT, CNKI, VEN: 冰箱, 制冰, 碎冰, 搅动, 驱动, 轴, 刀; REFRIGERATOR, ICE, CRUSH, DRIVE, BLADE, SHAFT, PARALLEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

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Date of the actual completion of the international search

30 October 2019

Date of mailing of the international search report

13 November 2019

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2019/100726

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