



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
29.12.2021 Bulletin 2021/52

(51) Int Cl.:
F24C 15/02 (2006.01)

(21) Application number: **20760154.3**

(86) International application number:
PCT/JP2020/005930

(22) Date of filing: **17.02.2020**

(87) International publication number:
WO 2020/170993 (27.08.2020 Gazette 2020/35)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Sharp Kabushiki Kaisha**
Sakai-shi
Osaka 590-8522 (JP)

(72) Inventor: **NISHIJIMA Masahiro**
Sakai-ku, Sakai City
Osaka 590-8522 (JP)

(74) Representative: **Treeby, Philip David William et al**
Maucher Jenkins
26 Caxton Street
London SW1H 0RJ (GB)

(30) Priority: **21.02.2019 JP 2019029568**

(54) **DOOR RELEASE MECHANISM FOR HEATING COOKING DEVICE, AND HEATING COOKING DEVICE**

(57) A door release mechanism of a heating cooking apparatus that can quickly open a door using a motor having a small torque is provided. A door release mechanism of a heating cooking apparatus in which an engagement portion provided to a door engages with an engagement receptacle provided to a cooking apparatus main body so that the door is in a closed state with respect to the cooking apparatus main body includes: a motor provided to the cooking apparatus main body; a cam provided to the cooking apparatus main body and configured to be rotated by the motor; and a linear moving member provided to the cooking apparatus main body and configured to linearly move in a first direction by the rotation of the cam to move the engagement portion in a direction in which an engagement of the engagement portion with the engagement receptacle is released.

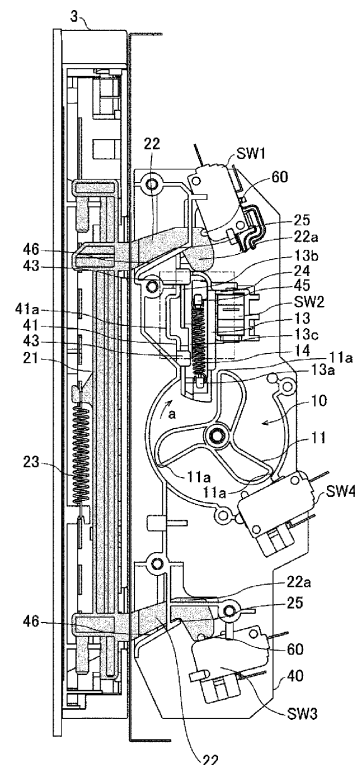


FIG. 5

Description

Technical Field

[0001] The present invention relates to a door release mechanism for a heating cooking apparatus such as an oven and a microwave oven, and a heating cooking apparatus provided with the same. The present application claims priority from JP 2019-029568 filed in Japan on February 21, 2019, the content of which is hereby incorporated by reference into this application.

Background Art

[0002] PTL 1 discloses a door release mechanism including a hold mechanism that can engage with a door of a home appliance such as a heating cooking apparatus and that can shift between a first arrangement in which the door is held in a closed position and a second arrangement in which the door is open, a cam having a plurality of cam surfaces, and a motor for driving the cam in response to a control signal. The hold mechanism includes a hook spacer sliding with respect to the cam surface and rotate the hook spacer by rotation of the cam to push up a door key provided to the door. The pushed up door key climbs over an engagement receptacle to release the engagement, and the door is opened.

Citation List

Patent Literature

[0003] PTL 1: JP 5485167 B

Summary of Invention

Technical Problem

[0004] In the door release mechanism described in PTL 1, since the hook spacer is rotated by the rotation of the cam to push up the door key, the force obtained by a driving of the motor is dispersed, and the motor having a large torque is required.

[0005] However, when the motor having large torque is used, the required time from when the opening of the door is instructed to when the door is opened is longer, so that the door cannot be quickly opened. In order to open the door quickly, a motor having a small torque is required to be used.

[0006] An aspect of the present invention is conceived in light of the problem described above, and has an object to provide a door release mechanism for a heating cooking apparatus that can quickly open a door using a motor having a small torque, and a heating cooking apparatus provided with the same.

Solution to Problem

[0007] In order to solve the above problem, a door release mechanism for a heating cooking apparatus according to an aspect of the present invention is a door release mechanism of a heating cooking apparatus in which an engagement portion provided to a door engages with an engagement receptacle provided to a cooking apparatus main body so that the door is in a closed state with respect to the cooking apparatus main body, the door release mechanism including: a motor provided to the cooking apparatus main body; a cam provided to the cooking apparatus main body and configured to be rotated by the motor; and a linear moving member provided to the cooking apparatus main body and configured to linearly move in a first direction by the rotation of the cam to move the engagement portion in a direction in which an engagement of the engagement portion with the engagement receptacle is released.

Advantage Effects of Invention

[0008] According to an aspect of the invention, an effect is exhibited that a door release mechanism of a heating cooking apparatus that can quickly open a door using a motor having a small torque, and a heating cooking apparatus provided with the same can be provided.

Brief Description of Drawings

[0009]

FIG. 1 is a perspective view illustrating an appearance of a heating cooking apparatus according to a first embodiment of the present invention.

FIG. 2 is a front view of the heating cooking apparatus with a front door thereof opened.

FIG. 3 is a block diagram illustrating a configuration of a control device included in the heating cooking apparatus.

FIG. 4 is a perspective view illustrating a configuration of a latch mechanism and a door release mechanism included in the heating cooking apparatus.

FIG. 5 is a view illustrating an internal structure of a main portion to which the latch mechanism and the door release mechanism are attached, with the front door in a closed state.

FIG. 6 is a perspective view of a hook forming body in which a latch hook of the latch mechanism is formed.

FIG. 7 is an enlarged view of a portion surrounded by a square in FIG. 5.

FIG. 8(a) is a view illustrating a state in which a latch lever is inserted into a predetermined position of the hook forming body, and 8(b) is a view illustrating a state in which a closed state detection switch on a middle stage is attached so that the latch lever is prevented from falling off.

FIG. 9(a) is a cross-sectional view taken along line B-B of (b) of FIG. 8, and FIG. 9(b) is a perspective view of the latch lever viewed from the side in contact with the hook forming body.

FIG. 10 is a view illustrating the internal structure of the main portion to which the latch mechanism and the door release mechanism are attached, with the front door in a half opened state.

FIG. 11 is a view illustrating the internal structure of the main portion to which the latch mechanism and the door release mechanism are attached, with a front door 3 in an opened state.

FIG. 12 is a view illustrating the internal structure of the main portion to which the latch mechanism and the door release mechanism are attached, with the front door in a half opened state, in a heating cooking apparatus according to a second embodiment of the present invention.

FIG. 13 is a view illustrating the internal structure of the main portion to which the latch mechanism and the door release mechanism are attached, with the front door in a half opened state, in a heating cooking apparatus according to a third embodiment of the present invention.

Description of Embodiments

First Embodiment

[0010] An embodiment of the present invention will be described in detail below. FIG. 1 is a perspective view illustrating an appearance of a heating cooking apparatus 1 according to the present embodiment. FIG. 2 is a front view of the heating cooking apparatus 1 illustrated in FIG. 1 in a state in which the front door 3 is opened.

Outline of Heating Cooking Apparatus 1

[0011] As illustrated in FIG. 1 and FIG. 2, the heating cooking apparatus 1 is, for example, a microwave oven and includes a front door (door) 3 covering a heating chamber 4 on the front face of a cooking apparatus main body 2. In the present embodiment, the front door 3 is a lateral opening type in which an end portion on the left side (left side as viewed) is hinged. Note that the present invention can also be applied to a door in which the right side, the upper side, or the lower side is hinged.

[0012] The front door 3 is provided with a latch head member 21 (see FIG. 4) in the door housing of the right end portion serving as the open end. The latch head member 21 includes latch heads (engagement portions) 22 including engagement claw portions 22a at the tip portions at two upper and lower locations. The latch heads 22 protrude from openings 3a and 3a formed in the door housing of the front door 3.

[0013] The cooking apparatus main body 2 includes latch hooks (engagement receptacles) 25 and 25 (see FIG. 4) engaging with the latch heads 22 and 22 provided

in the front door 3 and a door release mechanism 10 in a main body housing on the right front side. Openings 2a and 2a for receiving the latch heads 22 provided in the front door 3 are formed in the main body housing on the right front side of the cooking apparatus main body 2.

[0014] The latch head 22 engages with the latch hook 25, so that the front door 3 is in a closed state. The latch head 22 and the latch hook 25 constitute a latch mechanism holding the front door 3 in the closed state. The door release mechanism 10 is a mechanism that releases the engagement between the latch head 22 and the latch hook 25 to open the front door 3. As will be described in detail below, the door release mechanism 10 includes a motor 12 (see FIG. 4), and electrically releases the engagement to open the front door 3.

[0015] The heating cooking apparatus 1 includes an operation panel 5 above the front door 3. The operation panel 5 is provided with a door opening switch 6 for opening the front door 3.

Control Device

[0016] FIG. 3 is a block diagram illustrating a configuration of a control device included in the heating cooking apparatus 1. The control device includes a control unit 30 for controlling operations of the heating cooking apparatus 1. The control unit 30 is constituted of a micro-computer, for example, and includes a CPU, a ROM, and a RAM. As illustrated in FIG. 3, the operation panel 5, a heating operation unit 31, a front door open-close detection unit 32, the motor 12 of the door release mechanism 10, and the like are connected to the control unit 30.

[0017] The heating operation unit 31 is an operation unit for heating the food product placed in the heating chamber 4, and is a heating device such as a microwave output device and a heater in a case where the heating cooking apparatus 1 is a microwave oven. When the control unit 30 is instructed to start the cooking by receiving input of the heating cooking condition and the like using the operation panel 5 and determines that the front door 3 is in the closed state, the control unit 30 operates the heating operation unit 31 to start cooking.

[0018] The front door open-close detection unit 32 includes three closed state detection switches SW1 to SW3 described later. In a case where the control unit 30 receives, from all of the three closed state detection switches SW1 to SW3, signals indicating that a knob 60 (see FIG. 5) is depressed, the control unit 30 determines that the front door 3 is in the closed state.

[0019] The motor 12 of the door release mechanism 10 rotates a cam 11 described later (see FIG. 5). The door opening switch 6 of the operation panel 5 is operated, so that the control unit 30 drives the motor 12.

Door Release Mechanism 10

[0020] FIG. 4 is a perspective view illustrating a configuration of the latch mechanism and the door release

mechanism 10. FIG. 5 is a view illustrating the internal structure of the main portion to which the latch mechanism and the door release mechanism 10 are attached. In FIG. 4 and FIG. 5, the front door 3 is in the closed state. In FIG. 5, the illustration of the motor 12 is omitted. FIG. 6 is a perspective view of the hook forming body 40 in which the latch hook 25 of the latch mechanism is formed. FIG. 7 is an enlarged view of a portion surrounded by a square in FIG. 5.

[0021] As illustrated in FIG. 4 and FIG. 5, the latch heads 22 and 22 provided to the front door 3 and the latch hooks 25 and 25 provided to the cooking apparatus main body 2 constitute the latch mechanism. The latch head member 21 provided with the latch heads 22 and 22 is vertically movably attached in the door housing of the front door 3 and is biased downward by a door spring 23. The latch heads 22 and 22 are provided to one latch head member 21, so that the latch heads 22 and 22 integrally move.

[0022] The latch heads 22 and 22 are inclined upward as they are away from the rod-shaped portion of the latch head member 21, and a tip portions thereof are bent downward. The bent tip portions are engagement claw portions 22a and 22a that engage with the latch hooks 25. The lower end of the engagement claw portion 22a of the upper side that is lifted by the latch lever 13 among the engagement claw portions 22a and 22a is rounded and is formed to slide smoothly with respect to the latch lever 13.

[0023] As illustrated in FIG. 6, the latch hooks 25 and 25 are formed on the hook forming body 40. The hook forming body 40 is a substrate formed from a vertically elongated resin molded article. The closed state detection switches SW1 to SW3 for detecting the closed state of the front door 3, and the cam 11, the motor 12, the latch lever 13, the latch spring 14, the cam position detection switch SW4, and the like that are the components of the door release mechanism 10 are attached to one face of the hook forming body 40. In other words, the hook forming body 40 is a support body of the closed state detection switches SW1 to SW3 and the components of the door release mechanism 10.

[0024] An inclined surface portions 46 and 46 with which the lower ends of the engagement claw portions 22a and 22a of the latch heads 22 and 22 come into contact when the front door 3 opens and closes are formed on the front door 3 side of the latch hooks 25 and 25 in the hook forming body 40.

[0025] As illustrated in FIG. 4 and FIG. 5, the closed state detection switch (second switch) SW1 is attached on a top stage of the hook forming body 40, the closed state detection switch (first switch) SW2 is attached on a middle stage, and the closed state detection switch SW3 is attached on a bottom stage.

[0026] The closed state detection switch SW1 on the top stage is positioned such that the knob 60 is depressed by the tip of the engagement claw portion 22a of the latch head 22 of the upper side. The closed state detection

switch SW3 on the bottom stage is positioned such that the knob 60 is depressed by the lower end of the engagement claw portion 22a of the latch head 22 of the lower side. The closed state detection switch SW2 on the middle stage is positioned such that the knob 60 is depressed by the latch lever 13 which is depressed by the engagement claw portion 22a of the latch head 22 of the upper side to move downward (in a second direction) and reaches the lower position.

[0027] The door release mechanism 10 includes at least the motor 12, the cam 11 rotated by the motor 12, and the latch lever (linear moving member) 13 linearly moving upward (in the first direction) by the rotation of the cam 11 to move the latch head 22 of the upper side in a direction in which the latch hook 25 is released.

[0028] The cam 11 and the motor 12 are attached to a vertically central portion of the hook forming body 40. The motor 12 rotationally drives the cam 11, and the cam 11 is fixed to a shaft (not illustrated) of the motor 12. The cam 11 includes a plurality of cam surfaces 11a sliding with respect to the lower end of the latch lever 13 to move the latch lever 13 upward. The cam position detection switch SW4 is provided to detect the position of the cam 11. The latch lever 13 is arranged between a guide long wall (guide wall) 41 and a guide short wall (guide wall) 42 formed on the hook forming body 40. The latch lever 13 is attached to be linearly movable in the vertical direction along the guide long wall 41 and the guide short wall 42.

[0029] The latch lever 13 has an elongated shape in the vertical direction, which is the direction in which the latch lever 13 linearly moves, and one end portion along the lateral direction slides with respect to the cam 11, and the other end portion along the lateral direction abuts the engagement claw portion 22a of the latch head 22 on the upper side. With such a shape, it is possible to achieve a compact configuration in which the dimension of the front-rear direction (sliding direction, open-close direction) of the door release mechanism 10 is suppressed.

[0030] The latch lever 13 is biased upward (in the first direction) by the latch spring 14. In the latch spring 14, the upper end thereof is latched to a clamp 45 formed on the hook forming body 40, and the lower end thereof is latched to a clamp 13a formed on the latch lever 13.

[0031] The latch lever 13 linearly moves downward against a biasing force of the latch spring 14 to depress the knob 60 (see FIG. 4) of the closed state detection switch SW2 on the middle stage. In the present embodiment, a projection 24 is provided to the latch lever 13, and the knob 60 of the closed state detection switch SW2 on the middle stage is depressed by the projection 24. Accordingly, the closed state detection switch SW2 is positioned easily compared to a configuration in which the knob 60 is depressed by a rotating member.

[0032] The guide long wall 41 is formed longer in the vertical direction compared to the guide short wall 42, and the upper end of the guide long wall 41 reaches the

latch hook 25 of the upper side. The guide long wall 41 is provided with claw portions 43 and 43 that latch the latch lever 13 and restrict the movement of the latch lever 13 in two directions orthogonal to the direction of linear movement.

[0033] The claw portions 43 and 43 has an L shape and are formed on the end surfaces in the height direction of the wall of the guide long wall 41. The claw portions 43 and 43 sandwich the wall portion 13b of the latch lever 13 extending in the vertical direction to restrict the movement of the latch lever 13 only in the vertical direction. In the present embodiment, the claw portions 43 are formed at two locations separated from each other in the vertical direction, but the claw portion 43 may be formed at one location.

[0034] A concave relief portion 41a is formed between the claw portion 43 and the claw portion 43 of the guide long wall 41, and a concave relief portion 13c is formed in the wall portion 13b of the latch lever 13. The height of the wall of the relief portion 13c is lower than that of the wall portion 13b so as not to come into contact with the claw portion 43. The relief portions 41a and 13c are used to avoid interference with the guide long wall 41 and the claw portion 43 when the latch lever 13 is attached to and detached from the hook forming body 40. The latch lever 13 is arranged to be latched to the two claw portions 43 and 43 using such relief portions 41a and 13c, and subsequently the closed state detection switch SW2 on the middle stage is attached to prevent the latch lever 13 from falling off. This will be described with reference to FIG. 8.

[0035] (a) of FIG. 8 is a view illustrating a state in which the latch lever 13 is inserted into a predetermined position of the hook forming body 40, and (b) of FIG. 8 is a view illustrating a state in which the closed state detection switch SW2 on the middle stage is attached, so that the latch lever 13 is prevented from falling off. As illustrated in (a) of FIG. 8, the latch lever 13 is inserted between the guide long wall 41 and the guide short wall 42 formed on the hook forming body 40 so that the wall portion 13b is sandwiched between the claw portions 43 and 43. An opening 13d through which the clamp 45 formed on the hook forming body 40 is inserted is formed in the latch lever 13, and the latch lever 13 is inserted in a state in which the lower end of the latch lever 13 is slightly rotated away from a side where the latch head 22 engages, with the inserted clamp 45 as a fulcrum. At this time, the relief portion 41a formed in the guide long wall 41 avoids the interference with the upper end of the latch lever 13, and the relief portion 13c formed in the wall portion 13b of the latch lever 13 avoids the interference with the claw portion 43 of the lower side. Accordingly, the latch lever 13 can be inserted so as to be latched to the claw portions 43 and 43. Subsequently, as illustrated in (b) of FIG. 8, the closed state detection switch SW2 on the middle stage is attached. Accordingly, since the closed state detection switch SW2 on the middle stage serves as an obstacle, the latch lever 13 cannot reach a position at the time of

attachment and detachment in which the latch lever 13 rotates about the clamp 45 illustrated in (a) of FIG. 8 as a fulcrum, and as a result, the latch lever 13 is prevented from falling off.

[0036] In this manner, in the present embodiment, the closed state detection switch SW2 on the middle stage prevents the latch lever 13 in a state in which the claw portions 43 and 43 are engaged from falling out. Note that the guide short wall 42 is not necessarily required and may be omitted when the latch lever 13 stably linearly moves by only the guide long wall 41.

[0037] As a more preferred configuration, a technique has been devised to reduce friction when the latch lever 13 linearly moves. In the present embodiment, projecting portions 44 coming into line contact with the latch lever 13 are provided to the guide long wall 41 and the guide short wall 42. As illustrated in FIG. 7, in the present embodiment, the guide long wall 41 and the guide short wall 42 are each provided with two elongated projecting portions 44 extending in the height direction of the walls, and are configured such that the latch lever 13 always comes into contact with the four projecting portions 44 in the movable range. Accordingly, the contact area with respect to the guide long wall 41 and the guide short wall 42 is reduced to suppress friction, and the latch lever 13 can be moved with a smaller force. Rattling of the latch lever 13 in the front-rear direction can be eliminated by always keeping contact with projecting portions 44 provided in at least two locations on one side. Note that the projecting portions 44 may be formed to extend in the width direction (direction of linear movement) of the wall, in other words, such that the contact area can be reduced. In a case where the projecting portions 44 are formed to extend in the width direction of the wall, a projecting portion 44 coming into contact with the guide long wall 41 and the guide short wall 42 may be provided on the latch lever 13 side.

[0038] Furthermore, in the present embodiment, as a measure of reducing friction when the latch lever 13 linearly moves, a sliding surface when the latch lever 13 linearly moves is provided with a convex portion 13e coming into line contact with the hook forming body 40, serving as a sliding counterpart. (a) of FIG. 9 is a cross-sectional view taken along line B-B of (b) of FIG. 8, and (b) of FIG. 9 is a perspective view of the latch lever 13 viewed from the side in contact with the hook forming body 40. By providing such a convex portion 13e, the contact between the latch lever 13 and the hook forming body 40 is line contact, and friction when the latch lever 13 linearly moves can be effectively reduced.

Operations of Door Release Mechanism

[0039] Next, operations of the door release mechanism 10 will be described using FIG. 5, FIG. 10, and FIG. 11. FIG. 10 and FIG. 11 are views illustrating the internal structures of the main portion to which the latch mechanism and the door release mechanism 10 are attached.

In FIG. 10 and FIG. 11, the illustration of the motor 12 is omitted. FIG. 5 illustrates a state in which the front door 3 is closed as described above, FIG. 10 illustrates a state in which the front door 3 is half opened, and FIG. 11 illustrates a state in which the front door 3 is opened.

[0040] As illustrated in FIG. 5, in the state in which the front door 3 is closed, the engagement claw portions 22a and 22a of the latch heads 22 and 22 provided to the front door 3 engage with the latch hooks 25 and 25 provided to the cooking apparatus main body 2. The latch lever 13 is in a lower position by being pressed down by the lower end of the engagement claw portion 22a of the latch head 22 of the upper side. In this state, the closed state detection switch SW1 on the upper stage is depressed by the tip of the engagement claw portion 22a of the latch head 22 of the upper side, and the closed state detection switch SW3 on the lower stage is depressed by the lower end of the engagement claw portion 22a of the latch head 22 of the lower side. The closed state detection switch SW2 on the middle stage is depressed by the projection 24 of the latch lever 13 moved to the lower position.

[0041] In such a state, when the door opening switch 6 of the operation panel 5 (see FIG. 1) is operated, the motor 12 is driven and the cam 11 is rotated clockwise indicated by an arrow a. Accordingly, the cam surface 11a of the cam 11 and the lower end of the latch lever 13 slide with respect to each other, the cam 11 pushes up the latch lever 13, and the latch lever 13 linearly moves upward. Accordingly, the closed state illustrated in FIG. 5 shifts to the state illustrated in FIG. 10.

[0042] As illustrated in FIG. 10, the latch lever 13 linearly moves upward (in the first direction), so that the upper end of the latch lever 13 lifts (pushes up) the lower end of the engagement claw portion 22a of the latch head 22 of the upper side. Accordingly, the engagement claw portion 22a of the latch head 22 of the lower side moving integrally therewith is also lifted. When the lower ends of the engagement claw portions 22a and 22a of the latch heads 22 and 22 of the upper side and the lower side climb over the latch hooks 25 and 25, the engagements with the latch hooks 25 and 25 are released and the state illustrated in FIG. 10 shifts to the state illustrated in FIG. 11.

[0043] As illustrated in FIG. 11, when the engagement claw portions 22a and 22a of the latch heads 22 and 22 of the upper side and the lower side climb over the latch hooks 25 and 25, the engagement claw portions 22a and 22a are guided obliquely downward along the inclined surface portions 46 and 46 by the biasing force of the door spring 23. In this state, the latch lever 13 is attracted upward by the biasing force of the latch spring 14, so that the closed state detection switch SW2 on the middle stage is not depressed.

Effects

[0044] In the configuration described above, the latch

lever 13 linearly moves by the rotation of the cam 11 to move the latch head 22 in a direction in which the engagement with the latch hook 25 is released, so that the loss of force can be reduced and the torque required for the motor 12 can be reduced compared to the configuration of PTL 1 in which the force obtained by driving the motor is transmitted by a continuous rotation.

[0045] Accordingly, a motor having a small torque can be used as the motor 12, so that the range of selection of the motor 12 is widened and the front door 3 can be opened in a short period of time (quickly opened) after the door opening switch 6 is pressed.

[0046] In the configuration described above, friction when the latch lever 13 linearly moves is reduced by the projecting portions 44 formed on the guide long wall 41 and the guide short wall 42, the convex portion 13e formed on the latch lever 13, and the like. Accordingly, the torque required for the motor 12 can be further reduced.

Second Embodiment

[0047] Another embodiment of the present invention will be described below. Note that, for convenience of description, components having the same function as those described in the above-described embodiment will be denoted by the same reference signs, and descriptions of those components will be omitted.

[0048] FIG. 12 illustrates a second embodiment, and is a view illustrating an internal structure of a main portion to which a latch mechanism and a door release mechanism 10A are attached. As illustrated in FIG. 12, a heating cooking apparatus of the present embodiment includes the door release mechanism 10A instead of the door release mechanism 10. The door release mechanism 10A is the same as the door release mechanism 10 except that an engagement wall 48 is included. The engagement wall 48 abuts the latch lever 13 to restrict upward movement of the latch lever 13 and prevents the latch lever 13 from coming into contact with a knob (sensing portion) 60 of a closed state detection switch SW1 on the upper stage. The engagement wall 48 is provided below the attachment position of the closed state detection switch SW1 on the upper stage in a hook forming body 40.

[0049] By providing such an engagement wall 48, a problem that when the latch lever 13 is pushed up by the cam 11 and moves upward, the tip of the latch lever 13 comes into contact with the knob 60 of the closed state detection switch SW1 on the upper stage to apply a load to the knob 60 is surely avoided.

Third Embodiment

[0050] Another embodiment of the present invention will be described below. Note that, for convenience of description, components having the same function as those described in the above-described embodiment will be denoted by the same reference signs, and descrip-

tions of those components will be omitted.

[0051] FIG. 13 illustrates a third embodiment, and is a view illustrating an internal structure of a main portion to which a latch mechanism and a door release mechanism 10B are attached. As illustrated in FIG. 13, a heating cooking apparatus 1 according to the present embodiment includes the door release mechanism 10B instead of the door release mechanism 10A. The door release mechanism 10B is the same as the door release mechanism 10A except that a latch lever 53 is included instead of the latch lever 13. The latch lever 53 includes an extending portion 54 extending rearward in the sliding direction on a lower end sliding with respect to the cam surface 11a of the cam 11. Note that the latch lever 53 is the same as the latch lever 13 except that the extending portion 54 is included.

[0052] By providing such an extending portion 54, the time for coming into contact with the cam surface 11a is longer, so that the latch lever 53 holds a position of uppermost stage where the latch head 22 of the upper side is lifted and moved in the direction in which the engagement is released for a long time. Accordingly, the latch heads 22 and 22 can ensure a sufficient amount of time when the latch heads 22 and 22 climb over the latch hooks 25 and 25 to slide down the forward inclined surface portions 46 and 46 while the latch lever 53 is configured to have an elongated shape in the vertical direction and a reduced dimension in the front-rear direction (sliding direction) of the door release mechanism 10A. As a result, it is possible to surely avoid a problem that the rotational speed of the motor 12 is too fast, so that the latch lever moves downward before the latch heads 22 and 22 move to the position where the front door 3 is released, and thus the opening of the front door 3 is insufficient.

Supplement

[0053] A door release mechanism of the heating cooking apparatus according to a first aspect of the present invention is a door release mechanism of a heating cooking apparatus in which an engagement portion provided to a door engages with an engagement receptacle provided to a cooking apparatus main body so that the door is in a closed state with respect to the cooking apparatus main body, the door release mechanism including: a motor provided to the cooking apparatus main body; a cam provided to the cooking apparatus main body and configured to be rotated by the motor; and a linear moving member provided to the cooking apparatus main body and configured to linearly move in a first direction by the rotation of the cam to move the engagement portion in a direction in which an engagement of the engagement portion with the engagement receptacle is released.

[0054] The door release mechanism of the heating cooking apparatus according to a second aspect of the present invention can be configured, in the first aspect, to include a guide wall configured to guide a linear move-

ment of the linear moving member, wherein the guide wall is provided with a claw portion configured to engage with the linear moving member to restrict a movement of the linear moving member in two directions orthogonal to a direction of the linear movement.

[0055] The door release mechanism of the heating cooking apparatus according to a third aspect of the present invention can be configured, in the second aspect, such that a first switch detecting the closed state of the door is configured to prevent the linear moving member in a state of being engaged with the claw portion from falling out.

[0056] The door release mechanism of the heating cooking apparatus according to a fourth aspect of the present invention can be configured, in the second or third aspect, such that the guide wall is provided with a projecting portion coming into line contact with the linear moving member.

[0057] The door release mechanism of the heating cooking apparatus according to a fifth aspect of the present invention can be configured, in any one of the first to fourth aspects, such that the linear moving member have an elongated shape in a linearly moving direction, one end portion of the linear moving member along the lateral direction slides with respect to the cam, and the other end portion of the linear moving member along the lateral direction abuts the engagement portion.

[0058] The door release mechanism of the heating cooking apparatus according to a sixth aspect of the present invention can be configured, in any one of the first to fifth aspects, such that a sliding surface when the linear moving member linearly moves is provided with a convex portion coming into line contact with a member of a sliding counterpart.

[0059] The door release mechanism of the heating cooking apparatus according to a seventh aspect of the present invention can be configured, in any one of the first to sixth aspects, such that the linear moving member is biased in the first direction, and the linear moving member linearly moves in a second direction opposite to the first direction against the biasing force by engaging the engagement portion with the engagement receptacle and depress the first switch detecting the closed state of the door.

[0060] The door release mechanism of the heating cooking apparatus according to an eighth aspect of the present invention can be configured, in any one of the first to seventh aspects, such that the engagement portion is provided to depress a second switch configured to detect a closed state of the door by engaging the engagement receptacle, and includes an engagement wall configured to abut the linear moving member to restrict the movement of the linear moving member in the first direction to prevent the linear moving member from coming into contact with a sensing portion of the second switch.

[0061] The door release mechanism of the heating cooking apparatus according to a ninth aspect of the

present invention can be configured, in the fifth aspect, such that an end portion on a side where the linear moving member slides with respect to the cam includes an extending portion extending rearward in the sliding direction.

[0062] A heating cooking apparatus according to a tenth aspect of the present invention includes a cooking apparatus main body, a door provided to the cooking apparatus main body to be openable, and the door release mechanism according to any one of the first to ninth aspects.

[0063] The present invention is not limited to each of the above-described embodiments. It is possible to make various modifications within the scope of the claims. An embodiment obtained by appropriately combining technical elements each disclosed in different embodiments falls also within the technical scope of the present invention. Furthermore, technical elements disclosed in the respective embodiments may be combined to provide a new technical feature.

Claims

1. A door release mechanism of a heating cooking apparatus in which an engagement portion provided to a door engages with an engagement receptacle provided to a cooking apparatus main body so that the door is in a closed state with respect to the cooking apparatus main body, the door release mechanism comprising:

a motor provided to the cooking apparatus main body;
a cam provided to the cooking apparatus main body and configured to be rotated by the motor; and
a linear moving member provided to the cooking apparatus main body and configured to linearly move in a first direction by the rotation of the cam to move the engagement portion in a direction in which an engagement of the engagement portion with the engagement receptacle is released.

2. The door release mechanism according to claim 1 further comprising:

a guide wall configured to guide a linear movement of the linear moving member,
wherein the guide wall is provided with a claw portion configured to engage with the linear moving member to restrict a movement of the linear moving member in two directions orthogonal to a direction of the linear movement.

3. The door release mechanism according to claim 2, wherein a first switch detecting the closed state of

the door is configured to prevent the linear moving member in a state of being engaged with the claw portion from falling out.

4. The door release mechanism according to claim 2 or 3,
wherein the guide wall is provided with a projecting portion coming into line contact with the linear moving member.

5. The door release mechanism according to any one of claims 1 to 4,

wherein the linear moving member have an elongated shape in a linearly moving direction, one end portion of the linear moving member along the lateral direction slides with respect to the cam, and
the other end portion of the linear moving member along the lateral direction abuts the engagement portion.

6. The door release mechanism according to any one of claims 1 to 5,

wherein a sliding surface when the linear moving member linearly moves is provided with a convex portion coming into line contact with a member of a sliding counterpart.

7. The door release mechanism according to any one of claims 1 to 6,

wherein the linear moving member is biased in the first direction, and
the linear moving member linearly moves in a second direction opposite to the first direction against the biasing force by engaging the engagement portion with the engagement receptacle and depress the first switch detecting the closed state of the door.

8. The door release mechanism according to any one of claims 1 to 7,

wherein the engagement portion is provided to depress a second switch configured to detect a closed state of the door by engaging the engagement receptacle, and includes an engagement wall configured to abut the linear moving member to restrict the movement of the linear moving member in the first direction to prevent the linear moving member from coming into contact with a sensing portion of the second switch.

9. The door release mechanism according to claim 5, wherein an end portion on a side where the linear moving member slides with respect to the cam includes an extending portion extending rearward in the sliding direction.

10. A heating cooking apparatus comprising:

a cooking apparatus main body;
a door provided to the cooking apparatus main
body to be openable; and
the door release mechanism according to any
one of claims 1 to 9.

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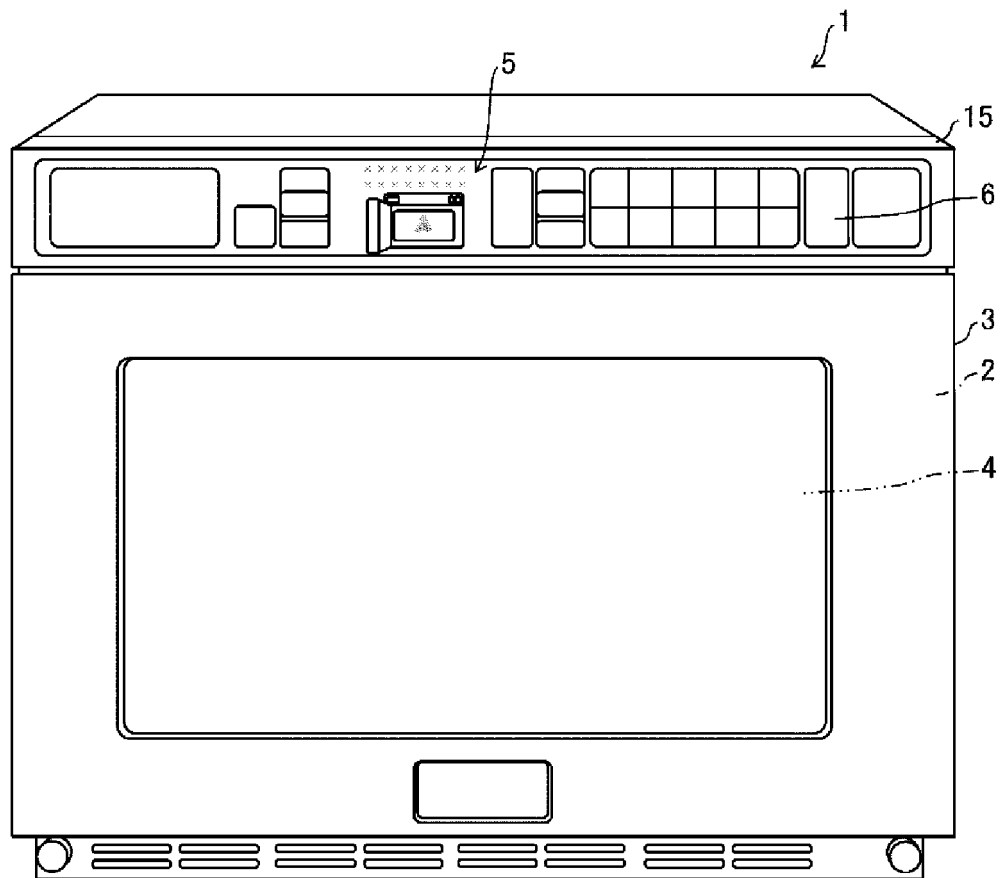


FIG. 1

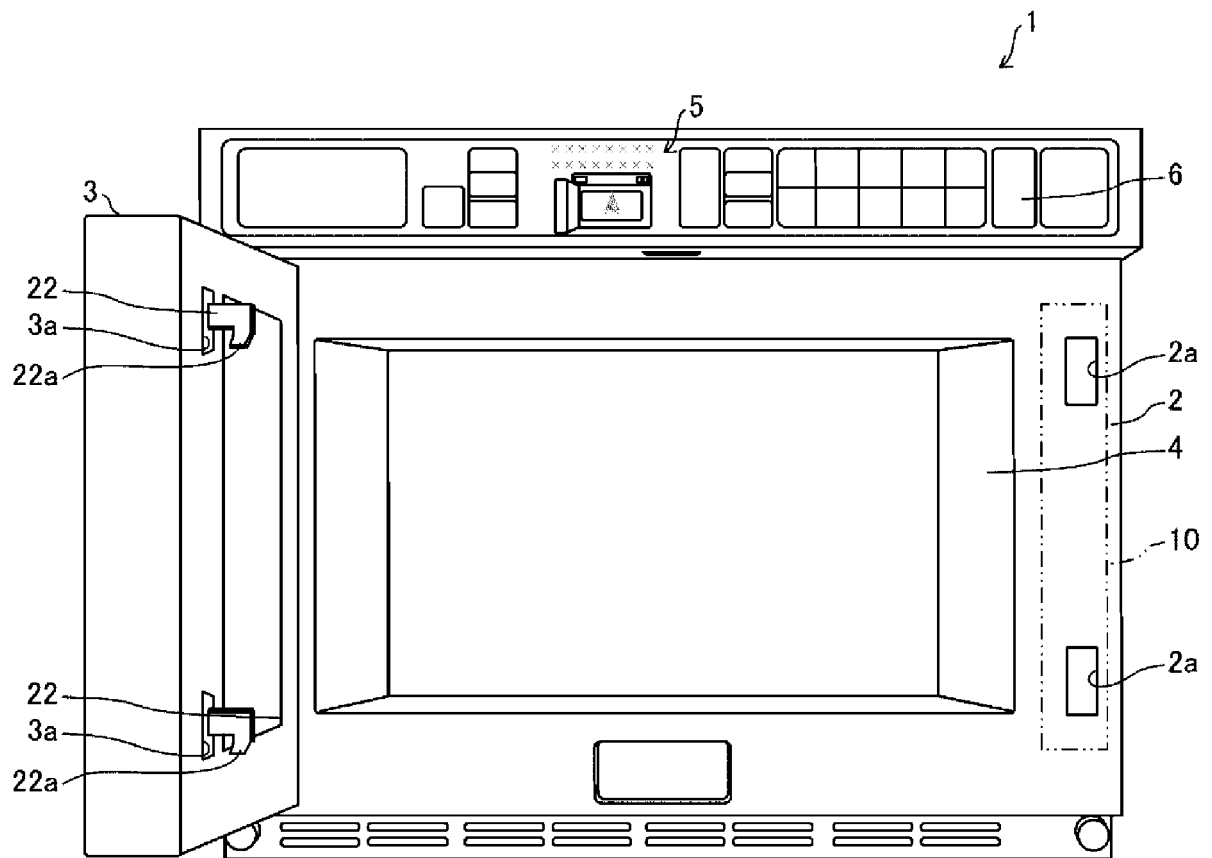


FIG. 2

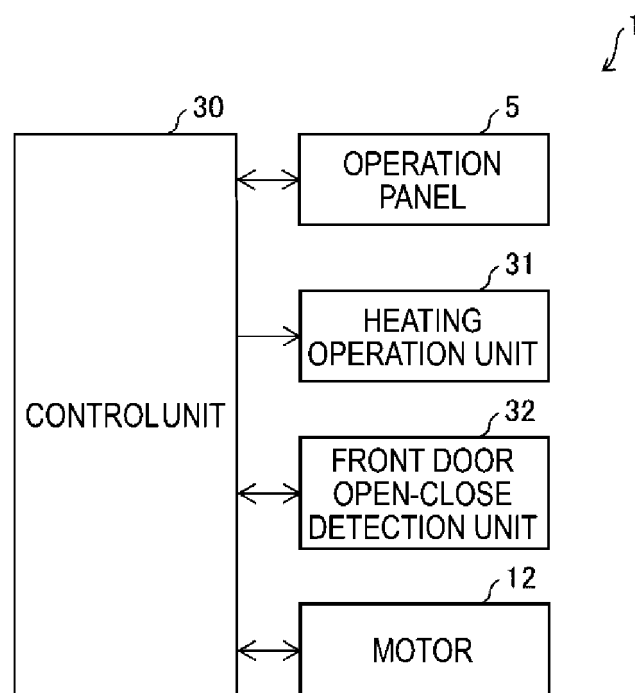


FIG. 3

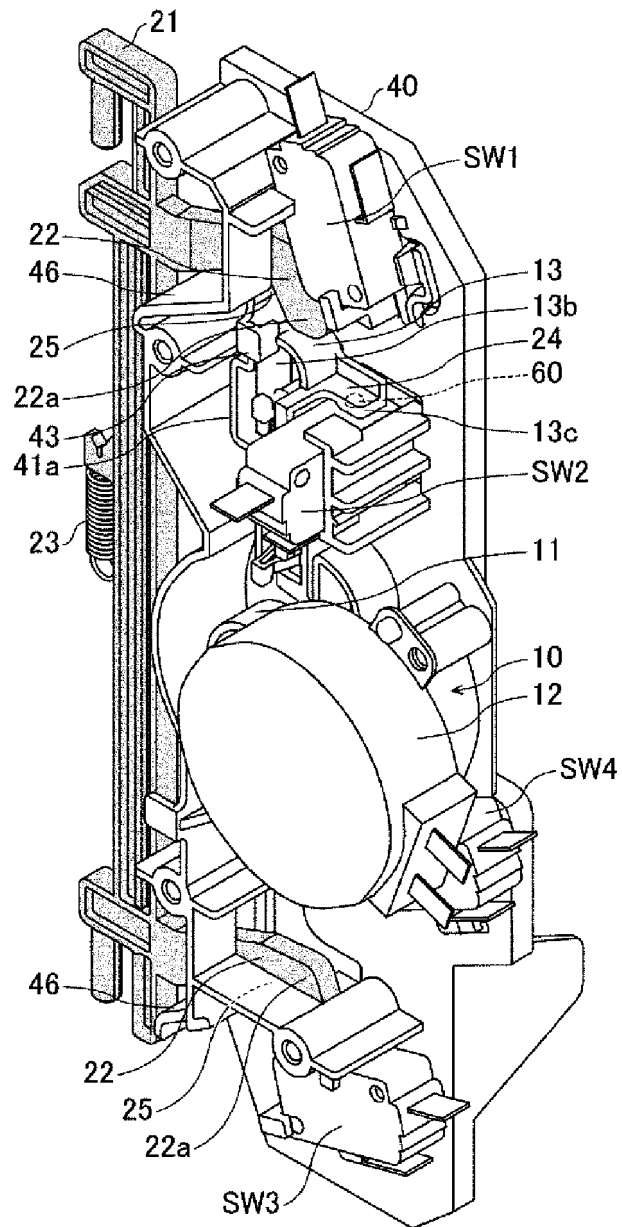


FIG. 4

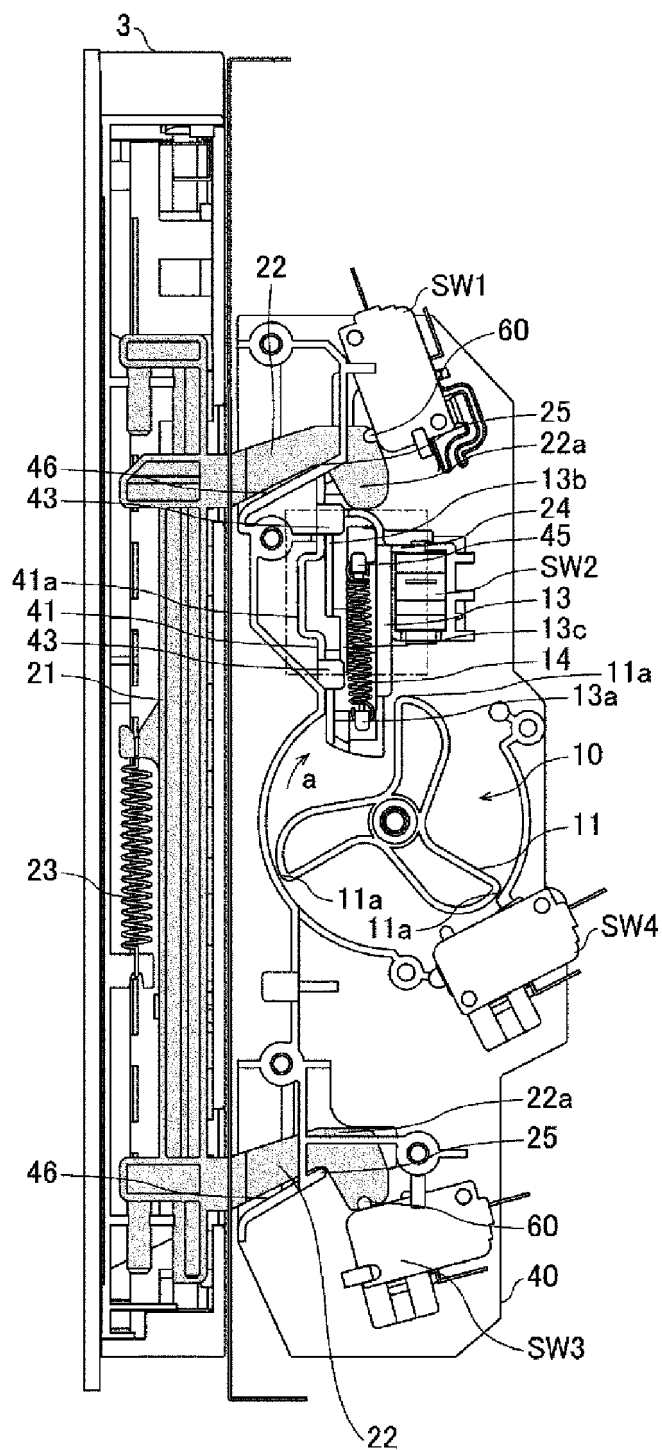


FIG. 5

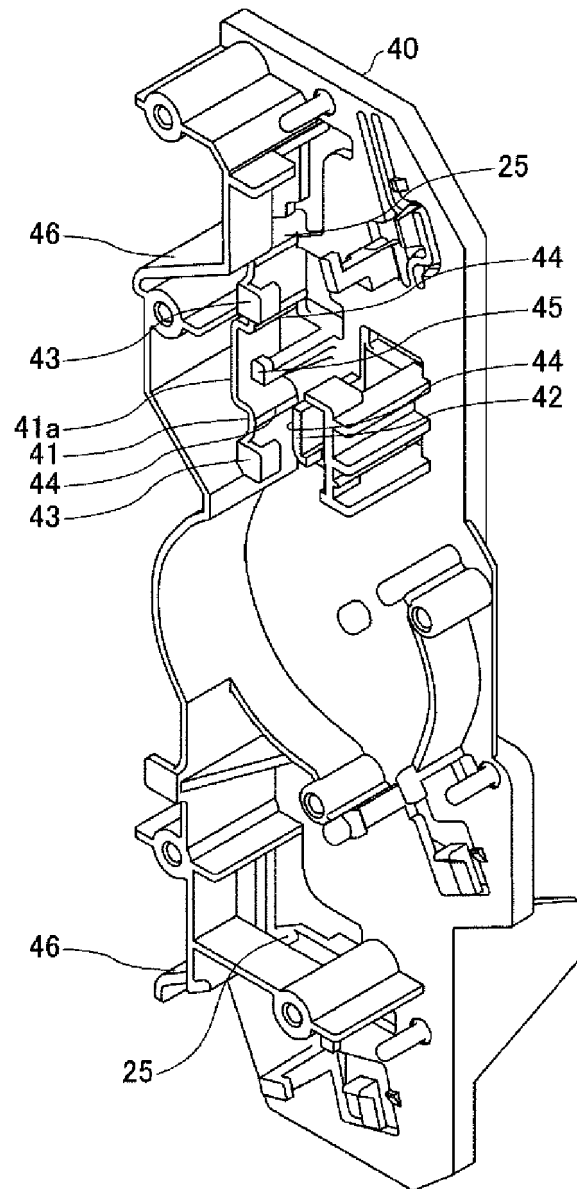


FIG. 6

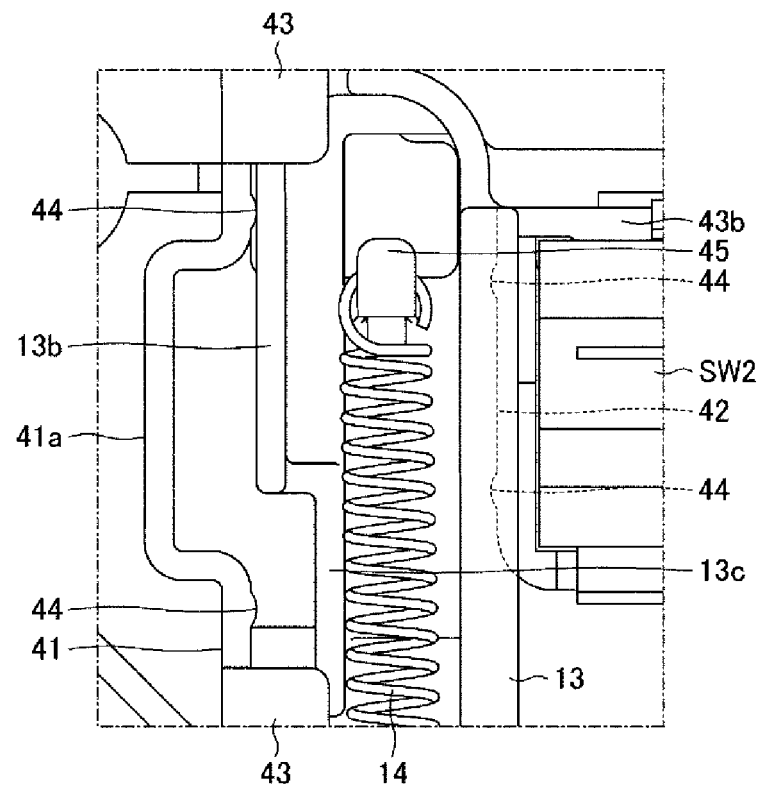


FIG. 7

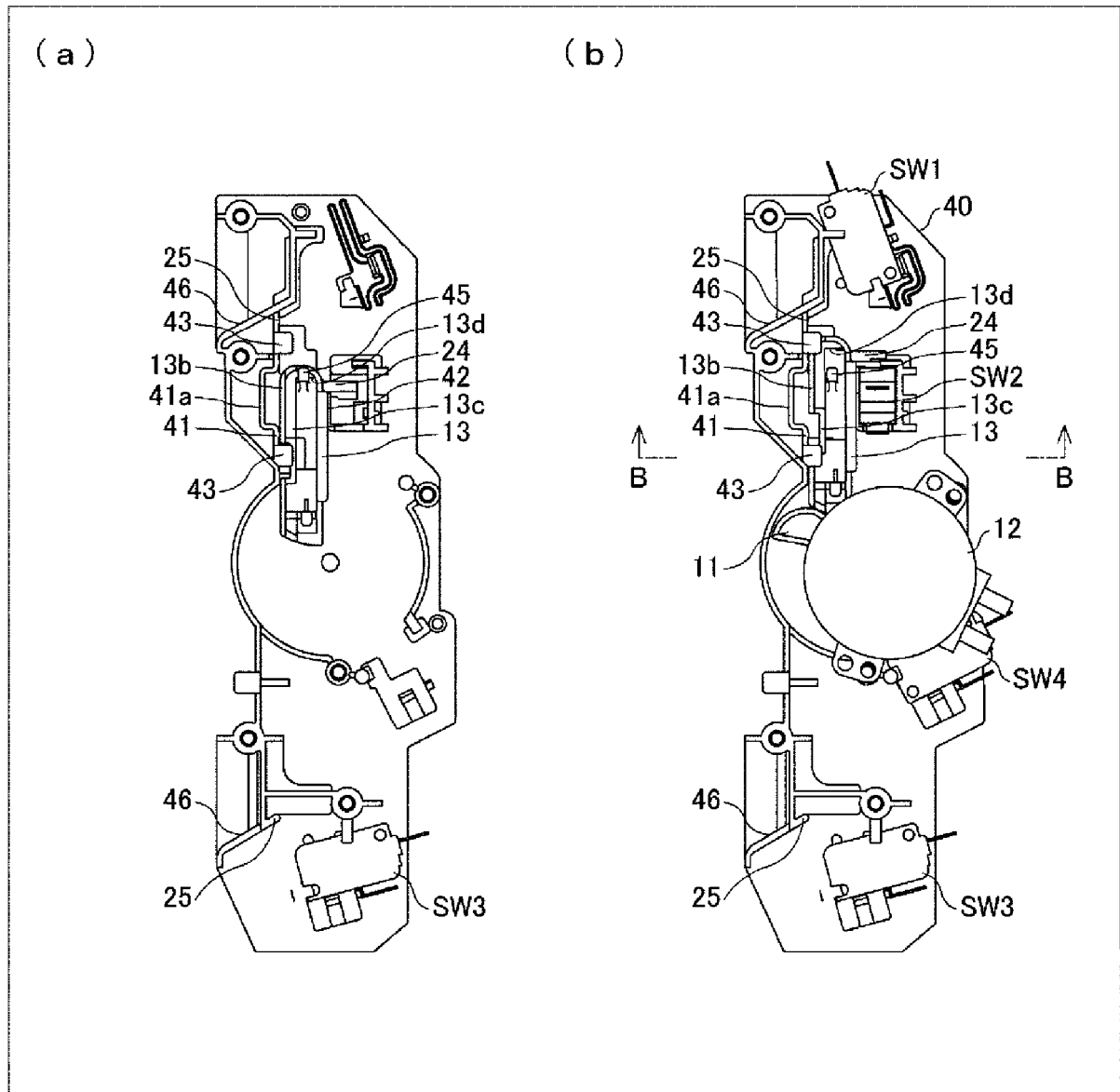


FIG. 8

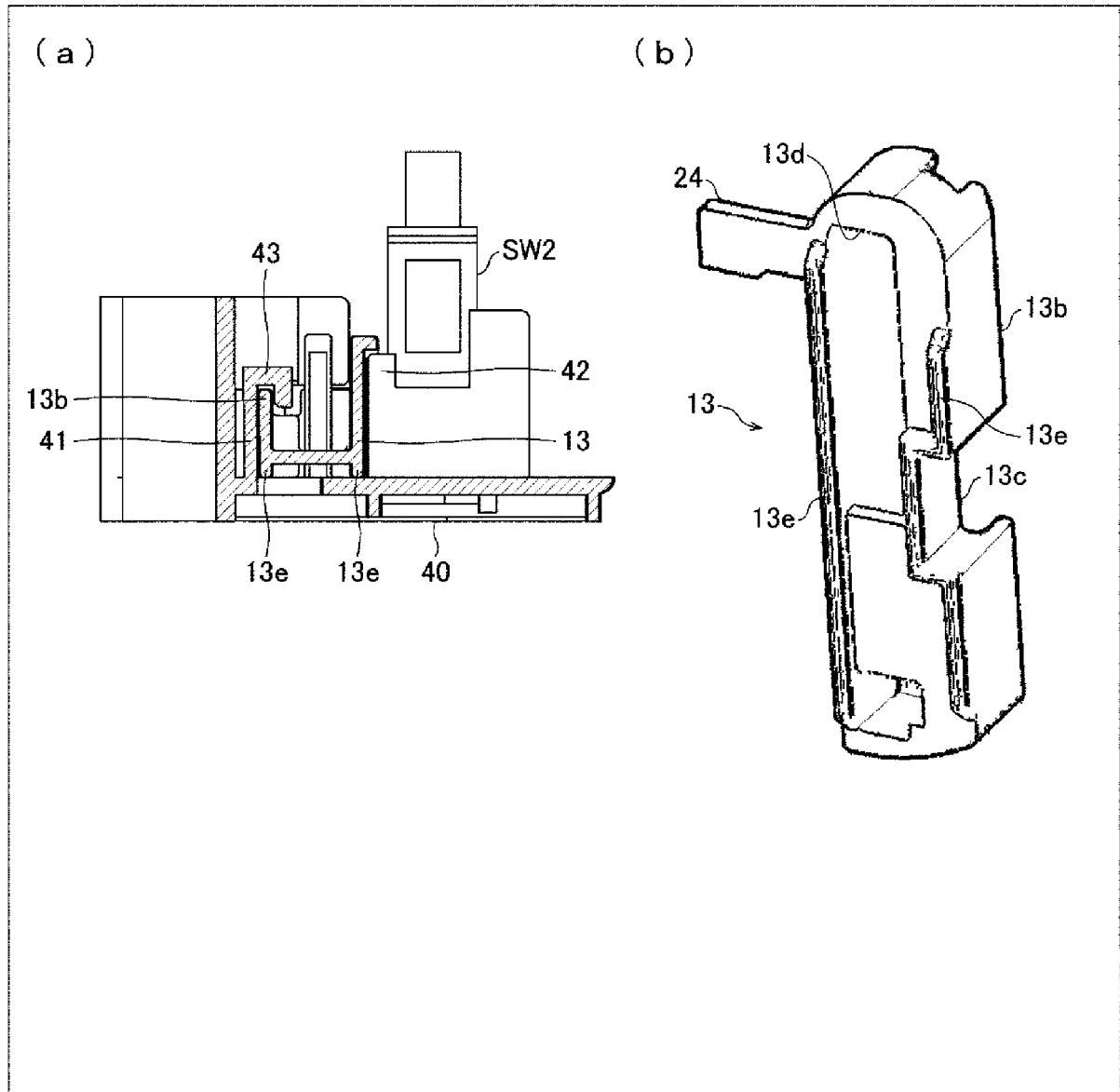


FIG. 9

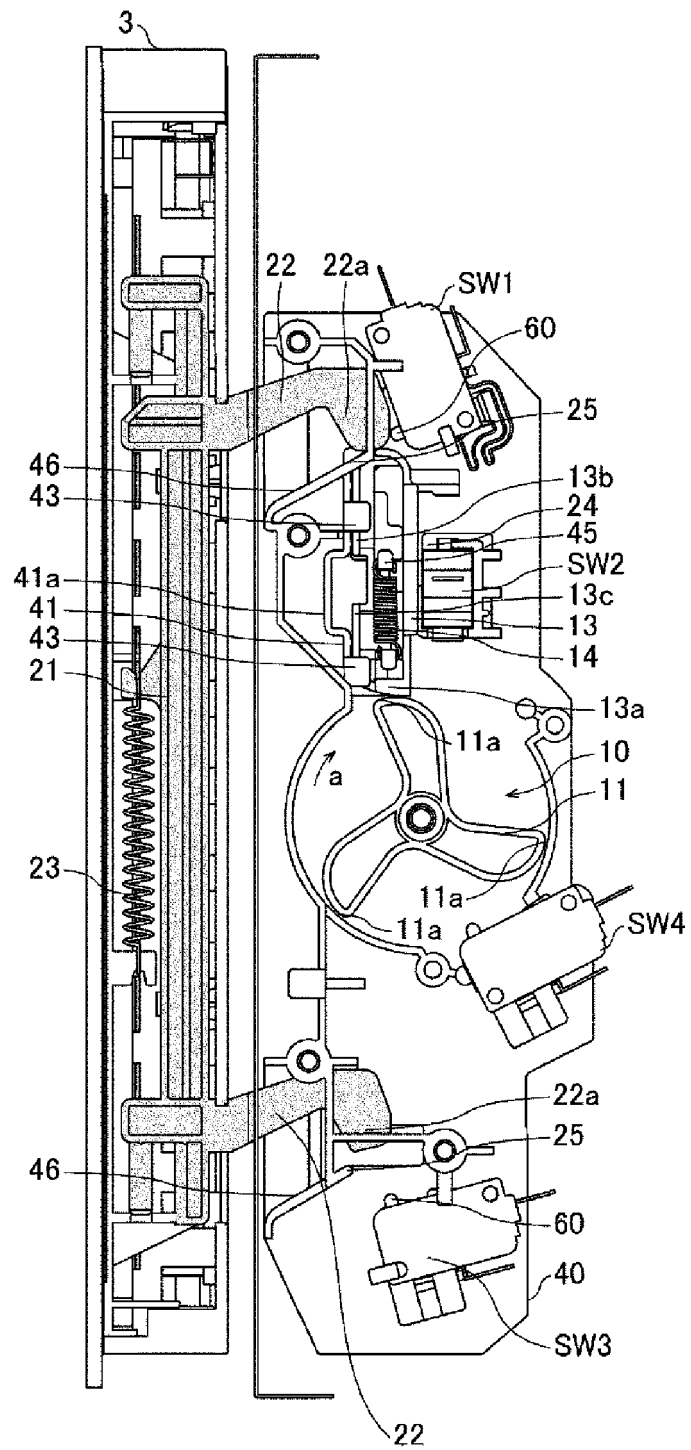


FIG. 10

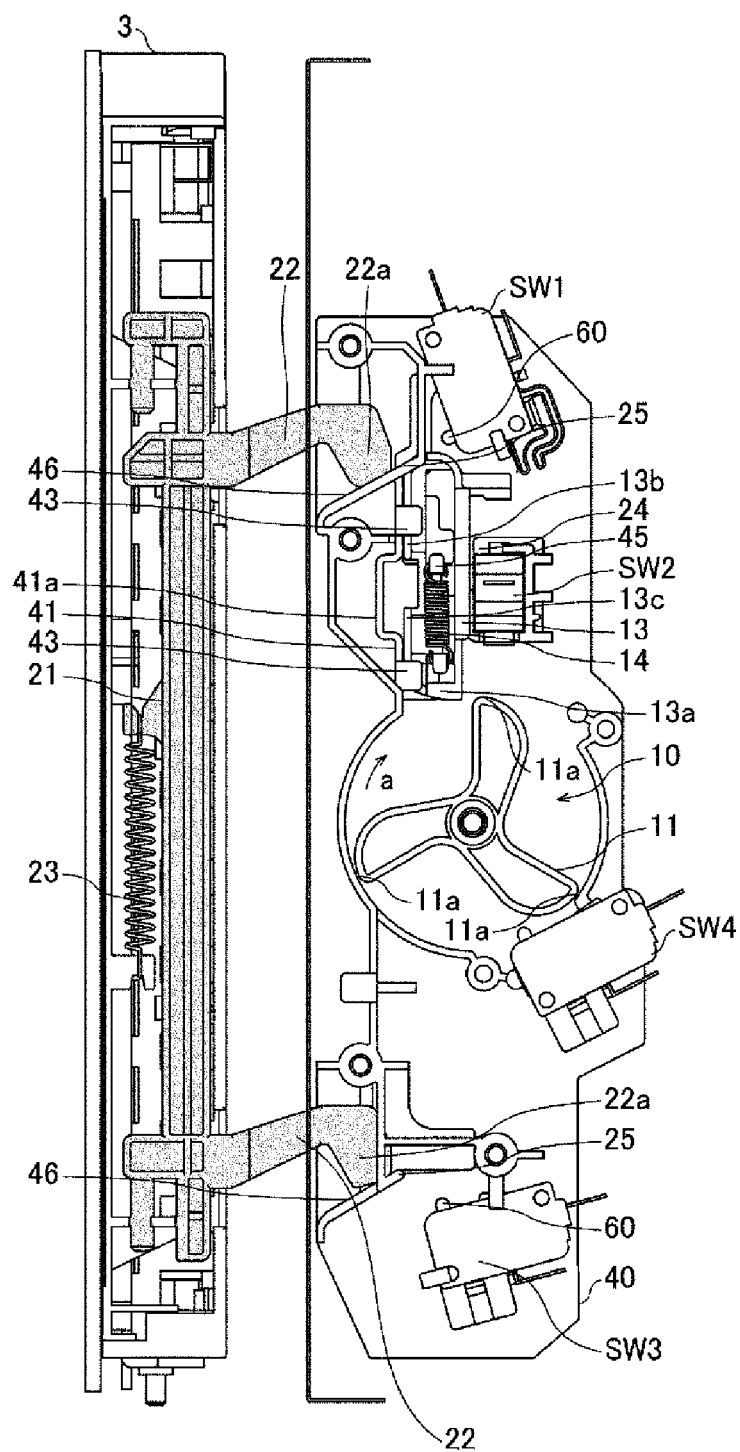


FIG. 11

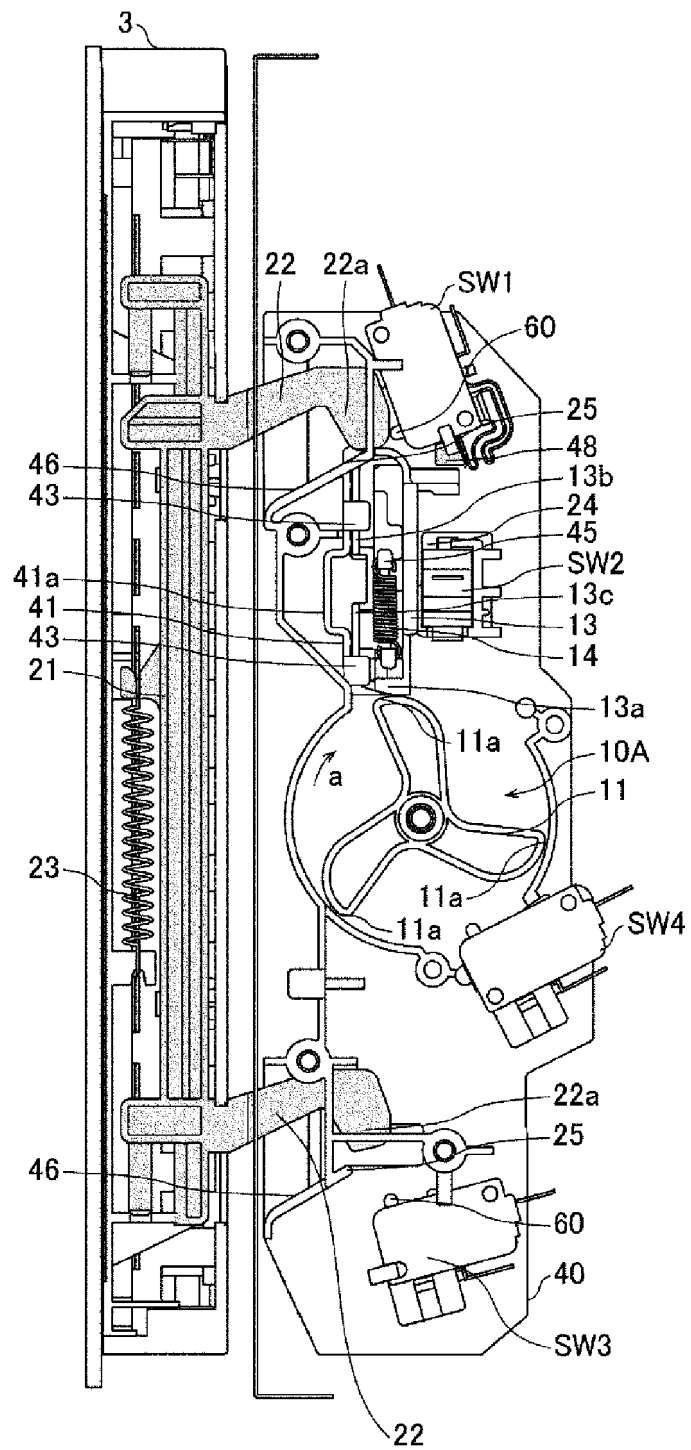


FIG. 12

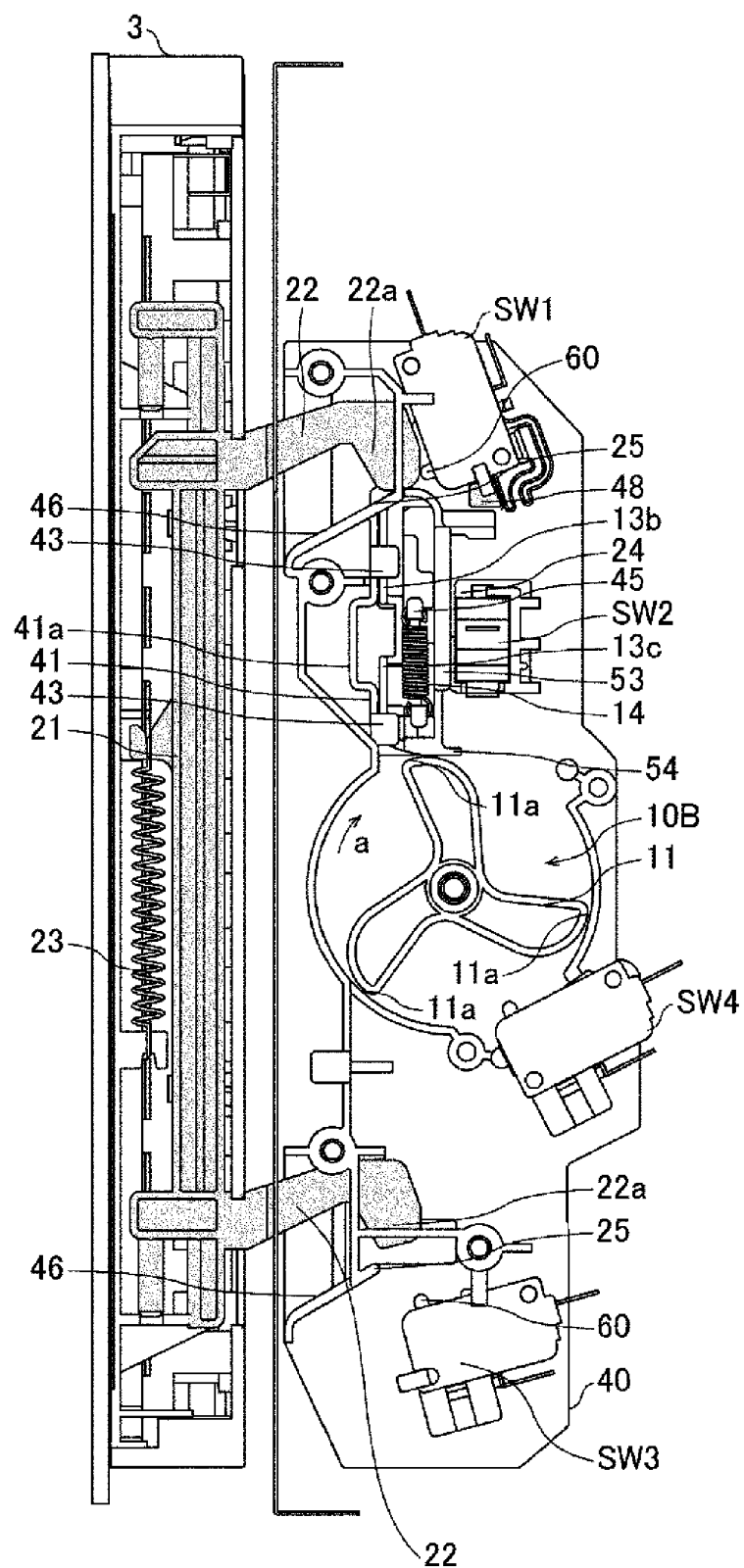


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/005930

A. CLASSIFICATION OF SUBJECT MATTER

F24C 15/02 (2006.01) i

FI: F24C15/02 C

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)

F24C15/02

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2020

Registered utility model specifications of Japan 1996-2020

Published registered utility model applications of Japan 1994-2020

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2018-185070 A (SHARP CORP.) 22.11.2018 (2018-11-22) paragraphs [0001], [0010]-[0054], fig. 1-9	1-6, 9
Y		7-8, 10
Y	JP 2002-267177 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 18.09.2002 (2002-09-18) paragraphs [0001], [0013]-[0028], fig. 1-3	7-8, 10
A		1-6, 9



Further documents are listed in the continuation of Box C.



See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search

03 April 2020 (03.04.2020)

Date of mailing of the international search report

21 April 2020 (21.04.2020)

Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/005930

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2018-185070 A	22 Nov. 2018	(Family: none)	
JP 2002-267177 A	18 Sep. 2002	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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- JP 2019029568 A [0001]
- JP 5485167 B [0003]