US012390082B2

(12) **United States Patent**
Marzorati

(10) **Patent No.: US 12,390,082 B2**
(45) **Date of Patent: Aug. 19, 2025**

(54) **DISHWASHER WITH COVER DEVICE**

(71) Applicant: **Electrolux Appliances Aktiebolag**, Stockholm (SE)

(72) Inventor: **Luca Marzorati**, Porcia (IT)

(73) Assignee: **Electrolux Appliances Aktiebolag**, Stockholm (SE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 305 days.

(21) Appl. No.: **18/016,376**

(22) PCT Filed: **Jul. 17, 2020**

(86) PCT No.: **PCT/EP2020/070293**
§ 371 (c)(1),
(2) Date: **Jan. 16, 2023**

(87) PCT Pub. No.: **WO2022/012754**
PCT Pub. Date: **Jan. 20, 2022**

(65) **Prior Publication Data**

US 2023/0270314 A1 Aug. 31, 2023

(51) **Int. Cl.**
A47L 15/42 (2006.01)

(52) **U.S. Cl.**
CPC ***A47L 15/4265*** (2013.01)

(58) **Field of Classification Search**
CPC A47L 15/4265
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2009/0251036 A1 10/2009 Laible et al.

FOREIGN PATENT DOCUMENTS

DE	2937384 A *	4/1981	.....	A47L 15/4265
DE	602005000881 T2	12/2007		
EP	819404 A2 *	1/1998	.....	A47L 15/4265
EP	2407723 A2	1/2012		
SE	454044 B	3/1988		

OTHER PUBLICATIONS

International Search Report and Written Opinion for International Application No. PCT/EP2020/070293, dated Mar. 23, 2021, 8 pages.

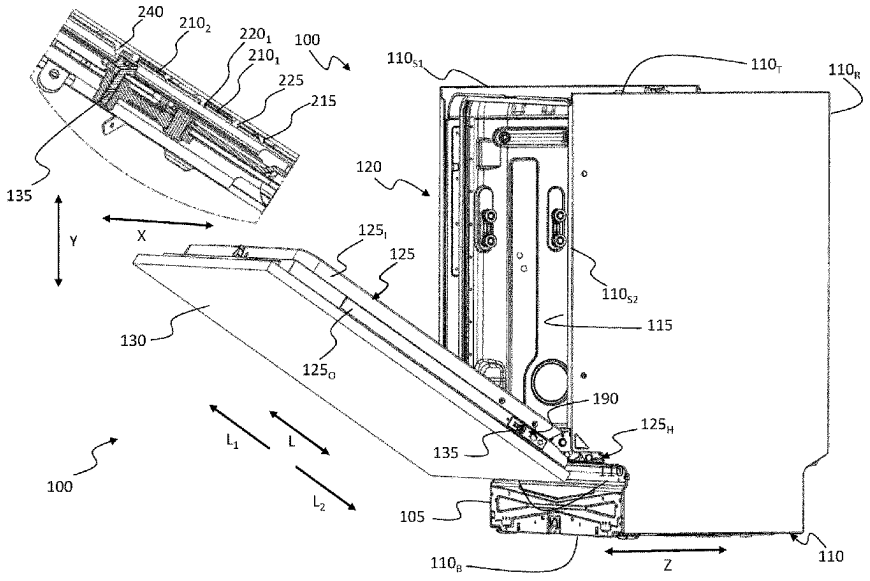
* cited by examiner

Primary Examiner — Michael E Barr
Assistant Examiner — Kevin G Lee
(74) *Attorney, Agent, or Firm* — Bradley Arant Boult Cummings LLP

(57) **ABSTRACT**

A dishwasher having a chamber, and a door assembly having a chamber door movable between closed and open positions. The door has an access aperture to access an adjusting member for adjusting a position of a decorative front panel relative to the door, and a sliding member that slides along a sliding axis during door movement. The sliding member is configured to slide the decorative front panel relative to the door along the sliding axis during door movement. A cover is mounted on the door assembly and configured to take a first operative position in which it uncovers the access aperture and a second operative position in which it covers at least partially the access aperture. The cover mechanically cooperates with the sliding member to automatically move from the first operative position to the second operative position in response to the sliding of the sliding member.

29 Claims, 25 Drawing Sheets



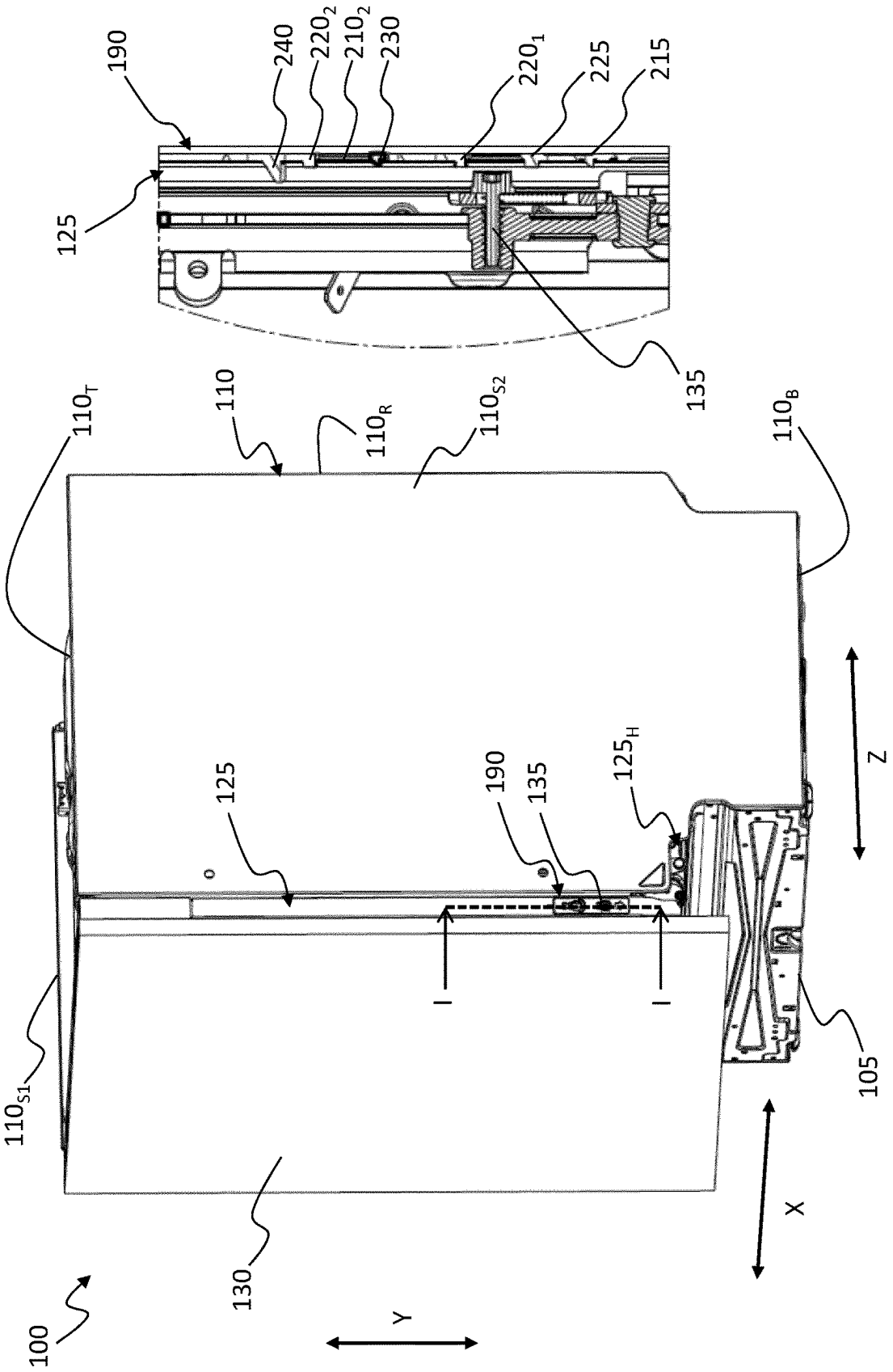

190
240
220$_2$
210$_2$
230
220$_1$
225
215
125
135
110$_T$
110
110$_R$
110$_{S2}$
110$_B$
125
190
135
125$_H$
I
I
Z
110$_{S1}$
105
130
X
Y
100

Figure 1A

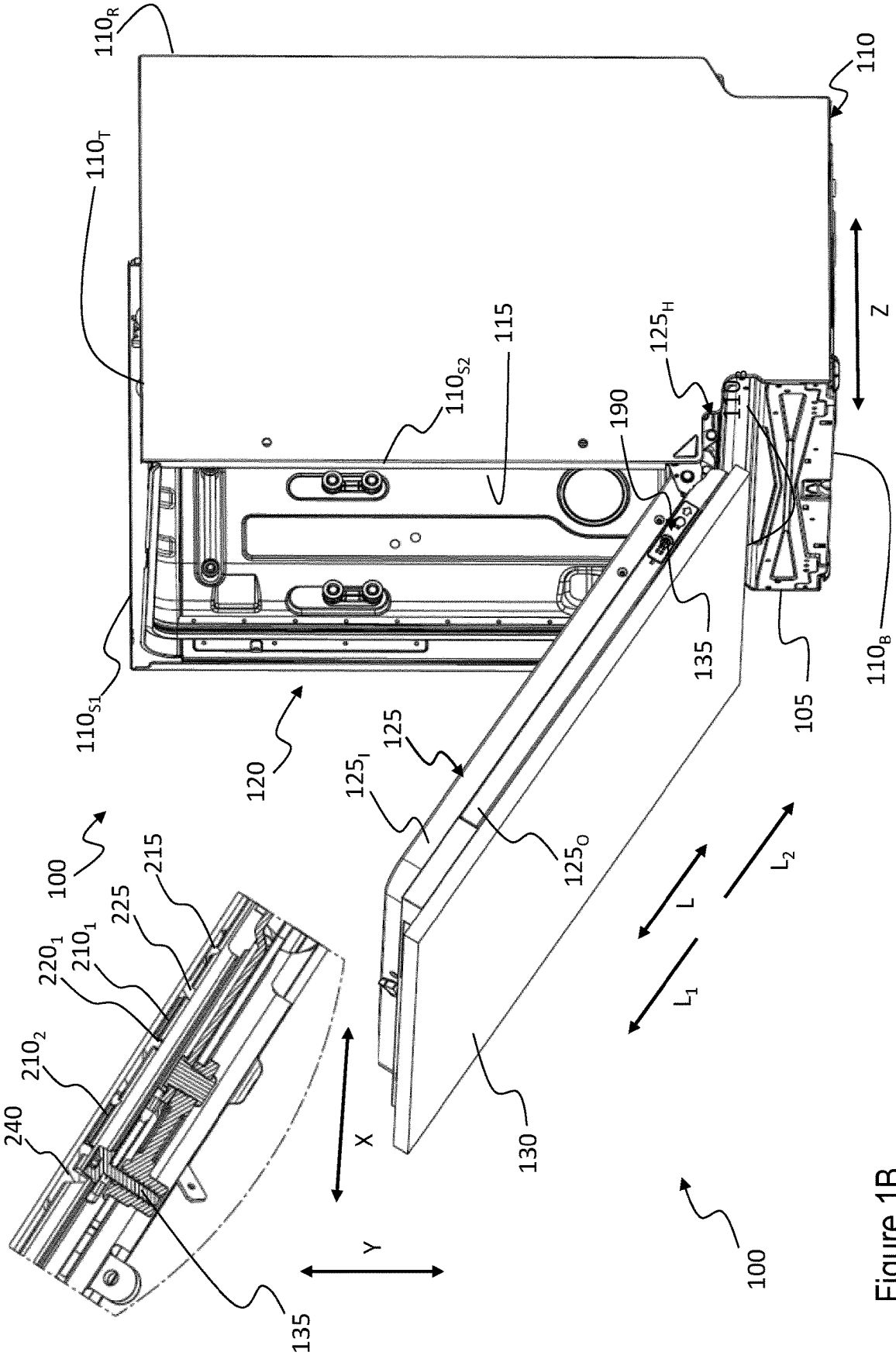

110_R
110_T
110
115
110_{S2}
125_H
190
110_B
Z
110_{S1}
120
125_I
125
125_O
135
105
110_B
100
215
225
220_1
210_1
210_2
240
135
X
Y
130
L
L_1
L_2
100

Figure 1B

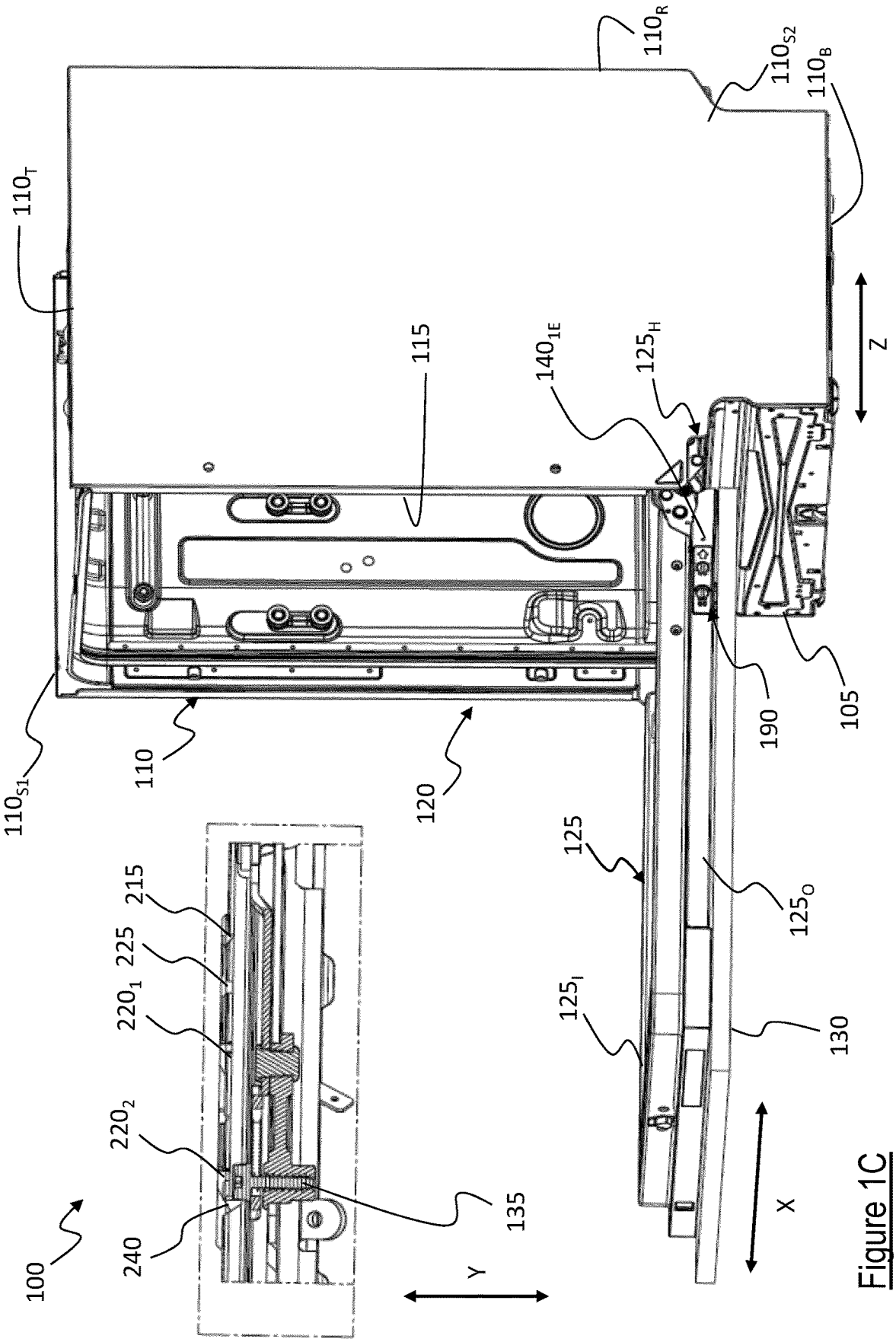

110R
110S2
110B
110T
115
140IE
125H
Z
105
190
110S1
110
120
125
125O
125I
130
215
225
220₁
220₂
240
135
100
Y
X

Figure 1C

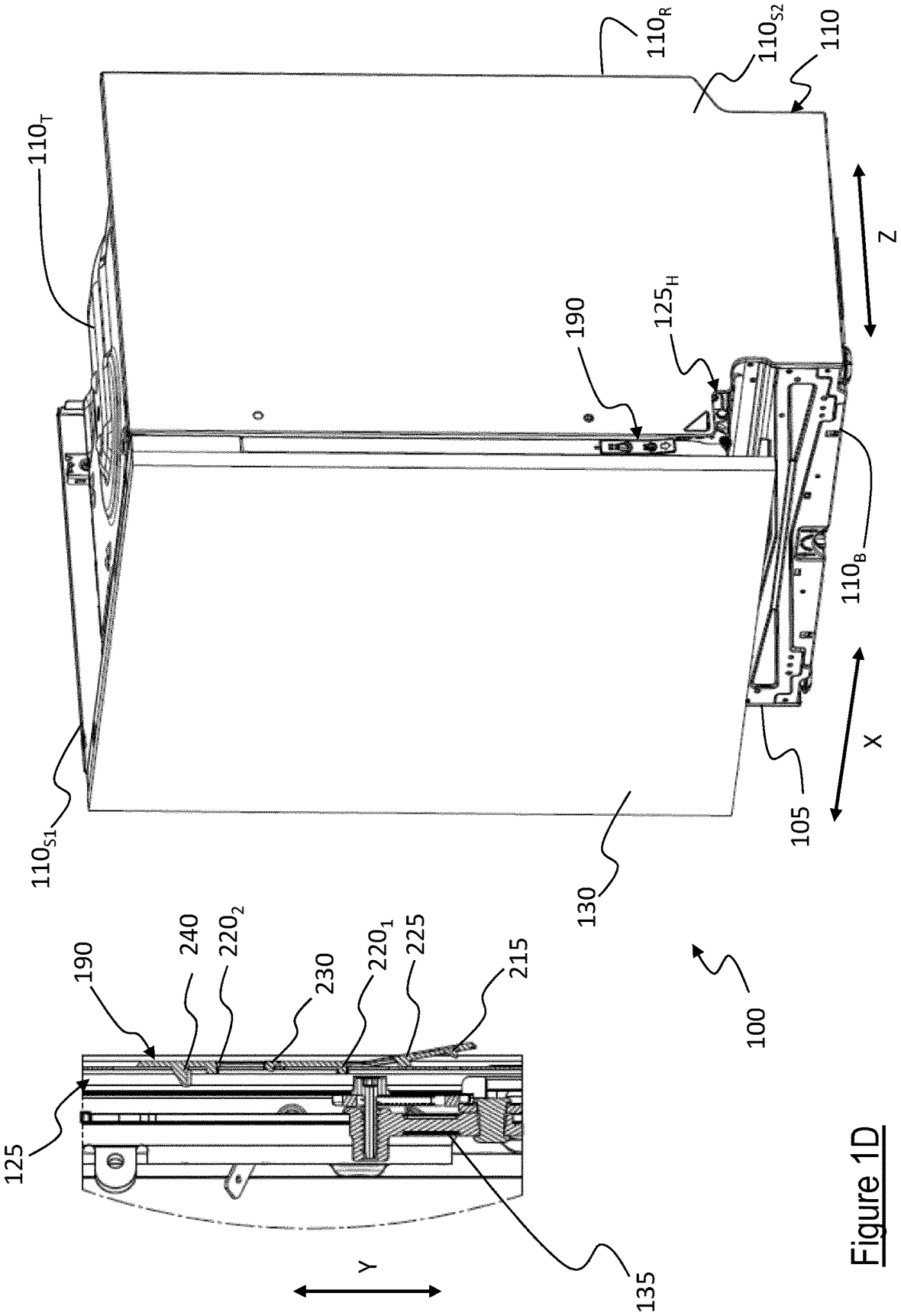

110R
110S2
110
110T
Z
190
125H
110B
X
110S1
105
130
100
190
240
220₂
230
220₁
225
215
125
135
Y

Figure 1D

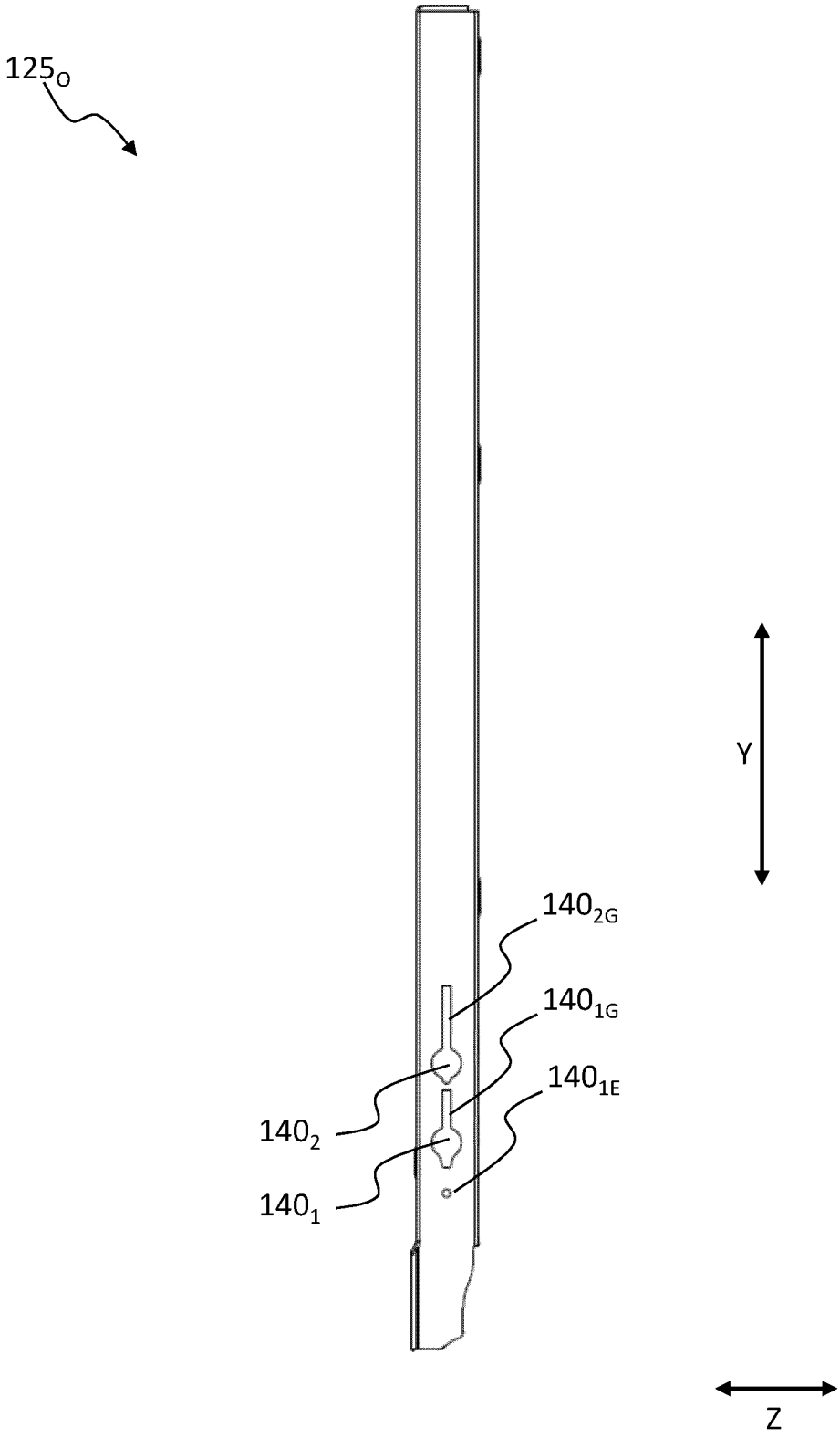


Figure 1E

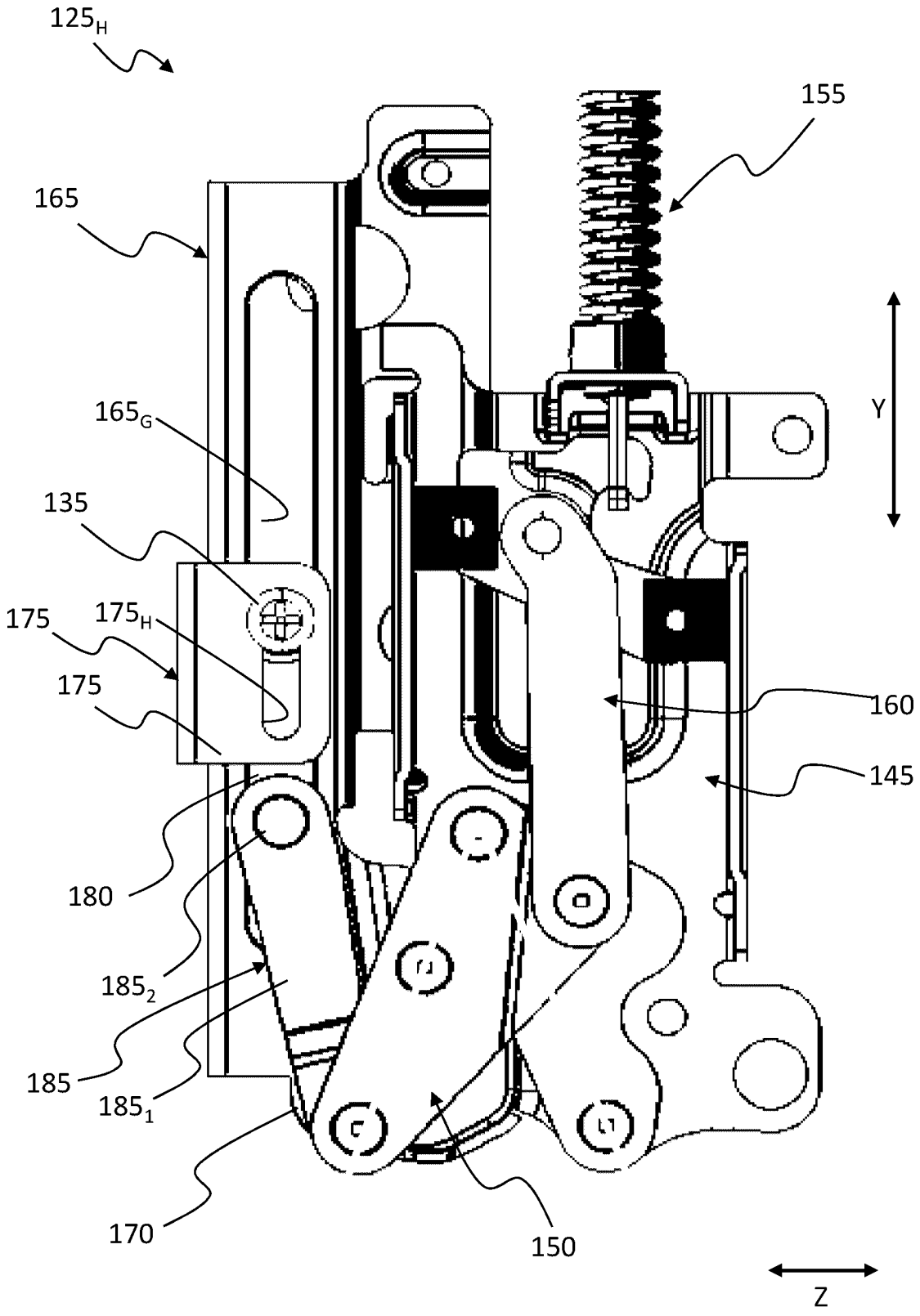

125H
155
165
165G
135
175
175H
175
160
145
180
185
185
185
170
150
Y
Z

Figure 1F

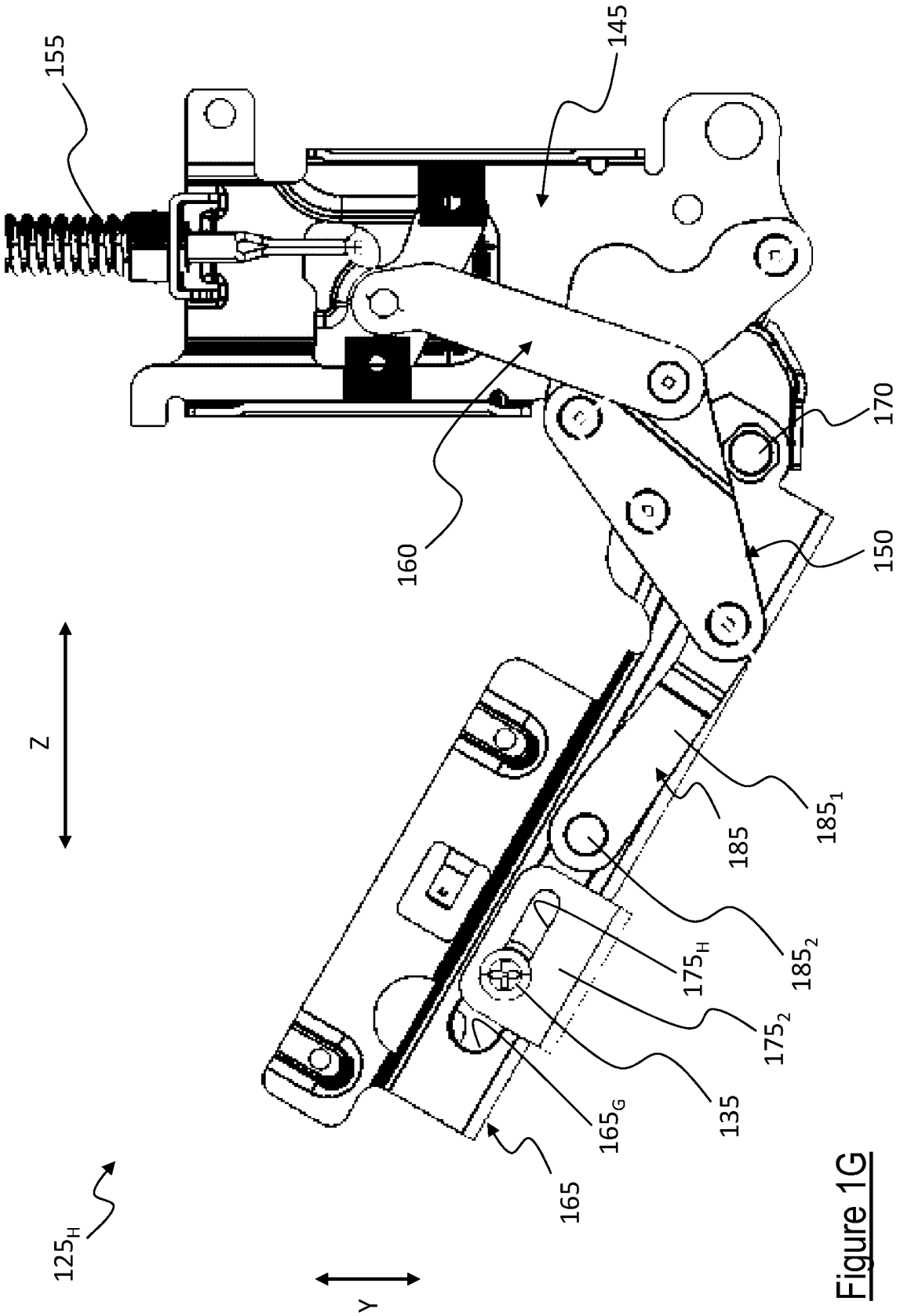

155
145
160
170
150
185
185_1
185_2
175_H
175_2
135
165_G
165
125_H
Z
Y

Figure 1G

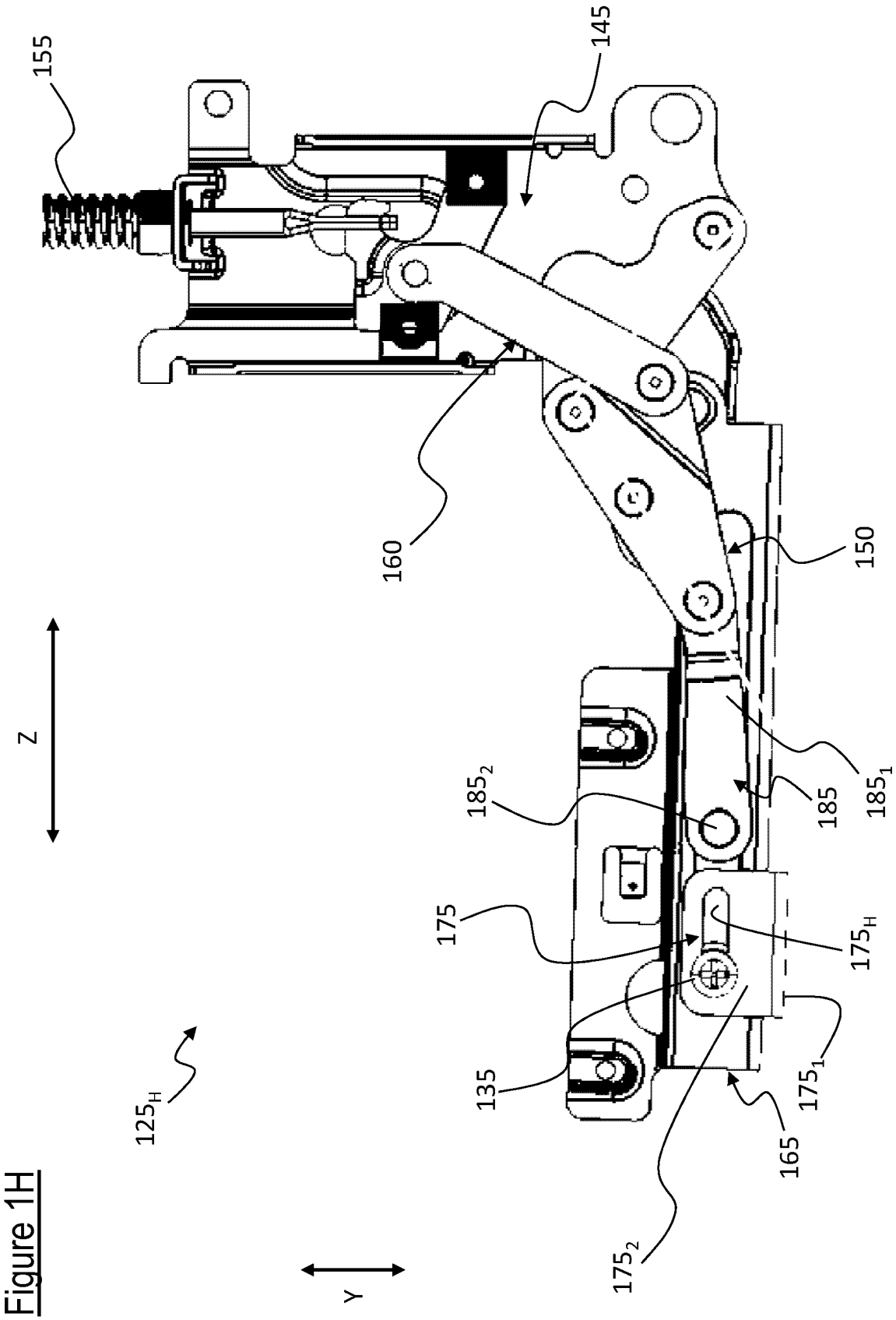

155
145
160
150
185$_2$
185
185$_1$
175
175$_H$
135
175$_1$
165
175$_2$
125$_H$
Z
Y

Figure 1H

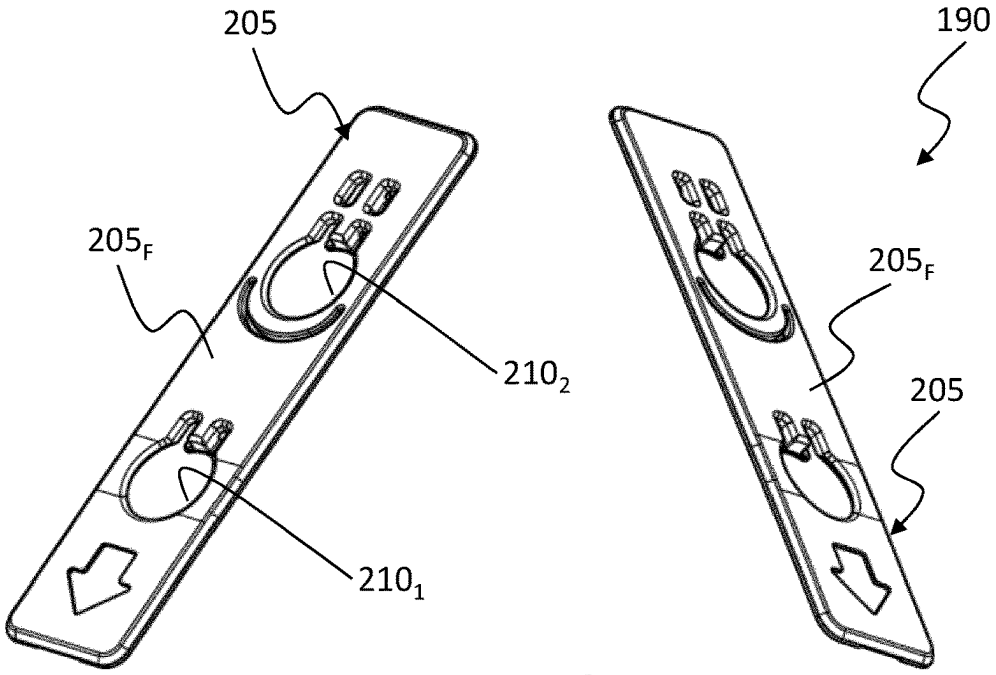


Figure 2A

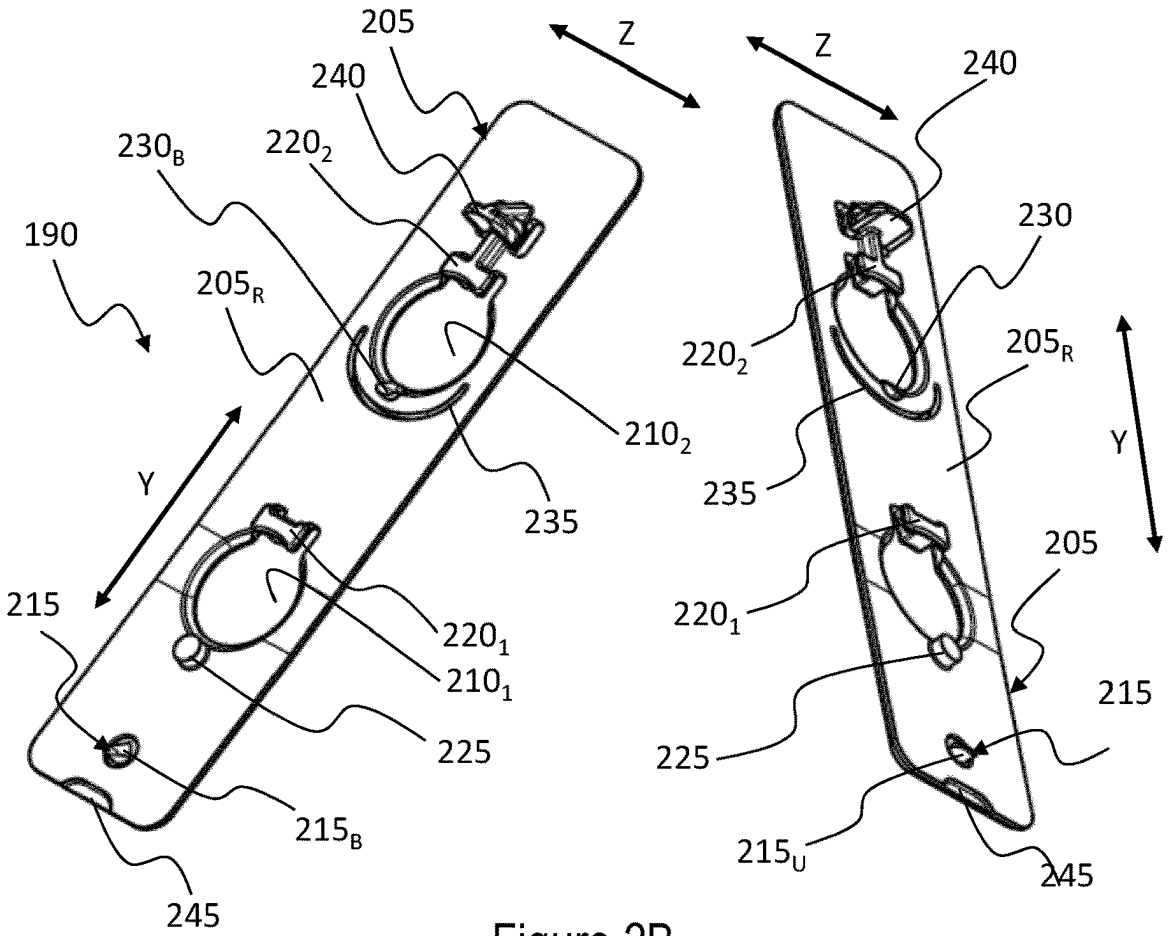


Figure 2B

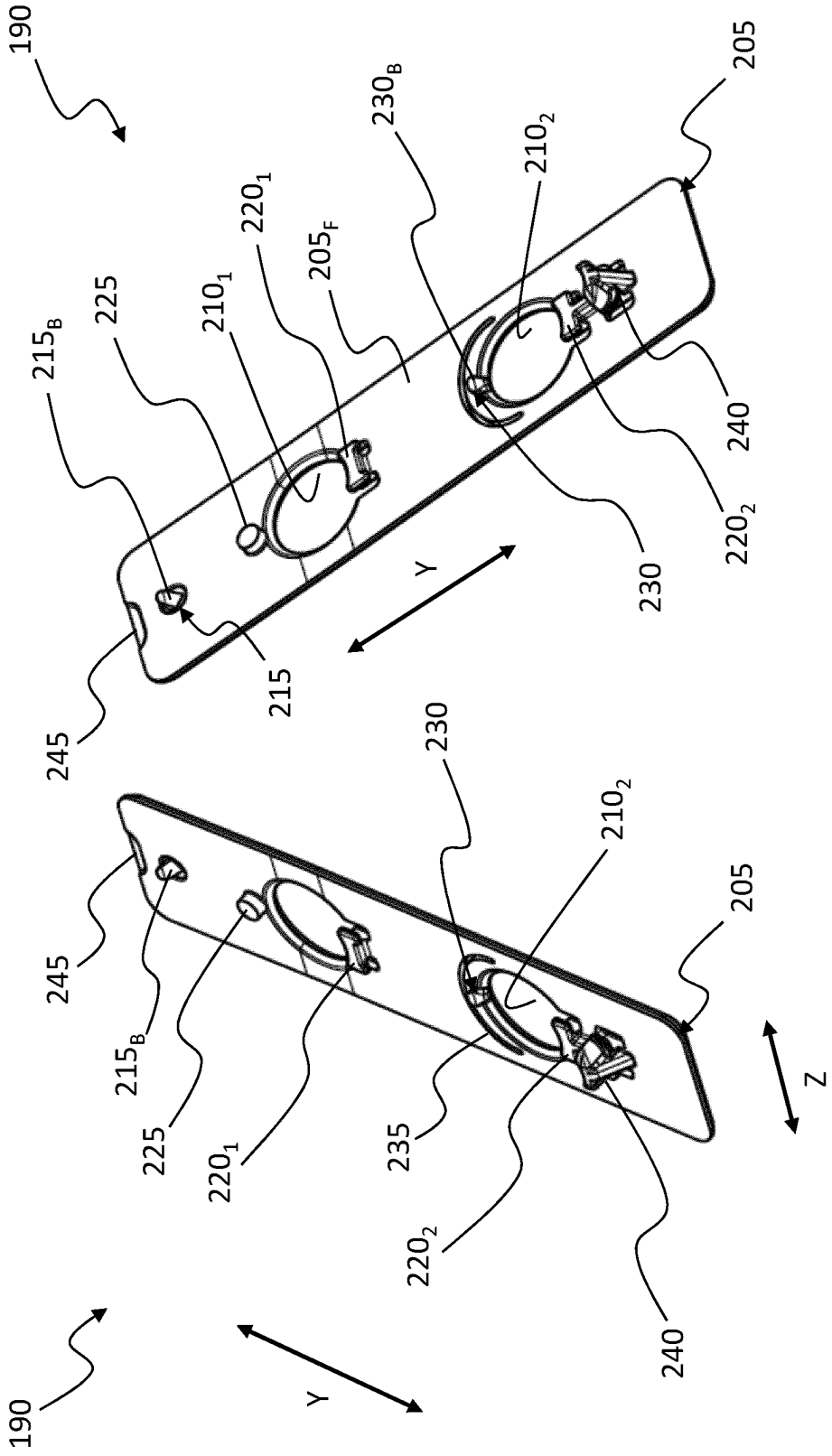

190
205
230_B
210_2
220_1
205_F
210_1
225
215_B
240
220_2
230
Y
215
245
230
210_2
205
245
215_B
225
220_1
235
220_2
240
Z
Y
190

Figure 2C

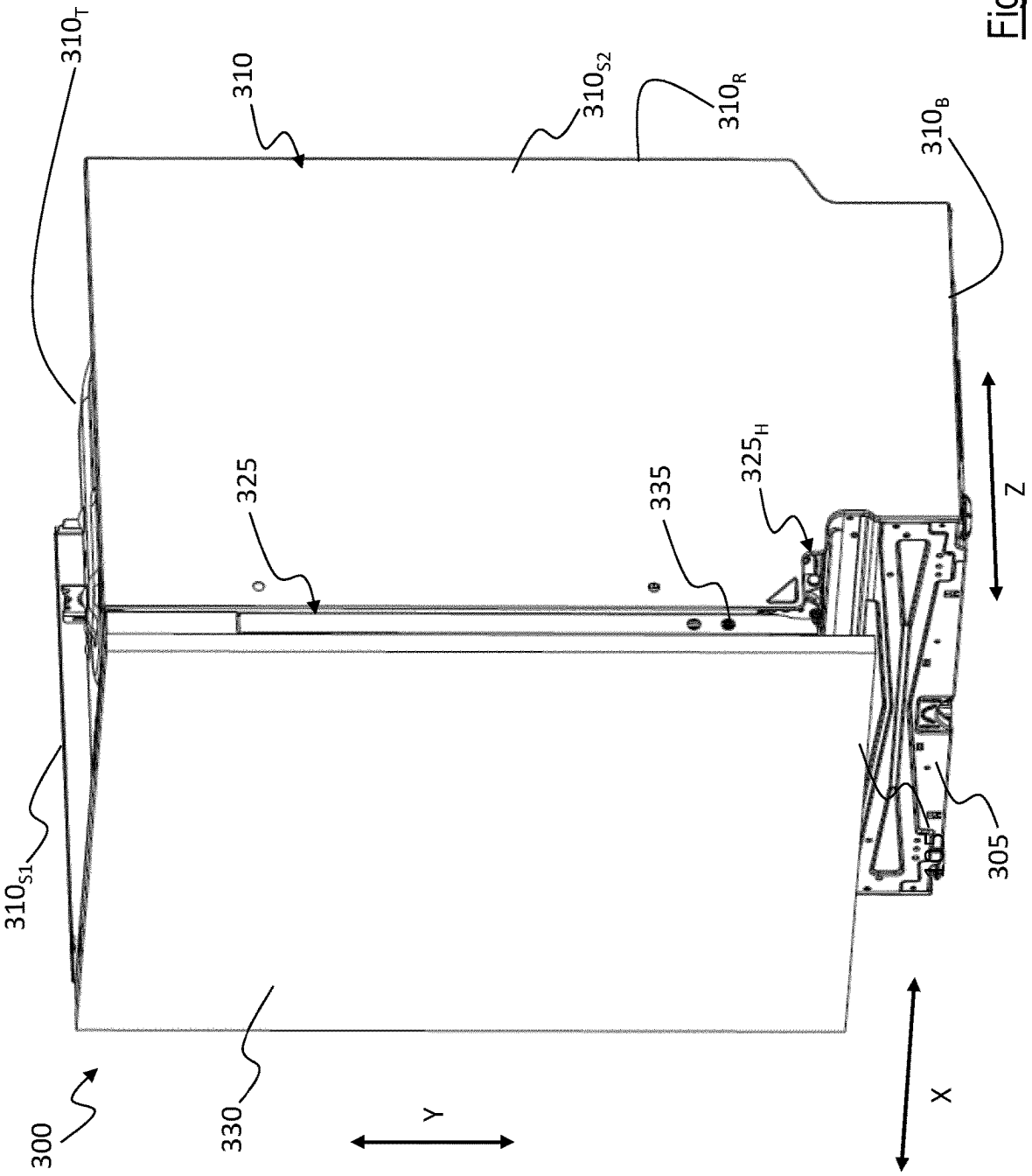


Figure 3A

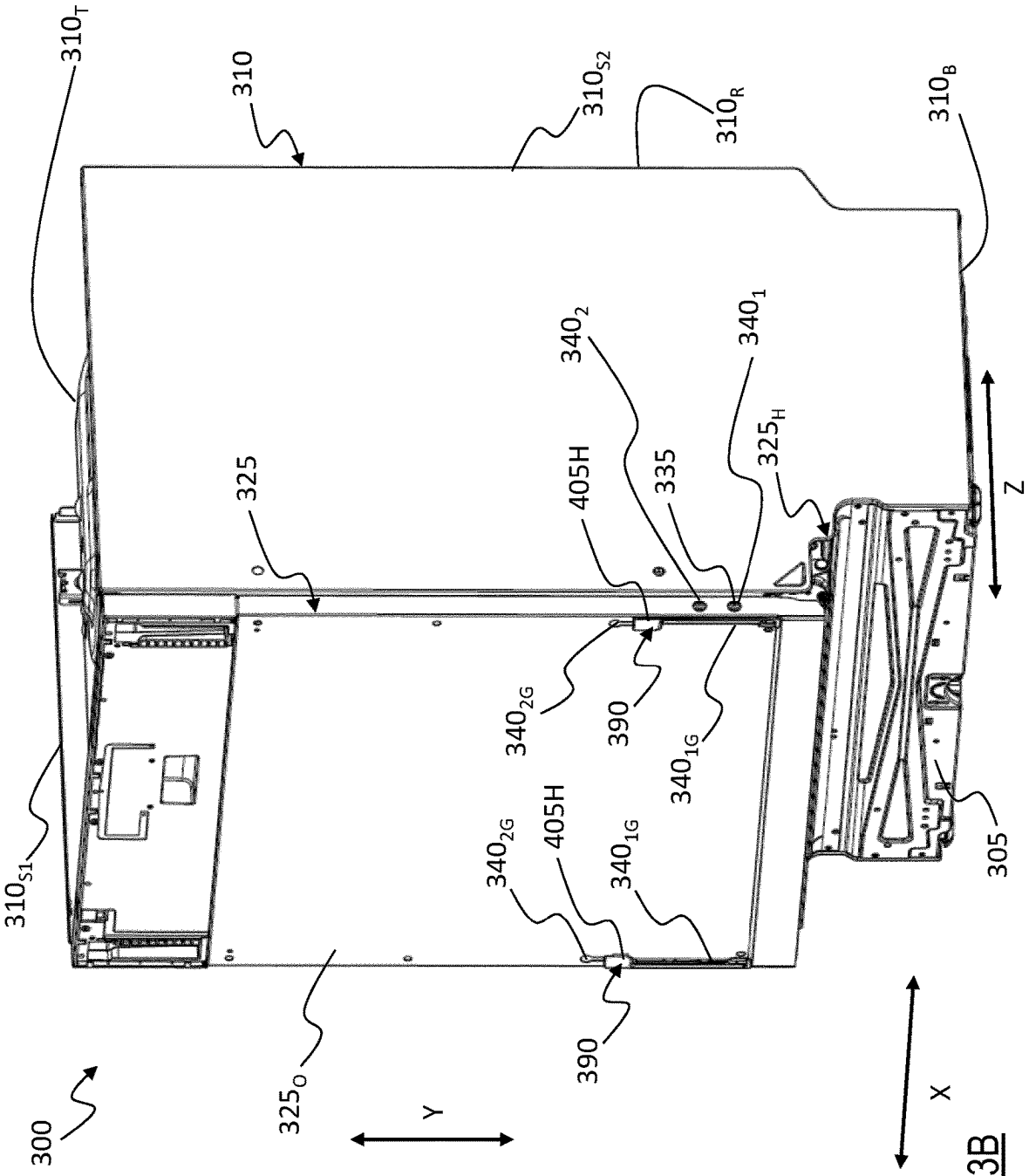

310_T
310
310_{S2}
310_R
310_B
340_2
340_1
325_H
325
405H
335
Z
340_{2G}
390
340_{1G}
310_{S1}
340_{2G}
405H
340_{1G}
305
300
325_O
390
Y
X

Figure 3B

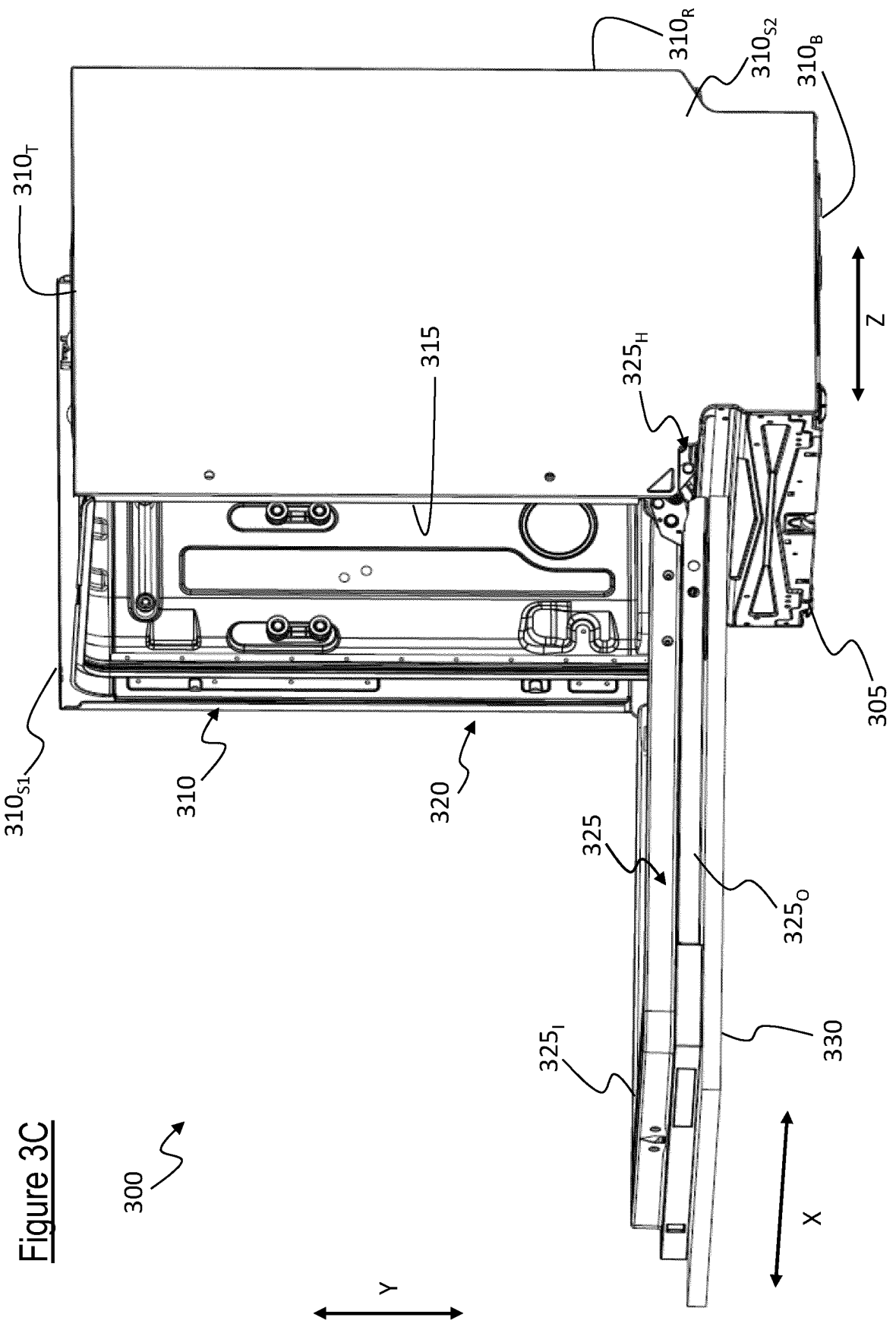

310_R
310_{S2}
310_B
310_T
315
325_H
Z
305
310_{S1}
310
320
325
325_O
325_I
330
300
Y
X

Figure 3C

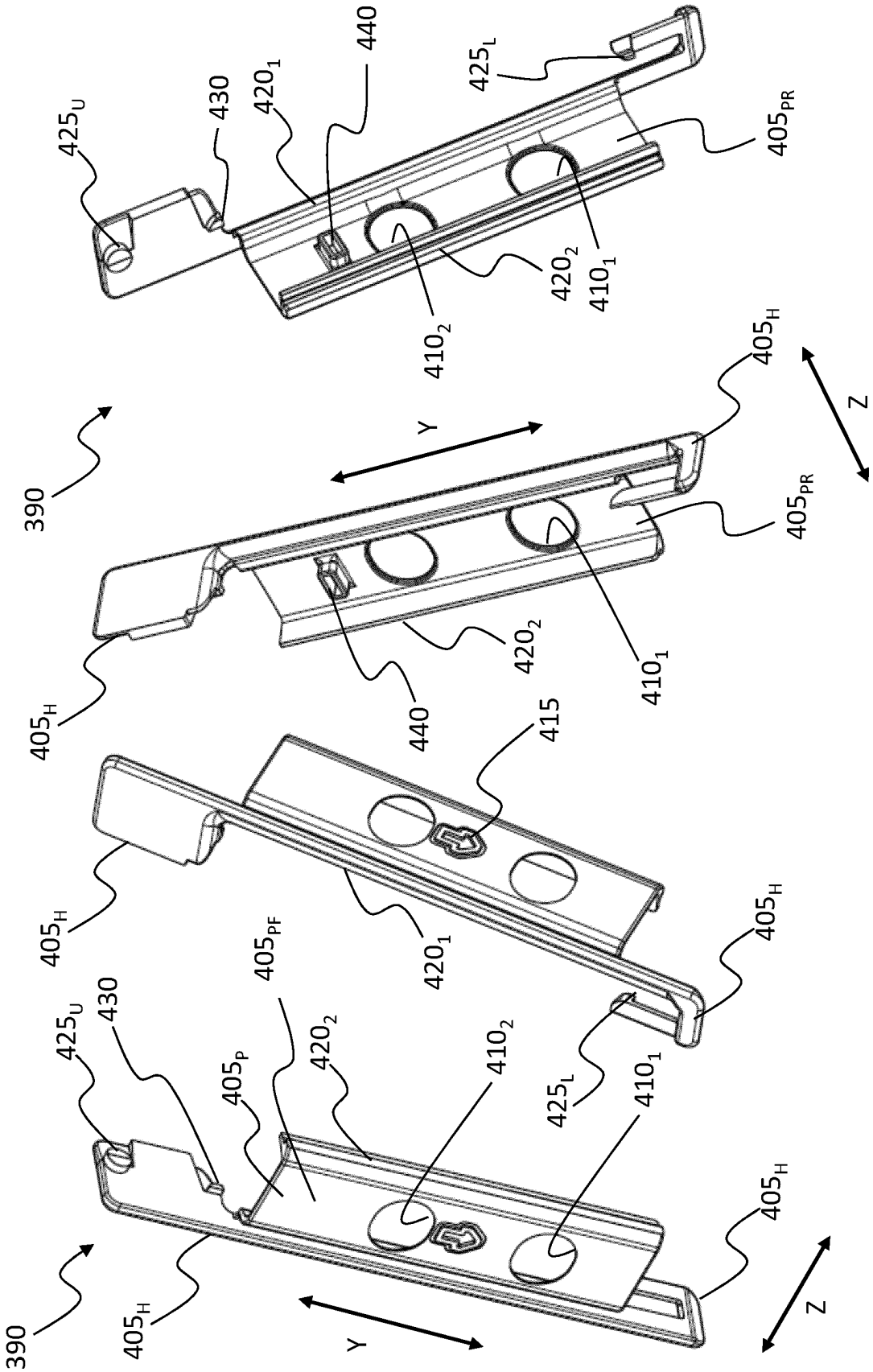


Figure 4A

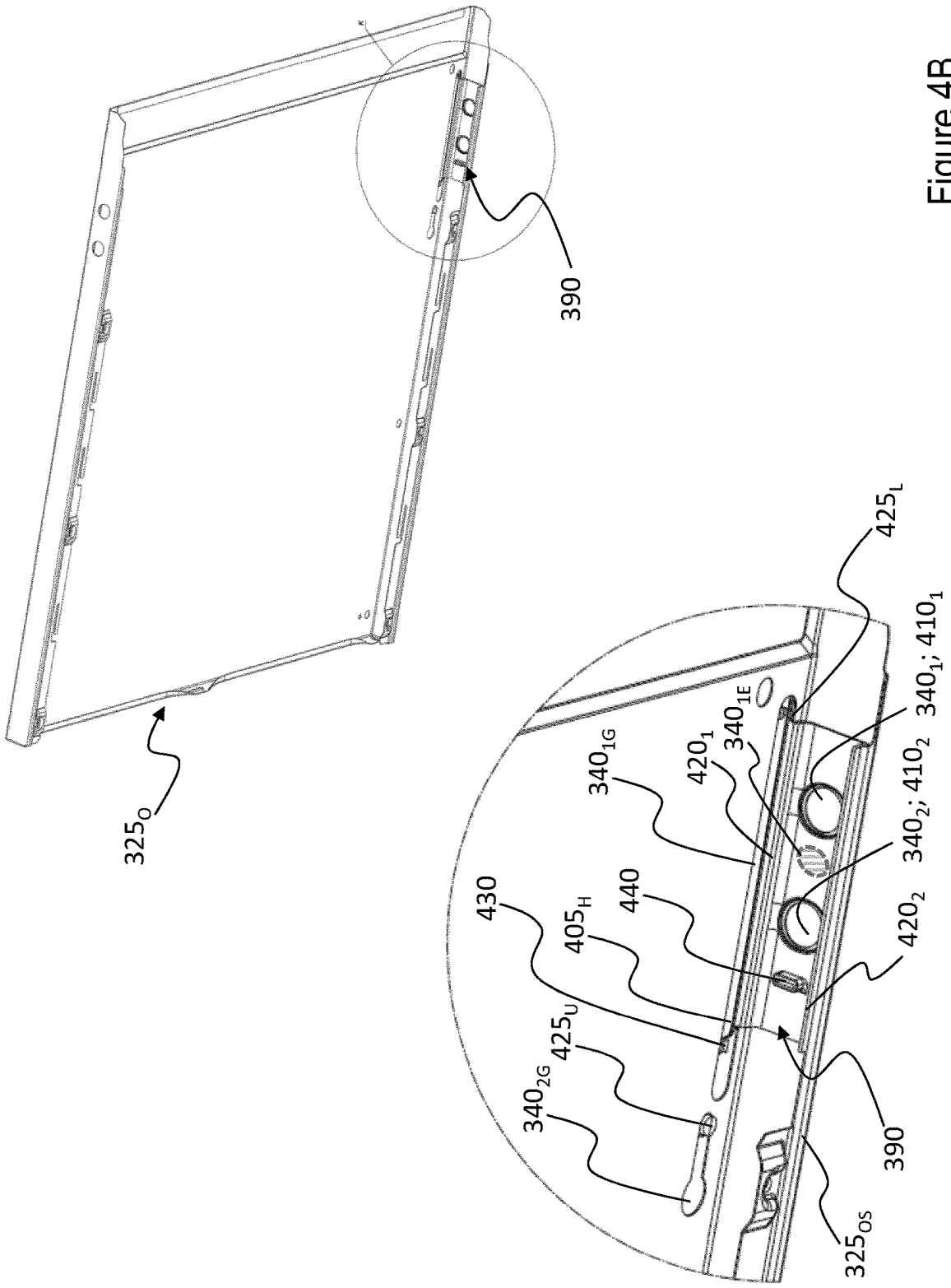

390
325_O
425_L
340_1; 410_1
340_{1E}
420_1
340_{1G}
340_2; 410_2
420_2
430
405_H
440
425_U
340_{2G}
390
325_{OS}

Figure 4B

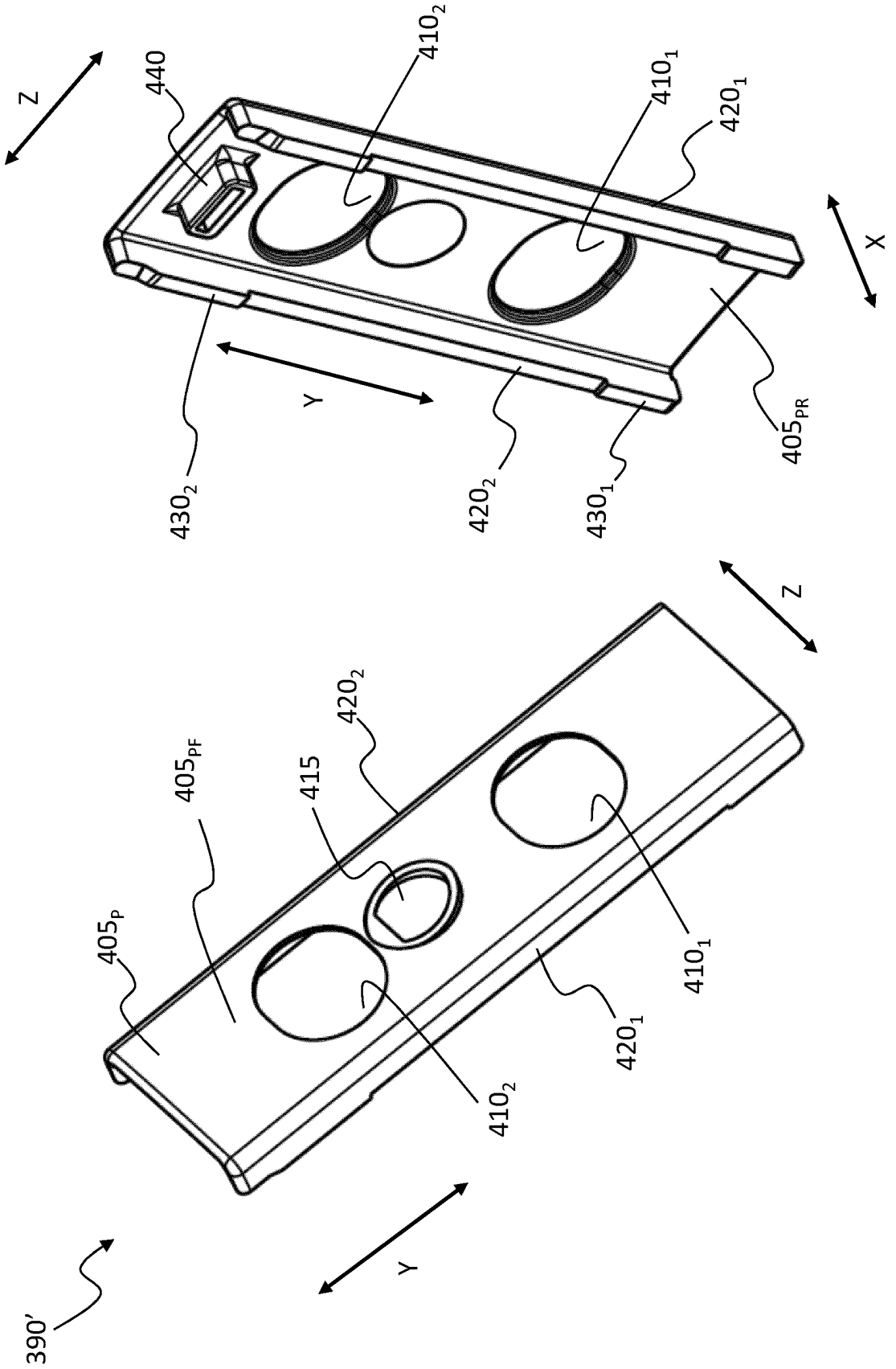

Z
440
410_2
410_1
420_1
X
Y
430_2
420_2
430_1
405_{PR}
Z
420_2
405_{PF}
415
405_P
410_1
410_2
420_1
Y
390'

Figure 4C

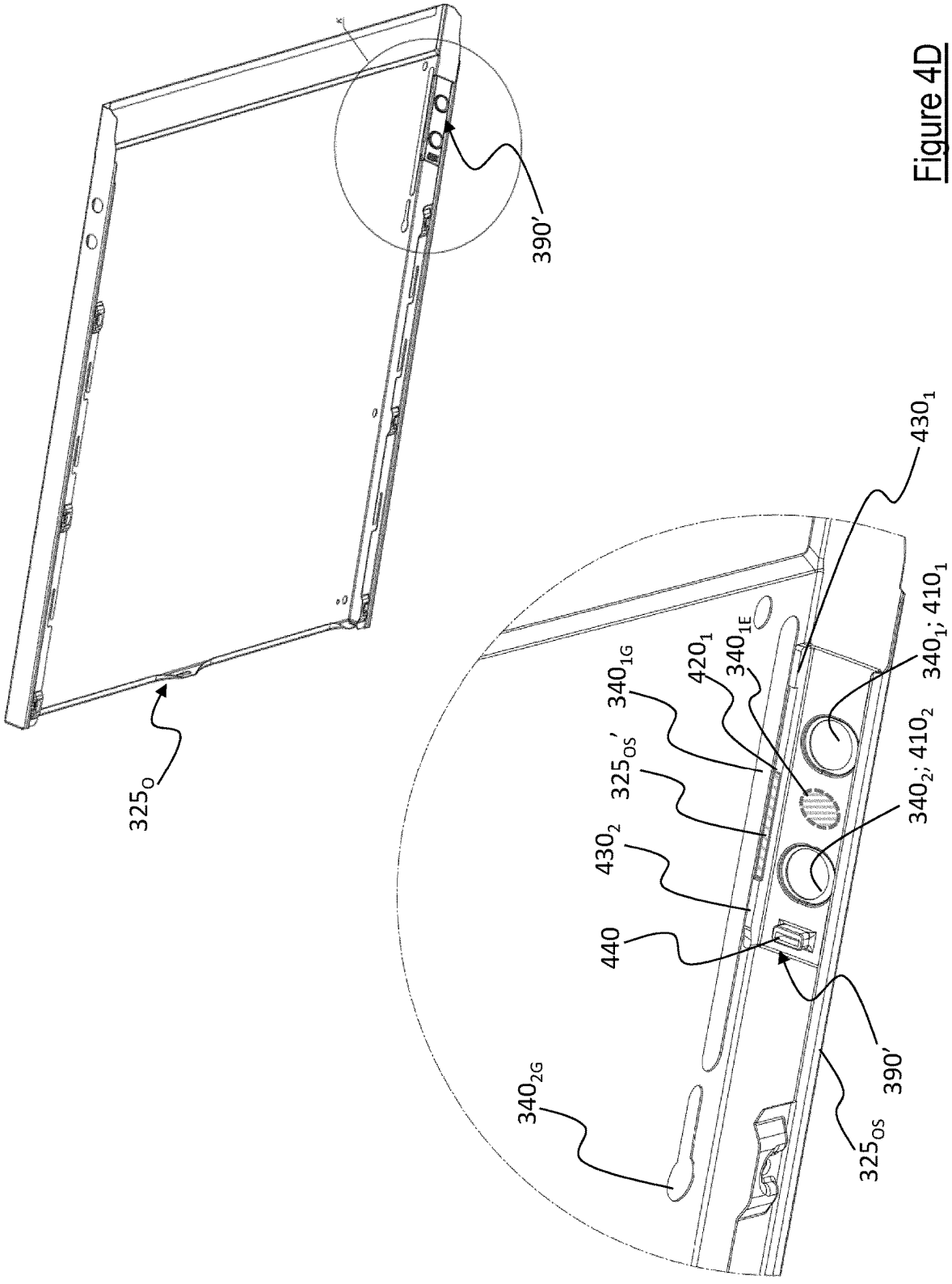

390'
325_O
430_1
340_1; 410_1
340_2; 410_2
340_{1E}
420_1
340_{1G}
325_{OS}'
430_2
440
340_{2G}
390'
325_{OS}

Figure 4D

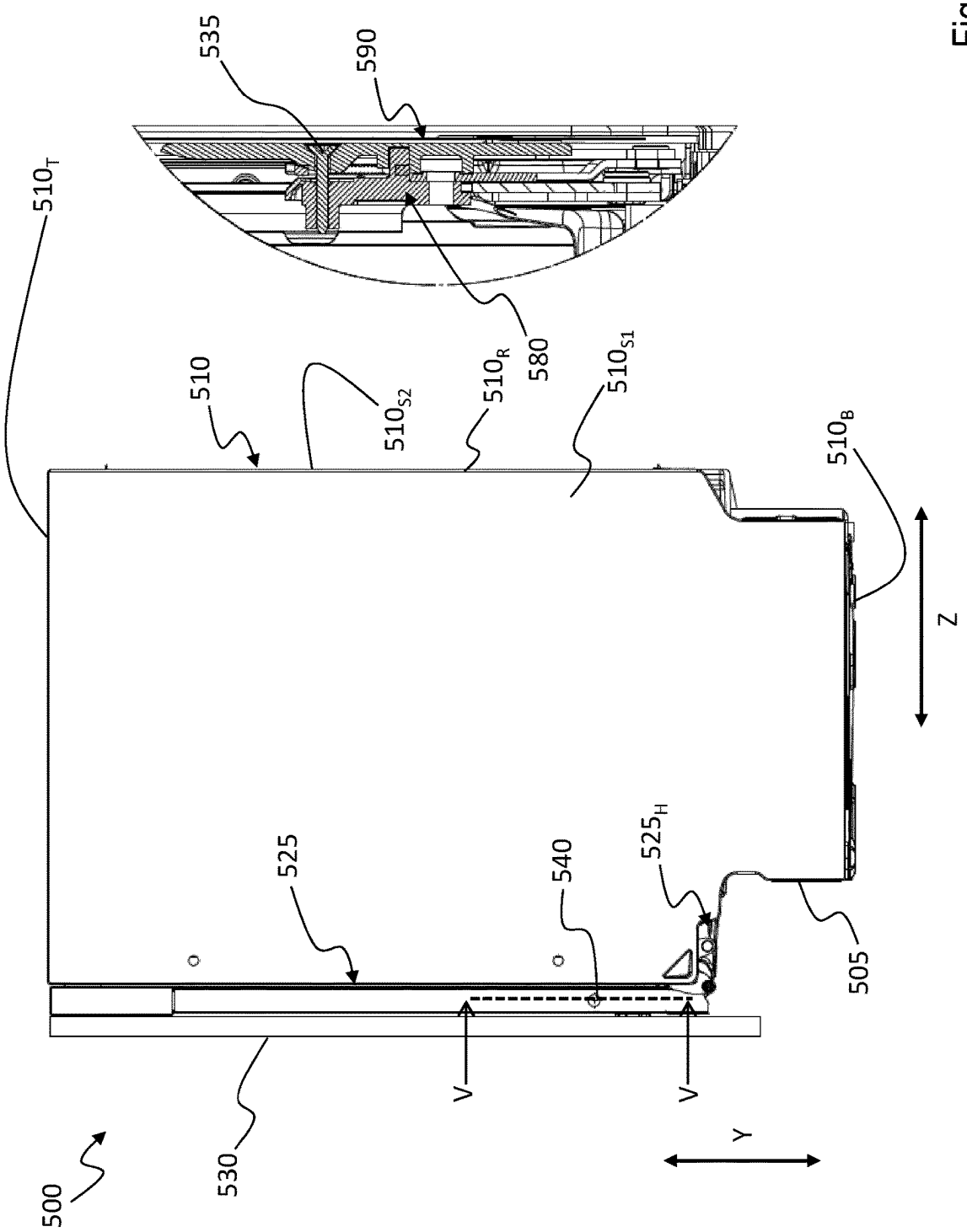

535
590
510_T
580
510
510_{S2}
510_R
510_{S1}
510_B
Z
525
540
525_H
505
V
V
Y
530
500

Figure 5A

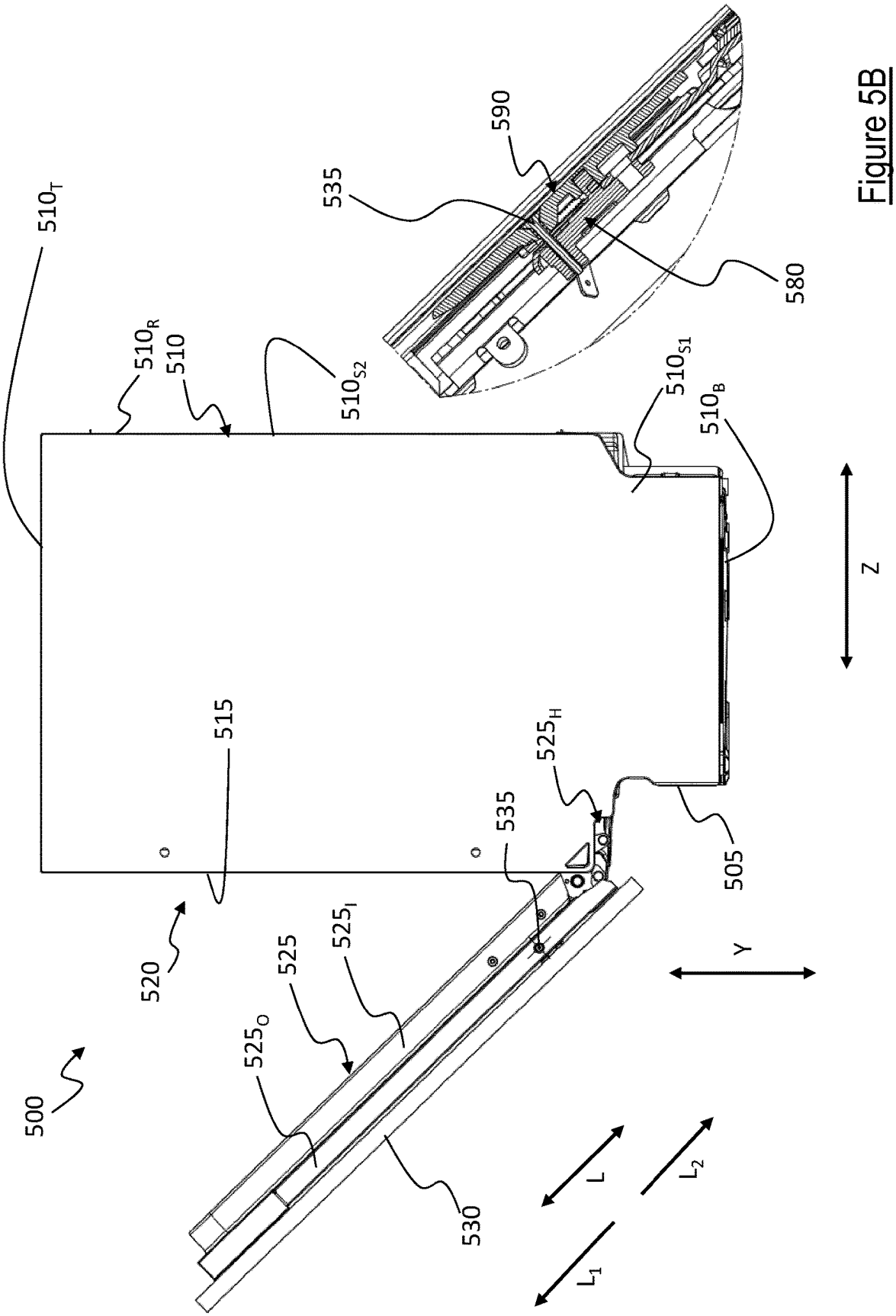

590
535
580
510_T
510_R
510
510_{S2}
510_{S1}
510_B
515
525_H
535
505
520
525
525_I
525_O
500
530
L
L_2
L_1
Y
Z

Figure 5B

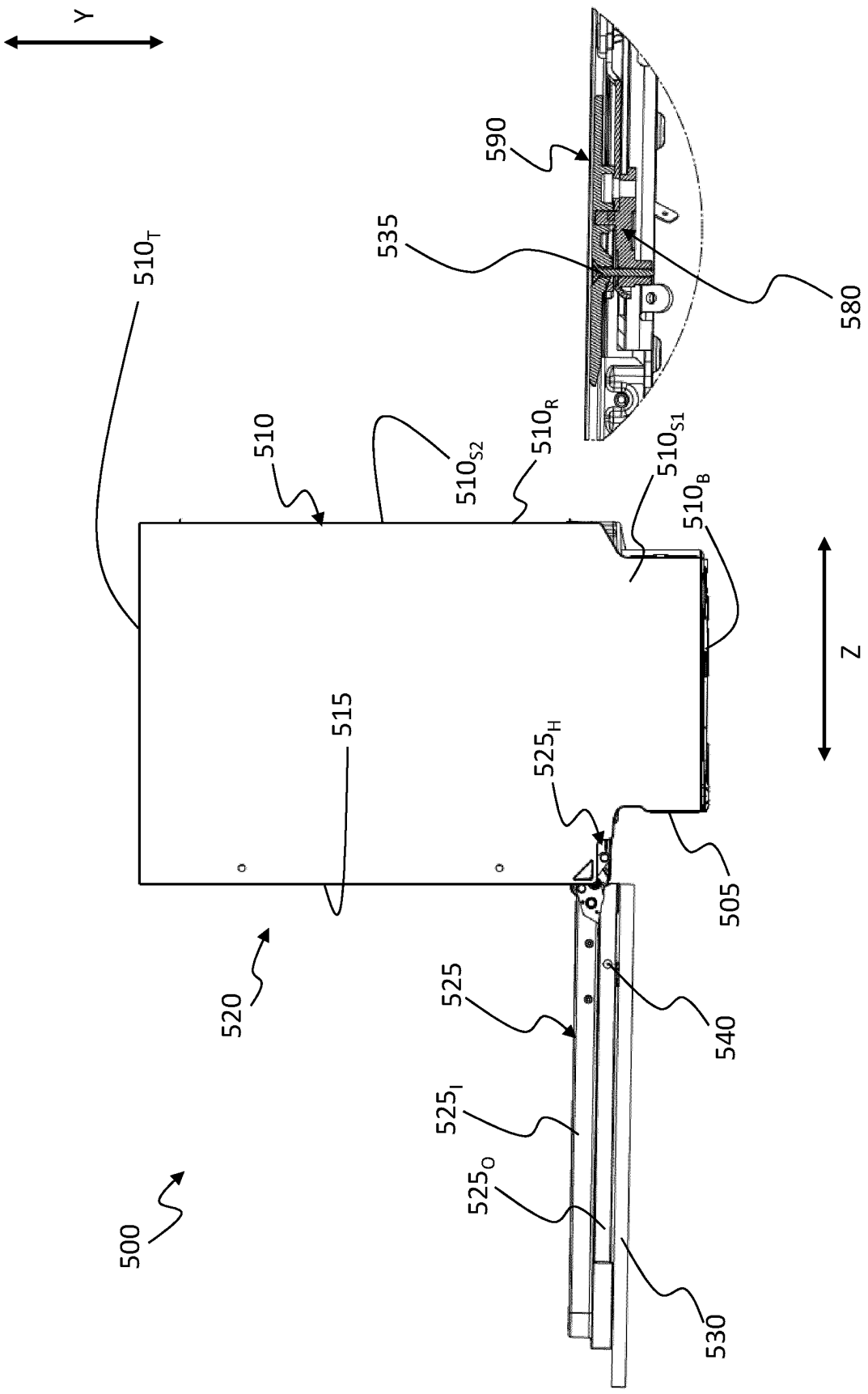
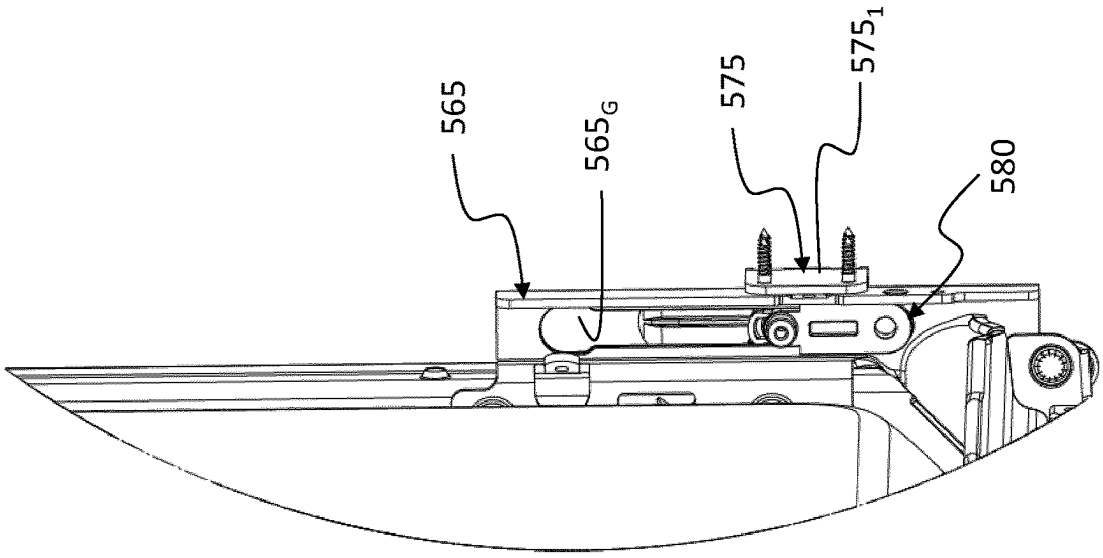

Y
Z
590
535
580
510_T
510
510_{S2}
510_R
510_{S1}
510_B
515
525_H
505
520
525
540
525_I
525_O
530
500

Figure 5C



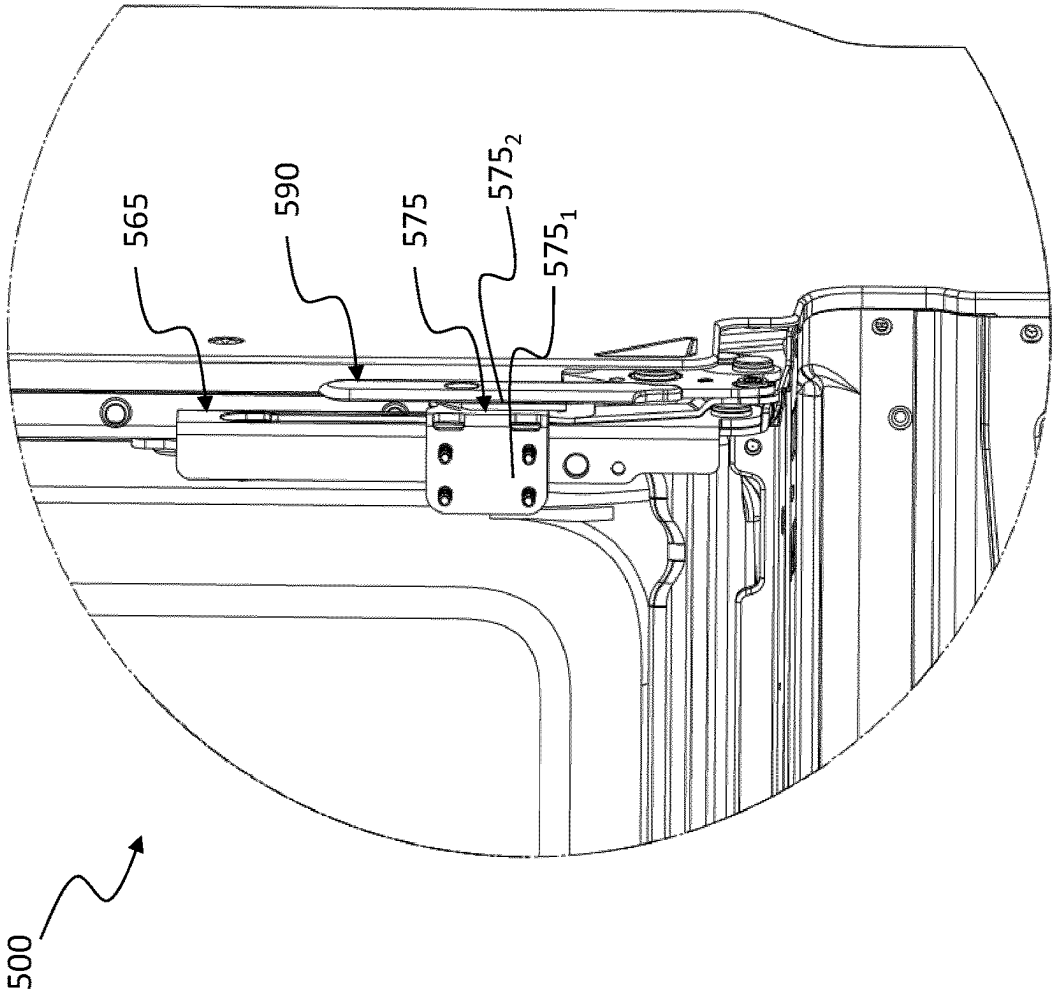


Figure 5D

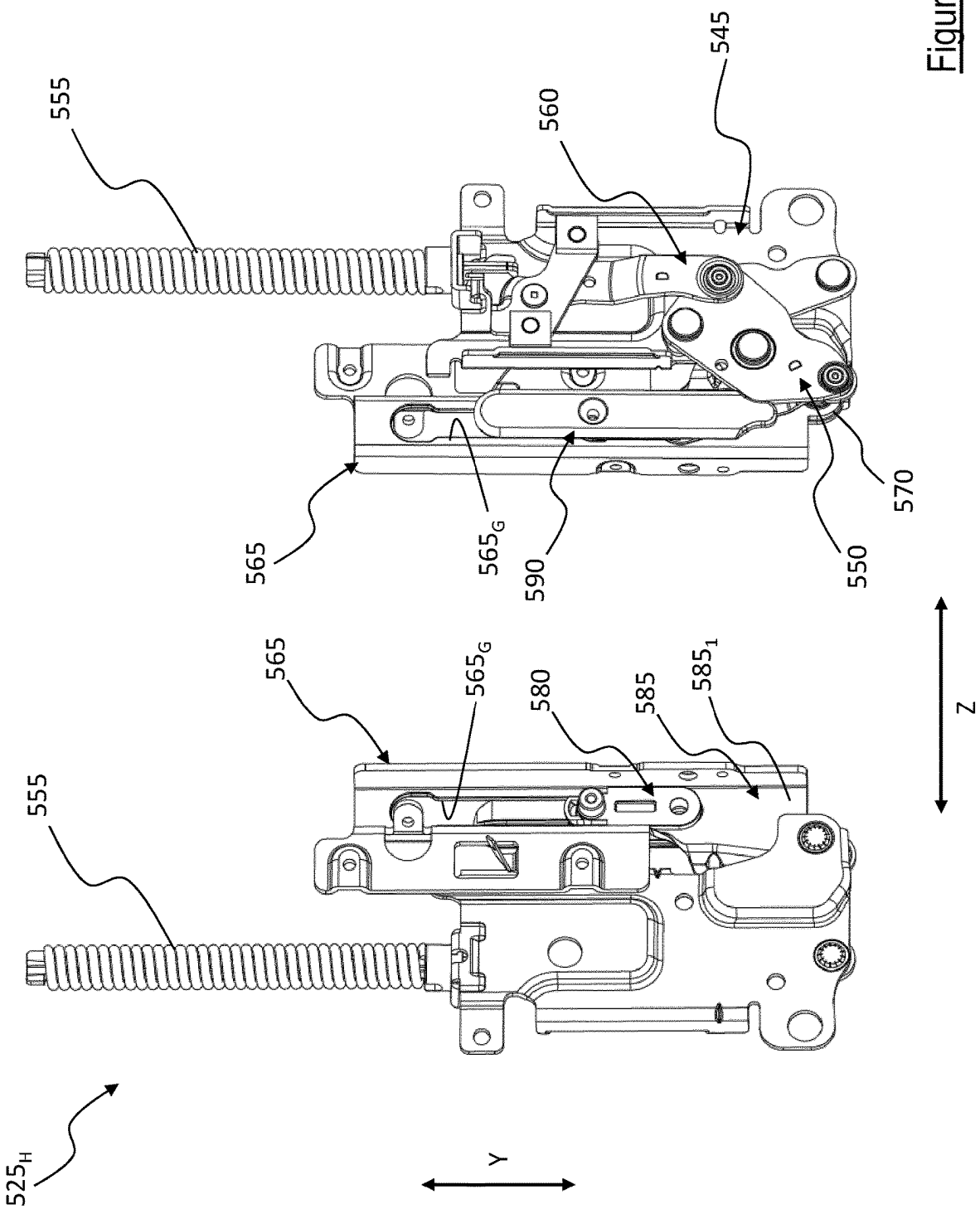

555
560
545
565
565_G
590
550
570
555
565
565_G
580
585
585_1
525_H
Y
Z

Figure 5E

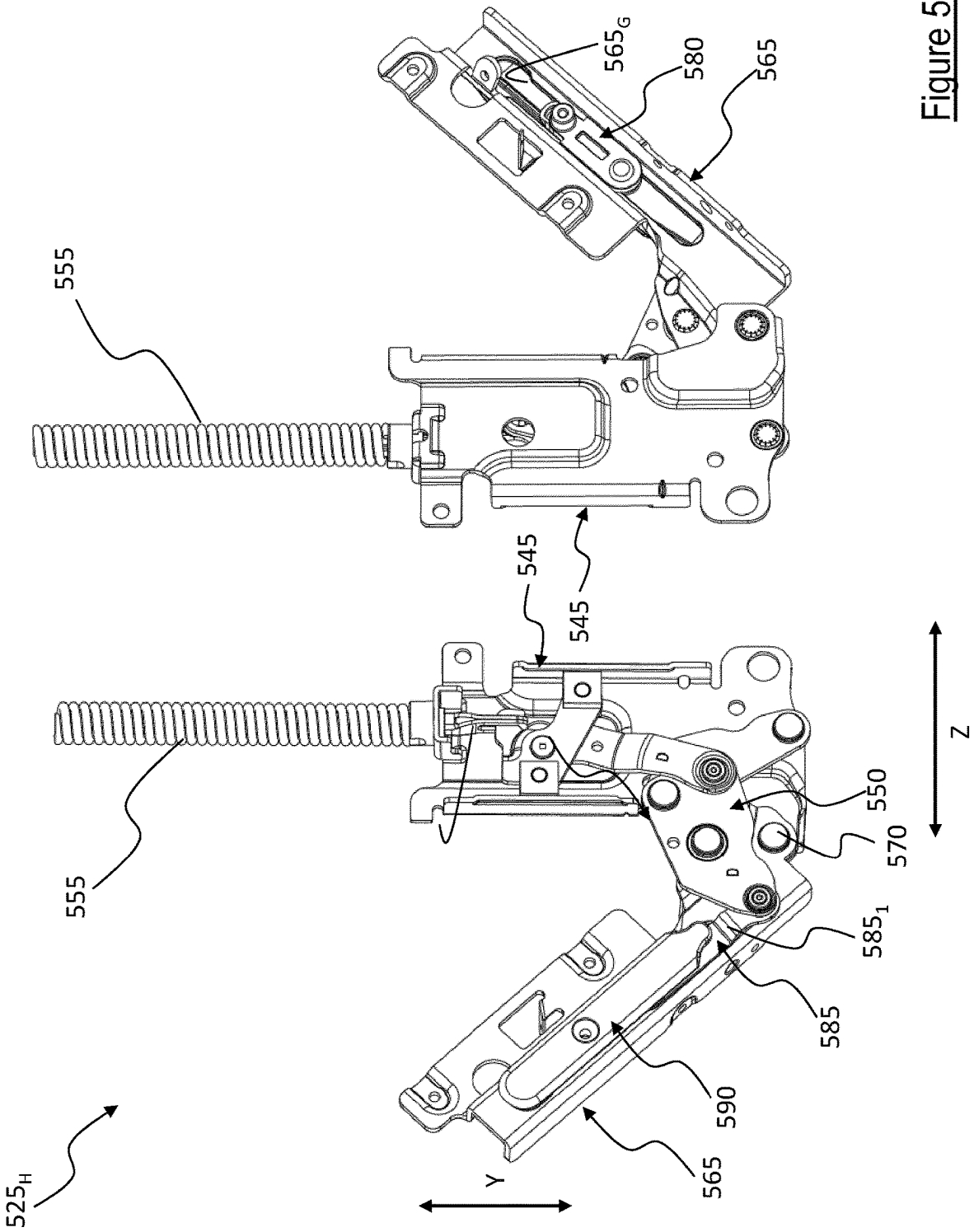
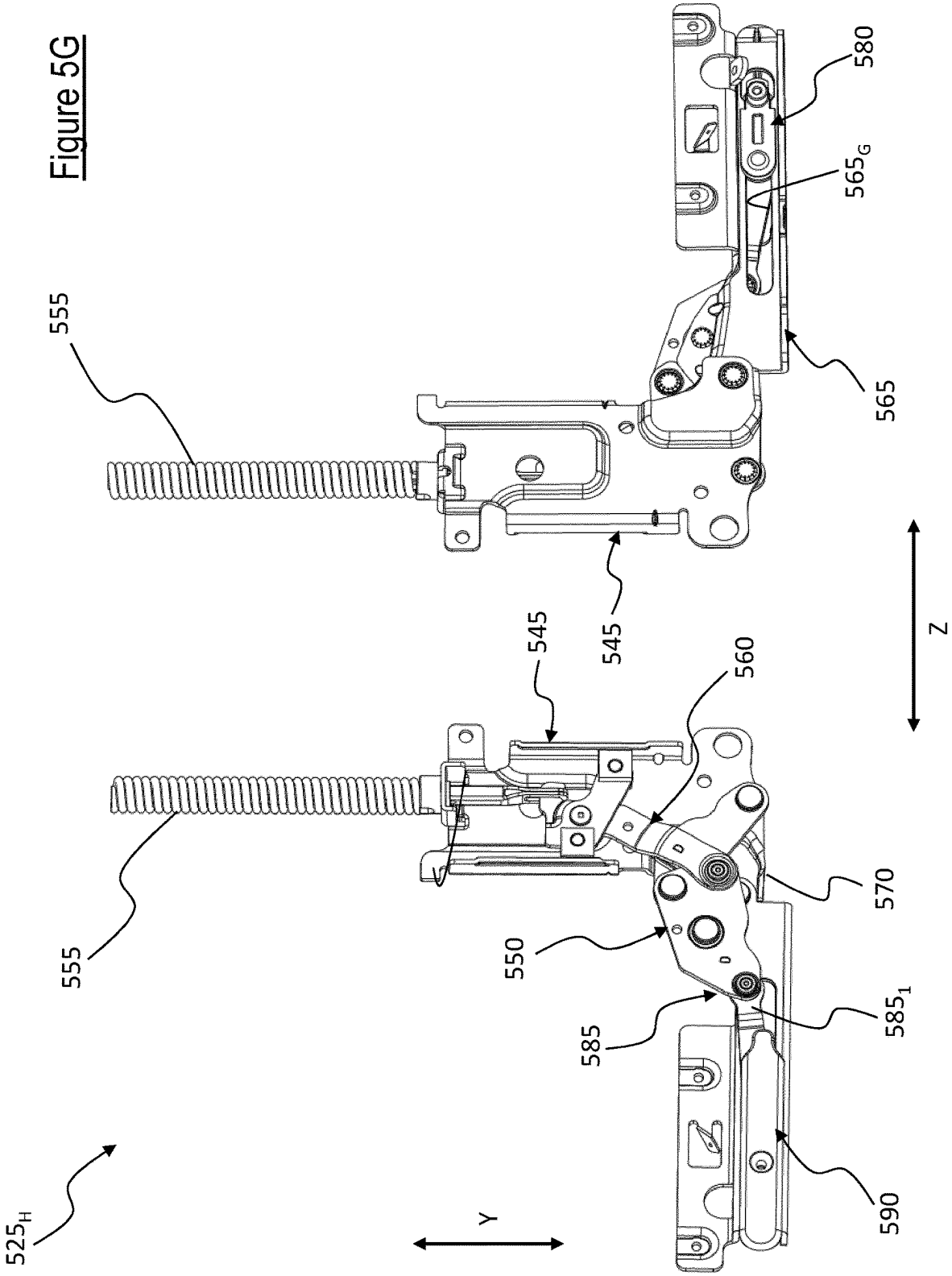


Figure 5F

Figure 5G



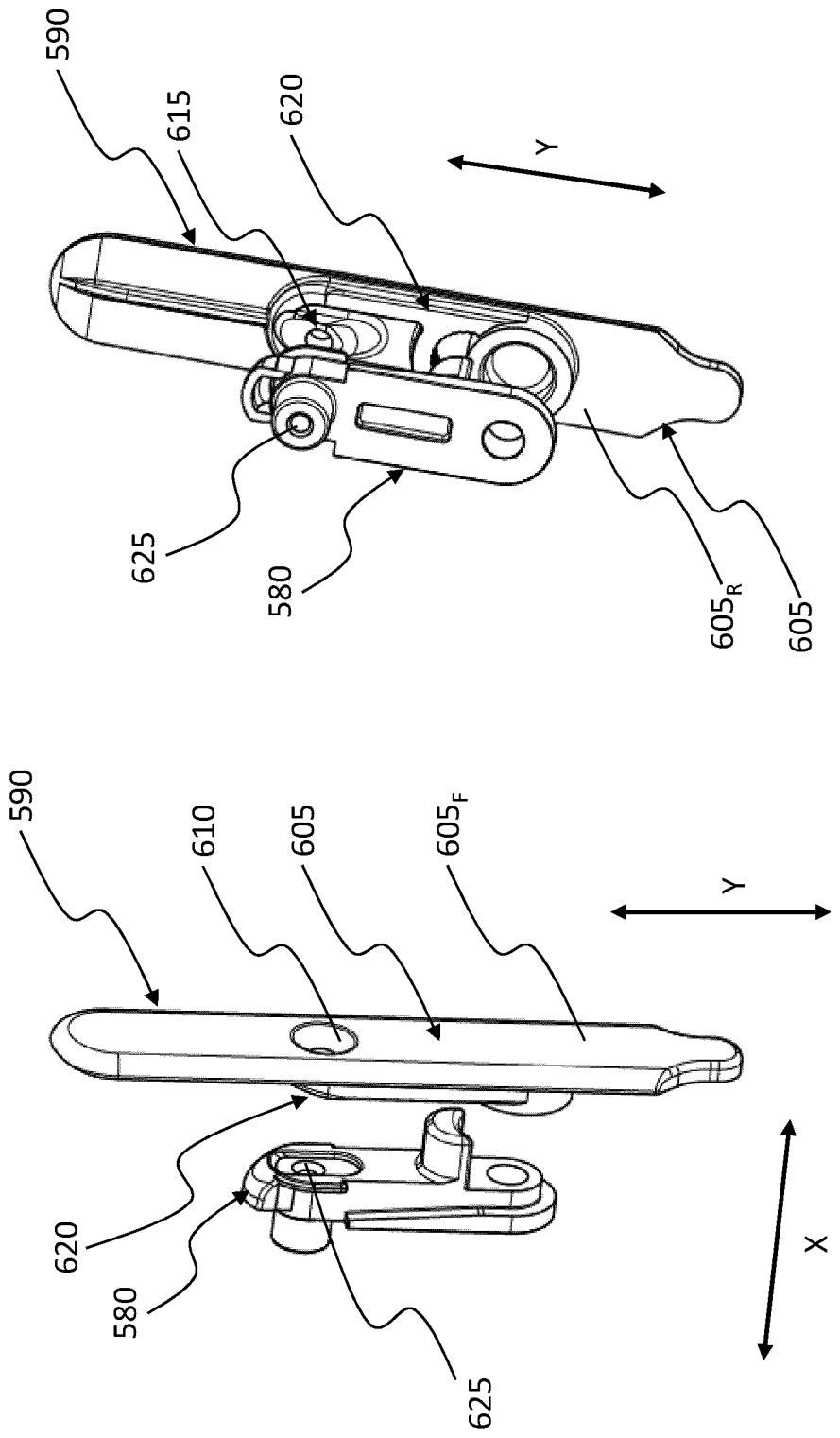


Figure 6

DISHWASHER WITH COVER DEVICE

This application is a U.S. National Phase application of PCT International Application No. PCT/EP2020/070293, filed Jul. 17, 2020, which is incorporated by reference herein.

FIELD OF THE INVENTION

The present invention relates to the field of electric appliances. Particularly, the present invention relates to the field of dishwashers. More particularly, the present invention relates to a dishwasher provided (or adapted to be provided with) with a cover device for safety purposes.

BACKGROUND ART

A conventional dishwasher comprises a (e.g., parallelepiped shaped) body or frame, which defines a (e.g., hollow) treatment chamber for items to be washed (the items to be washed comprising for example one or more among dishes, cutlery, glasses, pots and pans), and a door movable between closed and open positions for selectively accessing the treatment chamber.

The door is typically pivoted to a base of the dishwasher (by means of a pair of lateral hinges); in this way, the door may rotate (while moving between the closed and open positions) about a horizontal rotation axis raised from the floor.

A dishwasher may be either freestanding or integrated with other pieces of furniture. In the latter case (but not only), a decorative front panel (normally with the same appearance of the other pieces of furniture) may be installed on the door of the dishwasher.

In some countries, the decorative front panel has the same length as the door (with the base of the dishwasher that is covered by a baseboard, or plinth, of the kitchen); in other countries, instead, the decorative front panel is longer than the door (so as to project below it).

In both cases, a lower end of the decorative front panel may interfere with the baseboard when the door is in the open position (depending on a height of its pivoting area) or even during an initial movement of the door from the closed position.

EP2407723, filed by the same Applicant, addresses this issue.

EP2407723 discloses a sliding member configured to slide along a sliding axis during door movement, wherein the sliding member is coupleable to the decorative front panel such that, when coupled to the decorative front panel, a sliding of the sliding member during door movement causes the decorative front panel to slide with respect to the door along the sliding axis. EP2407723 also discloses an access aperture, formed at a door side, for allowing a user to access an adjusting member actuatable (by a user or an operator) to adjust a position of the decorative front panel with respect to the door.

SUMMARY OF THE INVENTION

The Applicant has understood that the solution disclosed in EP2407723 may give rise to safety issues.

Indeed, a user or an operator (or, even worse, a kid or a baby) may accidentally insert his/her fingers through the access aperture, and reach the sliding member (which could cause injury, such as cut or squashing).

In order to remedy such issues, a cap may be provided (e.g., as an accessory of the dishwasher) that the user or the operator has to mount on the access aperture after installation of the decorative front panel to the door. However, according to the Applicant, relying on the user or the operator to mount the cap does not solve the safety issues, in that the user or the operator may forget to do this or even overlook its importance.

In this respect, the Applicant has faced the above-mentioned issues, and has devised a dishwasher comprising a cover device configured to automatically move from a first operative position (in which the cover device leaves the access aperture of the door uncovered) and a second operative position (in which the cover device covers at least partially the access aperture of the door).

One or more aspects of the present invention are set out in the independent claims, with advantageous features of the same invention that are indicated in the dependent claims, whose wording is enclosed herein verbatim by reference (with any advantageous feature being provided with reference to a specific aspect of the present invention that applies mutatis mutandis to any other aspect).

More specifically, an aspect of the present invention relates to a dishwasher. The dishwasher comprises a frame defining a treatment chamber for items to be washed. The dishwasher comprises a door assembly. The door assembly comprises a door movable between closed and open positions for selectively accessing the treatment chamber. The door comprises an access aperture for allowing a user to access an adjusting member actuatable to adjust a position of a decorative front panel with respect to the door. The door assembly comprises a sliding member configured to slide along a sliding axis during door movement. The sliding member is coupleable to the decorative front panel such that, when coupled to the decorative front panel, a sliding of the sliding member during door movement causes the decorative front panel to slide with respect to the door along the sliding axis. The dishwasher comprises a cover device mounted or mountable on the door assembly and configured to take, when mounted on the door assembly, a first operative position in which the cover device leaves the access aperture of the door uncovered and a second operative position in which the cover device covers at least partially the access aperture of the door. The cover device is configured to mechanically cooperate with the sliding member so as to automatically move from the first operative position to the second operative position in response to the sliding of the sliding member.

The automatic movement of the cover device from the first operative position to the second operative position advantageously allows avoiding to rely on the user or the operator to cover the access aperture.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is mounted or mountable on the door.

The mounting of the cover device on the door advantageously allows the easy mounting of the cover device at the manufacturer site.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the door comprises a guiding member for guiding the cover device between the first and second operative positions, the cover device being configured to move from the first operative position to the second operative position by sliding along the guiding member.

The provision of a guiding member for guiding, by sliding, the cover device between the first and second operative positions advantageously allows achieving the automatic movement of the cover device in a simple, practical and effective manner.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the adjusting member is mechanically coupled to the sliding member so as to slide integrally to the sliding member during door movement. The cover device comprises an interception member configured to intercept the adjusting member during sliding thereof, while moving the door from the closed position to the open position the sliding of the adjusting member exerting on the interception member a force along the sliding axis that causes the cover device to move from first operative position to the second operative position.

The provision of an interception member intercepting the adjusting member advantageously allows achieving the automatic movement of the cover device by exploiting the movement of the adjusting member already provided in the dishwasher for allowing the translation of the decorative front panel in response to door (rotational) movement.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises an engaging member configured to engage an engaging region of the door in the first operative position of the cover device. Said force causes the engaging member to disengage from the engaging region of the door so as to move the cover device towards the second operative position.

The provision of an engaging member for engaging an engaging region of the door in the first operative position of the cover device allows achieving a stable coupling between the door and the cover device in the first operative position. This makes the mounting the cover device at the manufacturer site even more feasible, in that the engaging member prevents accidental detaching of the cover device (in the first operative position) from the door during shipping and/or installation of the dishwasher.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is configured to resiliently bend to allow the engaging member to disengage from the engaging region of the door so as to move the cover device from the first operative position to the second operative position.

The resilient bending of the cover device advantageously allows the cover device to be disengaged from the first operative position by mere action of the force applied by the adjusting member on the interception member.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises an engaging member configured to engage an engaging portion of the door in the second operative position of the cover device, said force causing the engaging member to engage the engaging portion of the door.

The provision of an engaging member for engaging an engaging portion of the door in the second operative position of the cover device allows achieving a stable coupling between the door and the cover device in the second operative position, which is therefore essentially unaffected by any subsequent door movement and/or by any accidental touches of the cover device.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is configured to automatically move from the first operative position to the second operative position in response to a first door movement, the engaging between the engaging member and the engaging portion allowing the cover device to be maintained in the second operative position at each door movement following the first door movement.

The automatic moving of the cover device from the first operative position to the second operative position and the maintaining of the cover device in the second operative position at each following door movement advantageously allows the cover device to cover the access aperture for all the lifetime of the dishwasher (unless the access aperture has to be uncovered to access the adjusting member, e.g. for maintenance purposes), thus avoiding injury risks and relieving the user from the burden of remembering to cover the access aperture.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is configured to be manually moved from the second operative position to the first operative position.

The manual moving of the cover device from the second operative position to the first operative position advantageously allows the uncovering of the access aperture only when necessary, and on purposive action by the user.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the door is configured to rotate between the closed and open positions about a rotation axis. The cover device is configured to be manually moved from the second operative position to the first operative position when the door is rotated with respect to the rotation axis by at least one predetermined rotation angle.

The manual movement of the cover device from the second operative position to the first operative position when the door is in one or more predetermined positions (such as when the door is rotated with respect to the rotation axis by at least one predetermined rotation angle) advantageously allows the uncovering of the access aperture only on a purposive action by the user.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, each predetermined rotation angle corresponds to a distance along the sliding axis between the interception member of the cover device and the adjusting member, which distance is greater than a predetermined distance.

The manual movement of the cover device from the second operative position to the first operative position when the distance between the interception member and the adjusting member is greater than a predetermined distance advantageously allows avoiding that the interception member obstructs the cover device while moving towards the first operative position; this makes the gesture required to the manual moving of the cover device back to the first position simple (indeed, this gesture involve a downwards sliding movement when the door is in the closed or substantially closed position).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the access aperture is provided on a side wall of the door. The cover device being mountable or mounted on an external face of the side wall of the door.

The fact that the cover device is mountable or mounted on an external face of the side wall of the door advantageously allows the user to easily access the cover device, e.g. for manually moving it from the second operative position back to the first operative position.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the dishwasher comprises a guiding aperture provided at a side wall of the door. According to an embodiment, the guiding member comprises said guiding aperture.

The provision of a guiding aperture at a side of the wall acting as guiding member advantageously allows the cover device to be mounted externally to the door.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises at least one frictional member for providing a frictional coupling between the cover device and the door. According to an embodiment, the frictional member is configured to be retained by friction within the guiding member when no external force is applied to the cover device and to frictionally slide within the guiding member when an external force higher than a frictional force between the frictional member and the guiding member is applied to the cover device.

The provision of one or more frictional members advantageously allows achieving a backup coupling function between the cover device and the door (e.g., in case of break or damage of one or more engaging members of the cover device).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises at least one reinforcing member for reinforcing a coupling between the cover device and the door when the cover device is in the first operative position. According to an embodiment, the reinforcing member may be configured to abut against the access aperture (for example, a bottom of the access aperture) when the cover device is in the first operative position.

The provision of one or more reinforcing members for reinforcing a coupling between the cover device and the door when the cover device is in the first operative position advantageously allows achieving a backup coupling function between the door and the cover device in the first operative position (e.g., in case of break or damage of one or more engaging members of the cover device). This makes the mounting the cover device at the manufacturer site even more feasible, in that the reinforcing members prevent accidental detaching of the cover device (in the first operative position) from the door during shipping and/or installation of the dishwasher.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the access aperture comprises a first and a second access apertures. Said engaging portion of the door may comprise a portion of said first access aperture. The cover device may comprise an anti-release member for preventing the cover device from being accidentally decoupled from the door when the cover device is in the second operative position. According to an embodiment, the anti-release member may be configured to abut against a portion of the access aperture (e.g., of the second access aperture) when the cover device is in the second operative position.

The provision of the anti-release member advantageously allows achieving a backup coupling function between the door and the cover device in the second operative position (e.g., in case of break or damage of one or more engaging members of the cover device).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises a plate having an access hole matching the access aperture of the door in the first operative position of the cover device.

The provision in the cover device of an access hole matching the access aperture of the door in the first operative position of the cover device allows avoiding that the cover device, in the first operative position, obstructs an access of the user or the operator to the access aperture, and particularly that obstructs the insertion by the user or the operator of a screw driver or wrench to reach the adjusting member.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the door comprises an engaging hole for engaging the cover device and the door in the first operative position (the engaging region of the door for example comprising said engaging hole of the door). According to an embodiment, the cover device may be configured to engage a portion of the access aperture in the second operative position (the engaging portion of the door for example comprises a portion of the access aperture).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the sliding member is configured to slide, along the sliding axis, in a first direction when the door is moved from the closed position to the open position and in a second direction, opposite the first direction, when the door is moved from the open position to the closed position. According to an embodiment, the cover device moves in the first direction while automatically moving from first operative position to the second operative position; the force exerted on the cover device (e.g., on the interception member) that allows automatically moving the cover device from first operative position to the second operative position may for example comprise a first force in the first direction (said first force being for example a sliding force in the first direction). The cover device may be configured to be manually moved from the second operative position to the first operative position by exerting on the cover device a pulling force orthogonal to the sliding axis and a second force in the second direction along the sliding axis (said second force being a sliding force in the first direction).

The use of a pulling force and of a sliding force in the second direction to manually move the cover device from the second operative position to the first operative position advantageously allows the user to easily restore the cover device back to its first operative position.

Moreover, the concurrent application of the pulling and sliding forces is a sufficiently complex gesture that the manual movement from the second operative position to the first operative position has to be necessarily performed by the user purposely, which prevents that a kid or a baby could accidentally do it.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises at least one grip member for allowing the user to grasp the cover device.

The provision of the grip member advantageously allows the user to manually move the cover device between the first operative position and the second operative position. Particularly, the provision of the grip member advantageously allows the user to manually move the cover device from the second operative position to the first operative position, the grip member for example allowing the user to exert said pulling force and said second force easily and effectively.

According to an embodiment, whose features are additional or alternative to any features of the previous embodi-

ments, the cover device comprises one or more flex grooves to enhance a resilience of the cover device during bending thereof.

The provision of flex grooves to enhance a resilience of the cover device during bending thereof advantageously prevents that the stiffening of the material over time due to aging causes the cover device to break.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the access aperture is provided at a side wall of the door. The cover device may be mounted on an internal face of the side wall of the door.

The provision of the cover device on the internal face of the side wall of the door prevents the user from accidentally accessing the cover device, and hence accidental moving thereof. Moreover, the provision of the cover device on the internal face of the side wall of the door determines a more agreeable appearance of the dishwasher.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the dishwasher comprises a guiding aperture provided at a front wall of the door orthogonal to the side wall of the door for guiding the cover device between the first and second operative positions. The cover device may comprise a plate configured to rest on the internal face of the side wall of the door, and an overhanging member projecting from the plate and configured to be coupled to the guiding aperture.

The provision of the overhanging member avoids structural modifications to the door, in that an elongated slot that, in some conventional dishwashers, is provided on the front wall of the outer door panel for assembling and adjusting the decorative front panel may be used as the guiding aperture (thus without the need of a dedicated guiding aperture).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the overhanging member is configured to engage the door. According to an embodiment, the overhanging member comprises said engaging member.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device comprises at least one frictional member for providing a frictional coupling between the cover device and the door, the frictional member being configured to be retained by friction within the guiding member when no external force is applied to the cover device and to frictionally slide within the guiding member when an external force higher than a frictional force between the frictional member and the guiding member is applied to the cover device.

The provision of one or more frictional members advantageously allows achieving a backup coupling function between the cover device and the door (e.g., in case of break or damage of one or more engaging members of the cover device).

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the engaging region of the door comprises a region of the guiding aperture, and the portion of the door comprises an engaging hole of the door.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the sliding member is configured to slide, along the sliding axis, in a first direction when the door is moved from the closed position to the open position and in a second direction, opposite the first direction, when the door is moved from the open position to the closed position. According to an embodiment, the cover device moves in the first direction while automatically moving from first operative position to the second operative position; the force exerted on the cover device (e.g., on the interception member) that allows automatically moving the cover device from first operative position to the second operative position may for example comprise a first force in the first direction (said first force being for example a sliding force in the first direction). The cover device may be configured to be manually moved from the second operative position to the first operative position by exerting a pushing force orthogonal to the sliding axis and a second force in the second direction along the sliding axis (said second force being a sliding force in the second direction).

The use of a pushing force and of a sliding force in the second direction to manually move the cover device from the second operative position to the first operative position advantageously allows the user to easily restore the cover device back to its first operative position.

Moreover, the concurrent application of the pushing and sliding forces is a sufficiently complex gesture that the manual movement from the second operative position to the first operative position has to be necessarily performed by the user purposely, which prevents that a kid or a baby could accidentally do it.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is mounted on the sliding member, whereby the cover device is configured to move from the first operative position to the second operative position when the door is moved from the closed position to the open position and to move from the second operative position to the first operative position when the door is moved from the open position back to the closed position.

The mounting of the cover device on the sliding member advantageously allows a completely automatic movement of the cover device between the first operative position and the second operative position.

According to an embodiment, whose features are additional or alternative to any features of the previous embodiments, the cover device is mounted on the sliding member by snap-fitting.

The mounting of the cover device on the sliding member by snap-fitting advantageously allows obtaining a simple, fast and effective coupling between the cover device and the sliding member.

BRIEF DESCRIPTION OF THE DRAWING

These and other features and advantages of the present invention will be made apparent by the following description of some exemplary and non-limitative embodiments thereof; for its better intelligibility, the following description should be read making reference to the attached drawings, wherein:

FIGS. **1**A-**1**D show a dishwasher in different operative positions, according to an embodiment of the present invention;

FIG. **1**E shows a portion of a door of the dishwasher of FIGS. **1**A-**1**D according to an embodiment of the present invention;

FIGS. **1**F-**1**H show a door hinge of the dishwasher of FIGS. **1**A-**1**D, according to an embodiment of the present invention;

FIG. **2**A and FIGS. **2**B-**2**C show perspective front and rear views, respectively, of a cover device of the dishwasher of FIGS. **1**A-**1**D according to an embodiment of the present invention;

FIGS. **3**A-**3**C show a dishwasher in different operative positions, according to an embodiment of the present invention;

FIG. **4**A shows perspective front and rear views of a cover device of the dishwasher of FIGS. **3**A and **3**B according to an embodiment of the present invention;

FIG. **4**B shows the cover device of FIG. **4**A mounted on a door of the dishwasher, according to an embodiment of the present invention;

FIG. **4**C shows perspective front and rear views of a variant of the cover device of FIG. **4**A according to an embodiment of the present invention;

FIG. **4**D shows the cover device of FIG. **4**C mounted on a door of the dishwasher, according to an embodiment of the present invention;

FIGS. **5**A-**5**C show a dishwasher in different operative positions, according to an embodiment of the present invention;

FIG. **5**D shows a portion of the dishwasher of FIGS. **5**A-**5**C according to an embodiment of the present invention;

FIGS. **5**E-**5**G show a door hinge of the dishwasher of FIGS. **5**A-**5**D in different operative positions, according to an embodiment of the present invention, and

FIG. **6** shows a cover device and a sliding member of the dishwasher of FIGS. **5**A-**5**C according to an embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The attached drawings essentially show, according to embodiments of the present invention, a dishwasher equipped with a cover device for safety purposes.

In the following, when one or more features of the dishwasher (as well as of components thereof) and of the cover device (as well as of components thereof) are introduced by the wording "according to an embodiment", they are to be construed as features additional or alternative to any features previously introduced, unless otherwise indicated and/or unless there is evident incompatibility among feature combinations.

In the following, only features of the dishwasher that are deemed relevant for the understanding of the present invention will be discussed, with well-known features and/or obvious variants of the relevant features that are omitted for the sake of conciseness.

In the following, directional terminology (such as top, bottom, front, rear, central, side, upper and lower) is only used for describing the dishwasher (as well as of components thereof) and the cover device (as well as of components thereof) according to the intended orientation use thereof, therefore directional terminology should be under no circumstances construed in absolute terms. In particular, the directional terminology is referred to mutually orthogonal reference axis X, Y, and Z, hereinafter referred to as longitudinal, vertical and transverse axis, respectively.

With reference to FIGS. **1**A-**1**D, they show perspective side views of a dishwasher **100** in different operative positions, according to an embodiment of the present invention. Each one of the FIGS. **1**A-**1**D also shows a sectional view of the dishwasher **100** along the I-I sectional axis, each sectional view illustrating a respective interaction between the cover device and a door of the dishwasher **100**.

According to an embodiment the dishwasher **100** comprises a base **105** for resting the dishwasher **100** on a support surface (not shown in the figures), e.g. parallel to the plane defined by the longitudinal X and transverse Z axis (hereinafter, X-Z plane), such as a floor or a support surface of a suitable niche of a piece of furniture wherein the dishwasher **100** can be installed.

According to an embodiment, the dishwasher **100** comprises a (e.g., parallelepiped shaped) body or frame **110**.

According to an embodiment, the frame **110** defines a (e.g., hollow) treatment chamber **115** for items to be washed. According to an embodiment, the items to be washed comprise one or more among dishes, cutlery, glasses, pots and pans.

According to an embodiment, the dishwasher **100** comprises, within the treatment chamber **115**, one or more pullout racks (not shown in the figures) for inserting the items to be washed into the treatment chamber **115**.

According to an embodiment, the frame **110** comprises top $\mathbf{110}_T$ and bottom $\mathbf{110}_B$ walls parallel to the X-Z plane, a rear wall $\mathbf{110}_B$ parallel to the plane defined by the longitudinal X and vertical Y axis (hereinafter, X-Y plane), and two side walls $\mathbf{110}_{S1}$,$\mathbf{110}_{S2}$ orthogonal to the top $\mathbf{110}_T$, bottom $\mathbf{110}_B$ and rear $\mathbf{110}_R$ walls (i.e., parallel to the plane defined by the vertical Y and transverse Z axis, hereinafter Y-Z plane). External faces of the side walls $\mathbf{110}_{S1}$, $\mathbf{110}_{S2}$, i.e. the faces of the side walls $\mathbf{110}_{S1}$, $\mathbf{110}_{S2}$ that do not face the treatment chamber **115**, are usually covered by external side panels (not shown in the figures), typically part of the piece of furniture wherein the dishwasher **100** is installed.

According to an embodiment, the frame **110** defines a front load opening **120** parallel to the X-Y plane, and opposite to the rear wall $\mathbf{110}_R$ along the transverse axis Z.

According to an embodiment, the dishwasher **100** comprises a door assembly.

According to an embodiment, the door assembly comprises a door **125** for selectively opening the front load opening **120**, and hence for selectively accessing the treatment chamber **115**.

According to an embodiment, the door **125** is movable (e.g., rotatable) between closed and open positions.

The door **125** is exemplary shown in the closed position in FIGS. **1**A and **1**D, in a partially open position in FIG. **1**B and in the open position in FIG. **1**C.

According to an embodiment, the door **125** comprises an outer door panel $\mathbf{125}_O$ and an inner door panel $\mathbf{125}_I$.

According to an embodiment, the inner door panel $\mathbf{125}_I$ is mounted on a rear face of the outer door panel $\mathbf{125}_O$, the rear face of the outer door panel $\mathbf{125}_O$ for example facing the treatment chamber **115** when the door **125** is in the closed position.

According to an embodiment, the outer $\mathbf{125}_O$ and inner $\mathbf{125}_I$ door panels are sized such that, upon outer $\mathbf{125}_O$ and inner $\mathbf{125}_I$ door panels mounting, a portion (preferably, a perimeter edge portion) of the rear face of the outer door panel $\mathbf{125}_O$ is uncovered by the inner door panel $\mathbf{125}_I$ and acts as an abutment portion (preferably, a perimeter abutment portion) abutting against borders of the front load opening **120** to seal the treatment chamber **115** when the door **125** is in the closed position.

According to an embodiment, the door assembly comprises a door hinge $\mathbf{125}_H$ for rotationally coupling the door **125** to the base **105**, so that the door **125** can rotate with respect to the frame **110** about a horizontal rotation axis (raised from the floor), e.g. parallel to the longitudinal axis X. According to an embodiment, the door **125** can be moved from the closed position to the open position by a drop-down movement, and from the open position to the closed position by a pull-up movement.

According to an embodiment, the dishwasher **100** may be a fully-integrated dishwasher or a semi-integrated dish-

washer. By fully integrated dishwasher it is herein meant that, when the door **125** is in the closed position, the dishwasher **100** may be totally indistinguishable from the other pieces of the furniture where it is installed. By semi-integrated dishwasher it is herein meant that, when the door **125** is in the closed position, the dishwasher **100** may be partially indistinguishable from the other pieces of the furniture where it is installed. For this purpose, upon dishwasher installation, the door **125** may be coupled to a decorative front panel **130** so as to be completely or almost completely covered by it. According to an embodiment, the decorative front panel **130**, which is not part of the dishwasher **100**, has same appearance as, or it is at least coordinated with, the other pieces of the furniture, the decorative front panel **130** being for example made of wood.

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a fastening system for fastening the decorative front panel **130** to the door **125** and for adjusting a position (i.e. a vertical position, taking the door **125** in the closed position as a reference) of the decorative front panel **130** with respect to the door **125**. The fastening system, not entirely visible in FIGS. **1**A-**1**D, will be better discussed in the following.

For the purposes of the present disclosure, the fastening system comprises an actuatable or adjusting member, for example a trimming screw **135** (e.g., made of a metal material or other rigid material) adapted to be screwed/unscrewed or rotated by the user or the operator.

According to an embodiment, the door comprises one or more access apertures for allowing the user or the operator to access and actuate (e.g., by insertion of a screw driver or wrench) the trimming screw **135**.

According to an embodiment, the access aperture(s) are provided at the outer door panel $\mathbf{125}_O$, e.g. at a lower end region of a side wall thereof that is visible by the user when the door **125** is not in the closed position.

With reference also to FIG. **1**E, it shows an external face of the door side wall, and particularly the external face of the side wall of the outer door panel $\mathbf{125}_O$, according to an embodiment of the present invention.

According to an embodiment, the outer door panel $\mathbf{125}_O$, comprises two access apertures $\mathbf{140}_1$,$\mathbf{140}_2$. According to an embodiment, the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ are aligned to each other along the vertical axis Y, so as to define a lower access aperture $\mathbf{140}_1$ and an upper access aperture $\mathbf{140}_2$ (taking the orientation of use of the dishwasher **100** and the door **125** in the closed position as references).

According to an embodiment, each access aperture $\mathbf{140}_1$, $\mathbf{140}_2$ is designed (i.e., shaped and sized) to allow the user to access and actuate the trimming screw **135** in respective positions of the door **125** (as better discussed in the following, the trimming screw **135** moves in response to door movement, whereby the trimming screw **135** may be accessed through the lower access aperture $\mathbf{140}_1$ or through the upper access aperture $\mathbf{140}_2$ depending on a position of the door **125**).

According to an embodiment, the lower access aperture $\mathbf{140}_1$ is designed to allow the user to access and actuate the trimming screw **135** when the door **125** is almost in the closed position, e.g. for assembling the decorative front panel **130** on the door **125**.

According to an embodiment, the upper access aperture $\mathbf{140}_2$ is designed (i.e., shaped and sized) to allow the user to access and actuate the trimming screw **135** when the door **125** is in a predetermined (e.g., substantially intermediate) position between the closed and open positions (the intermediate position corresponding for example to about a 45-degree rotation angle of the door **125** with respect to the vertical axis Y), e.g. for adjusting the vertical position of the decorative front panel **130** on the door **125** and/or for disassembling the decorative front panel **130** from the door **125**.

According to an embodiment, each access aperture $\mathbf{140}_1$, $\mathbf{140}_2$ is circular (or substantially circular) in shape, and is large enough to allow the user or the operator to access and actuate (e.g., by insertion of a screw driver or wrench) the trimming screw **135**.

According to an embodiment, the door **125** comprises, e.g. at the side of the outer door panel $\mathbf{125}_O$, one or more guiding members, such as one or more guiding apertures. According to an embodiment, the door **125** comprises, e.g. at the side of the outer door panel $\mathbf{125}_O$, two guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$, each guiding aperture $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ being preferably associated with a respective access aperture $\mathbf{140}_1$,$\mathbf{140}_2$. According to an embodiment, the guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ are aligned to each other along the vertical axis Y. According to an embodiment, each guiding aperture $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ extends along the vertical axis Y, each guiding aperture $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ being for example elongated in shape. According to an embodiment, each guiding aperture $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ is arranged at (and extends from) a top of a respective access aperture $\mathbf{140}_1$,$\mathbf{140}_2$. According to an embodiment, the guiding aperture $\mathbf{140}_{1G}$ opens to (e.g., the top of) the lower access aperture $\mathbf{140}_1$ (reason why it will be referred to as lower guiding aperture $\mathbf{140}_{1G}$), and the guiding aperture $\mathbf{140}_{2G}$ opens to (e.g., the top of) the upper access aperture $\mathbf{140}_2$ (reason why it will be referred to as upper guiding aperture $\mathbf{140}_{2G}$).

According to an embodiment, the guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ are designed to allow movement/sliding of the cover device during movement/sliding of the decorative front panel **130** with respect to the door **125** (so as to cover the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$, as better discussed in the following). As better discussed in the following, the guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ allow guiding the cover device between a first operative position in which the cover device leaves the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ uncovered (hereinafter, opening position) and a second operative position in which the cover device covers at least partially the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ (hereinafter, closing position). As better discussed in the following, the cover device is configured to move or switch from the opening position to the closing position by sliding along the guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ (or by sliding along a single guiding aperture, e.g. in embodiments in which a single access aperture and a single guiding aperture are provided).

According to an embodiment, the door **125** comprises, e.g. at the side of the outer door panel $\mathbf{125}_O$, an engaging region or portion, for example an engaging hole $\mathbf{140}_{1E}$. According to an embodiment, the engaging hole $\mathbf{140}_{1E}$ is provided, along the vertical axis Y, below the lower access aperture $\mathbf{140}_1$.

As better discussed in the following, the engaging hole $\mathbf{140}_{1E}$ is designed to receive an engaging member (such as an engaging tooth) of the cover device, e.g. so as to stably retain the cover device in the opening position. Therefore, the cover device can be advantageously mounted on the door assembly at manufacturer site (thus relieving the user from this burden).

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a sliding system, not visible in FIGS. **1**A-**1**D, for allowing the decorative front panel **130** to slide with respect to the door **125** during door movement (i.e., when the door **125** is moved between the closed and open positions).

According to an embodiment, the sliding system is configured to slide along a sliding axis L essentially orthogonal to the rotation axis of the door **125** (the sliding axis being parallel to the vertical axis Y when the door **125** is in the closed position, and to the transverse axis Z when the door **125** is in the open position). According to an embodiment, the sliding system is configured to slide, along the sliding axis L, in a first direction L_1 (hereinafter, forward direction) when the door **125** is moved from the closed position to the open position and in a second direction L_2 (hereinafter, backward direction), opposite to the forward direction L_1, when the door **125** is moved from the open position to the closed position.

As better discussed in the following, the sliding system is coupleable to the decorative front panel **130** such that, when coupled to the decorative front panel **130**, a sliding of the sliding system during door movement causes the decorative front panel **130** to slide with respect to the door **125** along the sliding axis L, thus avoiding interferences of the decorative front panel **130** with any furniture baseboard (not shown).

As better discussed in the following, the fastening system is mechanically coupled to the sliding system so as to slide integrally to the sliding system during door movement, the trimming screw **135** being thus movable along the sliding axis L with the sliding of the sliding system (and, hence, with the door movement).

With reference also to FIGS. **1**F-**1**H, they show the door hinge $\mathbf{125}_H$ in different operative positions, according to an embodiment of the present invention.

According to an embodiment, the door hinge $\mathbf{125}_H$ is analogous to the door hinge disclosed in EP2407723 (the entire disclosure of which is incorporated by reference).

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a support bracket **145** for connecting the door hinge $\mathbf{125}_H$ to the frame **110**—for example, by means of corresponding screws (not shown).

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a driving mechanism **150**. According to an embodiment, the driving mechanism **150** is of a lever type.

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a door balancing device **155** configured to counterbalance a weight of the door **125**, with its decorative front panel (not shown in the figure).

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a coupling mechanism **160** for coupling the driving mechanism **150** and the balancing device **155** to each other.

According to an embodiment, the door hinge $\mathbf{125}_H$ comprises a rotating bracket **165** for connecting the door **125** and the door hinge $\mathbf{125}_H$ to each other. According to an embodiment, the rotating bracket **165** is rotationally connected to the support bracket **145** by means of a fulcrum pin **170**; in this way, the door **125** (connected to the rotating bracket **165**) can rotate with respect to the frame **110** (connected to the support bracket **145**) about the fulcrum pin **170**, which then defines its rotation axis.

According to an embodiment, the rotating bracket **165** comprises an elongated guide structure $\mathbf{165}_G$, which extends essentially orthogonally relative to the rotation axis of the door **125** (the elongated guide structure $\mathbf{165}_G$ thus extending along the sliding axis L). According to an embodiment, the elongated guide structure $\mathbf{165}_G$ comprises an elongated access window provided along the rotating bracket **165**, e.g. essentially in the middle of the rotating bracket **165**.

According to an embodiment, the fastening system comprises the trimming screw **135**.

According to an embodiment, the fastening system comprises a fastening bracket **175**. According to an embodiment, the fastening bracket **175** has a L-shaped profile, the fastening bracket for example comprising a first plate $\mathbf{175}_1$ parallel, in use, to the decorative front panel **130** (hereinafter, longitudinal plate $\mathbf{175}_1$), and a second plate $\mathbf{175}_2$, orthogonal to the first plate $\mathbf{175}_1$, parallel, in use, to the rotating bracket **165** (hereinafter, transverse plate $\mathbf{175}_2$). According to an embodiment, the longitudinal plate $\mathbf{175}_1$ of the fastening bracket **175** comprises one or more (e.g., two) holes configured to receive respective fastening screws, for example self-tapping screws (not shown in the figure), screwed into the decorative front panel **130** (so as to grip the fastening bracket **175**, and particularly the longitudinal plate $\mathbf{175}_1$ thereof, against the decorative front panel **130**).

According to an embodiment, the fastening bracket **175** comprises, e.g. at the transverse plate $\mathbf{175}_2$ thereof, a trimming slotted hole $\mathbf{175}_H$. As better discussed in the following, the trimming screw **135** is configured to be inserted through the trimming slotted hole $\mathbf{175}_H$ to mechanically couple the fastening system to the sliding system, so as to allow the decorative front panel to slide with respect to the door **125** during door movement.

According to an embodiment, the sliding system comprises a sliding member **180**, which is slidably guided along the elongated guide structure $\mathbf{165}_G$ of the rotating bracket **165**.

According to an embodiment, the sliding member **180** comprises a threaded hole (not shown in the figure) adapted to receive the trimming screw **135**. According to an embodiment, by inserting (and screwing) the trimming screw **135** through the trimming slotted hole $\mathbf{175}_H$, the access window of the elongated guide structure $\mathbf{165}_G$, and the threaded hole of the sliding member **180**, the fastening bracket **175** is gripped against the sliding member **180**. According to an embodiment, the fastening bracket **175** abuts against a spacer (not indicated in the figures) of the sliding member **180** that maintains the fastening bracket **175** spaced apart from the elongated guide structure $\mathbf{165}_G$, so as to allow its sliding together with the sliding member **180**.

According to an embodiment, the sliding system comprises a crank mechanism **185** connected between the driving mechanism **150** and the sliding member **180**, so as to convert a rocking movement of the driving mechanism **150** into a translation of the sliding member **180** (so as to achieve the above-mentioned sliding of the sliding member **180** along the elongated guide structure $\mathbf{165}_G$, and the corresponding sliding of the fastening bracket **175**, and hence of the decorative front panel **130** fixed thereto, with respect to the door **125**).

According to an embodiment, the crank mechanism **185** comprises a transmission arm $\mathbf{185}_1$ coupled, at a first end thereof, to a rocking arm of the driving mechanism **150**, and at a second end thereof, to the sliding member **180** by means of a pin $\mathbf{185}_2$ (the transmission arm $\mathbf{185}_1$ being for example coupled to the sliding member **180** at a lower end thereof, below the fastening bracket **175**).

As visible in FIG. **1**F, when the door **125** (not shown) is in the closed position, the rotating bracket **165** extends along the vertical axis Y in contact with the support bracket **145**, and the sliding member **180** is at a lower position along the elongated guide structure $\mathbf{165}_G$.

As visible in FIG. **1**G, when the door **125** (not shown in this figure) is in a partially open position, the rotating bracket **165** (connected to the door **125**) rotates with respect to the support bracket **145** about the fulcrum pin **170**, so as to move away from the support bracket **145** (connected to

the frame **110**, not shown in this figure). The corresponding rotation of the rocking arm of the driving mechanism **150** pushes the transmission arm $\mathbf{185}_1$ away from the fulcrum pin **170**, so as to translate the sliding member **180** (and the fastening bracket **175** coupled thereto) along the elongated guide structure $\mathbf{165}_G$.

As visible in FIG. **1**H, the rotation of the rotating bracket **165** (and, hence, the opening of the door **125**, not shown in this figure) stops when it reaches a maximum opening angle of about 85-90° (for example, with the rotating bracket **165** that abuts against a bottom of the support bracket **145**). According to an embodiment, in this position the sliding member **180** reaches an end of stroke of the elongated guide structure $\mathbf{165}_G$.

Back to FIGS. **1**A-**1**E, as mentioned above, the dishwasher **100** comprises a cover device **190** mountable on the door assembly and configured to take, when mounted on the door assembly, the opening position (in which the cover device **190** leaves the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ of the door **125** uncovered), and the closing position (in which the cover device **190** covers at least partially, preferably completely, the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ of the door **125**).

According to an embodiment, in the closing position the cover device **190** covers both the access apertures $\mathbf{140}_1$, $\mathbf{140}_2$.

According to an embodiment, the cover device **190** is configured to mechanically cooperate/interact with the sliding system so as to automatically move from the opening position to the closing position in response to the sliding of the sliding system.

With reference also to FIGS. **2**A and FIGS. **2**B-**2**C, they show perspective front and rear views, respectively, of the cover device **190** according to an embodiment of the present invention.

According to an embodiment, the cover device **190** is mountable on the door **125**.

According to an embodiment, the cover device **190** is mountable on a side wall of the door **125**.

According to an embodiment the cover device **190** is mountable on an external face of the side wall of the door **125** (in the example at issue, the cover device being mounted on the external face of the side wall of the outer door panel $\mathbf{125}_O$ shown in FIG. **1**E).

According to an embodiment, the cover device **190** comprises a plate **205** (i.e. a substantially flat and relatively thin piece of material), whereby the cover device **190** does not interfere with the frame **110** during door movement when the cover device **190** is mounted externally to the door **125** (e.g., on the external face of the side wall of the outer door panel $\mathbf{125}_O$).

According to an embodiment, the cover device **190** is rectangular in shape.

According to an embodiment, the cover device **190** is made of a material exhibiting resilience properties, so that the cover device **190** is capable of (slightly) temporarily deforming during sliding thereof (as better discussed in the following). According to an embodiment, the cover device **190** is made of a plastic material.

According to an embodiment, the cover device **190** comprises one or more access holes for allowing the user or the operator to access the access aperture(s) $\mathbf{140}_1$,$\mathbf{140}_2$. According to an embodiment, the cover device **190** comprises two access holes $\mathbf{210}_1$,$\mathbf{210}_2$, the access hole $\mathbf{210}_1$ being for example associated with the lower access aperture $\mathbf{140}_1$ (reason why it will be referred to as lower access hole $\mathbf{210}_1$) and the access hole $\mathbf{210}_2$ being for example associated with the upper access aperture $\mathbf{140}_2$ (reason why it will be referred to as upper access hole $\mathbf{210}_2$).

According to an embodiment, the access holes $\mathbf{210}_1$,$\mathbf{210}_2$ are designed (i.e., shaped and sized) such that, when the cover device **190** is mounted on the door **125** in the opening position, the access holes $\mathbf{210}_1$,$\mathbf{210}_2$ uncover the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$, respectively, whereby the user or the operator is allowed to access the trimming screw **135** through the access holes $\mathbf{210}_1$,$\mathbf{210}_2$ of the cover device **190** and the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$ of the door **125**.

According to an embodiment, the access holes $\mathbf{210}_1$,$\mathbf{210}_2$ are essentially circular in shape, e.g. in order to match the shape of the access apertures $\mathbf{140}_1$,$\mathbf{140}_2$.

According to an embodiment, the cover device **190** comprises an engaging member **215**, such as an engaging tooth. According to an embodiment, the engaging tooth **215** is configured to engage respective engaging regions or portions of the door **125** in the opening and closing positions of the cover device **190**. As better discussed in the following, according to an embodiment, the engaging tooth **215** is configured to engage the engaging hole $\mathbf{140}_{1E}$ of the outer door panel $\mathbf{125}_O$ when the cover device **190** is in the opening position (the engaging hole $\mathbf{140}_{1E}$ thus acting as engaging region or portion for the engaging tooth **215** in the opening position of the cover device **190**), and a bottom of the lower access aperture $\mathbf{140}_1$ when the cover device **190** is in the closing position (the lower access aperture $\mathbf{140}_1$, e.g. the bottom of the lower access aperture $\mathbf{140}_1$, thus acting as engaging region or portion for the engaging tooth **215** in the closing position of the cover device **190**).

According to an embodiment, the engaging tooth **215** is provided, along the vertical axis Y (considering the orientation of use of the cover device **190**, i.e. when it is mounted on the door **125**), below the access hole $\mathbf{210}_1$, at a distance from it substantially corresponding to the distance between the engaging hole $\mathbf{140}_{1E}$ and the bottom of the access aperture $\mathbf{140}_1$. According to an embodiment, the engaging tooth **215** protrudes orthogonally to plate **205** from a surface (hereinafter, rear surface) $\mathbf{205}_R$ of the plate **205** that, in use, faces the external face of the side wall of the outer door panel $\mathbf{125}_O$, the rear surface $\mathbf{205}_R$ being opposite to a surface (hereinafter, front surface) $\mathbf{205}_F$ of the cover device **190** that, in use, is visible by the user.

According to an embodiment, as visible in the figure, the engaging tooth **215** comprises a beveled edge $\mathbf{215}_B$ facing the access holes $\mathbf{210}_1$,$\mathbf{210}_2$, and an upright edge $\mathbf{215}_U$ opposite the beveled edge $\mathbf{215}_B$. As better discussed in the following, the beveled edge $\mathbf{215}_B$ promotes disengaging of the engaging tooth **215** from the engaging hole $\mathbf{140}_{1E}$ whereas the upright edge $\mathbf{215}_U$ determines the engaging of the engaging tooth **215** at the bottom of the lower access aperture $\mathbf{140}_1$.

According to an embodiment, the cover device **190** comprises one or more frictional members for providing a frictional coupling between the cover device **190** and the door **125** (e.g., between the cover device **190** and the outer door panel $\mathbf{125}_O$).

According to an embodiment, the frictional member(s) comprise a sliding shoe $\mathbf{220}_1$ associated with the lower access hole $\mathbf{210}_1$ (reason why it will be referred to also as lower sliding shoe $\mathbf{220}_1$).

According to an embodiment, lower the sliding shoe $\mathbf{220}_1$ is provided at a top of the lower access hole $\mathbf{210}_1$, so as to be essentially at the open end (i.e., at the bottom) of the lower guiding aperture $\mathbf{140}_{1G}$ when the cover device **190** is in the opening position. According to an embodiment, the lower sliding shoe $\mathbf{220}_1$ is designed (i.e., shaped and sized)

to be coupled and retained by friction within the edges of the lower guiding aperture $\mathbf{140}_{1G}$ when no external force is applied to the cover device **190**, and to frictionally slide within the lower guiding aperture $\mathbf{140}_{1G}$ when an external force (higher than a frictional force between the lower sliding shoe $\mathbf{220}_1$ and the edges of the lower guiding aperture $\mathbf{140}_{1G}$) is applied to the cover device **190**. According to an embodiment, the lower sliding shoe $\mathbf{220}_1$ extends from the rear surface $\mathbf{205}_R$ of the plate **205**, e.g. substantially orthogonally thereto. According to an embodiment, the lower sliding shoe $\mathbf{220}_1$ extends from the rear surface $\mathbf{205}_R$ of the plate **205** to such an extent that it does not interfere with the trimming screw **135** during sliding thereof.

Although the lower sliding shoe $\mathbf{220}_1$ may be omitted in basic embodiments, the lower sliding shoe $\mathbf{220}_1$ may advantageously provide a backup coupling function between the cover device **190** and the outer door panel $\mathbf{125}_O$ (e.g., in case of break or damage of the engaging tooth **215**).

According to an embodiment, the frictional member(s) comprise a sliding shoe $\mathbf{220}_2$ associated with the upper access hole $\mathbf{210}_2$ (reason why it will be referred to also as upper sliding shoe $\mathbf{220}_2$).

According to an embodiment, the upper sliding shoe $\mathbf{220}_2$ is provided at a top of the upper access hole $\mathbf{210}_2$, so as to be essentially at the open end (i.e., at the bottom) of the upper guiding aperture $\mathbf{140}_{2G}$ when the cover device **190** is in the opening position. According to an embodiment, the upper sliding shoe $\mathbf{220}_2$ is designed (i.e., shaped and sized) to be coupled and retained by friction within the edges of the upper guiding aperture $\mathbf{140}_{2G}$ when no external force is applied to the cover device **190**, and to frictionally slide within the upper guiding aperture $\mathbf{140}_{2G}$ when an external force (higher than a frictional force between the upper sliding shoe $\mathbf{220}_2$ and the edges of the upper guiding aperture $\mathbf{140}_{2G}$) is applied to the cover device **190**. According to an embodiment, the upper sliding shoe $\mathbf{220}_2$ extends from the rear surface $\mathbf{205}_R$ of the plate **205**, e.g. substantially orthogonally thereto. According to an embodiment, the upper sliding shoe $\mathbf{220}_2$ extends from the rear surface $\mathbf{205}_R$ of the plate **205** to such an extent that it does not interfere with the trimming screw **135** during sliding thereof.

Although the upper sliding shoe $\mathbf{220}_2$ may be omitted in basic embodiments, the upper sliding shoe $\mathbf{220}_2$ may advantageously provide a backup coupling function between the cover device **190** and the outer door panel $\mathbf{125}_O$ (e.g., in case of break or damage of an interception element, discussed in the following).

According to an embodiment, the cover device **190** comprises one or more reinforcing members for reinforcing the coupling between the cover device **190** and the door **125** (e.g., between the cover device **190** and the outer door panel $\mathbf{125}_O$).

According to an embodiment, the reinforcing element(s) comprise a reinforcing pin **225**. According to an embodiment, the reinforcing pin **225** is provided at a bottom of the lower access hole $\mathbf{210}_1$, the reinforcing pin **225** being for example opposite to the lower sliding shoe $\mathbf{220}_1$ along the vertical axis Y. According to an embodiment, the reinforcing pin **225** is designed (i.e., shaped and sized) to abut against the bottom of the lower access aperture $\mathbf{140}_1$ when the cover device **190** is in the opening position. According to an embodiment, the reinforcing pin **225** extends from the rear surface $\mathbf{205}_R$ of the plate **205**, e.g. substantially orthogonally thereto. According to an embodiment, the reinforcing pin **225** extends from the rear surface $\mathbf{205}_R$ of the plate **205** to such an extent that it does not interfere with the trimming screw **135** during sliding thereof.

Although the reinforcing pin **225** may be omitted in basic embodiments, the reinforcing pin **225** may advantageously provide, in the opening position of the cover device **190**, a backup coupling function between the cover device **190** and the outer door panel $\mathbf{125}_O$ in case of break or damage of the engaging tooth **215**.

According to an embodiment, the cover device **190** comprises an anti-release member for preventing the cover device **190** from being easily (and, hence, accidentally) decoupled from the door **125** (e.g., from the outer door panel $\mathbf{125}_O$).

According to an embodiment, the anti-release member comprises an anti-release tooth **230**. According to an embodiment, the anti-release tooth **230** is provided at a bottom of the upper access hole $\mathbf{210}_2$. According to an embodiment, the anti-release tooth is designed (i.e., shaped and sized) to abut against the bottom of the upper access aperture $\mathbf{140}_2$ when the cover device **190** is in the opening position. According to an embodiment, the anti-release tooth **230** extends from the rear surface $\mathbf{205}_R$ of the plate **205**, e.g. substantially orthogonally thereto. According to an embodiment, the anti-release tooth **230** extends from the rear surface $\mathbf{205}_R$ of the plate **205** to such an extent that it does not interfere with the trimming screw **135** during sliding thereof.

According to an embodiment, as visible in the figure, the anti-release tooth **230** is similar in structure to the engaging tooth **215**. According to an embodiment, the anti-release tooth **230** comprises a beveled edge $\mathbf{230}_B$. According to an embodiment, the beveled edge $\mathbf{230}_B$ faces the upper access hole $\mathbf{210}_2$. According to an embodiment, the anti-release tooth **230** abuts, with an upright edge opposite the beveled edge $\mathbf{230}_B$, to the bottom of the upper access aperture $\mathbf{140}_2$ when the cover device **190** is in the opening position, so as to prevent the sliding of the cover device **190** (along the backward sliding direction L_2, and particularly downwards along the vertical axis Y when the door in in the closed position) when the cover device **190** is in the opening position.

Although the anti-release tooth **230** may be omitted in basic embodiments, the anti-release tooth **230** advantageously prevents the cover device **190** from being easily (and, hence, accidentally) decoupled from the outer door panel $\mathbf{125}_O$ when the cover device **190** is in the opening position and a force along the backward direction L_2 is accidentally applied to it.

According to an embodiment, the cover device **190** comprises one or more flex members to enhance a resilience of the cover device **190** (particularly, of the plate **205**) during bending thereof—indeed, as better discussed in the following, the cover device **190** undergoes a flexure both while automatically sliding from the opening position to the closing position (i.e., for allowing the engaging tooth **215** to disengage from the engaging hole $\mathbf{140}_{1E}$), and while being manually slid from the closing position to the opening position (i.e., for allowing the engaging tooth **215** to disengage from the lower access hole $\mathbf{140}_1$).

According to an embodiment, the flex member(s) comprise one or more flex grooves to enhance, along the grooves, the resilience of the cover device **190** (particularly, of the plate **205**) during bending thereof. According to an embodiment, the flex groove(s), or at least a subset thereof, are provided on the rear surface $\mathbf{205}_R$ of the plate **205**.

According to an embodiment, the flex groove(s) comprise a rounded (e.g., semicircular) flex groove **235**.

According to an embodiment, the flex groove **235** is provided, along the vertical axis Y, below the upper access

hole **210**$_2$. According to an embodiment, the flex groove **235** is provided, along the vertical axis Y, below the anti-release tooth **230**.

According to an embodiment, the cover device **190** comprises an interception member **240** for intercepting the trimming screw **135** while moving the door **125** from the closed position to the open position.

According to an embodiment, the interception member **240** extends from the rear surface **205**$_R$ of the plate **205**, e.g. substantially orthogonally thereto. According to an embodiment, the interception member **240** extends from the rear surface **205**$_R$ of the plate **205** to such an extent that it interferes with the trimming screw **135** during sliding thereof. According to an embodiment, while moving the door **125** from the closed position to the open position, the sliding of the trimming screw **135** (which slides integrally with the sliding member **180**) exerts on the interception member **240** a force along the sliding axis L (and particularly, along the forward direction L_1), hereinafter forward sliding force, that causes the cover device **190** to move from opening position to the closing position (as mentioned above, the forward sliding force causing the engaging tooth **215** to disengage from the engaging hole **140**$_{1E}$ and to engage the lower access aperture **140**$_1$).

As mentioned above, according to an embodiment, the interception member **240** is designed (i.e., shaped and sized) such as to provide also a coupling function at the top of the cover device **190**. According to an embodiment, such a coupling function at the top of the cover device **190** comprises a frictional coupling between the interception member **240** (i.e., side edges thereof) and the edges of the upper guiding aperture **140**$_{2G}$. This allows increasing the coupling between the cover device **190** and the door **125**.

According to an embodiment, the cover device **190** comprises one or more grip members for allowing the user or the operator to manually move the cover device **190** from the closing position to the opening position.

According to an embodiment, the grip member(s) comprise a recessed grip **245**. According to an embodiment, the recessed grip **245** is formed on the rear surface **205**$_F$ of the plate, at a bottom of the plate **205** (considering the orientation of use of the cover device illustrated in FIGS. **1**A-**1**D).

The operation of the cover device **190** may be summarized as follows.

When the cover device **190** is mounted on the door **125** in the opening position (FIG. **1**A), the access holes **210**$_1$,**210**$_2$ uncover the access apertures **140**$_1$,**140**$_2$ (so that the user or the operator is allowed to access the trimming screw **135** through the access holes **210**$_1$,**210**$_2$ of the cover device **190** and the access apertures **140**$_1$,**140**$_2$ of the door **125** in order to fasten the decorative front panel **130** on the door **125** and adjust the vertical position of the decorative front panel **130** with respect to the door **125**), the engaging tooth **215** engages (e.g., it is fitted into) the engaging hole **140**$_{1E}$, the sliding shoe **220**$_1$,**220**$_2$ is frictionally coupled to the bottom of the guiding aperture **140**$_{1G}$,**140**$_{2G}$, the reinforcing pin **225** abuts against the bottom of the lower access aperture **140**$_1$, the anti-release tooth **230** abuts against the bottom of the upper access aperture **140**$_2$ and the interception member **240** is within the upper guiding aperture **140**$_{2G}$ (the interception member **240** being for example frictionally retained between the edges of the upper guiding aperture **140**$_{2G}$).

The movement of the door **125** from the closed position to the open position causes a sliding of the sliding system (and, hence, of the trimming screw **135**) along the sliding axis L, in the forward direction L_1. When the door **125** is in a predetermined position (hereinafter, interception position) between the closed and open position, the trimming screw **135** is intercepted (while sliding) by the interception member **240** (FIG. **1**B). According to an embodiment, the interception position corresponds to a about a 60-70-degree rotation angle of the door **125** with respect to the vertical axis Y.

The subsequent movement of the door **125** from the interception position to the open position (FIG. **1**C) causes the trimming screw **135** to apply a forward sliding force to the interception member **240** (the forward sliding force acting along the sliding axis L, in the forward direction L_1) that allows the cover device **190** to (slightly) temporarily deform at the flex groove **235** and the engaging tooth **215** to disengage from the engaging hole **140**$_{1E}$. As mentioned above, the disengaging of the engaging tooth **215** from the engaging hole **140**$_{1E}$ is promoted by the beveled edge **215**$_B$, and particularly by the direction of the beveled edge **215**$_B$ with respect to the forward direction L_1. After disengaging of the engaging tooth **215** from the engaging hole **140**$_{1E}$, the forward sliding force applied on the interception member **240** by the trimming screw **135** (due to its sliding) determines the sliding of the cover device **190** through the guiding apertures **140**$_{1G}$,**140**$_{2G}$ (particularly, the sliding shoe **220**$_1$,**220**$_2$ frictionally slides from the bottom of the guiding aperture **140**$_{1G}$,**140**$_{2G}$ in the forward direction L_1 and the interception member **240** frictional slides within the upper guiding aperture **140**$_{2G}$ in the forward direction L_1).

When the door **125** is in the open position (FIG. **1**C), the interception member **240** is essentially at the end of the upper guiding aperture **140**$_{2G}$, the engaging tooth **215** is the bottom of the lower access aperture **140**$_1$, and the plate **205** (i.e., the solid parts thereof) cover the access apertures **140**$_1$,**140**$_2$. This corresponds to the closing position of the cover device **190**, which prevents the user or the operator (or, even worse, a kid or a baby) from accidentally inserting his/her fingers through the access aperture, and reaching the sliding system (which could cause injury, such as cut or squashing).

Therefore, according to an embodiment, the cover device **190** is configured to automatically move from the opening position to the closing position in response to an initial movement of the door **125** from the closed position to the open position (the initial movement of the door being for example, although not necessarily, the very first door movement performed after the installation of the decorative front panel **130**).

The automatic movement of the cover device from the opening position to the closing position allows avoiding to rely on the user or the operator to cover the access apertures.

In the closing position of the cover device **190**, the moving of the cover device **190** back to the opening position is prevented by the engaging tooth **215** (particularly, by the upright edge **215**$_U$ thereof) abutting against the bottom of lower the access aperture **140**$_1$ and by frictional coupling provided by the sliding shoes **220**$_1$,**220**$_2$ and by the interception member **240**. Moreover, the movement of the door **125** from the open position to the closed position, which determines the trimming screw **135** to move, along the sliding axis L, in the backward direction L_2 does not affect the cover device **190** (indeed, the trimming screw **135**, while moving in the backward direction L_2 gets away from the interception member **240**) whereby the cover device **190** stably takes the closing position for any subsequent door movement, unless the user or the operator need to move it to the opening position for accessing the trimming screw **135** (as discussed here below). Therefore, thanks to the engaging between the engaging tooth **215** and the lower the

access aperture $\mathbf{140}_1$ (and preferably to the frictional coupling provided by the sliding shoes $\mathbf{220}_1$,$\mathbf{220}_2$ and by the interception member **240**), the cover device **190** is maintained in the closing position at each door movement following the initial door movement.

According to an embodiment, the cover device **190** is configured to be manually moved from the closing position to the opening position (e.g., for adjusting the vertical position of the decorative front panel **130** on the door **125** and/or for disassembling the decorative front panel **130** from the door **125**).

According to an embodiment, the cover device **190** is configured to be manually moved from the closing position to the opening position when the door is, along the sliding axis L, between the closed position and a partially-open position. According to an embodiment, the partially-open position corresponds to a distance greater than a predetermined distance, and particularly to such distance (along the sliding axis L) between the interception member **240** and the trimming screw **135** that the sliding of the cover device **190** (and, hence, of the interception member **240**) in the backward direction L_2 is not hindered by the trimming screw **135**. According to an embodiment, the partially-open position of the door **125** at which the cover device **190** can be moved from the closing position to the opening position corresponds to about a 30-40-degree rotation angle of the door **125** with respect to the vertical axis Y. Otherwise stated, according to an embodiment, the cover device **190** is configured to be manually moved from the closing position to the opening position when the door is rotated with respect to the rotation axis by at least one predetermined rotation angle, e.g. about a 50-60-degree rotation angle with respect to the rotation axis.

According to an embodiment, in order to move the cover device **190** from the closing position to the opening position, the user or the operator has to grasp with his/her fingers the recessed grip **245** and concurrently apply a pulling force (i.e., a force essentially orthogonal to the sliding axis L) and a sliding force in the backward direction L_2 (hereinafter, backward sliding force). In the example illustrated in FIG. **1**C in which the cover device **190** is moved from the closing position to the opening position when the door **125** in the closed position, the backward sliding force is a downwards force. As should be understood, the pulling force determines the bending of the plate **205** and hence the disengaging of the engaging pin **215** from the bottom of the lower access aperture $\mathbf{140}_1$, and the backward sliding force determines the sliding of the cover device **190** along the guiding apertures $\mathbf{140}_{1G}$,$\mathbf{140}_{2G}$ in the backward direction L_2 (until the engaging pin **215** engages the engaging hole $\mathbf{140}_{1E}$).

With reference to FIGS. **3**A-**3**C, they show a dishwasher **300** in different operative positions, according to an embodiment of the present invention.

According to an embodiment, the dishwasher **300** is structurally similar to the dishwasher **100**, whereby same or similar components are denoted by corresponding references and their explanation will not be repeated when deemed not necessary.

According to an embodiment the dishwasher **300** comprises a base **305** for resting the dishwasher **300** on a support surface (not shown in the figures), e.g. parallel to the plane X-Z), such as a floor or a support surface of a suitable niche of a piece of furniture wherein the dishwasher **300** can be installed.

According to an embodiment, the dishwasher **300** comprises a (e.g., parallelepiped shaped) body or frame **310**.

According to an embodiment, the frame **310** defines a (e.g., hollow) treatment chamber **315** for items to be washed.

According to an embodiment, the dishwasher **300** comprises, within the treatment chamber **315**, one or more pullout racks (not shown in the figures) for inserting the items to be washed into the treatment chamber **315**.

According to an embodiment, the frame **310** comprises top $\mathbf{310}_T$ and bottom $\mathbf{310}_B$ walls parallel to the X-Z plane, a rear wall $\mathbf{310}_R$ parallel to the X-Y plane, and two side walls $\mathbf{310}_{S1}$,$\mathbf{310}_{S2}$ parallel to the Y-Z plane.

According to an embodiment, the frame **310** defines a front load opening **320** parallel to the X-Y plane, and opposite to the rear wall $\mathbf{310}_R$ along the transverse axis Z.

According to an embodiment, the dishwasher **300** comprises a door assembly.

According to an embodiment, the door assembly comprises a door **325** for selectively opening the front load opening **320**, and hence for selectively accessing the treatment chamber **315**.

According to an embodiment, the door **325** is movable (e.g., rotatable) between closed and open positions.

The door **325** is exemplary shown in the closed position in FIGS. **3**A and **3**B and in the open position in FIG. **3**C.

According to an embodiment, the door **325** comprises an outer door panel $\mathbf{325}_O$ and an inner door panel $\mathbf{325}_I$, structurally and functionally similar to the outer door panel $\mathbf{125}_O$ and the inner door panel $\mathbf{125}_I$.

According to an embodiment, the door assembly comprises a door hinge $\mathbf{325}_H$ for rotationally coupling the door **325** to the base **305**, so that the door **325** can rotate with respect to the frame **310** about a horizontal rotation axis (raised from the floor), parallel to the longitudinal axis X. According to an embodiment, the door **325** can be moved from the closed position to the open position by a drop-down movement, and from the open position to the closed position by a pull-up movement. According to an embodiment, the door hinge $\mathbf{325}_H$, not shown in these figures, is analogous to the door hinge $\mathbf{125}_H$.

According to an embodiment, the dishwasher **300** is a fully-integrated dishwasher or a semi-integrated dishwasher, whereby upon dishwasher installation, the door **325** may be coupled to a decorative front panel **330** so as to be completely or almost completely covered by it. According to an embodiment, the decorative front panel **130**, which is not part of the dishwasher **300**, has same appearance as, or it is at least coordinated with, the other pieces of the furniture, the decorative front panel **330** being for example made of wood. FIGS. **3**A and **3**C show the dishwasher **300** with the decorative front panel **330**, and FIG. **3**B shows the dishwasher **300** without the decorative front panel **330**.

According to an embodiment, the door hinge $\mathbf{325}_H$ comprises a fastening system for fastening the decorative front panel **330** on the door **325** and for adjusting the vertical position of the decorative front panel **330** with respect to the door **325**. According to an embodiment, the fastening system, not shown in these figures, is analogous to the fastening system illustrated in FIGS. **1**F-**1**H.

For the purposes of the present disclosure, the fastening system comprises an actuatable or adjusting member, for example a trimming screw **335** (e.g., made of a metal material or other rigid material) adapted to be screwed/unscrewed or rotated by the user or the operator.

According to an embodiment, the door **325** comprises one or more access apertures for allowing the user or the operator to access and actuate (e.g., by insertion of a screw driver or wrench) the trimming screw **335**.

According to an embodiment, the access aperture(s) are provided at the outer door panel $\mathbf{325}_O$, e.g. at a lower end region of a side thereof that is visible by the user when the door **325** is not in the closed position.

According to an embodiment, the outer door panel $\mathbf{325}_O$, comprises two access apertures $\mathbf{340}_1$,$\mathbf{340}_2$. According to an embodiment, the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$ are aligned to each other along the vertical axis Y, so as to define a lower access aperture $\mathbf{340}_1$ and an upper access aperture $\mathbf{340}_2$ (taking the orientation of use of the dishwasher **300** as a reference).

According to an embodiment, each access aperture $\mathbf{340}_1$, $\mathbf{340}_2$ is designed (i.e., shaped and sized) to allow the user to access and actuate the trimming screw **335** in respective positions of the door **325** (as discussed in the foregoing, the trimming screw **335** moves in response to door movement, whereby the trimming screw **335** may be accessed through the lower access aperture $\mathbf{340}_1$ or through the upper access aperture $\mathbf{340}_2$ depending on a position of the door **325**).

According to an embodiment, each access apertures $\mathbf{340}_1$, $\mathbf{340}_2$ is circular (or substantially circular) in shape, and is large enough to allow the user or the operator to access and actuate (e.g., by insertion of a screw driver or wrench) the trimming screw **335**.

According to an embodiment, the door **325** comprises, e.g. on a front wall of the outer door panel $\mathbf{325}_O$, one or more guiding apertures. According to an embodiment, the door **325** comprises two guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ (visible in FIGS. **3**B and **4**B). According to an embodiment, the guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ are aligned to each other along the vertical axis Y. According to an embodiment, each guiding aperture $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ extends and are aligned along the vertical axis Y (reason why they will be referred to also as lower guiding aperture $\mathbf{340}_{1G}$ and upper access aperture $\mathbf{340}_2$), each guiding aperture $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ being for example elongated in shape. According to an embodiment, the guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ correspond to the elongated slots that, in some conventional dishwashers, are provided on the front wall of the outer door panel $\mathbf{325}_O$ for assembling and adjusting the decorative front panel (according to an embodiment, such elongated slots are provided also in the dishwasher **100**, although not discussed as being not relevant for the understanding of FIGS. **1**A-**2**B embodiment).

According to an embodiment, the guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ are designed to guide movement/sliding of the cover device during movement/sliding of the decorative front panel **330** with respect to the door **325** (so as to cover the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$, as better discussed in the following). As better discussed in the following, the guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ allow guiding the cover device between the opening and closing positions.

According to an embodiment, the door hinge $\mathbf{325}_H$ comprises a sliding system for allowing the decorative front panel **330** to slide with respect to the door **325** during door movement. According to an embodiment, the sliding system (not shown in these figures) is analogous to the sliding system illustrated in FIGS. **1**F-**1**H, the sliding system being configured to slide, along the sliding axis L, in the forward direction L_1 when the door **325** is moved from the closed position to the open position and in the backward direction L_2 when the door **325** is moved from the open position to the closed position.

As discussed in the foregoing, the sliding system is coupleable to the decorative front panel **330** such that, when coupled to the decorative front panel **330**, a sliding of the sliding system during door movement causes the decorative front panel **330** to slide with respect to the door **325** along the sliding axis L, thus avoiding interferences of the decorative front panel **330** with any furniture baseboard (not shown).

As discussed in the foregoing, the fastening system is mechanically coupled to the sliding system so as to slide integrally to the sliding system during door movement, the trimming screw **335** being thus movable along the sliding axis L with the sliding of the sliding system (and, hence, with the door movement).

The dishwasher **300** comprises a cover device **390** (partially visible in FIG. **3**B) mountable on the door assembly and configured to take, when mounted on the door assembly, the opening position (in which the cover device **390** leaves the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$ of the door **325** uncovered), and the closing position (in which the cover device **390** covers at least partially, preferably completely, the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$ of the door **325**).

Similarly to the cover device **190**, the cover device **390** is configured to mechanically cooperate/interact with the sliding system so as to automatically move from the opening position to the closing position in response to the sliding of the sliding system.

According to an embodiment, the cover device **390** is mounted on the door **325**.

According to an embodiment, the cover device **390** is mounted internally to the door **325**. According to an embodiment, the cover device **390** is mounted internally to the outer door panel $\mathbf{325}_O$.

According to an embodiment the cover device **390** is mounted on an internal face of the side wall of the outer door panel $\mathbf{325}_O$ and on an internal side of a front wall of the outer door panel $\mathbf{325}_O$ (the external and internal sides of the front wall of the outer door panel $\mathbf{325}_O$ being visible in FIGS. **3**B and **4**B, respectively).

With reference also to FIG. **4**A, it shows perspective front (on the left) and rear (on the right) views of the cover device **390** according to an embodiment of the present invention. For ease of description, FIG. **4**A will be discussed jointly to FIG. **4**B, which shows the cover device **390** mounted on the outer door panel $\mathbf{325}_O$ of the dishwasher **300**.

According to an embodiment, the cover device **390** is made of a material exhibiting resilience properties, so that the cover device **390** is capable of (slightly) temporarily deforming during sliding thereof (as better discussed in the following). According to an embodiment, the cover device **390** is made of a plastic material.

According to an embodiment, the cover device **390** comprises a plate $\mathbf{405}_P$ (e.g., rectangular in shape) configured to rest on the internal face of the side wall of the outer door panel $\mathbf{325}_O$.

According to an embodiment, the cover device **390** comprises, e.g. on the plate $\mathbf{405}_P$, one or more access holes for allowing the user or the operator to access the access aperture(s). According to an embodiment, the cover device **390** comprises, e.g. on the plate $\mathbf{405}_P$, two access holes for allowing the user or the operator to access the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$. According to an embodiment, the cover device **390** comprises a lower access hole $\mathbf{410}_1$ associated with the lower access aperture $\mathbf{340}_1$, and an upper access hole $\mathbf{410}_2$ associated with the upper access aperture $\mathbf{340}_2$.

According to an embodiment, the access holes $\mathbf{410}_1$,$\mathbf{410}_2$ are designed (i.e., shaped and sized) such that, when the cover device **390** is mounted on the door **325** in the opening position, the access holes $\mathbf{410}_1$,$\mathbf{410}_2$ uncover the access apertures $\mathbf{340}_1$,**340**, respectively (so that the user or the operator is allowed to access the trimming screw **335**

through the access holes 410_1,410_2 of the cover device **390** and the access apertures 340_1,340_2 of the door **325**).

According to an embodiment, the access holes 410_1,410_2 are essentially circular in shape, e.g. in order to match the shape of the access apertures 340_1,340_2.

According to an embodiment, the cover device **390** comprises an engaging member **415**, such as an engaging protrusion. According to an embodiment, the engaging protrusion **415** is configured to engage respective engaging regions or portions of the door **325** in the opening and closing positions of the cover device **390**. As better discussed in the following, according to an embodiment, the engaging protrusion **415** is configured to frictionally engage the internal face of the outer door panel 325_O when the cover device **390** is in the opening position, and edges of the upper access aperture 340_2 when the cover device **390** is in the closing position (the upper access aperture 340_2, e.g. the edges of the upper access aperture 340_2, thus acting as engaging region or portion for the engaging protrusion **415** in the closing position of the cover device **390**).

According to an embodiment, the engaging protrusion **415** is provided, along the vertical axis Y (considering the orientation of use of the cover device **390**, i.e. when it is mounted on the door **325**), below the upper access hole 410_2. The region of the internal face of the side wall of the outer door panel 325_O between the lower 340_1 and upper 340_2 access apertures (indicated in FIG. **4**B by the number reference 340_{1E}) thus acts as engaging region or portion for the engaging protrusion **415** in the opening position of the cover device **390**. According to an embodiment, the engaging protrusion **415** protrudes orthogonally to plate 405_P from a front surface 405_{PF} thereof that, in use, faces the internal face of the side wall of the outer door panel 325_O, the front surface 405_{PF} being opposite to a rear surface 405_{PR}.

According to an embodiment, the engaging protrusion **415** has a circular (or substantially circular) or semicircular (or substantially semicircular) shape, so as to substantially matches the edges of the upper access aperture 340_2 when the cover device **390** is in the closing position.

According to an embodiment, the cover device **390** comprises one or more frictional members for providing a frictional coupling between the cover device **390** and the door **325** (e.g., between the cover device **390** and the outer door panel 325_O).

According to an embodiment, the frictional member(s) comprise two sliding brackets 420_1,420_2 provided at respective sides of the plate 405_P (hereinafter referred to also as left 420_1 and right 420_2 sliding brackets).

According to an embodiment, the right sliding bracket 420_1 is designed (i.e., shaped and sized) to be coupled and retained by friction within an inwardly rounded profile 325_{OS} of the side wall of the outer door panel 325_O (visible in FIG. **4**B). As will be understood from the following discussion, the inwardly rounded profile 325_{OS} also acts as a guiding member for guiding the cover device **390** within or along it.

According to an embodiment, the sliding bracket 420_2 is designed (i.e., shaped and sized) to be abut and slide with friction on the internal face of the front wall of the outer door panel 325_O (see FIG. **4**B).

According to an embodiment, each sliding bracket 420_1, 420_2 extends, from the respective side of the plate 405_P, substantially orthogonally to the plate 405_P, so that the sliding brackets 420_1,420_2 and the plate 405_P substantially define a C-shape profile.

According to an embodiment, the sliding brackets 420_1, 420_2 are formed in a single piece with the plate 405_P.

Although the sliding brackets 420_1,420_2 may be omitted in basic embodiments, the sliding brackets 420_1,420_2 may advantageously provide a backup coupling function between the cover device **390** and the door **325** (e.g., in case of break or damage of the engaging protrusion **415**).

According to an embodiment, the cover device **390** comprises one or more reinforcing members for reinforcing the coupling between the cover device **390** and the door **325**.

According to an embodiment, the reinforcing members are configured to cooperate with the front wall of the outer door panel 325_O.

According to an embodiment, the reinforcing members are configured to cooperate with the guiding apertures 340_{1G},340_{2G}.

According to an embodiment, the reinforcing member(s) comprise an overhanging member 405_H projecting from the plate 405_P (particularly, from the left sliding bracket 420_1) and configured to be coupled to the guiding apertures 340_1,340_2 (or at least one thereof). According to an embodiment, the overhanging member 405_H projects from the left sliding bracket 420_1, the overhanging member 405_H being for example made in a single piece with the left sliding bracket 420_1.

According to an embodiment, the reinforcing member(s) comprise, e.g. at an upper portion of the overhanging member 405_H, a reinforcing pin 425_U (hereinafter, upper reinforcing pin). According to an embodiment, the upper reinforcing pin 425_U extends from the upper portion of the overhanging member 405_H, e.g. substantially orthogonally thereto.

According to an embodiment, the upper reinforcing pin 425_U is designed (i.e., shaped and sized) to abut against the bottom of the upper access aperture 340_2 when the cover device **390** is in the opening position (as visible in FIG. **4**B).

Although the upper reinforcing pin 425_U may be omitted in basic embodiments, the upper reinforcing pin 425_U may advantageously provide, in the opening position of the cover device **390**, a backup coupling function between the cover device **390** and the door **325** in case of break or damage of a lower reinforcing pin (discussed here below).

According to an embodiment, the reinforcing member(s) comprise, at a lower portion of the of the overhanging member 405_H, a reinforcing pin 425_L (hereinafter, lower reinforcing pin). According to an embodiment, the lower reinforcing pin 425_L, extends from the lower portion of the overhanging member 405_H, e.g. substantially orthogonally thereto.

According to an embodiment, the lower reinforcing pin 425_L is designed (i.e., shaped and sized) to abut against the bottom of the lower access aperture 340_1 when the cover device **390** is in the opening position (as visible in FIG. **4**B).

Although the lower reinforcing pin 425_L may be omitted in basic embodiments, the lower reinforcing pin 425_L may advantageously provide, in the opening position of the cover device **390**, a backup coupling function between the cover device **390** and the door **325** in case of break or damage of the upper reinforcing pin 425_U.

According to an embodiment, the overhanging member 405_H is configured to resiliently deform with respect to a rest condition (shown in FIG. **4**A). According to an embodiment, the overhanging member 405_H is configured to resiliently deform with respect to the rest condition to allow a snap mounting of the cover device **390** to the door **325**. According to an embodiment, as better discussed in the following, the upper portion of the overhanging member 405_H is configured to resiliently deform with respect to the rest condition so as to allow the upper portion of the overhanging member

405_H to pass through the lower access aperture 340_1 and to stably adhere to the external face of the front side of the outer door panel 325_O (see FIGS. 3B and 4B) due to the elastic force exerted by the overhanging member 405_H tending to elastically return to its rest position.

According to an embodiment, the cover device **390** comprises an end stroke member for stopping a sliding of the cover device **390** when the cover device **390** has reached the closing position.

According to an embodiment, the end stroke member comprises an end stroke tooth **430**. According to an embodiment, the end stroke tooth **430** is provided at a bottom of the upper portion of the overhanging member 405_H, the end stroke tooth **430** for example extending substantially orthogonally to the upper portion of the overhanging member 405_H (the end stroke tooth **430** for example extending along the transverse direction Z). According to an embodiment, the end stroke tooth **430** is designed (i.e., shaped and sized) to abut against the top of the lower access aperture 340_1 when the cover device **390** is in the closing position.

Although the end stroke tooth **430** may be omitted in basic embodiments, the end stroke tooth **430** advantageously prevents the cover device **390** from sliding (in the forward direction L_1) beyond the closing position, otherwise it could be difficult to move the cover device **390** from the closing position back to the opening position.

According to an embodiment, the cover device **390** comprises an interception member **440** for intercepting the trimming screw **335** while moving the door **325** from the closed position to the open position.

According to an embodiment, the interception member **440** extends from the rear surface 405_{PR} of the plate 405_P, e.g. substantially orthogonally thereto. According to an embodiment, the interception member **440** extends from the rear surface 405_{PR} of the plate 405_P to such an extent that it interferes with the trimming screw **335** during sliding thereof. According to an embodiment, while moving the door **325** from the closed position to the open position, the sliding of the trimming screw **335** (which slides integrally with the sliding member) exerts on the interception member **440** a forward sliding force (along the sliding axis L, in the forward direction L_1) that causes the cover device **390** to move from opening position to the closing position (as mentioned above, the forward sliding force causing the engaging protrusion **415** to slide along (thus disengaging from) the internal face of the side wall of the outer door panel 325_O and to engage the upper access aperture 340_2).

According to an embodiment, the cover device **390** comprises one or more grip members for allowing the user or the operator to manually move the cover device **390** from the closing position to the opening position.

According to an embodiment, the grip member(s) are provided on the engaging protrusion **415**, so as to be accessible by the user or the operator through the upper access aperture 340_2 when the cover device **390** is in the closing position. According to an embodiment, the grip member(s) comprise a relief portion of the engaging protrusion **415**. In the exemplary illustrated embodiment, the relief portion of the engaging protrusion **415** that advantageously acts as a grip member has the shape of an arrow (which is advantageously directed in the backward sliding).

The operation of the cover device **390** may be summarized as follows.

When the cover device **390** is mounted on the door **125** in the opening position (FIG. 4B), the access holes 410_1,410_2 uncover the access apertures 340_1,340_2, the engaging protrusion **415** frictionally engages the engaging region 340_{1E} of the internal face of the side wall of the outer door panel 325_O between the lower 340_1 and upper 340_2 access apertures, the left sliding bracket 420_1 is coupled and retained by friction within the inwardly rounded profile 325_{OS} of the side wall of the outer door panel 325_O, the right sliding bracket 420_2 abuts on the internal face of the front wall of the outer door panel 325_O, the upper portion of the overhanging member 405_H is snap fitted and adheres to the external face of the front side of the outer door panel 325_O (see also FIG. 3B), the upper reinforcing pin 425_U abuts against the bottom of the upper access aperture 340_2, the end stroke tooth **430** is within the upper guiding aperture 340_{2G}, and the lower reinforcing pin 425_L abuts against the bottom of the lower access aperture 340_1.

Similarly to the cover device **190**, the movement of the door **325** from the closed position to the open position causes a sliding of the sliding system (and, hence, of the trimming screw **335**) along the sliding axis L, in the forward direction L_1. When the door **325** is in the interception position, the trimming screw **335** is intercepted (while sliding) by the interception member **340** (not shown).

Similarly to the cover device **190**, the subsequent movement of the door **325** from the interception position to the open position determines an external force to be applied to the interception member **340** along the sliding axis L (in the forward direction L_1) that allows the cover device **190** to slide through the guiding apertures 340_{1G},340_{2G}.

When the door **325** is in the open position, the end stroke tooth **430** abuts against the top of the upper access aperture 340_2 and the plate 305_P (i.e., the solid parts thereof) covers the access apertures 340_1,340_2. This corresponds to the closing position of the cover device **390**.

Therefore, according to an embodiment, the cover device **390** is configured to automatically move from the opening position to the closing position in response to an initial movement of the door **325** from the closed position to the open position (the initial movement of the door being for example, although not necessarily, the very first door movement performed after the installation of the decorative front panel **330**).

The automatic movement of the cover device from the opening position to the closing position allows avoiding to rely on the user or the operator to cover the access apertures.

In the closing position of the cover device **390**, the moving of the cover device **390** back to the opening position is prevented by the engaging protrusion **415** fitted within the upper access aperture 340_2 and by the frictional coupling provided by the sliding brackets 420_1,420_2. Moreover, the movement of the door **325** from the open position to the closed position, which determines the trimming screw **335** to move, along the sliding axis L, in the backward direction L_2 does not affect the cover device **390** (indeed, the trimming screw **335**, while moving in the backward direction L_2 gets away from the interception member **440**) whereby the cover device **390** stably takes the closing position for any subsequent door movement, unless the user or the operator needs to move it to the opening position for accessing the trimming screw **335** (as discussed here below). Therefore, thanks to the engaging between the engaging protrusion **415** and the upper access aperture 340_2 (and preferably to the frictional coupling provided by the sliding brackets 420_1, 420_2), the cover device **390** is maintained in the closing position at each door movement following the initial door movement.

According to an embodiment, the cover device **390** is configured to be manually moved from the closing position to the opening position (e.g., for adjusting the vertical

position of the decorative front panel **330** on the door **325** and/or for disassembling the decorative front panel **330** from the door **325**).

According to an embodiment, the cover device **390** is configured to be manually moved from the closing position to the opening position when the door is, along the sliding axis L, between the closed position and a partially-open position. According to an embodiment, the partially-open position corresponds to a distance greater than a predetermined distance, and particularly to such a distance (along the sliding axis L) between the interception member **440** and the trimming screw **335** that the sliding of the cover device **390** (and, hence, of the interception member **440**) in the backward direction L_2 is not hindered by the trimming screw **335**. According to an embodiment, the partially-open position of the door **325** at which the cover device **390** can be moved from the closing position to the opening position corresponds to about a 30-40-degree rotation angle of the door **325** with respect to the vertical axis Y. Otherwise stated, according to an embodiment, the cover device **390** is configured to be manually moved from the closing position to the opening position when the door is rotated with respect to the rotation axis by at least one predetermined rotation angle, e.g. about a 50-60-degree rotation angle with respect to the rotation axis.

According to an embodiment, in order to move the cover device **390** from the closing position to the opening position, the user or the operator has to access with his/her fingers the grip member on (e.g., the relief portion of) the engaging protrusion **415** and apply a pushing force (i.e., a force essentially orthogonal to the sliding axis L, opposite to the pulling force of FIGS. **1**A-**2**B embodiment) and a backward sliding force in the backward direction L_2. When the door **325** in the closed position, the backwards sliding force is a downwards force. As should be understood, the pushing force determines the bending of the plate $\mathbf{305}_P$ and hence the disengaging of the engaging protrusion **415** from the upper access aperture $\mathbf{340}_2$, and the backward sliding force determines the sliding of the cover device **390** along the guiding apertures $\mathbf{340}_{1G}$,$\mathbf{340}_{2G}$ in the backward direction L_2 (until the upper reinforcing pin $\mathbf{425}_U$ abuts on the bottom of the upper guiding aperture $\mathbf{340}_{2G}$ and the lower reinforcing pin $\mathbf{425}_L$ abuts on the bottom of the lower guiding aperture $\mathbf{340}_{1G}$).

FIG. **4**C shows perspective front (on the left) and rear (on the right) views of a variant of the cover device **390** according to an embodiment of the present invention, the variant of the cover device **390** being denoted by the reference **390'**. For ease of description, FIG. **4**C will be discussed jointly to FIG. **4**D, which shows the cover device **390'** mounted on a variant of the outer door panel $\mathbf{325}_O$ of the dishwasher **300** (the variant of the outer door panel $\mathbf{325}_O$ of the dishwasher **300** being denoted by the reference $\mathbf{325}_O$').

The cover device **390'** is very similar to the cover device **390**, i.e. it comprises the plate $\mathbf{405}_P$ having front $\mathbf{405}_{PF}$ and rear $\mathbf{405}_{PR}$ surfaces and configured to rest (with its front surface $\mathbf{405}_{PF}$) on the internal face of the side wall of the outer door panel $\mathbf{325}_O$', the lower $\mathbf{410}_1$ and upper $\mathbf{410}_2$ access holes, the engaging protrusion **415** configured to frictionally engage the engaging region $\mathbf{340}_{1E}$ of the internal face of the side wall of the outer door panel $\mathbf{325}_O$' when the cover device **390'** is in the opening position and the edges of the upper access aperture $\mathbf{340}_2$ when the cover device **390'** is in the closing position, the interception member **440** for intercepting the trimming screw **335** while moving the door from the closed position to the open position, and the left $\mathbf{420}_1$ and right $\mathbf{420}_2$ sliding brackets.

Differently from the cover device **390**, no overhanging member is provided in the cover device **390'**. Indeed, according to an embodiment, the cover device **390'** is configured to be coupled and retained at both left $\mathbf{420}_1$ and right $\mathbf{420}_2$ sliding brackets. In order to achieve it, according to an embodiment, the outer door panel $\mathbf{325}_O$' comprises, in addition to the inwardly rounded profile $\mathbf{325}_{OS}$, a cantilevered plate $\mathbf{325}_{OS}$' provided, along the transverse direction Z, at an opposite side with respect to the inwardly rounded profile $\mathbf{325}_{OS}$. As will be understood from the following discussion, the cantilevered plate $\mathbf{325}_{OS}$' also acts as a guiding member for guiding the cover device **390'** within or along it.

According to an embodiment, the left sliding bracket $\mathbf{420}_1$ is coupled and retained (and slide with friction) within the inwardly rounded profile $\mathbf{325}_{OS}$ (as for the cover **390**) and the right sliding bracket $\mathbf{420}_2$ is coupled and retained (and slide with friction) between the cantilevered plate $\mathbf{325}_{OS}$' and the portion of the internal face of the side wall of the outer door panel $\mathbf{325}_O$' below it.

According to an embodiment, the cover device **390'** comprises one or more end stroke members for stopping a sliding of the cover device **390'** when the cover device **390'** has reached the closing position and/or the opening position.

According to an embodiment, the end stroke member(s) comprise two end stroke members $\mathbf{430}_1$,$\mathbf{430}_2$ provided, along the vertical direction Y, at respective ends of the right sliding bracket $\mathbf{420}_2$ (reason why they will be referred to also as lower $\mathbf{430}_1$ and upper $\mathbf{430}_2$ end strokes members). According to an embodiment, each end stroke member $\mathbf{430}_1$,$\mathbf{430}_2$ extends from the right sliding bracket $\mathbf{420}_2$, orthogonally thereto (i.e., each end stroke member $\mathbf{430}_1$, $\mathbf{430}_2$ extends from the right sliding bracket $\mathbf{420}_2$ along the longitudinal direction X).

According to an embodiment, the end stroke members $\mathbf{430}_1$,$\mathbf{430}_2$ and the cantilevered plate $\mathbf{325}_{OS}$' are designed (i.e., shaped and sized) such that the cantilevered plate $\mathbf{325}_{OS}$' abuts against the upper end stroke member $\mathbf{430}_2$ when the cover device **390'** is in the opening position (as visible in FIG. **4**D) and against the lower end stroke member $\mathbf{430}_1$ when the cover device **390'** is in the closing position.

The operation of the cover device **390'**, very similar to the operation of the cover device **390**, may be summarized as follows.

When the cover device **390'** is mounted on the door **325** in the opening position (FIG. **4**D), the access holes $\mathbf{410}_1$, $\mathbf{410}_2$ uncover the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$, the engaging protrusion **415** frictionally engages the engaging region $\mathbf{340}_{1E}$ of the internal face of the side wall of the outer door panel $\mathbf{325}_O$ between the lower $\mathbf{340}_1$ and upper $\mathbf{340}_2$ access apertures, the left sliding bracket $\mathbf{420}_1$ is coupled and retained within the inwardly rounded profile $\mathbf{325}_{OS}$ of the side wall of the outer door panel $\mathbf{325}_O$, the right sliding bracket $\mathbf{420}_2$ is coupled and retained between the cantilevered plate $\mathbf{325}_{OS}$' and the region of the outer door panel $\mathbf{325}_O$' below it, and the cantilevered plate $\mathbf{325}_{OS}$' abuts against the upper end stroke member $\mathbf{430}_2$.

Similarly to the cover device **390**, the movement of the door **325** from the closed position to the open position causes a sliding of the sliding system (and, hence, of the trimming screw **335**) along the sliding axis L, in the forward direction L_1. When the door **325** is in the interception position, the trimming screw **335** is intercepted (while sliding) by the interception member **440** (not shown).

Similarly to the cover device **390**, the subsequent movement of the door **325** from the interception position to the open position determines a forward sliding force to be

applied to the interception member **340** along the sliding axis L (in the forward direction L_1) that allows the cover device **390'** to slide.

When the door **325** is in the open position, the cantilevered plate $\mathbf{325}_{OS}$' abuts against the lower end stroke member $\mathbf{430}_1$ and the plate $\mathbf{305}_P$ (i.e., the solid parts thereof) covers the access apertures $\mathbf{340}_1$,$\mathbf{340}_2$. This corresponds to the closing position of the cover device **390'**.

Similarly the cover device **390**, according to an embodiment, the cover device **390'** is configured to be manually moved from the closing position to the opening position by applying a pushing force on the engaging protrusion **415** (which determines the bending of the plate $\mathbf{305}_P$ and hence the disengaging of the engaging protrusion **415** from the upper access aperture $\mathbf{340}_2$) and a backward sliding force in the backward direction L_2 (which determines the sliding of the cover device **390'** until the cantilevered plate $\mathbf{325}_{OS}$' abuts back against the upper end stroke member $\mathbf{430}_2$).

With reference to FIGS. **5**A-**5**C, they show perspective side views of a dishwasher **500** in different operative positions, according to an embodiment of the present invention. Each one of the FIGS. **5**A-**5**C also shows a sectional view of the dishwasher **500** along the V-V sectional axis, each sectional view illustrating a respective interaction between the cover device and a hinge of the dishwasher **500**. For ease of description, FIGS. **5**A-**5**C will be discussed jointly to FIG. **5**D, which show rear (on the left) and side (on the right) views of a portion of the dishwasher **500** according to an embodiment of the present invention.

According to an embodiment, the dishwasher **500** is structurally similar to the dishwashers **100** and **300**, whereby same or similar components are denoted by corresponding references and their explanation will not be repeated when deemed not necessary.

According to an embodiment, the dishwasher **500** comprises a base **505** for resting the dishwasher **500** on a support surface (not shown in the figures), e.g. parallel to the plane X-Z), such as a floor or a support surface of a suitable niche of a piece of furniture wherein the dishwasher **500** can be installed.

According to an embodiment, the dishwasher **500** comprises a (e.g., parallelepiped shaped) body or frame **510**.

According to an embodiment, the frame **510** defines a (e.g., hollow) treatment chamber **515** for items to be washed.

According to an embodiment, the frame **510** comprises top $\mathbf{510}_T$ and bottom $\mathbf{510}_B$ walls parallel to the X-Z plane, a rear wall $\mathbf{510}_R$ parallel to the X-Y plane, and two side walls $\mathbf{510}_{S1}$,$\mathbf{510}_{S2}$ parallel to the Y-Z plane.

According to an embodiment, the frame **510** defines a front load opening **520** parallel to the X-Y plane, and opposite to the rear wall $\mathbf{510}_R$ along the transverse axis Z.

According to an embodiment, the dishwasher **500** comprises a door assembly.

According to an embodiment, the door assembly comprises a door **525** for selectively opening the front load opening **520**, and hence for selectively accessing the treatment chamber **515**.

According to an embodiment, the door **525** is movable (e.g., rotatable) between closed and open positions.

The door **525** is exemplary shown in the closed position in FIG. **5**A, in a partially open position in FIG. **5**B and in the open position in FIG. **5**C.

According to an embodiment, the door **525** comprises an outer door panel $\mathbf{525}_O$ and an inner door panel $\mathbf{525}_I$, structurally and functionally similar to the outer door panels $\mathbf{125}_O$,$\mathbf{325}_O$ and the inner door panels $\mathbf{125}_I$,$\mathbf{325}_O$.

According to an embodiment, the door assembly comprises a door hinge $\mathbf{525}_H$ for rotationally coupling the door **525** to the base **505**, so that the door **525** can rotate with respect to the frame **510** about a horizontal rotation axis (raised from the floor), parallel to the longitudinal axis X. According to an embodiment, the door **525** can be moved from the closed position to the open position by a drop-down movement, and from the open position to the closed position by a pull-up movement.

According to an embodiment, the dishwasher **500** is a fully-integrated dishwasher or a semi-integrated dishwasher, whereby upon dishwasher installation, the door **525** may be coupled to a decorative front panel **530** so as to be completely or almost completely covered by it.

According to an embodiment, the door assembly comprises a fastening system for fastening the decorative front panel **530** on the door **525** and for adjusting the vertical position of the decorative front panel **530** with respect to the door **525**. According to an embodiment, the fastening system, not shown in these figures, is analogous to the fastening system illustrated in FIGS. **1**F-**1**H (as better discussed in the following).

For the purposes of the present disclosure, the fastening system comprises an actuatable or adjusting member, for example a trimming screw **535** (e.g., made of a metal material or other rigid material) adapted to be screwed/unscrewed or rotated by the user or the operator.

According to an embodiment, the door **525** comprises one or more access apertures for allowing the user or the operator to access and actuate (e.g., by insertion of a screw driver or wrench) the trimming screw **535**.

According to an embodiment, the access aperture(s) are provided at the outer door panel $\mathbf{525}_O$, e.g. at a lower end region of a side thereof that is visible by the user when the door **525** is not in the closed position.

According to an embodiment, the outer door panel $\mathbf{325}_O$, comprises a single access aperture **540**.

According to an embodiment, the access aperture **540** is designed (i.e., shaped and sized) to allow the user to access and actuate the trimming screw **535** in a predetermined position of the door **525** (as discussed in the foregoing, the trimming screw **535** moves in response to door movement, whereby the trimming screw **535** may be accessed through the access aperture **540** when the door **525** is in the predetermined position).

According to an embodiment, the door assembly comprises a sliding system for allowing the decorative front panel **530** to slide with respect to the door **525** during door movement. According to an embodiment, the sliding system is configured to slide, along the sliding axis L, in the forward direction L_1 when the door **525** is moved from the closed position to the open position and in the backward direction L_2 when the door **525** is moved from the open position to the closed position.

As discussed in the foregoing, the sliding system is coupleable to the decorative front panel **530** such that, when coupled to the decorative front panel **530**, a sliding of the sliding system during door movement causes the decorative front panel **530** to slide with respect to the door **525** along the sliding axis L, thus avoiding interferences of the decorative front panel **530** with any furniture baseboard (not shown).

As discussed in the foregoing, the fastening system is mechanically coupled to the sliding system so as to slide integrally to the sliding system during door movement, the

trimming screw **535** being thus movable along the sliding axis L with the sliding of the sliding system (and, hence, with the door movement).

The sliding system is structurally different from the sliding system illustrated in FIGS. **1**F-**1**H (in that, as better discussed in the following, in this embodiment the cover device is configured to be mounted directly on the sliding system).

According to an embodiment, the dishwasher **500** comprises a cover device **590** mountable on the door assembly and configured to take, when mounted on the door assembly, the opening position (in which the cover device **590** leaves the access aperture **540** of the door **525** uncovered), and the closing position (in which the cover device **590** covers at least partially, preferably completely, the access aperture **540** of the door **525**).

Similarly to the cover devices **190**, **390** and **390'**, the cover device **590** is configured to mechanically cooperate/interact with the sliding system so as to automatically move from the opening position to the closing position in response to the sliding of the sliding system.

According to an embodiment, the cover device **590** is mounted on the sliding system, whereby the cover device **590** is configured to move from the opening position to closing position when the door **525** is moved from the closed position to the open position, and to move from the closing position to the opening position when the door **525** is moved from the open position back to the closed position.

With reference also to FIGS. **5**E-**5**G, they show the door hinge $\mathbf{525}_H$ in different operative positions, according to an embodiment of the present invention (the operative positions of the door hinge $\mathbf{525}_H$ shown in FIGS. **5**E-**5**G for example corresponding to the operative positions of the dishwasher **500** shown in FIGS. **5**A-**5**C, respectively). Particularly, each one of the FIGS. **5**E-**5**G shows the door hinge $\mathbf{525}_H$ in the respective operative position, from opposite sides.

Analogously to the door hinge $\mathbf{125}_H$, according to an embodiment, the door hinge $\mathbf{525}_H$ comprises a support bracket **545** for connecting the door hinge $\mathbf{525}_H$ to the frame **510**, a driving mechanism **550**, a door balancing device **555**, a coupling mechanism **560** for coupling the driving mechanism **550** and the balancing device **555** to each other, a rotating bracket **565** for connecting the door **525** and the door hinge $\mathbf{525}_H$ to each other, a fulcrum pin **570** for rotationally connecting the rotating bracket **565** to the support bracket **545**, and an elongated guide structure $\mathbf{565}_G$ provided in the rotating bracket **565**.

According to an embodiment, the door hinge $\mathbf{525}_H$ comprises a fastening system analogous to the fastening system of FIGS. **1**F-**1**H, i.e. it comprises the trimming screw **535**, a fastening bracket **575** (visible in FIG. **5**D) with mutually orthogonal longitudinal $\mathbf{575}_1$ and transverse $\mathbf{575}_2$ plates, and a trimming slotted hole (not visible in these figures) provided in the fastening bracket **575** (particularly, in the transverse plate $\mathbf{575}_2$).

According to an embodiment, the door hinge $\mathbf{525}_H$ comprises a sliding system.

According to an embodiment, the sliding system comprises a sliding member **580**, which is slidably guided along the elongated guide structure $\mathbf{565}_G$ of the rotating bracket **565** (analogously to the sliding member of FIGS. **1**F-**1**H). According to an embodiment, the sliding member **580** is configured to be fastened to the cover device **590** (as better discussed in the following).

Analogously to the sliding system of FIGS. **1**F-**1**H, according to an embodiment the sliding system of the door hinge $\mathbf{525}_H$ comprises a crank mechanism **585** connected between the driving mechanism **550** and the sliding member **580** (so as to convert a rocking movement of the driving mechanism **550** into a translation of the sliding member **580**.

Analogously to the crank mechanism of FIGS. **1**F-**1**H, according to an embodiment the crank mechanism **585** comprises a transmission arm $\mathbf{585}_1$ coupled, at a first end thereof, to a rocking arm of the driving mechanism **550**, and at a second end thereof, to the sliding member **580** by means of a pin.

With reference now to FIG. **6**, it shows the cover device **590** and the sliding member **580** according to an embodiment of the present invention.

According to an embodiment, the cover device **590** comprises a plate **605** (e.g., elliptical in shape). According to an embodiment, the plate **605** comprises a front surface $\mathbf{605}_F$ that, in use, faces the inner face of the side wall of the outer door panel $\mathbf{525}_O$, and a rear surface $\mathbf{605}_R$ (opposite to the front surface $\mathbf{605}_F$) that, in use, faces the sliding member **580**.

According to an embodiment, the cover device **590** comprises, e.g. on the plate **605**, one or more access holes for allowing the user or the operator to access the trimming screw **535**. According to an embodiment, the cover device **590** comprises, e.g. on the plate **605**, a single access hole **610** (e.g., circular in shape) for allowing the user or the operator to access the trimming screw **535** through the access aperture **540** (i.e. when the access hole **610**, with the trimming screw **535** fitted thereinto, and the access aperture **540** are aligned to each other, as discussed in the following).

According to an embodiment, the cover device **590** is configured to be mounted on the sliding member **580**. According to an embodiment, the cover device **590** is configured to be snap-fitted on the sliding member **580**. According to an embodiment, the cover device **590** comprises an engaging region **615** configured to engage a respective engaging member of the sliding member **580**.

According to an embodiment, the engaging region **615** is provided, along the vertical axis Y, below the access hole **610**. According to an embodiment, the engaging region **615** comprises a slot having a semicircular (or substantially semicircular) shape.

According to an embodiment, the engaging region **615** is provided in a spacing member **620** of the cover device **590** extending or protruding from the rear surface $\mathbf{605}_R$ of the plate **605**, orthogonally thereto. According to an embodiment, the engaging region **615** extends through the spacing member **620** towards the front surface $\mathbf{605}_F$ of the plate **605**. According to an embodiment, the engaging region **615** does not reach (i.e. it does not open to) the front surface $\mathbf{605}_F$ of the plate **605**, whereby the front surface $\mathbf{605}_F$ of the plate **605** (which provides the closing or covering function of the cover device **590**) is mainly solid (exception made for the access hole **610**).

According to an embodiment, the spacing member **620** protrudes (along the longitudinal direction X) to such an extent that the cover device **590** is allowed to be snap fitted on the sliding member **580** with interposition of the fastening bracket **575** and of the rotating bracket **565** (as better discussed here below).

According to an embodiment, the sliding member **580** comprises a threaded hole **625** adapted to receive the trimming screw **535**. According to an embodiment, upon mounting (e.g., snap fitting) of the cover device **590** on the sliding member **580**, the threaded hole **625** of the sliding member **580** is aligned with the access hole **610** of the cover device **590**, whereby the trimming screw **535** can be inserted through the access hole **610** and the threaded hole **620**.

As visible in FIG. **5**D, according to an embodiment, the fastening bracket **575** (particularly, the transverse plate 575_2 thereof) is fastened between the sliding member **580** and the cover device **590**. According to an embodiment, upon mounting (e.g., snap fitting) of the cover device **590** on the sliding member **580** with interposition of the fastening bracket **575** (particularly, the transverse plate 575_2 thereof), the threaded hole **625** of the sliding member **580** is aligned with the access hole **610** of the cover device **590** and with the trimming slotted hole 575_H of the fastening bracket **575** (particularly, of the transverse plate 575_2 thereof): therefore by insertion (and screwing) of the trimming screw **535** through the access hole **610**, the trimming slotted hole 575_H and the threaded hole **625**, the fastening bracket **575** is gripped between the sliding member **580** and the cover device **590**.

As visible in FIG. **5**D, according to an embodiment, the rotating bracket **565** is gripped between the sliding member **580** and the fastening plate **575** (particularly, the transverse plate 575_2 thereof). According to an embodiment, upon mounting (e.g., snap fitting) of the cover device **590** on the sliding member **580** with interposition of the fastening bracket **575** (particularly, the transverse plate 575_2 thereof) and of the rotating bracket **565**, the threaded hole **625** of the sliding member **580** is aligned with the access hole **610** of the cover device **590**, with the trimming slotted hole 575_H of the fastening bracket **575** (particularly, of the transverse plate 575_2 thereof) and with the elongated guide structure 565_G of the rotating bracket **565**: therefore by insertion (and screwing) of the trimming screw **535** through the access hole **610**, the trimming slotted hole 575_H, the threaded hole **625**, and the elongated guide structure 565_G, the fastening bracket **575**/sliding member **580**/cover device **590** assembly is allowed to slide along the elongated guide structure 565_G.

As visible in FIGS. **5**A and **5**E, when the door **525** is in the closed position, the rotating bracket **565** extends along the vertical axis Y in contact with the support bracket **545**, and the sliding member **580** (as well as the fastening bracket **575** and the cover device **590** coupled thereto) is at a lower position along the elongated guide structure 565_G. The access aperture **540** is covered by the cover device **590**.

As visible in FIGS. **5**B and **5**F, when the door **525** is in a partially open position, the rotating bracket **565** (connected to the door **525**) rotates with respect to the support bracket **545** about the fulcrum pin **570**, so as to move away from the support bracket **545** (connected to the frame **510**, not shown in this figure). The corresponding rotation of the rocking arm of the driving mechanism **550** pushes the transmission arm 585_1 away from the fulcrum pin **570**, so as to translate the sliding member **580** (as well as the fastening bracket **575** and the cover device **590** coupled thereto) along the elongated guide structure 565_G. As visible in the figures, in this position the access hole **610** of the cover device **590** is aligned with the access aperture **540** of the door **525**, whereby the trimming screw **535** is accessible by the user for adjusting the vertical position of the decorative front panel **530** on the door **525** and/or for disassembling the decorative front panel **530** from the door **525**.

As visible in FIGS. **5**C and **5**G, the rotation of the rotating bracket **565** (and, hence, the opening of the door **525**, not shown in this figure) stops when it reaches a maximum opening angle of about 85-90° (for example, with the rotating bracket **565** that abuts against a bottom of the support bracket **545**). According to an embodiment, in this position the sliding member **580** (as well as the fastening bracket **575** and the cover device **590** coupled thereto) reaches an end of stroke of the elongated guide structure 565_G. The access aperture **540** is covered by the cover device **590**.

Therefore, the cover device **590** is configured to automatically move from the opening position to the closing position in response to each movement of the door **525** between the closed position and the open position.

The automatic movement of the cover device **590** at each door movement allows avoiding to rely on the user or the operator to uncover the access aperture **540** to access the trimming screw **535**.

Moreover, the cover device **590** is configured to uncover the access aperture **540** only at a single rotation angle of the door (in the example at issue, the rotation angle of FIGS. **5**B and **5**F), the access aperture **540** being instead covered or closed in any other door position.

As should be understood, although the cover device **590** allows accessing the access aperture **540** during door movement, this does not determine any injury issue: indeed, the sliding member **580** is spaced apart (through the fastening bracket) from the cover device **590**, and furthermore the sliding member **580** slides together with the cover device **590**: the possibility of introducing fingers between the cover device **590** and the sliding member **580** is therefore avoided.

Naturally, in order to satisfy local and specific requirements, a person skilled in the art may apply to the invention described above many logical and/or physical modifications and alterations. More specifically, although the present invention has been described with a certain degree of particularity with reference to preferred embodiments thereof, it should be understood that various omissions, substitutions and changes in the form and details as well as other embodiments are possible. In particular, different embodiments of the invention may even be practiced without the specific details set forth in the preceding description for providing a more thorough understanding thereof; on the contrary, well-known features may have been omitted or simplified in order not to encumber the description with unnecessary details. Moreover, it is expressly intended that specific elements and/or method steps described in connection with any disclosed embodiment of the invention may be incorporated in any other embodiment.

The invention claimed is:

1. A dishwasher comprising:

a frame defining a treatment chamber for items to be washed;

a door assembly comprising:

a door movable between a closed position and an open position for selectively accessing the treatment chamber, the door comprising an access aperture;

a front panel configured to be coupled with the door, wherein the access aperture is configured to allow a user to access an adjusting member operably coupled with at least one of the door and the front panel and actuatable to adjust a position of a the front panel with respect to the door, and

a sliding member configured to slide along a sliding axis during movement of the door between the closed position and the open position, the sliding member being coupleable to the front panel such that, when coupled to the front panel, a sliding of the sliding member during movement of the door between the closed position and the open position causes the front panel to slide with respect to the door along the sliding axis, and

a cover device configured to be mounted on the door assembly and configured to take, when mounted on the

door assembly, a first operative position in which the cover device leaves the access aperture of the door uncovered and a second operative position in which the cover device covers at least partially the access aperture of the door, wherein the cover device is configured to mechanically cooperate with the sliding member as the sliding member slides along the sliding axis such that the cover device moves from the first operative position to the second operative position in response to the sliding of the sliding member.

2. The dishwasher according to claim **1**, wherein the cover device is mounted on the door.

3. The dishwasher according to claim **1**, wherein the door comprises a guiding member configured to guide the cover device between the first operative position and the second operative position, the cover device being configured to move between the first operative position to the second operative position by sliding along the guiding member.

4. The dishwasher according to claim **3**, wherein the guiding member comprises a guiding aperture provided at a side wall of the door.

5. The dishwasher according to claim **1**, wherein the adjusting member is mechanically coupled to the sliding member so as to slide integrally to the sliding member during movement of the door between the closed position and the open position, and wherein the cover device comprises an interception member configured to intercept the adjusting member during sliding thereof, while moving the door from the closed position to the open position, the sliding of the adjusting member exerting on the interception member a force along the sliding axis that causes the cover device to move from the first operative position to the second operative position.

6. The dishwasher according to claim **5**, wherein the cover device comprises an engaging member configured to engage an engaging region of the door in the first operative position of the cover device, said force causing the engaging member to disengage from the engaging region of the door so as to move the cover device towards the second operative position.

7. The dishwasher according to claim **6**, wherein the cover device is configured to resiliently bend to allow the engaging member to disengage from the engaging region of the door so as to move the cover device from the first operative position to the second operative position.

8. The dishwasher according to claim **5**, wherein the cover device comprises an engaging member configured to engage an engaging portion of the door in the second operative position of the cover device, said force causing the engaging member to engage the engaging portion of the door.

9. The dishwasher according to claim **8**, wherein the cover device is configured to automatically move from the first operative position to the second operative position in response to a first movement of the door between the closed position and the open position, the engaging between the engaging member and the engaging portion allowing the cover device to be maintained in the second operative position at each movement of the door between the closed position and the open position following the first movement of the door between the closed position and the open position.

10. The dishwasher according to claim **1**, wherein the cover device is configured to be manually moved from the second operative position to the first operative position.

11. The dishwasher according to claim **10**, wherein the door is configured to rotate between the closed and open positions about a rotation axis, the cover device being configured to be manually moved from the second operative position to the first operative position when the door is rotated with respect to the rotation axis by at least one predetermined rotation angle.

12. The dishwasher according to claim **1**, wherein the access aperture is provided on a side wall of the door, and the cover device is mounted on an external face of the side wall of the door.

13. The dishwasher according to claim **1**, further comprising, at a side wall of the door, a guiding aperture configured to guide the cover device between the first and second operative positions.

14. The dishwasher according to claim **1**, wherein the cover device comprises at least one frictional member configured to provide a frictional coupling between the cover device and the door.

15. The dishwasher according to claim **1**, wherein the cover device comprises at least one reinforcing member configured to reinforce a coupling between the cover device and the door when the cover device is in the first operative position.

16. The dishwasher according to claim **15**, wherein the reinforcing member is configured to abut against the access aperture when the cover device is in the first operative position.

17. The dishwasher according to claim **1**, wherein the cover device comprises an anti-release member configured to prevent the cover device from being accidentally decoupled from the door when the cover device is in the second operative position.

18. The dishwasher according to claim **17**, wherein the anti-release member is configured to abut against a portion of the access aperture when the cover device is in the second operative position.

19. The dishwasher according to claim **1**, wherein the cover device comprises a plate having an access hole matching the access aperture of the door in the first operative position of the cover device.

20. The dishwasher according to claim **1**, wherein the door comprises an engaging hole configured to engage the cover device and the door in the first operative position, the cover device being configured to engage a portion of the access aperture in the second operative position.

21. The dishwasher according to claim **1**, wherein the sliding member is configured to slide, along the sliding axis, in a first direction when the door is moved from the closed position to the open position and in a second direction, opposite the first direction, when the door is moved from the open position to the closed position, the cover device moving in the first direction while automatically moving from first operative position to the second operative position, and wherein the cover device is configured to be manually moved from the second operative position to the first operative position by exerting on the cover device a pulling force orthogonal to the sliding axis and a force in the second direction.

22. The dishwasher according to claim **1**, wherein the cover device comprises at least one grip member configured to allow the user to grasp the cover device.

23. The dishwasher according to claim **1**, wherein the access aperture is provided at a side wall of the door, the cover device being mounted on an internal face of the side wall of the door.

24. The dishwasher according to claim **23**, comprising a guiding aperture provided at a front wall of the door orthogonal to the side wall of the door and configured to guide the cover device between the first operative position

and the second operative position, wherein the cover device comprises a plate configured to rest on the internal face of the side wall of the door, and an overhanging member projecting from the plate and configured to be coupled to the guiding aperture.

25. The dishwasher according to claim **24**, wherein the overhanging member is configured to engage the door.

26. The dishwasher according to claim **23**, wherein the cover device comprises at least one frictional member configured to provide a frictional coupling between the cover device and the door.

27. The dishwasher according to claim **23**, wherein the sliding member is configured to slide, along the sliding axis, in a first direction when the door is moved from the closed position to the open position and in a second direction, opposite the first direction, when the door is moved from the open position to the closed position, the cover device moving in the first direction while automatically moving from first operative position to the second operative position, and wherein the cover device is configured to be manually moved from the second operative position to the first operative position by exerting on the cover device a pushing force orthogonal to the sliding axis and a force in the second direction.

28. The dishwasher according to claim **1**, wherein the cover device is mounted on the sliding member, whereby the cover device is configured to move from the first operative position to the second operative position when the door is moved from the closed position to the open position and to move from the second operative position to the first operative position when the door is moved from the open position back to the closed position.

29. The dishwasher according to claim **28**, wherein the cover device is mounted on the sliding member by snap-fitting.

* * * * *