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CA 2675673 C 2015/04/28

(11)(21) 2 675 673

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2008/02/04
(87) Date publication PCT/PCT Publication Date: 2008/08/14
(45) Date de délivrance/Issue Date: 2015/04/28
(85) Entrée phase nationale/National Entry: 2009/07/16
(86) N° demande PCT/PCT Application No.: US 2008/052895
(87) N° publication PCT/PCT Publication No.: 2008/097893
(30) Priorités/Priorities: 2007/02/06 (US60/888,478);
2008/01/11 (US11/972,936)

(51) Cl.Int./Int.Cl. *A47L 15/42* (2006.01),
D06F 39/12 (2006.01)

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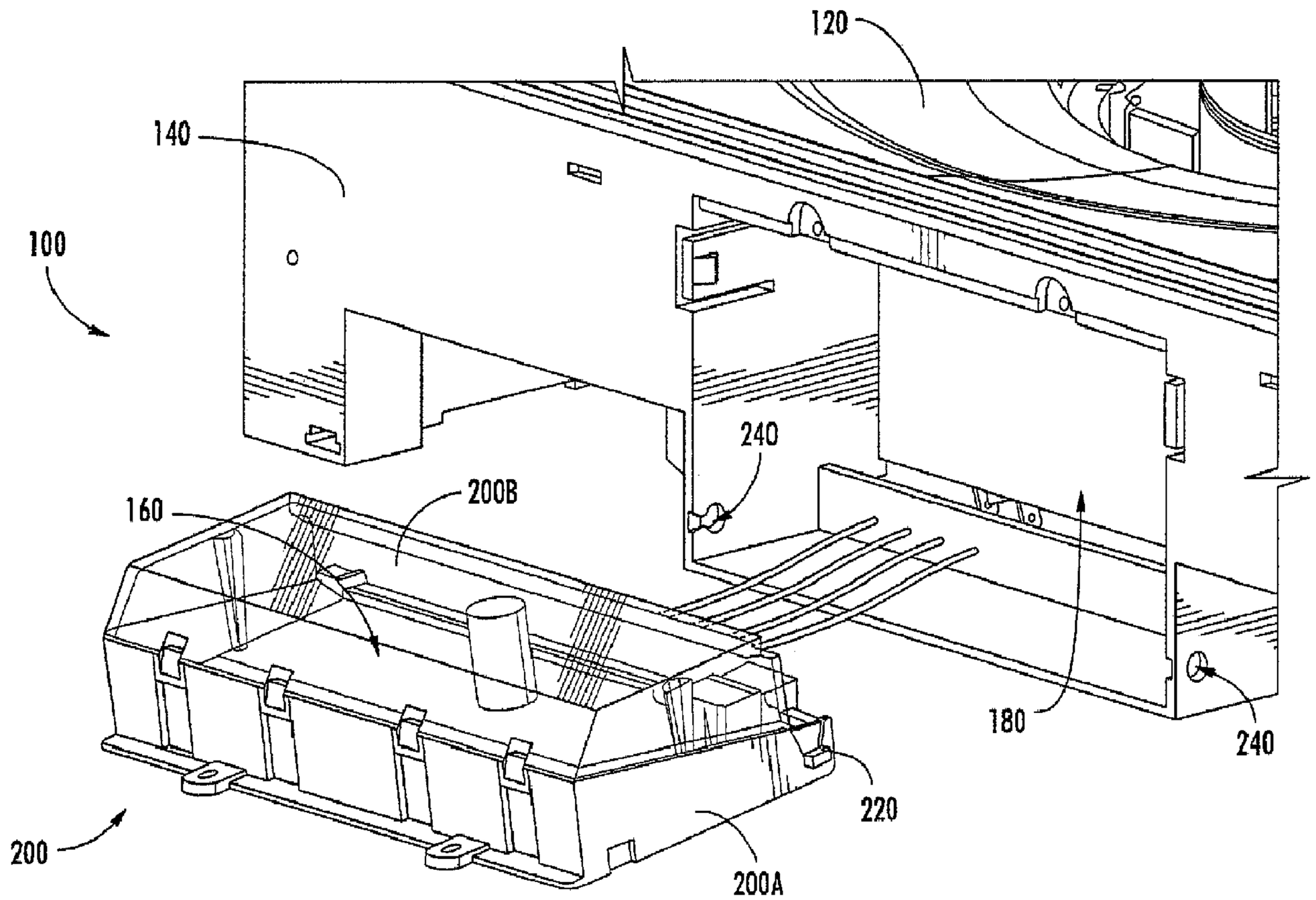
(54) Titre : LAVE-VAISSELLE COMPORTANT UNE UNITE DE COMMANDE ACCESSIBLE ET PROCEDE ASSOCIE
(54) Title: DISHWASHER WITH ACCESSIBLE CONTROL UNIT, AND ASSOCIATED METHOD



(57) Abrégé/Abstract:
A dishwasher is provided, comprising a base portion (140) _ adapted to support a tub portion (120). A control unit (160) is configured to be in communication with at least one dishwasher operational component and with at least one control switch device

CA 2675673 C 2015/04/28

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(57) Abrégé(suite)/Abstract(continued):
remotely disposed with respect to the base portion. The control unit is responsive to the at least one control switch device to control the at least one dishwasher operational component. The control unit is disposed about the base portion and is selectively accessible from a forward side thereof. An associated method of forming the dishwasher is also provided.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 August 2008 (14.08.2008)

PCT

(10) International Publication Number
WO 2008/097893 A1

(51) International Patent Classification:
A47L 15/42 (2006.01) *D06F 39/12* (2006.01)

(21) International Application Number:
PCT/US2008/052895

(22) International Filing Date: 4 February 2008 (04.02.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/888,478	6 February 2007 (06.02.2007)	US
11/972,936	11 January 2008 (11.01.2008)	US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: DISHWASHER WITH ACCESSIBLE CONTROL UNIT, AND ASSOCIATED METHOD

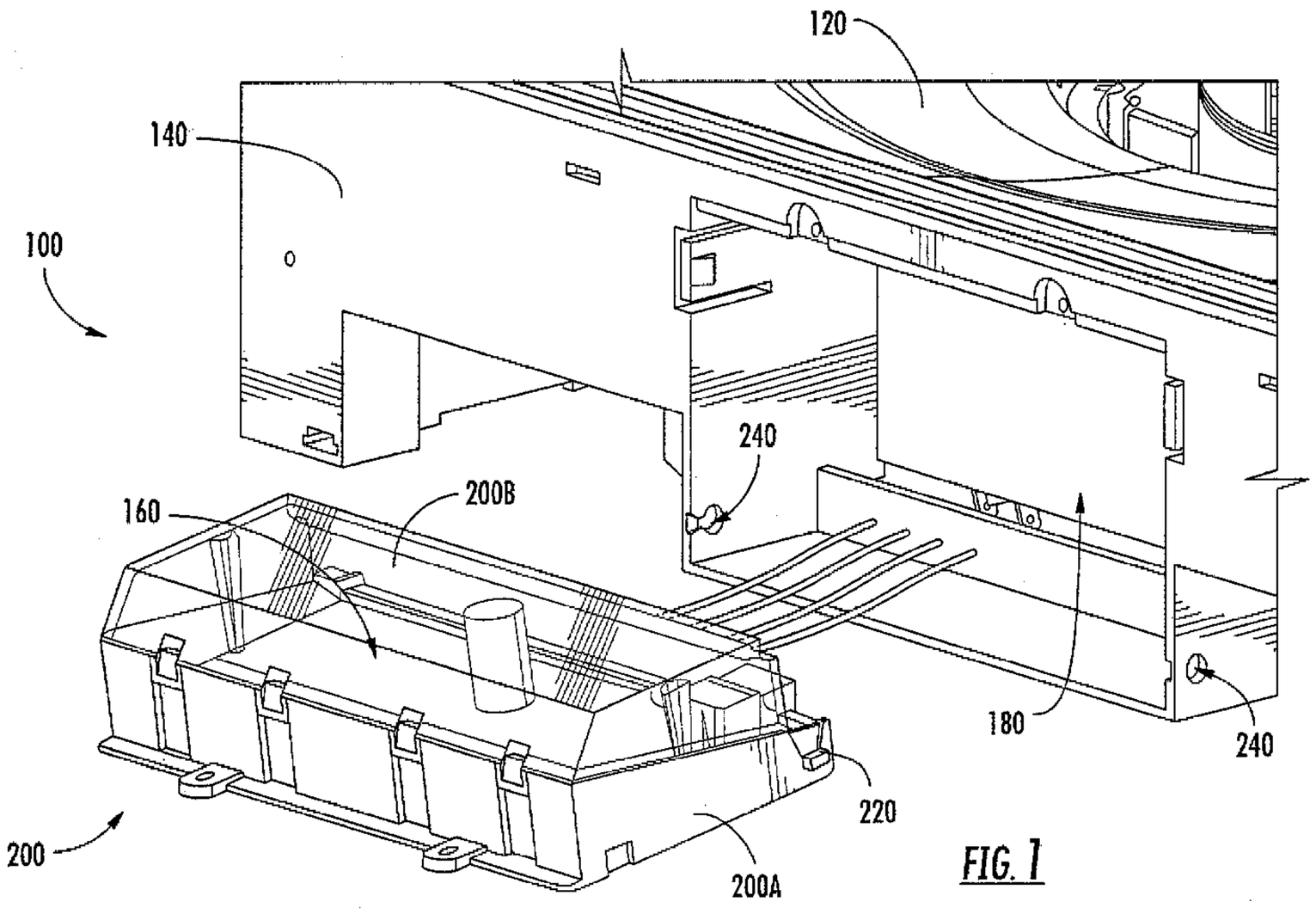


FIG. 1

(57) Abstract: A dishwasher is provided, comprising a base portion (140) _ adapted to support a tub portion (120). A control unit (160) is configured to be in communication with at least one dishwasher operational component and with at least one control switch device remotely disposed with respect to the base portion. The control unit is responsive to the at least one control switch device to control the at least one dishwasher operational component. The control unit is disposed about the base portion and is selectively accessible from a forward side thereof. An associated method of forming the dishwasher is also provided.

WO 2008/097893 A1

WO 2008/097893 A1

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

DISHWASHER WITH ACCESSIBLE CONTROL UNIT, AND ASSOCIATED METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

Embodiments of the present invention relate to dishwashers and, more particularly, to a dishwasher having an accessible control unit, and a method associated therewith.

Description of Related Art

Typically, when installing a dishwasher in an under-counter cabinet, the electrical supply from the house wiring to the dishwasher is first attached to the designated terminals of the dishwasher (usually disposed within the dishwasher base) before the dishwasher is installed in the cabinet. The electrical power is then directed through the terminals to the electronic control unit (ECU) of the dishwasher, wherein the ECU may be mounted within the base in conjunction with the terminals, or in the door assembly of the dishwasher. As such, it may only be possible to gain access to the terminals of the ECU only when the dishwasher is removed from the cabinet. Further, disassembly of the dishwasher may be necessary if access to the ECU is required for service, diagnostics, and/or replacement. Thus, the dishwasher must often be removed from the cabinet for connecting/disconnecting electrical power, and extensive disassembly/assembly of the dishwasher may be required to access the ECU. Accordingly, a dishwasher having improved access to the ECU thereof would be desirable.

BRIEF SUMMARY OF THE INVENTION

The above and other needs are met by the present invention which, in one embodiment, provides a dishwasher, comprising a base portion adapted to support a tub portion. A control unit is configured to be in communication with at least one

dishwasher operational component and with at least one control switch device remotely disposed with respect to the base portion. The control unit is responsive to the at least one control switch device to control the at least one dishwasher operational component. The control unit is disposed about the base portion and is selectively accessible from a forward side thereof.

Another aspect of the present invention comprises a method of forming a dishwasher. Such a method comprises disposing a control unit about a base portion of the dishwasher, wherein the base portion is adapted to support a tub portion, such that the control unit is selectively accessible from a forward side of the base portion. The control unit is configured to be in communication with at least one dishwasher operational component and with at least one control switch device remotely disposed with respect to the base portion, such that the control unit is responsive to the at least one control switch device to control the at least one dishwasher operational component.

Aspects of the present invention thus provide significant advantages as further detailed herein.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 schematically illustrates an exploded perspective view of a dishwasher device having an accessible control unit according to one embodiment of the present invention;

FIG. 2A schematically illustrates a perspective view of a dishwasher device having an accessible control unit pivotably mounted to a base portion thereof, with the control unit in an open accessible position, according to the embodiment of the present invention shown in **FIG. 1**;

FIG. 2B is a side elevation of a dishwasher device having an accessible control unit, with the control unit in an open accessible position, according to the embodiment of the present invention shown in **FIG. 2A**;

FIG. 3 is a perspective view of a dishwasher device having an accessible control unit, with the control unit in a closed inaccessible position, according to the embodiment of the present invention shown in **FIG. 2A**;

FIG. 4 schematically illustrates an exploded perspective of an accessible control unit having a barrier member associated therewith, according to one embodiment of the present invention;

FIG. 5A schematically illustrates a perspective front view of an accessible control unit having a barrier member associated therewith, according to one embodiment of the present invention;

FIG. 5B schematically illustrates a perspective rear view of an accessible control unit having a barrier member associated therewith, according to one embodiment of the present invention;

FIG. 6 is a perspective view of a dishwasher device having an accessible control unit with a barrier member associated therewith, with the control unit in a closed inaccessible position, according to the embodiment of the present invention shown in **FIGS. 5A and 5B**; and

FIG. 7 is a cross-sectional side elevation view of a dishwasher device having an accessible control unit with a barrier member associated therewith, with the control unit in a closed inaccessible position, according to the embodiment of the present invention shown in **FIGS. 5A and 5B**.

DETAILED DESCRIPTION OF THE INVENTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the inventions are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

FIGS. **1, 2A, 2B,** and **3** illustrate one embodiment of a dishwasher device according to the present invention, the dishwasher device being generally indicated by the numeral **100**. Such a dishwasher device **100** generally comprises a tub **120**

supported by a base **140**, wherein both the tub **120** and the base **140** define respective forward ends, each adapted to face outwardly from any cabinet in which the dishwasher device **100** is installed. In some instances, the front end defines an access opening of the tub **120**, through which dishware is loaded and unloaded with respect to the dishwasher device **100**.

Such dishwasher devices **100** are typically electronically-controlled, implementing an electronic control unit **160** ("ECU") for interacting with various components (i.e., circulation pump, drain pump, water valve) of the dishwasher device **100** to control a dishwashing process. In such instances, the performed functions (i.e., wash, rinse, drain) or cycles (i.e., heated dry) may be selected by a user via one or more appropriate selector devices (not shown), such as one or more switches, buttons, knobs, or any combinations thereof. The selector devices may be disposed remotely with respect to the ECU **160**. For example, such selector devices may be disposed about the upper end of the door (not shown) of the dishwasher device **100** for facilitating interaction therewith by a user. However, the electrical supply from the house wiring to the dishwasher device **100** must also be engaged with designated electrical terminals of the dishwasher device **100**, as well as with the ECU **160**, before the dishwasher device **100** is installed.

As such, in one aspect of the present invention, the base **140** is configured so as to define a compartment **180** about the forward end thereof, wherein the compartment **180** is configured to receive the ECU **160**. With the compartment **180** disposed about the forward end of the base **140**, the electrical supply from the house wiring, as well as the connections (i.e., wires) connecting the ECU **160** to the selector devices, may be directed through or connected to the compartment **180**, as shown in FIG. **1**. As such, the dishwasher device **100** may be installed, for example, within a cabinet structure, prior to the electrical connections to the dishwasher device **100** being established. However, in some instances, the electrical connections may be established elsewhere about the dishwasher device **100**, and then appropriate power leads (i.e., wires) directed to or through the compartment **180**. With the dishwasher device **100** being configured to receive the ECU **160** in the compartment **180** about the forward end of the base **140**, the ECU **160** is readily accessible without requiring

removal of the dishwasher device **100** from the cabinet, or extensive disassembly of the dishwasher device **100**. In this manner, service, diagnosis, and/or replacement of the ECU **160** is facilitated.

The ECU **160** is mounted within a housing **200**, which may be formed as one or more portions **200A**, **200B** configured to contain the ECU **160**. For example, the housing **200** may be injection-molded in two complementary portions **200A**, **200B** of a thermoplastic material, wherein the ECU **160** is disposed in one portion **200A** of the housing **200**, and the other portion **200B** of the housing **200** cooperates therewith to enclose the ECU **160**. In such a manner, the ECU **160** is protected, for example, from water and dirt ingress. The housing **200** may further include provisions for allowing the wiring (i.e., a wiring harness) extending from or through the receptacle **180** to engage the ECU **160** within the housing **200**. Once the ECU **160** is connected to the wiring, representing the electrical power connections, as well as the communication connections with the selector devices (i.e., both input and output connections), the housing **200** may be mounted within the compartment **180**.

In one instance, opposing lateral ends of the housing **200** may have pins **220** extending therefrom, wherein the pins **220** are configured to engage complementary receptacles **240** defined by the lateral edges of the compartment **180**. In this manner, the housing **200** becomes pivotably mounted with respect to the compartment **180** along a pivoting side of the housing **200**. Further, in some instances, the ECU **160** may be disposed within the housing **200** such that a first electrical connector portion (not shown) operably engaged and associated with the ECU **160** is accessible through the pivoting side of the housing. When the housing **200** is so engaged with the compartment **180**, a second electrical connector portion (not shown) can be engaged with or otherwise connected to the first electrical connector portion about the pivoting side of the housing **200** and any excess length of wire(s) extending to the housing **200** may be retracted into the base **140**. Once assembled in such a manner, the housing **200** containing the ECU **160** is pivotable with respect to the compartment **180**. As such, once engaged with the compartment **180** via the pins **220** and receptacles **240**, the housing **200** becomes pivotable between an open accessible position (see, e.g., FIGS. **2A** and **2B**) and a closed inaccessible position (see, e.g., FIG. **3**). Accordingly, in the open accessible position as shown in FIGS. **2A** and **2B**, one portion **200B** of the

housing **200** may be opened or removed so as to allow access to the ECU **160** therein for repair or replacement. Once the portion **200B** of the housing **200** is replaced in a closed configuration containing the ECU **160**, the housing **200** may be pivoted into a position whereby the housing **200** is substantially received within the compartment **180** and the ECU **160** is essentially inaccessible. The housing **200** in the inaccessible position may be secured with respect to the compartment **180** by appropriate fasteners **260**, as shown in FIG. **3**.

If access to the ECU **160** is required for service, diagnosis, and/or replacement, the fasteners **260** can be removed and the housing **200** pivoted outwardly of the compartment **180** to the accessible position (FIGS. **2A** and **2B**) such that the ECU **160** can be accessed. In such a manner, access to the ECU **160** is possible without disassembling or uninstalling the dishwasher device **100**.

FIGS. **4, 5A, 5B, 6,** and **7** illustrate another embodiment of dishwasher device **100** according to the present invention. In such embodiments, the ECU **160** (or control unit, control device, or circuit board) is mounted within a housing **200**, which may be formed as one or more portions **200A**, **200B** configured to contain the ECU **160**. For example, the housing **200** may be injection-molded in two complementary portions **200A**, **200B** of a thermoplastic material, wherein the ECU **160** is disposed in one portion **200A** of the housing **200**, and the other portion **200B** of the housing **200** cooperates therewith to enclose the ECU **160**. In such a manner, the ECU **160** is protected, for example, from water and dirt ingress. A barrier member **210** may be configured to operably engage the housing **200**, for example, about the pivoting side thereof, and to extend at least partially along the pivoting side of the housing **200** such that at least a portion of the barrier member **210** is disposed between the housing **200** and the base **140**. In this manner, the barrier member **210** may provide, for example, a flame barrier between the high voltage connectors (i.e., wiring) of the ECU **160** (control unit) and base **140**, as may be needed, for example, in the event of a malfunction of the ECU **160**.

In some instances, the barrier member **210** may be configured to "snap onto" or otherwise engage the housing **200**, for example, the housing portion **200A**,via engagement features **212** associated therewith, as shown in FIG. **5A**. The barrier member **210** may be further adapted to be at least partially received within

compartment **180** along with housing portions **200A** and **200B**, as shown in FIG. **6**. FIG. **7** further shows that, according to some embodiments, the barrier member **210** may be configured to extend at least partially along the pivoting side of the housing **200** and have a first portion **214** configured to extend at least partially between the housing **200** and a bottom portion **142** of the base **140**, when the housing **200** is mounted within compartment **180**. As further shown in FIG. **7**, a second portion **216** of the barrier member **210** may extend from the first portion **214** to engage the housing **200**, for example, through engagement features **212**.

In some instances, the barrier member **210** may be further configured, for instance, to further include or otherwise form at least one securement member for securing or holding a second electrical connector portion (not shown), extending from and associated with the electrical power connections, as well as the communication connections with the selector devices (i.e., both input and output connections), to the first electrical connector portion associated with the ECU **160**. In this manner, the wiring harness / power wiring connectors may be retained in place relative to the ECU **160** (control unit) disposed within the housing **200**. For example, one or more tab portions **218** may be configured to project from the barrier member **210** and to cooperate with the first portion **214** of the barrier member **210** to form the at least one securement member for retaining the wiring harness / power wiring connectors in place relative to the ECU **160** in housing **200**.

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

1. A dishwasher, comprising:

a tub portion comprising an access opening adapted to receive dishware therein;

a door configured to cover the access opening and comprising at least one control switch device disposed at an upper end thereof;

a base portion adapted to support the tub portion; and

an electronic control unit configured to be in communication with at least one dishwasher operational component and with the at least one control switch device, the at least one control switch device being remotely disposed with respect to the base portion and the electronic control unit, the electronic control unit being responsive to the at least one control switch device to control the at least one dishwasher operational component, and the electronic control unit being disposed about the base portion and selectively accessible, independently of the at least one control switch device, from a forward side thereof to facilitate service, diagnosis, and/or replacement of the electronic control unit.

2. A dishwasher according to Claim 1, wherein the base portion is configured so as to define a compartment about the forward side thereof, the compartment being configured to receive the electronic control unit.

3. The dishwasher according to Claim 1 further comprising a housing configured to enclose the electronic control unit therein.

4. A dishwasher according to Claim 3, wherein the base portion is configured so as to define a compartment at the forward side thereof, the compartment being configured to receive the housing having the electronic control unit disposed therein.

5. A dishwasher according to Claim 4, wherein the housing comprises first and second portions, the electronic control unit being disposed in the first portion of the housing, and the second portion of the housing being configured to engage the first portion to enclose the electronic control unit therebetween.

6. A dishwasher according to Claim 4, wherein the housing is pivotably mounted with respect to the compartment such that the housing is pivotable between an open accessible position outwardly of the compartment and a closed inaccessible position within the compartment.

7. A dishwasher according to Claim 6, wherein the housing comprises opposing lateral ends each configured to be coupled to the compartment such that each lateral end of the housing is pivotably mounted with respect to the compartment to define a pivoting side of the housing located between the lateral ends.

8. A dishwasher according to Claim 7, wherein the electronic control unit is disposed within the housing such that a first electrical connector portion associated with the control unit is accessible through the pivoting side of the housing.

9. A dishwasher according to Claim 8, further comprising a barrier member configured to operably engage the housing and to extend along the pivoting side thereof between the lateral ends of the housing such that the barrier member is disposed between the housing and the base portion to provide a flame barrier therebetween.

10. A dishwasher according to Claim 9, wherein the barrier member further comprises at least one securement member adapted to secure a second electrical connector portion in engagement with the first electrical connector portion associated with the electronic control unit.

11. A dishwasher according to Claim 9, wherein the barrier member comprises a first portion configured to extend between the housing and the base portion and within the compartment and a second portion extending from the first portion, the second portion comprising a plurality of engagement features configured to engage the housing outside of the compartment.

12. A method of forming a dishwasher, comprising:

disposing an electronic control unit about a base portion of the dishwasher, the base portion being adapted to support a tub portion comprising an access opening configured to receive dishware therein, such that the electronic control unit is selectively

accessible from a forward side of the base portion to facilitate service, diagnosis, and/or replacement of the electronic control unit, the electronic control unit being configured to be in communication with at least one dishwasher operational component and with at least one control switch device, the at least one control switch device being disposed at an upper end of a door configured to cover the access opening and being remotely disposed with respect to the base portion and the electronic control unit, such that the electronic control unit is responsive to the at least one control switch device to control the at least one dishwasher operational component, the electronic control unit being selectively accessible independently of the at least one control switch device.

13. A method according to Claim 12, wherein disposing an electronic control unit about a base portion of the dishwasher further comprises disposing the electronic control unit within a compartment defined by the base portion about the forward side thereof, the compartment being configured to receive the electronic control unit.

14. A method according to Claim 12, wherein disposing an electronic control unit about a base portion further comprises disposing the electronic control unit within a housing configured to be received within a compartment defined by the base portion at the forward side thereof.

15. A method according to Claim 14, wherein the housing comprises first and second portions, and disposing the electronic control unit within a housing further comprises disposing the electronic control unit in the first portion of the housing, and engaging the second portion of the housing with the first portion of the housing such that the first and second portions cooperate to enclose the electronic control unit therebetween.

16. A method according to Claim 14, wherein the housing is pivotably mounted with respect to the compartment, and the method further comprises pivoting the housing between an open accessible position outwardly of the compartment and a closed inaccessible position within the compartment.

17. A method according to Claim 14, wherein the housing is pivotably mounted with respect to the compartment along a pivoting side of the housing and the method further comprises disposing the electronic control unit within the housing such that a first electrical connector portion associated with the electronic control unit is accessible through the pivoting side of the housing.

18. A method according to Claim 17, further comprising operably engaging a barrier member with the housing such that the barrier member extends along the pivoting side thereof, and such that at least a portion of the barrier member is disposed between the housing and the base portion to provide a flame barrier therebetween.

19. A method according to Claim 18, wherein the barrier member further comprises at least one securement member and operably engaging a barrier member with the housing further comprises engaging the barrier member with the housing such that the at least one securement member secures a second electrical connector portion in engagement with the first electrical connector portion associated with the electronic control unit.

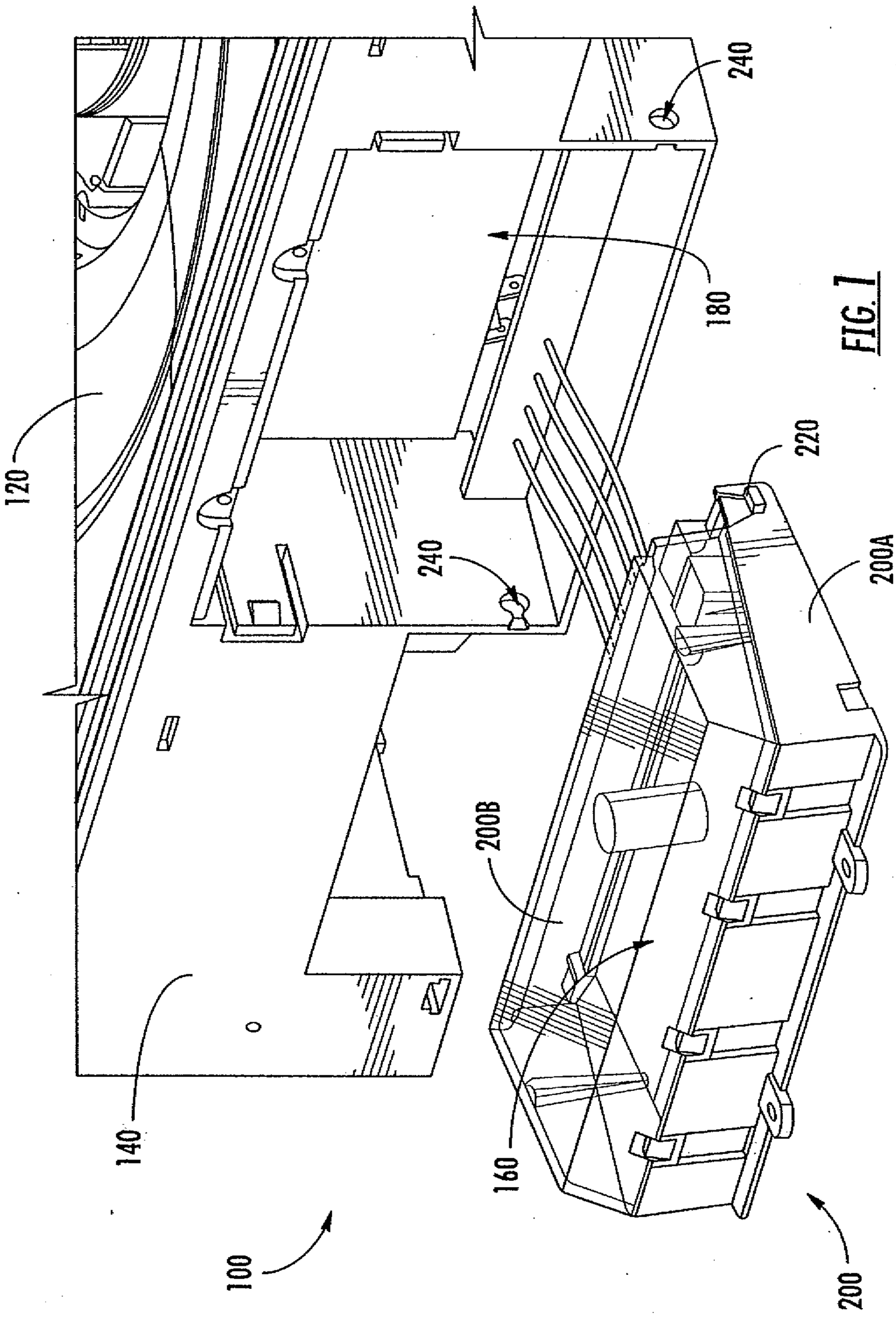


FIG. 1

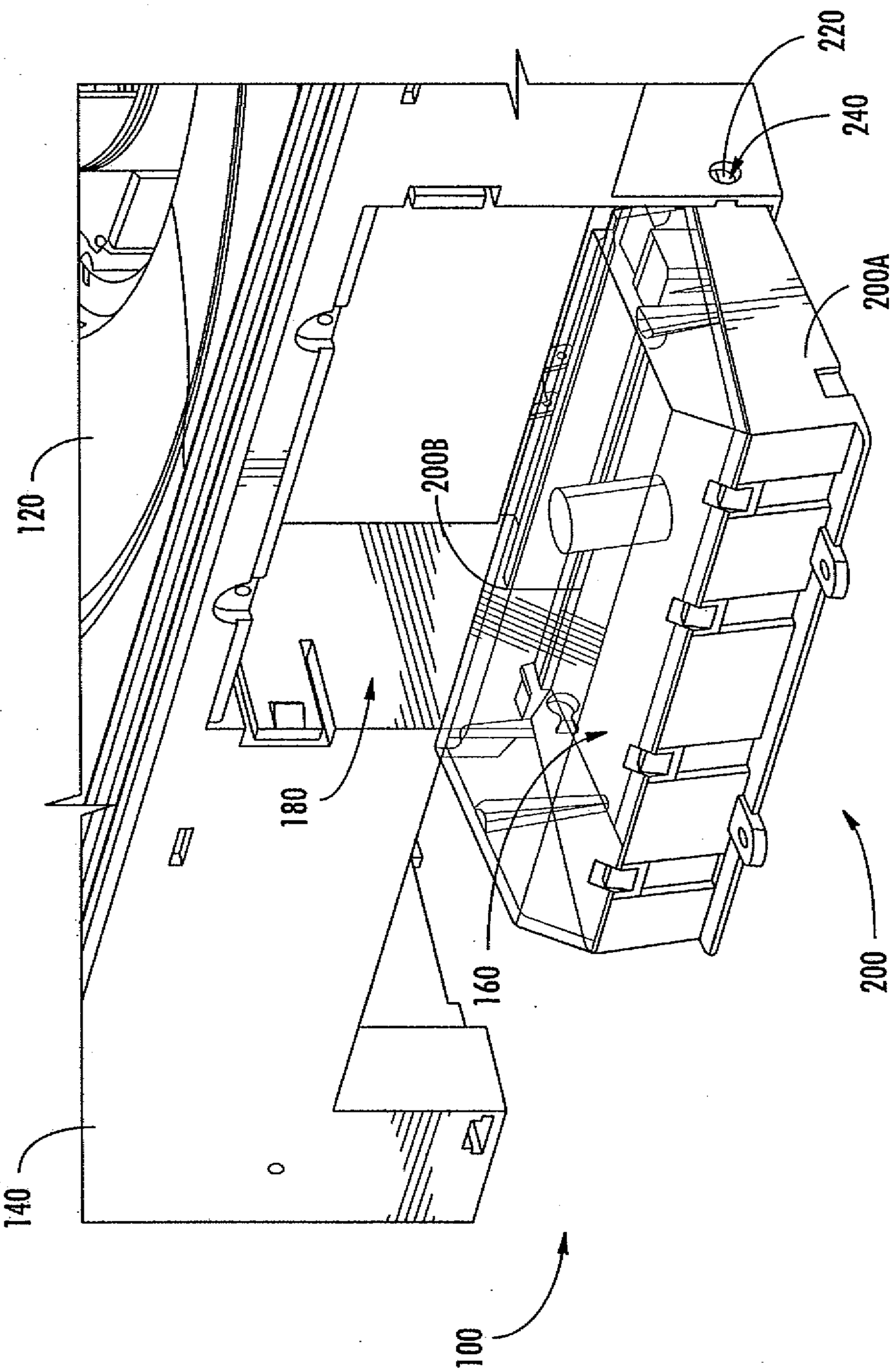


FIG. 2A

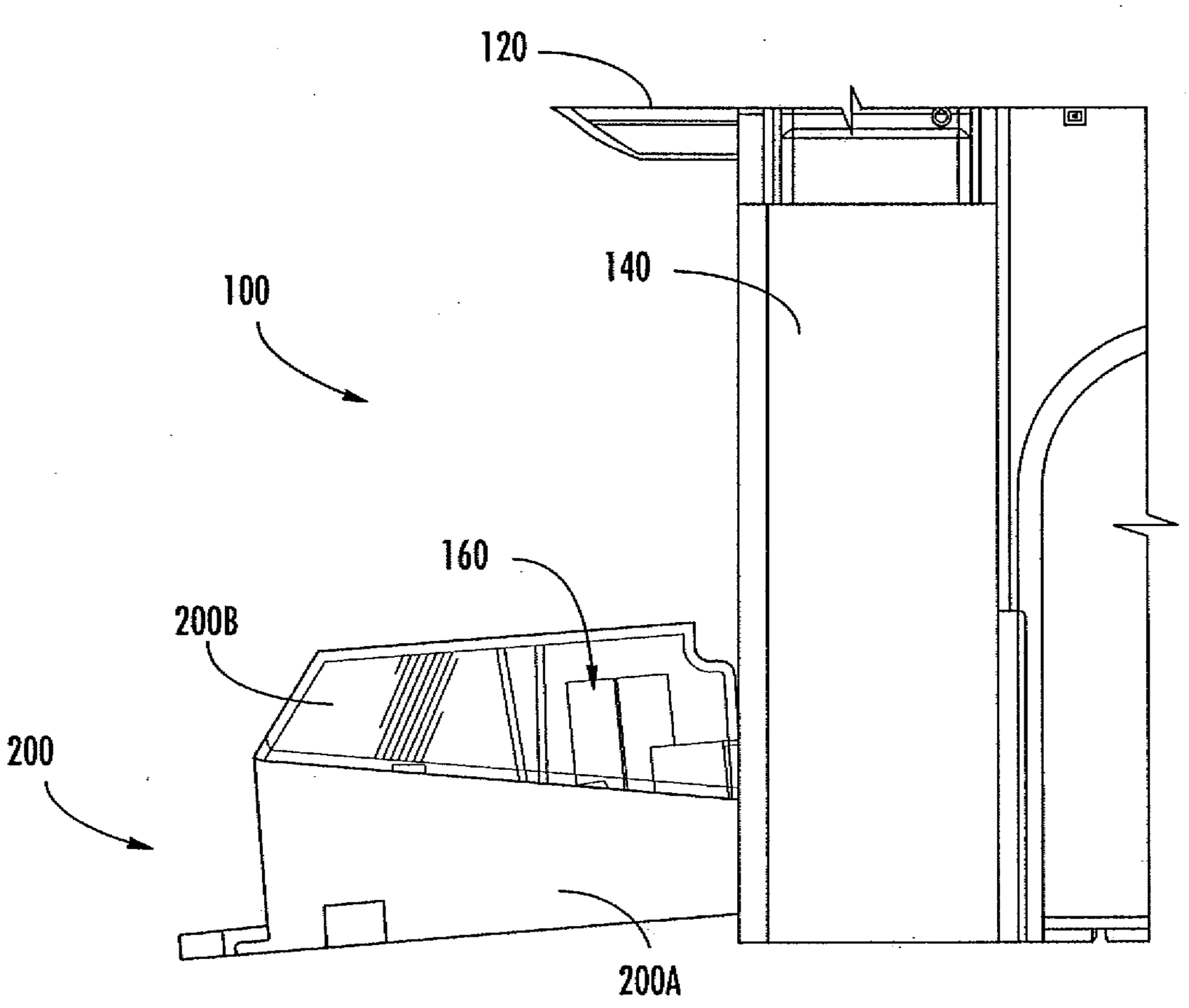


FIG. 2B

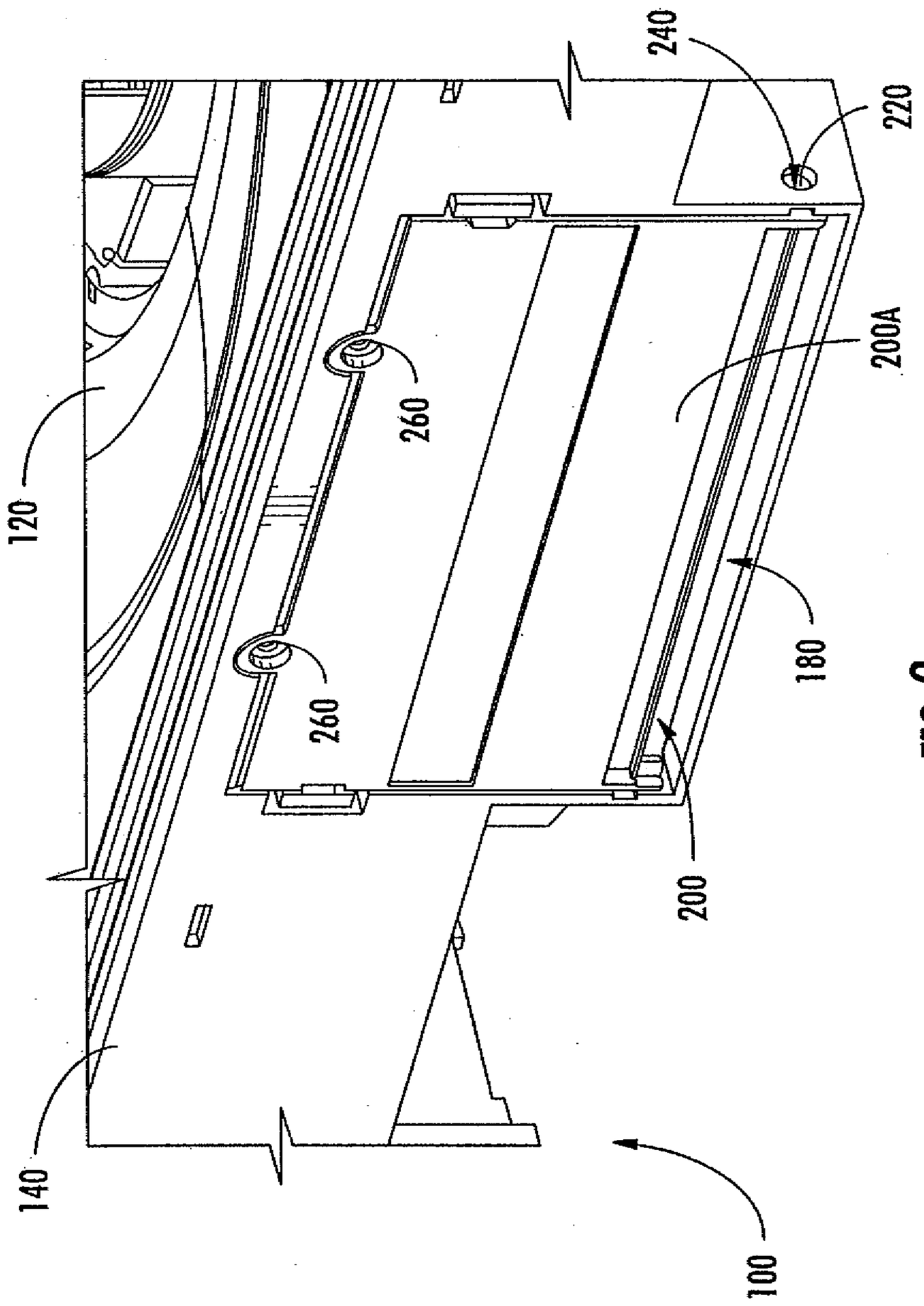


FIG. 3

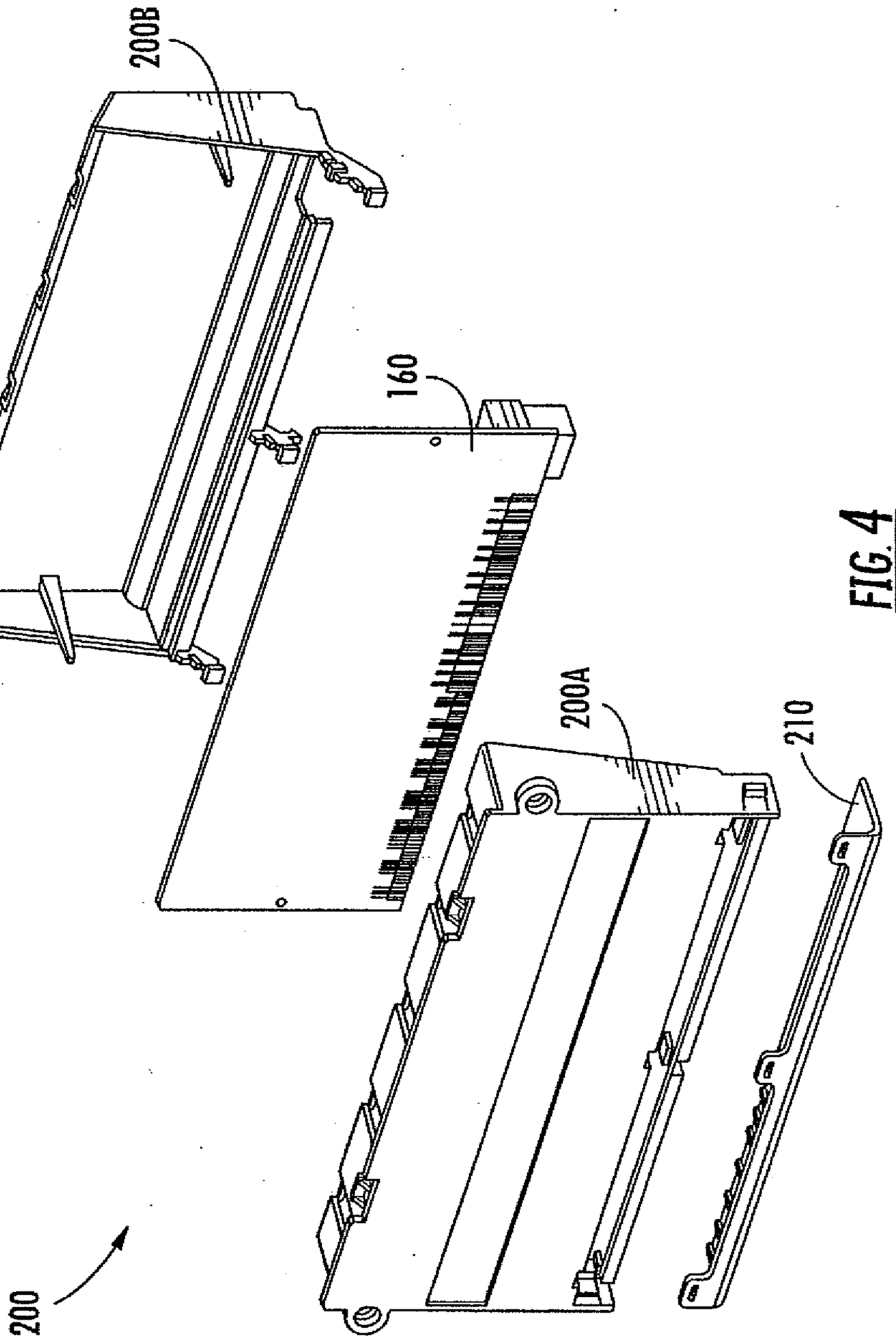


FIG. 4

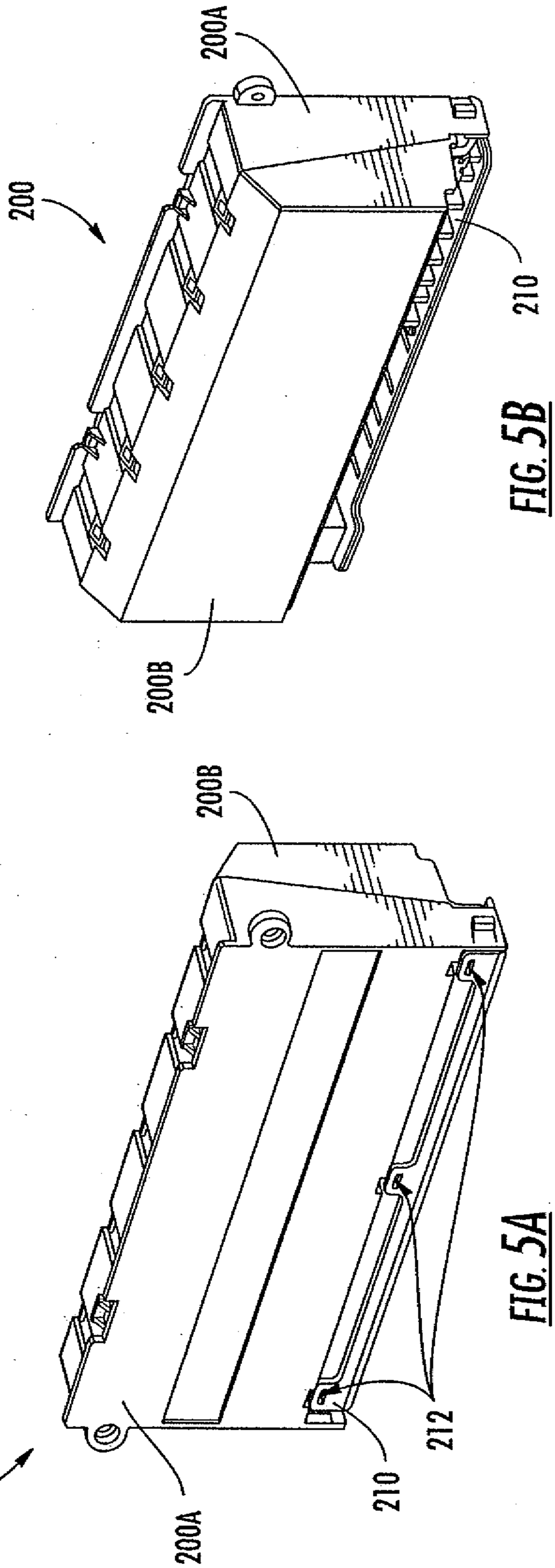


FIG. 5B

FIG. 5A

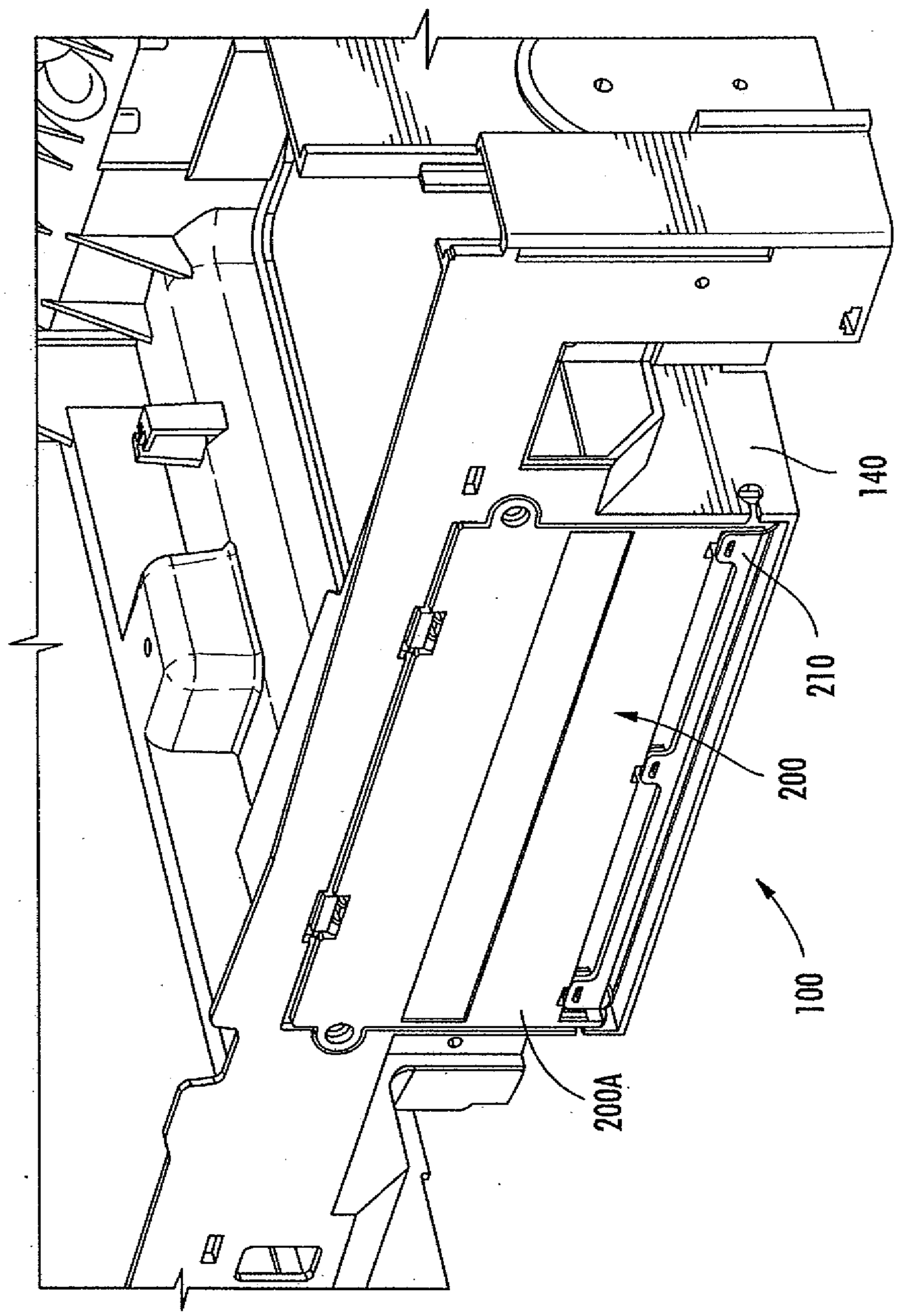


FIG. 6

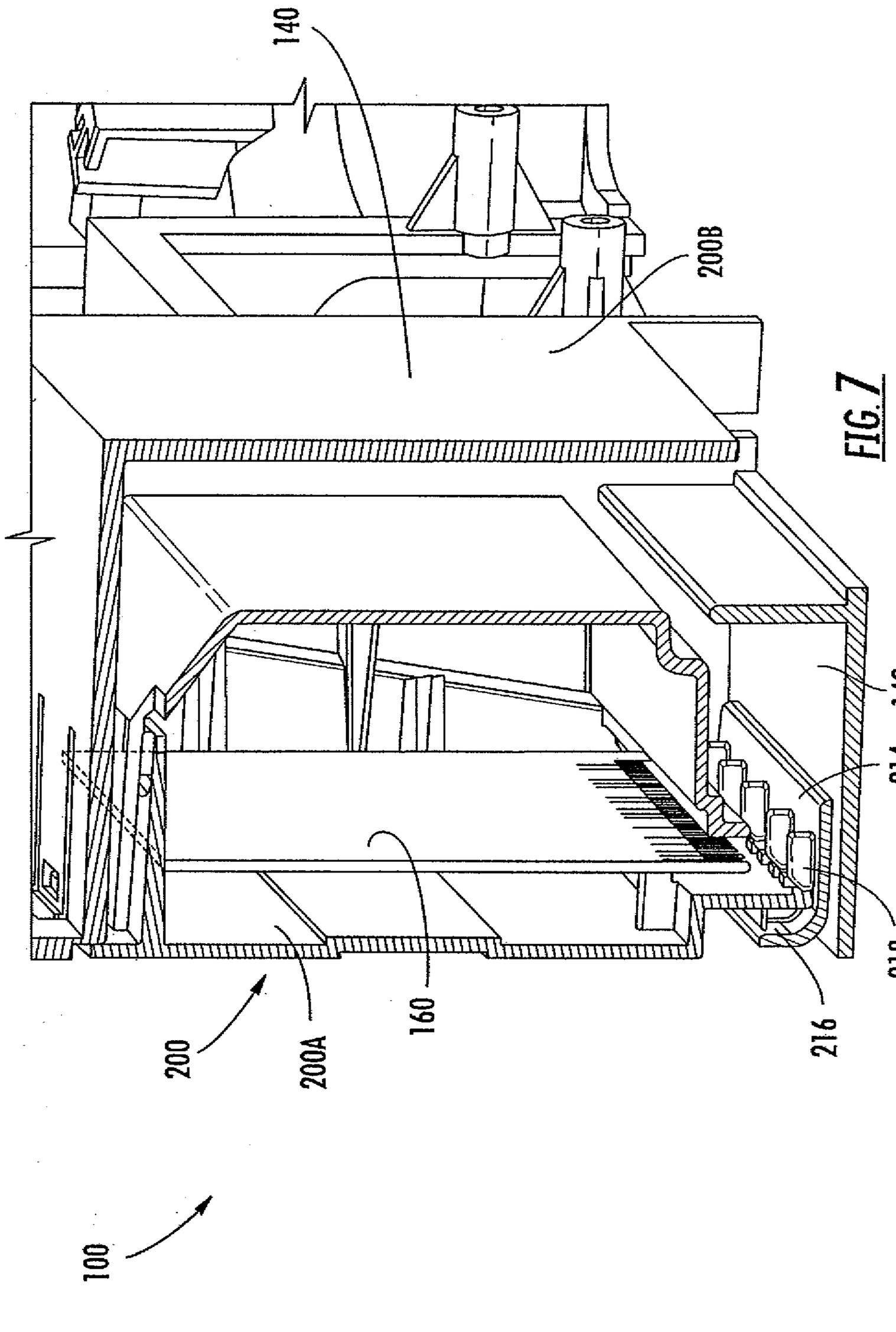
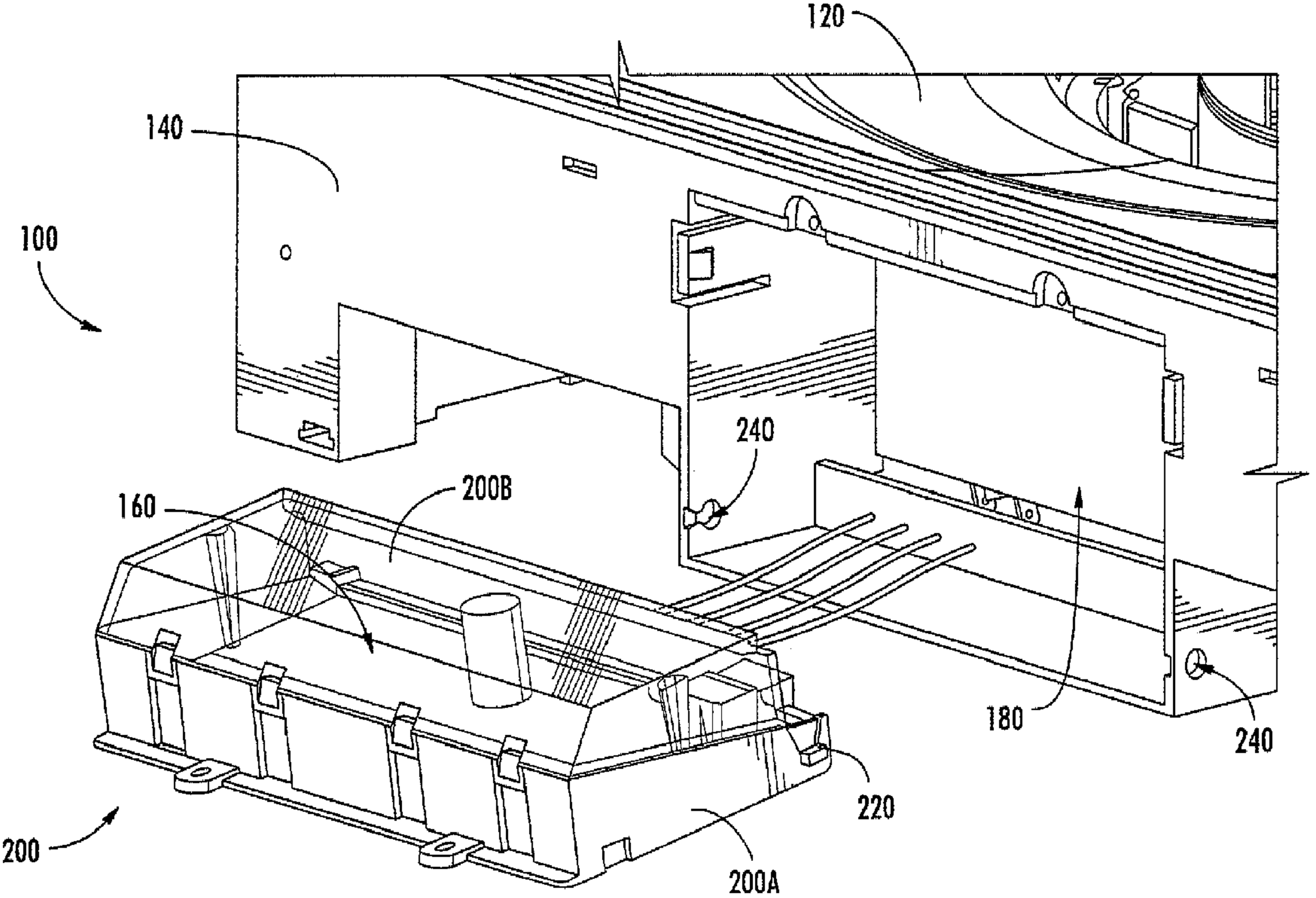


FIG. 7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