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Haney et al.

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(54) **SLIDE OUT DOOR BIN**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

4,735,470 A 4/1988 Falk
4,751,826 A 6/1988 Kawahara
(Continued)

FOREIGN PATENT DOCUMENTS

DE 20303859 U1 5/2003
DE 102011078146 A1 12/2012
(Continued)

OTHER PUBLICATIONS

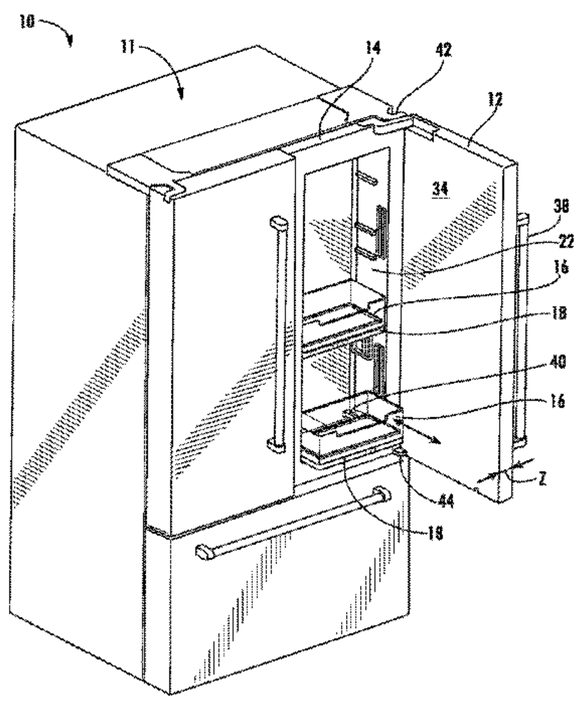
European Patent Office, "Extended European Search Report", mailed in connected with European Patent Application No. 17182661.3, dated Feb. 21, 2018, 7 pages.

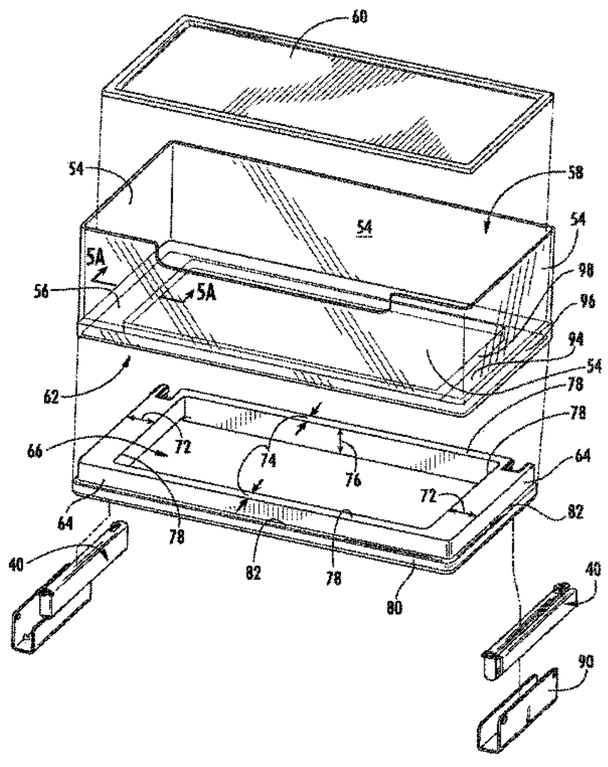
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(57) **ABSTRACT**

A refrigeration appliance door bin assembly that includes: a refrigeration appliance door bin having a substantially planar main base portion, at least one upwardly extending wall that is free of an indentation, apertures or recesses extending upward from the main base portion and a downwardly extending perimeter lip portion where the main base portion and the downwardly extending lip portion define a downwardly facing door bin frame engagement space, the door bin engagement space engages a door bin frame of a refrigerator spaced within the door of a refrigerator such that the downwardly extending lip portion surrounds an exterior portion of the door bin frame and prevents substantial movement of the door bin when the door bin is engaged with the door bin frame caused by a refrigeration appliance door opening force or a refrigeration appliance door closing force; and a refrigeration appliance door bin bottom surface cover.

20 Claims, 10 Drawing Sheets





Related U.S. Application Data

continuation of application No. 15/356,148, filed on Nov. 18, 2016, now Pat. No. 9,816,746.

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F25D 25/02 (2006.01)
F25D 23/04 (2006.01)

(52) **U.S. Cl.**
CPC ***F25D 25/024*** (2013.01); ***F25D 25/025*** (2013.01); *F25D 2323/023* (2013.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,472,974	B2	1/2009	Czach et al.	
8,424,985	B2	4/2013	Kwon et al.	
8,702,185	B2	4/2014	Chellappan	
8,894,167	B2	11/2014	Lee et al.	
8,960,824	B2	2/2015	Wilcox et al.	
9,212,848	B2	12/2015	Kendall et al.	
9,903,641	B1 *	2/2018	Shrader	F25D 25/025
10,228,183	B2 *	3/2019	Jung	F25D 11/02
2006/0244350	A1	11/2006	Martin	
2006/0250063	A1 *	11/2006	Czach	F25D 23/04 312/405.1
2006/0266070	A1	11/2006	Ertz	
2008/0168794	A1	7/2008	Cho	
2009/0302724	A1	12/2009	Allard	
2010/0019641	A1	1/2010	Laible	
2010/0270902	A1 *	10/2010	Kim	F25D 17/042 312/405.1
2012/0325827	A1	12/2012	Hauser et al.	
2013/0026900	A1	1/2013	Oh	
2014/0132143	A1	5/2014	Kim et al.	
2014/0239790	A1	8/2014	Yoo	
2014/0265800	A1	9/2014	Haltmeyer	
2014/0265807	A1	9/2014	Kendall et al.	
2014/0265808	A1	9/2014	Kendall	
2014/0312758	A1 *	10/2014	Gossens	F25D 23/04 312/404
2015/0069066	A1	3/2015	Choi et al.	
2016/0216027	A1	7/2016	Go	
2017/0082351	A1	3/2017	Jung	
2017/0219275	A1 *	8/2017	Suh	F25D 25/025

FOREIGN PATENT DOCUMENTS

EP	2336683	A2	6/2011
JP	2001104174	A	4/2001
WO	2015082272	A1	6/2015
WO	2016060456	A1	4/2016

* cited by examiner

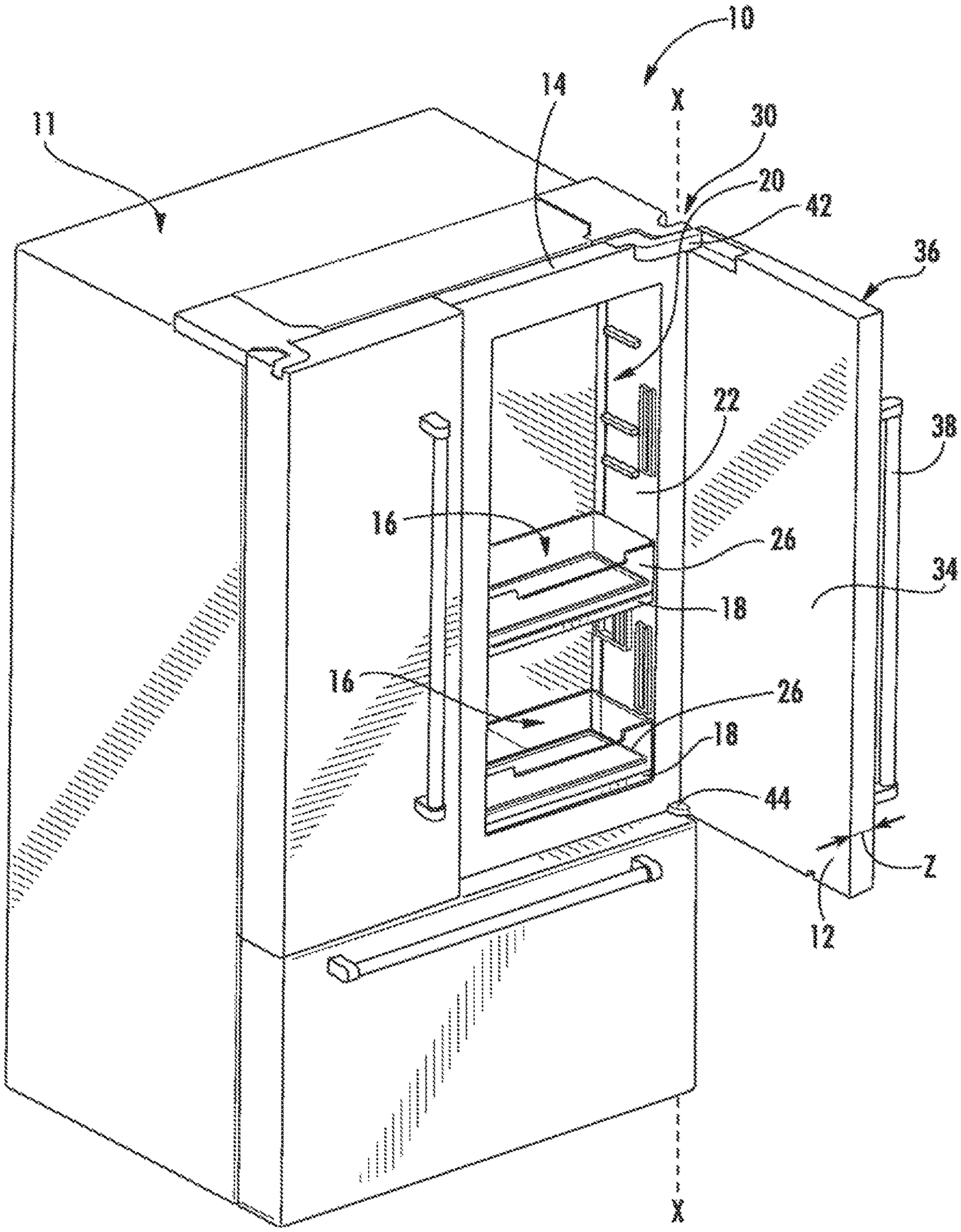


FIG. 1A

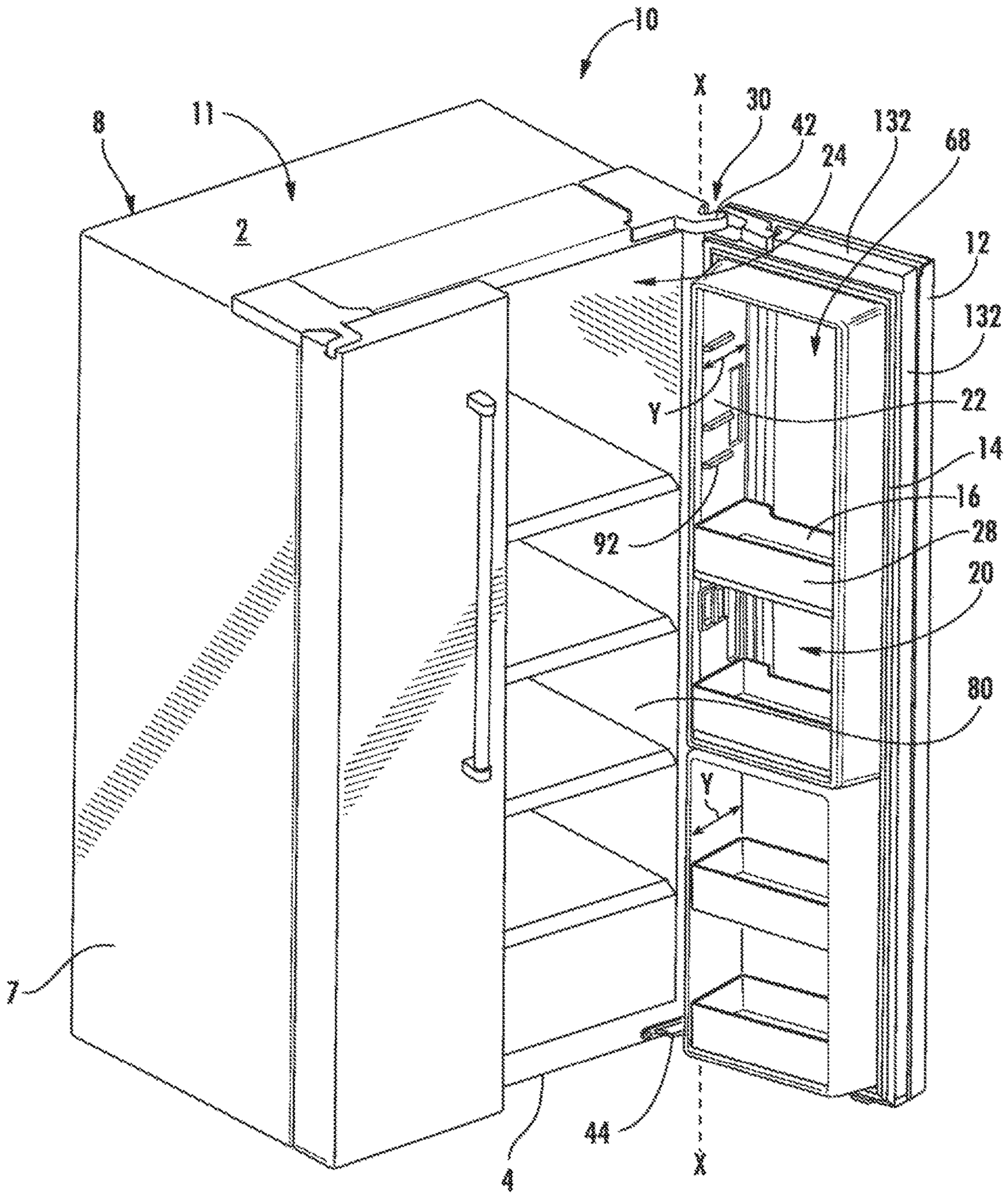


FIG. 1B

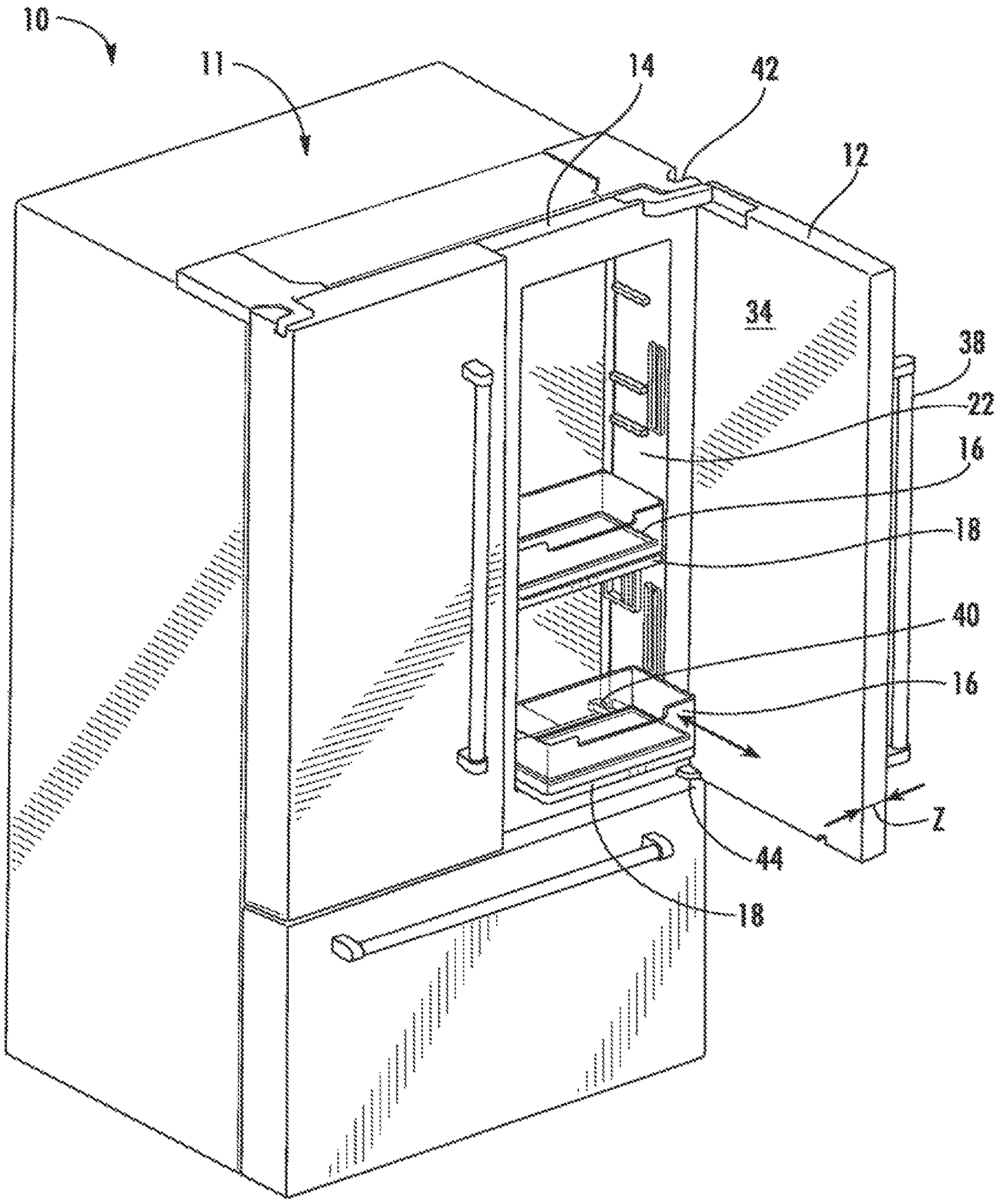


FIG. 2

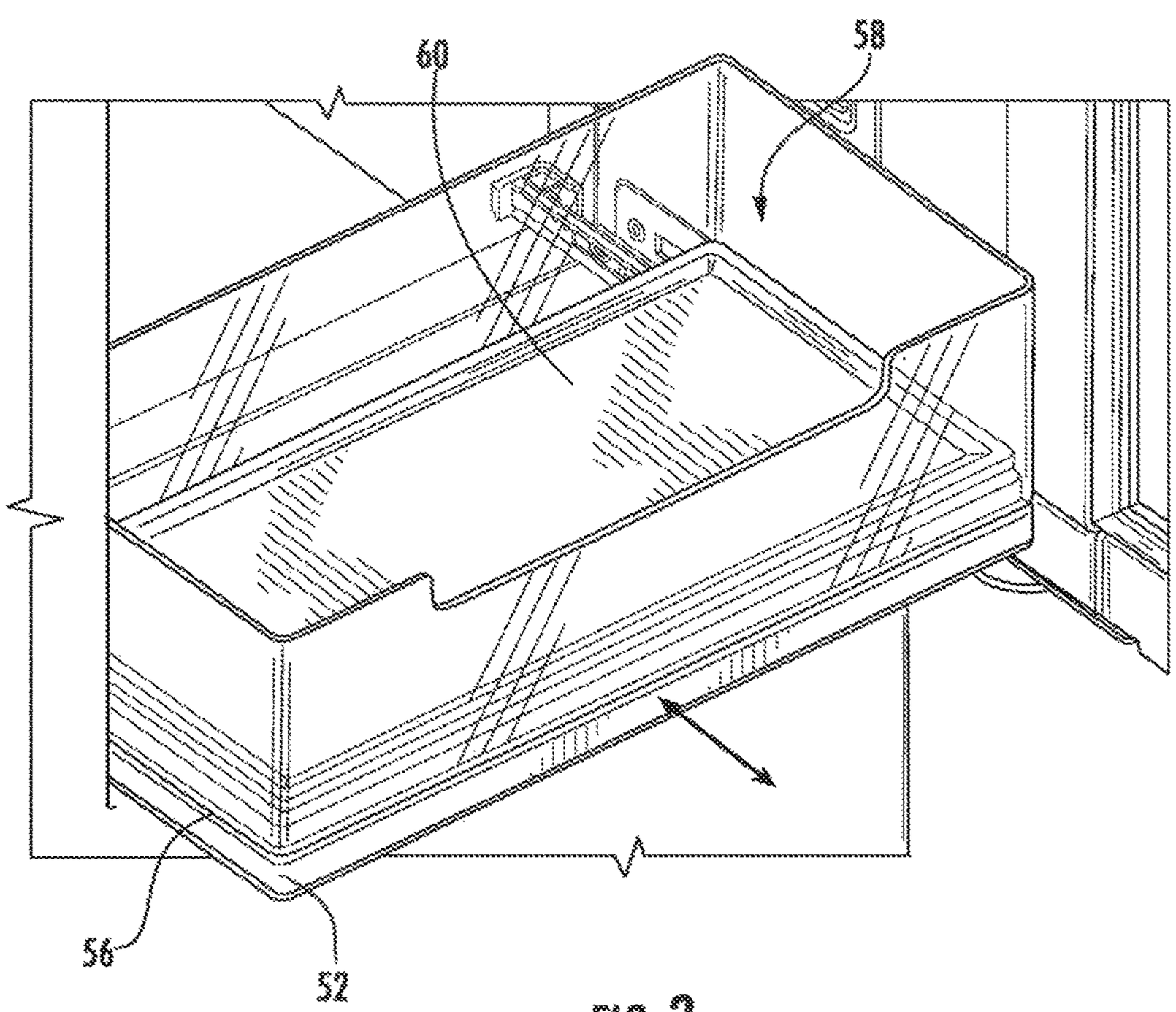


FIG. 3

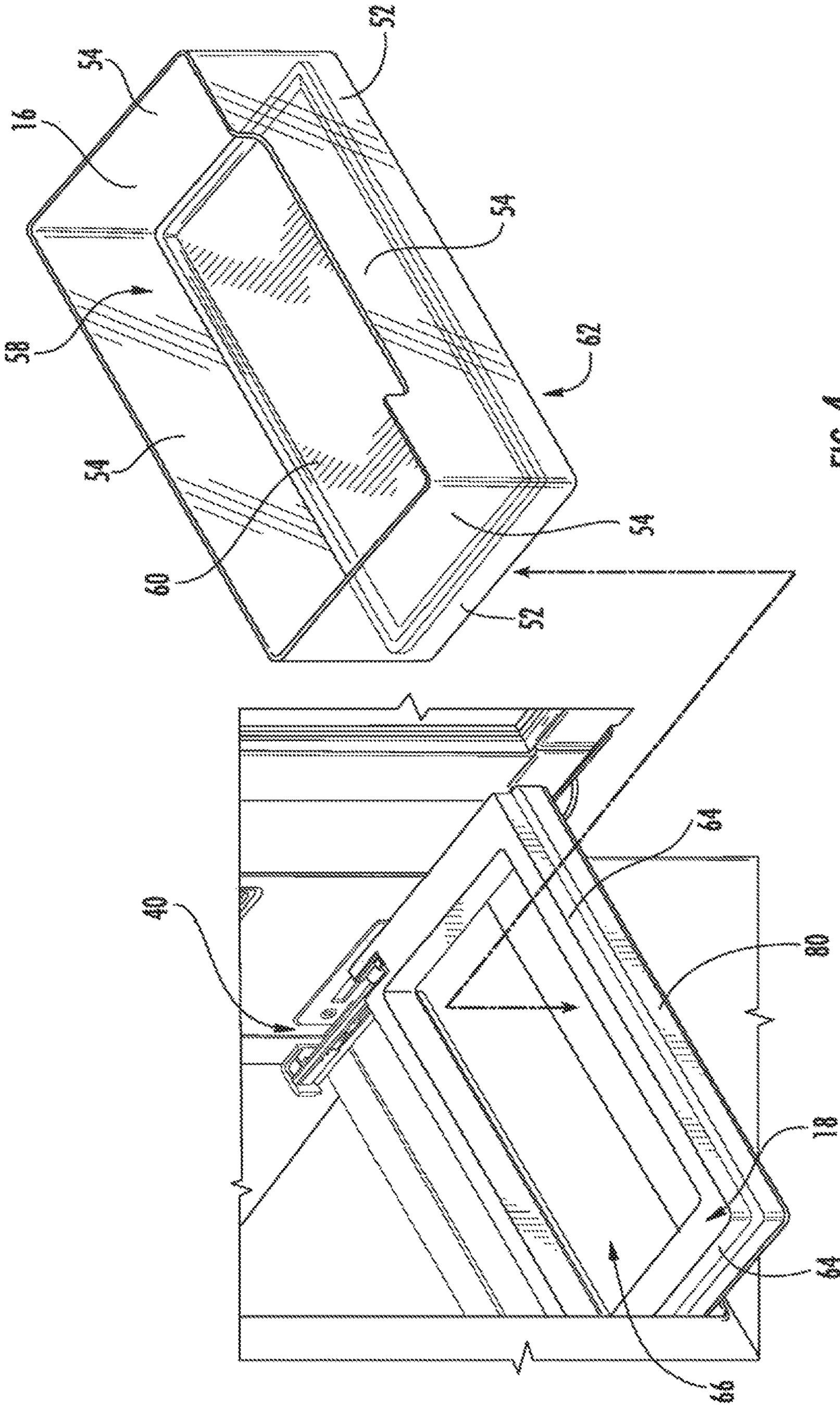


FIG. 4

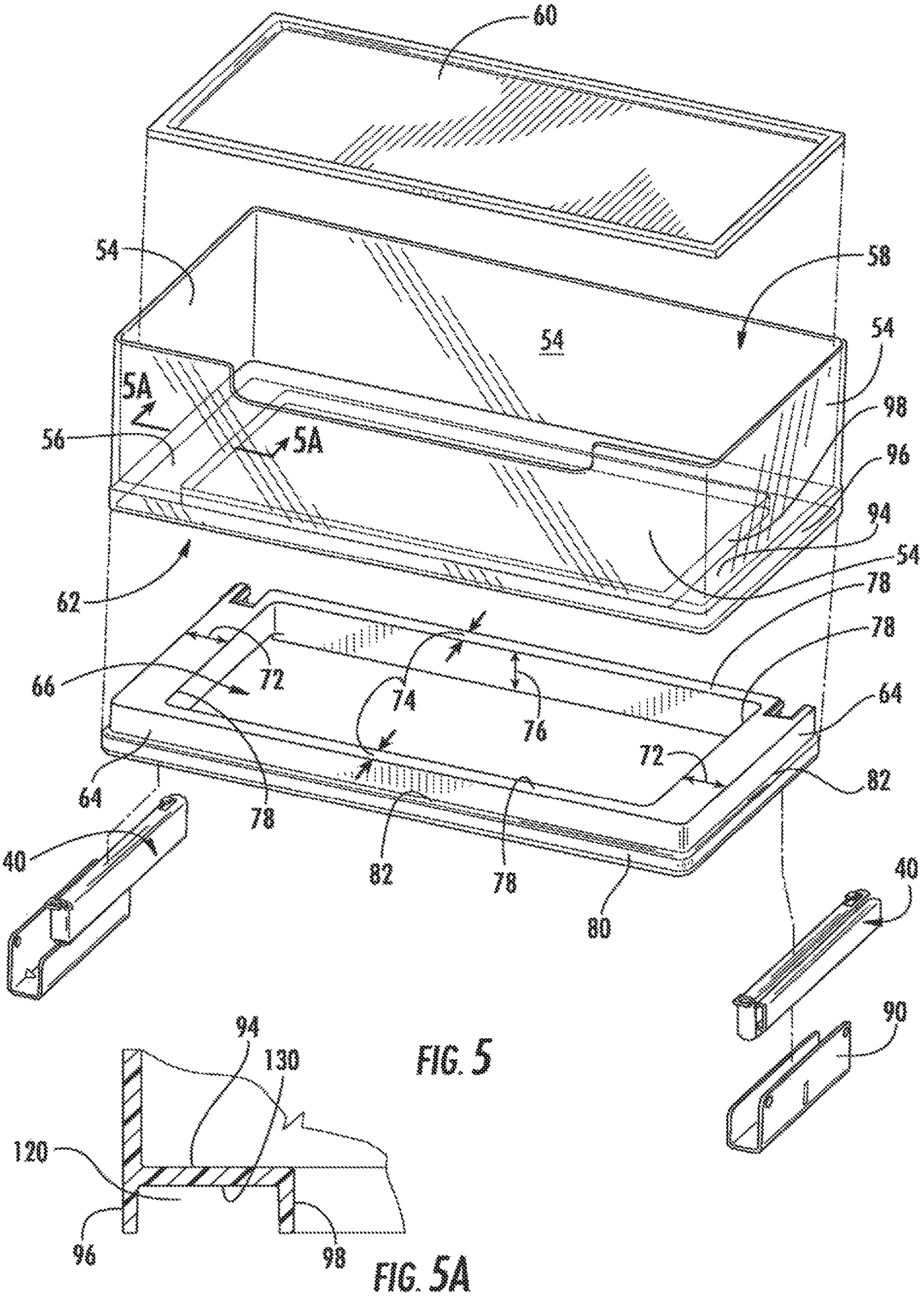

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FIG. 5

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FIG. 5A

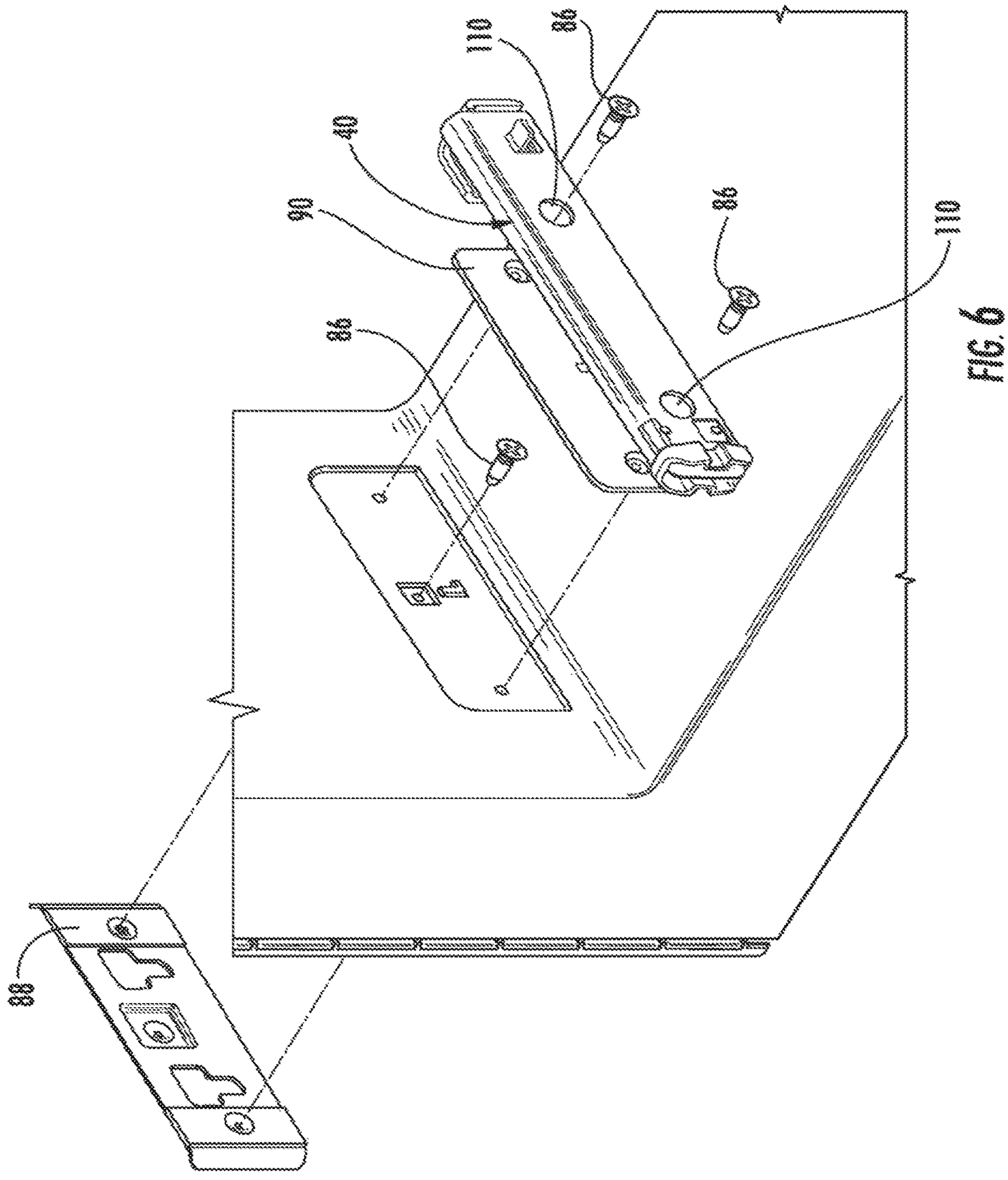


FIG. 6

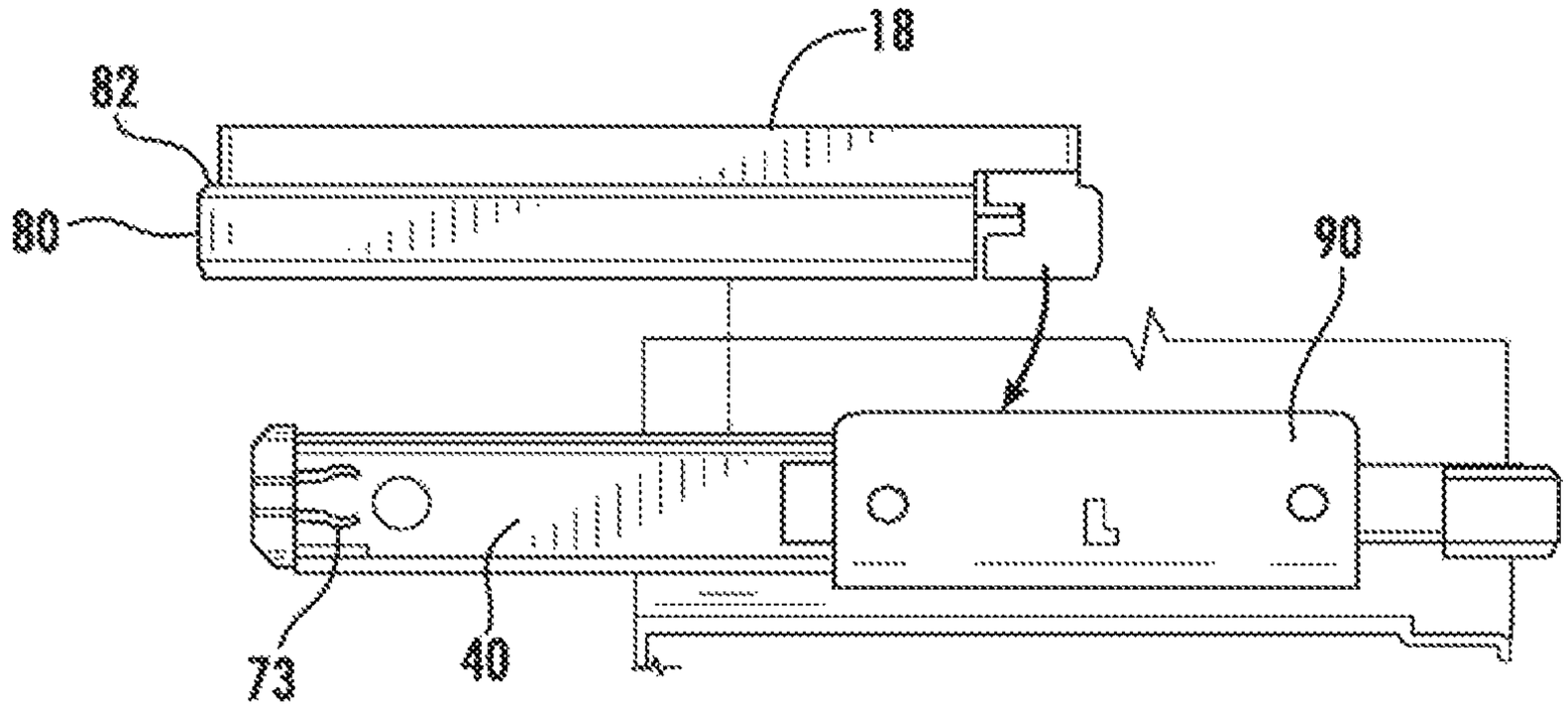


FIG. 7A

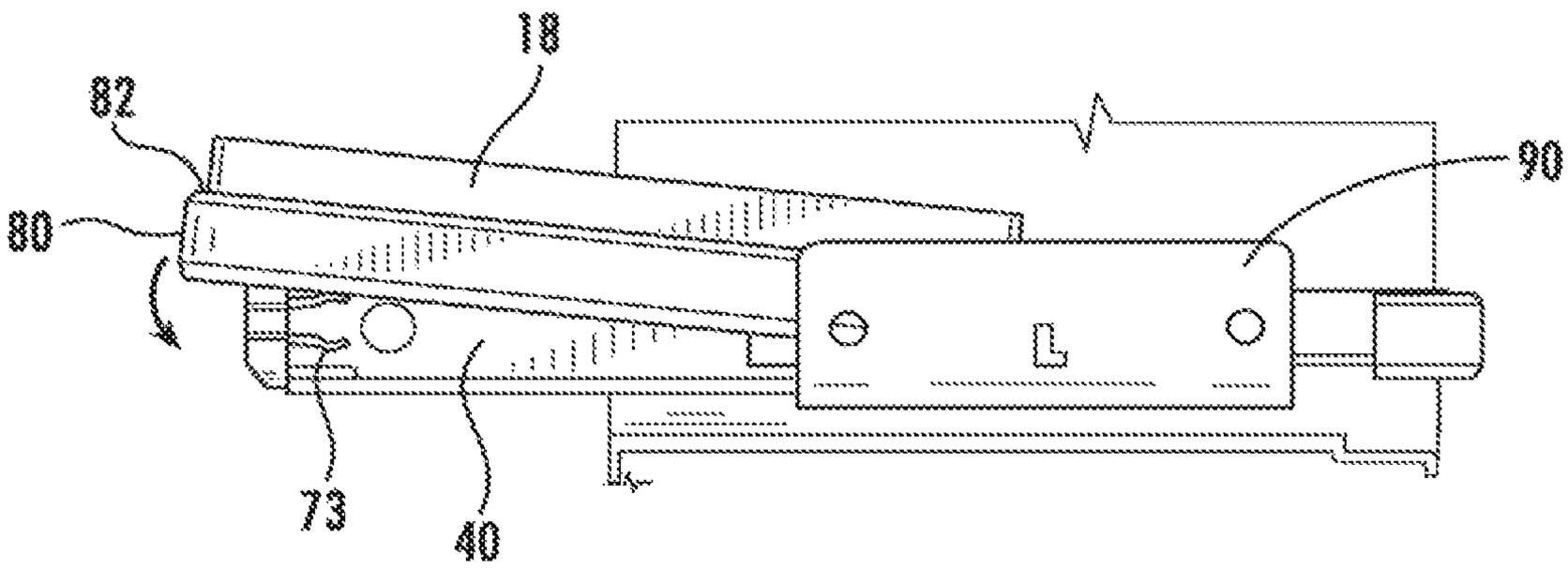


FIG. 7B

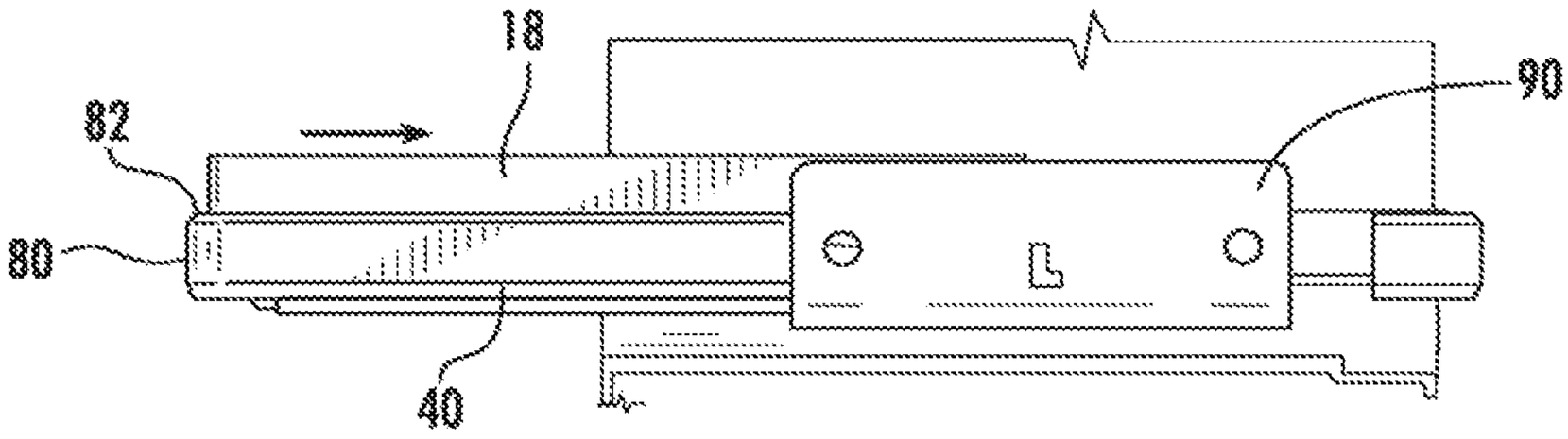


FIG. 7C

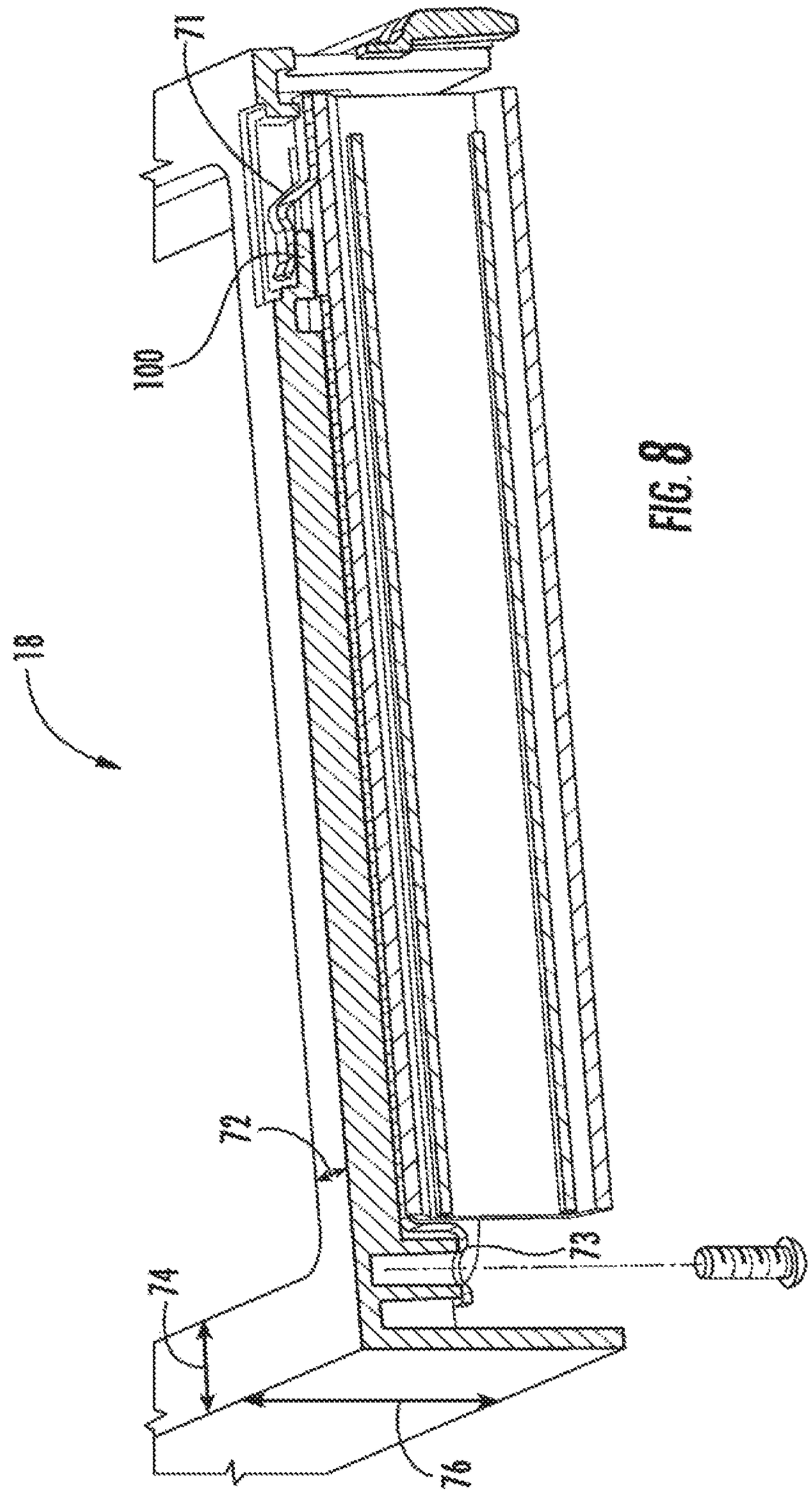
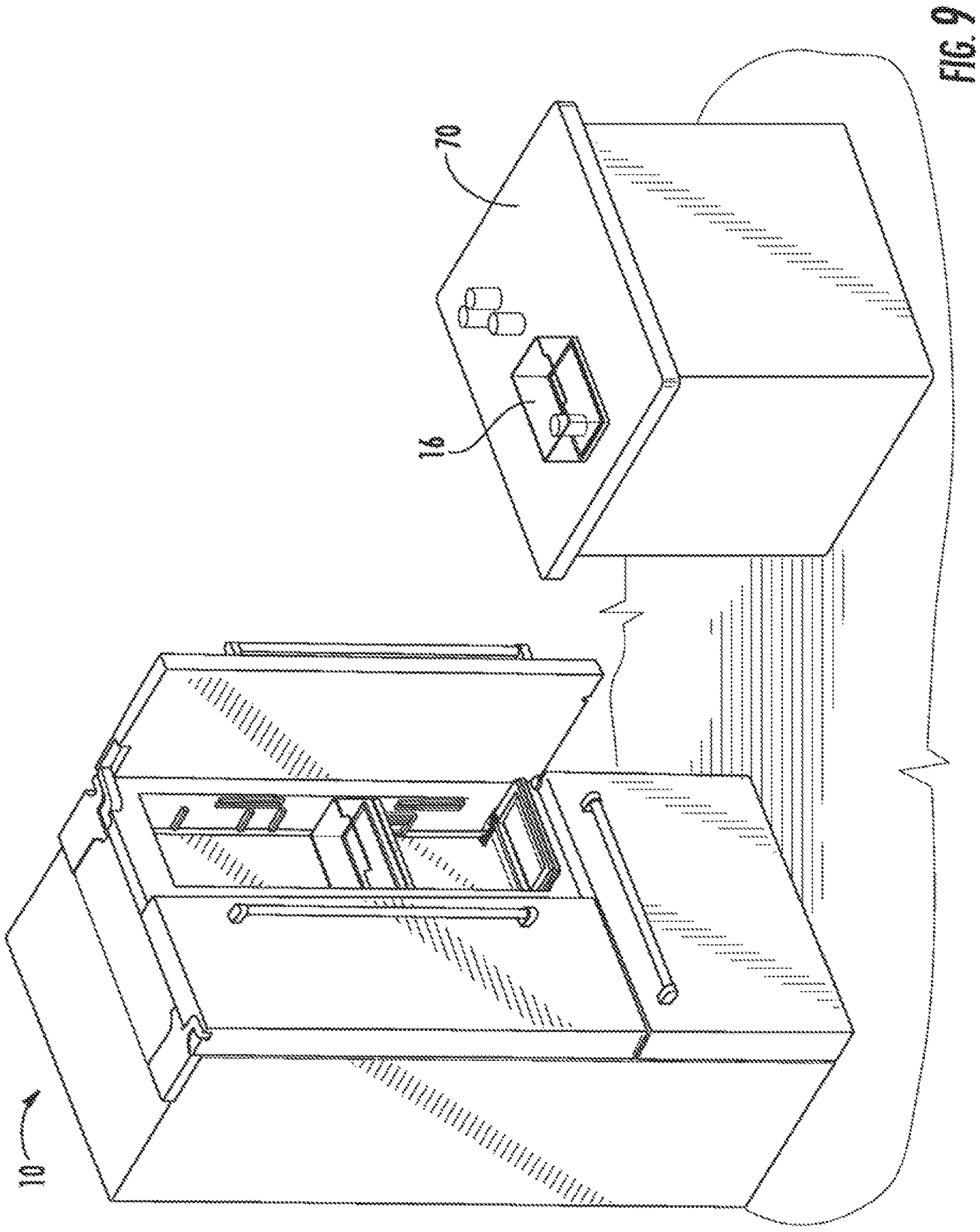


FIG. 8


FIG. 9
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SLIDE OUT DOOR BIN

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation of and claims priority to U.S. patent application Ser. No. 15/724,801, filed on Oct. 4, 2017, entitled "SLIDE OUT DOOR BIN," pending, which is a continuation of U.S. patent application Ser. No. 15/356,148, filed on Nov. 18, 2016, entitled "SLIDE OUT DOOR BIN," now U.S. Pat. No. 9,816,746, the disclosures of which are hereby incorporated herein by reference in their entirety.

BACKGROUND

Refrigerators are an essential part of kitchens around the world. Refrigerators are known in the art to have cooled storage chambers for preserving food, drinks, and other items that require cooling. These appliances typically provide multiple compartments for cooling items at different temperatures such as one or more refrigerator compartment and one or more freezer compartment. Within the compartment are specific storage areas such as crisper, baskets, shelves and door bins.

Door bins typically contain frequently used items such as drinks and condiments that may come in oddly shaped bottles. One type of refrigerator uses door bins that are fixed to the inner side of the door. In order to access the contents of a door bin users must open the door and remove the desired items, then transfer them to a flat surface like the table or counter. In another system the door bin may be accessed through a second outer door while the main refrigerator compartment door remains closed. The door bins of this type of system may include a solid base with upright projection that receives and engages mating indentation in the corresponding door bin. Not only do the mating indentation of the door bins take up valuable storage space within the door bin and make the door bin more difficult to clean, the door bins of these systems are constructed in a way that, when the door bin is removed and disengaged from the base to transport items in the door bin to another location (i.e. a table), the solid base remains and may appear to be a "shelf" to a user. This configuration allows users to use the solid base as a shelf. When a flat surface in such a configuration is used as a shelf, any items placed on the frame can easily fall when the outermost door of such systems is opened or closed. Items placed therein may fall out of or into the refrigerator and break or spill.

SUMMARY

One aspect of the present disclosure includes a door bin located in a main door and configured to pull out of the refrigerator through a second auxiliary door. The door bin is located on the door of an appliance and is accessible by opening the main door and by opening an auxiliary, outermost door. When accessed through the second door, the door bin may be laterally rolled/extended out and away from the standard storage position within the door, typically being a pair of glides. The door bin may also disengage the door of the refrigerator by hand and without the use of tools.

Yet another aspect of the present disclosure is generally directed to a refrigeration appliance door bin assembly that includes a refrigeration appliance door bin and a refrigeration appliance door bin bottom surface cover. The refrigeration appliance door bin includes: a substantially planar main base portion, at least one upwardly extending wall that is free of an indentation, apertures or recesses extending upward from the main base portion surrounding and thereby defining an interior volume of the refrigeration appliance door bin where the interior volume is sized to fit within a sub-volume within a larger volume of a door where the larger volume of the door is defined by a top wall, a bottom wall and two side walls of the door; and a downwardly extending perimeter lip portion. The main base portion and the downwardly extending lip portion define a downwardly facing door bin frame engagement space and the main base portion establishes the door bin frame cavity upper surface and the downwardly extending lip portion establishes an exterior surface of the door bin frame engagement space. The door bin engagement space engages a door bin frame of a refrigerator spaced within the door of a refrigerator such that the downwardly extending lip portion surrounds an exterior portion of the door bin frame and prevents substantial movement of the door bin when the door bin is engaged with the door bin frame caused by a refrigeration appliance door opening force or a refrigeration appliance door closing force. The refrigeration appliance door bin bottom surface cover is removably engaged with the refrigeration appliance door bin's substantially planar main base portion and spaced within the interior volume of the refrigeration appliance door bin. The refrigeration appliance door bin bottom surface cover is removable by hand and without the use of tools from the interior volume of the substantially planar main base portion. The refrigeration appliance door bin bottom surface cover covers at least one recess or aperture on a bottom of the refrigeration appliance door bin and the refrigeration appliance door bin bottom surface cover is engaged with at least a portion of the substantially planar main base portion.

A further aspect of the present disclosure is generally directed to an appliance that includes: a door bin frame further comprising at least one door bin frame support member that extends around and defines an aperture; and a door bin that includes: a substantially planar main base portion; an upwardly extending wall section extending upward from the substantially planar main base portion that surrounds and defines an interior volume of the door bin; and a downwardly extending perimeter lip portion. The main base portion and the downwardly extending lip portion define a downwardly facing door bin frame engagement space and the main base portion establishes the door bin frame cavity upper surface and the downwardly extending lip portion establishes an exterior surface of the door bin frame engagement space; the door bin engagement space engages a door bin frame of a refrigerator spaced within the door of a refrigerator such that the downwardly extending lip portion surrounds an exterior portion of the door bin frame and prevents substantial movement of the door bin when the door bin is engaged with the door bin frame caused by a refrigeration appliance door opening force or a refrigeration appliance door closing force; wherein the upwardly extending wall section is free of indentations or recessed portions configured to mate with a portion of an appliance and that project into the interior volume of the bin. The appliance cabinet has an interior storage area defined by at least a first side wall, a second side wall, a back wall, and a rotatably connected door system that includes a main cabinet door and an exterior door. The main cabinet door provides user access to the interior storage area of the appliance cabinet and wherein the exterior door provides access to the door bin when positioned within the rotably connected door system, but not unobstructed access to the interior storage area. The sliding mechanism assembly includes an interior

facing bracket mounted to at least an interior facing surface of the main cabinet door and slidably engaged to a sliding mechanism, allowing the door bin to extend linearly outward.

Yet another aspect of the present disclosure includes a method for removing a door bin from a door frame where the method includes the steps of: providing a refrigerator comprising a cabinet, a main cabinet door for allowing access to an interior volume of the cabinet, wherein the main cabinet door defines an interior door volume and an exterior door that provides access to the interior door volume; selectively opening the exterior door such that a side of a door bin spaced with the interior door volume faces a user of the refrigerator or opening the main cabinet door such that an opposite side of the door bin faces the user of the refrigerator; sliding the door bin away from the interior of the cabinet when the exterior door is open, the door bin being removably engaged to a door bin frame attached to a sliding mechanism disposed within the interior door volume; and lifting the door bin by hand and without the use of tools from the door bin frame to disengage the door bin from the door bin frame and remove the door bin from the refrigerator. The method may also include the step of setting the bin on a surface that is not part of the refrigerator to provide convenient access to the door bin and the contents of the door bin. The door bin has a substantially rectangular cuboid shape where the sides of the door bin are free of any indentation, aperture or recess that mates with or engages a movable portion of an appliance.

The removable door bin systems of the present disclosure may also include a door bin with an interior volume that is defined by a planar base portion and at least one upwardly extending wall section that extends up from the planar base portion. The removable bin system also typically includes a door bin frame that can be connected and disconnected from the door bin and the door bin retained in engagement with the door bin frame using a downwardly extending lip portion of the door bin. The downwardly extending lip portion extends down from the planar base section of the door bin to create an engagement space that is sized to snugly surround an exterior portion of the door bin frame thereby preventing substantial lateral movement of the door bin when the door bin is connected with the door bin frame. Furthermore, the door bin frame defines a perimeter around at least one aperture. The aperture is typically sized to prevent users from placing items on the door bin frame when the bin is removed and may also prevent the user from perceiving the door bin frame as a shelf. Such a feature prevents items from being placed on the frame and falling into the refrigerator or out of the refrigerator due to the force of the outermost door on the main cabinet door being opened or closed.

The door bin may include a door bin bottom surface cover that is sized and shaped to cover any apertures in the bottom of the door bin frame. The bottom surface cover can be a plastic plate with a wooden finish to give the door bin an elegant look. Other finishes, such as a metallic or clear finish would also be possible.

In addition, at least the upwardly extending side wall sections of the door bin are free of indentations or recessed portions configured to mate with a portion of an appliance that project into the interior volume of the bin. Typically all upwardly extending wall sections of the door bin are free of indentations or recessed portions configured to mate with a portion of an appliance that project into the interior volume of the bin. In fact, all upwardly extending wall sections are typically free of any kind of indentation or recessed portions or apertures. This design allows the door bin to fit snugly within the door of the appliance while maximizing storage space within the bin and the interior volume of the appliance. In addition, the flat walls provide a more elegant look and easier to clean food, beverage or other debris than walls with a recessed portion.

The appliance door bin may be used in several applications. It may have use areas outside of refrigeration, like tool boxes, shelving, and file cabinets. The present disclosure should not be understood to be limited to use solely in a refrigerator or other appliance.

Another aspect of the present disclosure includes the appliance and the ability of the door bin to pull and extend the bin out laterally once an auxiliary door is in the open position. The door bin is engaged with the main door, but the outer, auxiliary door also provides direct access to the door bin without the main cabinet door being opened. The auxiliary door can share a hinge with the main door and open coaxially with the main door in order to rotate in the same axis as the main door, but this is not necessarily so. Conceivably, the two doors could rotate about different axes.

An appliance typically uses the door bin described above with the optional bottom surface cover. In addition, the appliance cabinet has an interior storage area defined by at least a first side wall, a second side wall, a back wall, and a rotatably connected door system. The rotatably connected door system may include a main door to access the interior storage area, and another auxiliary door that rotates in the same axis as the main door and provides access to the door bin. A sliding mechanism, which typically consists of a bracket mounted to first door and a slidably engaged track which allows the door bin to extend linearly out of the auxiliary door by at least about forty percent of the length of the mounting bracket for the bin glides that support the door bin frame to about one hundred percent from the primary storage position to an extended position. The extended position is typically an extension of at least about 2 inches and typically from about 2 inches to about 5 inches away from the primary storage position.

These and other aspects, objects, and features of the present disclosure and claimed invention will be understood and appreciated by those skilled in the art upon studying the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1**A is a perspective view of a refrigerator with the exterior, auxiliary door open with the door bin in the door bin storage position.

FIG. **1**B is a perspective view of the refrigerator with the main cabinet door instead of the outermost door open according to another embodiment wherein the freezer compartment is located vertically next to the fresh food compartment.

FIG. **2** is a perspective view of a refrigerator with the door open according to the first embodiment in which the pull-out bin can be seen to move outwardly in the sliding trim frame from the door bin storage position to the extended position.

FIG. **3** is an enlarged perspective view of the door bin and the door bin frame.

FIG. **4** is an enlarged perspective view of the door bin and the door bin frame in the extended position with the door bin disengaged from the door bin frame.

FIG. **5** is an enlarged, partially exploded, perspective view of the door bin in which the bottom surface cover has been removed from the door bin base and the door bin disengaged from the door bin frame.

FIG. **5**A is a cross-section taken along line **5**A-**5**A in FIG. **5**.

FIG. **6** is an enlarged, partially exploded, perspective view of the sliding mechanism and the exterior and interior mounting brackets.

FIG. **7**A is an elevated and partially exploded side view of the sliding mechanism and bracket with the door bin frame disengaged from the sliding mechanism.

FIG. **7**B is an elevated and partially exploded side view of the door bin frame beginning to be engaged with the sliding mechanism where the rearward side of the frame is initially engaged and the overall frame is positioned at an angle to the plane of the sliding mechanism.

FIG. **7**C is an elevated and partially exploded side view of the sliding mechanism engaged with the door bin frame after having been rotated downward and into at least a snap-fit or fastened engagement with the sliding mechanism.

FIG. **8** is a cross-sectional view of a side of the door bin frame engaged with the sliding mechanism.

FIG. **9** is a perspective view of a refrigerator employing the slide out door bin showing how the door bin may be removed and carried to another surface such as a dining or food preparation surface.

DETAILED DESCRIPTION OF EMBODIMENTS

Before the present disclosure is described further, it is to be understood that the present disclosure is not limited to the particular embodiments of the disclosure described below, as variations of the particular embodiments may be made and still fall within the scope of the appended claims. It is also to be understood that the terminology employed is for the purpose of describing particular embodiments/aspects, and is not intended to be limiting. Instead, the scope of the present invention will be established by the appended claims.

Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates otherwise, between the upper and lower limit of that range, and any other stated or intervening value in that stated range, is encompassed within the invention. The upper and lower limits of these smaller ranges may independently be included in the smaller ranges, and are also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either or both of those included limits are also included in scope of the present disclosure.

In this specification and the appended claims, the singular forms "a," "an" and "the" include plural reference unless the context clearly dictates otherwise.

For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the orientation shown in FIG. **1**A. However, it is to be understood that various alternative orientations are also within the scope of the present disclosure, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

Referring to FIGS. **1**A and **1**B, reference numeral **10** generally designates a refrigeration appliance **10**. As shown in FIG. **1**B, a cabinet interior volume **24** may be defined by a top wall **2**, a bottom wall **4**, a first side wall **6**, a second side wall **7**, a back wall **8**, and a first door **14**, which is a main, fresh food compartment or, less frequently, a freezer compartment access door. Cabinet interior volume **24** is located inside of cabinet **11** of refrigerator **10**. FIG. **1** shows a French-door bottom mount configuration for a refrigerator, but it should be known to those within the art that this disclosure could apply to any number of refrigerator configurations such as side-by-side (see FIG. **1**B), top-mount, bottom-mount, or any other configuration. In fact, the present disclosure should not be limited to an appliance, but the pull-out door bin could conceivably be used for a door bin spaced within any door with a main and secondary door access to allow access to both the front and back of the door bin depending upon which door is open.

The refrigerator **10** may have a fresh food compartment with a normal operating temperature above about 32° F. and a freezer compartment with a normal operating temperature of about 32° F. or below to hold foodstuffs, ice, or anything else that needs to be refrigerated at certain temperatures. The refrigerator may also have a door(s) **12** that provides selective access to the interior of the fresh food compartment or the freezer compartment, but does not open the first door to the fresh food compartment or freezer compartment. The refrigerator may also employ solely fresh food compartments or solely freezer compartments. Additionally, the appliance may have a single fresh food compartment or a single freezer compartment along with one or more main door **14**. As seen in FIG. **1**B, the door(s) **14** may have an inner liner that defines door interior volume **20** for the placement of storage devices such as bins **16**, drawers, or the like. The door interior volume **20** may be isolated from the cabinet interior volume **24** having a separate duct to cool interior volume **20**, the interior volume **20** may be not isolated and without any separate cooling, or any combination thereof. The doors **12** may be attached to the cabinet **11** via a hinge(s) **42**, **44** disposed on the top and/or bottom of the doors **12**. The hinges **42**, **44** may be attached to the doors **12**, **14** and rotationally coupled with the cabinet **11**, or attached to the cabinet **11** and rotationally coupled with the doors **12** to allow the doors to rotate about an axis X (FIG. **1**A) with respect to the cabinet **11** and allow a user access to the interior **24** of the cabinet **11** and to the interior volume **20** of the doors **12**, **14**.

Still referring to FIG. **1**A, door bin(s) **16** may be located on a first door **14** in the interior volume **20** of the first door **14** between two upwardly extending and at least substantially parallel sides **22**. There may be a second door **12**, which is a door bin access door that does not allow unimpeded access to the fresh food compartment, disposed on first door **14**. Second door **12** may be disposed coaxially with first door **14**, but it should be known that first door **14** may also rotate about a second axis that may be parallel with, but at a spaced apart distance from the main door axis of rotation, or may be oblique to the main door axis of rotation. Door bin **16** may be disposed between first door **14** and second door **12**. Front side **26** of door bin **16** can be accessed without opening first door **14** and allowing cooled air within the fresh food compartment to mix with ambient air by instead opening second door **12** to the front back side **26** of door bin **16** (FIG. **1**B). Second door **12** provides easy access to door bin **16** and its contents and facilitates removal

of door bin **16**. First door **14** remains fixed while door bin **16** is rolled out and removed.

First door **14**, shown according to one embodiment in FIG. **1**B, may be generally rectangular with a perimeter portion **132** having a thickness Y of from about 1 inch to about 2 inches and a handle in FIB. **1**B to open the first door **14** alone or in conjunction with second door **12**. A first corner (the upper right corner of the door when closed as shown in FIG. **1**B) of first door **14** may connect to top hinge **42** and a second corner (bottom right corner of the door when closed) of first door **14** may connect to bottom hinge **44** allowing first door **14** to rotate about axis X. Alternatively, first door **14** may rotate about separate hinges from second door **12**. For example, the first door **14** may be mounted to the cabinet **11** with a top hinge and a bottom hinge and a second top hinge and a second bottom hinge may connect first door **14** and second door **12**.

As shown in FIG. **1**A, second door **12** may have front side **36** that faces outward and back side **34** that faces the interior volume **24** of the refrigerator **10**. Door bin **16** may engage bin mounting protrusions **92** having a generally rectangular shape and constructed of plastic or other material. Bin mounting protrusions **92** may be formed on or engaged with door side wall **22** on an interior surface of the bin mounting protrusions **92** and may taper to a narrower cross section moving from the second door back side **34** toward the cabinet interior volume **24**. The tapered shape may function as a stopper for door bin **16**, so it may only roll out in one direction. In addition, the shape of the bin mounting protrusions may be rectangular, and the stopping function may be served with rubber stoppers or any other method known in the art. First door **14** may be made of a plastic or other insulating material to resist temperature change inside the refrigerator **10**. First door **14** may be transparent, translucent, or opaque with a stainless steel, colored, or some other finish.

Second door **12** may be generally rectangular with a thickness Z of from about 0.5 inch to about 1.5 inches and be constructed of plastic with foam or other thermal insulation. The second door may also be constructed using any other materials or combination of materials known in the art such as those necessary to form a clear glass door to allow visual inspection of the door bin when second door **12** is closed. The second door **12** may connect to top hinge **42** along a top portion substantially near one side, and the second door **12** may connect to bottom hinge **44** along a bottom potion substantially near the same side, allowing second door **12** to rotate about axis X. Door to hinge connections may use a metal or bolt or screw to attach doors to hinges. Alternatively, connections may be made with any other connection known in the art. Hinges **42**, **44** may be fixed to cabinet **11** with epoxy, screws, or any method known in the art. First door **14** may open with second door **12** as shown in FIG. **1**B or second door **12** may open separately of first door **14** as shown in FIG. **1**A.

Also seen in FIGS. **1**A, **1**B and **2**, second door **12** may have front side **36** that faces outward and back side **34** that faces the interior volume **24** of the refrigerator **10**. A handle **38** may be attached to the front side **36** of second door **12** to facilitate opening and closing the first door **14** and/or second door **12**. Second door **12** may be made of a plastic or other insulating material to resist temperature change inside the refrigerator **10**. Second door **12** may be transparent, translucent, or opaque with a stainless steel, colored, or some other finish, but, as mentioned above, is often opaque or has a central glass section that allows contents of the door bins to be seen.

As seen in FIGS. **3**, **4**, and **5**, door bin **16** may have door bin bottom surface cover **60**, which sits atop door bin base portion **56** and comes in various styles, including wood grain, to give door bin **16** a more elegant look. Door bin bottom surface cover **60** is typically a separable insert that can be made of plastic, polymer, wood, or other material having a thickness of preferably less than about one half inch more typically about a quarter inch or less. Door bin bottom surface cover **60** is shaped and sized to fit inside door bin **16** and substantially cover door bin base portion **56**, which extends around the perimeter of the door bin and is recessed away from the bottom perimeter edge **80** to form a perimeter lip **82**. The door bin bottom surface cover **60** can be removed from the door bin by hand and without the use of tools. In one embodiment, the door bin bottom surface cover **60** covers aperture **66** of door bin frame **18**. Although shown in FIGS. **5** and **5**A as having a top ledge **94** and outside door bin frame retaining walls **96**, which are a downwardly extending lip, and inside door bin frame retaining walls **98** that essentially straddle the door bin frame, the door bin **16** may also have solely outside door bin frame restraining walls **96** and a solid base that bridges across the aperture **66** of the door bin frame or a corresponding aperture to the door bin frame aperture that is covered by the door bin bottom surface cover **60**. Upward extending wall **54** extends up from the base portion **56** to create a bin interior volume **58**. Upwardly extending wall section **54** may be free of indentations, apertures, or recessed portions which are configured to mate with a portion of an appliance **10** that projects into the interior volume **58** of door bin **16**. The wall sections **54** are typically completely flat sides without any apertures, indentations, or recesses. The base portion and the downwardly extending outside door bin frame retaining walls **96** define a downwardly facing door bin fi **120** and the base portion **56** establishes the door bin frame cavity upper surface **130** and the downwardly extending outside door bin frame retaining walls **96** establish the exterior surface of the door bin frame engagement space. The door bin engagement space engages the door bin frame **18** such that the downwardly extending outside door bin frame retaining walls **96** surrounds an exterior portion of the door bin frame and prevents substantial movement of the door bin caused by a refrigeration appliance door opening force or a refrigeration appliance door closing force when the door bin is engaged with the door bin frame.

As seen in FIG. **5**, door bin **16** sits on door bin frame **18** and can be removed by hand and without the use of tools by lifting door bin **16** off of frame **18**. The door bin can then be transported to another location such as a different door bin location within the appliance or set onto a substantially planar surface remote from the refrigerator like surface **70** (see FIG. **9**), i.e. a dining table or countertop.

Door bin frame **18** may be of a generally rectangular shape with at least four sides that create aperture perimeter **78** around aperture **66**. The at least four sides define aperture perimeter **78**. The sides preferably have side frame width **72** of approximately 2 inches and front and rear frame width **74** of approximately 1 inch. The door bin frame typically has a height **76** of from about 1 inch to about 2 inches, more typically approximately 1.2 inches. Door bin frame **18** may be made of a substantially rigid material, typically a plastic or a wood material, and may be finished with chrome or other color.

As seen in FIGS. **4-6**, to facilitate removal of door bin **16** and to provide easier access to the contents of the door bin **16** even if it is not removed, the door bin **16** and door bin frame move outward and inward. The door bin frame **18** can

be attached to sliding mechanism **40** that allows door bin **16** and frame **18** to slide out of second door **12**. Typically the door bin and frame can be extended anywhere from 40 percent to 100 percent away from the interior, storage space/location, more preferably by 50 to 80 percent when second door **12** is open. The percent extension is the lateral distance by which door bin frame **18** can extend on sliding mechanism **40**. The percent is measured relative to the size of door bin **16**. For example, if door bin **16** has a width of ten inches, one hundred percent extension would mean that door bin frame **18** could extend 10 inches from its initial, in-door storage position outward from second door **12** is open. Door bin frame **18** can be connected and disconnected from sliding mechanism **40**.

FIGS. **7**A, **7**B, **7**C, and **8** show the sliding mechanism **40** and how it may connect to the door bin frame **18**. FIG. **8** shows the door bin frame **18**. A frame engaging tab **71** on the sliding mechanism **40** matingly engages with a frame tab **100**. A spring clip **73** may be used to attach and detach door bin frame **18** from sliding mechanism **40**.

To install the door frame into engagement with the sliding mechanism on each side of the interior surface/liner of the door, the door frame is inserted at an angle such that frame tab **100** is spaced under the frame engaging tab **71** of the sliding mechanism. Thereafter, the frame is dropped down into a snap-fit engagement with the spring clip **73**. This process is shown generally in FIGS. **7**A, **7**B and **7**C.

As shown in FIGS. **5-6**, sliding mechanism **40** includes an inner member and an outer member with a bearing cage between them. The sliding mechanism is typically made of a rigid material like metal and can have a rectangular cross section with rounded corners having dimensions of approximately 5"×1"×0.5". The sliding mechanism and mounting assembly typically includes front bracket **90**, back bracket **88**, and sliding mechanism **40**. Sliding mechanism **40** is fixed to front mounting bracket **90**, which connects to door side wall **22** by screws **86**. Back mounting bracket **88** is attached to the outer wall of first door **14** and connects to first door **14** with screw **86** that comes through first door **14** and into a threaded screw hole at the center of back bracket **88**. Typically, as shown in FIG. **6**, the sliding mechanism has one or more aperture **110** that allows for the screws **86** to be engaged with the front and back mounting brackets with the screwdriver passing through aperture(s) **110**. FIGS. **7**A, **7**B, and **7**C show an embodiment of a sliding mechanism that consists of two rails that may be slidably connected with bearings. However, the sliding mechanism **40** can be any sliding mechanism known in the art.

Door bin **16** may be engaged or disengaged from door bin frame **18**. As discussed somewhat previously and as shown in FIG. **4**, to facilitate engagement, door bin **16** may have perimeter lip portion **52** extending down from base portion **56** creating door bin engagement space **62**. Frame exterior portion **64** fits within engagement space **62**, typically in a mating engagement, to connect door bin **16** and door bin frame **18** when exterior portion **64** is surrounded by lip portion **52**, thereby preventing substantial lateral movement of the door bin when the door bin is seated on the door bin frame. The snug fit between the exterior portion **64** and the lip portion **52** prevents substantial lateral movement, which is any significant movement of the door bin **16** such that could cause spilling or jarring of the contents of door bin **16** while sitting on door bin frame **18**.

It will be understood by one having ordinary skill in the art that construction of the described devices and systems of the present disclosure and other components is not limited to any specific material. Other exemplary embodiments disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

For purposes of this disclosure, the term "coupled" (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

It is also important to note that the construction and arrangement of the elements of the present disclosure and claimed invention as shown in the exemplary embodiments are illustrative only. Although only a few embodiments of the present innovations have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts or elements shown as multiple parts may be integrally formed, the operation of the interfaces may be reversed or otherwise varied, the length or width of the structures and/or members or connector or other elements of the system may be varied, the nature or number of adjustment positions provided between the elements may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Accordingly, all such modifications are intended to be included within the scope of the present innovations. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the desired and other exemplary embodiments without departing from the spirit of the present innovations.

It will be understood that any described processes or steps within the described processes may be combined with other disclosed processes or steps to form structures within the scope of the present disclosure and claimed invention. The exemplary structures and processes disclosed herein are for illustrative purposes and are not to be construed as limiting.

It is also to be understood that variations and modifications can be made on the aforementioned structures and methods without departing from the concepts of the present disclosure, and further it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

What is claimed is:

1. A refrigerator comprising:

a door having a pair of parallel interior walls that define an interior volume of the door;

a sliding mechanism slidably coupled to the pair of parallel interior walls;

a frame removably attached to the sliding mechanism and having a bottom perimeter edge and an upstanding exterior portion offset within and above the bottom

perimeter edge, and a horizontal lip connecting the bottom perimeter edge to the upstanding exterior portion;

a storage bin removably attached to the frame, the storage bin comprising:

an upstanding wall with a substantially rectangular cross-section extending upwardly from and flush with the bottom perimeter edge;

wherein the bottom of the ledge rests on the upstanding exterior portion when the storage bin is installed in the door.

2. The refrigerator of claim **1**, wherein the storage bin further comprises a base and a bottom surface cover that rests on a top surface of the base.

3. The refrigerator of claim **2**, wherein the sliding mechanism further comprises a frame engaging tab.

4. The refrigerator of claim **3**, wherein the frame further comprises a frame tab that corresponds to the frame engaging tab through a snap fit.

5. The refrigerator of claim **1** further comprising a second door that shares an axis with the door.

6. The refrigerator of claim **5**, wherein the second door is openable without opening the door.

7. The refrigerator of claim **6**, wherein the storage bin is slidable toward a user without opening the door.

8. The refrigerator of claim **7**, wherein the storage bin is slidable away from the second door when the door is open.

9. The refrigerator of claim **1**, wherein the refrigerator is a French-door bottom mount refrigerator.

10. A refrigerator comprising:

a first door having an inboard wall, an outboard wall, a top wall, and a bottom wall defining an interior portion of the first door;

a second door;

a sliding mechanism slidably coupled to the inboard wall and the outboard wall;

a door bin frame removably attached to the sliding mechanism and having a bottom perimeter edge and an upstanding exterior portion offset within and extending above the bottom perimeter edge, a horizontal lip connecting the bottom perimeter edge to the upstanding exterior portion, and a side frame with a width;

a storage bin removably attached to the door bin frame, the storage bin comprising:

a base with a perimeter and frame engagement space defined by a ledge on the top, a frame retaining wall extending downwardly from the perimeter, and inside retaining walls extending downwardly on an inboard side of the ledge;

an upstanding wall extending upwardly from and flush with the bottom perimeter edge;

a bottom surface cover that rests on the top of the ledge;

wherein the door side frame fits inside the frame engagement space.

11. The refrigerator of claim **10**, wherein the sliding mechanism is configured to allow movement of the storage bin into the refrigerator 80% and out of the refrigerator 100%.

12. The refrigerator of claim **10**, wherein the door bin frame is removable from the sliding mechanism without the use of tools.

13. The refrigerator of claim **12**, wherein the sliding mechanism further comprises a frame engaging tab and the side frame is substantially rectangular shaped.

14. The refrigerator of claim **13**, wherein the door bin frame further comprises a frame tab that corresponds to the frame engaging tab through a snap fit at a first end of the door bin frame and a screw fastener at a second end of the door bin frame, wherein the frame tab and the screw fastener securely fasten the door bin frame to the sliding mechanism.

15. The refrigerator of claim **10** wherein the second door that shares an axis with the first door.

16. The refrigerator of claim **15**, wherein the second door is openable without opening the first door.

17. The refrigerator of claim **16**, wherein the storage bin is slidable toward a user without opening the first door.

18. The refrigerator of claim **17**, wherein the storage bin is slidable away from the second door when the first door is open.

19. The refrigerator of claim **10**, wherein the refrigerator is a French-door bottom mount refrigerator.

20. A refrigerator door assembly comprising:

a door having a volume defined by a top wall, a bottom wall and two side walls;

a sliding mechanism fixedly attached to the door;

a frame removably attached to the sliding mechanism, the frame comprising a bottom perimeter, an upstanding exterior portion offset within and extending above the bottom perimeter, and a ledge connecting the bottom perimeter and the upstanding exterior portion;

a storage bin removably attached to the frame, the storage bin having an upstanding wall with a substantially rectangular shape and extending upwardly from and flush with the bottom perimeter

wherein the frame and storage bin fit within volume.

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