



(11)

EP 4 495 518 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.01.2025 Bulletin 2025/04

(51) International Patent Classification (IPC):
F25D 27/00^(2006.01) F25D 23/02^(2006.01)

(21) Application number: **24189549.9**

(52) Cooperative Patent Classification (CPC):
**F25D 23/028; A47F 3/0426; A47F 3/043;
F25D 27/00; F25D 2327/001**

(22) Date of filing: **18.07.2024**

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

(72) Inventors:
• **NIEUWLAAT, Jos**
Glenview, 60025 (US)
• **EMMEN, Janbas**
Glenview, 60025 (US)

(74) Representative: **HGF**
HGF Limited
1 City Walk
Leeds LS11 9DX (GB)

(30) Priority: **19.07.2023 GB 202311024**

(71) Applicant: **Illinois Tool Works Inc.**
Glenview IL 60025 (US)

(54) **A REFRIGERATOR APPLIANCE**

(57) The present invention provides a refrigerator appliance (100, 300) comprising a cuboid frame (108, 312), a cabinet (101, 301) and a door (102, 302), wherein the door comprises a projection surface (104, 304) that is

angled inwardly with respect to the cuboid frame, and wherein the refrigerator further comprises a light source (306) arranged to project light onto the projection surface.

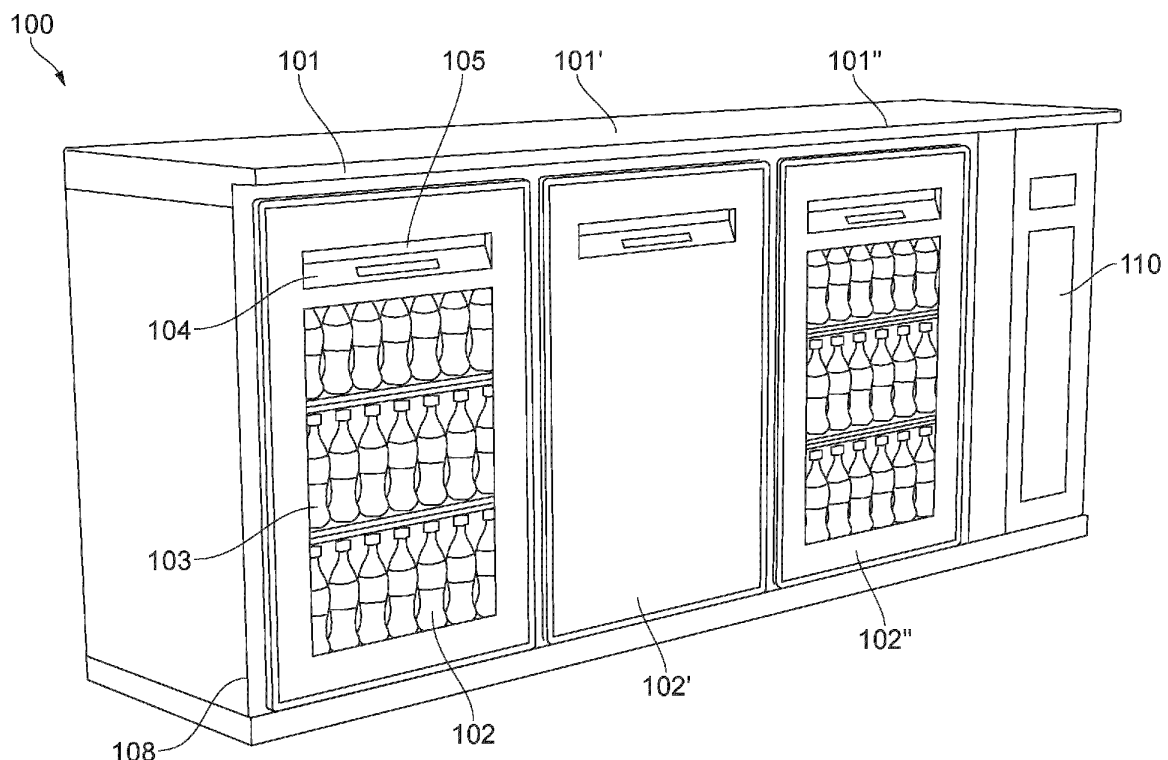


FIG. 1

Description

[0001] The invention relates generally to a refrigerator appliance, for example a back bar refrigerator appliance such as the type used in bars and restaurants to refrigerate and display containers such as beverage bottles.

Background

[0002] Known back bar refrigerators used for storing cans and beverages at a predetermined temperature comprise a door having a transparent window and a source of light located inside the refrigerator to help the consumer visualise the contents of the refrigerator. As the source of light is always on, this leads to undesired energy consumption. In addition, the transparent window in the door typically does not have good thermal insulation properties.

[0003] Some back bar refrigerator appliances have solid doors, which have better thermal insulation properties. However, a solid door does not provide visual access to the contents, which is useful for practical reasons (to visually assess stock), and for marketing reasons (so customers can see what is on offer).

Summary of the Invention

[0004] In accordance with the present invention there is provided a refrigerator appliance according to the appended claims.

[0005] According to an aspect of the present invention, there is provided refrigerator appliance comprising a cuboid frame, a cabinet, and a door, wherein the door comprises a projection surface that is angled inwardly with respect to a side of the cuboid frame, and wherein the refrigerator further comprises a light source arranged to project light onto the projection surface.

[0006] Advantageously, having a light source projecting the light onto the projection surface can illuminate a particular area of the door, for example a handle recess, and/or provide visual information.

[0007] In an embodiment, the door is solid. Advantageously, a solid door provides good thermal insulation, and the light source may be used to project visual information onto the door, such as information on the contents of the refrigerator appliance.

[0008] In an embodiment, the door comprises a transparent window, for example, a glass window. Advantageously, the light source may illuminate the contents of the appliance through the transparent window so that any heat generated by the light source is dissipated outside of the cabinet.

[0009] In an embodiment, the door comprises a handle recess, and wherein the light source is disposed in the handle recess. Advantageously, the light source may therefore illuminate the handle recess, providing a visual indication of the location of the handle recess.

[0010] In an embodiment, the handle recess com-

prises the projection surface.

[0011] In an embodiment, the light source is configured to project visual information onto the projection surface. In examples, the visual information may comprise the type of the contents and/or the quantity of the contents in the refrigerator appliance. Additionally or alternatively, the visual information may comprise a brand name or logo associated with the contents of the refrigerator appliance or the establishment where the refrigerator appliance is located (e.g., a bar or restaurant name). Additionally or alternatively, the visual information may comprise operating parameters of the refrigerator appliance (e.g., a temperature setting or energy use of the refrigerator appliance).

[0012] In an embodiment, the handle recess is formed at or near a top of the door and faces downwardly.

[0013] In an embodiment, the door comprises a planar door panel, and wherein the projection surface is formed on the planar door panel. In particular, the door panel may be angled inwardly with respect to the cuboid frame and light and/or visual information can be projected onto the door panel.

[0014] In an embodiment, the handle recess extends vertically along one side of the door.

[0015] In an embodiment, the handle recess extends vertically along substantially the entire side of the door.

[0016] In an embodiment, the light source extends along substantially the entire handle recess.

[0017] In an embodiment, the light source is configured to project a light gradient across the projection surface.

[0018] In an embodiment, the door comprises a handle member attached to a side of the door and defining a handle recess, wherein the handle member comprises an opening disposed adjacent to a door post of the frame when the door is closed, and wherein the light source is disposed on the door post and directs light through the opening.

[0019] Light from the light source may therefore visually indicate the location of the handle recess, and additionally or alternatively the light source may project visual information on the door panel.

[0020] In an embodiment, when the door is open the light source is positioned to illuminate the cabinet. In particular, by locating the light source on the door post it can be directed to illuminate the contents of the cabinet when the door is open. This may reduce or eliminate the need for a light source within the cabinet.

[0021] In an embodiment, the refrigerator appliance further comprises a seal arranged between the door and the door post, and wherein the light source is disposed outwardly of the seal when the door is closed.

[0022] Advantageously, this may reduce energy use of the refrigerator appliance because heat generated by the light source is dissipated outside of the cabinet.. In examples, the seal may be attached to the door or the door post.

[0023] In examples, the refrigerator appliance is a back bar refrigerator appliance, for example a bottle cooler.

The refrigerator appliance may be a commercial appliance such as the type used in bars and restaurants to refrigerate and display containers such as beverage bottles.

Brief Description of the Drawings

[0024] Embodiments of the invention are now described, by way of example only, hereinafter with reference to the accompanying drawings, in which:

- Figure 1** illustrates a perspective view of a refrigerator appliance having a handle recess near or at the top of the door;
- Figure 2** illustrates a close-up view of the handle recess according to the first embodiment of the invention;
- Figure 3** illustrates a perspective view of the alternative embodiment of a refrigerator appliance having a handle recess on the side of the door;
- Figure 4** illustrates a front view of the doors of the refrigerator appliance according to the second embodiment of the invention;
- Figure 5** illustrates a top view of the doors of a refrigerator appliance according to the second embodiment of the invention;
- Figure 6** illustrates a cross-section of the handle recess of a refrigerator appliance according to the second embodiment of the invention;
- Figures 7A, 7B show a front view of alternative embodiments of a refrigeration appliance having a handle recess at or near the top of the door.
- Figure 8 illustrate a close up view of the recess as shown in Figure 7B.

Detailed Description

[0025] Certain terminology is used in the following description for convenience only and is not limiting. The words 'right', 'left', 'lower', 'upper', 'front', 'rear', 'upward', 'down' and 'downward' designate directions in the drawings to which reference is made and are with respect to the described component when assembled and mounted. The words 'inner', 'inwardly' and 'outer', 'outwardly' refer to directions toward and away from, respectively, a designated centreline or a geometric centre of an element being described (e.g. central axis), the particular meaning being readily apparent from the context of the description.

[0026] Further, as used herein, the terms 'connected', 'attached', 'coupled', 'mounted' are intended to include direct connections between two members without any other members interposed therebetween, as well as,

indirect connections between members in which one or more other members are interposed therebetween. The terminology includes the words specifically mentioned above, derivatives thereof, and words of similar import.

[0027] Further, unless otherwise specified, the use of ordinal adjectives, such as, "first", "second", "third" etc. merely indicate that different instances of like objects are being referred to and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking or in any other manner.

[0028] Like reference numerals are used to depict like features throughout.

[0029] It will be further understood that the term "refrigerator appliance" can be interchangeably used with the term "back bar refrigerator" or the term "bottle cooler". Back bar refrigerator appliances are typically sized to fit within a cavity or recess behind a bar, for example under a worksurface and/or between opposing walls.

[0030] Referring now to Figure 1, there is shown a refrigerator appliance 100. In this example, the appliance 100 is a back bar refrigerator appliance or a bottle cooler that is sized to fit within a cavity or recess behind a bar, for example under a worksurface and/or between opposing walls.

[0031] The refrigerator appliance 100 comprises a generally cuboidal frame 108 having top, bottom, front, back, left and right faces. Accordingly, the overall shape of the refrigerator appliance 100 is a cuboid.

[0032] Within the frame 108 the refrigerator appliance 100 comprises a plurality of cabinets 101, 101', 101", in this example three cabinets. Each cabinet 101, 101', 101" has a door 102, 102', 102" that is openable to provide access to the contents of the cabinets 101, 101', 101". It will be appreciated that any number of cabinets 101, 101', 101" and doors 102, 102', 102" may be provided.

[0033] As shown in Figure 1, the refrigerator appliance 100 further comprises a technical cabinet 110 located adjacent to the one of the cabinets 101, 101', 101", in this case adjacent to the cabinet 101" with the door 102". The technical cabinet 110 houses part of the refrigeration system, particularly those parts that generate heat (i.e., the condenser and compressor), and may additionally house the expansion valve. One or more evaporators of the refrigeration system are typically positioned within the storage compartments and act to cool the storage compartments.

[0034] In certain embodiments at least one of the doors 102, 102', 102" is solid. In an alternative embodiment, at least one of the doors 102, 102', 102" comprises a transparent window 103, such as a glass widow. However other transparent materials, such as plastic, are also contemplated. The transparent glass window 103 allows to visualise the contents of the cabinet 101, 101', 101". In this example, two cabinets 102, 102' comprise glass door and one cabinet 102" comprises a solid door.

[0035] Each door 102, 102', 102" comprises a handle recess 105 that extends inwardly. In particular, the handle recesses 105 extend inwardly of the cuboid frame 108.

The handle recesses 105 can be used for opening the doors 102, 102', 102". A top 107 of each handle recess 105 includes a lip for a person to grip when opening the door 102, 102', 102". The handle recesses 105 each include a projection surface 104 that is angled inwardly, as best seen in Figure 2. That is, the projection surfaces 104 are angled inwardly relative to the cuboid frame 108.

[0036] In an exemplary embodiment, the handle recess 105 is formed at or near the top of the door 101, 101', 101", however other locations may be suitable, such as along a side of the door 101, 101', 101". In the example shown in Figures 1 and 2 the handle recess 105 is horizontal (parallel to the top and bottom of the frame 108 of the refrigerator appliance 100) and the projection surface 104 also extends horizontally. However, it is appreciated that other variants are also possible, and the handle recess 105 can be, for example, vertical, or positioned at an angle with respect to the side/top of the door.

[0037] As described below, light can be projected onto the projection surface 104 to provide illumination of the handle recess 105 and/or to provide visual information. The projection surface 104 may include a plate 106 onto which the light is projected. The plate 106 may be of a material, colour and/or reflectivity to improve the clarity of the light and/or visual information projected onto the projection surface 104.

[0038] A light source (not illustrated) can be integrated into the top 107 of the handle recess 105, behind the lip, to project light onto the projection surface 104. The light source may be, for example, an LED, LED strip or light guide that illuminates the projection surface 104 to improve visibility of the handle recess 105. In other examples, the light source may project visual information onto the projection surface 104, for example a product name or product logo.

[0039] In an alternative embodiment, the light source can comprise a projector configured to project visual information onto the projection surface 104 of the handle recess 105, for example a product name or product logo. Projecting visual information onto the projection surface 104 may also help to improve the visibility of the handle recess 105.

[0040] In another alternative embodiment, the light source can comprise an electronic display located on the projection surface 104 of the handle recess 105 and configured to display visual information, for example a product name or product logo. Displaying visual information on the projection surface 104 may also help to improve the visibility of the handle recess 105.

[0041] In a specific embodiment, the handle recess 105 may include a light source, for example an LED or light guide, for illuminating the projection surface 104, and a projector or electronic display for providing visual information on the projection surface 104.

[0042] The refrigerator appliance 100 may include a controller configured to control the light source and/or electronic display. In particular, the controller is config-

ured to control what light and information is projected onto the projection surface 104 or displayed on the electronic display. The controller may include a graphical user interface for input of control information by a user. Additionally or alternatively, the controller may include a connection, for example a wireless connection, to an external device that can be used to control the light source.

[0043] In examples, the light source or electronic display is operable to display information on the contents of the refrigerator appliance 100, such as the type of the contents and/or the quantity of the contents. In other examples, the light source or electronic display is additionally or alternatively operable to display a brand name or logo associated with the contents of the refrigerator appliance 100 or the establishment where the refrigerator appliance is located (e.g., a bar or restaurant name). In other examples, the light source or electronic display may additionally or alternatively be operable to display operating parameters of the refrigerator appliance 100 (e.g., a temperature setting or energy use of the refrigerator appliance 100). In examples, the controller may switch between displaying different types of visual information, or illumination of the projection surface, according to a program or according to user input.

[0044] Advantageously, the projection surface 104 is angled inwardly and is non-parallel to any of the sides of the cuboid frame 108. This provides an ergonomic line of sight for the consumer to identify the position of the handle recess 105 and clearly see any visual information being presented on the projection surface 104.

[0045] Figures 3 to 6 show a further example refrigerator appliance 300. In this example, the appliance 300 is a back bar refrigerator appliance or a bottle cooler that is sized to fit within a cavity or recess behind a bar, for example under a worksurface and/or between opposing walls.

[0046] The refrigerator appliance 300 is similar to the refrigerator appliance 100, having a cuboid frame 312 with cabinets 301, 301', 301" and doors 302, 302', 302". In this example the refrigerator appliance 300 comprises three cabinets 301, 301', 301". Each cabinet 301, 301', 301" has a door 302, 302', 302" that is openable to provide access to the contents of the cabinets 301, 301', 301". It will be appreciated that any number of cabinets 301 and doors 302 may be provided.

[0047] In this example, each of the doors 302, 302', 302" comprises a door panel 313 that is angled inwardly and provides a projection surface 304. In examples, the door panel 313 defines a majority of the outer surface of each door 302, 302', 302". In examples, the door panels 313 may be solid or transparent, for example glass.

[0048] As shown most clearly in Figures 4 to 6, the door panels 313 are angled inwardly towards a handle recess 305 formed vertically along one side of the door 302, 302', 302". A light source 306, shown in Figure 6, is located within the handle recess 305 or adjacent to the handle recess 305 and projects light across the front surface of

the door panel 313. In this way, the front surface of each door panel 313 provides a projection surface 304.

[0049] In examples, the light source 306 may be arranged to create a light gradient across the projection surface 304, as shown in Figure 4. That is, light from the light source 306 most intensely illuminates the projection surface 304 close to the handle recess 305, and the intensity of illumination reduces further from the handle recess 305. This provides a clear visual indication of the location of the handle recess 305.

[0050] In an alternative embodiment, as shown in Figure 7A, the door panel 313 is angled inwardly towards the top of the door 302, 302', 302" substantially across all the height of the door, thus forming a projection surface 304. In this embodiment, the recess 305 and the light source 306 are also located at or near the topmost edge of the door and are configured to create a light gradient across the projection surface 304. If the door panel 313 is transparent, the contents of the appliance are illuminated from the top down. If the door panel 313 is solid, the handle recess is illuminated and a light gradient is formed in the height direction of the door.

[0051] In yet another embodiment, as shown in Figure 7B, the projection surface 304 is only formed in the top part of the door 302, 302', 302". Figure 8 shows a close up view of the projection surface 304 with the recess 305. The light source 306 is configured to be aligned with a gap opening 309 and to illuminate the light onto the projection surface 304 the opening. The projection surface 304 can for example cover less than 50% of the surface of the door panel 313. In another example, the projection surface 304 covers less than 25% of the door panel. In the embodiment shown in figures 7B and 8, the door panel 313 is solid, i.e. non-transparent, therefore the light is configured to illuminate the handle recess 305, thus allowing the user to more intuitively open the appliance door.

[0052] In Figure 5 the top view of the refrigerator appliance 300 is shown. It can be seen that each door panel 313 is angled inwardly and forms a projection surface 304 that is non-parallel to any of the sides of the refrigerator appliance 300.

[0053] In one example, the light source is arranged on the handle, within the handle recess 305.

[0054] Figure 6 shows a further example of how the light source 306 is arranged. As shown, a handle member 308 is formed on the side of the door 302. The handle member 308 is either attached to the door 302 or integrally formed with the door 302. The handle member includes a lip 310 for a person to grip when opening the door 302. The handle member also includes a gap or opening 309, which may extend partially or entirely along the vertical length of the handle member 308 (e.g., with narrow joining portions extending across the opening 309). As shown in Figure 6, the opening 309 aligns with the light source 306 provided on the door post 307 when the door 302 is closed.

[0055] In this way, when the door 302 is closed light

from the light source 306 is projected across the projection surface 304 on the door panel 313. As illustrated, the light source 306 and/or the opening 309 are non-parallel to the projection surface 304, creating the light gradient across the projection surface 304. In examples, the light source 306 and/or the opening 309 may be generally parallel with the front face of the cuboid frame (312, see Figure 3). Advantageously, the position of the light source 306 on the door post 307 means that when the door 302 is open the light source 306 illuminates the contents of the cabinet 301.

[0056] In examples, the light source 306 may be an LED, for example, an LED strip, and/or a light guide with a light source (e.g., an LED) at one or more end. A controller can control the illumination of the projection surface 304 by the light source 306 in the same manner as described above.

[0057] In examples, the light source 306 may comprise a projector configured to project visual information on the projection surface 304. For example, visual information may comprise the type of the contents and/or the quantity of the contents in the refrigerator appliance 300, a brand name or logo associated with the contents of the refrigerator appliance 300 or the establishment where the refrigerator appliance is located (e.g., a bar or restaurant name), and/or operating parameters of the refrigerator appliance 300 (e.g., a temperature setting or energy use of the refrigerator appliance 100). In examples, the controller may switch between displaying different types of visual information, or illumination of the projection surface 304, according to a program or according to user input.

[0058] Optionally, the refrigerator appliance 300, in particular the door post 307 comprises a seal 311, as shown in FIG. 6. The seal 311 is configured to contact the handle member 308 when the door is closed. Advantageously, the light source 306 is disposed on an outside of the seal 311 when the door 302, 302', 302" is closed, so any heat generated by the light source 306 is dissipated outside of the cabinet 301 and does not increase the energy consumption of the refrigeration system. In other examples, the seal 311 may be provided on the handle member 308 and arranged to contact the door post 307 inwardly of the light source 306 when the door 302 is closed.

[0059] It will be appreciated by persons skilled in the art that the above detailed examples have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departing from the scope of the invention as defined by the appended claims. Various modifications to the detailed examples described above are possible.

[0060] Through the description and claims of this specification, the words "comprise" and "contain" and variations of them mean "including but not limited to", and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the sin-

gular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

[0061] Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive. The invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract or drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

[0062] It will be appreciated by persons skilled in the art that the above embodiment(s) have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departing from the scope of the invention as defined by the appended claims. Various modifications to the detailed designs as described above are possible.

Claims

1. A refrigerator appliance comprising a cuboid frame, a cabinet, and a door, wherein the door comprises a projection surface that is angled inwardly with respect to a side of the cuboid frame, and wherein the refrigerator further comprises a light source arranged to project light onto the projection surface.
2. The refrigerator appliance of claim 1, wherein the door is solid.
3. The refrigerator appliance of claim 1, wherein the door comprises a transparent window, for example a glass window.
4. The refrigerator appliance of any of claims 1 to 3, wherein the door comprises a handle recess, and wherein the light source is disposed in the handle recess.
5. The refrigerator appliance of claim 4, wherein the handle recess comprises the projection surface.
6. The refrigerator appliance of claim 5, wherein the light source is configured to project visual informa-

tion onto the projection surface.

7. The refrigerator appliance of claim 5 or claim 6, wherein the handle recess is formed at or near a top of the door and faces downwardly.
8. The refrigerator appliance of claim 4, wherein the door comprises a planar door panel, and wherein the projection surface is formed on the planar door panel.
9. The refrigerator appliance of claim 8, wherein the handle recess extends vertically along one side of the door.
10. The refrigerator appliance of claim 9, wherein the handle recess extends vertically along substantially the entire side of the door.
11. The refrigerator appliance of claim 10, wherein the light source extends along substantially the entire handle recess.
12. The refrigerator appliance of any of claims 8 to 11, wherein the light source is configured to project a light gradient across the projection surface.
13. The refrigerator appliance of any of claims 8 to 12, wherein the door comprises a handle member attached to a side of the door and defining the handle recess, wherein the handle member comprises an opening disposed adjacent to a door post of the frame when the door is closed, and wherein the light source is disposed on the door post and directs light through the opening.
14. The refrigerator appliance of claim 13, wherein when the door is open the light source is positioned to illuminate the cabinet.
15. The refrigerator appliance of claim 13 or claim 14, further comprising a seal arranged between the door and the door post, and wherein the light source is disposed outwardly of the seal when the door is closed.

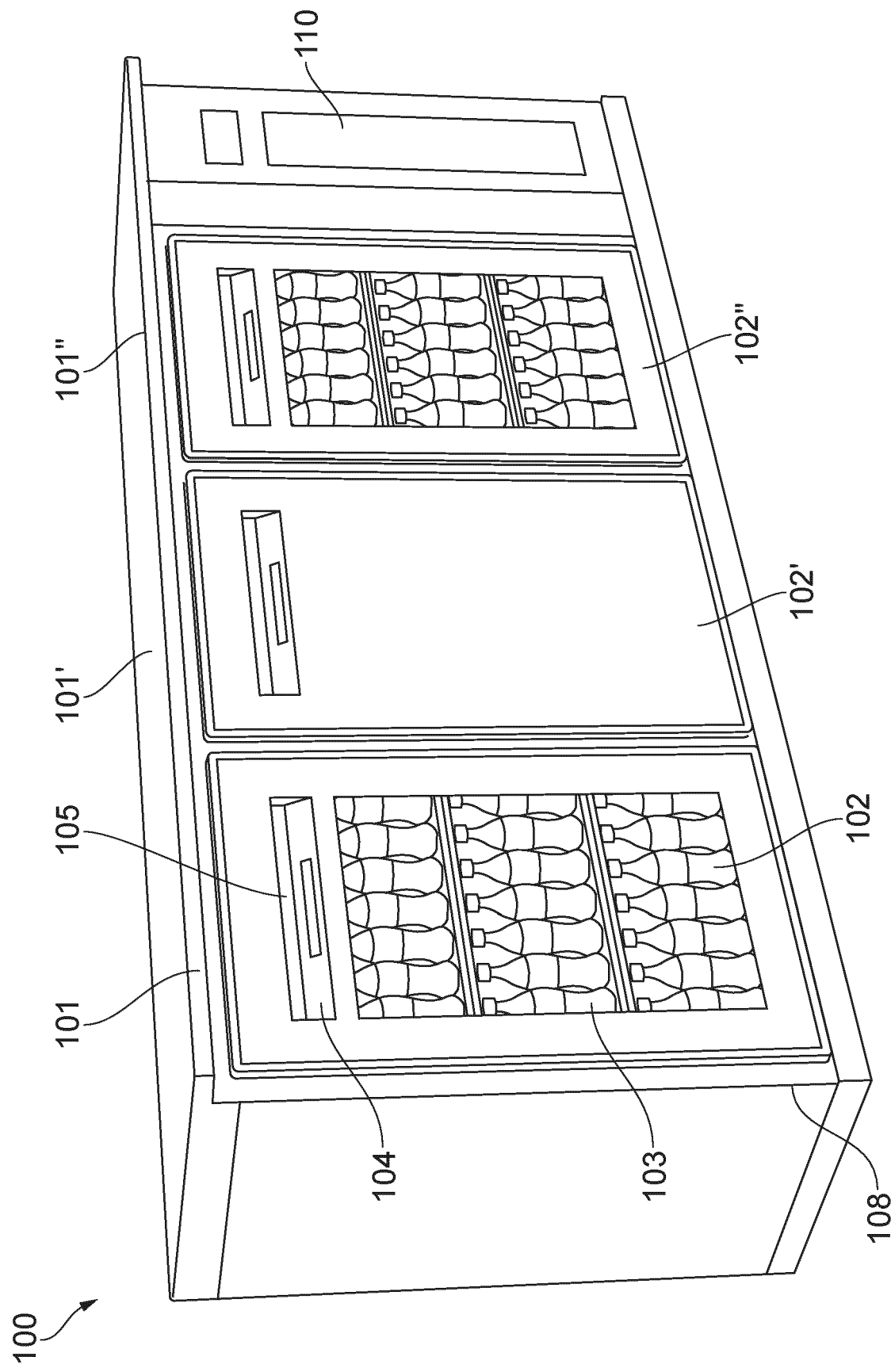


FIG. 1

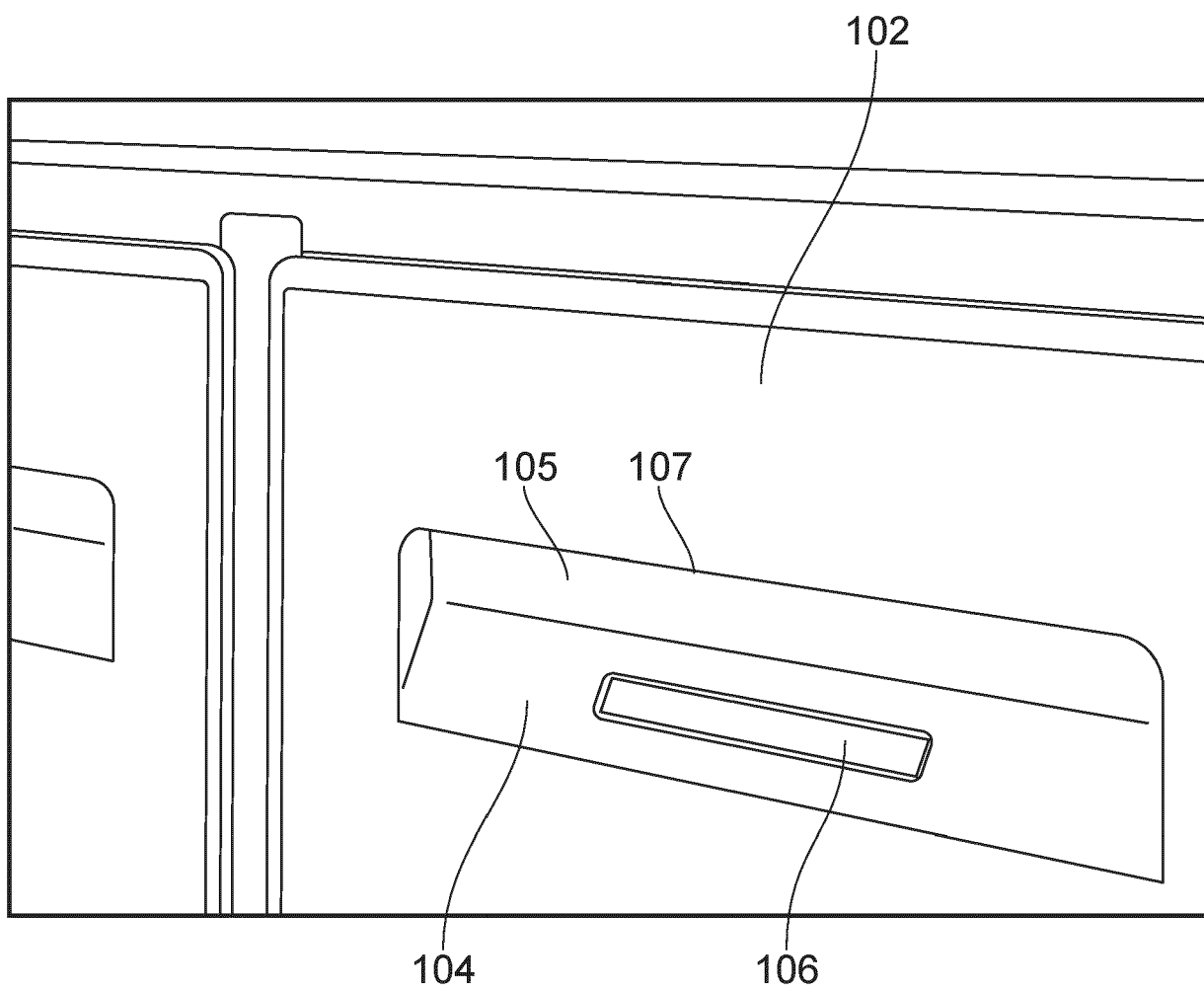


FIG. 2

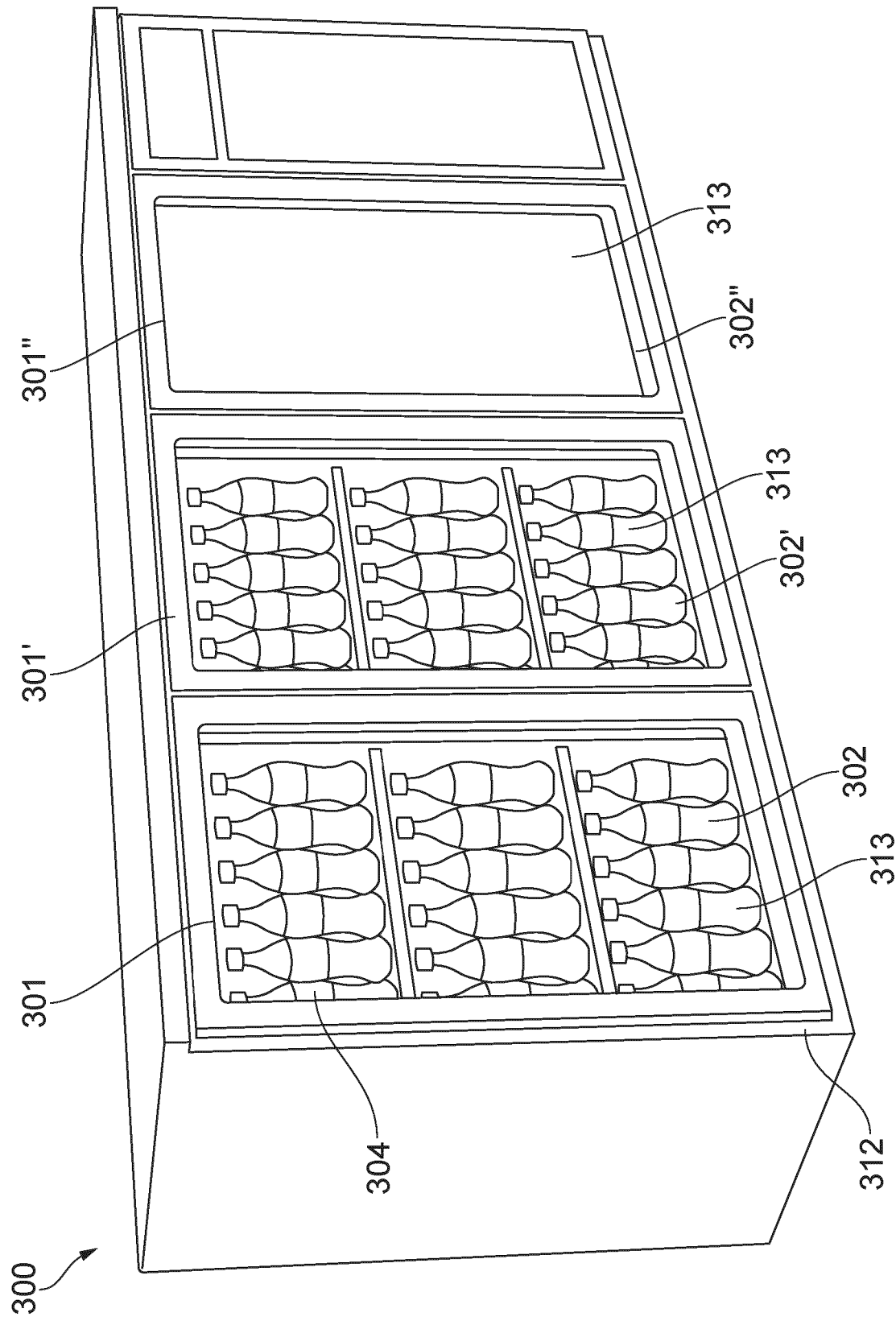


FIG. 3

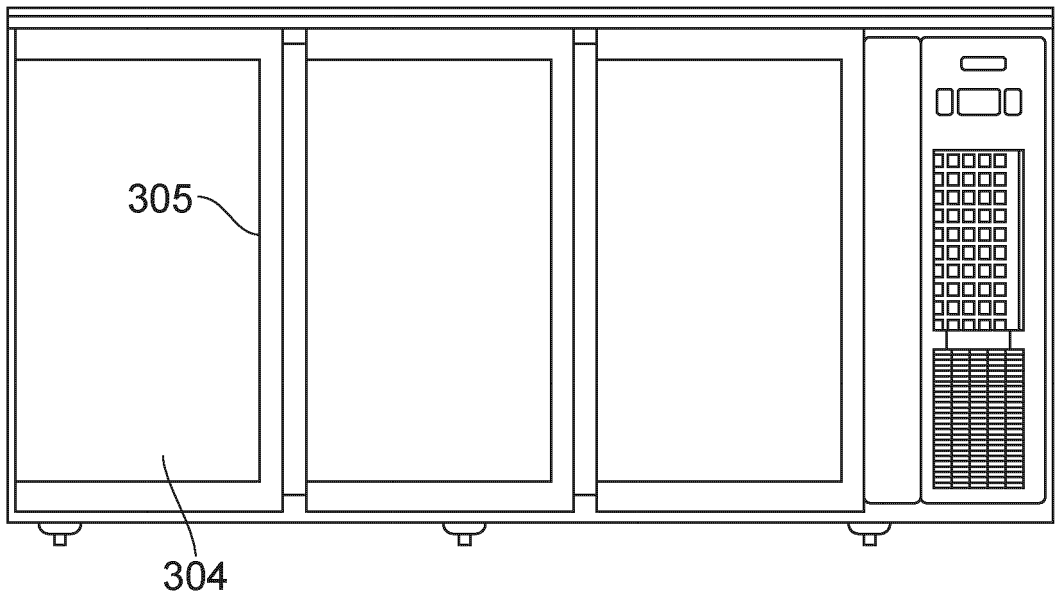


FIG. 4

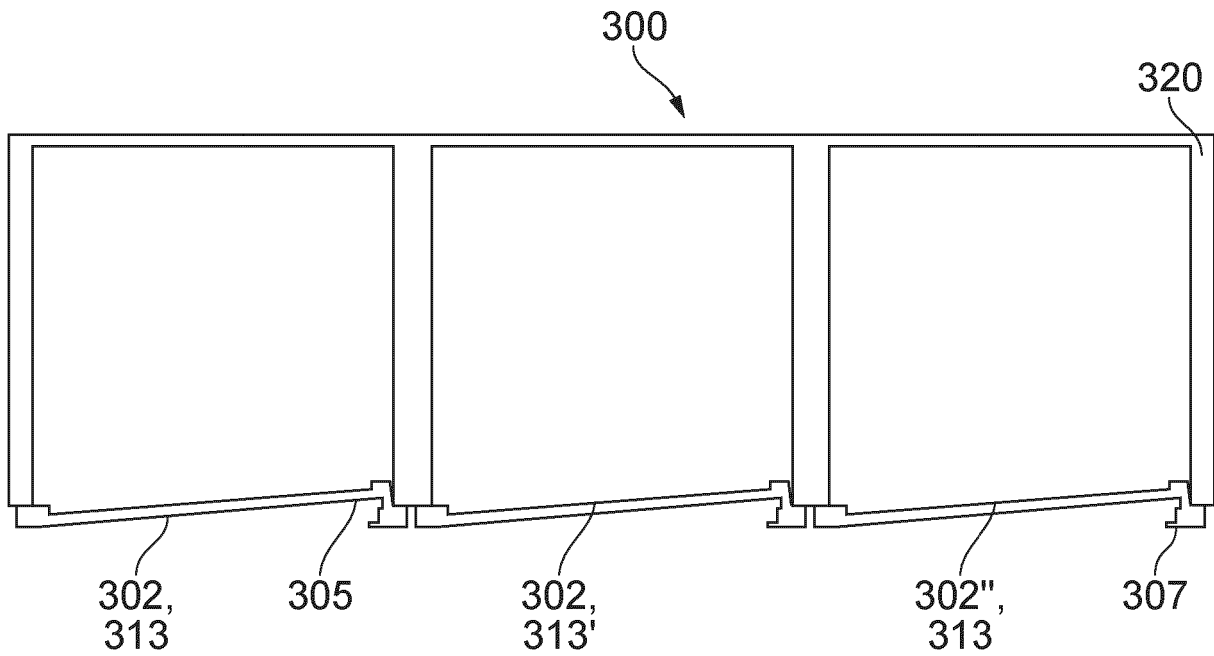


FIG. 5

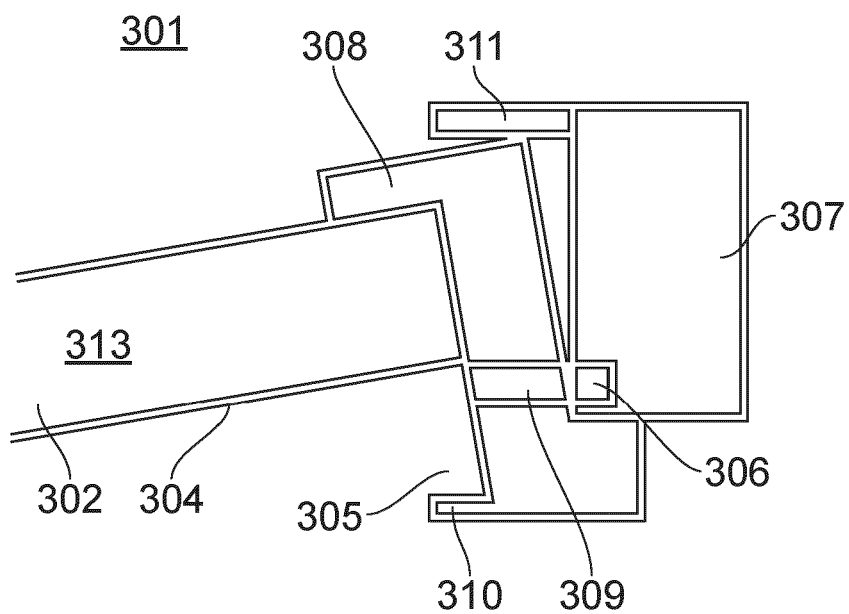


FIG. 6

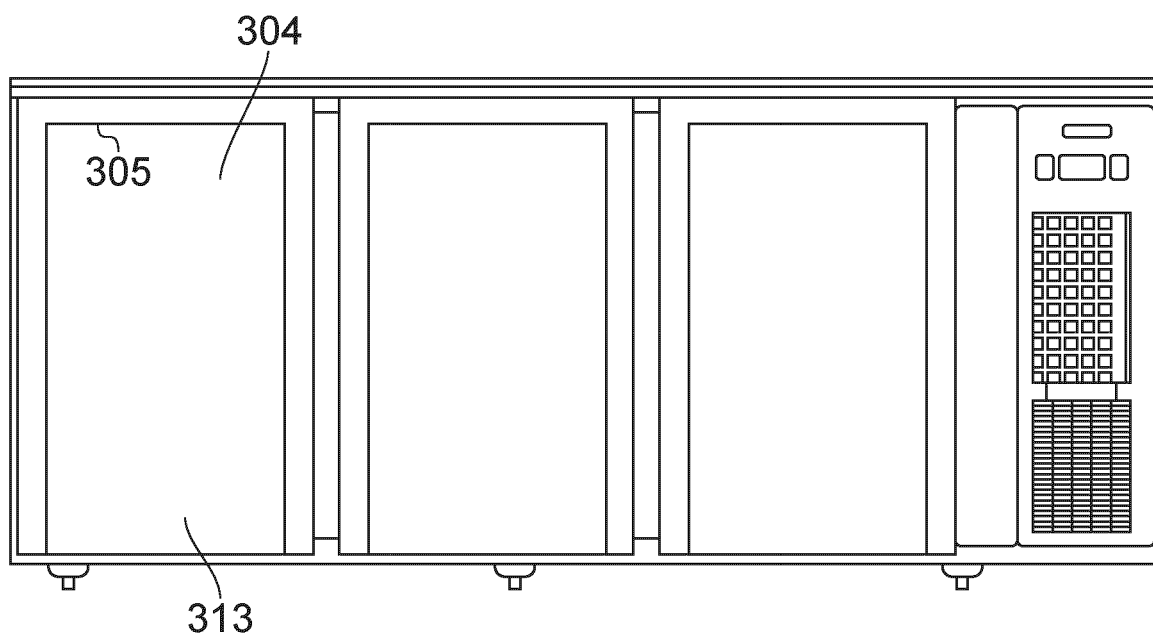


FIG. 7A

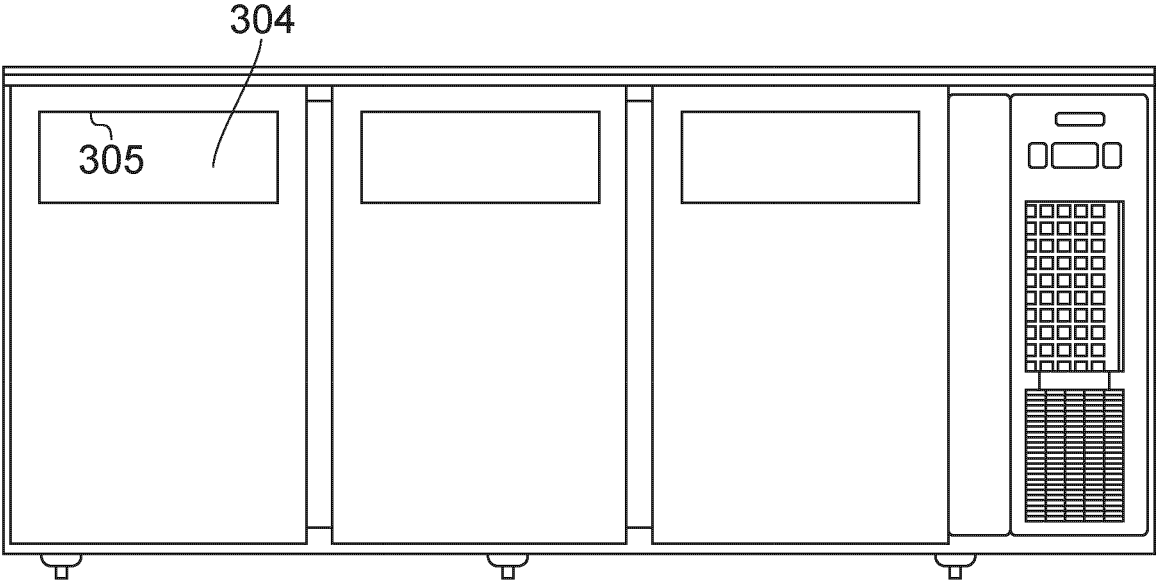


FIG. 7B

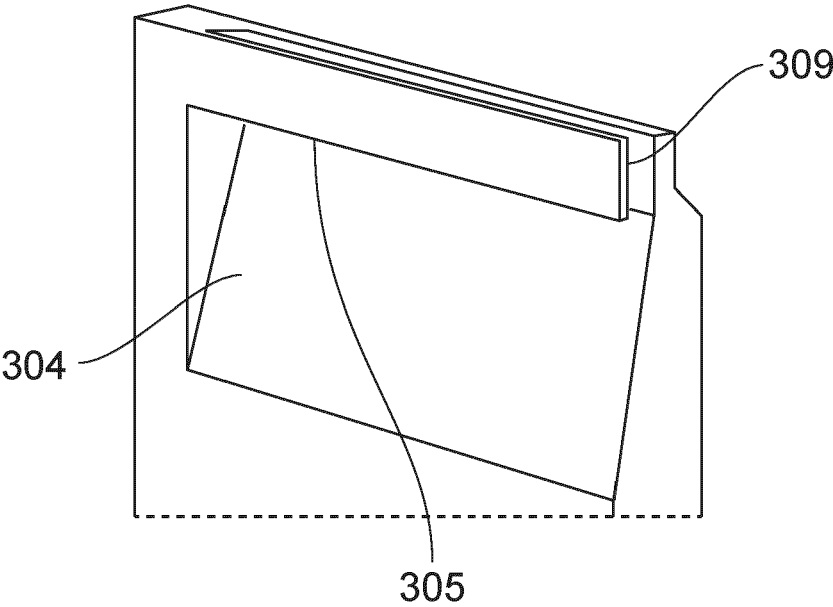


FIG. 8



EUROPEAN SEARCH REPORT

Application Number

EP 24 18 9549

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F25D A47F
Place of search		Date of completion of the search	Examiner
The Hague		19 November 2024	Canköy, Necdet
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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