



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:
29.03.2023 Bulletin 2023/13
- (51)

International Patent Classification (IPC):
A47B 51/00 (2006.01)
- (21)

Application number: 22192224.8
- (52)

Cooperative Patent Classification (CPC):
A47B 51/00
- (22)

Date of filing: 25.08.2022

- (84)

Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN
- (72)

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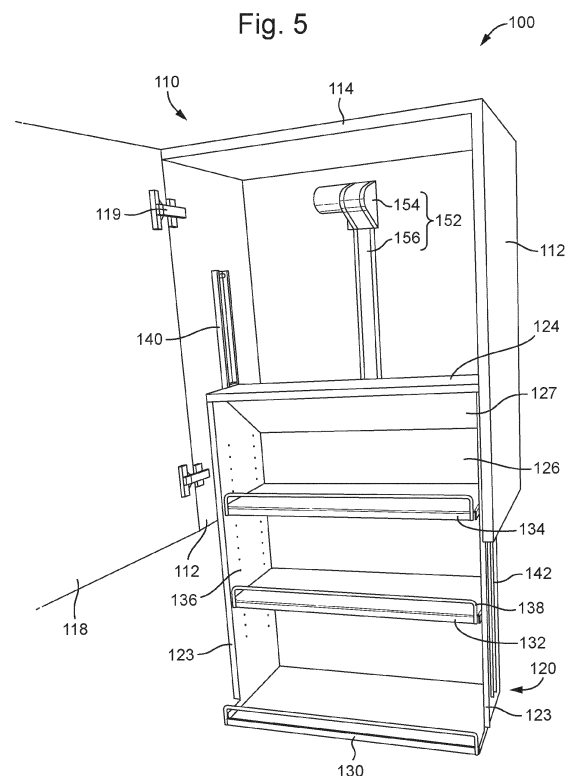
Priority: 28.09.2021 GB 202113876
- (71)

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(54)

A WALL CABINET

(57) A wall cabinet (100) for example for use in a kitchen, the wall cabinet comprising: a cabinet carcass (110) fixable to a wall of the kitchen; and a shelving unit (120) housable within the carcass (110), wherein the shelving unit (120) is movable relative to the carcass (110) between: a first position in which the shelving unit (120) is housed within the carcass (110); and a second position in which the shelving unit (120) extends beneath the carcass (110).



Description

Technical Field

[0001] The present disclosure relates to furniture and is particularly, although not exclusively, concerned with a height-adjustable wall cabinet for improved accessibility.

Background

[0002] It is common for kitchens to have a worktop upon which appliances (e.g. a microwave oven) may be provided and upon which activities (e.g. food preparation) may be performed. Further, it is common for kitchens to have wall cabinets, provided above the worktop, for storing kitchen items (e.g. crockery).

[0003] Such worktops and wall cabinets are typically provided at standardised heights above the floor, based upon the reach and capabilities of a standing person. However, people vary and not all people, including those with certain disabilities, are able to stand or have typical reach or related capabilities.

Statements of Invention

[0004] It would therefore be advantageous to provide furniture having improved accessibility in order to better accommodate those having differing reaches and capabilities. Additionally, it would be advantageous to provide kitchen furniture which is able to accommodate both those with certain disabilities and those without, whether by accessibility, versatility or improved functionality or ergonomics.

[0005] To better address one or more of the above, the present disclosure provides the following aspects.

[0006] According to an aspect of the present disclosure, there is provided a wall cabinet for a kitchen, the wall cabinet comprising a cabinet carcass fixable to a wall of the kitchen; and a shelving unit housable within the carcass, wherein the shelving unit is movable (e.g. continuously or incrementally) relative to the carcass between: a first position in which the shelving unit is housed within the carcass; and a second position in which the shelving unit extends at least partially beneath the carcass. The wall cabinet may be a height-adjustable wall cabinet.

[0007] According to another aspect of the present disclosure, there is provided a wall cabinet for attachment to a wall, the wall cabinet comprising: a cabinet carcass fixable to the wall; and a shelving unit housable within the carcass, wherein the shelving unit is movable relative to the carcass between: a first position in which the shelving unit is housed within the carcass; and a second position in which the shelving unit extends at least partially beneath the carcass, wherein the shelving unit comprises a bottom shelf and a further shelf, the bottom shelf protruding forward beyond the further shelf.

[0008] The carcass may comprise two side panels, a top panel, a back panel and/or a door. The carcass may not comprise a base panel. The carcass may be fixed to a wall.

5 [0009] In the first position, a bottom shelf of the shelving unit may form a bottom surface or base of the wall cabinet. In the first position, the shelving unit may be accessible by means of a door of the carcass. For example, a standing user may open the door in order to access the shelving unit. In the second position, at least a portion of the shelving unit (e.g. a bottom shelf thereof) may be accessible beneath the carcass.

10 [0010] The shelving unit may be slidable or translatable relative to the carcass. In an installed configuration, the shelving unit may be linearly slidable relative to the carcass in a substantially vertical plane (e.g., a vertical plane). The shelving unit may be slidable in the vertical plane only (e.g., no forward or horizontal component to a direction of sliding).

15 [0011] At least one of (e.g. both) the carcass and the shelving unit may comprise a means for permitting a slidable connection therebetween, such as one or more slide rails. The slide rail may be configured to cooperate with a corresponding component on the other of the carcass and the shelving unit. In an installed configuration, the or each slide rail may be provided substantially vertically (e.g., a vertical plane).

20 [0012] The shelving unit may comprise a bottom shelf and one or more further shelves. The bottom shelf may protrude forward beyond the further shelf or shelves. The bottom shelf may protrude forward beyond a remainder of the shelving unit, such that the bottom shelf may project furthest from the wall and form a forwardmost surface of the shelving unit. The bottom shelf of shelving unit may form a base or bottom surface of the wall cabinet in the first position. When a door of the carcass is closed (e.g., fully closed), the bottom shelf of the shelving unit may be immediately adjacent the door along the whole front edge of the shelf. For example, the space between the front edge of the bottom shelf and the internal surface of the door may be smaller than the transverse dimensions of a user's finger (e.g., as small as possible, without contact therebetween).

25 [0013] The shelving unit may comprise a ceiling panel. The ceiling panel may be configured to restrict the height of items placed in the shelving unit e.g. when in the second position.

30 [0014] The shelving unit may comprise a back panel of which a portion may be inclined to a remainder of the back panel. In an installed configuration the inclined portion may be inclined to the vertical, such that a space is provided to its rear.

35 [0015] The shelving unit may comprise two side panels. Shelf-engaging apertures may be provided in the side panels.

40 [0016] The wall cabinet may comprise an actuator configured to move the shelving unit between the first position and the second position. At a first end, a body of the

actuator may be fixed relative to the wall or to the carcass. At a second end, an arm of the actuator may be attached to the shelving unit.

[0017] The arm of the actuator may be attached to a bottom shelf of the shelving unit. The actuator may be attached to the shelving unit only at the bottom shelf. For example, the actuator may be attached to the shelving unit at only a single point.

[0018] In an installed configuration, the actuator (e.g. its body) may be provided between a back panel of the shelving unit and a back panel of the carcass. For example, the actuator may be housed between the sloped portion of the back panel and the back panel of the carcass. The arm of the actuator may be provided between the back panel of the shelving unit and the back panel of the carcass. The actuator may be fixed relative to a wall upon which the wall cabinet is provided.

[0019] In the first position, the shelving unit may be accessible by means of a door of the carcass.

[0020] The wall cabinet may additionally comprise and/or be in communication with a sensor configured to detect a position of a door of the cabinet and/or a position of the hinges or one of the hinges. The sensor may be provided in the hinges. The sensor may be in communication with a controller. The wall cabinet may be movable towards the first position when the door is in an open position (e.g. only when the door is fully open and/or at an angle of at least 90 degrees to the front edge of the bottom shelf). The sensor may operate only when the shelving unit is in a position other than the first position (e.g., only when the shelving unit extends beneath the carcass).

[0021] The wall cabinet may additionally comprise or be in communication with a sensor configured to detect an environment beneath the shelving unit. The sensor may, for example comprise an optical sensor or a pressure sensor. The sensor may be configured to detect an object provided beneath the shelving unit (e.g. so as to prevent the shelving unit contacting the object). The sensor may comprise a sensor or sensor strip provided on an underside of the shelving unit. The sensor may comprise a proximity detector. The sensor may be in communication with a controller. The controller may be configured to control the wall cabinet.

[0022] The wall cabinet may additionally comprise or be in communication with a sensor configured to detect an acceleration (e.g., a deceleration) of the shelving unit, e.g. a gyroscope (e.g., when the shelving unit is moving towards the second position, optionally only when the shelving unit is moving towards the second position). The sensor may be configured to detect a contact between the shelving unit and its environment. The sensor may not operate when the shelving unit is moving towards the first position. The sensor may operate only when the shelving unit is in a position other than a maximally extended position.

[0023] The wall cabinet may be in communication with a controller configured to control motion of the shelving

unit. The wall cabinet may comprise a controller.

[0024] The wall cabinet may be actuable remotely. The wall cabinet may be actuable by voice control. The wall cabinet may be actuable from the first position to the second position (e.g., a maximally extended second position) by a user issuing only a single "down" command. The wall cabinet may be actuable from the second position to the first position using a repeated or continual "up" command. For example, a single "up" command may move the shelving unit only an incremental distance.

[0025] According to another aspect of the present disclosure, there is provided a method of controlling an item of height-adjustable furniture (e.g. the wall cabinet). The method may comprise moving the item of height-adjustable furniture between the first position and the second position. The method may comprise receiving an instruction to move the shelving unit (e.g., towards, optionally to, the first or second position).

[0026] When the item of furniture is the wall cabinet, the method may comprise: receiving an instruction to move the shelving unit towards the first position; determining a position of a door of the cabinet; and in response to determining that a door of the cabinet is open (e.g., at an angle of at least a predetermined threshold), moving the shelving unit towards the first position (e.g. from the second position to the first position); or in response to determining that a door of the cabinet is closed or at an angle of less than or no greater than a predetermined threshold, not moving the shelving unit. This may prevent objects (e.g. a user's fingers or a kitchen utensil) from becoming squashed between the shelving unit and the carcass. The predetermined threshold may relate to a finger-crush condition.

[0027] The angle may be defined between the door and the front edge of the shelving unit, optionally a front edge of the bottom shelf, such as when the bottom shelf protrudes. An angle of a predetermined threshold may be defined as an angle at which it is not possible to crush a user's finger between the door and a closest point of a front edge of the bottom shelf. The predetermined threshold may be substantially 90 degrees.

[0028] When the item of furniture is the wall cabinet, the method may comprise: receiving an instruction to move the shelving unit towards (e.g. to) the second position; determining a position of the shelving unit so as to determine a remaining travel span towards the second position; determining a distance to an object provided beneath the shelving unit (e.g. receiving a signal from a sensor describing a separation between an underside of the shelving unit and an object provided beneath the shelving unit); moving the shelving unit towards the second position to an extent that the shelving unit does not collide with the object. For example, if the object is further away than a remaining travel span, the method may comprise moving the shelving unit to the second position.

[0029] When the object comprises a second item of height-adjustable furniture (e.g. a worktop unit) or an ob-

ject provided thereupon, the method may comprise: determining a distance to the second item of height-adjustable furniture beneath the shelving unit or an object provided thereupon; and transmitting an instruction to adjust the height of the second item of height-adjustable furniture. This may be particularly useful if the wall cabinet and the second item of height-adjustable furniture have overlapping travel spans or nearly overlapping travel spans (e.g. travel spans which are within 100 mm or 10 mm of one another).

[0030] The method may comprise: detecting a deceleration of the shelving unit; and reversing the direction of motion of the shelving unit e.g. for one second.

[0031] According to another aspect of the present disclosure, there is provided a controller for an item of height-adjustable furniture (e.g. the wall cabinet), the controller configured to control the item of height-adjustable furniture. The controller may be a controller for controlling a plurality of items of height-adjustable furniture, wherein the items of furniture have overlapping travel spans or travel spans which nearly overlap.

[0032] To avoid unnecessary duplication of effort and repetition of text in the specification, certain features are described in relation to only one or several aspects or embodiments of the invention. However, it is to be understood that, where it is technically possible, features described in relation to any aspect or embodiment of the invention may also be used with any other aspect or embodiment of the invention.

Brief Description of Drawings

[0033] For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a perspective view of a wall cabinet according to one embodiment of the present invention in a first position;

Fig. 2 is a sectional side view through a bisecting plane of the wall cabinet of Fig. 1 in the first position;

Fig. 3 is a perspective view of a shelving unit of the wall cabinet of Fig. 1;

Fig. 4A is a transparent perspective view of a bottom shelf of the shelving unit of Fig. 3;

Fig. 4B is a perspective view of two pairs of slide rails;

Fig. 4C is a perspective view of an actuator;

Fig. 5 is a perspective view of the wall cabinet according to Fig. 1 shown in a second position;

Fig. 6 is a flowchart of a method of controlling furni-

ture according to an embodiment of the present invention; and

Fig. 7 is a controller according to another embodiment of the present invention.

[0034] Throughout the drawings, like reference numerals are used to refer to indicate like features.

Detailed Description

[0035] With reference to Figs. 1, 2 and 3, a wall cabinet 100 comprises a cabinet carcass 110 and a shelving unit 120. In the orientation shown in Fig. 1, it will be understood that the front of the cabinet 100 is nearest to the viewer in the plane of the page, and the back of the cabinet is furthest away from the viewer in the plane of the page. Similarly, in Fig. 2, the front of the cabinet 100 faces the right hand side of the page, and the back of the cabinet faces the left of the page.

[0036] Fig. 1 shows the wall cabinet 100 in the first position, in which the shelving unit 120 is housed within the carcass 110. The carcass 110 comprises side panels 112, a top panel 114, a back panel 116 (Fig. 2) and a door panel 118. The door panel 118 is hingedly attached to one side panel 112 by hinges 119, so as to be openable and closable (e.g. about a vertical axis). The panels 112, 114, 116, 118 collectively define a cuboidal space therebetween. For example, each panel 112, 114, 116, 118 is provided substantially perpendicularly to an adjacent panel.

[0037] In the embodiment shown in Figs. 1, 2 and 5, the cabinet carcass 110 does not comprise a base panel. The panels 112, 114, 116, 118 are typically made from timber, chipboard or MDF, but it will be understood that other suitable materials may be used. In the first position, the wall unit 100 has the advantage of appearing substantially similar to a typical, fixed wall unit and the door 118 may be opened by a user in a conventional manner to access any goods stored inside.

[0038] The carcass 110 is fixedly attachable to a wall, such as a kitchen wall, for example by means of a number of brackets (not shown) attached to the carcass and the wall by means of screws (not shown). The carcass 110 may thereby be fixed in position at a particular height relative to the wall. The brackets may attach the back panel 116 to the wall, such that the back panel 116 and the rear surfaces of the side panels 112 and top panel 114 may sit flush against the wall.

[0039] In embodiments not shown, the carcass 110 may not comprise a back panel 116, and the brackets may thereby attach the top and side panels 112, 114 of the carcass 110 to the wall. Further, it will be understood that, additional or alternative means suitable for fixedly attaching the carcass 110 to a wall may be used in place of or in addition to one or more brackets.

[0040] Each side panel 112 of the carcass 110 comprises, on its major internal surface, a slide rail 140 (Fig.

5) The slide rail 140 extends substantially vertically down each side panel 112. The slide rail 140 may be provided down a midline of the panel 112, or alternatively away from the midline such as two-thirds of the way to the back of each side panel 112. The slide rail 140 may not comprise an end stop (e.g. an end stop at its top end, or an end cap at either end). As will be described below, the slide rails 140 are configured to cooperate with corresponding features 142 provided on the shelving unit 120 so as to permit a sliding connection between the carcass 110 and the shelving unit 120.

[0041] With reference to Figs. 2 and 3, the shelving unit 120 comprises side panels 122, a ceiling panel 124 and a back panel 126. The shelving unit 120 additionally comprises a bottom shelf 130 and a number of further shelves 132, 134. In the example shown in Figs. 2 and 3, although the shelving unit 120 has two further shelves, it will be understood that the number of further shelves may be varied according to the requirements of the user.

[0042] Each of the side panels 122 and ceiling panels 124 may be substantially planar. In the illustrated embodiment, the side panels 122, ceiling panel 124 and back panel 126 collectively define a substantially cuboidal space therebetween. For example, each panel 122, 124, 126 is provided substantially perpendicular to an adjacent panel 122, 124, 126. A cuboidal space may be defined as a space having six flat faces and all angles between the faces are right angles.

[0043] On an outer lateral surface of each side panel 122 is provided a slide rail 142 (Fig. 3). Each slide rail 142 extends substantially vertically down the corresponding side panel 122. Each slide rail 142 may be located approximately down the midline of each side panel 122. Each slide rail 142 may not comprise an end stop (e.g. an end stop at either end and/or an end stop at a lower end). Each slide rail 142 may comprise an end stop at an upper end only.

[0044] The slide rail 140 of the carcass 110 and the slide rail 142 of the shelving unit 120 are configured to cooperate with one another so as to guide motion of the shelving unit 120. The slide rails 140, 142 may permit a sliding connection between the shelving unit 120 and the carcass 110, such that when installed the shelving unit 120 may slide linearly in a vertical plane relative to the carcass 110. For example, the rails 140, 142 may be configured to prevent rotation of the shelving unit 120 relative to the carcass 110. Whilst the sliding connection between the carcass 110 and the shelving unit 120 has been described in terms of rails 140, 142, it will be understood that alternative means may be provided, such as a wheel in rail or lead screw or rack and pinion arrangement (not shown).

[0045] At the front edge of each side panel 122, there is provided a fold or flange 123 (Fig. 3). The fold performs the purpose of preventing objects, e.g. fingers or other body parts or items of clothing or kitchen apparatus, from becoming trapped between the shelving unit 120 and the carcass 110 during movement of the shelving unit 120.

The fold may extend the full length of each side panel, such that the mechanisms of the slide rails 140, 142 may not be visible or accessible from the front of the wall cabinet 100.

[0046] As shown in Fig. 2, the back panel 126 of the shelving unit 120 may comprise a sloped portion towards (e.g. at) its top end. For example, a majority of the back panel 126 may be flat and/or planar such that it may form a vertical rear surface of the shelving unit 120 when installed. Towards a top end, the back panel 126 may comprise a sloped portion 127 being inclined to the remainder of the back panel 126 such that a discontinuity in gradient is formed along a horizontal line of the back panel 126. In other words, the back panel 126 may comprise a lower portion which is substantially flat and planar, and an upper portion which is substantially flat and planar but provided at an angle to the lower portion. Accordingly, the back panel 126 of the shelving unit 120 may comprise an upper portion which is inclined to the vertical once installed.

[0047] Similarly, as shown in Fig. 3, the side panels 122 of the shelving unit 120 may comprise a tapering in dimensions towards (e.g. at) their top. The side panels 122 may thereby comprise a complex shape (e.g. not a simple rectangular shape). For example, a majority of each side panel 122 may comprise a rectangular shape. At a top end, each side panel 122 may comprise a right-angled trapezoid, the sloped side of the trapezoid being provided at the rear edge of the side panel 122 and/or the right-angled side of the trapezoid being provided at the front edge of the side panel 122. The top edge of each side panel 122 may thereby be narrower than the bottom edge of each side panel 122. The tapering of the side panels 122 may be configured to conform to the sloped portion 127 of the back panel 126, such that the side panels 122 and the back panel 126 may form an edge where they meet.

[0048] Accordingly, when the shelving unit 120 comprises tapered side panels 122 and a sloped back panel 126, the shelving unit 120 may comprise a smaller depth dimension at its top than at its midpoint and/or bottom.

[0049] The side panels 122 and the back panel 126 may thereby be shaped so as to provide a cavity or space behind the shelving unit 120 once installed in the carcass 110. For example, the side panels 122 and the back panel 126 may be tapered and sloped respectively so as to form a triangular-prismatic space behind a top of the shelving unit 120. The triangular prismatic space may be configured (e.g. shaped and sized) so as to accommodate, when the shelving unit 120 is in the first position, between the carcass 110 and the shelving unit 120, an actuator means 150 (described later).

[0050] The shelves 130, 132, 134 are provided substantially horizontally between the side panels 122 and the back panel 126. The shelves 132, 134 are supported by the side panels 122 by means of apertures 136 provided in the side panels 122, into which cooperating features of the shelves may be inserted so as to support the

shelves 132, 134. The shelves 130, 132, 134 are configured to support and hold goods placed thereon for storage.

[0051] Each of the shelves 130, 132, 134 may comprise a front bar 138 which extends, from the front corners of each shelf 130, 132, 134, above the horizontal surface and front edge of the respective shelf. The front bar 138 is configured to retain any items placed on the shelf, so as to reduce the likelihood of the items falling off the shelf during motion of the shelving unit 120. Further, the front bars 138 may perform the purpose of reducing the likelihood of (e.g. preventing) fingers, other body parts or other items from becoming trapped or pinched during motion (e.g. retraction) of the shelving unit 120.

[0052] Each of the two further shelves 132, 134 comprises a downwardly extending flange 139 (e.g. on a side of the shelf 132, 134 opposite to that of the front bar 138). The flange 139 extends from the front edge of each shelf perpendicularly below the major horizontal surface of the respective shelf. For example, the flange may extend away from the front bar 138 provided on the opposite side of the front edge of the shelf. The front flanges 139 may perform the purpose of reducing the likelihood of (e.g. preventing) fingers, other body parts or other items from becoming trapped or pinched during motion (e.g. opening) of the shelving unit 120.

[0053] Fig. 4A shows a perspective transparent view of the bottom shelf 130. The bottom shelf 130 comprises a flanged perimeter 131, in which a flange extends perpendicularly away from the major surface at each edge of the shelf 130. The flange 133 provided at the rear of the shelf 130 may be substantially larger (e.g. extend substantially further) than the other flanges. An attachment point 135 may be provided on the rear surface of the rear flange 133. The attachment point 135 may be configured to receive an arm 156 of an actuator (described below) such that the actuator 152 may be able to act on the bottom shelf 130.

[0054] The bottom shelf 130 (Fig. 4) forms a base or bottom surface of the shelving unit 120. The bottom shelf 130 may not be supported by the side panels 122. For example, the side panels 122 and the back panel 126 of the shelving unit 120 may sit within and be welded to the flanged perimeter 131 of the bottom shelf. The bottom shelf 130 may thereby support (e.g. bear the weight of) the shelving unit 120, the bottom shelf 130 being supported by the actuator.

[0055] As shown in Figs. 2 and 3, the bottom shelf 130 is deeper (e.g. in the front/back direction) than the side panels 122, the ceiling panel 126 and, when present, the shelves 132, 134. The bottom shelf 130 thereby protrudes forward, beyond the shelves 132, 134, and the front surfaces of each of the side panels 122 and the ceiling panel 126. For example, the bottom shelf 132 may comprise a depth dimension being greater than that of the shelves 132, 134 and the side panels 122 by an amount substantially equal to the depth dimension of the hinges 119 when installed on the side panels 112 which

attach the door 118 to one of the side panels 114.

[0056] The bottom shelf 130 may thereby comprise dimensions being substantially equal to the internal dimensions of the carcass 110, including the top panel 116, such that the bottom shelf 130 may effectively form a base or bottom surface of the wall cabinet 100 when in the first position shown in Fig. 1.

[0057] Extending from the top edges of the back panel 126 and the side panels 122 is the ceiling panel 124. The ceiling panel effectively ensures that, when the shelving unit 120 is in the second position (described later), items cannot be placed within the shelving unit 120 which may prevent the shelving unit 120 from shutting or may be crushed in the second position. For example, the ceiling panel 124 creates a height restriction which prevents objects of excessive height being stored in the shelving unit 120.

[0058] The shelving unit 120 may be made from metal, however it will be understood that alternative suitable materials may be used.

[0059] The shelving unit 120 is housable within the cabinet carcass 110. For example, the shelving unit 120 is dimensioned such that there is a small clearance between the external dimensions of the shelving unit 120 and the internal dimensions of the carcass 110. For example, as shown in Fig. 2, the depth of the shelving unit 120 is smaller than the depth of the carcass 110.

[0060] Similarly, the shelves 130, 132, 134, back panel 126 and ceiling panel 124 of the shelving unit 120 may have a width dimension which is narrower than the corresponding dimensions of the carcass 110 so as to allow a small clearance therebetween.

[0061] A front-back dimension of the side panels 122 may be smaller than the corresponding dimension of the side panels 112 of the carcass 110 in order to accommodate the hinges 119 of the carcass 110 and/or the actuator means 150.

Actuator means

[0062] The wall cabinet 100 comprises an actuator means 150 configured to control the motion of the shelving unit 120 relative to the carcass 110. The actuator means 150 is configured to control the motion continuously between the first position and the second position. In the embodiments shown in Figs. 2, 4C and 5, the actuator means 150 comprises a motorised linear actuator 152 which, as will be described later, may be controlled remotely. However, it will be understood that alternative actuator means which are suitable for the present use may be used.

[0063] The actuator 152 (Fig. 4C) comprises a body 154 and an arm or push tube 156. The body 154 of the actuator 152 is fixedly attached to the wall behind the carcass 110. For example, the body 154 of the actuator may be fixedly attached to the wall behind the carcass by means of a bracket 158 (Fig. 2) which is fixedly attached to the wall and comprises a limb 160 (Fig. 2) which

extends through an opening in the carcass 110, the body 154 being fixedly attached to the limb 160. Accordingly, the carcass 110 may be fixedly attached to the wall, and the actuator means 150 may be fixedly attached to the wall, such that the actuator acting on the shelving unit 120 may move the shelving unit 120 relative to the wall and thus relative to the carcass 110.

[0064] A distal end of the arm 156 may be attached to the shelving unit 120, such that the actuator 152 is configured to act upon the shelving unit 120 so as to move the shelving unit 120 (e.g. relative to the wall and thus the carcass 110). In particular, the arm 156 may be provided in a vertical plane. For example, the arm 156 may be provided substantially parallel with the slide rails 140, 142 of the carcass 110 and the shelving unit 120. The actuator 152 and the rails 140, 142 may thereby cooperate to allow the shelving unit 120 to slide linearly (e.g. vertically) relative to the carcass 110.

[0065] The distal end of the arm 156 may be attached to the bottom shelf 130 of the shelving unit 120, in particular the attachment point 135. For example, the distal end of the arm 156 may be attached only to the bottom shelf 130. The actuator 152 may thereby act on the shelving unit 120 by acting on the bottom shelf 130, to which the remainder of the shelving unit 120 is attached.

[0066] Accordingly, the actuator 152 may be configured to bear the load of the shelving unit by means of the attachment point 135 of the bottom shelf 130. Similarly, the bottom shelf 130 may be configured to bear the load of the shelving unit 120 by means of the remainder of the shelving unit 120 sitting on, and being attached to, the bottom shelf. The slide rails 140, 142 may prevent rotation of the shelving unit about the attachment point 135 of the bottom shelf 130.

[0067] The slide rails 140, 142 (Fig. 4B) of the carcass 110 and the shelving unit 120 may be configured to permit a travel span of the shelving unit 120 which is sufficient to allow access to all of the shelves 130, 132, 134 of the shelving unit (e.g. with the door 118 in a closed position). In a preferred example, the travel span of the shelving unit 120 is at least as long as the height of the shelving unit 120. For example, in the second position, the ceiling panel 126 of the shelving unit 126 may be level with the underside of (e.g. the side panels 112 of) the carcass 110.

[0068] In a particular example, the shelving unit 120 is 684 mm tall and 544 mm wide, the bottom shelf is 299 mm deep (excluding attachment point) and the further shelves are 205 mm deep. The tapered portion of the side panels comprises a cutaway right-angled triangle of 130 mm height and 25 mm depth. The travel span of the actuator is up to 880 mm.

[0069] Although Fig. 5 shows the shelving unit 120 in the second position with the door 118 open, it should be understood that it may not be necessary for the door to be open in order for the wall unit 100 to be in the second position. For example, it may not be necessary for the door 118 to be open in order to move the shelving unit 120 from the first position towards (e.g. to) the second

position. However, it may be necessary for the door 118 to be open for the shelving unit 120 to move from the second position towards (e.g. to) the first position.

5 Sensors

[0070] The shelving unit 120 may comprise a sensor (not shown) (e.g. at least one sensor or multiple sensors). The sensor may be configured to detect the surroundings of the wall cabinet 100, for example so as to prevent the shelving unit 120 from colliding with any nearby objects when it moves from the first position towards the second position or vice versa. The sensor may comprise a proximity detector, configured to detect a separation or distance between the bottom shelf 130 and an object provided beneath the wall unit 100, such as an appliance or a countertop. The sensor may be provided on a lowermost surface of the shelving unit 120. For example, the sensor may be provided on the underside of the bottom shelf 130, as it may be the bottom shelf which is most likely to collide with another object. Additionally or alternatively, a sensor may be provided on an upper surface of the bottom shelf 130.

[0071] In certain examples, when the wall cabinet is provided above an adjustable-height worktop unit 200 (described later), the proximity detector may be configured to detect a separation between the bottom shelf 130 and an uppermost surface of the worktop.

[0072] Additionally or alternatively, the sensor may comprise a gyroscope (not shown) configured to detect an acceleration of the shelving unit 120. For example, the sensor may be configured to detect a sudden deceleration of the shelving unit 120, which may be indicative of a collision.

[0073] Additionally or alternatively, the wall cabinet 100 may be in communication with (e.g. comprise) a further sensor configured to determine a status of the door of the cabinet 100. For example, the wall cabinet 100 may comprise a further sensor. The further sensor may be configured to determine whether the door 118 is either open, closed, or in a position therebetween. As will be described below, the status of the door 118 may be taken into account when controlling the wall unit 100.

[0074] The wall unit 100 may be in communication with a controller. For example, the wall unit 100 may comprise a controller. The controller may control the operation of the actuator means 150 and the motion of the shelving unit 120.

50 Operation

[0075] In use, the shelving unit 120 is movable between the first position and the second position. For example, the shelving unit 120 is continuously movable between the first position and the second position, such that a user may move the shelving unit 120 only as far beneath the carcass 110 as is required (e.g., to access the bottom shelf 130 only).

[0076] The shelving unit 120 may be controlled according to a determination or detection made by one or more of the or each sensor.

[0077] The shelving unit may be movable between the first and second positions according to a status or position of the door 118. For example, the shelving unit 120 may be movable towards the second position (e.g. from the first position to the second position) regardless of whether the door 118 is in an open position. However, the shelving unit 120 may be movable towards the first position (e.g. from the second position to the first position) only when the door 118 is in an open position (e.g. a full open position perpendicular to the wall upon which the cabinet 100 is installed).

[0078] The shelving unit 120 may be movable towards the second position to an extent that the shelving unit 120 does not collide with its surroundings. For example, responsive to a determination of a distance or separation between a bottom of the shelving unit 120 and an object within the travel span of the shelving unit 120, the shelving unit 120 may be movable by a distance marginally short of the determined separation between the shelving unit 120 and the object.

[0079] The motion of the shelving unit 120 may be controlled according to the detection of a sudden or unexpected deceleration. For example, upon detecting a sudden deceleration of the shelving unit 120, e.g. by a gyroscope or similar sensor, the shelving unit 120 may be configured to reverse its direction of motion, e.g. for one second, before stopping.

[0080] The actuator 152 may be controlled remotely, for example using a remote control device. A user may issue an "open" or "down" command once in order to command the actuator to move the shelving unit 120 from the first position to the second position. However, a user may have to press or hold an "up" or "close" command in order to return the shelving unit towards the first position (e.g. from the second position).

[0081] Additionally or alternatively, the actuator 152 may be controlled by voice control. For example, a user of the wall cabinet 100 may say a command word in order to control the operation of the actuator.

Installation

[0082] The wall cabinet 100, specifically the carcass 110, may be installed on a wall of a kitchen at the height of a typical wall cabinet (e.g. a non-movable or fixed height cabinet). This may allow a standing user to use the wall cabinet 100 in the first position, e.g. by opening and closing the door 118.

[0083] The travel span of the actuator means 152 may be selected such that in the second position the shelving unit 120 may be reached and used by a seated user (e.g. a wheelchair user).

[0084] The wall cabinet 100 may be installed above a height-adjustable worktop unit. The controller may be capable of controlling both the wall cabinet 100 and the

height-adjustable worktop unit.

Method

5 **[0085]** With reference to Fig. 6, a method 900 of controlling an item of height-adjustable furniture is described. The item of height-adjustable furniture may be a wall cabinet 100, or a worktop unit 200.

10 **[0086]** The method 900 comprises 902 moving the item of height-adjustable furniture between the first position and the second position. The method 900 may additionally comprise 904 receiving a signal from a sensor. The method may additionally comprise 906 determining whether a move condition is satisfied.

15 **[0087]** For example, when the item of height-adjustable furniture comprises the wall cabinet 100, the method 900 may comprise moving the wall cabinet 100, specifically the shelving unit 120, from the second position to the first position. The method may further comprise receiving a signal from a sensor describing a status of the door 118. The method may comprise determining whether the door 118 is open (e.g. fully open), the move condition thereby being the status of the door 118 being open.

25 **[0088]** The method 900 may comprise detecting a deceleration of the item of furniture, for example, a sudden or unexpected deceleration. For example, a gyroscope may detect a sudden deceleration of the wall cabinet 100 during movement towards the second position. In response, the method may comprise reversing the direction of travel of the item of furniture e.g. for one second. This may reduce the force of any impact.

30 **[0089]** The method 900 may comprise determining a distance to an object provided beneath or above the item of furniture, and moving the item of furniture (e.g. towards the second position) to an extent that the item of furniture does not collide with the object. For example, the method may comprise moving the item of furniture marginally short of the determined distance to the object.

35 **[0090]** The method 900 may be a method of controlling at least one item (e.g. two items) of height-adjustable furniture, when provided and installed with overlapping travel spans (e.g. when a wall cabinet 100 and a worktop unit are installed above and below one another).

45 **[0091]** For example, when the wall cabinet 100 is provided above a worktop unit which is also vertically movable, then the wall cabinet 100 and the worktop unit 200 may have travel spans which are capable of overlapping, such that in certain configurations, the items may collide. Alternatively, the travel spans of the wall cabinet 100 and the worktop unit may not overlap, however the travel spans may be sufficiently close that an object placed on the worktop unit may be capable of interacting with the shelving unit 120 in certain positions.

55 **[0092]** The method may thereby comprise determining the position of each of the items of furniture having overlapping or close travel spans.

[0093] Fig. 7 shows a controller 1000 which is config-

ured to control an item of height-adjustable furniture. The controller 1000 may be configured to perform the method 900. The item of height-adjustable furniture (e.g. the wall cabinet 100) may be in communication with the controller 1000. Additionally or alternatively, the wall cabinet 100 may comprise the controller 1000.

[0094] Where a worktop unit and a wall cabinet 100 are provided above and below one another, the worktop unit and the wall cabinet 100 may be in communication with the same controller 1000. The controller 1000 may be configured to control the operation of the wall cabinet 100 and the worktop unit, e.g. such that the two items of furniture do not collide. Additionally or alternatively, the controller 1000 may be configured to control the items of furniture in a concerted or coordinated manner. For example, the controller 1000 may be configured to move the worktop unit and the wall cabinet 100 to particular positions (e.g. first and second positions respectively) such that the items of furniture are more easily accessible for a wheelchair user.

[0095] Additional Statements of Invention are set out below

Statement 1. A wall cabinet for attachment to a wall, the wall cabinet comprising:

a cabinet carcass fixable to the wall; and

a shelving unit housable within the carcass,

wherein the shelving unit is movable relative to the carcass between:

a first position in which the shelving unit is housed within the carcass; and

a second position in which the shelving unit extends at least partially beneath the carcass.

Statement 2. The wall cabinet of statement 1, wherein in the first position, a bottom shelf of the shelving unit forms a bottom surface or base of the wall cabinet and/or wherein in the second position, the shelving unit is accessible beneath the carcass.

Statement 3. The wall cabinet of statements 1 or 2, wherein the shelving unit is slidable relative to the carcass, optionally wherein in an installed configuration the shelving unit is linearly slidable relative to the carcass in a substantially vertical plane.

Statement 4. The wall cabinet of any preceding statement, wherein at least one of the carcass and the shelving unit comprises a slide rail configured to permit a slidable connection therebetween, optionally wherein in an installed configuration, the or each slide rail is provided substantially vertically.

Statement 5. The wall cabinet of any preceding statement, wherein the shelving unit comprises a bottom shelf and a further shelf, the bottom shelf protruding forward beyond the further shelf.

Statement 6. The wall cabinet of any preceding statement, wherein the shelving unit comprises a ceiling panel.

Statement 7. The wall cabinet of any preceding statement, wherein the shelving unit comprises a back panel of which a portion is inclined to a remainder of the back panel, optionally wherein in an installed configuration the inclined portion is inclined to the vertical.

Statement 8. The wall cabinet of any preceding statement, wherein the wall cabinet comprises an actuator configured to move the shelving unit between the first position and the second position, wherein at a first end, a body of the actuator is fixed relative to the wall, and at a second end, an arm of the actuator is attached to the shelving unit.

Statement 9. The wall cabinet of statement 8, wherein the arm of the actuator is attached to a bottom shelf of the shelving unit, optionally wherein the actuator is attached to the shelving unit only at the bottom shelf.

Statement 10. The wall cabinet of any of statements 8 or 9, wherein in an installed configuration, the actuator is provided between a back panel of the shelving unit and a back panel of the carcass.

Statement 11. The wall cabinet of any preceding statement, wherein in the first position, the shelving unit is accessible by means of a door of the carcass.

Statement 12. The wall cabinet of any preceding statement, wherein the wall cabinet comprises:

a sensor configured to detect a position of a door of the cabinet;

a sensor configured to detect an environment beneath the shelving unit; and/or

a sensor configured to detect an acceleration of the shelving unit.

Statement 13. The wall cabinet of any preceding statement, wherein the wall cabinet is in communication with a controller, optionally wherein the wall cabinet comprises a controller, the controller being configured to control motion of the shelving unit.

Statement 14. The wall cabinet of any preceding

statement, wherein the wall cabinet is actuatable remotely, optionally wherein the wall cabinet is actuatable by voice control.

Statement 15. A method of controlling a wall cabinet of any of statements 1 to 14, the method comprising moving the shelving unit between the first position and the second position.

Statement 16. The method of statement 15, wherein the method comprises:

determining a position of a door of the cabinet; and

in response to determining that a door of the cabinet is open, moving the shelving unit towards the first position; or

in response to determining that a door of the cabinet is closed, not moving the shelving unit towards the first position.

Statement 17. The method of statements 15 or 16, wherein the method comprises:

receiving an instruction to move the shelving unit towards the second position;

determining a position of the shelving unit so as to determine a remaining travel span towards the second position;

determining a distance to an object provided beneath the shelving unit;

moving the shelving unit towards the second position to an extent that the shelving unit does not collide with the object.

Statement 18. The method of any of statements 15 to 17, wherein the method comprises:

detecting a deceleration of the shelving unit; and

reversing the direction of motion of the shelving unit.

Statement 19. A controller for a wall cabinet, the controller configured to perform the method of any of statements 15 to 18.

[0096] It will be appreciated by those skilled in the art that although the invention has been described by way of example, with reference to one or more exemplary examples, it is not limited to the disclosed examples and that alternative examples could be constructed without departing from the scope of the invention as defined by

the appended claims.

Claims

1. A wall cabinet for attachment to a wall, the wall cabinet comprising:

a cabinet carcass fixable to the wall; and
a shelving unit housable within the carcass,

wherein the shelving unit is movable relative to the carcass between:

a first position in which the shelving unit is housed within the carcass; and
a second position in which the shelving unit extends at least partially beneath the carcass,

wherein the wall cabinet comprises:

a sensor configured to detect a position of a door of the wall cabinet; and/or
a sensor configured to detect an acceleration of the shelving unit.

2. The wall cabinet of claim 1, wherein in the first position, a bottom shelf of the shelving unit forms a bottom surface or base of the wall cabinet and/or wherein in the second position, the shelving unit is accessible beneath the carcass.

3. The wall cabinet of claims 1 or 2, wherein the shelving unit is slidable relative to the carcass, optionally wherein in an installed configuration the shelving unit is linearly slidable relative to the carcass in a substantially vertical plane.

4. The wall cabinet of any preceding claim, wherein at least one of the carcass and the shelving unit comprises a slide rail configured to permit a slidable connection therebetween, optionally wherein in an installed configuration, the or each slide rail is provided substantially vertically.

5. The wall cabinet of any preceding claim, wherein the shelving unit comprises a bottom shelf and a further shelf, the bottom shelf protruding forward beyond the further shelf.

6. The wall cabinet of any preceding claim, wherein the shelving unit comprises a ceiling panel.

7. The wall cabinet of any preceding claim, wherein the shelving unit comprises a back panel of which a portion is inclined to a remainder of the back panel, optionally wherein in an installed configuration the inclined portion is inclined to the vertical.

8. The wall cabinet of any preceding claim, wherein the wall cabinet comprises an actuator configured to move the shelving unit between the first position and the second position, wherein at a first end, a body of the actuator is fixed relative to the wall, and at a second end, an arm of the actuator is attached to the shelving unit. 5
9. The wall cabinet of claim 8, wherein the arm of the actuator is attached to a bottom shelf of the shelving unit, optionally wherein the actuator is attached to the shelving unit only at the bottom shelf. 10
10. The wall cabinet of any of claims 8 or 9, wherein in an installed configuration, the actuator is provided between a back panel of the shelving unit and a back panel of the carcass. 15
11. The wall cabinet of any preceding claim, wherein in the first position, the shelving unit is accessible by means of a door of the carcass. 20
12. The wall cabinet of any preceding claim, wherein the wall cabinet is in communication with a controller, optionally wherein the wall cabinet comprises a controller, the controller being configured to control motion of the shelving unit. 25
13. A method of controlling a wall cabinet of any of claims 1 to 12, the method comprising: 30
moving the shelving unit between the first position and the second position, and:
determining a position of a door of the cabinet; 35
and
in response to determining that a door of the cabinet is open, moving the shelving unit towards the first position; or
in response to determining that a door of the cabinet is closed, not moving the shelving unit 40
towards the first position,
and/or
detecting a deceleration of the shelving unit; and 45
reversing the direction of motion of the shelving unit.
14. The method of claim 13, further comprising: 50
receiving an instruction to move the shelving unit towards the second position;
determining a position of the shelving unit so as to determine a remaining travel span towards the second position; 55
determining a distance to an object provided beneath the shelving unit;
moving the shelving unit towards the second po-
- sition to an extent that the shelving unit does not collide with the object.
15. A controller for a wall cabinet, the controller configured to perform the method of claims 13 or 14.

Fig. 1

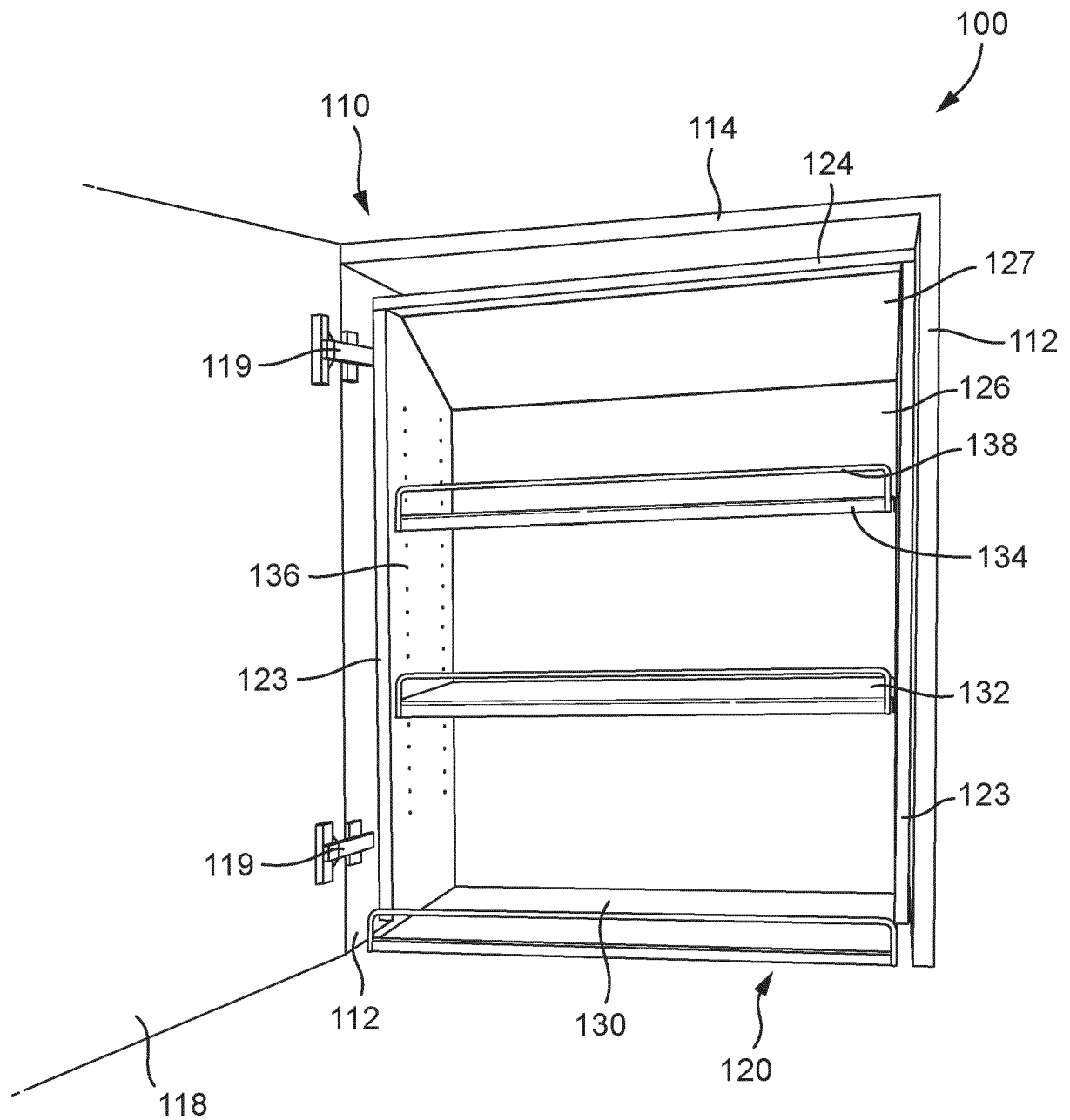


Fig. 2

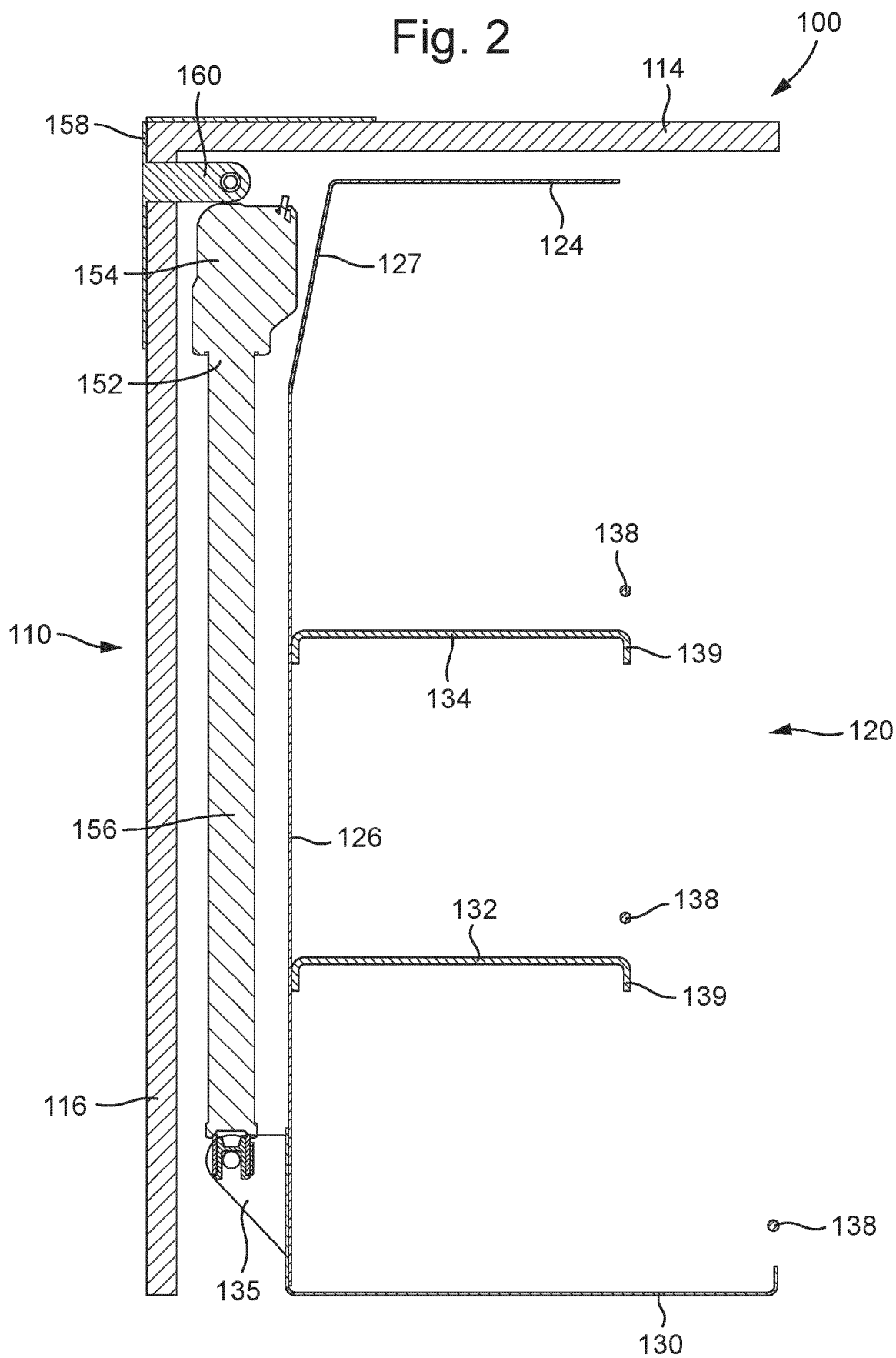


Fig. 3

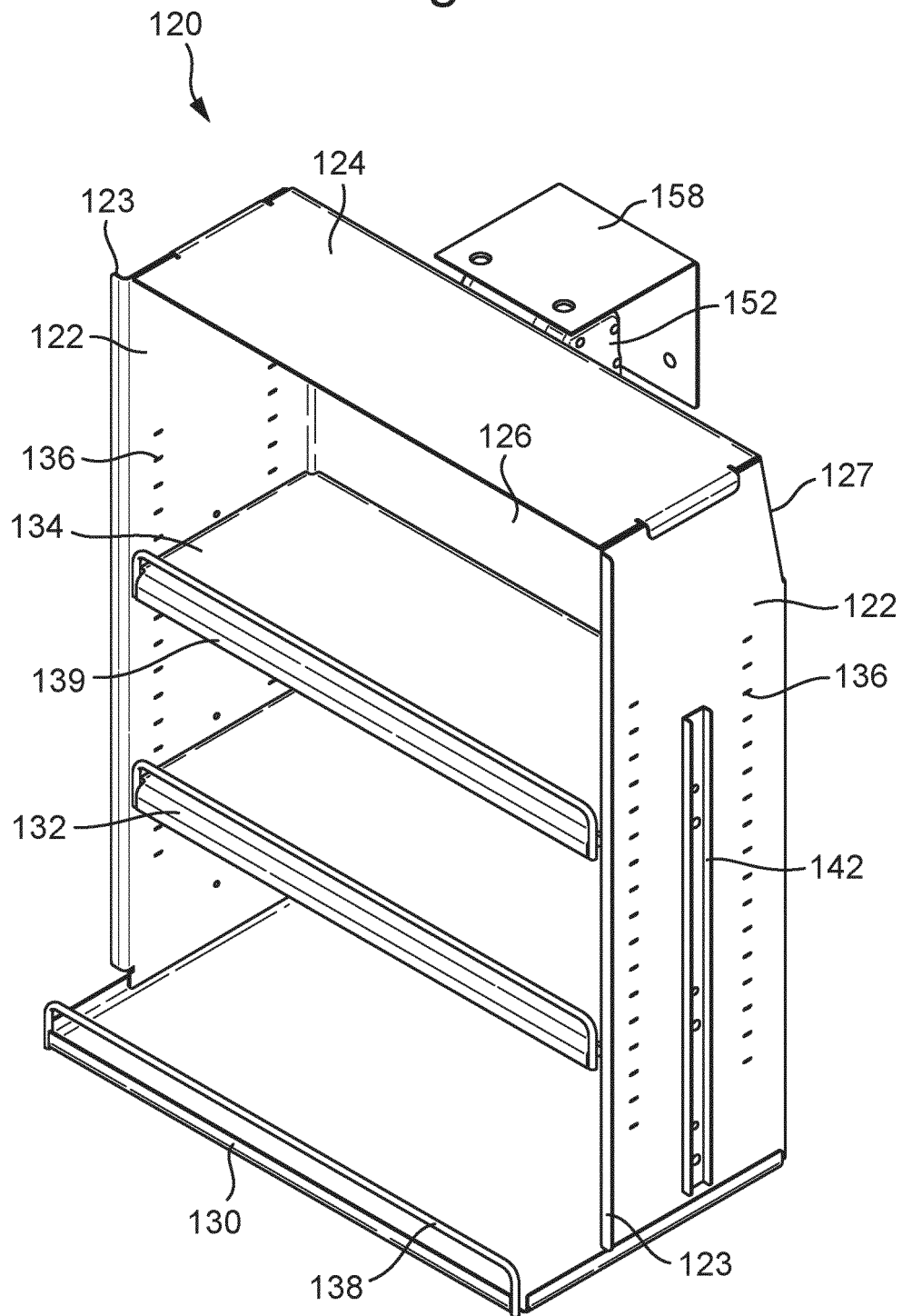


Fig. 4A

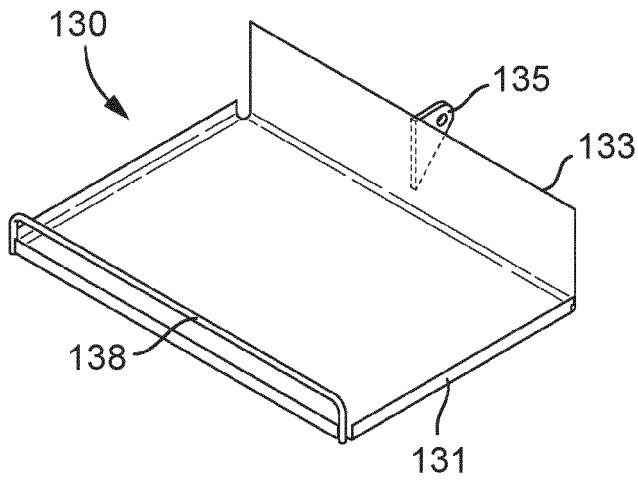


Fig. 4B

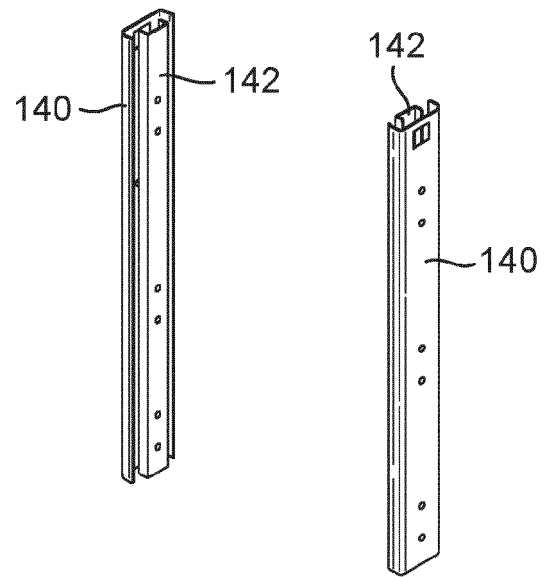


Fig. 4C

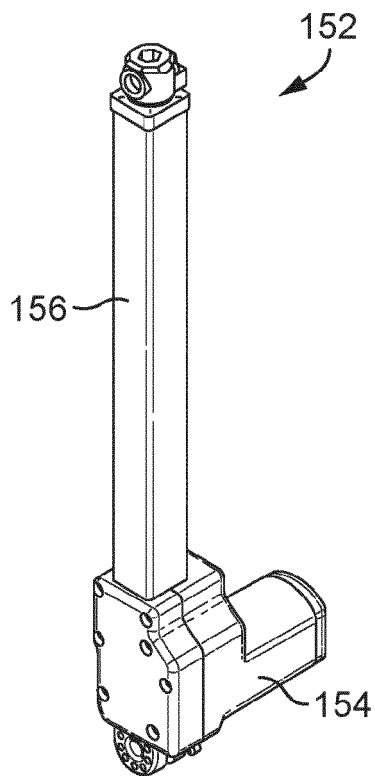


Fig. 5

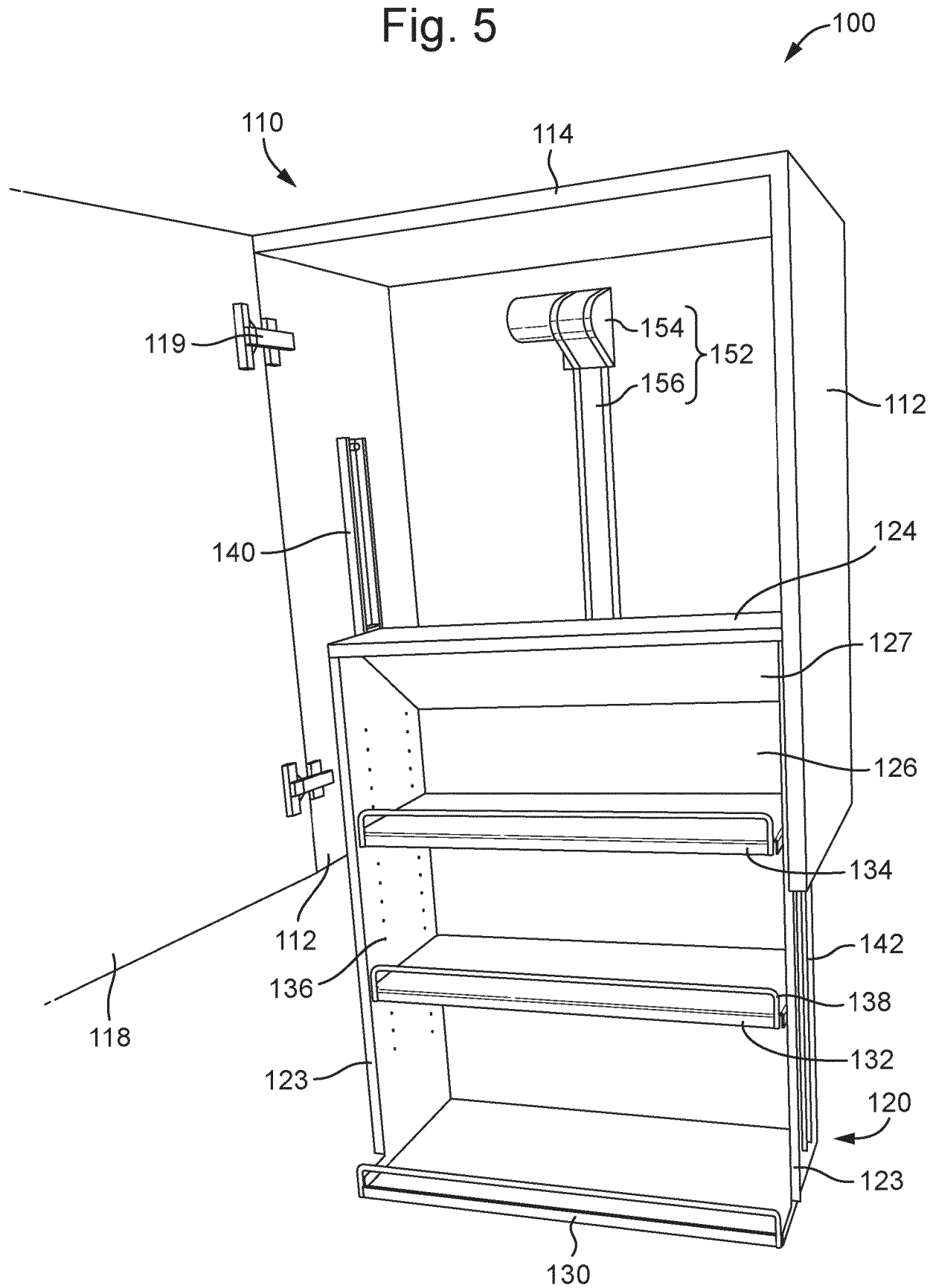


Fig. 6

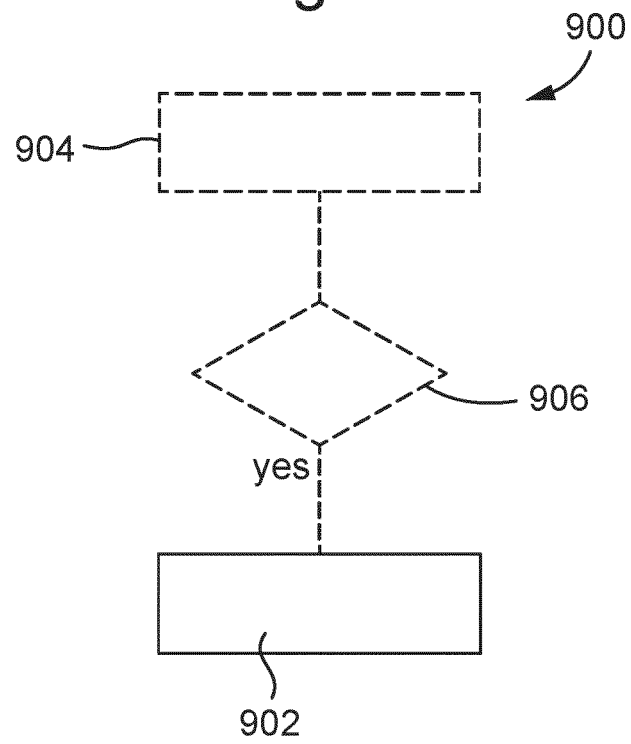
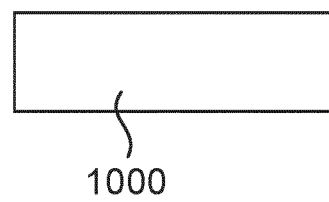


Fig. 7





EUROPEAN SEARCH REPORT

Application Number

EP 22 19 2224

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EPO FORM 1503 03.82 (P04C01)

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X	DE 20 2014 003631 U1 (BLUM GMBH JULIUS [AT]) 20 May 2014 (2014-05-20) * figures 1-8 * * paragraph [0005] - paragraph [0010] * -----	1-4, 6, 8, 9, 11-14	INV. A47B51/00
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			A47B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 January 2023	Examiner Linden, Stefan
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	

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

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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18-01-2023

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