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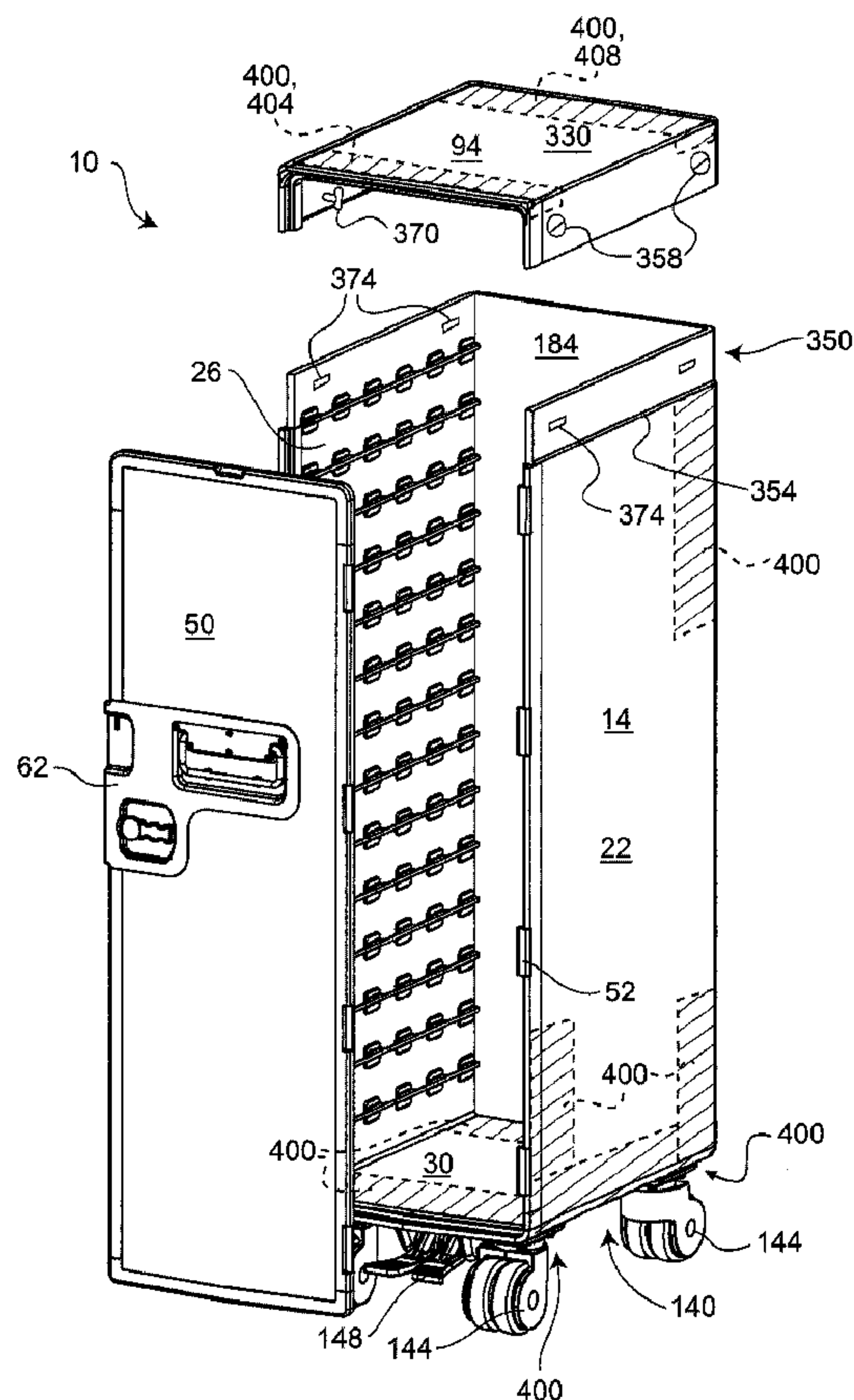
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(54) **Titre : ARMATURE DE CHARIOT ET SON PROCEDE DE FFABRICATION**

(54) **Title: BODY REINFORCEMENT AND METHOD OF MANUFACTURING THEREOF**



(57) **Abrégé/Abstract:**

A reinforced composite material utility cart comprising a body including two side portions interconnecting an upper portion and a bottom portion adapted to secure ground contacting members thereto is provided, at least one of the portions including composite

(57) Abrégé(suite)/Abstract(continued):

material and a reinforcement therein adapted to distribute a concentrated stress applied on the body to the composite material to prevent or reduce damages to the composite material. A method of manufacturing a reinforced composite panel adapted to be used in the construction of a utility cart adapted to be stowed in a bay of a galley of an airplane and locked in place with a lock disposed next to the bay in a position suitable to retain the utility cart in the bay by interfering with a reinforced edge of the utility cart is also provided.

MTC-025-019-012-CA1

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ABSTRACT

2 A reinforced composite material utility cart comprising a body including two side
3 portions interconnecting an upper portion and a bottom portion adapted to secure
4 ground contacting members thereto is provided, at least one of the portions
5 including composite material and a reinforcement therein adapted to distribute a
6 concentrated stress applied on the body to the composite material to prevent or
7 reduce damages to the composite material. A method of manufacturing a
8 reinforced composite panel adapted to be used in the construction of a utility cart
9 adapted to be stowed in a bay of a galley of an airplane and locked in place with a
10 lock disposed next to the bay in a position suitable to retain the utility cart in the
11 bay by interfering with a reinforced edge of the utility cart is also provided.

MTC-025-019-012-CA1**1 BODY REINFORCEMENT AND METHOD OF MANUFACTURING THEREOF****2 FIELD OF THE INVENTION**

3 **[01]** This invention relates generally to a utility cart for moving objects. More
4 precisely, the present invention relates to a reinforced composite material utility
5 cart body construction.

6 BACKGROUND OF THE INVENTION

7 **[02]** Utility carts are used in the transport industry to perform different tasks.
8 They carry goods along alleys and can be configured to serve drinks, food, sell
9 goods and collect garbage, among other tasks. Legacy carts are made in
10 aluminum that makes them strong but heavy. It is therefore desirable to have a
11 utility cart that is lighter to move and handle.

12 **[03]** Lighter utility carts made of composites materials are becoming more and
13 more popular. Composite materials offer a better strength / weight ratio than
14 most isotropic materials. Composites materials are lighter than metals, like
15 aluminum, because they are designed to provide material where it is the most
16 needed to sustain mechanical loads applied thereon. Generally, composite
17 material products are strong on their overall structure but are rather weak to
18 sustain loads locally applied thereto.

19 **[04]** Utility carts used in the aircraft industry are subjected to aeronautical
20 regulations. Some regulations are directed to fire resistance while others are
21 related to mechanical stresses resistance. SAE Aerospace Standard AS 8056
22 is an example of regulations applicable to utility carts intended to be used in
23 airplanes.

MTC-025-019-012-CA1

1 **[05]** Physical tests are performed on utility carts to ensure they meet each
2 mandatory requirement. Some tests are adapted to verify if the utility cart
3 resists to local impacts. For example, aerospace standards require a utility cart
4 to sustain direct local loads/stresses applied on some portions of the utility cart.
5 The utility cart needs to sustain concentrated loads of many G's (1G being one
6 time the Earth's gravity) without suffering significant damages. In the present
7 situation, loads equivalent to 9G must be bore by the utility cart.

8 **[06]** At least one of the requirements refers to a load applied on some portions of
9 the utility cart. Specific tests try to simulate the load applied by the locking
10 member securing the utility cart in the galley of an airplane. The load is applied
11 in the plan defined by the upper portion of the utility cart and in a direction
12 orthogonal with the front portion of the utility cart. Such a concentrated load
13 generally exceeds the strength of the composite material used to build the
14 utility cart structure.

15 **[07]** It is therefore desirable to find an improved composite material utility cart
16 structure over the existing art. It is also desirable to find a composite material
17 that is prone to support concentrated loads applied to a wall portion of the
18 utility cart.

19 **[08]** Other deficiencies will become apparent to one skilled in the art to which the
20 invention pertains in view of the following summary and detailed description
21 with its appended figures.

22 SUMMARY OF THE INVENTION

23 **[09]** The following presents a simplified summary of the invention in order to
24 provide a basic understanding of some aspects of the invention. This summary
25 is not an extensive overview of the invention. It is not intended to identify
26 key/critical elements of the invention or to delineate the scope of the invention.

MTC-025-019-012-CA1

1 Its sole purpose is to present some concepts of the invention in a simplified
2 form as a prelude to the more detailed description of exemplary embodiments
3 that is presented later.

4 **[010]** Therefore, the present invention improves at least some of the deficiencies
5 associated with the drawbacks identified above in accordance with at least one
6 embodiment of the present invention.

7 **[011]** The present invention provides a composite structure that is adapted to
8 better sustain concentrated loads applied to a composite materials utility cart in
9 accordance with at least one embodiment of the present invention.

10 **[012]** The present invention provides a variety of means to distribute the stress
11 applied to a composite wall of a utility cart in accordance with at least one
12 embodiment of the present invention.

13 **[013]** The present invention provides a reinforced top portion of a utility cart that
14 comprises a reinforcement member embedded therein in accordance with at
15 least one embodiment of the present invention.

16 **[014]** The present invention provides a composite material utility cart provided
17 with means to increase its resistance to concentrated mechanical stress
18 applied thereon in accordance with at least one embodiment of the present
19 invention.

20 **[015]** The present invention provides a utility cart provided with a reinforcement
21 located in the composite material wall of the utility cart that is wrapped with a
22 series of layers of fibers to increase its resistance to concentrated mechanical
23 stresses applied thereon in accordance with at least one embodiment of the
24 present invention.

MTC-025-019-012-CA1

1 **[016]** The present invention provides a utility cart comprising a body including two
2 side portions interconnecting an upper portion and a bottom portion adapted to
3 secure ground contacting members thereto is provided, at least one of the
4 portions including composite material and a reinforcement therein adapted to
5 distribute a concentrated stress applied on the body to the composite material
6 to prevent or reduce damages to the composite material.

7
8 **[017]** The present invention provides a method of manufacturing a reinforced
9 composite panel adapted to be used in the construction of a utility cart adapted
10 to be stowed in a bay of a galley of an airplane and locked in place with a lock
11 disposed next to the bay in a position suitable to retain the utility cart in the bay
12 by interfering with a reinforced edge of the utility cart is also provided.

13
14 **[018]** To the accomplishment of the foregoing and related ends, certain illustrative
15 aspects of the invention are described herein in connection with the following
16 description and the annexed drawings. These aspects are indicative, however,
17 of but a few of the various ways in which the principles of the invention may be
18 employed and the subject invention is intended to include all such aspects and
19 their equivalents. Other advantages and novel features of the invention may
20 become apparent from the following detailed description of the invention when
21 considered in conjunction with the drawings.

MTC-025-019-012-CA1**1 BRIEF DESCRIPTION OF THE DRAWINGS**

2 **[01]** Figure 1 is a perspective view of an airplane's galley having a series of utility
3 cart receiving bays with utility carts inserted therein in accordance with an
4 embodiment of the present invention;

5 **[02]** Figure 2 is a perspective view of a full size utility cart with a reinforcement
6 therein in accordance with an embodiment of the present invention;

7 **[03]** Figure 3 is a perspective view of a full size utility cart with a reinforcement
8 therein illustrated with extended tablets thereof in accordance with an
9 embodiment of the present invention;

10 **[04]** Figure 4 is a magnified view of a utility cart with a reinforcement therein in
11 accordance with an embodiment of the present invention;

12 **[05]** Figure 5 is a perspective view of a full size utility cart with opened doors and
13 reinforcements therein in accordance with an embodiment of the present
14 invention;

15 **[06]** Figure 6 is a front elevational view of the full size utility cart of Figure 1 with
16 reinforcements therein in accordance with an embodiment of the present
17 invention;

18 **[07]** Figure 7 is a right side elevational section view the full size utility cart of
19 Figure 1 with reinforcements therein in accordance with an embodiment of the
20 present invention;

21 **[08]** Figure 8 is a perspective view of a half size utility cart with reinforcements
22 therein in accordance with an embodiment of the present invention;

MTC-025-019-012-CA1

1 **[009]** Figure 9 is an exploded perspective view of a half size utility cart with
2 reinforcements therein in accordance with an embodiment of the present
3 invention;

4 **[010]** Figure 10 is an exploded perspective view of a half size utility cart with
5 reinforcements therein in accordance with an embodiment of the present
6 invention;

7 **[011]** Figure 11 is a perspective view of a body of a half size utility cart with
8 reinforcements therein in accordance with an embodiment of the present
9 invention;

10 **[012]** Figure 12 is a front elevational view of a half size utility cart with
11 reinforcements therein in accordance with an embodiment of the present
12 invention;

13 **[013]** Figure 13 is a sectional top plan view of a half size utility cart with
14 reinforcements therein in accordance with an embodiment of the present
15 invention;

16 **[014]** Figure 14 is a sectional view of a portion of a door closure mechanism of a
17 utility cart in accordance with an embodiment of the present invention;

18 **[015]** Figure 15 is a magnified view of a upper portion of a half size utility cart with
19 reinforcements therein in accordance with an embodiment of the present
20 invention;

21 **[016]** Figure 16 is a bottom plan view of a half size utility cart with reinforcements
22 therein in accordance with an embodiment of the present invention;

MTC-025-019-012-CA1

1 **[017]** Figure 17 is a perspective view of a body of a half size utility cart with
2 reinforcements therein in accordance with an embodiment of the present
3 invention;

4 **[018]** Figure 18 is a rear perspective view of a body of a half size utility cart with
5 reinforcements therein in accordance with an embodiment of the present
6 invention;

7 **[019]** Figure 19 is a perspective exploded view of a body of a half size utility cart
8 with reinforcements therein in accordance with an embodiment of the present
9 invention;

10 **[020]** Figure 20 is a schematic top plan view of a utility cart with reinforcements
11 therein in accordance with an embodiment of the invention;

12 **[021]** Figure 21 is a schematic front elevational sectional view of a portion of a
13 composite wall member with reinforcements therein in accordance with an
14 embodiment of the invention;

15 **[022]** Figure 22 is a schematic front elevational sectional view of a portion of a
16 composite wall member with reinforcements therein in accordance with an
17 embodiment of the invention;

18 **[023]** Figure 23 is a schematic sectional view of a portion of a composite wall
19 member with reinforcements therein in accordance with an embodiment of the
20 invention;

21 **[024]** Figure 24 is a schematic sectional view of a portion of a composite wall
22 member with reinforcements therein in accordance with an embodiment of the
23 invention;

MTC-025-019-012-CA1

1 **[025]** Figure 25 is a schematic sectional view of a portion of a composite wall
2 member with reinforcements therein in accordance with an embodiment of the
3 invention;

4 **[026]** Figure 26 is a schematic sectional view of a portion of a composite wall
5 member with reinforcements therein in accordance with an embodiment of the
6 invention;

7 **[027]** Figure 27 is a schematic isolated reinforcement in accordance with an
8 embodiment of the invention; and

9 **[028]** Figure 28 is a schematic view of a portion of a composite wall member with
10 reinforcements therein in accordance with an embodiment of the invention.

11 **DESCRIPTION OF EMBODIMENT(S) OF THE INVENTION**

12 **[029]** The present invention is now described with reference to the drawings,
13 wherein like reference numerals are used to refer to like elements throughout.
14 In the following description, for purposes of explanation, numerous specific
15 details are set forth in order to provide a thorough understanding of the present
16 invention. It may be evident, however, that the present invention may be
17 practiced without these specific details. In other instances, well-known
18 structures and devices are shown in schematic form in order to facilitate
19 describing the present invention.

20 **[030]** Figure 1 illustrates a typical airplane galley 2 including a plurality of bays 4
21 adapted to respectively receive therein a utility cart 10. Each utility cart 10 is
22 sized and designed to fit into its respective bay 4 and be secured by one or
23 many pivotable locks 6 adapted to restrain the utility cart 10 in its bay 4. Locks
24 6 are sized and designed to retain the utility cart 10 in case of accident and
25 therefore sustain significant loads thereof. The lock 6 generally secures an

MTC-025-019-012-CA1

1 upper portion 18 of the utility cart 10 and can alternatively secure a side or a
2 bottom portion of the utility cart 10.

3 **[031]** A utility cart 10 adapted to carry goods is illustrated in Figure 2 and used
4 throughout the present specification to present a tangible exemplary use of
5 embodiments of the invention. The utility cart 10 is adapted to be used in a
6 passenger airplane. The utility cart 10 could alternatively be used in other
7 environments like in a passenger train or, *inter alia*, in the medical field to
8 distribute medicine or food. The utility cart 10 illustrated in Figure 2 comprises
9 a body 14 defining an upper portion 18, a right lateral portion 22, a left lateral
10 portion 26 and a bottom portion 30. The body 14 of the utility cart 10 can be
11 described as a monocoque construction 34 simultaneously providing the
12 aesthetic envelope of the utility cart 10 and the structure providing its overall
13 mechanical strength. In other words, the monocoque construction 34 provides
14 an envelope that also serves as structural body 14 of the utility cart 10. As it
15 will be described below in respect with at least one embodiment, the
16 monocoque construction 34 can form a body 14 made of a single part.

17 **[032]** In the illustrated embodiment, the upper portion 18, the right lateral wall
18 portion 22, the left lateral wall portion 26 and the bottom wall portion 30 of the
19 body 14 are connected together in a continuous wall. Illustrative embodiments
20 described herein are using radius portions 32 to interconnect adjacent wall
21 portions 18, 22, 26, 30. The body 14 of the illustrated embodiment forms a
22 tubular member having four planar wall portions 18, 22, 26, 30 made of a
23 single part. Wall portions 18, 22, 26, 30 can be secured together to form the
24 body 14 in a first configuration while, alternatively, the four planar wall portions
25 18, 22, 26, 30 can be produced separately and later assembled in a unitary
26 body 14 in a second configuration. Both configurations can be defined as
27 forming a monocoque structure and can vary in terms of their overall shape
28 and size.

MTC-025-019-012-CA1

1 **[033]** It can be appreciated that the thickness of the wall portions 18, 22, 26, 30
2 can have different thicknesses adapted to sustain specific mechanical loads
3 applied thereto. In other words, the monocoque construction 34 can be
4 optimized to only use the required quantity of material at the right place and
5 therefore reduce the weight of the utility cart 10 while providing the appropriate
6 mechanical resistance thereof. For example, the upper portion 18 can have a
7 thinner wall section than the bottom portion 30 because the upper portion 18
8 does not bear the weight of the entire utility cart 10 and its content. Additional
9 details about the construction of the body 14 will be provided below.

10 **[034]** More precisely, the utility cart 10 illustrated in Figure 2 is a full-size utility
11 cart 10 having a predetermined longitudinal length 36 and provided with a door
12 opening 38 on each longitudinal side 42, 46. Each door 50 is hingedly 52
13 connected to the body 14 and is adapted to pivot between a closed position 54,
14 when mating with its respective door opening 38, and an opened position 58 as
15 illustrated in Figure 5. A reinforcement member 62 recessed into the door 50
16 provides support for a pull handle 66 pivotally secured thereon and adapted to
17 open the door 50. A locking member 70 protruding from the door opening 38
18 and passing through a corresponding opening 72 in the door 50, when the door
19 50 is in the closed position 54, to receive a lock (not shown) thereon to prevent
20 opening of the door 50 is also connected to the reinforcement member 62. A
21 handle 74 is pivotally secured to the reinforcement member 62 to selectively
22 disengage a retractable lock member 78 from a cooperating extending stem 82
23 to open the door 50. The handle 74 can be actuated in both the upward and
24 downward directions to retract the lock member 78 to allow unlocking and
25 opening of the door 50.

26 **[035]** Still referring to Figure 2, the utility cart 10 is provided with a cover element
27 module 90 illustratively made of molded plastic or thermo-plastic material to
28 cover the upper portion 18 of the body 14. The cover element module 90 is a

MTC-025-019-012-CA1

1 portion of the utility cart 10 adapted to specialize the utility cart 10 for better
2 assisting specific tasks while keeping the remaining portions of the utility cart
3 10 substantially unchanged. The cover element module 90 of the present
4 embodiment can be permanently secured to the body 14 with glue, fasteners,
5 or the like, to improve the shape of the upper portion 18 into a planar working
6 area 94 defined by a peripheral ridge 98 configured to prevent objects or
7 liquids to slide off the upper portion 18 of the body 14. Alternatively, the cover
8 element module 90 is secured via a securing element 86.

9 **[036]** Utility cart utility modules are portions of the utility cart 10 that can be
10 changed for specializing the utility cart 10 without changing the body 14 of the
11 utility cart 10. The modules can be located at various positions on the utility
12 cart 10 despite the illustrative examples presented herein are mostly only using
13 the upper portion 18 of the utility cart 10 to receive modules thereto. The
14 modularity of the present invention can be directed to the utility cart 10
15 manufacturing process by selecting the desired module at the time of
16 permanently assembling the utility cart 10 once the specific intended task of
17 the utility cart 10 is known from the client. The modularity of the present
18 invention can equally be directed to ongoing modifications to the utility cart 10
19 along its useful life by using non-permanent securing means to secure the
20 module to the utility cart 10.

21 **[037]** In the present embodiment, a tablet module 110 is secured inside the body
22 14, adjacent to the upper portion 18. The tablet module 110 of the illustrated
23 embodiment comprises an extendable tablet 114 and an adjacent extendable
24 receptacle 118. Dry ice (or means to cool) can be put in the extendable
25 receptacle 118 to cool the interior of the utility cart 10. The extendable tablet
26 114 is moveable between a closed position 122 and an opened position 126 as
27 it can better be appreciated in Figure 2 and Figure 3. A locking mechanism 130
28 actuated with a button in the present embodiment prevents the extendable

MTC-025-019-012-CA1

1 receptacle 118 to extend when undesired. Two handles 134 are defined in the
2 extendable tablet 114 and are accessible when the extendable tablet 114 is
3 slightly extended to drive the utility cart 10, when desired.

4 **[038]** Continuing with Figure 2, the bottom portion 30 rests on a wheelbase
5 module 140 adapted to pivotally secure thereto four (4) sets of caster wheels
6 144. The wheelbase module 140 is permanently or removably secured to the
7 bottom portion 30 of the body 14. Two pedals 148 are also pivotally secured to
8 the wheelbase module 140 to selectively lock or unlock the caster wheels 144
9 to immobilize the utility cart 10 with an operative mechanism.

10 **[039]** Reinforcements 400 in the upper portion 18 are displayed in Figure 2. As it
11 is known in the art, composite materials are anisometric materials adapted to
12 be used in the manufacturing of light components. However, composite
13 materials are generally recognized to be poor in sustaining local mechanical
14 stresses. Some parts of the utility cart 10 are subjected to potential high local
15 mechanical stresses. These stresses could be applied to the upper portion 18
16 or any other portions of the body 14 that is used to interfere with locks 6 of the
17 galley 2 to maintain the utility cart 10 in the bay 4. Two reinforcements 400 are
18 illustrated in the utility cart 10, one in the front 404 and the other in the rear 408
19 of the upper portion 18. These reinforcements 400 are molded in the
20 composite materials to add more strength to both the front and the rear edges
21 of the upper portion 18 by being made with a material stronger than the
22 composite materials so that localized mechanical stresses are distributed to a
23 wider composite material area to prevent breaking the composite materials.
24 Otherwise, the amount of composite materials required to sustain the same
25 localized stresses would be significantly more important, hence being heavier
26 and more costly. Reinforcements 400 are illustrated in the following Figures
27 and are discussed in more details below.

MTC-025-019-012-CA1

1 **[040]** Figure 4 is a magnified view of the tablet module 110. The semi-opened
2 door 50 allows seeing the interior of the utility cart 10 where a series of
3 receptacles-supporting parallel rails 160 are visible. The series of rails 160 are
4 secured to the interior side of the lateral wall portions 22, 26 at a constant
5 interval thereto to slideably receive receptacles, bins or drawers (not
6 illustrated) thereon. Openings (not visible) disposed on the lower portion of the
7 extendable receptacle 118 are allowing cold air to pass through the extendable
8 receptacle 118 and propagate to the rest of the body 14 to cool goods located
9 therein.

10 **[041]** Figure 5 illustrates the full size configuration utility cart 10 with the doors 50
11 in their respective opened position 58. Each door 50 can open 58 in a position
12 parallel to an adjacent lateral wall 22, 26. For doing so, the hinge 52 is
13 provided with a double pivot axis adapted to distance the side of the door 50
14 from the door opening 38 and allow parallel proximity with one of the lateral
15 wall portions 22, 26. A magnet can be used to keep the door 50 temporarily
16 affixed to its respective lateral wall portion 22, 26 in the open position 58.
17 Figure 5 also illustrates a reinforcement 400 applied to the bottom portion 30 of
18 the utility cart 10. The reinforcement 400 has a similar role as its counterparts
19 404, 408 disposed in the upper portion 18 and protects the front edge of the
20 bottom portion 30 against damages caused by significant local mechanical
21 stresses.

22 **[042]** Turning now to Figure 6 depicting the utility cart 10 and a section line
23 representing the cut location of the section view illustrated in Figure 7. Figure 7
24 put further emphasis on the mechanical layout of the tablet module 110 inside
25 the body 14. The full size utility cart 10 comprises two opposed tablet modules
26 110.1, 110.2. In other words there are two opposed extendable tablets 114 and
27 two extendable receptacles 118 to respectively be used on each longitudinal
28 side 42, 46 of the full size utility cart 10. Each tablet module 110 has a lower

MTC-025-019-012-CA1

1 wall 168 sized and designed to be secured on each side to the lateral wall
2 portions 22, 26. The tablet modules 110 of the present embodiment are located
3 inside the body 14 of the utility cart 10 as opposed to the outside of the body
4 14. Alternatively, the tablet modules 110 could be located outside the body 14
5 on top of the upper portion 18 and covered by an appropriate cover element
6 module 90.

7 **[043]** The full size utility cart 10 illustrated in Figure 2 has a smaller counterpart. A
8 half-size utility cart 180, as illustrated in Figure 8, has a smaller size due to its
9 shorter longitudinal length 36. The smaller volume of the half size utility cart
10 180 can contain fewer goods therein but allows more nimble movements. We
11 refer herein to a half-size utility cart although it could not exactly be half the
12 size of its larger counterpart.

13 **[044]** As it is called, the half size utility cart 180 of the present embodiment is
14 about half the length of the full size utility cart 10. This is mainly obtained by
15 reducing the longitudinal length 36 of the body 14 and the cover element
16 module 90 and by using a single tablet module 110, a single door 50 and
17 closing the opposite longitudinal side with a back portion 184 that can better be
18 appreciated in exploded Figure 9. Beside the shorter longitudinal length 36, the
19 components of the half size trolley 180 are substantially similar as the
20 components of the full size trolley 10. It can further be seen in Figure 9 that the
21 door 50 has a recessed portion 188 sized and designed to receive therein the
22 lock member 62 such that the lock member 62 and the locking components
23 located thereon do not significantly extend over the external surface of the door
24 50. Reinforcements 400 applied to both the front and the rear edges of the
25 upper portion 18 and the bottom portion 30 of the utility cart 10 are also
26 illustrated.

MTC-025-019-012-CA1

1 **[045]** Figure 10 illustrates the half size utility cart 180 in a more detailed exploded
2 view. It is first possible to appreciate that four reinforcement members 400 are
3 disposed in the upper portion 18 and the bottom portion 30 of the composite
4 body 14. Many parts are secured to the composite materials body 14 of the
5 utility cart 180. These parts are preferably secured with securing mechanisms
6 discussed in more details below. Beginning from the back of the utility cart 180
7 it can be appreciated there is a resilient member 200 illustratively adapted to
8 cover the rear edges 204 of the body 14. The resilient member 200 is
9 preferably made of a material capable of absorbing shocks, like rubber, plastic
10 or the like. Additional resilient members 200 can be added on other portions of
11 the utility cart 180 where needed to protect the body 14, or other parts of the
12 utility cart 180, against exterior objects that could damage the utility cart 180.
13 The parts are affixed to a half size utility cart 180 in the present embodiment
14 but could also be affixed to the full size utility cart 10 without departing from the
15 scope of the present invention.

16 **[046]** The cover element module 90 used on a half size utility cart 180 is obviously
17 smaller than the cover element module 90 adapted to be used in conjunction
18 with a full size utility cart 10 as illustrated in Figure 2. As previously mentioned,
19 the cover element module 90 is preferably made of thermoformable or
20 thermoset polymeric material because it is easy to shape, its low cost, its light
21 weight and the optional additional desirable features that could be added (i.e.
22 ridges, grooves, logos...) thereon. Anti-slip texture can be added on the upper
23 surface 208 of the cover element to prevent objects to slip thereon, to help
24 liquid to drain or to prevent undesired noise to be produced when objects are
25 put thereon. Similarly, a texture could be added on the lower surface 212 to
26 improve adhesion between the cover element module 90, the upper portion 18
27 and the side portions 22, 26 of the body 14. This might be desirable when the
28 cover element module 90 is glued to the body 14.

MTC-025-019-012-CA1

1 **[047]** Still in Figure 10, the tablet module 110 is extracted from the interior of the
2 body 14. The extendable tablet 114 and the extendable receptacle 118 are
3 dismantled from the side guides 220 in which they operatively slide between
4 their respective extended and retracted positions. The extendable tablet 114
5 and/or the extendable receptacle 118 are optionally spring loaded with spring
6 blades 124 located at the rear of the tablet module 110 to facilitate their
7 extensions when they are fully retracted in the body 14. A connection between
8 one end 224 of the spring blade 124 and its related side guide 220 locates the
9 spring 124 in a position where the spring blade 124 stores energy therein when
10 the extendable tablet 114 and/or the extendable receptacle 118 are retracted in
11 the body 14. The energy stored in the spring blade 124 is restored when the
12 locking mechanism unlocks the extendable tablet 114 and/or the extendable
13 receptacle 118 from its recessed position to push the tablet 114 or the
14 receptacle 118 out. Additional springs 124 associated with the tablet module
15 110 to preload an additional extendable tablet 114 and/or an additional
16 extendable receptacle 118 are alternatively provided. Each side guide 220 is
17 secured to the interior wall surface of the body 14 at the appropriate height.

18 **[048]** The side guides 220 of an embodiment of the present invention can be
19 glued or secured otherwise to the body 14, using or not, an intervening part
20 228. The present embodiment uses a pair of intervening parts 228 to interface
21 between respective side guides 220 and the body 14. These additional
22 intervening parts 228 are desirable to better locate the side guides 220 before
23 mounting the whole tablet module 110 in the body 14 as opposed to trying to
24 secure the complete tablet module 110 in the body 14. This is very convenient,
25 when the tablet module 110 is glued to the body 14, to glue the intervening
26 parts 228 to the body 14 and maintains it with a jig, wait for the glue to cure
27 and then secure the remaining parts of the tablet module 110 to the body 14.
28 The side guides 220 are also useful to removably secure the tablet module 110
29 or another module thereon. Another embodiment of the invention uses

MTC-025-019-012-CA1

1 fasteners to secure the side guides 220 to the body 14 therefore allowing the
2 side guides 220 to be removed if needed. Some means to secure parts to a
3 composite body 14 are detailed below. An alternate embodiment of the
4 invention provides a removable securing mechanism allowing easy and quick
5 removal of the side guides 220 to install some other desirable features that are
6 useful when the utility cart 180 is in use for some tasks. A front panel 232 is
7 located in front of the tablet module 110 and acts as a finishing element having
8 an aesthetic value. In the present embodiment, the front panel defines an
9 opening adapted to let the extendable tablet 114 and/or the extendable
10 receptacle 118 pass through.

11 **[049]** Figure 10 also depicts a door-opening frame 236 having a profile adapted to
12 mate with edges of the body 14 on one side and to receive the door 50, in the
13 closed position 54, on the other side - not illustrated in Figure 10 but illustrated
14 in Figure 2. The door-opening frame 236 is firmly anchored on the edge of the
15 body 14 and could be secured in place with adhesive and/or a securing means
16 illustrated below. In the illustrated embodiment the locking member 70 and the
17 extending stem 82 are molded in the door-opening frame 236 to ensure
18 sufficient stiffness and avoid transferring directly the load to the body 14.
19 Alternatively, the locking member 70 and the extending stem 82 are glued to
20 the door-opening frame 236. Another embodiment firmly secures the locking
21 member 70 and the extending stem 82 to the body 14 with fasteners and
22 extends through associated openings performed in the door-opening frame
23 236. Additionally, the door-opening frame 236 further defines a portion of the
24 hinge 52 pivotally securing the door 50 to the body 14. A hinge pivot 240 can
25 be seen in Figure 9. The long hinge pivot 240 is inserted through alternate
26 openings in the door-opening frame 236, the door 50 and the smaller hinge
27 members associated with reference number 52 in Figure 10.

MTC-025-019-012-CA1

1 **[050]** Turning now to Figure 11 illustrating a body 14 defining the aforementioned
2 upper wall portion 18, right lateral wall portion 22, left lateral wall portion 26,
3 bottom wall portion 30 and, because this is the body of a half size trolley 180, a
4 back wall portion 184. In one embodiment, the upper wall portion 18, right
5 lateral wall portion 22, left lateral wall portion 26 and bottom wall portion 30,
6 interconnected with radius portions 32, are made of a single part and the back
7 wall portion 184 is connected to the hollowed body 14 afterward. This allows
8 the hollowed body 14 to have an extrusion-like shape before it is capped on
9 one longitudinal side 42 to provide a half size utility cart body 14. Conversely,
10 as explained above in reference with the full size utility cart 10, the upper wall
11 portion 18, right lateral wall portion 22, left lateral wall portion 26 and bottom
12 wall portion 30 interconnected with radius portions 32 are forming the body 14
13 of the full size utility cart 10.

14 **[051]** The upper wall portion 18, right lateral wall portion 22, left lateral wall portion
15 26, bottom wall portion 30 are made of composite materials to provide a strong
16 global mechanical resistance yet light weight full size utility cart 10 and/or half
17 size utility cart 180. Composite materials are commonly known as
18 reinforcement fibers fixed with a resin matrix. The composite material is
19 advantageous for its lightweight; its anisometric structural benefits and for its
20 thermal efficiency, thus providing a good thermal barrier between the inside of
21 the utility cart 10 and the environment.

22 **[052]** The present application can utilize a liquid Phenolic resin to infuse dry
23 fabrics (e.g. fibers, reinforcement material, ...) in the composite layup by
24 means of vacuum infusion molding. This enables to reduce the costs of
25 materials while still enabling to mold the composite sandwich layup in a shape
26 of a finished trolley. Additionally, Phenolic resin meets the numerous safety
27 requirements for aviation applications.

MTC-025-019-012-CA1

1 **[053]** Vacuum Infusion Process (VIP) is a common resin infusion fabrication
2 method usable with Phenolic resin that uses vacuum pressure to drive liquid
3 resin into dry fiber-reinforcement material. Materials are laid up dry into the
4 mold and the vacuum is applied before resin is introduced. Once a complete
5 vacuum is achieved, resin is literally sucked into the laminate via carefully
6 placed resin-feed lines. The resin infusion process has been identified as a
7 cost-effective fabrication technique for producing damage tolerant textile
8 composites. Dry textile preforms are resin impregnated, consolidated and
9 cured in a single step eliminating costly prepreg tape manufacture and ply-by-
10 ply layup. VIP uses vacuum bag that is not reusable. The bag is placed over
11 the part and is sealed around the perimeter of the mold with tacky-tape. The
12 layup of material in the VIP consists of fiberglass woven cloth layers; a foam
13 core; Phenolic resin and vacuum bagging accessories.

14 **[054]** Continuing with Figure 11, the forward edge 244 of the body 14 is shaped
15 248 to accommodate the front panel, on its upper wall portion 18 and lateral
16 wall portions 22, 26. Additional forms/shapes 252 are performed on the right
17 lateral portion 26 to receive the locking member 70 and the extending stem 82
18 as taught in an embodiment of the invention. Other forms could be performed
19 on the body 14 to suit various other needs without departing from the scope of
20 the present invention.

21 **[055]** Still referring to Figure 11, reinforcements 400, 404, 408 have a shape
22 adapted to extend 416 to the lateral portions 22, 26. The extended shape of
23 the reinforcements 400, 404, 408 helps to further distribute the energy of a
24 mechanical load applied to the galley cart 10 to a wider portion of the body 14
25 while preventing the composite material of the body 14 to collapse. The
26 illustrated embodiment of Figure 11 has radius portions 32 defined between
27 the lateral portions 22, 26 and the back portion 184. The shape of the
28 reinforcements 400, 404, 408 is adapted to mate the shape of the radius

MTC-025-019-012-CA1

1 portions 32 to be properly integrated into the body 14. Reinforcements 400,
2 404, 408 could be more or less wide depending on their mechanical
3 resistance, the design of the body 14 and the expected mechanical load to be
4 applied thereon. In an alternate embodiment (not shown), the radius portions
5 32 can have a different shape and even be 90-degree angled. In this alternate
6 embodiment, the reinforcements 400, 404, 408 have a shape adapted to be
7 embedded in the body 14. The extended reinforcements 400, 404, 408 can be
8 made of a plurality of adjacent and/or cooperating reinforcements without
9 departing from the scope of the present disclosure.

10 **[056]** Further, in Figure 11, it can be appreciated that the lower portion of the
11 galley cart 10 is equipped with a series of cooperating reinforcements 400. The
12 series of reinforcements 400 provides a significant mechanical resistance
13 advantage to the body 14. A reinforcement 400 on a front side 420 of the body
14 14 can be connected to a rear side 424 of the body 14 via a junction member
15 428. Some areas 432 of the body 14 remain free of a reinforcement 400 if the
16 expected mechanical load to be applied thereto does not require any
17 reinforcement 400 and be sustained by the composite material alone. The
18 reinforcements 400 can extend to more than one plane (e.g. from the lateral
19 portions 22, 26 to the bottom portion 30 and further to the back portion 184) to
20 create a multi-dimensional reinforcement 403. The multi-dimensional
21 reinforcement 403 illustrated on the bottom of the body in Figure 11 is
22 preferably made of a unitary reinforcement 400 but can also be made of a few
23 cooperating/assembled reinforcement parts. The unitary multi-dimensional
24 reinforcement 403 can be machined or molded to the desired dimensions prior
25 to be embedded in the body 14. A unitary multi-dimensional reinforcement 403
26 is equipped, if required, of discontinuities 436 therein to allow some
27 dimensional variations at the time of infusing/molding/curing the unitary multi-
28 dimensional reinforcement 400 with the composite material to create the body
29 14. These discontinuities 436 are typically ruptures in the unitary multi-

MTC-025-019-012-CA1

1 dimensional reinforcement 403 intended to allow contraction or expansion of
2 the body 14 at the time of molding, infusing and or curing. The unitary multi-
3 dimensional reinforcement 403 can be made of more than one cooperating
4 multi-dimensional reinforcement 403.

5 **[057]** Figure 12 is an illustration of a half size utility cart 180 with an indication of
6 the section area used by following Figure 13 where it is possible to appreciate
7 in more details the composition of the composite materials used in the utility
8 cart body 14. This top plan view depicts the continuity between the left lateral
9 wall portion 26, the back wall portion 184 and the right lateral wall portion 22.
10 The radius portions 32 ensuring the composite wall continuity are well shown in
11 Figure 13 with their respective resilient member 200. The composite materials
12 comprise, in an embodiment of the invention, a sandwich structure of an
13 exterior finishing layer 260 used to protect the body 14 and improve its
14 resistance to contacts with exterior objects while giving an alternate aesthetic
15 finish to the body 14. An exterior layer 264 of fibers and Phenolic resin comes
16 next with a central core 268 having the role of distancing the interior layer 272
17 of fibers and Phenolic resin from the center of the wall portion thus increasing
18 the stiffness of the structure. An interior finishing layer 276 used to protect the
19 body 14 and improve its resistance to contacts with interior objects.

20 **[058]** Still in reference with Figure 13, one can appreciate that the door opening
21 frame 236 of the door opening 38 and the door contour frame 290 are made of
22 the same extruded material. In this embodiment of the invention the same
23 extruded shape is complementarily used for the door-opening frame 236 and
24 the door contour frame 290. The use of a single extruded shape of this
25 embodiment simplifies the assembly and reduces the tooling cost. The shape
26 of the extrusion depicted in Figure 13 and in Figure 14 are possible designs.
27 The extruded material is aluminum although other equally suitable material

MTC-025-019-012-CA1

1 could be used and still be considered within the scope of the present invention
2 (e.g. plastic).

3 **[059]** An alternate embodiment of the interface between the door opening frame
4 236 and the door contour frame 290 is illustrated in Figure 14. Two different
5 shapes of extrusion 300, 304 are used in this embodiment and a seal 308 (an
6 "O" ring) has been inserted in a groove 312 properly sized and designed. This
7 type of design improves the sealing of the door 50 with the body 14 to help
8 improve thermal efficiency of the utility cart 10, 180.

9 **[060]** Moving now to Figure 15 illustrating a more detailed exploded view of the
10 cover element module 90 with the upper portion 18 of the body 14. The cover
11 element module 90 is designed to slide fit the upper portion of the body 14 and
12 be secured thereto with glue or fasteners. A recessed portion 316 having a
13 depth significantly equivalent to the thickness of the cover element module 90
14 wall can optionally be performed in the body 14 to ensure an even exterior
15 finish to reduce the risk of hooking exterior objects, like cloths or seat fabric
16 material, when the utility cart 10, 180 is used. The cover element module 90
17 can alternatively be considered a utility module 330 in accordance with at least
18 one embodiment.

19 **[061]** In Figure 15, reinforcements 400, 404, 408 are illustrated embedded on top
20 of the body 14. A utility module 330 covers the reinforcements 400, 404, 408
21 and the upper portion 18 of the body 14. In contrast, non-embedded
22 reinforcements 400, 440 can be secured on top of the upper portion 18, with,
23 *inter alia*, glue, resin or fasteners and covered with the utility module 330 thus
24 assembling the reinforcements 400, 404, 408 in the galley cart 10. A gap 444
25 between the utility module 330 and the upper portion 18 of the body 14 could
26 remain between the two reinforcements 400 if other material does not fill it.
27 Another alternate embodiment is to secure or embed the reinforcements 400

MTC-025-019-012-CA1

1 inside 448 the utility module 330 (note that the reinforcement 400 illustrated
2 inside 448 the utility module 330 has been cut for illustrating the fastener 370
3 and extends over the width of the utility module 330). Once affixed to the body,
4 the utility module 330 would significantly increase the strength of the body 14.
5 A galley cart 10 with the utility module 330 installed thereon is shown in Figure
6 17 and Figure 18. A combination of these alternate embodiments remains
7 within the scope of the present disclosure.

8 **[062]** One embodiment of the invention providing a wheelbase 140 adapted to
9 secure caster wheels 144 thereon is shown in Figure 16. The wheelbase 140,
10 as presented by the present embodiment, is a rigid panel member helping
11 distributing the mechanical load from the body 14 to the caster wheels 144.
12 The wheelbase 140 can be glued or secured with fasteners to the bottom
13 portion 30 of the body 14. An alternate embodiment directly secures the caster
14 wheels 140 to the body 14 and a reinforcement plate (not illustrated) disposed
15 inside the body 14 adjacent to the bottom wall portion 30. The reinforcement
16 plate helps distribute the load to the complete bottom wall portion 30. A quick
17 release mechanism could alternatively be used to easily install and remove the
18 wheelbase 140 from the body 14. The quick release mechanism is a set of
19 three grooved members disposed under the bottom wall portion 30 and
20 configured to slide therein the wheelbase 140. A locking mechanism (not
21 illustrated) is provided to prevent the wheelbase 140 to slide out of the quick
22 release mechanism. Otherwise, the caster wheels 144 can be directly mounted
23 to the body 14 if the strength of the body 14 is sufficient. Here again, the
24 wheelbase 140 can also alternatively be considered a utility module 330.

25 **[063]** Figure 17 and Figure 18 are illustrating another embodiment of the
26 invention. The half size utility cart 180 presented herein does not have a tablet
27 module 110 therein. The body 14 of the half size utility cart 18 uses the entire
28 volume for receiving goods therein. The door 50 consequently covers the

MTC-025-019-012-CA1

1 complete longitudinal opening 42 and gives access, when opened, to the
2 complete internal volume of the body 14. Height long reinforcements 400 are
3 embedded in the body 14 to completely reinforce the vertical edges of the body
4 14 of Figure 17. Figure 18, in contrast, illustrates the discontinuous vertical
5 reinforcements 400 and continuous vertical reinforcements 400.

6 **[064]** Turning now to Figure 19 illustrating an alternate embodiment of a modular
7 utility cart 10 provided with a body 14 and a utility module 330. The utility
8 module 330 in accordance with embodiments of the invention is used to
9 specialize the utility cart 10 for performing a task. The utility module 330 is
10 adapted to be removably connected to the body 14 such that many utility
11 modules 330 can be used in conjunction with a single body 14. Conversely, the
12 utility module 330 can be permanently secured to the body 14 in accordance
13 with embodiments of the invention.

14 **[065]** As explained in connection with the embodiment illustrated in Figure 2, the
15 utility module 330 can be directly connected to the body 14. Alternatively, the
16 body 14 is equipped of a module receptacle 350 to quickly remove/connect the
17 utility module 330 to the body 14. The module receptacle 350 provides a
18 positioning element 354 and the securing element 86 to locate the utility
19 module 350 in respect with the body 14 and to secure the utility module 350 to
20 the body 14. The embodiment of Figure 19 illustrates a positioning element
21 354 in the shape of an edge on which rests the cooperating edge 362 of the
22 utility module 330. The securing element in the embodiment of Figure 19 is a
23 rotating clip 366 provided with a "T" shaped fastener 370 sized and design to
24 cooperate with slots 374 provided in the body 14. Turning 90 degree the
25 rotating clip 366 locks the "T" shape fastener 370 in their respective
26 cooperating slots 374. For example, the securing element 366 can be a quarter
27 turn assembly fastener as illustrated in Spaenaur catalog, page L36, L37,
28 Spaenaur number 110-064 that can be found at

MTC-025-019-012-CA1

1 http://www.spaenaur.com/view_pdf.asp?Page=L37 with its mating
2 member. Please note that the upper wall portion 18 has been removed on
3 Figure 19 to allow a better view of the body's 14 interior. In another
4 embodiment, the upper wall portion 18 remains in the body 14 and the utility
5 module 330 is secured thereon. Other fastener like the expandable fastener
6 440 that is going to be discussed later can be found at Spaenaur.com and
7 other merchants.

8 **[066]** Figure 20 depicts a schematic top plan view of an upper portion 18 with a
9 reinforcement member 404 on a front side 42 and a reinforcement member
10 404 on a rear side 46. Both reinforcement members 404, 408 are of different
11 widths 402 and offer different levels of mechanical stress resistance in
12 response to the load "L" applied thereon. Illustratively, for Nylon™ material
13 reinforcements 400, the width is about between 35 millimeters and 70
14 millimeters. Alternatively, the width of the reinforcements 400 can be more than
15 70 millimeters if required to sustain a more significant expected load "L" without
16 departing from the scope of the present invention. Each reinforcements 400 is
17 preferably located directly on the edge of the upper portion 18 to maximize its
18 strength by directly receiving the load "L" and to prevent any superficial
19 damages to the composite materials to the upper portion 18. The rectangular
20 reinforcement members 404, 408 illustrated in Figure 20 are symmetrically
21 disposed on the longitudinal direction of the upper portion 18 of the utility cart
22 10.

23 **[067]** The shape of the reinforcements 404, 408 shown in Figure 20 is rectangular
24 such that the thickness of the reinforcements 404, 408 can fit into the thickness
25 of the upper portion 18 while providing sufficient longitudinal strength with the
26 longer length. The reinforcements 404, 408 are provided with holes 446 therein
27 to help distribute the resin around the solid reinforcement member 404, 408
28 and properly wet the fibers of the composite materials disposed around. The

MTC-025-019-012-CA1

1 position and the size of the holes 446 can vary depending on the desired resin
2 flow at the time of infusion/injection. Grooves, gutters and/or slots 447 can also
3 be performed in the reinforcement member 404, 408 to improve the flow of
4 resin around the reinforcement member 404, 408. The shape, size, depth and
5 number of grooves, gutters and/or slots 447 can vary in accordance with the
6 unique requirement of each structure for suitable resin distribution and air
7 removal. The holes 446 and the gutters 447 can be used independently or
8 collectively to reach the desired effect. Ideally, the holes 446 and the gutters
9 447 are disposed to improve and ease the flow of resin from the resin injection
10 points (not illustrated in the Figures).

11 **[068]** Figure 21 illustrates a reinforcement member 404 that is not rectangular.
12 The shape of the reinforcement member 404 provides more material on each
13 side and less in the middle to improve the load transfer to the lateral portions
14 22, 26. Also, the shape of the reinforcement 404 optimizes material distribution
15 to avoid any unnecessary weight. Additionally, a junction member 450 is
16 optionally provided to transmit some load (identified by the letter "L" and
17 illustratively applied by a lock 6) to the opposed reinforcement 408 disposed on
18 the other side of the galley cart 10. Here again holes 446 and gutters 447 are
19 formed in the reinforcements 400.

20 **[069]** An alternate design of reinforcement 404 and junction member 450 is
21 depicted in Figure 22. The shape of the reinforcement 404 has a shape having
22 more material in the center thereof to properly sustain the load "L" applied
23 thereon where the stress is the higher. Three different junction members 450.1,
24 450.2, 450.3 are illustrated in Figure 22. They can have different shapes,
25 thicknesses and use different materials in addition to be collectively or
26 individually used. Junction member 450.1 has a triangular shape adapted to
27 evenly transfer mechanical stress to the side portion opposed to the
28 reinforcement 404. Symmetrical side portions 450.2 and 450.3 are adapted to

MTC-025-019-012-CA1

1 distribute mechanical stress to the lateral portions 22, 26. Different shapes,
2 thicknesses and different materials of reinforcement 400 can be used in
3 consideration of variables like the type of material, the load application speed
4 and the duration of the applied load. Additionally, the reinforcement 400, 404 is
5 equipped with openings 449 therein where material is unnecessary to sustain
6 loads applied to the reinforcements 400, 404, 408 in order to save weight on
7 the utility cart 10. The size and the shape of each opening 449, which can be
8 of non-identical shapes and sizes, can vary depending on the design of the
9 reinforcement 400.

10 **[070]** Turning now to Figure 23 illustrating an embodiment of an upper portion 18
11 construction where a juxtaposed reinforcement member 400, 464 as explained
12 above extends a foam core 460, on one of its ends. The reinforcement
13 member 464 is illustratively covered with two layers of carbon fibers 468 to
14 further increase its rigidity and ensure proper bonding with the remaining
15 structure. Once the reinforcement member 464 is properly juxtaposed next to
16 the foam core 460 it is covered by a series of additional layers of glass fibers
17 472 and/or carbon fibers 476 and further covered by a layer of glass veil 480.
18 The number and the nature of the layers of fibers can vary in accordance with
19 the expected load to be sustained without departing from the scope of the
20 present disclosure.

21 **[071]** The various layers of glass fibers 472 and carbon fibers 476 are disposed in
22 a pattern adapted to assemble the foam core 460 and the reinforcement 400,
23 464. The fibers layers 472, 476 are also adapted to transform the foam core
24 460 into an upper portion 18 having a strong front edge adapted to sustain the
25 stress applied by the lock 6 in case of impact. It can be appreciated that the
26 layers of glass fibers 472 and carbon fibers 476 are wrapping the
27 reinforcement 460, 464 and foam core 460 assembly. Some layers of glass
28 fibers 472 and carbon fibers 476 of specific lengths are disposed at precise

MTC-025-019-012-CA1

1 locations on the foam core 460 and on the reinforcement 400, 464 assembly.
2 Some layers of fibers 472, 476 are covering the extremities of the foam core
3 460, connecting a reinforcement 400, 464 or even two distinct portions of foam
4 core hence building additional thicknesses of material to increase the rigidity of
5 the edge of the upper portion 18. One preferred layout of glass fibers 472 and
6 carbon fibers 476 is illustrated in Figure 23. Resin, preferably phenolic resin, is
7 infused and cured to bond all the layers of glass fibers 472, carbon fibers 476
8 and glass veil 480 together. After, the upper portion 18 can be assembled with
9 the other portions into a complete body 14.

10 **[072]** An analogous construction of the bottom portion 30 is illustrated in Figure
11 24. The bottom portion 30 uses Nylon™ reinforcement 400, 484 on both ends
12 to increase the mechanical resistance of the bottom portion 30 at the front and
13 at the rear. The illustrated layout of the upper portion 18 and the bottom portion
14 30 respectively embodied in Figure 23 and Figure 24 can be interchanged and
15 remain encompassed by the scope of the present disclosure.

16 **[073]** Turning now to Figure 25 where is illustrated an upper portion 18 with a
17 foam core 460 and an abutted reinforcement 400, 464. The reinforcement 400,
18 464 has a distal side provided with a radius 466 preventing any sharp corner
19 that could break the fibers and retain air pocket in the composite materials. It
20 can be appreciated on the left side two core foam portions 460 wrapped in their
21 own layer of carbon fibers 476 and further covered and linked with additional
22 layers of carbon fibers layers 476 to increase the resistance of this side of the
23 upper portion 18 without using a Nylon™ reinforcement 400. The number of
24 assembled cores 460, 484 and their precise layout differs from the previous
25 embodiment illustrated in Figures 23 and 24. The sequence of layers of glass
26 fibers 472 and carbon fibers 484 also differs from the previous embodiment.

MTC-025-019-012-CA1

1 **[074]** Figure 26 illustrates an alternate arrangement of parts replacing the two
2 foam cores 460 of Figure 25 with a single reinforcement 400, 484 abutted to
3 the foam core 460 in Figure 26. A layout of layers of fibers 466, 472 are
4 connecting the reinforcement 400, 484 and the foam core 460 together. Figure
5 27 illustrates an alternate shape of reinforcement 400 with a curved portion
6 490 extending to two straight portions 495 disposed on each side thereof.
7 Finally, Figure 28 illustrates another alternate layout of reinforcements 400
8 interconnected with an alternate junction member 450 that serves also as
9 reinforcement 400.

10 **[075]** The description and the drawings that are presented above are meant to be
11 illustrative of the present invention. They are not meant to be limiting of the
12 scope of the present invention. Modifications to the embodiments described
13 may be made without departing from the present invention, the scope of which
14 is defined by the following claims:

1 What is claimed is:

- 2 1. A utility cart comprising a body including two side portions interconnecting
3 an upper portion and a bottom portion adapted to secure ground contacting
4 members thereto, at least one of the portions including composite material and a
5 reinforcement therein adapted to distribute a concentrated stress applied on an
6 edge of the body to the composite material to prevent or reduce damages to the
7 composite material.
- 8 2. The utility cart of claim 1, wherein the reinforcement is abutted to a foam
9 core.
- 10 3. The utility cart of any one of claims 1 or 2, wherein the composite comprises
11 a foam core and wherein the composite material portion comprises a layer of fiber
12 adapted to secure the foam core and the reinforcement together.
- 13 4. The utility cart of any one of claims 1 to 3, wherein the reinforcement is
14 made of Nylon.
- 15 5. The utility cart of any one of claims 1 to 4, wherein the utility cart is adapted
16 to be removably stowed in a galley and secured therein with a lock, the
17 reinforcement is located next to an edge of the utility cart that is adapted to be in
18 contact with the lock.
- 19 6. The utility cart of any one of claims 1 to 5, wherein the reinforcement is
20 provided with openings adapted to facilitate the flow of resin thereabout.
- 21 7. The utility cart of any one of claims 1 to 6, wherein the reinforcement is a
22 plurality of reinforcements interconnected with a junction member therebetween to
23 transfer the load applied to a first reinforcement to a second reinforcement.

1 8. The utility cart of any one of claims 1 to 7, wherein the reinforcement
2 includes a hollowed portion.

3 9. The utility cart of any one of claims 1 to 8, wherein the reinforcement
4 includes a radius on one side.

5 10. The utility cart of any one of claims 1 to 9, wherein the reinforcement is
6 wrapped in a first layer of composite material and then wrapped in a second layer
7 of composite material with a composite material portion.

8 11. The utility cart of any one of claims 1 to 10, wherein the reinforcement is
9 aligned with a plane defined by a composite material portion and wherein a layer of
10 fibers overlaps the reinforcement and the composite material portion.

11 12. A method of manufacturing a composite material utility cart body
12 comprising:

13 providing fiber material;

14 providing a reinforcement;

15 installing the fiber material in a mold;

16 installing the reinforcement near an edge of the mold;

17 adding resin in the mold;

18 curing the resin; and

19 removing the body from the mold.

1 13. The method of manufacturing utility cart of claim 12, wherein the
2 reinforcement is embedded inside the composite material portion and abutted to a
3 foam core.

4 14. The method of manufacturing utility cart of any one of claims 12 or 13,
5 wherein the composite material utility cart body comprises a foam core and
6 wherein the composite material portion comprises a layer of fiber adapted to
7 secure the foam core and the reinforcement together.

8 15. The method of manufacturing utility cart of any one of claims 12 to 14,
9 wherein the edge of the mold is adapted to shape a portion of an upper portion of
10 the body.

11 16. The method of manufacturing utility cart of any one of claims 12 to 15,
12 wherein the reinforcement is a plurality of reinforcements interconnected with a
13 junction member therebetween to transfer the load applied to a first reinforcement
14 to a second reinforcement.

15 17. The method of manufacturing utility cart of any one of claims 12 to 16,
16 wherein the reinforcement is wrapped in a first layer of fibers and then wrapped in
17 a second layer of fibers with a foam core.

18 18. The method of manufacturing utility cart of any one of claims 12 to 17,
19 wherein the reinforcement is butted to a foam core and wherein a layer of fibers
20 overlaps the reinforcement and the foam core.

21 19. A method of manufacturing a reinforced composite panel adapted to be
22 used in the construction of a utility cart adapted to be stowed in a bay of a galley of
23 an airplane and locked in place with a lock disposed next to the bay in a position
24 suitable to retain the utility cart in the bay by interfering with a reinforced edge of
25 the utility cart, the method comprising:

1 providing fibers and resin;

2 providing a reinforcement;

3 disposing the reinforcement member and the fibers in a physical
4 arrangement where the reinforcement is going to interfere with the lock of the
5 galley when the utility cart is going to be stowed in the galley and locked therein;
6 and

7 adding and curing the resin to define a reinforced composite panel of the
8 utility cart adapted to interfere with the lock when the utility cart is stowed in the
9 bay and locked therein with the lock.

10 20. The method of claim 19, wherein the fibers are adapted to secure a foam
11 core and the reinforcement together.

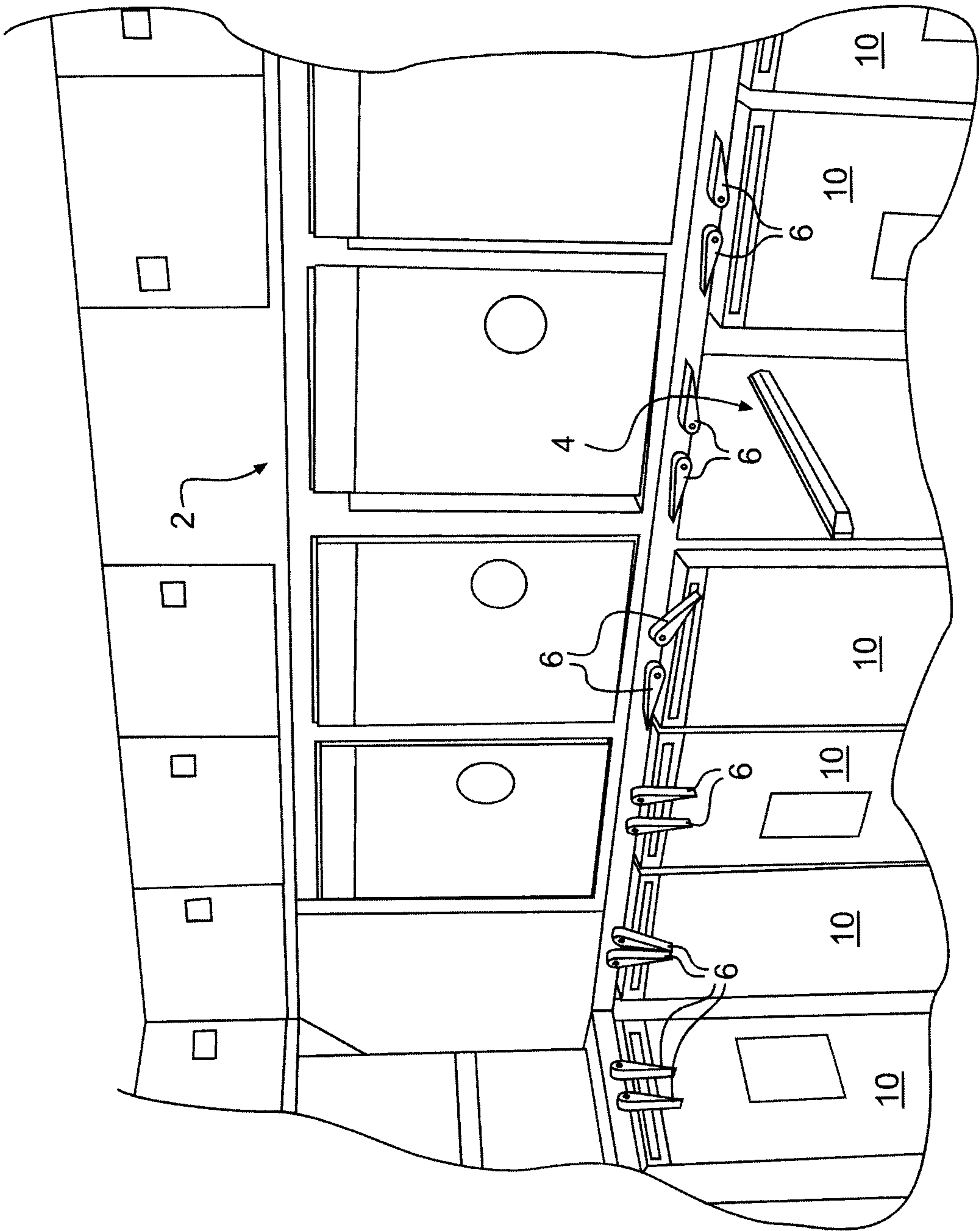
12 21. A utility cart comprising a composite materials body including fibers and
13 resin to form two side portions interconnecting an upper portion and a bottom
14 portion adapted to secure ground-contacting members thereto, at least one of the
15 portions including composite material and a reinforcement member discreetly
16 located therein to locally reinforce an area of the at least one of the portions, the
17 reinforcement member being adapted to distribute a concentrated stress to prevent
18 or reduce damages to the composite material.

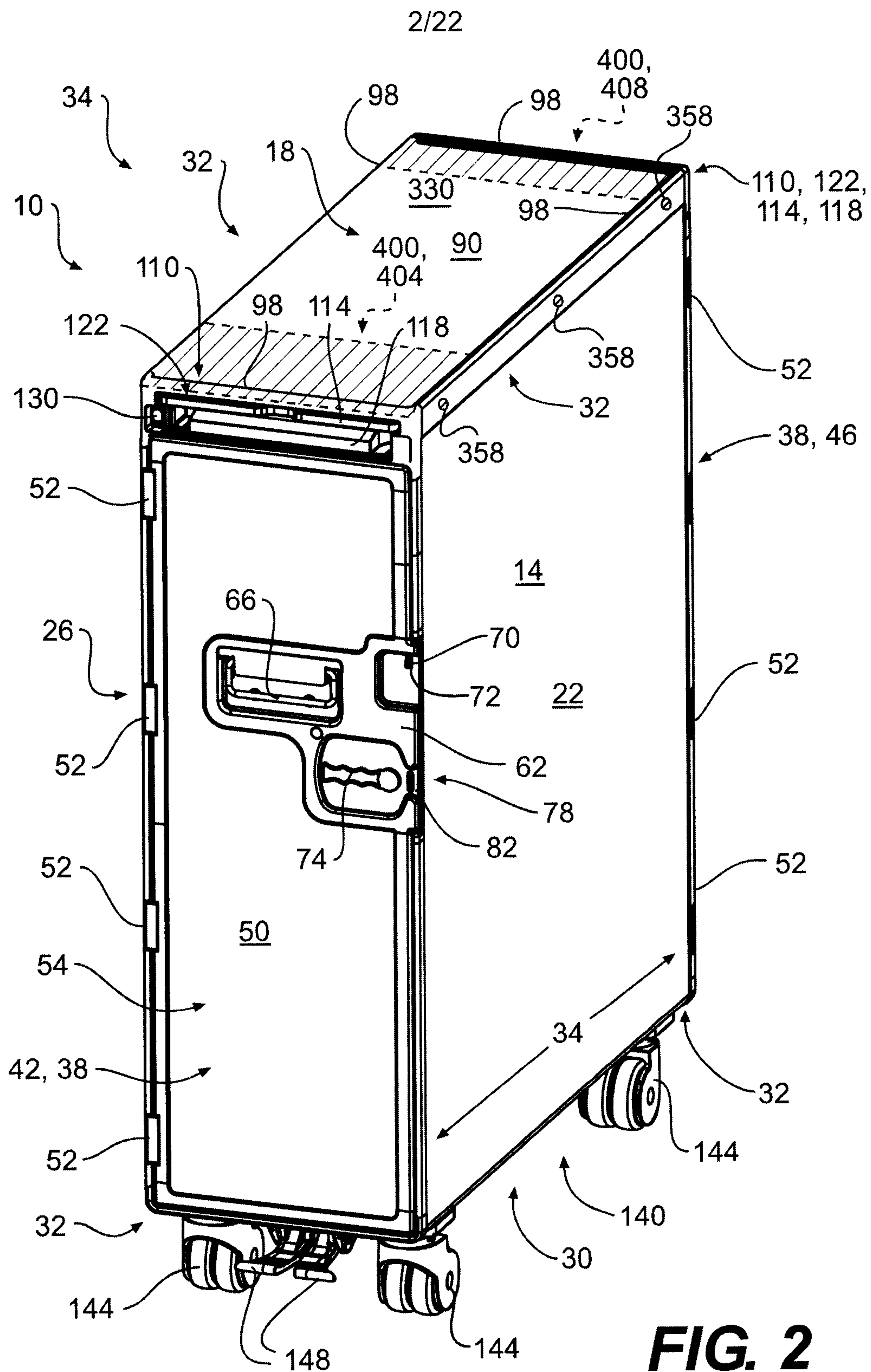
19 22. The utility cart of claim 21, wherein the reinforcement member is abutted to
20 a foam core.

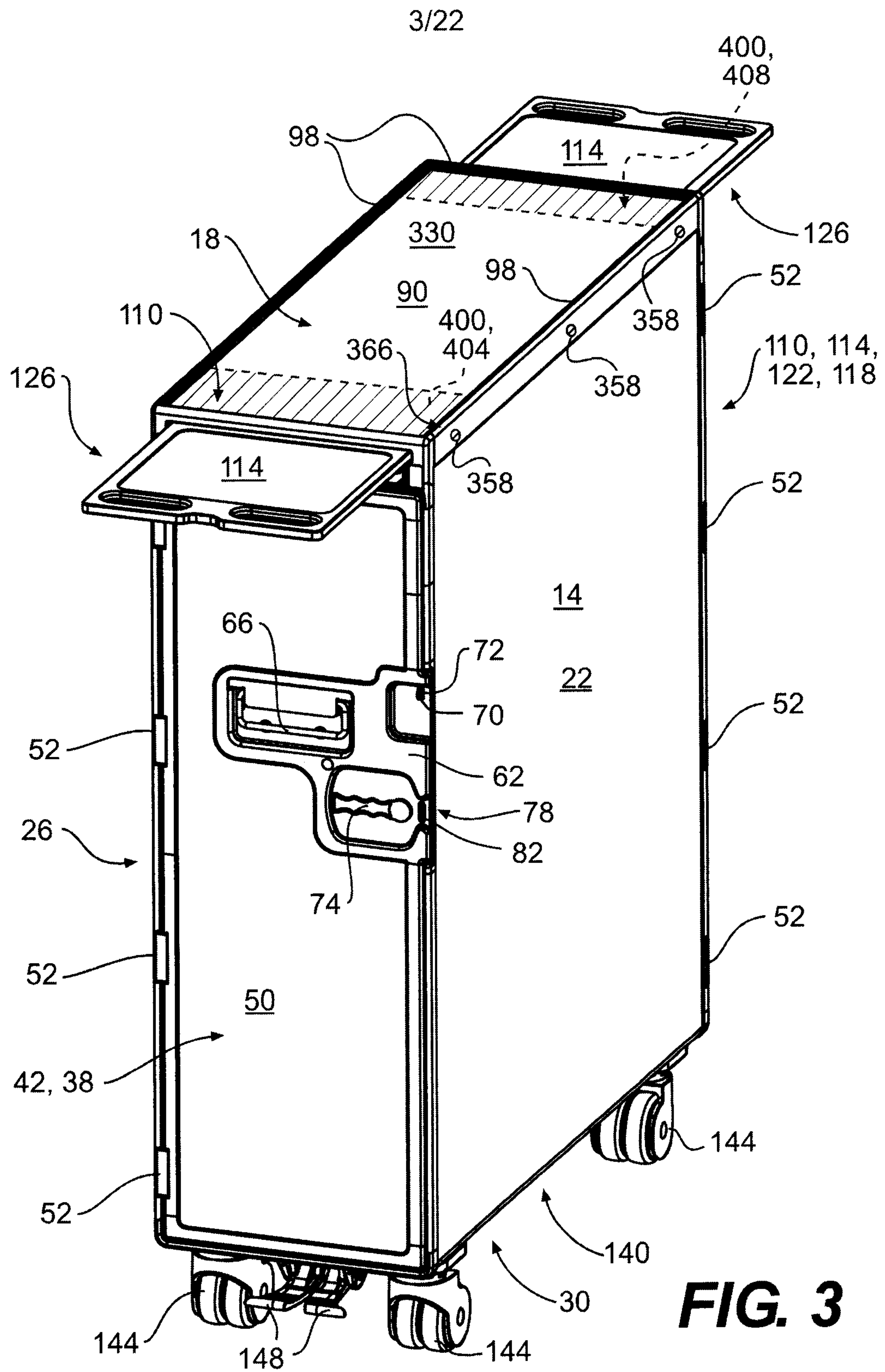
21 23. The utility cart of any one of claims 21 or 22, wherein the composite
22 materials further comprise a foam core wherein the composite materials comprise
23 a layer of fibers adapted to secure the foam core and the reinforcement member
24 together.

- 1 24. The utility cart of any one of claims 21 to 23, wherein the reinforcement
2 member includes Nylon material.
- 3 25. The utility cart of any one of claims 21 to 24, wherein the utility cart is
4 adapted to be removably stowed in a galley cart and secured therein with a lock,
5 the reinforcement member being disposed next to the edge of the utility cart that is
6 adapted to be in contact with the lock.
- 7 26. The utility cart of any one of claims 21 to 25, wherein the reinforcement
8 member is provided with openings adapted to facilitate the flow of resin thereabout.
- 9 27. The utility cart of any one of claims 21 to 26, wherein the reinforcement
10 member is a plurality of reinforcement members interconnected with a junction
11 member therebetween to transfer the load applied to a first reinforcement member
12 to a second reinforcement member.
- 13 28. The utility cart of any one of claims 21 to 27, wherein the reinforcement
14 member includes a hollowed portion.
- 15 29. The utility cart of any one of claims 21 to 28, wherein the reinforcement
16 member includes a radius on one side thereof.
- 17 30. The utility cart of any one of claims 21 to 29, wherein the reinforcement
18 member is wrapped in a first layer of composite materials and then wrapped in a
19 second layer of composite materials within the composite material body.
- 20 31. The utility cart of any one of claims 21 to 30, wherein the reinforcement
21 member is aligned with a plane defined by a composite materials body portion and
22 wherein a layer of fibers overlaps the reinforcement member and the composite
23 materials body portion.

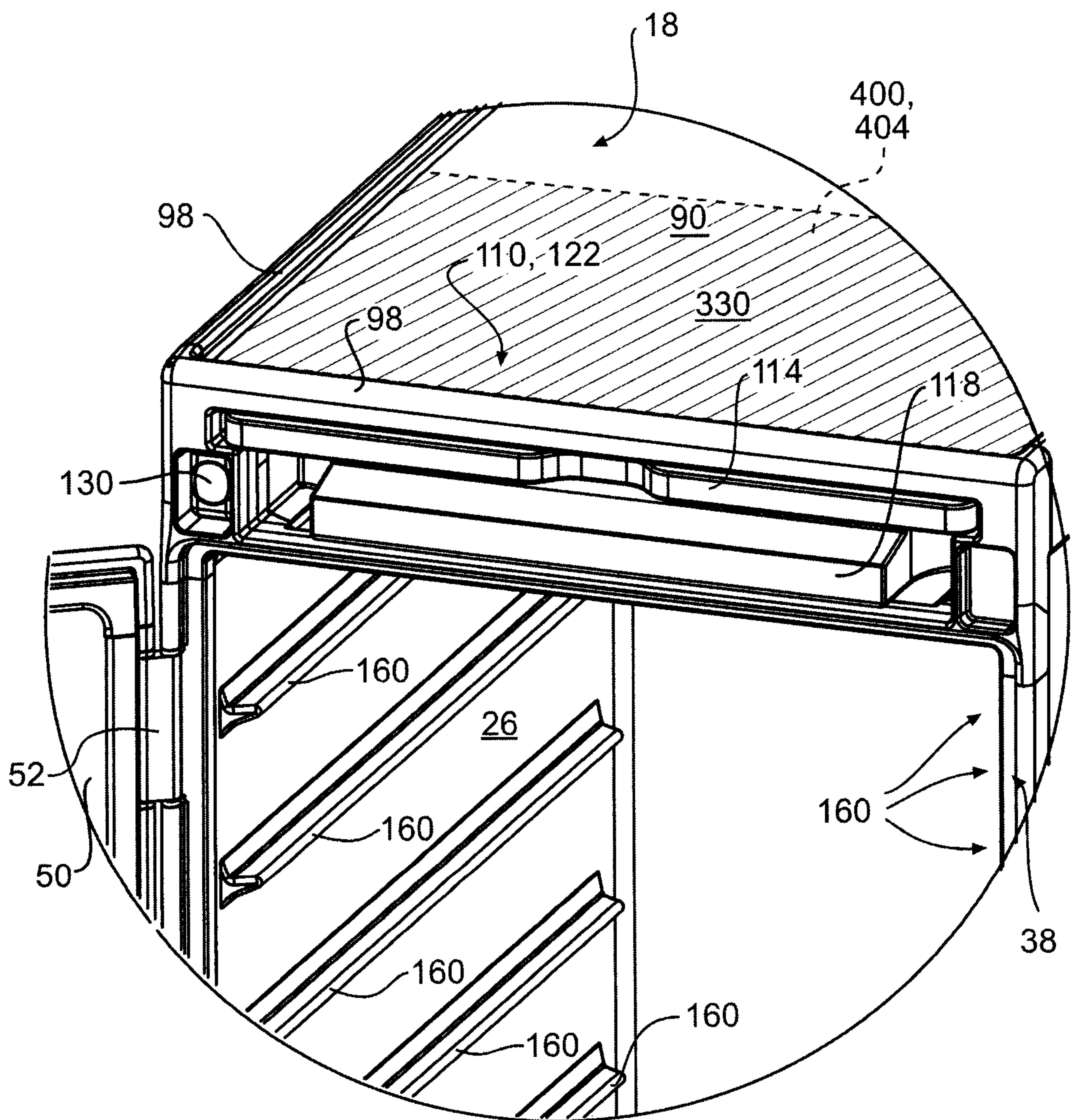
FIG. 1



**FIG. 2**



4/22

**FIG. 4**

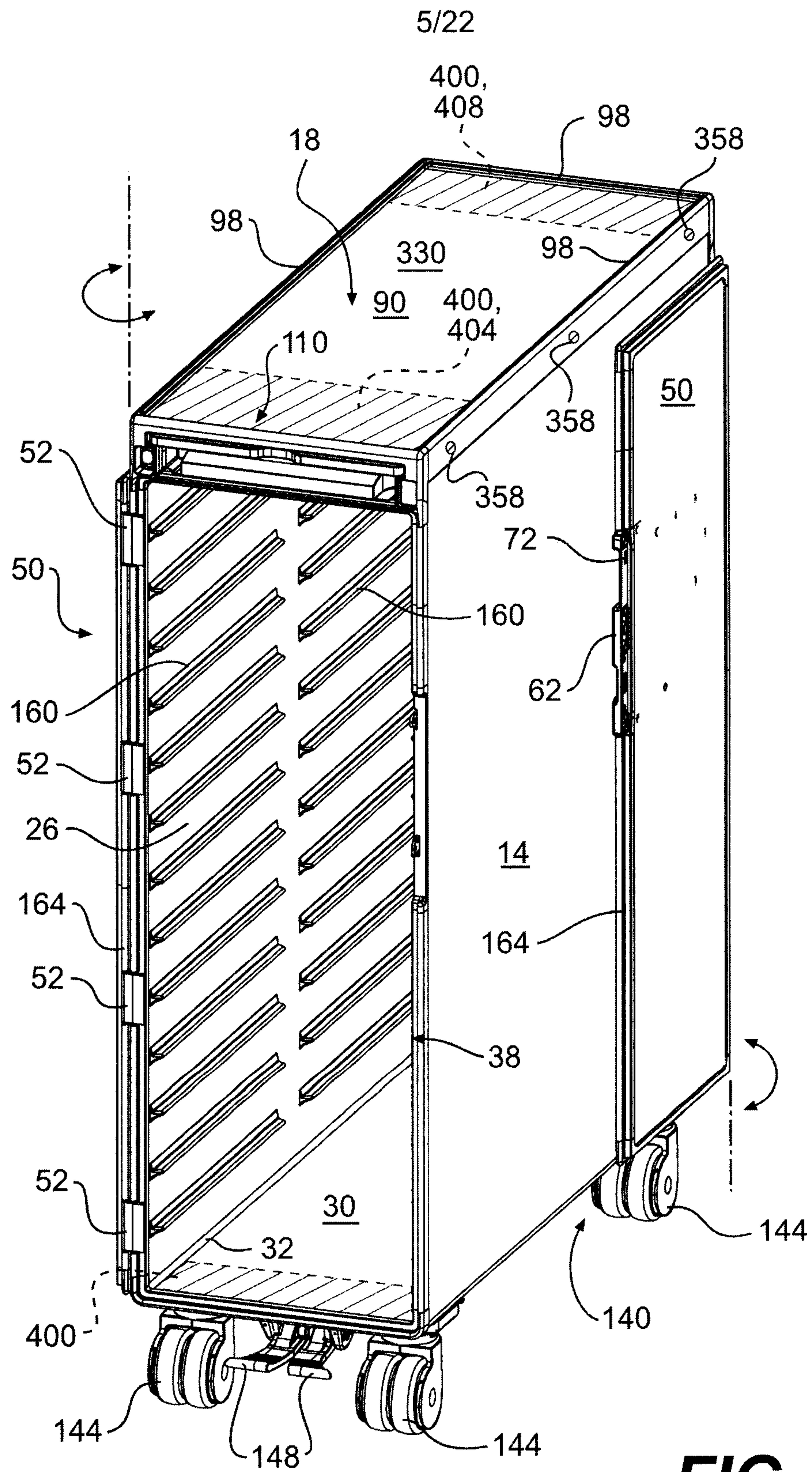
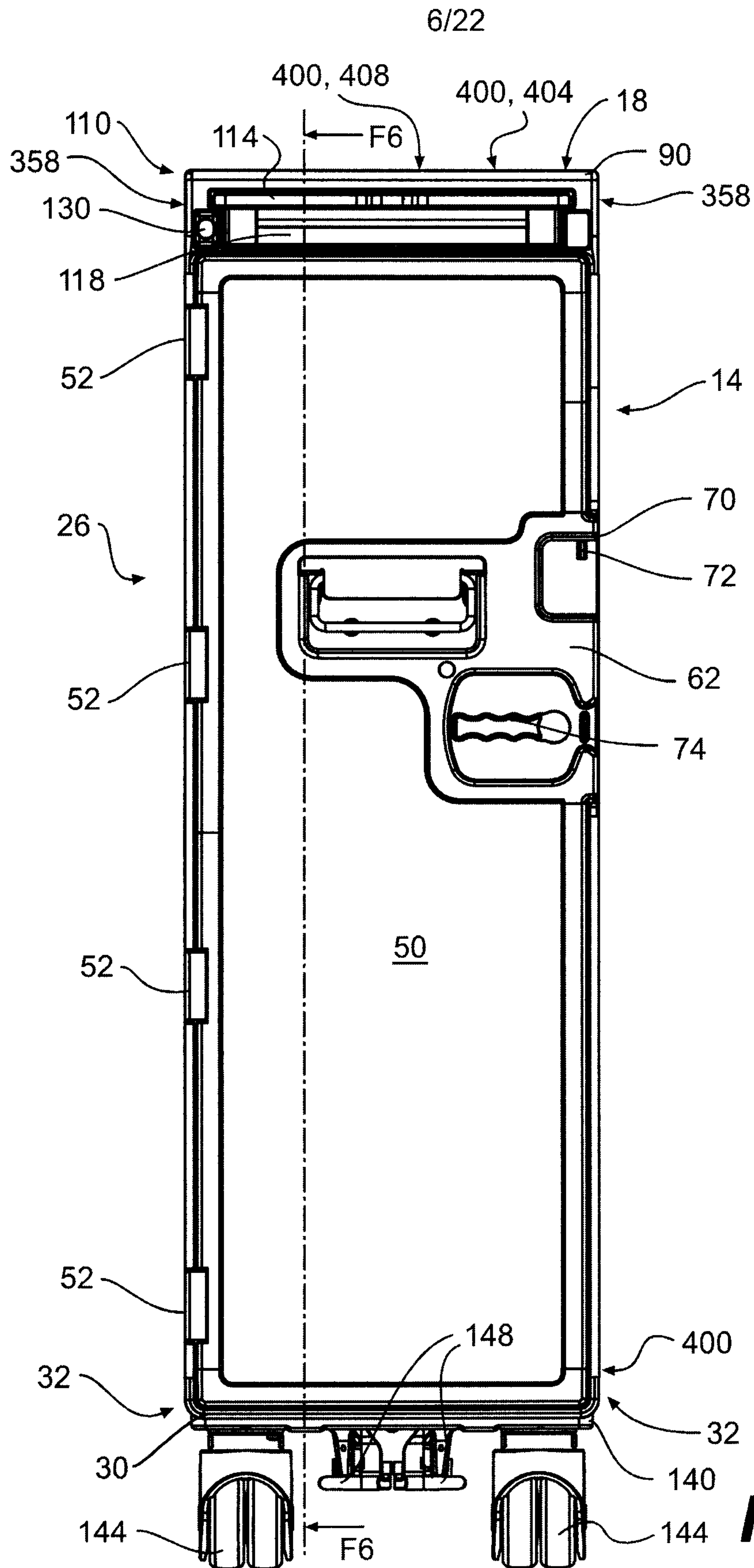


FIG. 5

**FIG. 6**

7/22

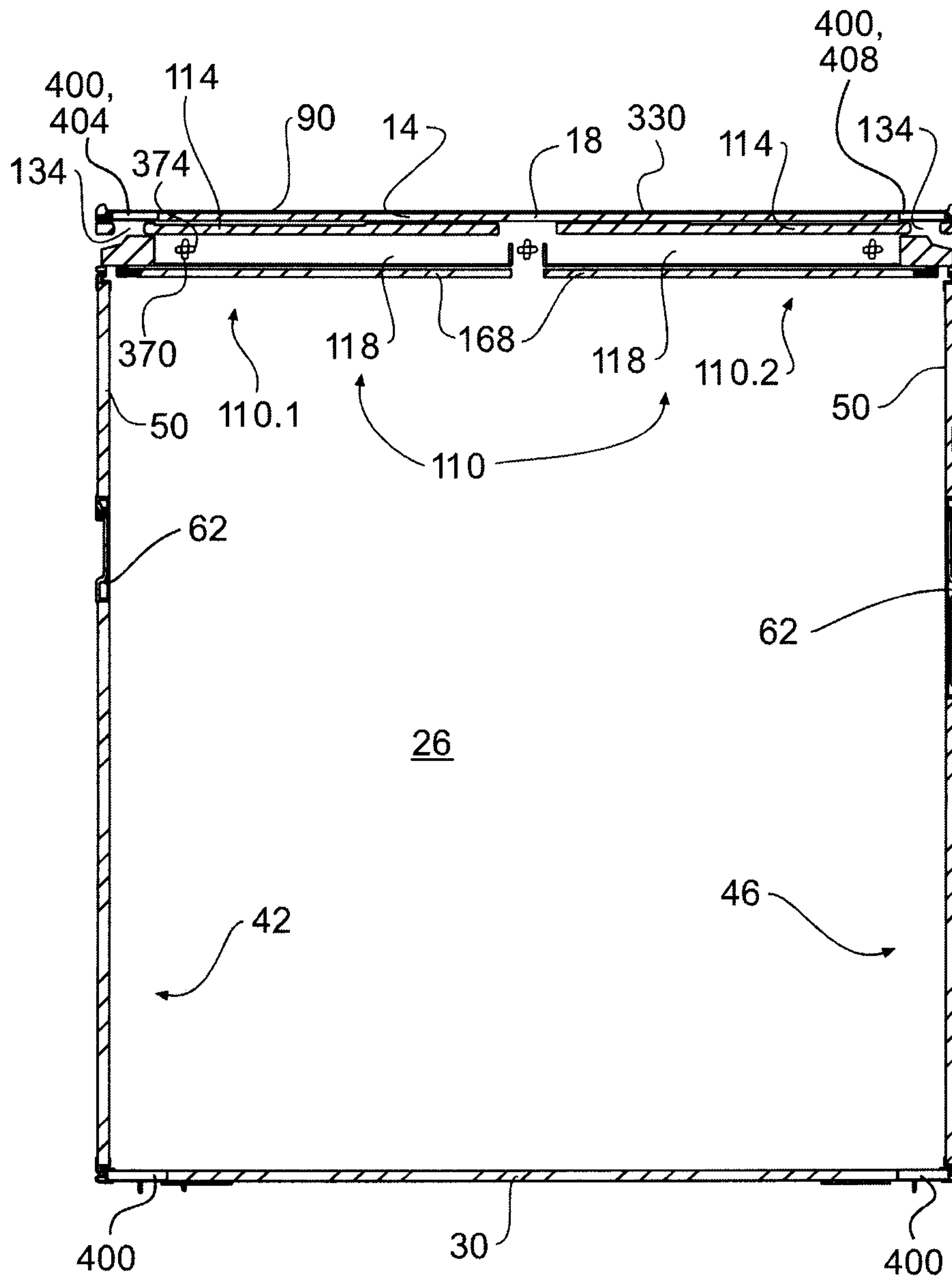
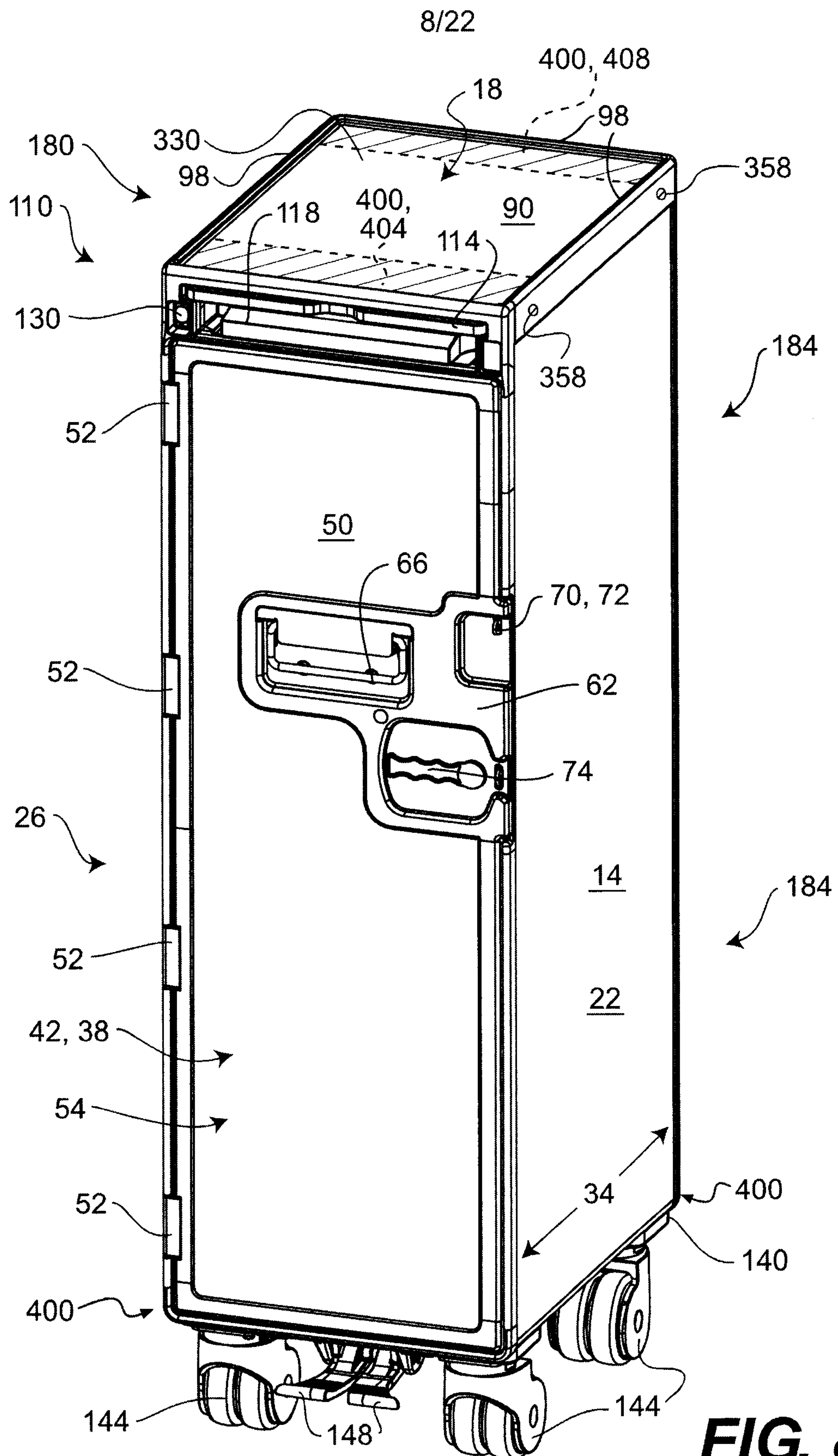
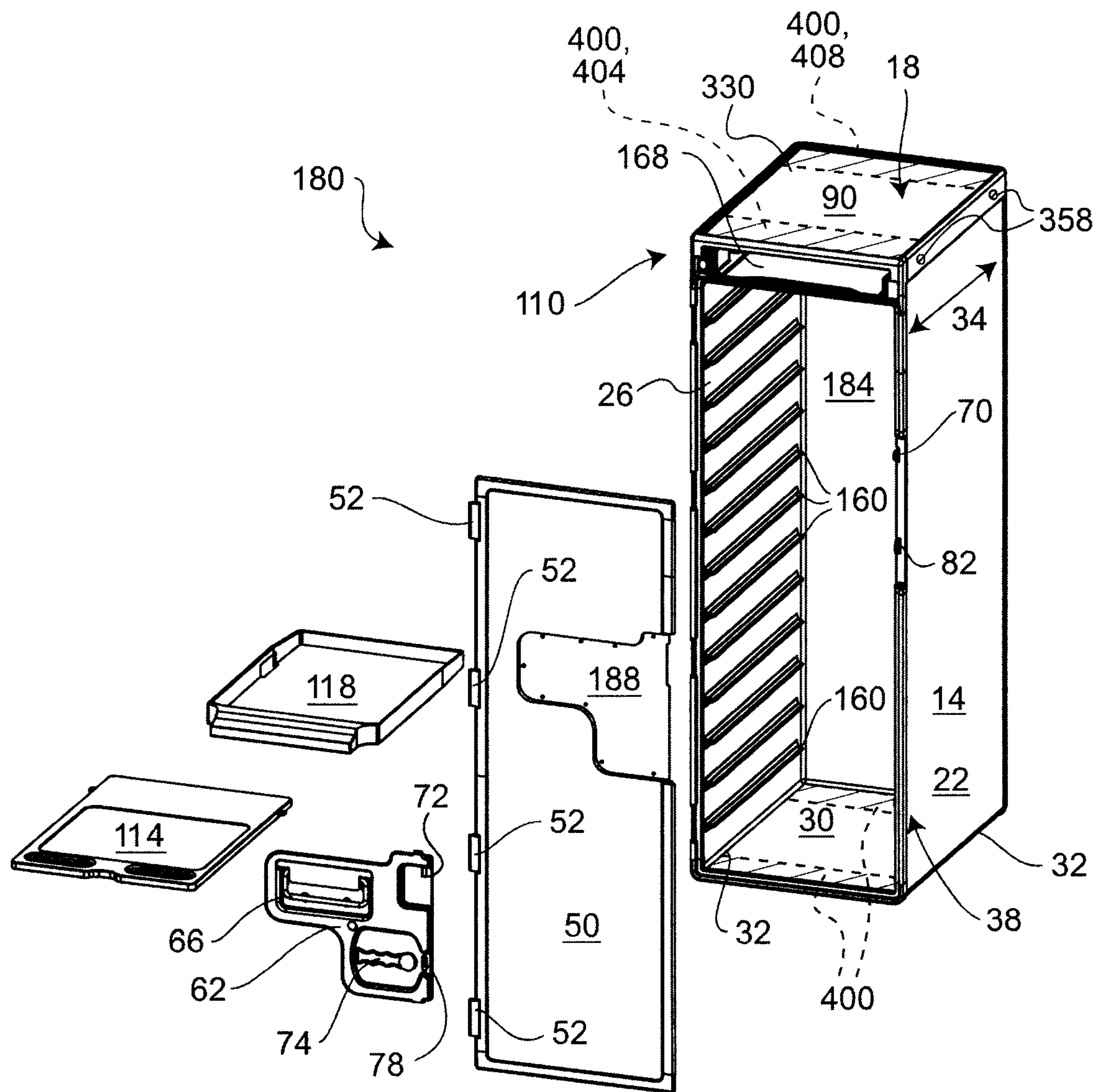


FIG. 7



9/22

**FIG. 9**

10/22

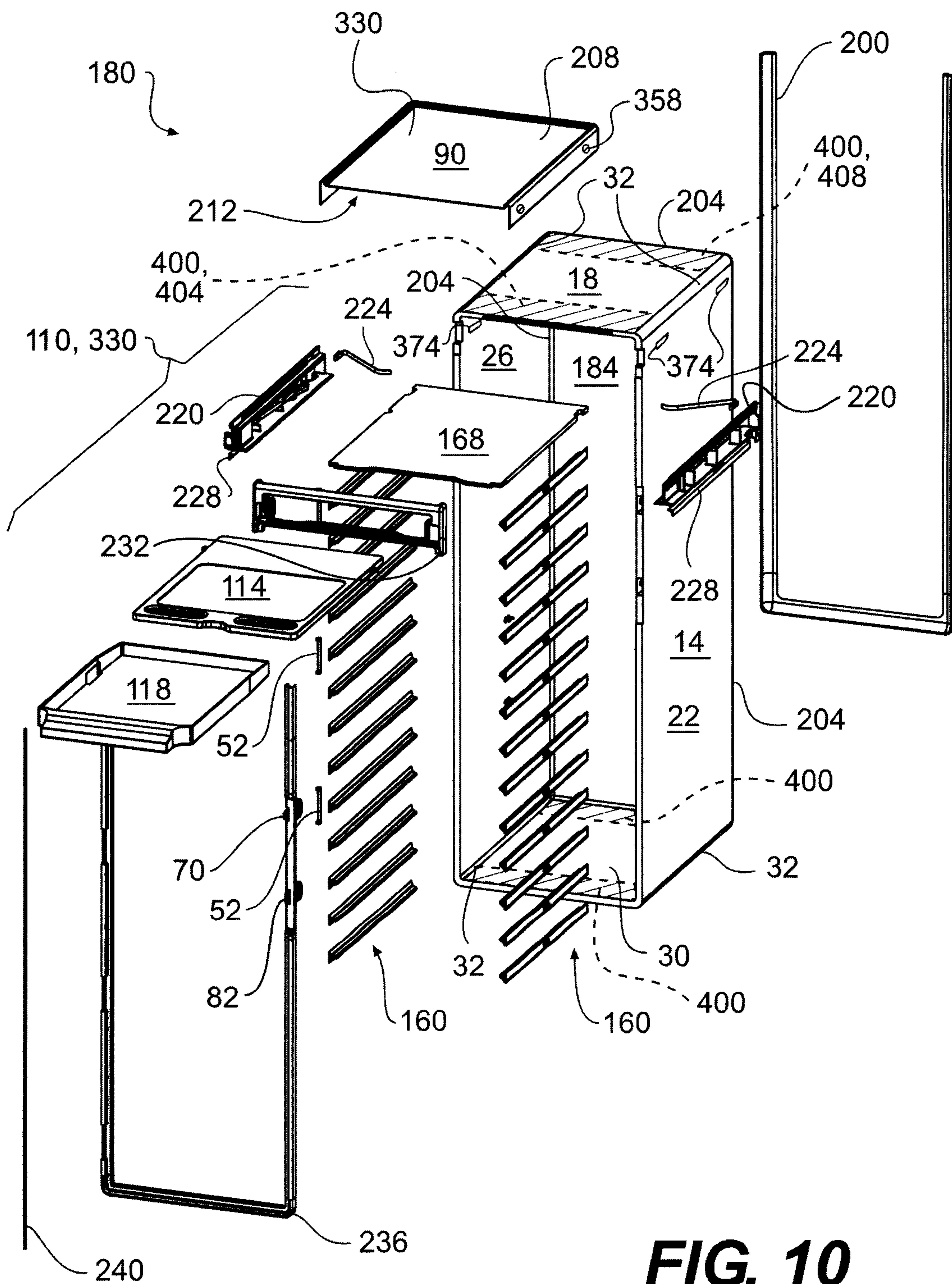
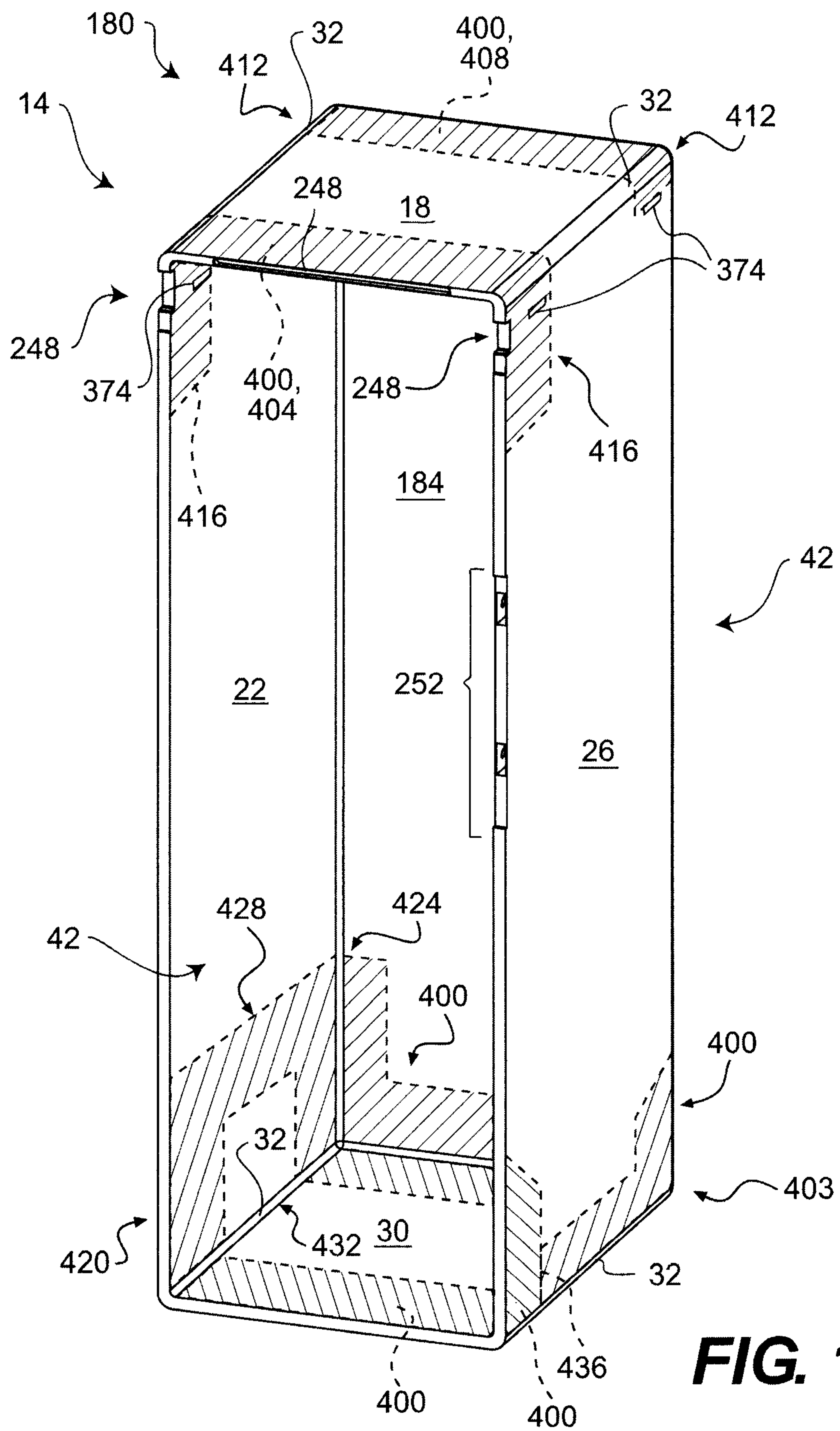


FIG. 10

11/22

**FIG. 11**

12/22

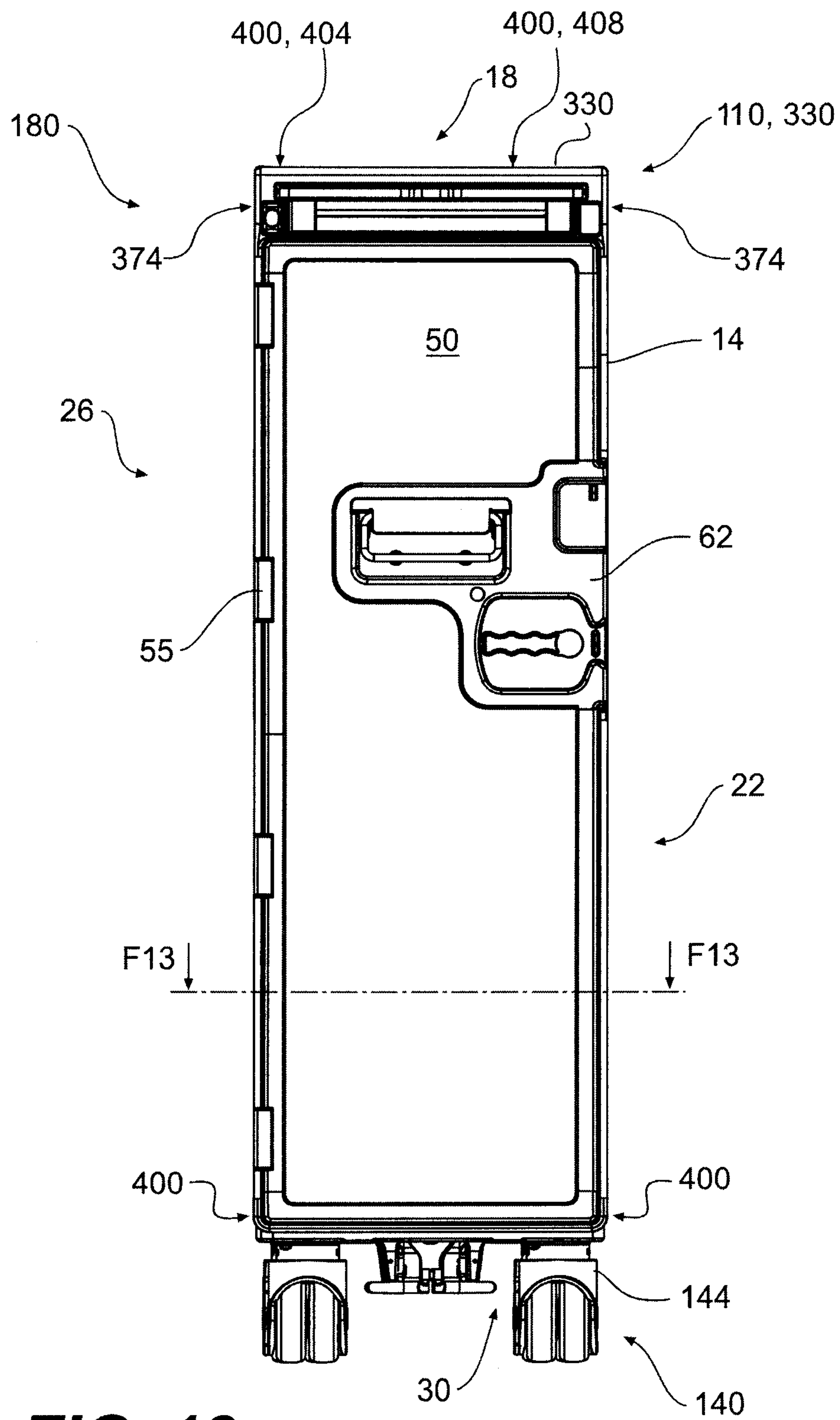
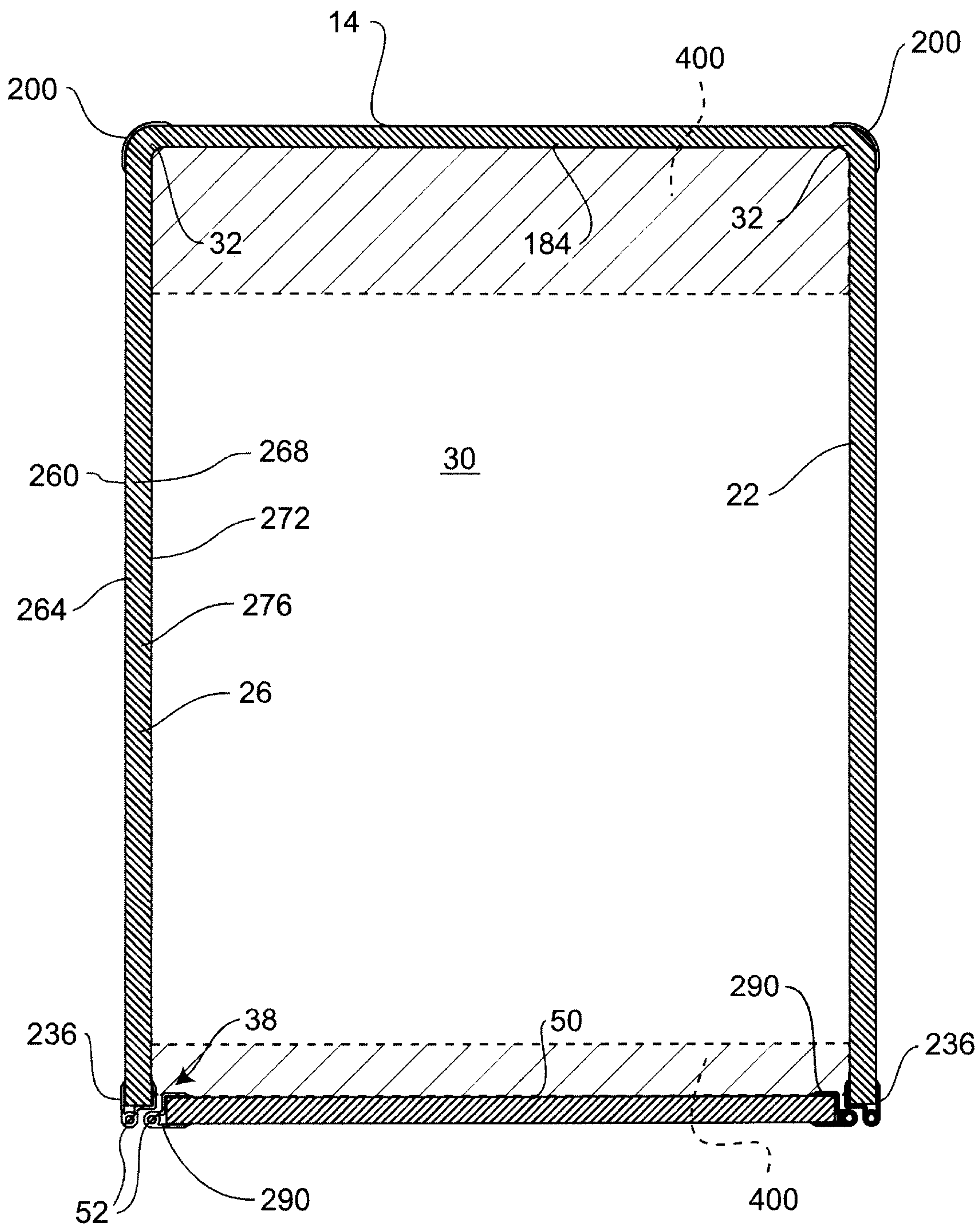


FIG. 12

13/22

**FIG. 13**

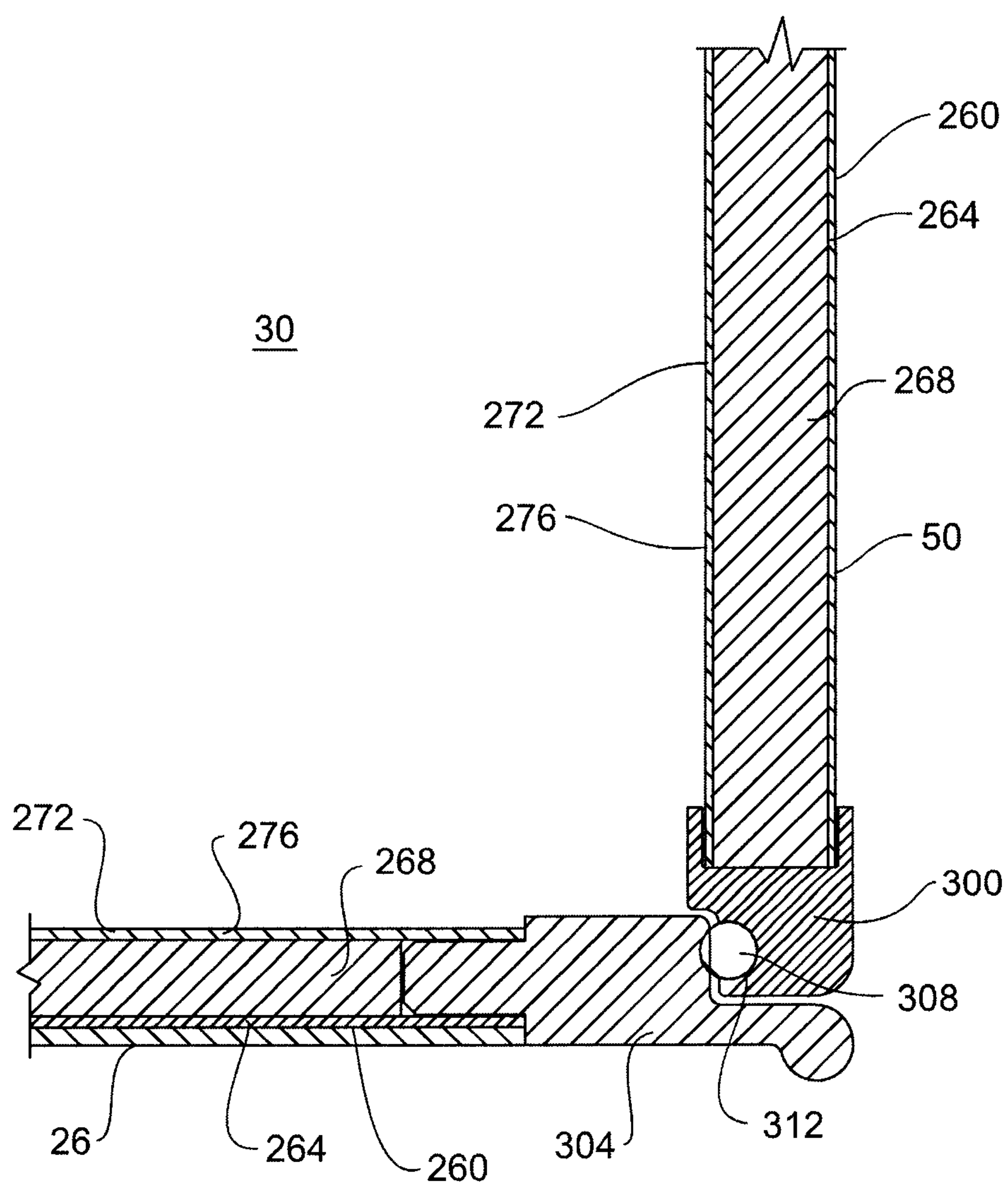
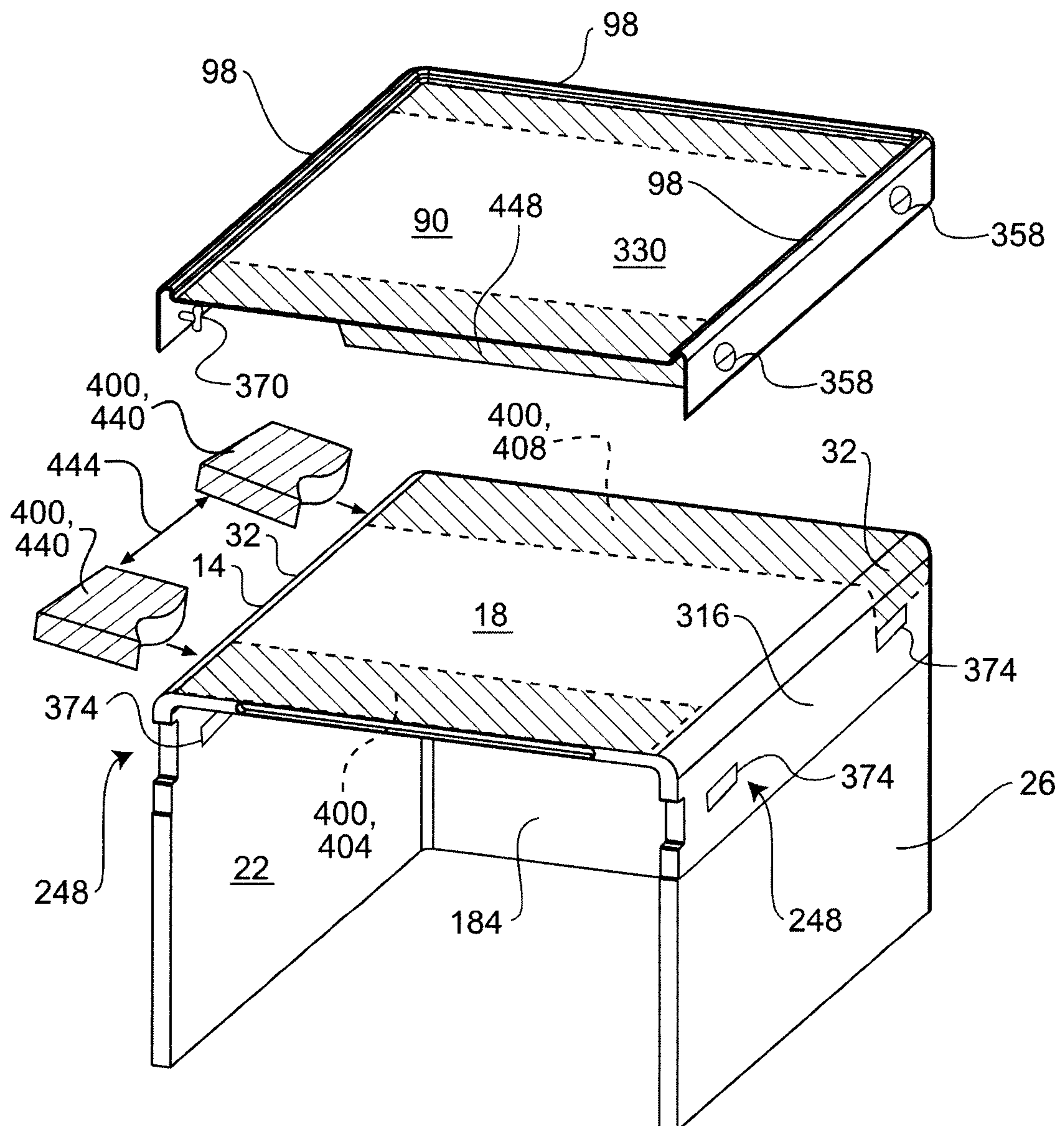
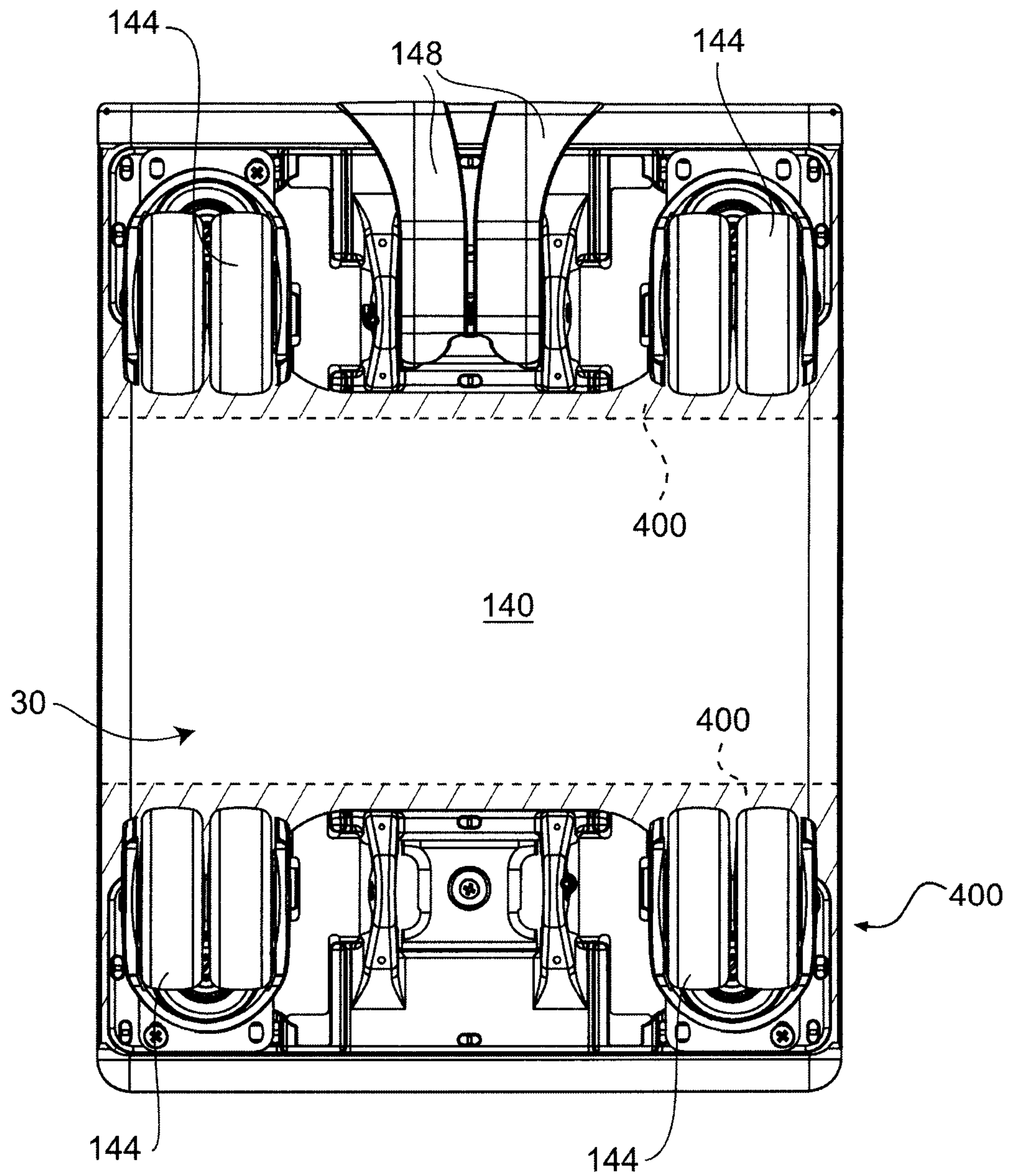


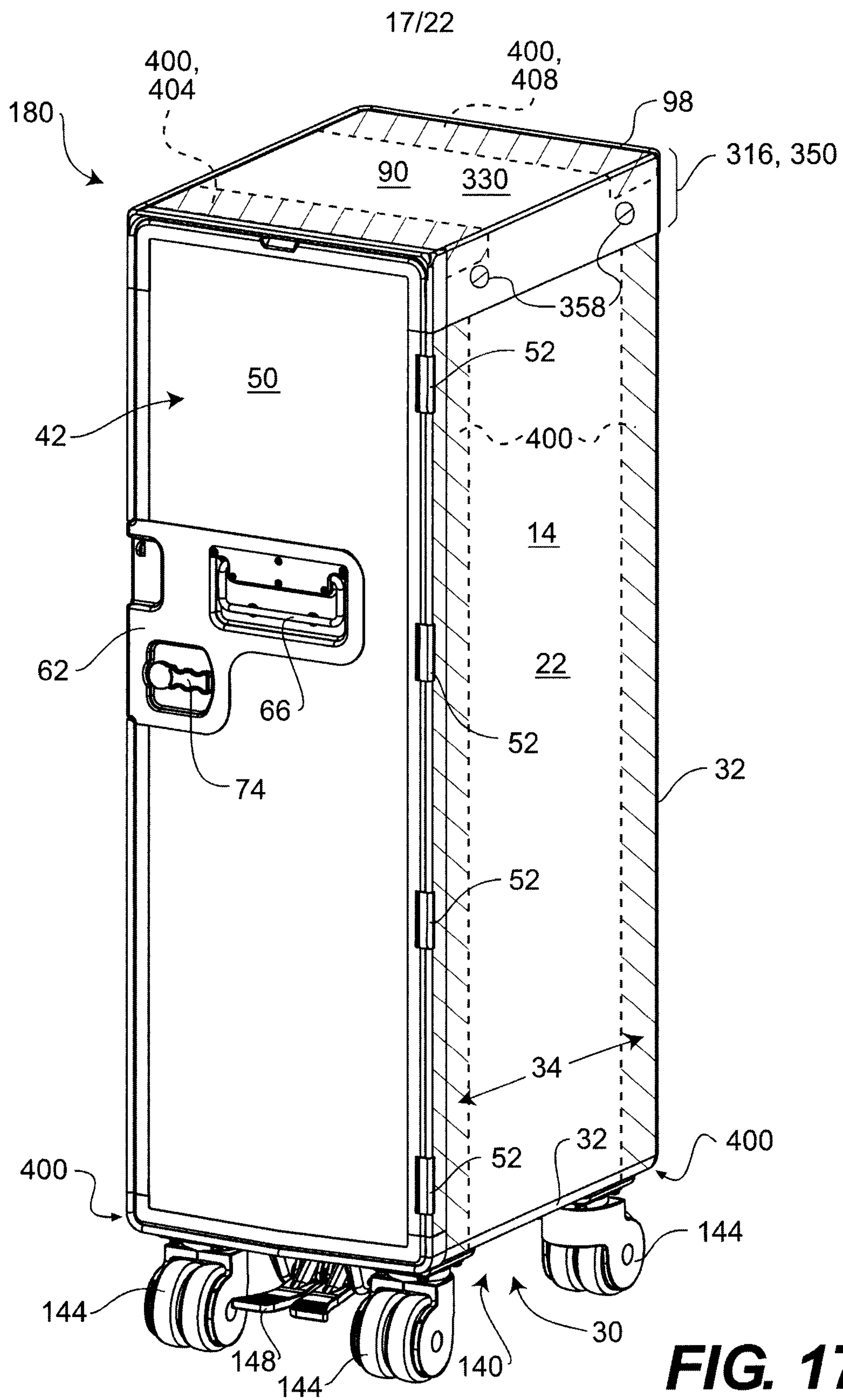
FIG. 14

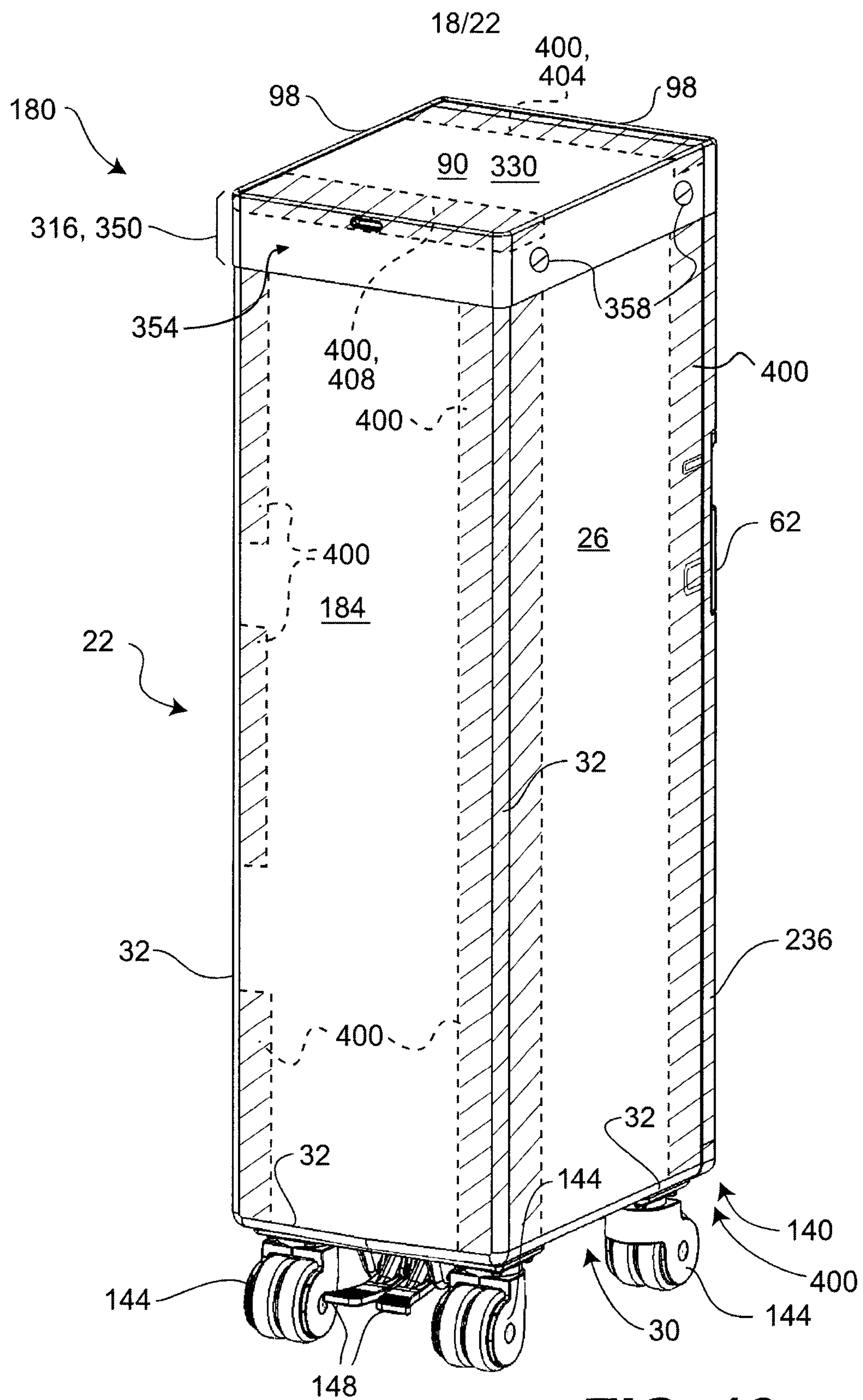
15/22

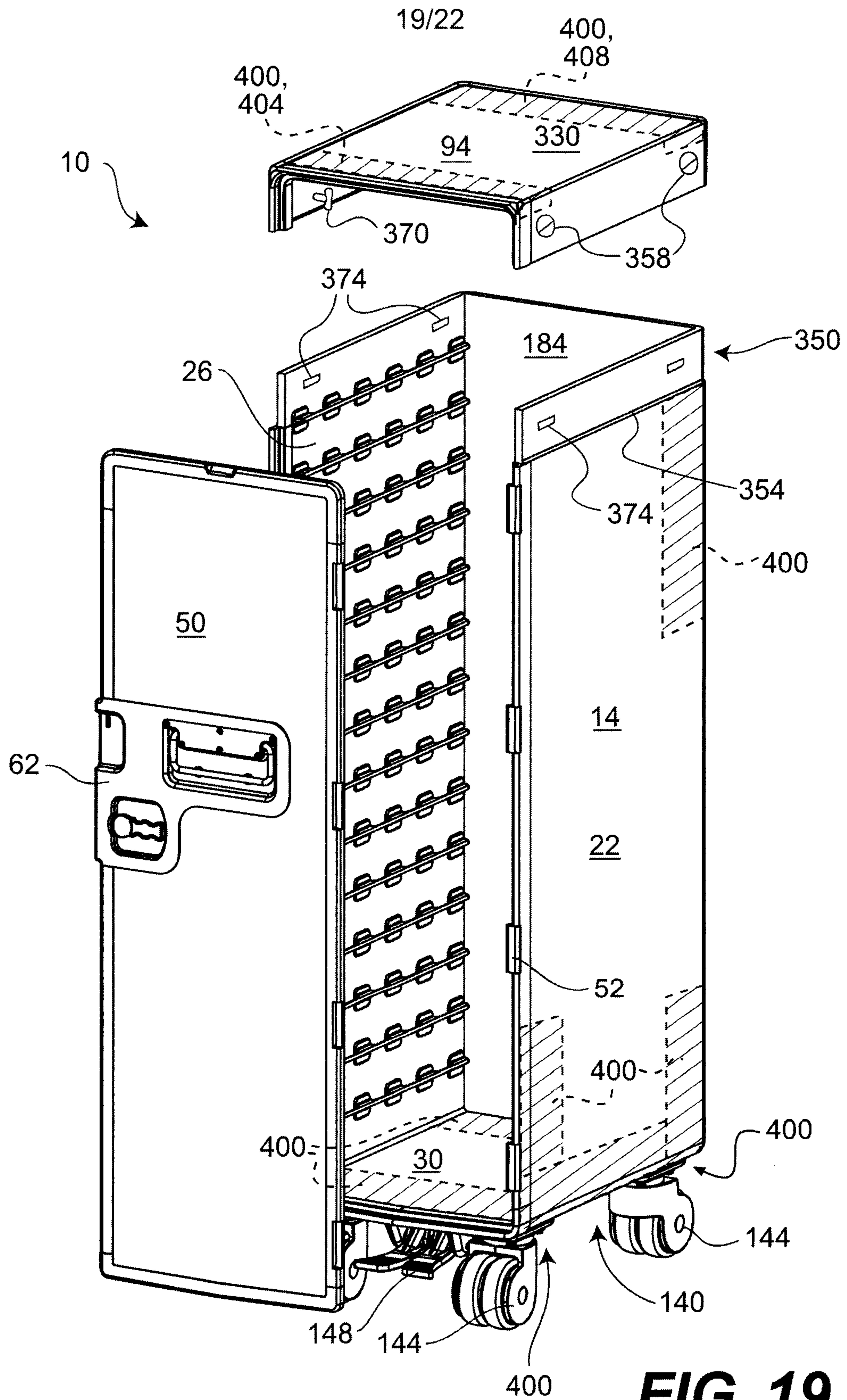
**FIG. 15**

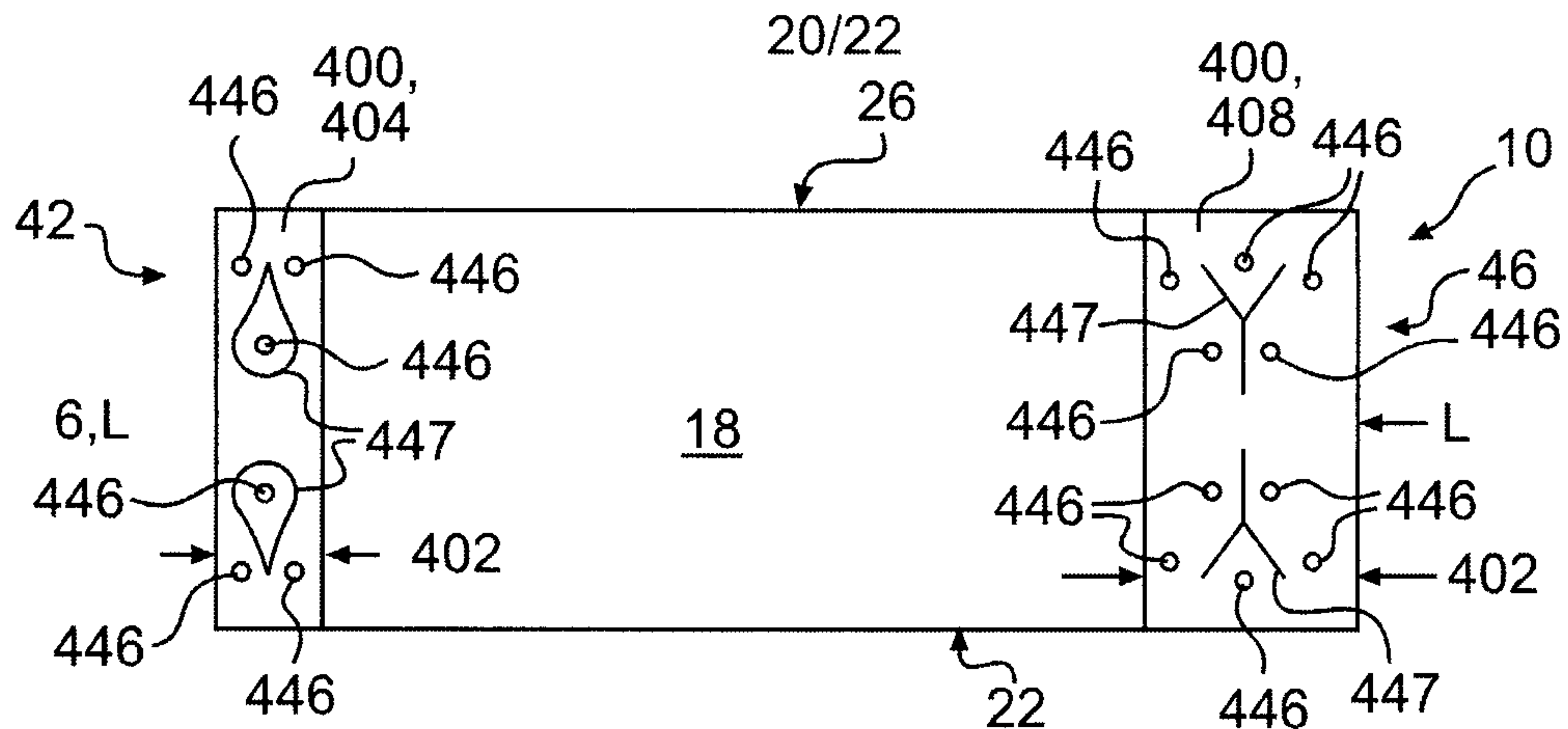
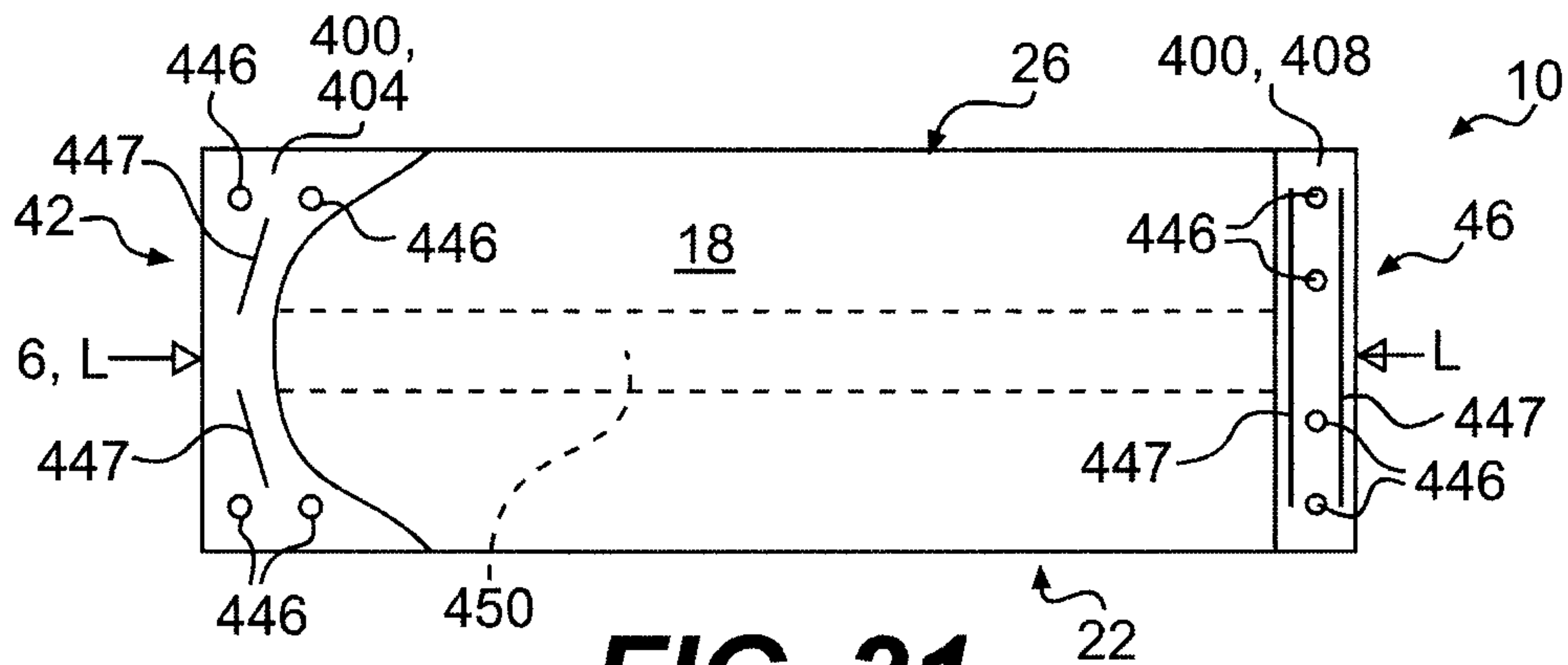
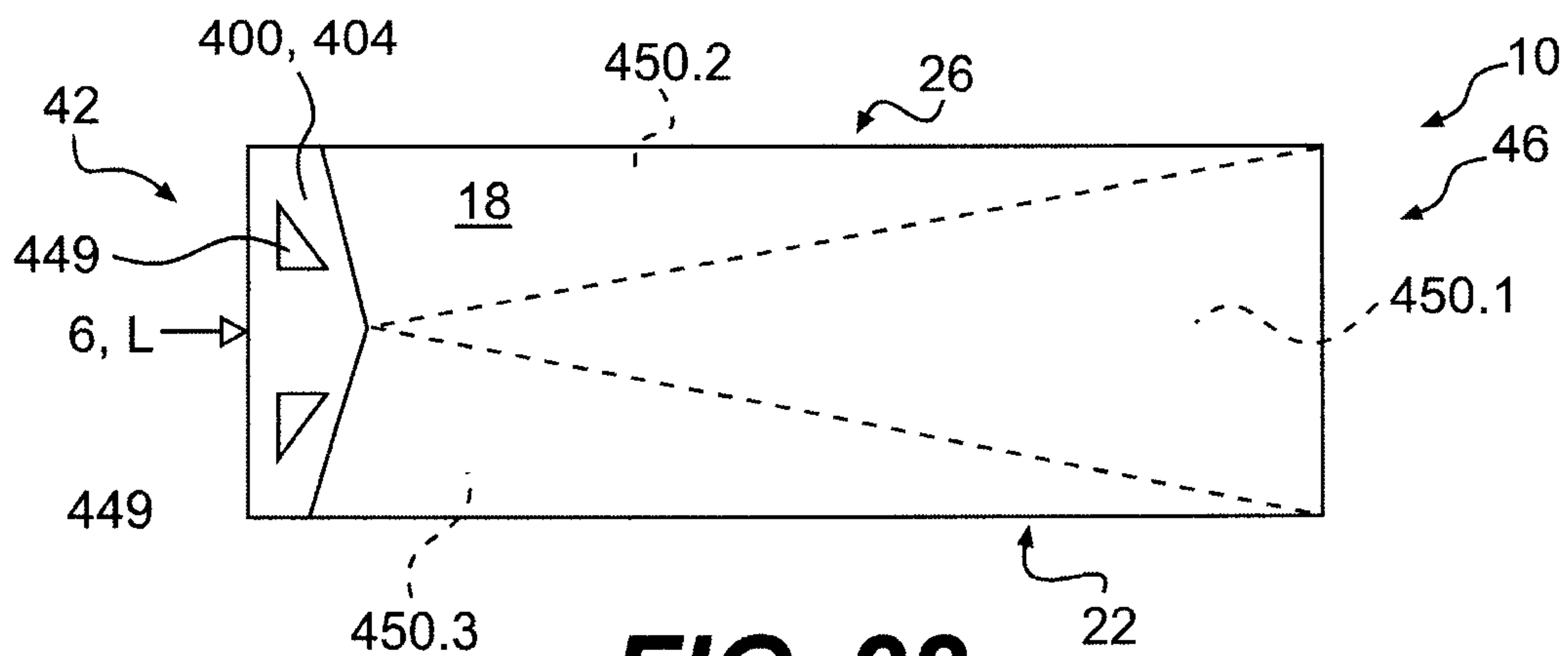
16/22

**FIG. 16**



**FIG. 18**

**FIG. 19**

**FIG. 20****FIG. 21****FIG. 22**

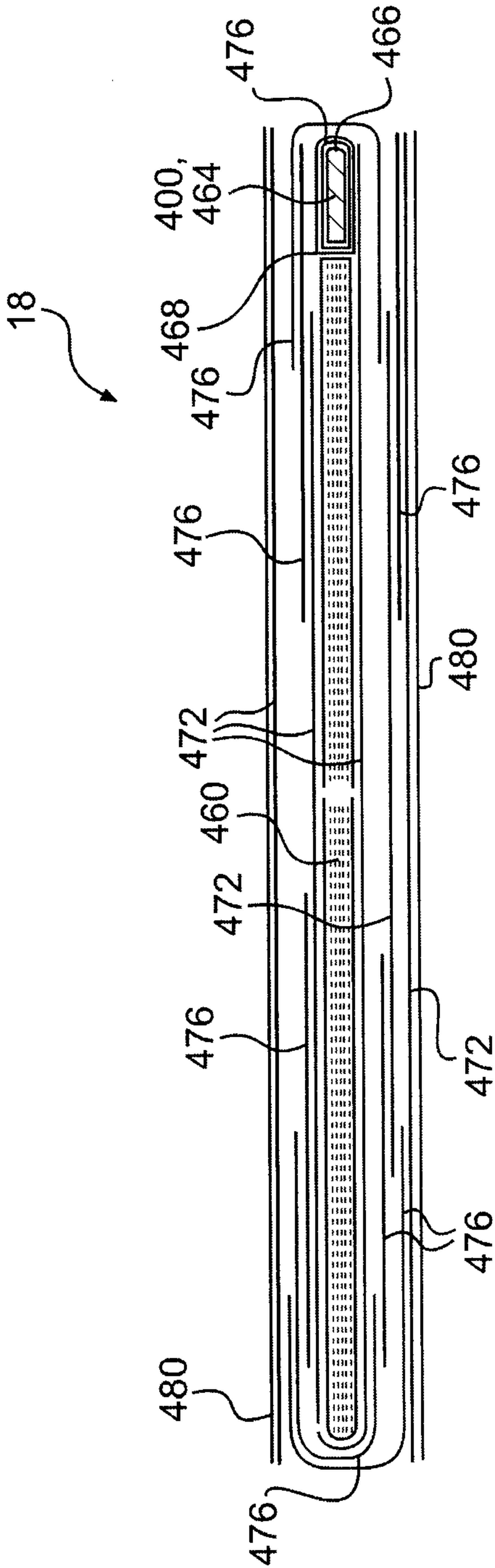


FIG. 23

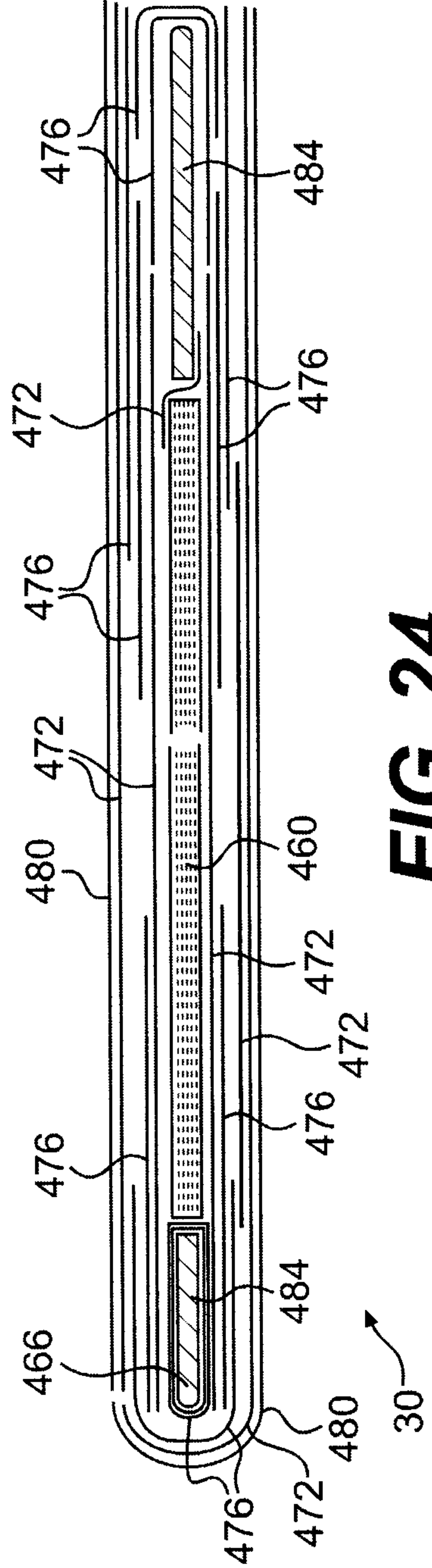


FIG. 24

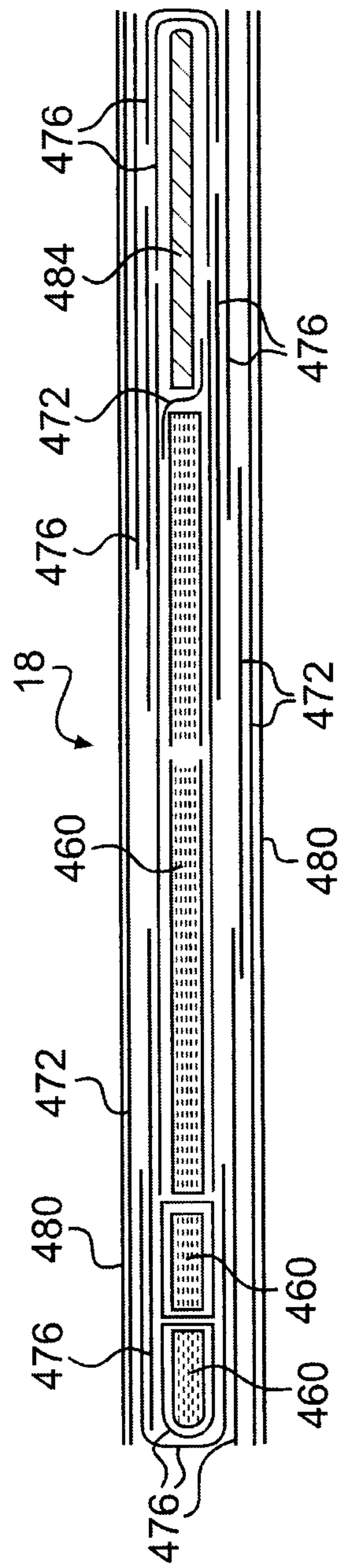


FIG. 25

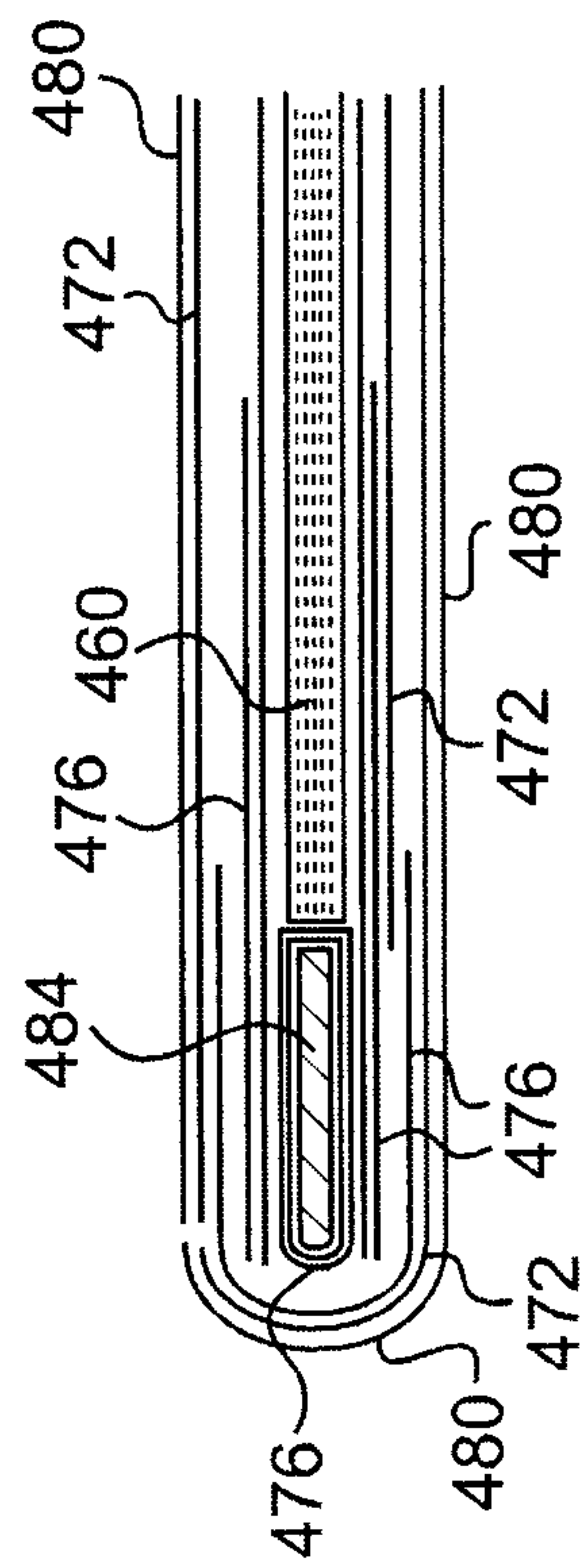


FIG. 26

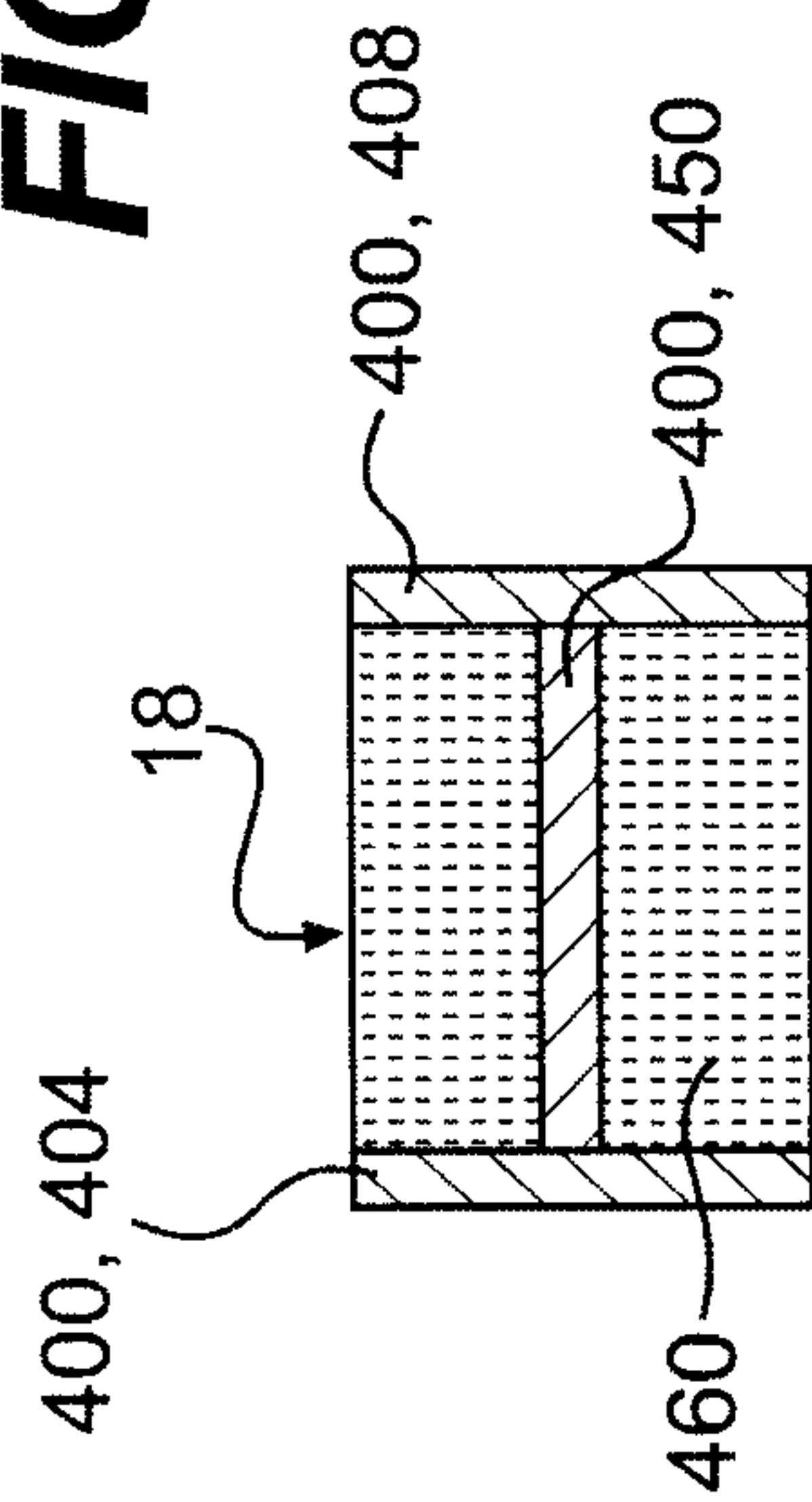


FIG. 28

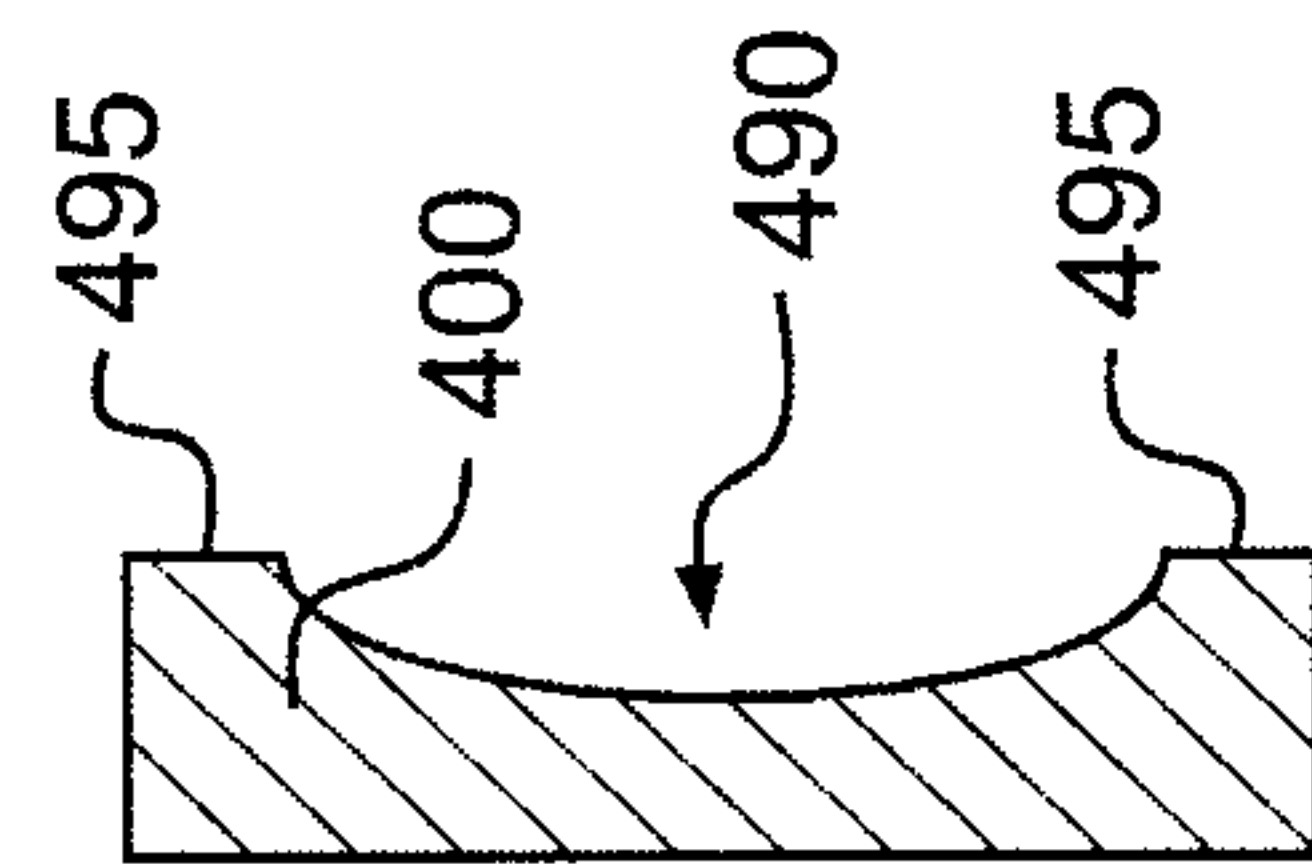


FIG. 27

