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(54) Method for the assembly of fixtures and equipment in a ship galley or like space and a fixture and equipment system.

(57) Method and system for the assembly of fixtures and equipment in a ship galley or like space. The fixtures and equipment are assembled as prefabricated fixture modules (10). The fixture modules comprise an equipment underlay (12), a frame portion formed of a wall and/or ceiling panel (14, 16, 18) and fixtures (44, 46) preassembled to said frame portion, such as cupboards, shelves and ovens as well as the necessary water armatures (52, 54) and electric and air conditioning devices (62, 63, 64, 65).

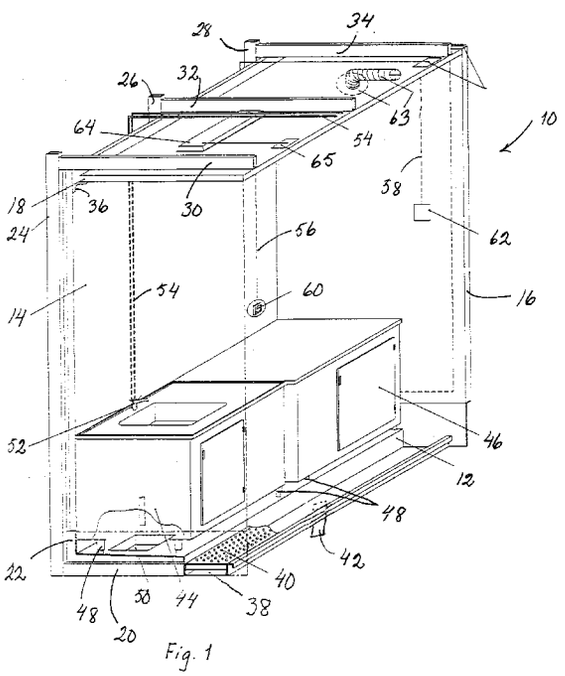

Fig. 1

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The present invention relates to a method for the assembly of fixtures and equipment in a ship galley or like space. The present invention also relates to the fixtures and equipment system of a ship galley or like space.

The entire assembly of the galley fixtures in ship galleys, bars, self service restaurants and like spaces is conventionally carried out on site in spaces, which require some preparatory work before the assembly being done. Equipment underlays or supports for the supporting bases of each cupboard, shelf, partition or like equipment are afixed to the deck, by means of which underlays or supports the fixtures are attached to the hull. There may be hundreds of equipment underlays and to place these on site beforehand to precise positions requires excellent and minute planning and accuracy. As dimensional deviations are common, the supporting bases do not necessarily accurately meet the underlays. The galley facilities are further often tiled even under the equipment and fixtures so as to make it easier to keep the surfaces clean. Said preparatory work is time-consuming. Also the floor materials and the tiling provide a considerable weight, which is a disadvantage in ship-building, especially as accurate estimates of said additional weight may hardly be given in advance.

After the preparatory work is done walls, partitions and separate fixtures, such as cupboards, shelves, refrigeration equipment, ovens, stoves, dish washing machines, other water armatures and electric devices possibly needed are assembled individually. First the wall panels are mounted to supporting rails attached to the hull. The fixtures are attached on underlays provided on the floor. Most of the fixtures are also individually attached to the wall structures of the ship, either by welding to a panel afixed to the wall or by bolting. The welding must be carried out from the front side of the wall unit without being able to see what is behind the wall. An electric cable or some other device may run behind the wall and be damaged by the heat generated in welding. On the other hand, when attaching fixtures by bolting through a wall it is also impossible to see to the other side of the wall and the bolts may hit something. When each fixture is assembled individually in a conventional way, a lot of welding must be performed on site and a large number of bolts must be attached in poor conditions.

Electric cables and pipes for water, steam, freon and pressurized air required by the fixtures and equipment are individually connected to respective piping of the ship. It is self-evident that such assemblies become complicated, while aiming to maintain the assembly openings as small as possible. The assembly openings are often prefabricated on the wall panels prior to their assembly in the ship. Consequently, the openings must be positioned at exactly the right places for a successful assembly. It may be risky to make new assembly openings later, for example by cutting, since it is not possible to see wires and cables, which are easily damaged, on the other side of the wall.

The accuracy in the equipment assembly is also disturbed by the ship not necessarily being positioned in a horizontal position in the shipyard, whereby the assembly of equipment in a horizontal position is difficult. It may generally be stated that conventionally assembly of galley fixtures takes place on site in the ship, where there is very little space and where the conditions are poor, which, of course, easily negatively affects the accuracy in the assembly and the quality of work. For example, the quality of welding, tightness, reliability and tidiness suffers from poor assembly conditions. The inspection of the welding, especially from the back side of the equipment and wall panels is, of course, difficult, if not impossible.

However, the accuracy in the assembly is highly important. For example, the United States Public Health Service (USPHS) sets up extremely strict regulations on the assembly of the galley fixtures and like in ships intending to call at US ports. The USPHS also sets up great demands on the cleaning possibilities of the galleys, which must also be taken into consideration when designing and assembling galleys.

When using conventional methods, the equipment, which is assembled, may be test run and the pipes pressure tested only after the assembly. If any defects are found, the apparatuses must be disassembled. This is not very simple, when the equipment is already secured, for example, by welding to a wall or equipment underlay.

It is often desirable to have additional insulation with the apparatuses, e.g. fire stops or sound absorbing insulation. The pipes and cables of the equipment may not, however, be completely insulated prior to the test run or pressure testing. Since the equipment is tested only after their assembly, the sealing thereafter is complicated.

The conventional assembly of ship galleys usually takes some months, during which time the assembly staff must stay on the ship and perform excellent work in rather poor conditions.

A purpose of the present invention is to provide an assembly method for fixtures and equipment and a fixture system, by means of which the actual assembly time on the ship may be reduced considerably, which again provides more time for other work taking place prior to floor, wall and ceiling assemblies.

Another purpose of the present invention is to provide an assembly method and a fixture system, by means of which the assembly of the fixtures on the assembly site is easier than before and the accuracy in the assembly is better than before.

It is also a purpose of the present invention to provide a fixture system for a ship galley or like space, by means of which the weight of the galley structures

may be reduced compared with the previous galleys.

Moreover, a purpose of the present invention is to provide a fixture system for a ship galley or like space, the accuracy in the assembly of which fixture system follows the regulations of the USPHS and the cleanability of a galley provided with such a fixture unit follows the regulations of the USPHS.

Further, it is a purpose of the present invention to provide a method, by means of which the transfer of the fixture system to the ship galley or like space may be carried out readily and quickly.

In achieving the above mentioned objects a characterizing feature of a method in accordance with the present invention for the assembly of galley fixtures is that the fixtures and equipment are assembled in a ship galley or like space as prefabricated fixture modules, comprising a self-supporting frame portion formed of an equipment underlay and a wall panel and/or a ceiling panel, and fixtures, such as cupboards, shelves and tables as well as the necessary apparatuses and devices, preassembled into the frame portion.

Respectively, it is a characterizing feature of the fixture and equipment system for a ship galley or like space in accordance with the present invention that the system is formed of fixture modules,

- which are transported to the assembly site as prefabricated units for the final assembly in a ship galley or like space; and
- which comprise a self-supporting frame portion formed of an equipment underlay and a wall panel and/or a ceiling panel, and fixtures as well as the apparatuses and devices necessary in said fixture module, such as cupboards, shelves, tables, dish washing machines, refrigeration equipment, ovens, air conditioning apparatuses, water armatures and electric and low current devices, preassembled into the frame portion.

According to the present invention the fixtures and equipment are preassembled to a self-supporting frame portion in the factory and are transported from there as prefabricated fixture modules into the ship, where the modules are assembled to their final places.

The frame portion of a fixture module is preferably formed of a steel plate, such as a 0,5 - 4 mm RST stainless steel plate. According to the invention primarily only the frame portion of the module is mounted in the final assembly stage to the hull, and not each fixture individually, as earlier. The frame portion of the module may, for example, be attached by welding to the middle deck of the ship or by bolting to the hull. According to a preferred embodiment of the present invention the equipment underlay of the frame portion of the fixture module is attached by welding to the deck of the ship.

The walls of the frame portion are attached to the equipment underlay preferably by welding already in the preassembly. The ceiling panel of the frame portion may be attached to the wall panel in the preassembly by welding or otherwise. In order to have a self-supporting construction the wall and ceiling panels are provided with supporting structures, which preferably support the wall panel so that it stays upright without any further support. The supporting structures attached to the ceiling panel may be connected to the supporting structures of the wall panel or to the vertical structures arranged between the ceiling panel and the equipment underlay. In the fixture modules, which have no wall panel, the ceiling panel is supported by vertical supporting structures, such as bars, to the equipment underlay.

The whole frame portion of the fixture module may be manufactured according to a second embodiment of the present invention of stainless steel plate, which is bent in such a way that it forms both the equipment underlay and the wall panel as well as the ceiling panel. Thus no seams are necessary between the different portions. In order to form a self-supporting structure supporting structures are mounted to the back side of the wall panel and to the upper side of the ceiling panel.

The fixtures intended for the galley of the ship may be divided according to the present invention into modules of suitable size, which modules preferably form an entity and which may be transported as a whole from the manufacturer to the assembly site on a ship. The transportation may take place, for example, in a freight container even for long distances. The outer dimensions of a fixture module are thus determined by the size of the container and may be, for example, about 1200 mm x 6000 mm x 2300 mm (depth, width, height). Other ways of transportation may, of course, be used for transporting fixture modules of other bigger module sizes.

On the manufacture site and especially on as ship at tight spaces, the fixture modules are readily movable on ball beds, which allow free transfer of fixtures in every direction.

The frame portions of the fixture modules are manufactured for the preassembly, for example, of 0,5 - 4 mm, preferably 3 - 4 mm RST stainless steel and the supporting structures are attached to them.

In the preassembly the frame portions are provided with the fixtures and equipment. Cupboards, shelves, tables and like may, if they are made of, for example stainless steel, be welded to the frame portion. The back side of the frame portion does not at this stage have cables or other members that are easily damaged by heat or, if there are such, they can be covered, since each part of the frame portion is easily reached. The assembly of the fixtures by bolting, for example, to the supporting constructions is also easily carried out, since the precise position of the supporting structures is to be seen. The fixtures

standing on supporting legs are easily assembled directly to the equipment underlay without any separate supports for the supporting legs.

Electric devices, water armatures, and, for example, air conditioning ducts are easy to preassemble to the fixture module at the site where the module is manufactured, when there is free access to the back side of the frame portion. Wires, cables and pipes may be assembled to the frame portion through minimal assembly openings, because the actual assembly is not performed through the assembly openings, but on both sides of the frame portion, in other words on both sides of the equipment underlay, wall and/or ceiling panels. The wires, cables and pipes to be assembled may easily be attached, if necessary, to the frame portion, to the back side thereof. The electric wires in the fixture module may all be led, for example, to a channel formed in the ceiling panel or in the wall panel, which channel is easily joined with electric channels of other like modules to simplify the assembly of the electric wires during the assembly in the ship. Similarly, it is possible to arrange water and other pipes to run on the back side of the frame pcrtion in such a way that the combination thereof to the respective pipes and networks of the ship may be readily carried out during the assembly.

The fixtures and equipment may be preassembled to the fixture module in such a way that said fixtures or equipment may be test run or, for example, the steam pipes and apparatuses operating with pressurized air may be pressure tested and the refrigeration equipment may be test run with freon prior to the transportation of the fixtures to the ship. This saves a lot of time and work in the actual assembly on the ship. Some equipment, such as refrigeration equipment cannot generally even be test run on the ship before the final assembly, because they will be connected to pipe/electric systems covering the entire ship.

When the apparatuses operating with steam are pressure tested in the factory, steam pipes may be entirely insulated, for example, with fire stop plates manufactured of mineral wool, before the final assembly. This is allowed only after the testing. By utilizing the assembly method in accordance with the present invention it is possible to attach the desired insulation materials, such as fire stop plates or sound absorbing plates, to the back side of the wall panel, the upper side of the ceiling panel and the front side of the equipment underlay of the fixture module before the actual assembly.

By utilizing the present invention, for example, following advantages are achieved:

- Short assembly time on the ship. The actual assembly time on the ship, which when using a conventional assembling method is about 3 months, may when using the assembling method of the present invention be about 4 weeks, which is a significant improvement. Consequently, it is not necessary to have the assembling staff on the assembly site as long as earlier and a considerably shorter time for the assembly of a ship galley is needed on the shipyard.
- The accuracy in the assembly and the quality of work are improved considerably, since the majority of the work may be carried out in better conditions, where there is more space, better assembling equipment, etc.
- When manufactured of a steel plate the fixture module is considerably lighter, even 20-25% lighter than when assembled on conventional equipment underlays and on tiled floors. The weight of a steel module may also be easily estimated beforehand.
- The steel plates may be joined by welding together in such a way that an almost seamless and tight surface is obtained. Usually no covering strips are necessary.
- The tiling or any great margins of error do not have to be taken into consideration on the ship. All the lead-throughs may be accurately planned beforehand. The assembly on an equipment underlay minimizes the deviations in the dimensions.
- The preassembly significantly decreases the machining work on the ship and thus the littering due to the assembly, whereby it is much easier to keep the assembly site tidy. The transport of excess material to the assembly site or away therefrom can be avoided.

The present invention will be described more closely below with reference to the accompanying drawings, in which

Fig. 1 is a schematic illustration of a fixture module in accordance with the present invention, having an equipment underlay, two wall panels and a ceiling panel;

Fig. 2 is a schematic illustration of a second fixture module in accordance with the present invention, having an equipment underlay, a wall panel and a ceiling panel;

Fig. 3 is a schematic illustration of a third fixture module in accordance with the present invention, having an equipment underlay, a partition wall panel and a ceiling panel;

Fig. 4 is a schematic illustration of a fourth fixture module in accordance with an equipment underlay and a ceiling panel; and

Fig. 5 is an enlarged schematic view of a portion circled in Fig. 4.

Fig. 1 illustrates a fixture module 10, having an equipment underlay 12, a back wall 14, a side wall 16 and a ceiling panel 18 formed of an RST plate. The steel plate forming the equipment underlay 12 is bent in such a way that it forms a stand mounted on sup-

porting bars 20. The steel plate forming the equipment underlay is bent upwards also in the back wall side of the fixture module in such a way that the steel plate forms a small upwards bent edge 22. The back wall is bent upwards in such a way that the steel plate forms a slight curve. The lower edge of the back wall panel is attached to said upwards bent edge 22 of the equipment underlay by welding, whereby a tight seam is formed between the equipment underlay and the back wall.

Three vertical bars 24, 26 and 28 are mounted to the back wall 14, forming the supporting structure of the wall. Respective supporting structure members of the ceiling, in other words bars 30, 32 and 34 supporting the ceiling 18 are attached to the upper ends of the supporting structure members of the wall. The gap between the ceiling 18 and the back wall 14 is covered by a covering strip 36. The side wall 16 is mounted to the equipment underlay 12, the back wall 14 and the ceiling 18.

The fixture module 10 is mounted in the actual assembly to the hull preferably by welding the equipment underlay 12 to the deck of the ship and by attaching the supporting structures 24, 26, 28, 30, 32 and/or 34, for example, by bolting or by welding to the hull or to the supporting rails mounted to the hull.

In the actual assembly it is necessary to mount ceiling panels to the space between the fixture modules, for example, over the gangways, to join the modules and to form a continuous ceiling to the galley or like space. Respectively, wall fittings are used between separate fixture modules, for example, vertical bars, to connect the walls of the modules to each other.

A drain or gutter 38 bent of a steel plate is tightly attached, for example, by welding to the equipment underlay 12 to the front side thereof. Said drain is covered by a grating 40 preventing litters and garbage of large size from flowing into the drain. The drain is connected to a floor drain 42. The drain may, if so desired, be manufactured of the same steel plate as the equipment underlay by bending said steel plate in a suitable manner.

A sink 44 and a cupboard 46 manufactured of RST-steel are preassembled to the equipment underlay. The sink and the cupboard are afixed by their supporting legs 48 to the equipment underlay. They are also attached by welding or bolting to the back and side walls. A basin 50 is formed in the equipment underlay, which may be connected to the floor drain in the deck of the ship.

Water armatures 52 of the sink basin are preassembled to the sink and water pipes 54 to the back wall 14 and the ceiling 18. The water pipes are led from the sink basin upwards along the back side of the back wall and the upper side of the ceiling to the front edge of the ceiling, from where the pipes are easily connected to the main piping of the ship.

Respectively, electric cables 56, 58 of the fixture module from a wall socket 60 and a connecting box 62 may be led in the preassembly along the back side of the back wall and the side wall and the upper side of the ceiling towards the front edge of the ceiling, from where the cables are easily connected to the electric system of the ship.

Fig. 1 also illustrates an air conditioning duct 63, which is preassembled to the ceiling. A lighting fixture 64 and a connecting box 65 connected thereto are also preassembled to the ceiling.

Fig. 2 illustrates a fixture module, the frame portion of which comprises an equipment underlay 12, a back wall 14 and a ceiling 18. A drain is attached to the equipment underlay as in Fig. 1. Three apparatuses are preassembled on the equipment underlay, which may be, for example, ovens, stoves or like. The apparatuses are attached to the equipment underlay and the back wall by welding or by bolting.

A hood 72 and air-conditioning channels 74 and 76 are preassembled to the ceiling. The air conditioning channels are led towards the front edge of the ceiling, from where they are connected to the air-conditioning system of the ship.

Fig. 3 illustrates an embodiment of the present invention, in which a partition wall 78 is preassembled to the equipment underlay 12 and cupboards 80, 82, 84 on both sides of said partition wall 78. Further, shelves 86 and 88 are preassembled to the ceiling 18.

Fig. 4 illustrates yet another embodiment of the present invention, in which the fixture module is formed of two parts, i.e. an equipment underlay 12 and an apparatus 90 preassembled thereto, and a ceiling 18 and a shelf 92 and a roller shutter 94 preassembled to the ceiling 18.

The element 92 is attached by welding or by bolting to the equipment underlay. The cables or pipes of the element are preassembled under the equipment underlay and arranged to run there in such a way that in the assembly they accurately fit in the assembling points on the deck of the ship.

The ceiling panel 18 is secured by vertical supporting structures, for example, bars 95, to the equipment underlay. The shelf 92 and the attaching element 96 of the roller shutter are attached to the ceiling 18 by welding or by bolting. Respectively, the electric cables possibly connected to the shelf or the roller shutter are preassembled to run on the upper side of the ceiling to such a place, from where they may easily be connected in the final assembly to the electric system of the ship.

A fixture module illustrated in Fig. 4 is arranged on a transportation base or a ball bed 100, on which the fixture module is easily transferred, for example, along the middle deck of the ship to the assembly site for the final assembly. The transportation base is formed of a supporting plate 102 and balls 106 freely rotatable in all directions and partially submerged in

assembly recesses 104 under said plate 102. Balls may be arranged in the bearing plate within equal distances both in longitudinal and latitudinal directions, for example, within about 80 to 120 mm from each other. The balls thus support the fixture module and act at the same time as a slide bearing between the transportation base and the middle deck of the ship. Further, for example, each corner of the transportation base is provided with hooks 108, of which the transportation base may be pulled to different directions.

Fig. 5 illustrates an enlarged view of the portion circled in Fig. 4. The transportation base may be manufactured, for example, of about 3 - 5 mm steel plate 110. The diameter of the balls 106 may be about 10 - 30 mm and they may be submerged in the assembly recesses 104 in such a way that about 5 - 10 mm of the balls remains above the recesses. The height of the whole transportation base may thus be only about 20 - 40 mm.

The positioning of the transportation base under the fixture modules or the removal thereof from under the module requires the lifting of the module only about 5 mm. Thus, since the transportation base is very low and since it is not necessary to lift the fixture module much when transferring the module to the transportation base and removing it therefrom, it is possible to manufacture the fixture modules substantially utilizing the entire height of the ship galley or like space, in other words by utilizing substantially the whole space remaining between the decks of the ship.

The invention is described in Figs. 1 - 4 with references mainly to the assembly of galley fixtures. The invention may, however, also be applied, for example. in the assembly of the bars, self service counters and tables in the ship. The invention may also be applied to the assembly of galley or kitchen and bar fixtures in other places, where the fixtures and walls are mainly manufactured of steel and where great accuracy and similar kind of quality of work as in the ship galleys are required in the assembly. The examples are not given to restrict the invention to the described embodiments, but the invention may applied within the scope of invention defined by the attached claims.

Claims

1. Method for the assembly of fixtures and equipment in a ship galley or like space, **characterized** in that the fixtures and equipment are assembled in the ship galley or like space as prefabricated fixture modules comprising an equipment underlay and a self-supporting frame portion formed of a wall panel and/or a ceiling panel, and fixtures preassembled to the frame portion, such as cupboards, shelves and tables as well as the necessary apparatuses and devices.

2. Method in accordance with claim 1, **characterized** in that the underlay of the fixture module is attached in the assembly to the base structure of the ship galley or like space, such as the middle deck of the ship.

3. Method in accordance with claim 1, **characterized** in that the necessary water armatures, electric devices,
refrigeration equipment and/or apparatuses operating with steam are preassembled to the equipment underlay, wall panel and/or ceiling panel of the fixture module or to the fixtures mounted to them and are test run prior to the fixture module being brought to the final assembly site in a ship galley or like space.

4. Method in accordance with claim 1, **characterized** in that the fixture module is transferred in the ship by means of a ball bed to the final assembly site.

5. Fixtures and equipment system for a ship galley or like space, **characterized** in that said system is formed of fixture modules (10),
   - which are transported as prefabricated elements to the assembly site in a galley of a ship or like space for the final assembly; and
   - which comprise an equipment underlay (12) and a self-supporting frame portion formed of a wall panel (14, 16) and/or a ceiling panel (18), and fixtures (44, 46, 80, 82, 84, 86, 88, 90, 92) preassembled to said frame portion, such as cupboards, shelves and tables, and apparatuses and devices required in said fixture module, such as dish washing machines, refrigerating equipment, ovens (66, 68, 70), air conditioning apparatuses (63, 72, 74, 76), water armatures (52, 54) and electric and low current devices (56, 58, 60, 62).

6. System in accordance with claim 5, **characterized** in that the frame portion of the fixture module is manufactured of a stainless steel plate, such as 0,5 - 4 mm RST steel plate, which is bent to form the equipment underlay (12) and the wall panel (14) of said frame portion and that at least one vertical supporting structure (24, 26, 28) is attached to the wall panel (14) in the preassembly, for example, by welding, making the wall self-supporting.

7. System in accordance with claim 5, **character-**

ized in that the frame portion is manufactured of a stainless steel plate, which is bent to form an equipment underlay (12), a wall panel (14) and a ceiling panel (18) of said frame portion, and that in the preassembly the ceiling panel (18) is provided with at least one horizontal supporting structure (30, 32, 34) which is secured to the supporting structure (24, 26, 28) of the wall panel (14).

8. System in accordance with claim 5, **characterized** in that the ceiling panel is secured in the preassembly to the equipment underlay with two or more vertical supporting structures, which make the frame portion, formed of the equipment underlay and the ceiling panel, self-supporting.

9. System in accordance with claim 5, **characterized** in that a drain (38) is mounted to the equipment underlay (12), in such a way that it is possible to connect said drain (38) to the floor drain (42) of the galley or like.

10. System in accordance with claim 5, **characterized** in that the external dimensions of the fixture module may not exceed the internal dimensions of a freight container so that the fixture module may be transported to a ship in said container.

11. System in accordance with claim 5, **characterized** in that the back side of the wall panel and the upper side of the ceiling panel are provided during the preassembly with insulation material, such as fire stop panels or sound absorbing insulation.

12. System in accordance with claim 5, **characterized** in that the system comprises a transport base (100), which is arranged under the fixture module for the time of transportation of the fixture module and that said transport base comprises a support plate (102) and a number of balls (106) rotatably mounted to recesses (104) within a distance from each other below said support plate, on which balls the transport base may be transferred.

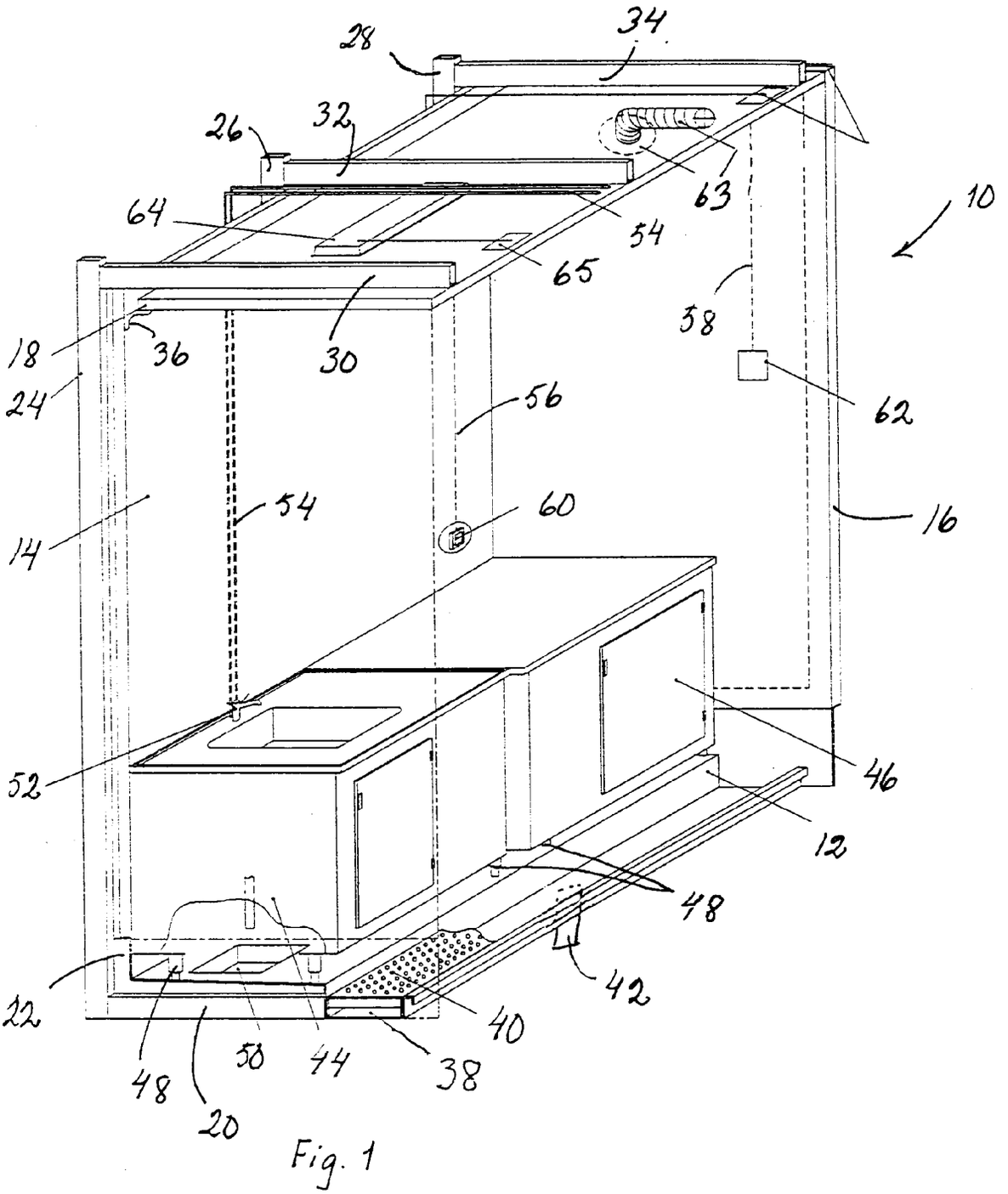
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Fig. 1

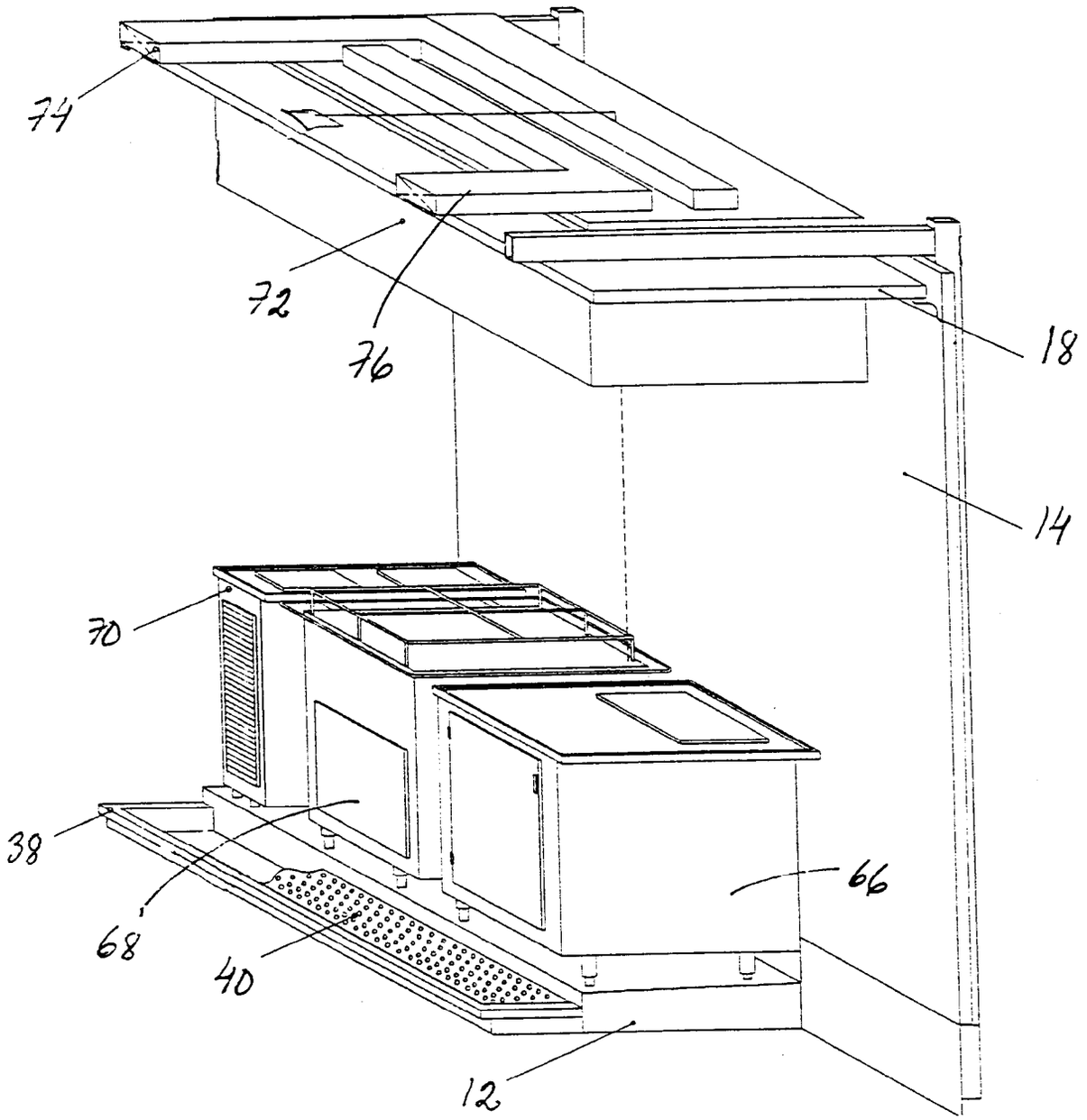

Fig 2

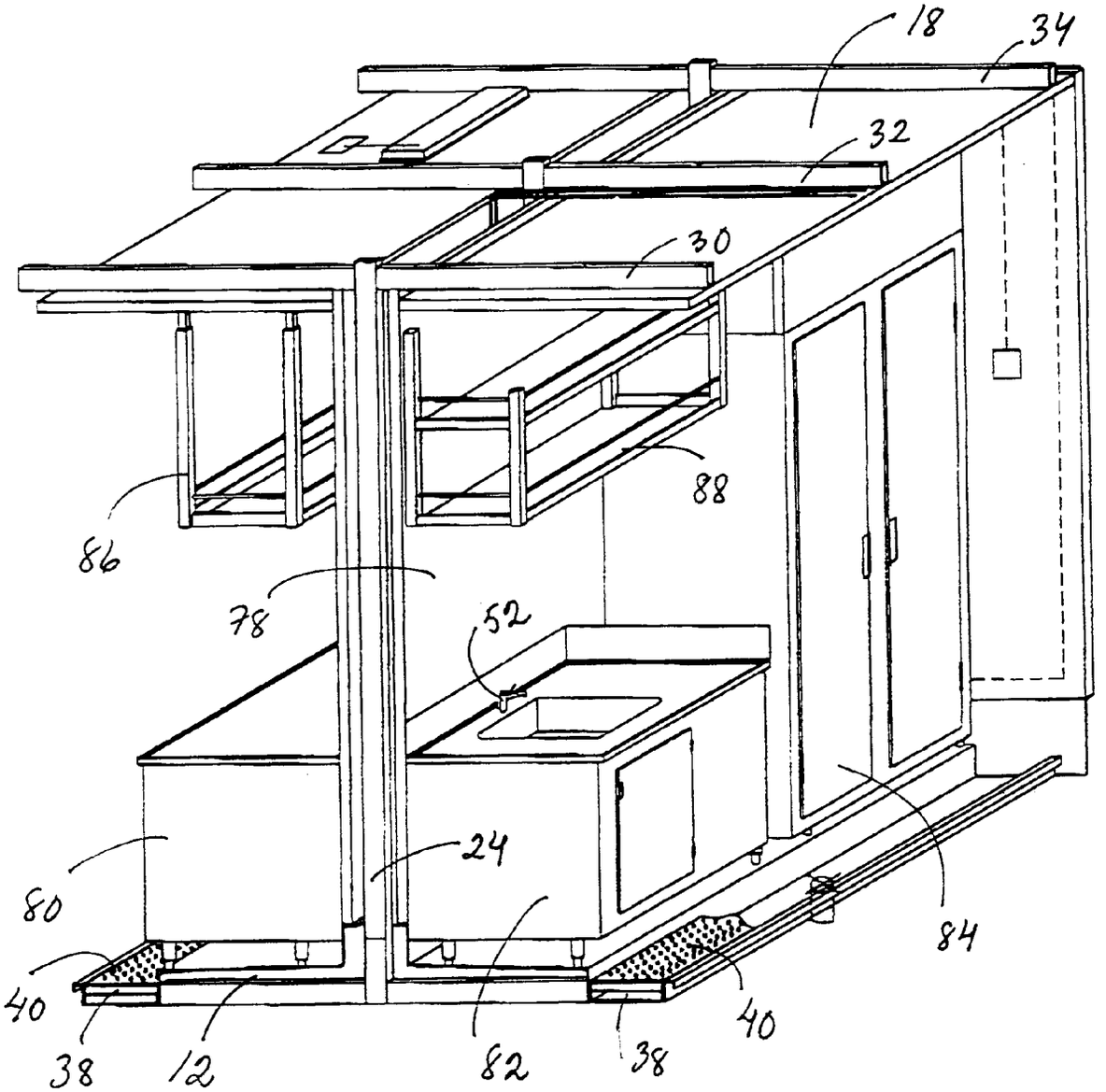

Fig. 3

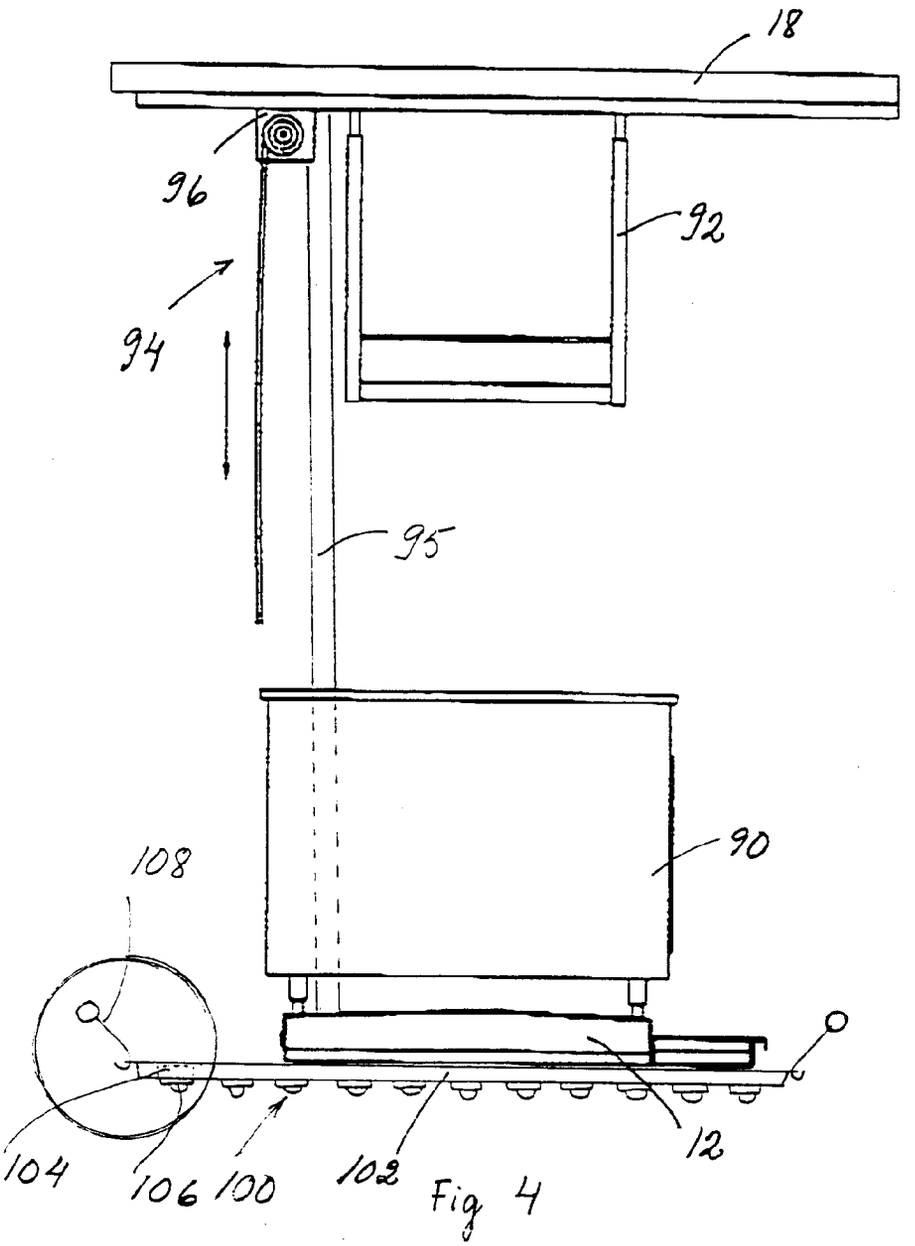

Fig 4

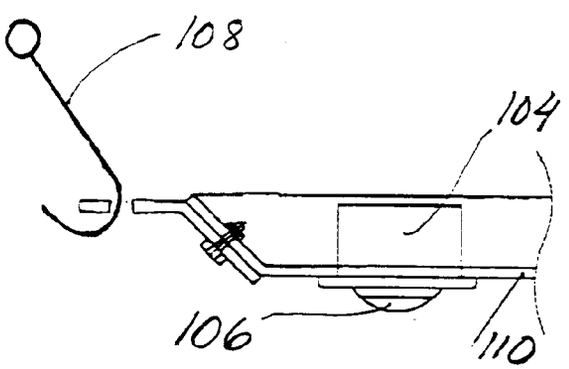

Fig 5