

(19)



(11)

EP 4 036 501 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.08.2022 Bulletin 2022/31

(51) International Patent Classification (IPC):
F25D 23/10 ^(2006.01) **F25D 11/02** ^(2006.01)
F25D 25/02 ^(2006.01)

(21) Application number: **22154484.4**

(52) Cooperative Patent Classification (CPC):
F25D 23/10; F25D 11/022; F25D 25/025;
F25B 2600/2511; F25D 2400/08

(22) Date of filing: **01.02.2022**

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

(71) Applicant: **Suomen Kotikylmiö Oy**
15860 Hollola (FI)

(72) Inventor: **KORPELA, Lasse**
15950 LAHTI (FI)

(74) Representative: **Berggren Oy**
P.O. Box 16
Eteläinen Rautatiekatu 10A
00101 Helsinki (FI)

(30) Priority: **01.02.2021 FI 20215106**

(54) **A PIECE OF REFRIGERATED FURNITURE AND A METHOD FOR PRODUCING COLD INSIDE A REFRIGERATED FURNITURE**

(57) Piece of kitchen furniture (100), which includes a furniture frame (115) of the kitchen furniture (100), on top of which a countertop (8) has been installed, which is at a height of 500-1000 mm or 600-900 mm from the floor (9) and on the front side of the furniture frame (115) there is a plinth (117), which is supported on the floor (9), whereby a cupboard of the kitchen furniture (100) or an oven (13) and at least one piece of refrigerated furniture

(1) is installed in said furniture frame (115), which refrigerated furniture (1) comprises either a refrigerator part (2) and a freezer part (3), which are installed in the refrigerated furniture (1) frame (6) on top of each other or a first refrigerator part (2; 2¹) and a second refrigerator part (2²), which are installed in the refrigerated furniture (1) frame (6) on top of each other.

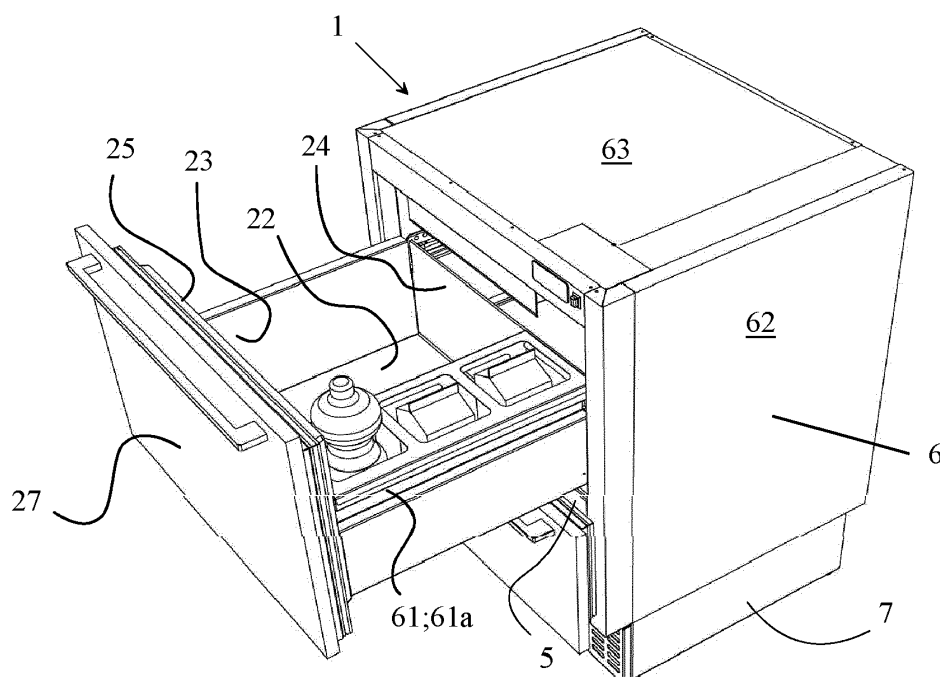


Fig. 1A

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Description

[0001] The invention relates to a piece of kitchen furniture in accordance with claim 1, which includes a furniture frame of the bottom part of the kitchen furniture, on top of which a countertop has been installed, which is at a height of 500-1000 mm or 600-900 mm from the floor and beneath which furniture frame there is a plinth, which is supported on the floor.

At least one piece of refrigerated furniture is installed in the furniture frame.

[0002] The invention additionally relates to a method for producing cold in a freezer space and refrigerator space or two superposed refrigerator spaces inside the refrigerated furniture according to claim 1.

[0003] These days, apartment sizes and also family sizes have become smaller, whereby space requirements for refrigerated furniture have also changed. Even though space requirements for refrigerated furniture have become more strict, i.e. the refrigerated furniture should fit in a very small space, users still have the need for refrigerated furniture, which has a freezer part and a refrigerator part or two separate superposed refrigerator parts. Additionally, for example persons with reduced mobility or who use a wheelchair have a need for a sufficiently low refrigerated furniture integrated into a countertop.

[0004] There are some refrigerated furniture on the market, which can be placed in a small space, for example underneath a kitchen furniture countertop or the like, but these are generally refrigerators with one temperature or freezers with one temperature, which usually have only one compartment.

[0005] Combination refrigerators, so-called yankee cabinets, on the market have a large refrigerator part and a quite small freezer part. Such a so-called yankee cabinet is not meant for and also not suitable for use beneath a countertop.

[0006] An object of the current invention, with the prior art above as its basis, is to eliminate or at least alleviate problems present in the prior art above.

[0007] Thus, an object of the present invention is to provide a refrigerated furniture comprising a freezer part and a refrigerator part or two refrigerator parts, wherein the cold production circuit of the cold production apparatus has a simple structure and takes up as little space as possible from the freezer part / other grocery storage space in the refrigerator part.

[0008] The objects above are achieved with a refrigerated furniture according to claim 1, which comprises a refrigerator part and a freezer part, which are installed in a shared refrigerated furniture frame on top of each other, or a first refrigerator part and a second refrigerator part, which are installed in a shared refrigerated furniture frame on top of each other.

[0009] The invention also relates to a method for producing cold in a superposed freezer space and refrigerator space inside a refrigerated furniture according to claim 1 or a method for producing cold in refrigerator spaces of two superposed refrigerator parts.

[0010] More particularly, the invention relates to a piece of kitchen furniture, which includes a furniture frame of the kitchen furniture, on top of which a countertop has been installed, which is at a height of 500-1000 mm or 600-900 mm from the floor and on the front side of which furniture frame there is a plinth, which is supported on the floor,

whereby a cupboard of the kitchen furniture or an oven and at least one piece of refrigerated furniture is installed in said furniture frame,

which refrigerated furniture comprises

either a refrigerator part and a freezer part, which are installed in the refrigerated furniture frame on top of each other or

a first refrigerator part and a second refrigerator part, which are installed in the refrigerated furniture frame on top of each other. Thus

the refrigerator part of the refrigerated furniture and the freezer part of the refrigerated furniture comprise a drawer of the refrigerator part and a drawer of the freezer part, respectively, inside which drawers a refrigerator space and a freezer space respectively remain, which drawers are installed to be glided horizontally on superposed horizontal rail pairs of the refrigerated furniture frame,

or

the first refrigerator part and second refrigerator part of the refrigerated furniture comprise a drawer of the first refrigerator part and a drawer of the second refrigerator part, respectively, inside which drawers a refrigerator space of the first refrigerator part and a refrigerator space of the second refrigerator part respectively remain, which drawers are installed to be glided horizontally on superposed horizontal rail pairs of the refrigerated furniture frame,

- a horizontal partition wall has been installed between the refrigerator part and the freezer part, which partition wall is equipped with insulation, to maintain the interior temperatures of the refrigerator space and the freezer space

respectively substantially constant or

a horizontal partition wall has been installed between the first refrigerator part and the second refrigerator part, which partition wall is equipped with insulation, to maintain the interior temperatures of the refrigerator space of the first refrigerator part and the refrigerator space of the second refrigerator part respectively substantially constant,

- the furniture frame of the kitchen furniture includes a group of frame modules delimited by vertical side walls, which frame modules extend in the vertical direction from the countertop to the floor, and on which frame modules the horizontal countertop is supported,

- different interior temperatures can be achieved in the respective refrigerator space and freezer space remaining inside the refrigerator and freezer parts of the refrigerated furniture or in the respective first refrigerator space and second refrigerator space remaining inside the first refrigerator part and second refrigerator part of the refrigerated furniture with the aid of a cooling circuit of a cold production apparatus of the refrigerated furniture, which cooling circuit comprises a valve arrangement, such as a three-way valve, and a heat pump,

for cooling the freezer space of the freezer part and the refrigerator space of the refrigerator part or

for cooling the refrigerator space of the first refrigerator part and the refrigerator space of the second refrigerator part,

which cooling circuit heat pump includes a compressor, which can be connected into refrigerant connection with a condenser and either evaporator, to bring said evaporators in turn into heat exchange connection

either with the air mass in the freezer space or with the air mass in the refrigerator space or

with the air mass in the first refrigerator space and with the air mass of the second refrigerator space,

- the condenser, compressor and valve arrangement of the cooling circuit of the refrigerated furniture are mainly situated in a technical space situated in the bottom part of the frame of the refrigerated furniture supported on the floor.

[0011] The present invention is based on the fact that in the invention, the aim is to fit the refrigerated furniture optimally in the kitchen furniture frame module, beneath the countertop running above the frame module. Thus, a separate freezer part and separate refrigerator part or two separate refrigerator parts have been formed inside the refrigerated furniture with the aid of drawers and a horizontal partition wall. A freezer space and a refrigerator space or two separate refrigerator spaces thus respectively remain inside the drawers. The cooling circuit has only one compressor, which is situated in the technical space beneath the freezer part or refrigerator part. This simplifies the structure of the cold production circuit and reduces its space requirements. Additionally, the cold production apparatus of the refrigerated furniture includes a valve arrangement, which has a three-way valve for steering refrigerant in turn to the evaporator of the refrigerator part or the freezer part or to the evaporator of either refrigerator part.

[0012] Such a refrigerated furniture according to the invention achieves the significant advantage that the structure of the freezer part and refrigerator part or the structure of the two superposed refrigerator parts can be kept simple and easy to use, when both above-mentioned parts are made up of drawers, inside which the freezer space and refrigerator space or both refrigerator spaces remain..

[0013] The main part of the cooling circuit of the refrigerated furniture is situated in the technical space situated in the bottom part of the refrigerated furniture frame. The cooling circuit comprises a three-way valve, a compressor, a condenser and two evaporators, of which the compressor, three-way valve and condenser are situated in the technical space. After the compressor there is the three-way valve, which steers the refrigerant to either evaporator. This achieves the significant advantage that the cooling circuit of the refrigerated furniture can be made a very compact and simple structure and thus a structure which only takes a little space.

[0014] In an advantageous embodiment of the invention, the furniture frame of the kitchen furniture includes a horizontal countertop and a group of frame modules, each of which comprises two parallel vertical walls, both of which extend from the countertop to the floor. The width direction of the vertical walls corresponds to the length direction of the kitchen furniture and the horizontal countertop is supported on the frame modules.

[0015] The refrigerated furniture is thus fitted or installed in the frame module, which is delimited upwards either by the horizontal countertop, which is supported on the walls of the frame module, or by a horizontal ceiling of the frame module running beneath the countertop. Advantageously, a distance V remains between two vertical walls of the frame module of the furniture frame in the length direction P of the furniture frame. The distance V can be 40, 60, 80, 100 cm

or 120 cm.

[0016] The kitchen furniture can here be an island, which includes a countertop and beneath it a one-part furniture frame of the kitchen furniture or a more traditional furniture frame of the lower part of a piece of kitchen furniture.

[0017] A plinth here means a vertical support or a cover strip supported on the floor or bottom of the furniture frame and/or walls of the furniture frame, which follows the outer walls of the furniture frame, especially the front walls of the furniture frame.

[0018] A countertop in this context means the level of the kitchen furniture sink table, which is manufactured from stainless steel or for example a countertop manufactured from solid wood.

[0019] In an advantageous embodiment of the invention, the cooling circuit of the refrigerated furniture, which comprises a condenser and a compressor and a valve arrangement, for steering refrigerant from the compressor to either evaporator, should be situated mainly in this technical space.

[0020] In still another advantageous embodiment of the invention, the door blades or door blades connected to front plates of the drawers of the refrigerated furniture are arranged to extend in the horizontal direction at least from the first side wall of the refrigerated furniture frame to the second side wall, and in the vertical direction from the ceiling of the refrigerator part /freezer part of the refrigerated furniture and from the bottom of the freezer part/refrigerator part of the refrigerated furniture respectively to the horizontal partition wall installed between the refrigerator part and the freezer part.

[0021] Alternatively, the door blades or door blades connected to front plates of the drawers of the refrigerated furniture are arranged to extend in the horizontal direction at least from the first side wall of the refrigerated furniture frame to the second side wall, and in the vertical direction from the ceiling of the first refrigerator part of the refrigerated furniture and from the bottom of the second refrigerator part of the refrigerated furniture respectively to the horizontal partition wall installed between the first refrigerator part and the second refrigerator part.

[0022] Advantageously, the door formed by each door blade should be dimensioned so that it extends in the horizontal direction from one side wall of the frame module to the other one.

[0023] In the following, the invention and the advantages obtainable with it are illustrated in even more detail by reference to the enclosed figures.

Figures 1A and 1B show a piece of refrigerated furniture according to the invention seen from the outside as a perspective view and diagonally from the front at slightly different angles.

Figure 2 shows the refrigerated furniture according to the invention seen from the side, which is installed in the bottom part of a kitchen furniture, beneath the countertop.

Figure 3 shows the valve arrangement used in the refrigerated furniture according to the invention, as a schematic longitudinal sectional view.

Figure 4 shows as a schematic view the cold production circuit of the refrigerated furniture according to the invention.

Figures 5A and 5B illustrate respectively a refrigerated furniture placed in kitchen furniture and the drawers of said refrigerated furniture.

Figure 6 shows the valve arrangement used in another refrigerated furniture according to the invention, as a schematic longitudinal sectional view.

[0024] In the following, we will first go through the main parts visible in the figures and which detail of the invention the figure illustrates, and thereafter illustrate the operation and alternative structures of the refrigerated furniture.

[0025] Figures 1A and 1B show an embodiment of the refrigerated furniture according to the invention seen from the outside, when the drawers 20 of the refrigerator part 2 of the refrigerated furniture is pulled out from the frame 6 of the refrigerated furniture 1.

[0026] Figure 2 in turn shows another embodiment of the invention, where the refrigerated furniture 1 according to the invention is shown as seen from the outside and installed beneath a kitchen counter 8. When the refrigerated furniture 1 is fitted to be installed in its entirety into the kitchen furniture beneath the countertop 8, the technical space 7 of the refrigerated furniture must be made as small as possible, so that the freezer part 3 and refrigerator part 2 can in turn be kept sufficiently spacious. In the invention, the main part of the cooling circuit 40 of the refrigerated furniture is situated inside the bottom part 64 of the frame 6 of the refrigerated furniture, in the technical space 7 remaining beneath the lower drawer (compare figure 3). The height of the technical space 7 is in turn fitted so that the plinth 117 of the kitchen furniture, which is supported on the floor, covers it, when looking at the plinth from the front. The plinth 117 is advantageously a plinth board.

[0027] In another embodiment according to the invention, the refrigerated furniture comprises a first refrigerator part

2¹ and a second refrigerator part 2² (compare figure 6 and its description). In this case, the technical space 7 is situated in the technical space 7 remaining beneath the drawer in the first refrigerator part 2¹ (compare figure 6). The main part of the cooling circuit 40 of the refrigerated furniture is also in this case situated in the technical space inside the bottom part 64 of the frame 6 of the refrigerated furniture.

[0028] The refrigerated furniture 1 seen in figure 2, or a corresponding refrigerated furniture 1 formed from a first refrigerator part 2¹ and second refrigerator part 2², which is seen in figure 6, can be fitted especially beneath a sink table, tabletop of the like functioning as a kitchen furniture countertop 8. The distance of the countertop from the floor is 830-900 mm, when using currently predominant dimensions of furniture frames of kitchen furniture. The refrigerated furniture 1 is fitted inside the frame module 116 of the furniture frame 115 of the refrigerated furniture 1, which module extends from the countertop 8 to the floor. A plinth 117 has been installed in front of the furniture frame 115, which plinth surrounds or follows the bottom part of the furniture frame 115. The plinth 117 can also form the bottom part of the furniture frame 115. The refrigerated furniture 1 is supported on the floor 9.

[0029] As is seen in figures 1A, 1B and 2, the frame 6 of the refrigerated furniture 1 comprises a continuous horizontal ceiling 63, from which a rear wall is directed downwards and parallel side walls 62 at a distance from each other. The side walls 62 and rear walls continue at a distance from the ceiling as a bottom part 6; 64, which is supported on the floor 9.

[0030] The technical space 7 is situated beneath the frame 6 of the refrigerated furniture, in the plinth 117 of the kitchen furniture. Additionally, the technical space 7 is situated in the bottom part 64 of the frame 6 of the refrigerated furniture remaining beneath the freezer space 31 of the freezer part 3.

[0031] In another embodiment of the invention, the mutual position of the freezer part 3 and the refrigerator part 2 can be such that the refrigerator part 2 is situated beneath the freezer part. Thus, naturally, the technical space 7 is situated in the bottom part 64 of the frame 6 of the refrigerated furniture remaining beneath the refrigerator space 21 of the refrigerator part 2.

[0032] In still another embodiment of the invention, the refrigerated furniture 1 has a superposed first refrigerator part 2¹ and second refrigerator part 2² (compare figure 6). Thus, the technical space 7 is situated in the bottom part 64 of the frame 6 of the refrigerated furniture remaining beneath the refrigerator space 21¹ of the lower first refrigerator part 2¹.

[0033] The cooling circuit 40 of the cold production apparatus 4 remaining in the technical space 7 comprises a three-way valve 41 and a condenser 46 and compressor 44 (compare figures 4 and 6).

[0034] In the embodiments of the refrigerated furniture 1 shown in figures 1A, 1B and 2, the refrigerated furniture 1 comprises a refrigerator part 2 and a freezer part 3. Such a refrigerated furniture 1 can be installed in a frame module 116 of a kitchen furniture 100 according to figure 2. Figure 2 shows the frame module 116 as a cross-sectional view and it comprises a vertical rear wall 116b of the frame module, which extends to the bottom 116c of the frame module. The bottom 116c of the frame module is here at the same time the floor 9.

[0035] The refrigerator part 2 and freezer part 3 are installed in a shared refrigerated furniture frame 6 on top of each other, with the refrigerator part 2 being above the freezer part 3. The refrigerator part 2 and freezer part 3 both comprise a respective drawer 20, 30.

[0036] The drawers 20, 30 are installed in the vertical frame 6 of the refrigerated furniture 1 on superposed horizontal rail pairs 61, to be glided in the horizontal direction.

[0037] In another embodiment of the invention (not shown in the figures), the refrigerator part 2 and freezer part 3 are installed in a shared refrigerated furniture frame 6 on top of each other in such a way that the refrigerator part 2 is beneath the freezer part 3.

[0038] Thus, in the embodiments of the invention seen in figures 1A-1B and 2, the freezer part 3 is made up of a drawer 30, which is installed to be glided in the horizontal direction on the lower horizontal rail pairs 61; 61b in the vertical frame 6 of the refrigerated furniture.

[0039] The drawer 20 of the refrigerator part 2 is in turn installed to be glided in the horizontal direction on the upper horizontal rail pairs 61; 61a in the vertical frame 6 of the refrigerated furniture.

[0040] If the refrigerated furniture comprises two refrigerator parts, as shown in figure 6, the first refrigerator part 2¹ is made up of the drawer 20, which is installed to be glided horizontally on the lower horizontal rail pairs 61; 61b in the vertical frame 6 of the refrigerated furniture. The drawer 20 of the second refrigerator part 2² is in turn installed to be glided in the horizontal direction on the upper horizontal rail pairs 61; 61a in the vertical frame 6 of the refrigerated furniture.

[0041] Additionally, a third horizontal rail pair 61; 61c (compare figure 5B) can be installed in the refrigerated furniture frame, which rail pair is situated above the refrigerator part 2. A third drawer 20a has been installed on these third, upper rail pairs. The third drawer can be used for example for storage of vegetables or other groceries requiring a higher temperature. Because the door blade 27 of the refrigerator part 2 extends upward from the plane of the refrigerator part frame (compare figures 1A, 1B and 2), said door blade 27 also covers the third drawer, when the refrigerated furniture frame is seen from direction A in figure 5B.

[0042] A refrigerator space 21 remains inside the drawer 20 of the refrigerator part 2 and a freezer space 31 in turn remains inside the drawer 30 of the freezer part 3. A separate third drawer 20a has further been placed in the refrigerator space 21 for example for cold cuts (compare figure 5B).

[0043] If two superposed refrigerator parts 2¹, 2² are placed in the refrigerated furniture frame (compare figure 6), a first refrigerator space 21¹ remains inside the drawer 20 of the first refrigerator part 2 and a second refrigerator space 21² in turn remains inside the drawer 20 of the second refrigerator part 2².

[0044] Each drawer 20, 20a, 30 comprises a horizontal bottom 22, 32 of the drawer. Side walls 23, a rear wall connecting the side walls and a front wall 25, 35 opposite the rear wall, integrated into the front plate 27, 37, rise up at a 90 degree angle from the bottom 22, 32 of the drawer 20, 20a, 30. Both side walls 23 of the drawer additionally have horizontal guides 61, in which corresponding horizontal rail pairs running on the inner surface of the refrigerated furniture frame 6 can be fitted to be glided.

[0045] A drawer door blade 27, 37 in the direction of the front wall 25, 35 is integrated respectively in both the front wall 25 of the drawer 20 delimiting the refrigerator space 21 and the front wall 35 of the drawer 30 delimiting the freezer space 31. Thus, the drawer door blade 27, 37 forms either the door 27 of the refrigerator part or the door 37 of the freezer part. The door blades 27, 37 form an airtight entity when both drawers 20, 30 are pushed inside the refrigerated furniture frame 6 in the way seen in figure 2 and 3.

[0046] Both the door blade 27, 37 of the drawer 20 delimiting the refrigerator space 21 and the one of the drawer 30 delimiting the freezer space 31 runs perpendicular to the bottom of the drawer 20, 30 and extends beneath the bottom of the drawer and above the side walls of the drawer 20, 30.

[0047] Thus, the freezer space 31 of the freezer part 3 comprises a horizontal bottom 32 of the drawer 30 and upward directed side walls and a rear wall connected to the bottom 32. The freezer space 31 is delimited on the side of the opening of the frame by the upper part of the front wall and possibly a drawer door blade 37 connected to the front wall. The freezer space 31 of the freezer part 3 is delimited upwards by the bottom 22 of the drawer 20 of the refrigerator part 2 above the freezer part 3 or by a horizontal partition wall 5 connected to the frame 6.

[0048] The partition wall 5 used as a space divider is seen in more detail in figure 3.

[0049] The refrigerator part 2 in turn is made up of a drawer 20, which is installed in the vertical frame of the refrigerated furniture on the upper horizontal rail pair 61; 61a also to be glided in a horizontal direction.

[0050] The refrigerator space 21 of the refrigerator part 2 comprises a horizontal bottom 22 of the drawer 20, side walls 23 directed upward at a 90-degree angle rising from the bottom 22 and a rear wall 24 and the upper part of the front wall 25 and possibly a drawer 20 door 37 connected to the front wall. The refrigerator part 2 is delimited from above by the continuous inner surface of the ceiling 63 of the refrigerated furniture frame 5.

[0051] A pipe system for refrigerant has been brought through the bottom 22 of the drawer 20 of the refrigerator part for transporting refrigerant to the evaporator of the refrigerator part (compare Fig. 4).

[0052] Different internal temperatures can be achieved in the freezer space 31 and refrigerator space 21 respectively remaining inside the freezer part 3 and refrigerator part 2 in a manner described below related to the cold production apparatus 4 of the refrigerated furniture.

[0053] The location of the cooling circuit is seen in figure 3 and its evaporators are in heat exchange connection with the air mass lpak and ljäa in the freezer space 31 and refrigerator space 21.

[0054] When two superposed refrigerator parts 2¹, 2² are placed in the refrigerated furniture frame, as seen in figure 6, the evaporators 48 are in the refrigerator space 21¹ of the first refrigerator part 2 and in the refrigerator space 21² of the second refrigerator part 2².

[0055] Figures 3 and 6 in turn show in a schematic manner a valve arrangement of a cold production apparatus 4 used for cooling the refrigerator space 21 and freezer space 31 of a refrigerated furniture and a valve arrangement of a cold production apparatus 4 used for cooling the first refrigerator space 21¹ and second refrigerator space 21² of a refrigerated furniture.

[0056] Figure 3 shows in a schematic manner a cooling circuit 40 of the cold production apparatus 4 of a refrigerated furniture 1, which cooling circuit is in heat exchange connection with the refrigerator space 21 and freezer space 31 via an evaporator (compare figure 4). The cooling circuit 40 comprises a heat pump for cooling the freezer space 31 of the freezer part 3 and a heat pump for cooling the refrigerator space 21 of the refrigerator part 2. The heat pump/heat pumps of the cooling circuit 40 includes one shared compressor 44, which is connected into refrigerant connection always with either evaporator 48; 48a or 48; 48b and with one condenser 46 (compare figure 4).

[0057] The cold production apparatus 4 of the refrigerated furniture additionally comprises a valve arrangement 41 for steering refrigerant either to the evaporator 48; 48a of the freezer space 3 or the evaporator 48; 48b of the refrigerator space 2. The valve arrangement 41 is situated in the technical space 7 in connection with the bottom 64 of the refrigerated furniture frame 6. The plinth 117 of the kitchen furniture covers the bottom part 64 of the refrigerated furniture frame 6.

[0058] Figure 6 in turn shows a cooling circuit 40 of the cold production apparatus 4 of a refrigerated furniture 1, which is in heat exchange connection with the refrigerator space 21¹ of the first refrigerator part 2¹ and the refrigerator space 21² of the second refrigerator part 2² via evaporators 48a and 48b in said refrigerator spaces (compare also figure 4). The cooling circuit 40 comprises a heat pump for cooling the refrigerator space 21¹ of the first refrigerator part 2¹ and a heat pump for cooling the refrigerator space 21² of the second refrigerator part 2². The heat pump/heat pumps of the cooling circuit 40 includes one shared compressor 44, which is connected into coolant connection always with either

evaporator 48; 48a or 48; 48b and with one condenser 46 (compare figure 4).

[0059] The cold production apparatus 4 of the refrigerated furniture additionally comprises a valve arrangement 41 for steering refrigerant either to the evaporator 48; 48b of the refrigerator space 21¹ of the first refrigerator part 2¹ or the evaporator 48; 48a of the refrigerator space 21² of the second refrigerator part 2². The valve arrangement 41 is situated in the technical space 7 in connection with the bottom 64 of the refrigerated furniture frame 6, which is beneath the refrigerator space 21¹ of the first refrigerator part 2¹. The plinth 117 of the kitchen furniture covers the bottom part 64 of the refrigerated furniture frame 6.

[0060] In the invention, cold is produced in the freezer space 31 of the freezer part 3 and the refrigerator space 21 of the refrigerator part 2 of the refrigerated furniture 1 in the following way:

[0061] The cooling circuit 40 in heat exchange connection with the evaporator 48; 48a of the air mass lpak inside the freezer space 31 of the freezer part 3 is used for cooling said air mass lpak inside the freezer space 31 to a freezing temperature of below - 15 °C (for example -18-20 °C) via the condenser 46 and compressor 44. Thereafter, the air mass ljäa inside the refrigerator space 21 of the refrigerator part 2 is cooled by directing the flow of cold production fluid via the valve arrangement 41 to the evaporator 48; 48b in the refrigerator space 41, to cool said air mass ljäa to a temperature of +2 - +6 °C. When the flow of cold production fluid is turned from the evaporator 48; 48a of the freezer space 31 to the evaporator 48; 48b of the refrigerator space, a cold production circuit is formed from the condenser 46, compressor 44 and said freezer space evaporator 48; 48a. The valve arrangement 41 advantageously includes a three-way valve, where the flow of the cold production fluid is changed with a solenoid, and temperature sensors and a logics circuit not shown in the figure, via which the operation of the valve arrangement is controlled.

[0062] Cold is produced in a corresponding way also in the refrigerated furniture shown in figure 6, where the cooling circuit 40 of the cold production apparatus 4 of the refrigerated furniture 1 is in heat exchange connection with the refrigerator space 21¹ of the first refrigerator part 2¹ and the refrigerator space 21² of the second refrigerator part 2² via the evaporator (compare figure 4): The cooling circuit 40 in heat exchange connection with the evaporator 48; 48b of the air mass ljäa inside the refrigerator space 21¹ of the first refrigerator part 2¹ is used for cooling said air mass ljäa to a refrigerator temperature of +2 - +6 °C via the condenser 46 and compressor 44. Thereafter, the air mass ljäa inside the refrigerator space 21² of the second refrigerator part 2² is cooled by directing the flow of cold production fluid via the valve arrangement 41 to the evaporator 48; 48a in the refrigerator space 41 of the refrigerator space 21² of the second refrigerator part 2², to cool said air mass ljäa to a temperature of +2 - +6 °C.

[0063] When the flow of cold production fluid is turned from the evaporator 48; 48b of the refrigerator space 21¹ of the first refrigerator part 2¹ to the evaporator 48; 48a of the refrigerator space 21² of the second refrigerator part 2², a cold production circuit is formed from the condenser 46, compressor 44 and said evaporator 48; 48a of the refrigerator space 21² of the second refrigerator part 2².

[0064] The valve arrangement 41 advantageously includes a three-way valve, where the flow of the cold production fluid is changed with a solenoid, and temperature sensors and a logics circuit not shown in the figure, via which the operation of the valve arrangement is controlled.

[0065] Typical three-way valves are for example solenoid valves, where the position of the spindle (anchor) can be stabilized in two different positions with a magnetic field generated by a current induced in a coil in the valve.

[0066] Figures 5A and 5B show some embodiments of the kitchen furniture according to the invention.

[0067] The general structure of the kitchen furniture 100 in the invention is common as such and with regards to its general structure, reference is made to prior art in the field. What is new in the kitchen furniture 100 is how the refrigerated furniture 1 is installed in the kitchen furniture, in the furniture frame 115 of the kitchen furniture, in a relatively low space beneath the countertop 8 of the lower part 110, so that a kitchen furniture/refrigerated furniture combination is provided (a refrigerated furniture 1 inlaid in a kitchen furniture), where the refrigerated furniture 1 is a refrigerator/freezer combination with two temperatures.

[0068] Generally speaking, the lower part of the kitchen furniture 100 according to the invention includes a furniture frame 115, which includes a group of frame modules 116, the side walls 116a¹, 116a². of which are formed from vertical walls perpendicular to the longitudinal direction P of the furniture frame 115. The countertop 8 is supported on the upper end of the vertical walls 116a of the frame module 116 and their lower end is supported either directly or via a plinth 117 on the floor.

[0069] In figure 5A a refrigerated furniture 1, various cupboards 11, 12 or an oven 13 have been installed in the space between two subsequent parallel side walls 116a¹, 116a² of each frame module 116 of the kitchen furniture 100 and the countertop 8 supported on their upper end. The distance V between two subsequent walls 116a¹, 116a² of the frame modules 116 of the bottom part 110 of the kitchen furniture 100 can for example be 40, 60, 80 or 100 cm. The oven 13 can be a microwave oven or an electric oven.

[0070] The upper part 120 of the kitchen furniture 100 in turn has wall cupboards, a fan 123 and an oven 124.

[0071] In order to fit the refrigerated furniture 1 into the frame module 116 of the kitchen furniture 1, one must above all take into account the distance of the countertop 8 from the floor 9 by the frame module 116, the height of the plinth 117 and the horizontal distance V between two vertical walls 116a¹, 116a² of the frame module 116. The distance V is

usually 60 or 80 cm.

[0072] The technical space 7 of the refrigerated furniture 1 should be dimensioned so that the main part of it for aesthetic reasons remains inside the plinth 117 and beneath the upper edge of the plinth 117. The condenser 46, compressor 44 and valve arrangement 41 of the cooling circuit 40 of the refrigerated furniture 1 for steering refrigerant should mainly be situated in this technical space 7, which remains beneath the refrigerated furniture 1 frame 6 and the freezer part 3 or refrigerator part 2. Further, the door blades 27,37 of the drawers 20,30 of the refrigerated furniture 1 are arranged to extend beneath the upper edge of the bottom part 64 of the frame 6 of the drawer 20,30 and in the horizontal direction at least to the side walls 62 of the refrigerated furniture 1 frame 6. Additionally, the door formed by the door blades 27, 37 should be dimensioned so that it extends to the ceiling 63 of the refrigerated furniture frame 6.

[0073] Advantageously, the door formed by the door blades 27, 37 should be dimensioned so that it extends in the horizontal direction to two adjacent side walls 116a¹, 116a² of the frame module 116.

List of reference numbers

	Refrigerated furniture	1
15	Cupboard	11,12
	Oven	13
	Refrigerator part	2
	drawer of refrigerator part	20
20	third drawer	20a
	refrigerator space	21
	bottom of drawer	22
	side wall	23
	rear wall	24
25	front wall	25
	door blade of front wall	27
	Freezer part	3
	drawer of freezer part	30
30	freezer space	31
	bottom of drawer	32
	front wall	35
	door blade of front wall	37
	Cold production apparatus	4
35	cooling circuit	40
	valve arrangement	41
	three-way valve	41a
	compressor	44
40	condenser	46
	evaporator	48
	Partition wall	5
	Refrigerated furniture frame	6
	rail pair	61
45	side wall	62
	ceiling	63
	bottom part	64
	Technical space	7
	Countertop	8
50	Kitchen furniture	100
	bottom part	110
	furniture frame	115
	frame module	116
55	(side) wall	116a
	rear wall	116b
	bottom	116c

(continued)

		plinth	117
		upper part	120
5		wall cupboard	121,121
		fan	123
	oven	124	
	Floor	9	
10	Air mass in refrigerator space	Ijää	
	Temperature of air mass in refrigerator space	Tjaa	
	Air mass in freezer space	Ipak	
	Temperature of air mass in freezer space	Tpak	
	Longitudinal line of furniture frame	P	

Claims

1. A piece of kitchen furniture (100), which includes a furniture frame (115) of the kitchen furniture (100), on top of which a countertop (8) has been installed, which is at a height of 500-1000 mm or 600-900 mm from the floor (9) and on the front side of the furniture frame (115) there is a plinth (117), which is supported on the floor (9),

whereby cupboard of the kitchen furniture (100) or oven (13) and at least one piece of refrigerated furniture (1) is installed in said furniture frame (115), which refrigerated furniture (1) comprises

either a refrigerator part (2) and a freezer part (3), which are installed in the refrigerated furniture (1) frame (6) on top of each other or

a first refrigerator part (2; 2¹) and a second refrigerator part (2²), which are installed in the refrigerated furniture (1) frame (6) on top of each other,

characterized in that

- the refrigerator part (2) of the refrigerated furniture and the freezer part (3) of the refrigerated furniture comprise a drawer (20) of the refrigerator part and a drawer (30) of the freezer part, respectively, inside which drawers (20,30) a refrigerator space (21) and a freezer space (31) respectively remain, which drawers (20,30) are installed to be glided horizontally on superposed horizontal rail pairs (61) of the refrigerated furniture (1) frame (6),

or

the first refrigerator part (2; 2¹) and second refrigerator part (2; 2²) of the refrigerated furniture comprise a drawer (20; 20¹) of the first refrigerator part (2; 2¹) and a drawer (20;20²) of the second refrigerator part (2; 2²), respectively, inside which drawers (20¹,20²) a refrigerator space (21; 21¹) of the first refrigerator part (2; 2¹) and a refrigerator space (21;21²) of the second refrigerator part (2; 2²) respectively remain, which drawers (20; 20¹, 20; 20²) are installed to be glided horizontally on superposed horizontal rail pairs (61) of the refrigerated furniture (1) frame (6),

- a horizontal partition wall (5) has been installed between the refrigerator part (2) and the freezer part (3), which partition wall is equipped with insulation, to maintain the interior temperatures of the refrigerator space (21) and the freezer space (31) respectively substantially constant or

a horizontal partition wall (5) has been installed between the first refrigerator part (2; 2¹) and the second refrigerator part (2; 2²), which partition wall is equipped with insulation, to maintain the interior temperatures of the refrigerator space (21; 21¹) of the first refrigerator part (2; 2¹) and the refrigerator space (21; 21; 21²) of the second refrigerator part (2; 2²) respectively substantially constant,

- the furniture frame (115) of the kitchen furniture (100) includes a group of frame modules (116) delimited by vertical side walls (116a; 116a¹, 116a²), which frame modules extend in the vertical direction from the countertop (8) to the floor, and on which frame modules the horizontal countertop (8) is supported,

- different interior temperatures can be achieved in the respective refrigerator space (21) and freezer space (31) remaining inside the refrigerator and freezer parts (2,3) of the refrigerated furniture or in the respective first refrigerator space (21¹) and second refrigerator space (21²) remaining inside the first refrigerator part and second refrigerator part (2¹, 2²) of the refrigerated furniture with the aid of a cooling circuit (40) of a

cold production apparatus (4) of the refrigerated furniture, which cold circuit (40) comprises a valve arrangement (41), such as a three-way valve, and a heat pump,

for cooling the freezer space (31) of the freezer part (3) and the refrigerator space (21) of the refrigerator part (2) or

for cooling the refrigerator space (21; 21¹) of the first refrigerator part (2; 2¹) and the refrigerator space (21; 21¹) of the second refrigerator part (2; 2²),

which cooling circuit (40) heat pump includes a compressor (44), which can be connected into refrigerant connection with a condenser (46) and either evaporator (48), which are placed in the refrigerator part (2) and freezer part (3) or in both refrigerator parts (21, 22), to bring said evaporators in turn into heat exchange connection

either with the air mass (Impak) in the freezer space (31) or the air mass (Imjää) in the refrigerator space (21) or with the air mass (Imjää) in the first refrigerator space (21¹) and the air mass (Imjää) of the second refrigerator space (21¹),

- the condenser (46), compressor and valve arrangement (41) of the cooling circuit (40) of the refrigerated furniture are mainly situated in a technical space (7) situated in the bottom part (64) of the frame (6) of the refrigerated furniture supported on the floor.

2. The kitchen furniture according to claim 1, **characterized in that** the cooling circuit (40) of the refrigerated furniture includes a compressor (44) and a condenser (46), which can be connected into refrigerant connection with two evaporators (48) via a valve arrangement, such as a three-way valve, whereby the first evaporator (48) is situated in the freezer space and the second evaporator is situated in the refrigerator space, or whereby the first evaporator (48) is situated in the first refrigerator space (21; 21¹) and the second evaporator (48) is situated in the second refrigerator space (21; 21²). .

3. The kitchen furniture according to claim 1, **characterized in that** the main part of the cooling circuit (40) of the refrigerated furniture is situated inside the frame (6) of the refrigerated furniture, in the technical space (7) remaining beneath the lower drawer.

4. The kitchen furniture (100) according to claim 1, **characterized in that** the technical space (7) of the refrigerated furniture is situated in the bottom part (64) of the frame (6) of the refrigerated furniture immediately beneath the freezer part (3) or the refrigerator part (2, 2¹, 2²), which bottom part is supported on the floor (9) via bridges or a stand.

5. The kitchen furniture (100) according to any of the preceding claims, **characterized in that** the frame (6) of the refrigerated furniture (1) comprises a continuous horizontal ceiling (63) of the refrigerated furniture, from which a rear wall is directed downwards and parallel side walls (62), which side walls and rear walls continue at a distance from the ceiling (63) of the refrigerated furniture as a bottom part (6; 64).

6. The kitchen furniture (100) according to claim 1, **characterized in that** a plinth (117) in the longitudinal direction of the furniture frame (115) runs on the bottom part of the front part of the furniture frame (115), the height of which plinth substantially corresponds to the height of the bottom part (64) of the frame (6) of the refrigerated furniture.

7. The kitchen furniture (100) according to claim 1, **characterized in that** the frame module (116) of the furniture frame is delimited upwards by a horizontal countertop (8), which is supported on the side walls (116a; 116a¹, 116a²) of the frame module and/or a horizontal intermediate ceiling of the frame module (116) running beneath the countertop (8).

8. The kitchen furniture (100) according to claim 1, **characterized in that** the frame module (116) of the furniture frame is open at its front part and its side walls are connected with each other via a rear plate.

9. The kitchen furniture (100) according to any of the preceding claims, **characterized in that** a distance V in the longitudinal direction of the furniture frame (115) of 40, 60, 80, 100 or 120 cm remains between the two vertical side walls (116; 116a¹, 116; 116a²) of each frame module (116) of the furniture frame (115).

10. The kitchen furniture (100) according to claim 1, **characterized in that**

both the drawer (20) of the refrigerator part (2) of the refrigerated furniture and the drawer (30) of the freezer part of the refrigerated furniture or

both the drawer (20) of the first refrigerator part (2¹) of the refrigerated furniture and the drawer (20) of the second refrigerator part (2¹)

comprises a horizontal bottom (22, 32 or 22,22) of the drawer, and side walls (23) directed upwards rising from the bottom of the drawer (22, 32 or 22, 22), a rear wall connecting the side walls and a front wall (25, 35) opposite the rear wall, whereby both side walls of each drawer (20, 30 or 20,20) additionally have horizontal guides (61), which can be fitted to glide on corresponding horizontal rail pairs (61) running on the inside of the side walls (62) of the refrigerated furniture frame (6).

11. The kitchen furniture (100) according to any of the preceding claims, **characterized in that** a door blade (27, 37) of the drawer has been integrated into the front wall (25, 35) of each drawer (20, 30 or 20,20) of the refrigerated furniture (1), whereby each drawer (20,30) attached to the door blade (27,37) can be pulled out of the frame independently from each other, but when both drawers (20,30 or 20,20) are pushed inside the refrigerated furniture (1) frame (6), the door blades (27, 37) of both drawers are fitted to form together a substantially airtight door of the refrigerated furniture (1).

12. The kitchen furniture (100) according to claim 11, **characterized in that** the door blades (27,37) of the front walls (25, 35) of the drawers (20,30 or 20,20) of the refrigerated furniture (1) run in a perpendicular direction to the plane of the bottom of the drawers (20,30 or 20,20) and each of them is arranged to respectively cover at least the front part of the refrigerator space (21) and the front part of the freezer space (30) or respectively the front part of the first refrigerator space (21:21¹) and the front part of the second refrigerator space (2; 21²) remaining inside the drawers of the refrigerated furniture (1).

13. The kitchen furniture (100) according to claim 11, **characterized in that** each front wall (25,35) of a drawer (20,30 or 20,20) or door blade (27, 37) attached to a front plate is arranged to extend in the horizontal direction at least from the first side wall of the refrigerated furniture (1) frame (6) to the second side wall and in the vertical direction -either

from the ceiling of the refrigerator part (2) or the ceiling of the freezer part (3) of the refrigerated furniture and from the bottom of the freezer part (3) of the refrigerated furniture or from the bottom of the refrigerator part (2) of the refrigerated furniture or

from the ceiling of the first refrigerator part (2;2¹) of the refrigerated furniture and from the bottom of the second refrigerator part (2; 2¹) of the refrigerated furniture,

to the horizontal partition wall (5) installed respectively between the refrigerator part (2) and freezer part (3) or the first refrigerator part (2;2¹) and the second refrigerator part (2; 2¹).

14. The kitchen furniture (100) according to claim 11, **characterized in that** each front wall (25, 35) of a drawer (20,30) or door blade (27,37) attached to said front wall is arranged to extend in the horizontal direction of the kitchen furniture to both side walls (116a¹, 116a²) of its frame module (116), inside which frame module the refrigerated furniture (1) is placed.

15. The kitchen furniture (100) according to any of the preceding claims, **characterized in that** the freezer part (3) of the refrigerated furniture or the first refrigerator part (2;2¹) or second refrigerator part (2; 2¹) of the refrigerated furniture comprises a drawer (30 or 20), which is installed on lower horizontal rail pairs of the side walls of the vertical frame (6) of the refrigerated furniture, to be glided horizontally, and the

door blade (37) connected to the front wall (35) of the drawer of which freezer part or

door blade (37) connected to the front wall (35) of the drawer of which first refrigerator part (2;2¹) or second refrigerator part (2; 2¹) of the refrigerate furniture,

functions as the door of the freezer part (3), or the door of the first refrigerator part (2;2¹) or second refrigerator part (2; 2¹), and which freezer part (3) or first refrigerator part (2;2¹) or second refrigerator part (2; 2¹) comprises two horizontal partition walls (5) connected to both side walls of the frame, which function as a bottom of the freezer part (31) or a bottom of the first refrigerator part (2;2¹) or second refrigerator part (2; 2¹).

16. The kitchen furniture (100) according to any of the preceding claims, **characterized in that** the refrigerator part (2,

2¹, 2²) of the refrigerated furniture (1) comprises a drawer (20), which is installed on upper horizontal rail pairs of the side walls of the frame (6) of the refrigerated furniture (1), to be glided horizontally, and the door blade (27) connected to the front wall (25) of which drawer functions as the door of the refrigerator part (2, 2¹, 2²), and which refrigerator part (2, 2¹, 2²) further comprises a bottom (22) to which side walls (23) directed upwards from said bottom and a rear wall (24) and the ceiling (63) of the refrigerator part are connected.

17. The kitchen furniture (100) according to claim 16, **characterized in that** the refrigerator part (2, 2¹, 2²) of the refrigerated furniture additionally comprises a second drawer (20a), which can be fitted into the refrigerator space (21).

18. The kitchen furniture according to any of the preceding claims, **characterized in that** the cooling circuit of the refrigerated furniture (1) includes a three-way valve regulating the flow of refrigerant, which three-way valve is advantageously implemented with a solenoid valve.

19. The kitchen furniture according to claim 1, **characterized in that** the kitchen furniture includes a refrigerated furniture (110) and at least one other kitchen furniture, which is selected from the group including a dishwasher, a set of drawers, an oven and/or a stove.

20. A method for achieving a kitchen furniture (1) according to claim 1 and for producing cold in a kitchen furniture according to claim 1 in a freezer space (31) of a freezer part (3) and a refrigerator space (21) of a refrigerator part (2) of a refrigerated furniture (1), **characterized in that**

- a refrigerated furniture (1) is fitted inside a frame module (16) of a furniture frame (115) of a kitchen furniture (1), which refrigerated furniture comprises a refrigerator part (2) and a freezer part (3), which are installed in the refrigerated furniture (1) frame (6) on top of each other,

- a first evaporator (48; 48a) of a cooling circuit (40) in heat exchange connection with an air mass (I_{pak}) inside the freezer space (31) of the freezer part (3) is used for cooling said air mass (I_{pak}) inside the freezer space (31) until it has reached a freezing temperature and

- a second evaporator (48; 48b) of a cooling circuit (40) in heat exchange connection with an air mass (I_{jaa}) inside the refrigerator space (21) of the refrigerator part (2) is used for cooling said air mass (I_{jaa}) inside the refrigerator space (21) until it has reached a refrigerator temperature and

- the flow of refrigerant to the first evaporator, which is situated in the freezer space (31), and to the second evaporator, which is situated in the refrigerator space (21), is steered with the aid of a three-way valve via one compressor (44).

21. A method for achieving a kitchen furniture (1) according to claim 1 and for producing cold in a kitchen furniture according to claim 1 in a refrigerator space (21; 21¹) of a first refrigerator part (2¹) and a refrigerator space (21²) of a second refrigerator part (2²) of a refrigerated furniture (1), **characterized in that**

- a refrigerated furniture (1) is fitted inside a frame module (16) of a furniture frame (115) of a kitchen furniture (1), which refrigerated furniture comprises a first refrigerator part (2¹) and a second refrigerator part (2²), which are installed in the refrigerated furniture (1) frame (6) on top of each other,

- a first evaporator (48; 48a) of a cooling circuit (40) in heat exchange connection with an air mass (I_{jaa}) inside the refrigerator space (21; 21¹) of the first refrigerator part (2¹) is used for cooling said air mass (I_{jaa}) inside the refrigerator space (21; 21¹) until it has reached a first refrigerator temperature and

- a second evaporator (48; 48b) of a cooling circuit (40) in heat exchange connection with an air mass (I_{jaa}) inside the refrigerator space (21; 21²) of the second refrigerator part (2) is used for cooling said air mass (I_{jaa}) inside the refrigerator space (21; 21²) until it has reached a second refrigerator temperature and

- the flow of refrigerant to the first evaporator, which is situated in the first refrigerator space (21; 21¹), and to the second evaporator, which is situated in the second refrigerator space (21; 21²), is steered with the aid of a three-way valve via one compressor (44).

22. The method according to claim 21, **characterized in that** the first and second refrigerator temperatures are different temperatures or the same temperatures, which temperatures are in the range of +2--6 °C.

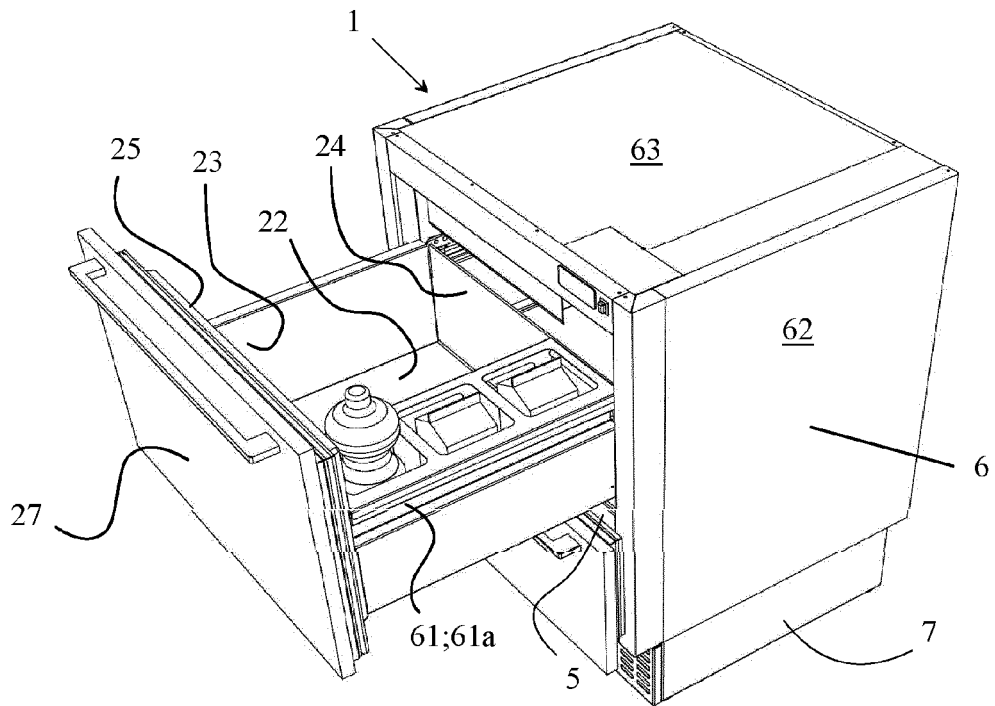


Fig. 1A

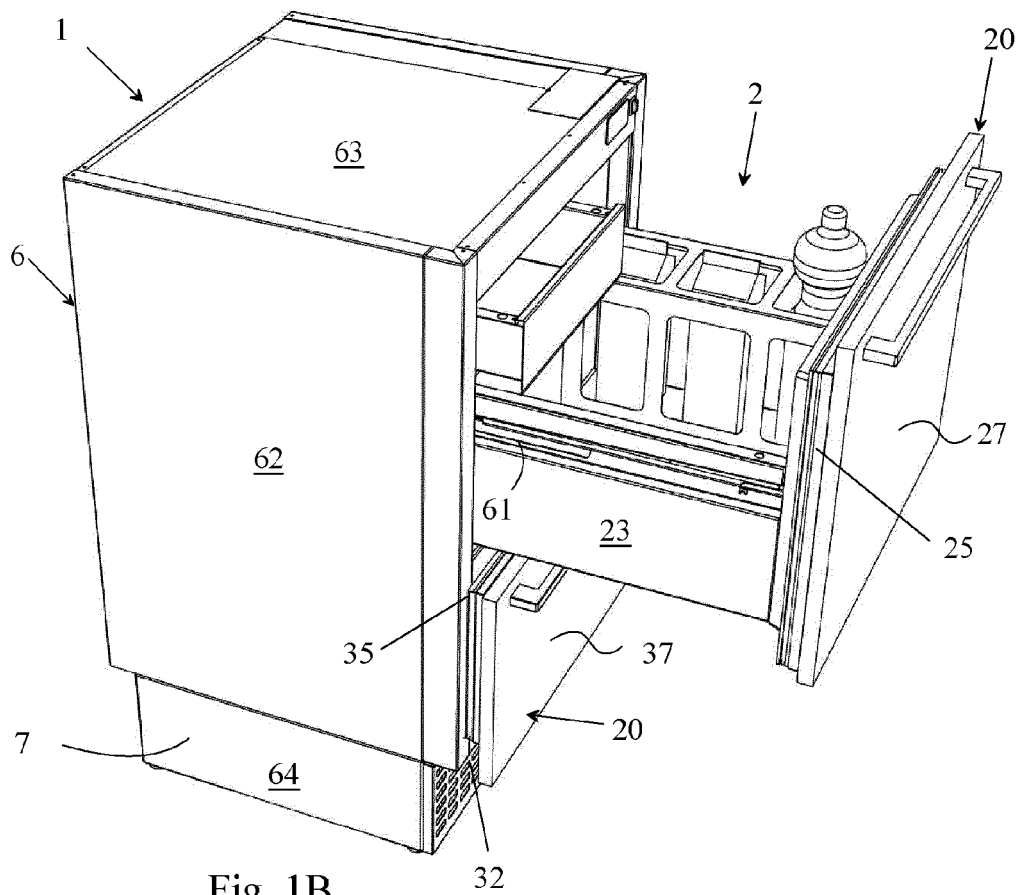


Fig. 1B

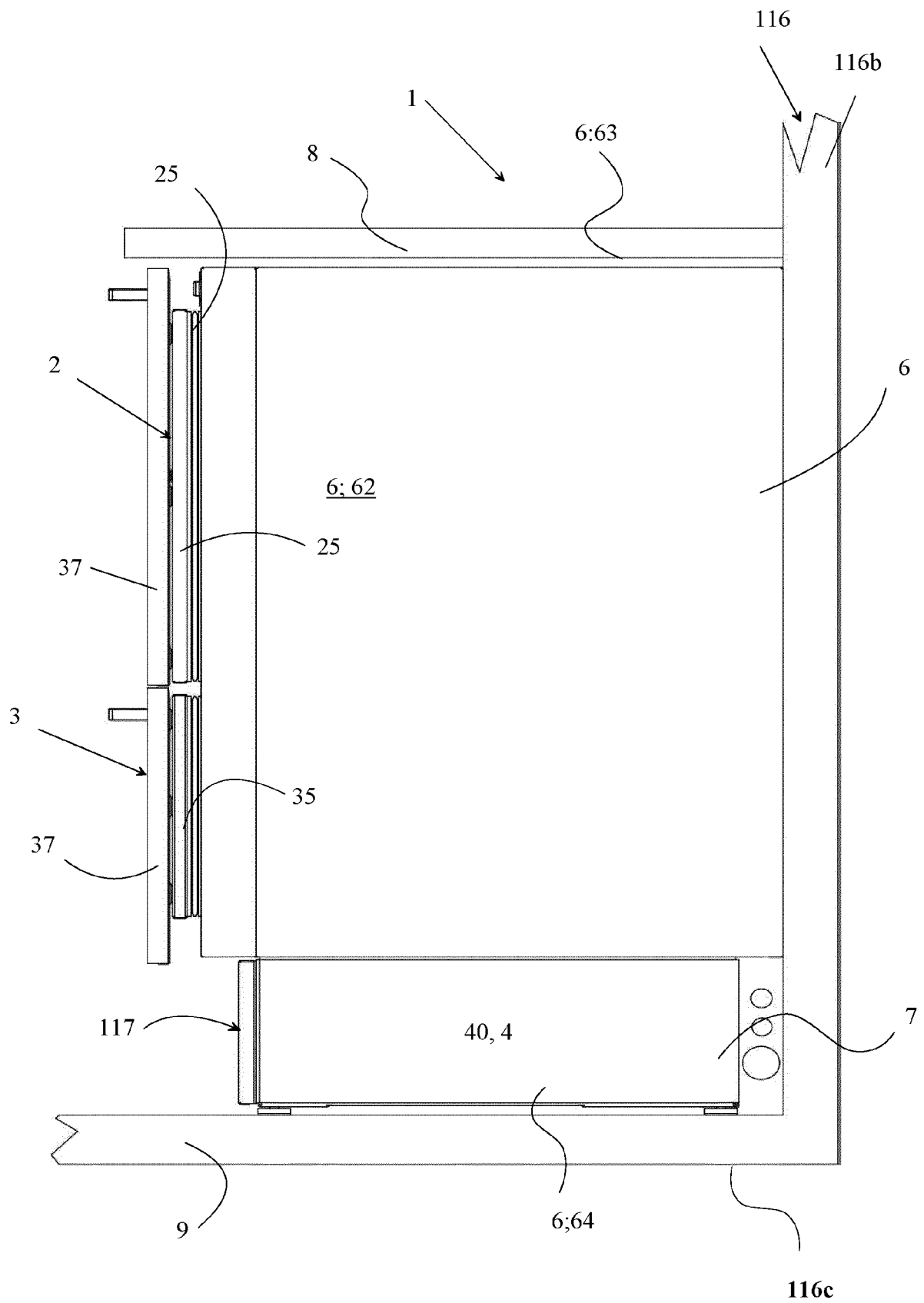


Fig.2

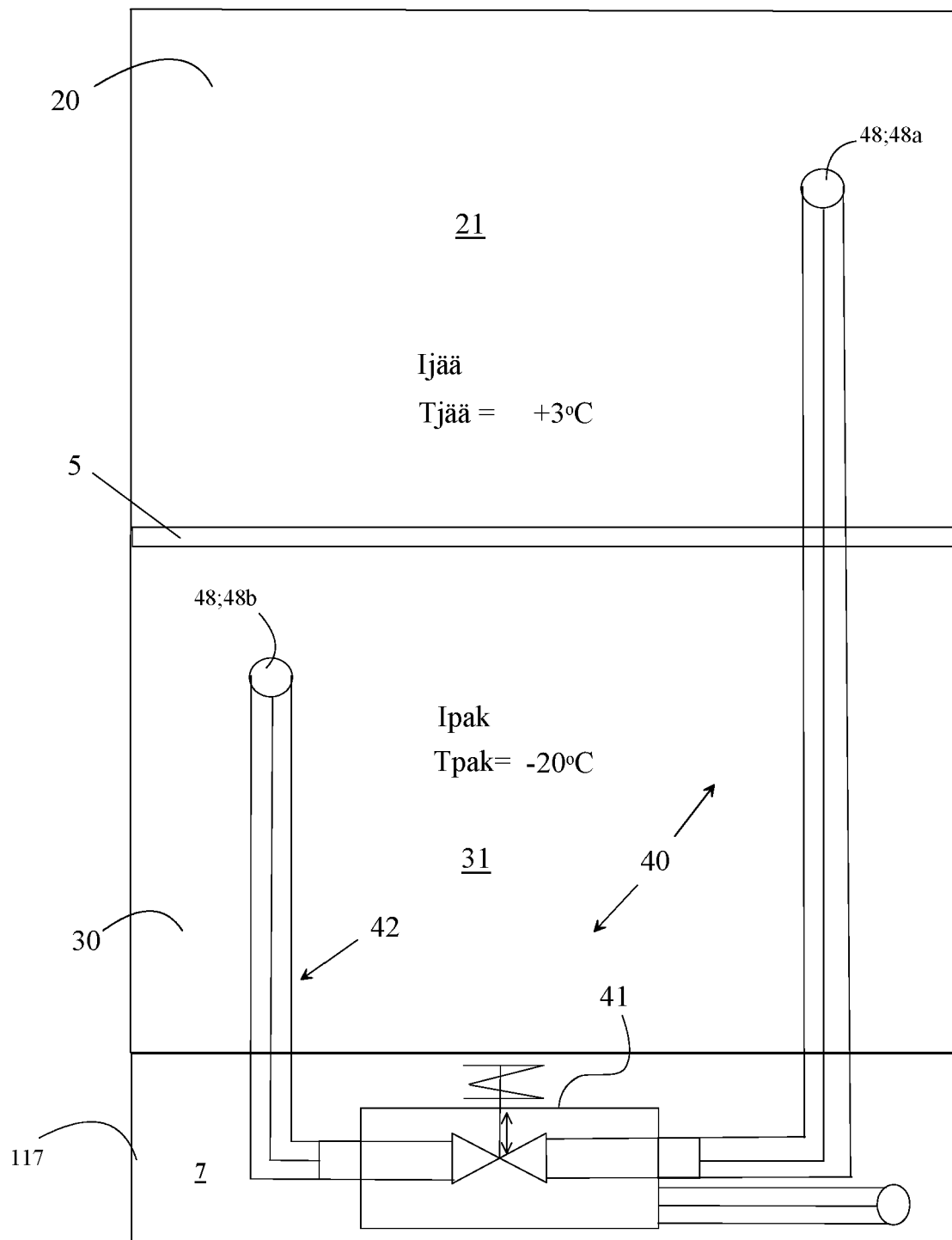


Fig. 3

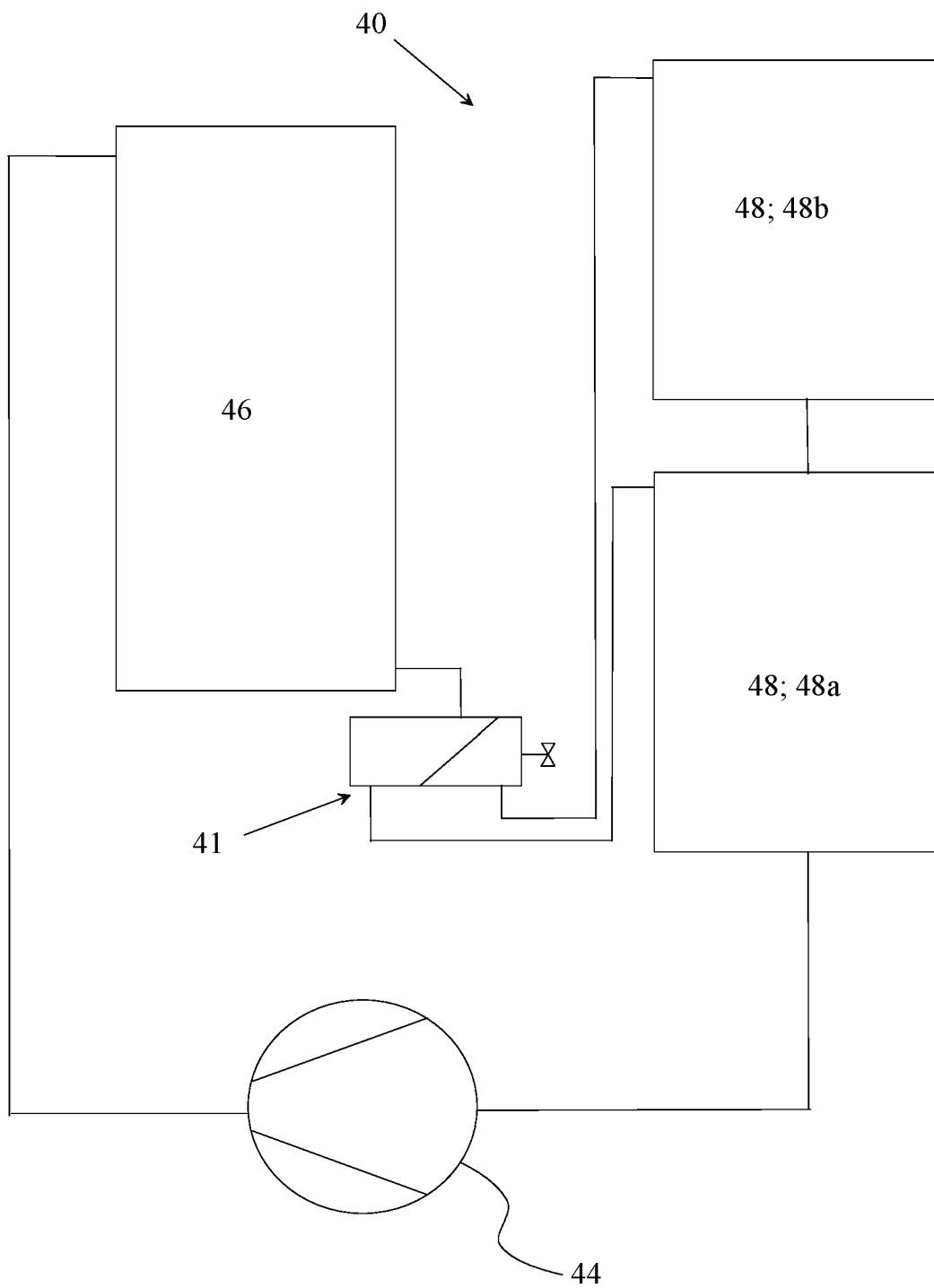


Fig. 4

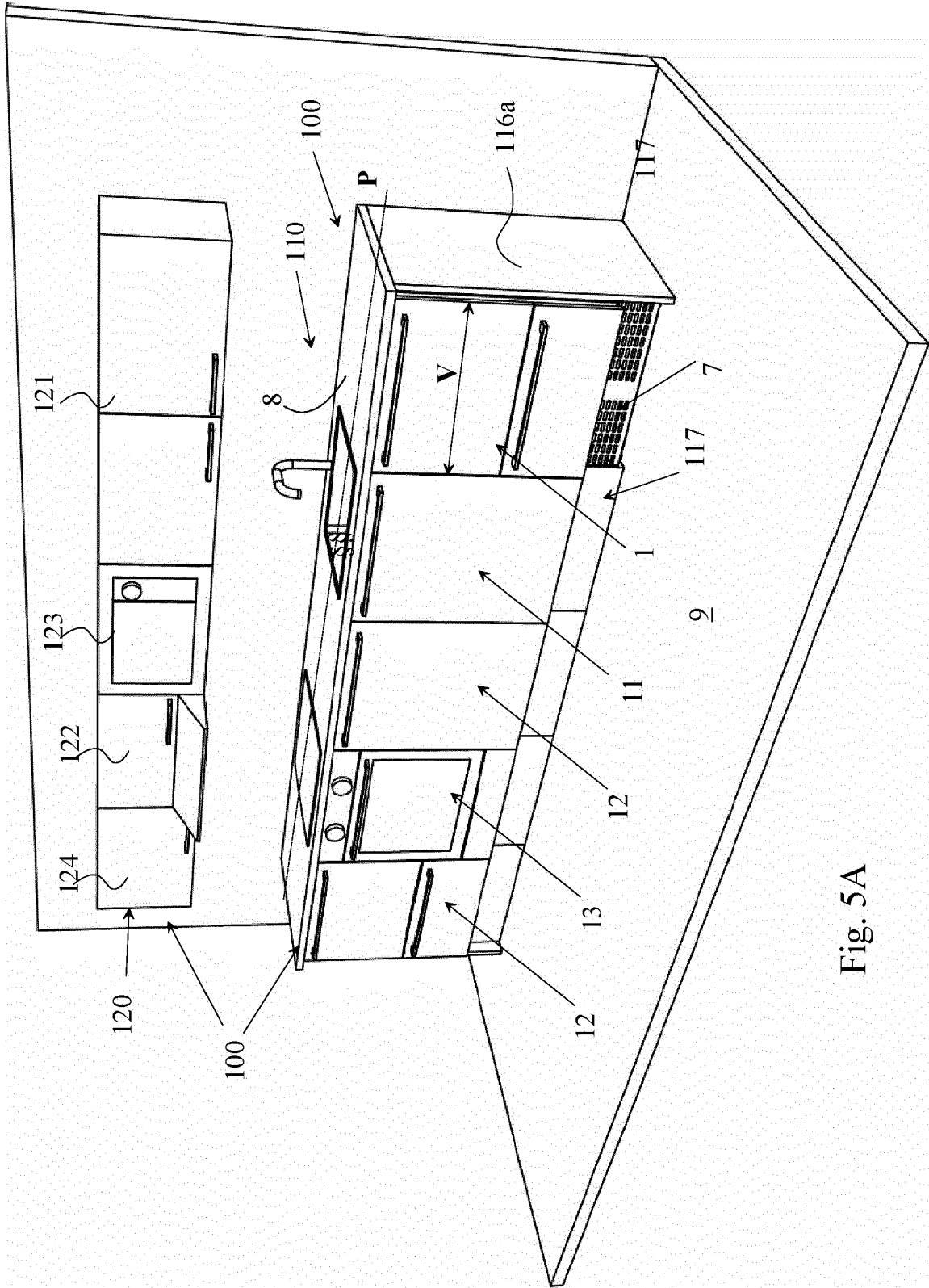


Fig. 5A

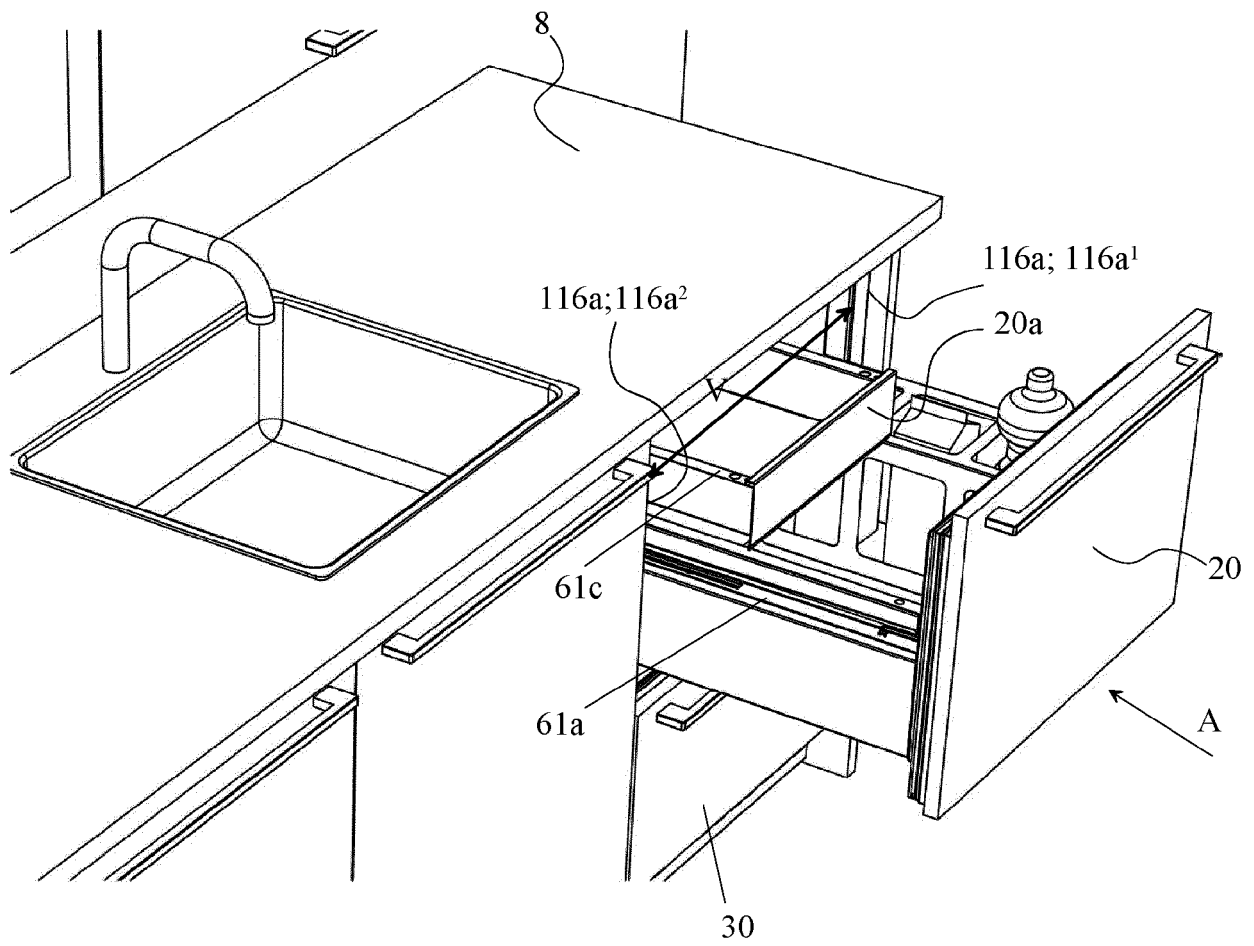


Fig. 5B

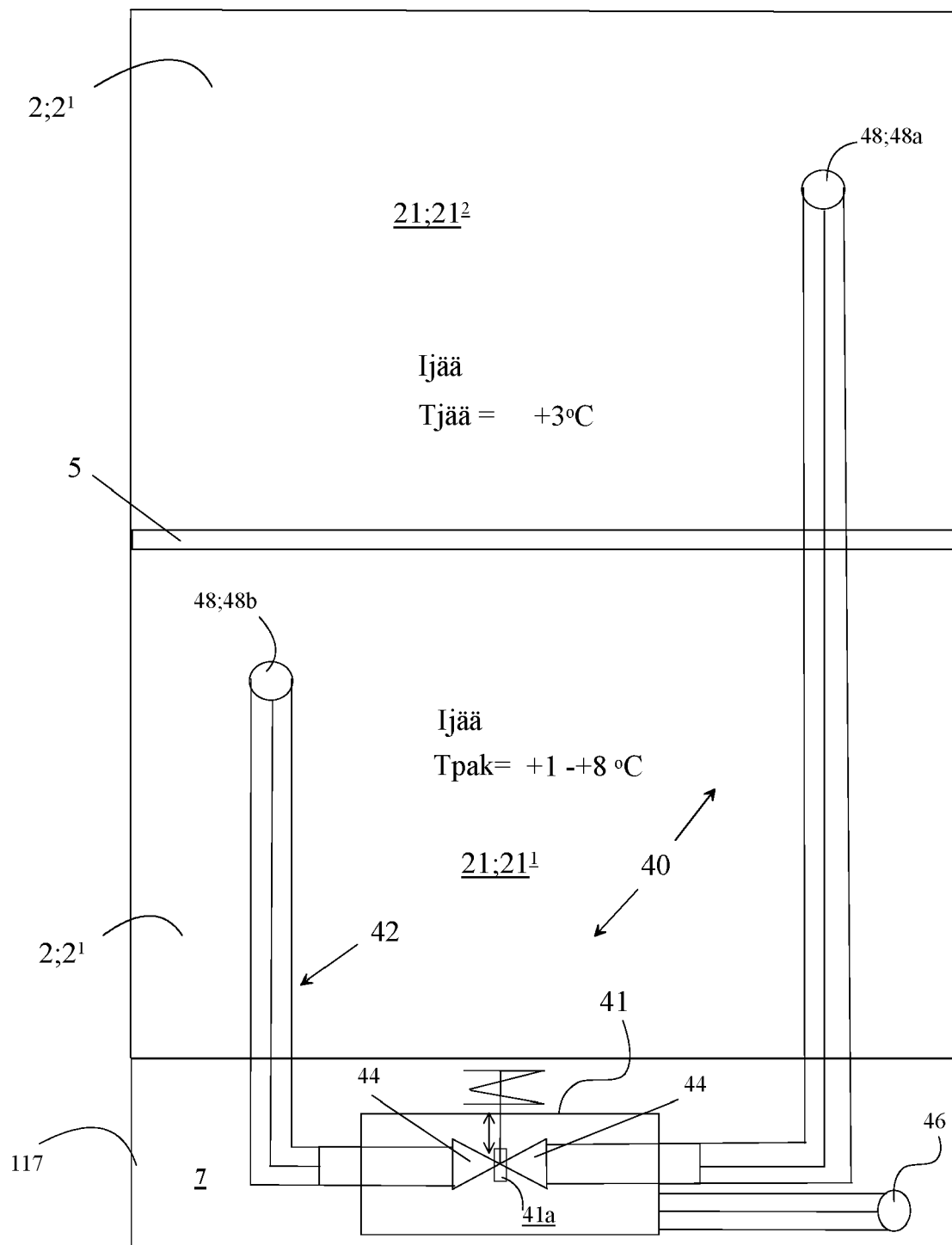


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 4484

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	KR 101 764 270 B1 (JUNGJI SYSTEM CO LTD [KR]) 4 August 2017 (2017-08-04) * abstract; figures 1-8 * -----	1-22	INV. F25D23/10 F25D11/02 F25D25/02
X	KR 200 328 713 Y1 (JUNGJI SYSTEM CO LTD) 4 October 2003 (2003-10-04) * abstract; figures 1-5 * -----	1-22	
X	KR 2004 0045703 A (WINIAMANDO INC) 2 June 2004 (2004-06-02) * abstract * -----	1-22	
			TECHNICAL FIELDS SEARCHED (IPC) F25D F25B

The present search report has been drawn up for all claims

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EPO FORM 1503 03:82 (P04C01)

Place of search

The Hague

Date of completion of the search

21 June 2022

Examiner

Yousufi, Stefanie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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 L : document cited for other reasons

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

EP 22 15 4484

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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21-06-2022

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		WO 2018004058 A1	04-01-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82