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(54) **REFRIGERATOR AND ITS MANUFACTURING METHOD**

(57) The present invention relates to a refrigerator and its manufacturing method. Said refrigerator includes a heat-insulating layer (25) and at least one fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f), wherein said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is at least partly received inside said heat-insulating layer (25). According to the present invention, said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is removably received inside said heat-insulating layer (25).

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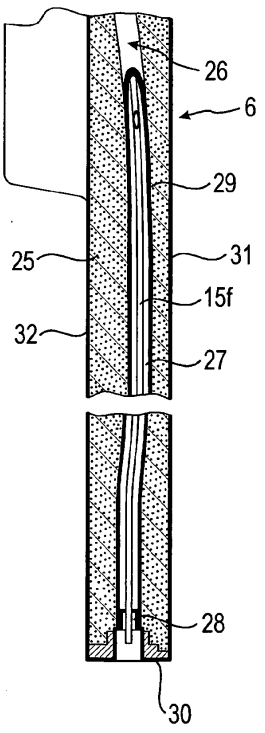

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Description

Technical Field

[0001] The present invention relates to a refrigerator and its manufacturing method, in particular relates to a domestic or commercial refrigerator provided with fluid delivery pipes and its manufacturing method.

Background Art

[0002] It's known that the refrigerator is provided with a distributor on the door so that the user can obtain the water and ice (usually stored in the storage space of the refrigerator) through the distributor, without opening the door. Ice can be provided by the ice-making machine inside the storage space (such as freezing compartment), and water can be obtained from the water tank which is located inside the refrigerating compartment and stores filtered water.

[0003] As to a typical refrigerator that can distribute ice and water automatically, the refrigerator is often provided inside with a water system for receiving water from outer water source (such as main-water tap) and treating water. Such water system can include a water filter and a switch valve connecting with the outlet end of the water filter. One of the outlets of the switch valve is connected with the water tank used to store the filtered water, and water in the water tank flows to the distributor (often provided on the door) via the outlet of the water tank by at least one water delivery pipes. Another outlet of the switch valve is used to supply water to the ice-making machine. At least one water delivery pipe is provided between the water filter and the switch valve, between the switch valve and the water tank, between the water tank and the distributor, and between the switch valve and the ice-making machine, so as to define the flow passage of water.

[0004] Someone proposed to install the water delivery pipes inside the heat-insulating layer of the refrigerator so as to hide the water delivery pipes and improve the outer appearance of the refrigerator. However, the water delivery pipes in the prior arts are bonded with the heat-insulating layer tightly by the foaming process. Because of the tight connecting relationship between the water delivery pipes and the heat-insulating layer, the serviceman cannot check/exchange the water delivery pipes without damaging the heat-insulating layer. When the water delivery pipes fail, the door and/or the case provided with the water delivery pipes have to be rejected entirely, which increases the maintenance cost and shortens the service life of the refrigerator.

Disclosure of invention

[0005] One object of the present invention is to overcome at least one of the above technical problems, so as to provide a refrigerator that can reduce the maintenance cost of the fluid delivery pipe greatly.

[0006] Another object of the present invention is to provide a manufacturing method of refrigerator, so as to obtain a refrigerator that can reduce the maintenance cost of the fluid delivery pipe greatly.

[0007] Therefore, one aspect of the present invention relates to a refrigerator, comprising: housing defining at least one storage space, said housing including a heat-insulating layer for surrounding said storage space; and at least one fluid delivery pipe, wherein, said fluid delivery pipe is at least partly received within said heat-insulating layer, and at least sometimes extends along said storage space, characterized in that, said fluid delivery pipe is removably received within said heat-insulating layer.

[0008] Another aspect of the present invention relates to a refrigerator, including: storage space; door for closing or opening at least a portion of said storage space selectively, said door including heat-insulating layer; and at least one fluid delivery pipe, which is at least partly received within said heat-insulating layer, characterized in that, said fluid delivery pipe is removably received within said heat-insulating layer.

[0009] Since the fluid delivery pipe is removable, people (in particular the serviceman) can examine and repair the fluid delivery pipe without damaging the heat-insulating layer of the refrigerator. Under the condition that the fluid delivery pipes are damaged, only the fluid delivery pipes need to be replaced, and the housing of the refrigerator (such as the entire case and /or the door) do not need to be replaced. Therefore, the service life of the refrigerator is prolonged greatly.

[0010] Those technical features that are regarded as the characteristic of the present invention singly or in combination with other features are described in the following claims.

[0011] According to a preferred embodiment, it comprises a separating member for separating said fluid delivery pipe and said heat-insulating layer. The separating member not only prevents the contact between the fluid delivery pipe and the heat-insulating layer, but also protects the fluid delivery pipe better.

[0012] According to a particularly preferred embodiment, said separating member defines a passage, said fluid delivery pipe extends through the passage and a gap is formed between said fluid delivery pipe and said passage. This facilitates the installation and the detachment of the fluid delivery pipe.

[0013] According to a particularly preferred embodiment, said separating member is embedded within said heat-insulating layer and bonds tightly together with the heat-insulating layer. Therefore, the position of the fluid delivery pipes can be determined.

[0014] According to a particularly preferred embodiment, said separating member is pipe-shaped, so that the separating member can be obtained easily and economically.

[0015] According to a preferred embodiment, said passage is separated from the heat-insulating layer in order

to protect the material of the heat-insulating layer entering the passage. It is particularly preferred that both ends of the separating member extend outside of the heat-insulating layer.

[0016] According to a preferred embodiment, said housing comprises inner wall and outer wall that are closely attached to the inner side and the outer side of the heat-insulating layer respectively, at least a portion of said fluid delivery pipe is provided adjacent the inner surface of said second wall so as to reduce the influence exerted by the cooling air (in the storage space) on the fluid delivery pipe, and to reduce or even eliminate the probability that ice is formed in the fluid delivery pipe. It is particularly preferred that at least a portion of said fluid delivery pipe contacts said outer wall.

[0017] According to a preferred embodiment, the end of said fluid delivery pipe is located within a distributor.

[0018] Another aspect of the present invention relates to a refrigerator, comprising: a heat-insulating layer for insulating heat; distributor; water filter for filtering water; and water tank for storing water; wherein, at least one water delivery pipe is connected between the distributor and the water tank, and at least one water delivery pipe is connected between the water filter and the water tank, wherein, at least one of said water delivery pipes are removably installed in said heat-insulating layer.

[0019] Another aspect of the present invention relates to a refrigerator, comprising: case defining at least one storage space; door for closing or opening at least a portion of said storage space selectively; said case body and said door comprising heat-insulating layer; ice-making machine; and water delivery path for supplying water to said ice-making machine, wherein, said water delivery path comprising pipe connector for connecting to water source and several water delivery pipes connected between said pipe connector and said ice-making machine, characterized in that, at least one of said fluid delivery pipes is removably arranged within said heat-insulating layer and extends therethrough.

[0020] Another aspect of the present invention relates to a method for manufacturing a refrigerator, characterized in that, comprising: a) providing a foaming pre-assembling unit, said foaming pre-assembling unit including a space adapted to receive heat-insulating foaming agent, said pre-assembling unit including a separating member at least partly located within said space, said separating member defining a passage that is separated from said space; b)filling the heat-insulating foaming agent into said space to form a heat-insulating layer, said separating member bonding with the heat-insulating layer; and c) extending the fluid delivery pipe through said passage so as to be received inside said heat-insulating layer.

[0021] Although the step c) can be carried out before the step b), according to a preferred embodiment, the step c) is performed after the step b) is finished.

[0022] Preferably, said step a) comprises: fixing said separating member on a wall defining said space.

[0023] The structure of the present invention and other objects and advantages of the present invention will be easily understood by the description in connection with the attached drawings.

Brief Description of Drawings

[0024] The attached drawings are a part of the description and facilitate to understand the present invention. The drawings illustrate the embodiments of the present invention, and explain the principle of the present invention together with the description. The drawings include:

Fig.1 is a schematic perspective view of the refrigerator according to a preferred embodiment of the present invention;

Fig.2 is a schematic view of the water system of the refrigerator according to a preferred embodiment of the present invention;

Fig.3 is a schematic partial cross-sectional view of the door of the refrigerator according to a preferred embodiment of the present invention;

Fig.4 is another schematic partial cross-sectional view of the door of the refrigerator according to a preferred embodiment of the present invention.

Embodiments

[0025] In the following description of the preferred embodiments, the same or similar features have the same reference numerals.

[0026] Refer to the drawings, in particular Fig.1 and Fig.2. Refrigerator 1 includes case 5, which in the present embodiment defines a freezing compartment 3 and a refrigerating compartment 4 arranged side by side. The refrigerator 1 also includes a freezing compartment door 6 and a refrigerating compartment door 7 corresponding to the freezing compartment 3 and a refrigerating compartment 4 respectively. The doors 6 and 7 are connected at sides of the case 5 by hinges 8 respectively, and can rotate around the rotating axis parallel to the longitudinal axis.

[0027] Under normal condition, the doors 6 and 7 are closed to prevent cold air leaving the freezing compartment 3 and the refrigerating compartment 4. Here, the inner sides of the freezing compartment door 6 and the refrigerating compartment door 7 define the front boundaries of the freezing compartment 3 and the refrigerating compartment 4 respectively. User can open the respective doors 6 and 7 when necessary so as to perform the operation such as accessing the food in the freezing compartment 3 or the refrigerating compartment 4. The user can open or close the doors 6 and 7 by the handles 9.

[0028] The peripheral walls of the case 5 and the walls for partitioning various storage spaces are provided inside with heat-insulating layers 25. Similarly, the doors 6 and 7 are also provided thereon with heat-insulating layers 25. The heat-insulating layers 25 are heat-insulat-

ing foam layers, preferably are formed of the heat-insulating foaming agent by foaming. When the doors 6 and 7 are closed, the freezing compartment 3 and the refrigerating compartment 4 are surrounded by the heat-insulating layers 25 around.

[0029] In the present embodiment, the freezing compartment 3 and the refrigerating compartment 4 are arranged side by side, and can be opened or closed by the corresponding doors 6 or 7. However, it is appreciated that the present invention is not limited thereto, and other embodiments are also possible. For example, in an alternative embodiment, the freezing compartment and the refrigerating compartment are up-down arranged. In another embodiment, one storage compartment (such as refrigerating compartment) is provided with two doors side by side to be opened or closed. In this embodiment, one door opens or closes only a portion of the storage compartment.

[0030] As shown in Figs. 1 and 2, the freezing compartment 3 is provided inside with an ice-making machine 10 and an ice-storing unit 11. The ice-making machine 10 includes a lattice-like slot for containing water, and water in the slot is formed as ice and has the shape corresponding to the slot. The ice-storing unit 11 includes an ice-storing container 12 for receiving and storing the ice prepared by the ice-making machine 10. The ice-storing unit 11 is provided at its front end with a discharge outlet (not labeled) for discharging ice. The ice-storing unit 11 includes an ice-discharging means 13 for pushing the ice toward said discharge outlet. In the present embodiment, the ice-discharging means 13 includes an auger in the ice-storing container 12 and a motor (not shown) for driving the auger.

[0031] The freezing compartment door 6 is provided thereon with a distributor 19 for automatically distributing the ice stored in the ice-storing unit 11, so that user can obtain the ice stored in the ice-storing container 12 without opening the door. It should be understood that the present invention is not limited thereto. In another embodiment, the distributor 19 can be installed on the refrigerating compartment door 7 by suitable arrangement.

[0032] The distributor 19 includes a distributor housing 33 fixed on the freezing compartment door 6. The distributor housing 33 defines a distributing cavity 24 exposed at the front surface of the freezing compartment door 6. The distributing cavity 24 is arranged to adapt to receive at least a portion of the outer container 23 such as a cup.

[0033] The distributor 19 includes an ice-discharging passage 21 penetrating the freezing compartment door 6. The inlet of the ice-discharging passage 21 is arranged to adapt to receive the ice discharged from the ice-storing unit 11. The outlet of the ice-discharging passage 21 is arranged to adapt to discharge ice to the outer container 23. The ice-discharging passage 21 is typically closed by a cover 22 so as to prevent outer air from entering the refrigerator 1. When the ice is discharged, the cover 2 opens the ice-discharging passage 21.

[0034] The refrigerator 1 includes an ice-making water delivery path for supplying water to the ice-making machine 10. The ice-making water delivery path includes a pipe connector 2 for connecting with outer water source. The pipe connector 2 is preferably located at the back side of the case 5. In the present embodiment, the water source is the main-water tap, to which the pipe connector 2 is connected via a pipe (as shown by dash line in Fig. 2) arranged outside.

[0035] The ice-making water delivery path includes water filter 14 to filter the water from the water source, so as to obtain drinking water. The water filter 14 is located inside the refrigerating compartment 4. The inlet of the filter 14 is connected with the pipe connector 2 by a first water delivery pipe 15a. The pipe connector 2 can be formed by a pipe joint located at the end of the first water delivery pipe 15a. In the present embodiment, the majority of the first water delivery pipe 15a except its two ends extends in the back wall of the case 5. The water filter 14 can adopt the known structure, and its detailed description is omitted here.

[0036] The outlet of the water filter 14 is connected to the switch valve 16 by a second water delivery pipe 15b. The switch valve 16 is a three-position two-way valve in the present embodiment. In the present embodiment, the second water delivery pipe 15b extends in the back wall of the case 5. The second water delivery pipe 15b extends generally along the diagonal line of the back wall of the case 5, from the right upper corner to the left bottom corner of the back wall of the case 5.

[0037] One outlet of the switch valve 16 supplies water to the ice-making machine 10 through a third water delivery pipe 15c. As a part of the ice-making water delivery path, the third water delivery pipe 15c also extends longitudinally in the back wall of the case 5. The third water delivery pipe 15c has a portion that is generally parallel with the outer surface of the back wall. The end of the third water delivery pipe 15c that is located at the left upper corner of the back wall of the case 5 is connected with the water inlet 17 by the pipe joint 35, so that the filtered water finally is supplied to the ice-making machine 10 via the water inlet 17. The water inlet 17 passes through a hole (not shown) penetrating the back wall of the case 5, and extends into the freezing compartment 3.

[0038] The refrigerator 1 also includes a water-distributing path for supplying the drinking water to the distributor 19. The water-distributing path includes a fourth water delivery pipe 15d connected to another outlet of the switch valve 16. The fourth water delivery pipe 15d in the present embodiment extends in the bottom walls of the freezing compartment 3 and the refrigerating compartment 4, and has a portion that is generally parallel to the horizontal surface.

[0039] The water-distributing path also includes a water tank 18 connected to another end of the fourth water delivery pipe 15d. The water tank 18 is disposed inside the refrigerating compartment 4 and is used to store the filtered water that can be drunk.

[0040] The water-distributing path also includes a fifth water delivery pipe 15e connected to the outlet of the water tank 18. The fifth water delivery pipe 15e in the present embodiment extends in the bottom walls of the freezing compartment 3 and the refrigerating compartment 4. The end of the fifth water delivery pipe 15e extends to the left bottom corner of the case 5.

[0041] The fifth water delivery pipe 15e is connected with a sixth water delivery pipe 15f (situated within the freezing compartment 3) by the connector 34. The sixth water delivery pipe 15f extends from the bottom of the freezing compartment door 6 upward to the inside of the distributor housing 33. The inlet end of the sixth water delivery pipe 15f preferably protrudes from the bottom wall of the freezing compartment door 6 so as to facilitate the connection with the fifth water delivery pipe 15e. The end of the sixth water delivery pipe 15f extends into the distributer 19. Preferably, a water outlet 20 is connected to the end of the sixth water delivery pipe 15f. The end of the water outlet 20 is arranged to face the distributing cavity 24, and is configured to be adapted to distribute water to the outer container 23.

[0042] Fig.3 schematically shows a longitudinal partial cross-sectional view of the freezing compartment door 6 according to a preferred embodiment of the present invention. Fig.4 schematically shows a lateral partial cross-sectional view of the freezing compartment door 6 according to a preferred embodiment of the present invention.

[0043] In the present embodiment, the first-sixth water delivery pipes 15a-15f all extend through and are disposed within the heat-insulating layers 25. The first-sixth water delivery pipes 15a-15f are removably received within the heat-insulating layers 25. In the present embodiment, the first-sixth water delivery pipes 15a-15f are installed in similar manners. Therefore, the following description only takes the sixth water delivery pipe 15f as an example to explain the installing manner of the water delivery pipes 15a-15f.

[0044] As shown in Figs. 3 and 4, the sixth water delivery pipe 15f extends through the heat-insulating layer 25 and is received in the heat-insulating layer 25, but does not contact the heat-insulating layer 25. Between the sixth water delivery pipe 15f and the heat-insulating layer 25 is provided a separating member 26 for separating the sixth water delivery pipe 15f and the heat-insulating layer 25, so that the sixth water delivery pipe 15f is removably received within the heat-insulating layer 25. That is to say, the sixth water delivery pipe 15f can be removed from the freezing compartment door 6 without damaging the heat-insulating layer 25.

[0045] In the present embodiment, the separating member 26 includes an outer pipe 29 enclosing the sixth water delivery pipe 15f. The outer pipe 29 bonds with the heat-insulating layer 25 tightly. Preferably, the outer pipe 29 is embedded within the heat-insulating layer 25 by foaming process. Therefore, it's better for the outer pipe 29 to have the structure and material that will not deform easily in the foaming process.

[0046] The outer pipe 29 defines a passage 27, through which the sixth water delivery pipe 15f can extend. The length of the passage 27 in the heat-insulating layer 25 is substantially identical with the length of the portion of the sixth water delivery pipe 15f in the heat-insulating layer 15, so that all the portions of the sixth water delivery pipe 15f in the heat-insulating layer 25 are surrounded by the outer pipe 29 and are separated.

[0047] A gap exists between the inner surface of the outer pipe 29 and the outer surface of the sixth water delivery pipe 15f, so that the sixth water delivery pipe 15f is movable in the passage 27. In the present embodiment, the passage 27 has a circle cross section, and its inner diameter is larger than the outer diameter of the sixth water delivery pipe 15f. Preferably, the inner diameter of the passage 27 is 1.2-2.5 times the outer diameter of the sixth water delivery pipe 15f.

[0048] The passage 27 is arranged to be separated from the space receiving the heat-insulating layer 25, so that during the foaming process, foaming agent cannot enter the passage 27. In the present embodiment, the separating member 26 includes a hollow cylinder 28 connected with the end of the outer pipe 29. The cylinder 28 extends upward from the bottom wall 30 of the freezing compartment door 6. The cylinder 28 can be formed integrately with the edge cover forming the bottom wall 30 of the door. As shown in Fig. 3, one end of the cylinder 28 is inserted into the passage 27, and another end extends outside of the heat-insulating layer 25. In another embodiment, it is also possible for the outer pipe 29 to directly project outside of the heat-insulating layer 25.

[0049] The freezing compartment door 6 includes inner wall 31 and outer wall 32 that are closely attached to the inner and outer sides of the heat-insulating layer 25 respectively. When the freezing compartment door 6 is closed, the inner wall 31 faces the freezing compartment 3. Because of the heat insulating effect of the layer 25, the outer wall 32 is influenced by the freezing compartment 3 to a less extent than the inner wall 3. In the present embodiment, the outer wall 32 forms the front surface of the freezing compartment door 6.

[0050] In order to further reduce the influence exerted by the freezing compartment 3 on the sixth water delivery pipe 15f, at least a portion of the sixth water delivery pipe 15f is provided adjacent the outer wall 32. Preferably, as shown in Fig. 4, the sixth water delivery pipe 15f contacts the outer wall 32.

[0051] As described above, the first - the sixth water delivery pipes 15a-15f are installed in similar manners, that is, extend in the heat-insulating layer 25 while being separated from the heat-insulating layers 25 by the separating members. Detailed description is omitted.

[0052] Now the method for manufacturing the refrigerator 1 according to a preferred embodiment of the present invention will be described.

[0053] Manufacturing the doors 6 and 7 and the case 5 of the refrigerator 1 includes a foaming process for form-

ing hard heat-insulating foam. It will be described as follows with respect to the manufacturing method of the freezing compartment door 6.

[0054] When manufacturing the freezing compartment door 6, firstly, the foaming pre-assembling unit of the door is provided. The foaming pre-assembling unit has a foaming space adapted to receive the heat-insulating foaming agent. With respect to the freezing compartment door 6, the foaming space is defined by a door pan, which includes outer wall 32, the longitudinal side walls and lateral side walls of the freezing compartment door 6 and has a monodirectional opening (the underlined sentence is amended after we discussed with Ms. Cai).

[0055] The pre-assembling unit includes the outer pipe 29 received inside of the foaming space. The outer pipe 29 defines a passage 27 that is separated from the foaming space. In the present embodiment, one end of the outer pipe 29 is fixedly connected with the cylinder 28 that extends upward from the inner side of the bottom wall 30, the other end of the outer pipe 29 is fixed on the distributor housing 33 and extends into the recessed cavity defined by the distributor housing 33. Additionally, the portion of the outer pipe 29 between the two ends is fixed to the inner side of the outer wall 32 by the fixing means such as adhesive tape.

[0056] Then, the prepared heat-insulating foaming agent is filled into the foaming space. During this process, the heat-insulating foaming agent floods the portion of the outer pipe 29 locating within the foaming space. After finishing the foaming process, the outer surface of the outer pipe 29 and the heat-insulating layer 25 bond together tightly. Therefore, the outer pipe 29 cannot move within the heat-insulating layer 25, and cannot be removed from the heat-insulating layer 25 without damaging the heat-insulating layer 25.

[0057] After finishing the foaming process, the sixth water delivery pipe 15f extends through the passage 27 defined by the outer pipe 29 and is mounted inside the freezing compartment door 6. One end of the sixth water delivery pipe 15f is connected with the water outlet 20 disposed within the distributor 19, and another end is exposed within the cylinder 28 (original Chinese description recites "pipe joint 28" here, and we amended it as "the cylinder 28" after discussing with Ms. Cai).

[0058] The manufacturing steps of the case 5 are substantially identical with those of the freezing compartment door 6, including: the step of providing the foaming pre-assembling unit of the case, foaming process, and the step of mounting the first - fifth water delivery pipes 15f on the case 5. Similar to the manufacturing method of the freezing compartment door 6, the foaming pre-assembling unit of the case is also provided inside with separating members so as to define a passage so that the water delivery pipes can extend therethrough.

[0059] After the freezing compartment door 6 is mounted on the case 5, the following operations are performed: a) connecting the first water delivery pipe 15a with the inlet end of the water filter 14; b) connecting one end of the second water delivery pipe 15b with the outlet end of the water filter 14, connecting the other end to the inlet end of the switch valve 16; c) connecting one end of the third water delivery pipe 15c to one of the outlets of the switch valve 16, connecting the other end with the water inlet 17 extending into the freezing compartment 3; d) connecting one end of the fourth water delivery pipe 15d with another outlet of the switch valve 16, connecting the other end to the inlet end of the water tank 18; e) connecting one end of the fifth water delivery pipe 15e to the outlet of the water tank 18, connecting and extending the other end to the left bottom corner of the case 5 (preferably, adjacent the connecting part between the case 5 and the freezing compartment door 6) so as to connect with the sixth water delivery pipe 15f.

[0060] Except that the connection between the fifth water delivery pipe 15e and the sixth water delivery pipe 15f should be performed when the freezing compartment door 6 and the case 5 are connected together, the installation of other water delivery pipes and their connection with the corresponding members are not restricted by this.

[0061] In the above embodiments, the first-sixth water delivery pipes 15a-15f extend through the outer pipe 29 after finishing the foaming process. However, in another alternative embodiment, it is also possible that: during the step of providing the foaming pre-assembling unit, the outer pipe 29 (wherein the water delivery pipe is enclosed within the outer pipe 29 in advance) is connected in the foaming pre-assembling unit and then the foaming process is carried out.

[0062] In the above embodiments, the first-sixth water delivery pipes 15a-15f are all removably mounted within the heat-insulating layers 25. However, in an alternative embodiment, it is also possible that only one of or some of the water delivery pipes are removably mounted within the heat-insulating layer 25.

[0063] In the above embodiments, the pipes are all related to the distribution of water or ice. However, it should be explained that the present invention can also be applied to the fluid delivery pipe of the refrigerator for other purpose, such as the pipe for leading out the frost-eliminating water. Obviously, the present invention can also be applied as the delivery pipes for the liquid other than water in the refrigerator.

Claims

1. A refrigerator (1), including heat-insulating layer (25) and at least one fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f), wherein, said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is at least partly received within said heat-insulating layer (25), **characterized in that**, said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is removably received within said heat-insulating layer (25).

2. A refrigerator (1), including:

storage space (3);
door (6) for closing or opening at least a portion of said storage space (3) selectively, said door (6) including a heat-insulating layer (25); and
at least one fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f), which is at least partly received within said heat-insulating layer (25),
characterized in that, said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is removably received within said heat-insulating layer (25).

3. A refrigerator (1) according to claims 1 or 2, **characterized in that**, comprising a separating member (26) for separating said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) and said heat-insulating layer (25).

4. A refrigerator (1) according to claim 3, **characterized in that**, said separating member (26) defines a passage (27), said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) extends through the passage (27), and a gap is formed between said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) and said passage (27).

5. A refrigerator (1) according to claims 3 or 4, **characterized in that**, said separating member (26) is embedded within said heat-insulating layer (25) and bonds tightly with the heat-insulating layer (25).

6. A refrigerator (1) according to claims 3, 4 or 5, **characterized in that**, said separating member (26) is pipe-shaped.

7. A refrigerator (1) according to claims 4, 5 or 6, **characterized in that**, said passage (27) is separated from the heat-insulating layer (25).

8. A refrigerator (1) according to any one of claims 3-7, **characterized in that**, both ends of the separating member (26) extend outside of the heat-insulating layer (25) respectively.

9. A refrigerator (1) according to any one of claims 1-8, **characterized in that**, said housing (2) comprises inner wall (31) and outer wall (32) that are closely attached to the inner side and the outer side of the heat-insulating layer (25) respectively, at least a portion of said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is provided adjacent the inner surface of said second wall (32).

10. A refrigerator (1) according to claim 9, **characterized in that**, at least a portion of said fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) contacts said outer wall (32).

11. A refrigerator (1) according to any one of claims 1-10, **characterized in that**, the end of said fluid delivery pipe (15) is located within a distributor (19).

12. A refrigerator (1), comprising:

A heat-insulating layer (25) for insulating heat;
Distributor (19);
Water filter (14) for filtering water; and
Water tank (18) for storing water;
Wherein, at least one water delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is connected between the distributor (19) and the water tank (14), and at least one water delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) is connected between the water filter (14) and the water tank (18), **characterized in that**, at least one of said water delivery pipes (15a, 15b, 15c, 15d, 15e, 15f) is removably mounted in said heat-insulating layer (25).

13. A refrigerator (1), comprising:

Case (5) defining at least one storage space (3, 4);
Door (6) for closing or opening at least a portion of said storage space (3, 4) selectively;
Said case (5) and said door (6) comprising heat-insulating layers (25);
Ice-making machine (10); and
Water delivery path for supplying water to said ice-making machine (10), wherein, said water delivery path comprising: pipe connector (2) for connecting to water source, and several water delivery pipes (15a, 15b, 15c) connected between said pipe connector (2) and said ice-making machine (10),
Characterized in that, at least one of said fluid delivery pipes (15a, 15b, 15c) is removably arranged within said heat-insulating layer (25) and extends therethrough.

14. A method for manufacturing a refrigerator (1), **characterized in that**, comprising:

a) providing a foaming pre-assembling unit, said foaming pre-assembling unit including a space adapted to receive heat-insulating foaming agent, said pre-assembling unit including a separating member (26) at least partly located within said space, said separating member (26) defining a passage (27), said passage (27) is separated from said space;
b) filling the heat-insulating foaming agent into said space to form a heat-insulating layer (25), said separating member (26) bonding with the heat-insulating layer (25) together; and
c) extending the fluid delivery pipe (15a, 15b, 15c, 15d, 15e, 15f) through said passage (26)

so that the fluid delivery pipe is received within said heat-insulating layer (25).

15. A method according to claim 14, **characterized in that**, the step c) is performed after the step b) is finished.

16. A method according to claims 14 or 15, **characterized in that**, said step a) comprises: fixing said separating member (27) on a wall (32) defining said space.

Abb.1

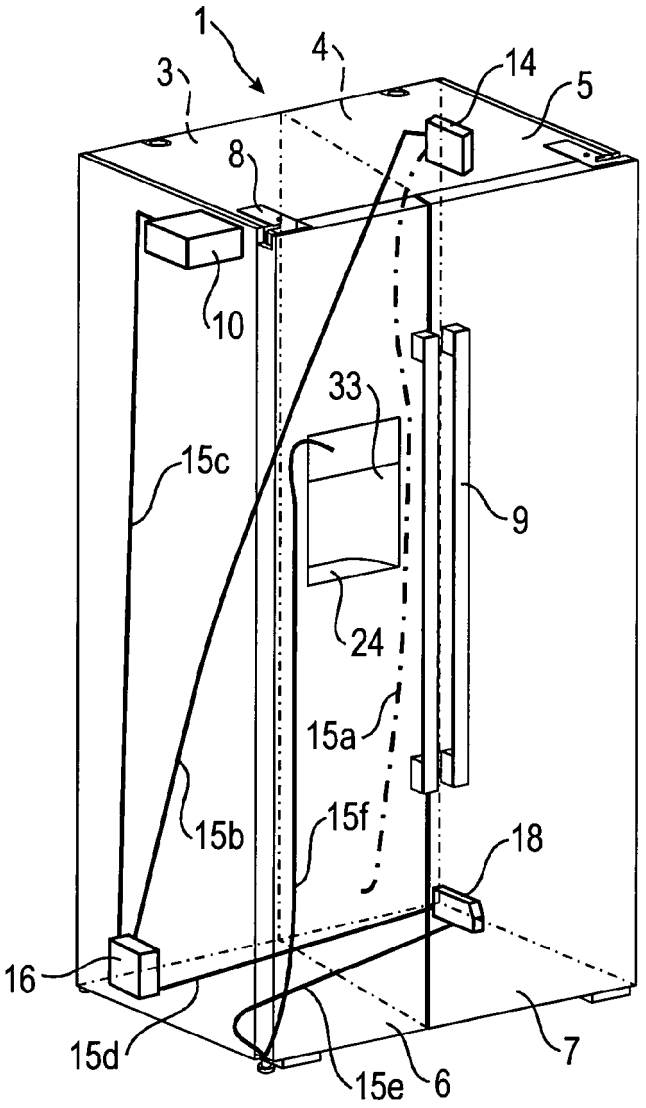

Abb.2

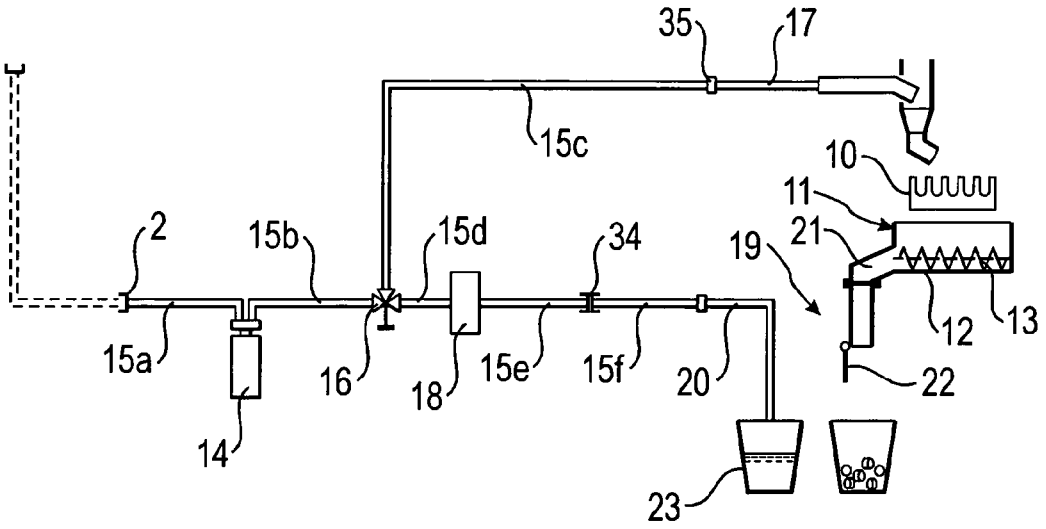
35
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Abb.4

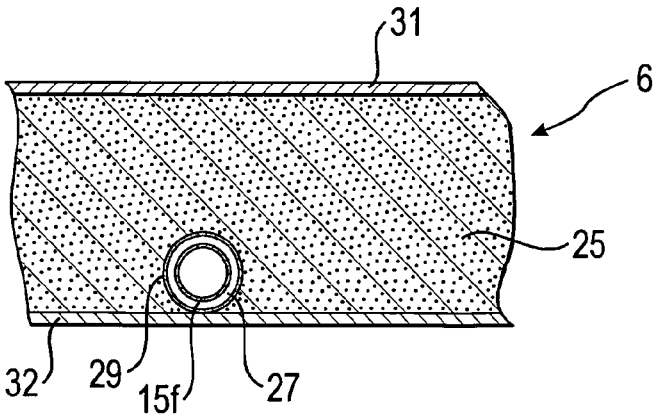
31
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Abb.3