(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 884 729 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.02.2008 Bulletin 2008/06

(51) Int Cl.:
F25D 17/06 *(2006.01)*

(21) Application number: **07112929.0**

(22) Date of filing: **23.07.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **24.07.2006 IT TO20060110 U**

(71) Applicant: **Indesit Company S.p.A.**
60044 Fabriano (AN) (IT)

(72) Inventors:
- **Fioretti, Gabriele**
  60044 Fabriano (AN) (IT)
- **Notarpietro, Eleonora**
  06077 Ponte Felcino (PG) (IT)

(74) Representative: **Dini, Roberto**
Metroconsult S.r.l.
Via Sestriere 100
10060 None (Torino) (IT)

(54) Refrigeration appliance with timed food cooling function

(57) A refrigeration appliance (1) is described which comprises at least one cell (2,3) for frozen foodstuffs and a system for cooling the cell (2,3). The system comprises an evaporator (4), located in the cell, and means for circulating a coolant within the evaporator (4). The appliance (1) also comprises timer means which are connected to the coolant circulation means and which can keep the latter operating for a preset period of time.

The time is selected by a user among a plurality of periods of time through suitable controls.

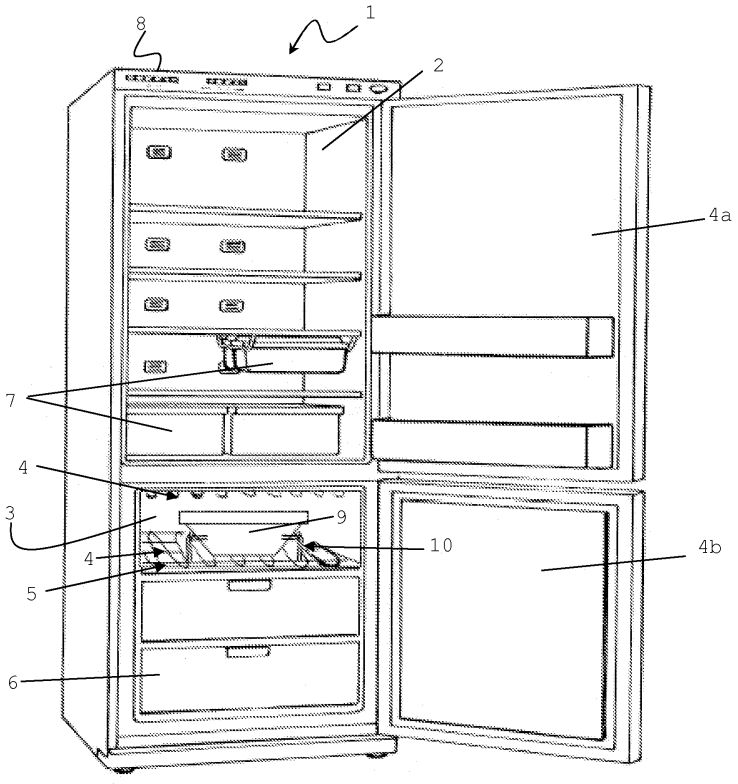

Fig. 1

EP 1 884 729 A2

Description

[0001] The present invention relates to a refrigeration appliance according to the preamble of claim 1.

[0002] In particular, the present invention is applicable to the field of household freezers or refrigerator-freezers.

[0003] It is known that normally a freezer has the only purpose and function of freezing foodstuffs, i.e. lowering their temperature to -18° C within certain times set by the Standards, whereas a refrigerator only provides the function of keeping foodstuffs at a low temperature, which should however remain above 0°C so that the foodstuffs can be preserved without being frozen.

[0004] Refrigeration appliances have one or more coil-type evaporators through which a coolant flows to absorb heat from within a freezer cell containing foodstuffs.

[0005] The circulation of the coolant is ensured by a compressor which is turned on and off according to operation cycles determined by a temperature sensor in the freezer cell. When the sensor detects that the temperature in the cell is higher than a certain value, then the compressor will be started.

[0006] While all known refrigerators lack any special quick-cooling functions, some known solutions of freezers or refrigerator-freezers comprise particular functions which allow to obtain a quick reduction in the temperature within the cell for frozen foodstuffs. For example, the product by ARISTON® model BCS 313 AVEI includes a "super freeze" function, which is useful for freezing newly purchased foodstuffs from room temperature, as well as an "ice party" function, which is useful for cooling drinks by bringing them from room temperature to a few degrees above 0°C.

[0007] Both the "super freeze" and the "ice party" functions require the compressor to operate non-stop, so that the removal of heat from the freezer cell can be concentrated in a short time.

[0008] In the "super freeze" function, the non-stop operation of the compressor ceases when a temperature sensor detects that a very low temperature has been reached (typically around-35°C).

[0009] Usually it takes more than ten hours to reach such a temperature, and therefore this is not a comfortable function to be used only for cooling foodstuffs: in fact, the user should open the freezer very often in order to check if the foodstuffs has not been frozen. Moreover, once the foodstuffs has been cooled the compressor would keep running uselessly, resulting in energy consumption.

[0010] It follows that an appliance having such a function turns out to be absolutely ineffective when used only for cooling foodstuffs.

[0011] In the "ice party" function, the non-stop operation of the compressor is stopped by timer means at the end of a preset period of time of approximately 25-30 minutes.

[0012] This period of time, which is optimized for cooling a predetermined quantity of drinks, is not always comfortable and efficient for cooling other foodstuffs or is too long for cooling small quantities of drinks (e.g. a glass of water).

[0013] Furthermore, in no case can the freezer be used for cooling hot foodstuffs, since it is well known that this would damage the frozen foodstuffs already in the freezer cell or at least it would cause the ice in the cell to thaw. The water produced by thawed ice would drip along the structure of the freezer, causing the formation of stalactites of ice which might cause the foodstuffs or the drawers to stick to the structure of the freezer.

[0014] As a result, the structure of the freezer might be damaged when removing foodstuffs or drawers.

[0015] The object of the present invention is to provide a refrigeration appliance which is particularly effective and comfortable for cooling foodstuffs quickly without causing them to freeze.

[0016] It is a further object to allow for a quick cooling of hot foodstuffs (i.e. foodstuffs having a temperature higher than room temperature) while not causing the ice in the freezer cell to thaw and preferably without altering other foodstuffs previously frozen and kept in the same freezer cell in which hot foodstuffs can be cooled.

[0017] These and other objects of the present invention are achieved through a refrigeration appliance incorporating the features set out in the appended claims, which are intended as an integral part of the present description.

[0018] Further objects and advantages of the present invention will become apparent from the following description and from the annexed drawings, supplied by way of non-limiting example, wherein:

- Fig. 1 shows a refrigeration appliance according to the present invention,
- Figs. 2a and 2b show a support for a foodstuffs container according to a preferred embodiment of the present invention.

[0019] Fig. 1 illustrates a refrigeration appliance 1 according to an embodiment of the present invention.

[0020] Refrigeration appliance 1 is a combined static refrigerator comprising a cell 2 for fresh foodstuffs, wherein the temperature is kept above 0°C, and a cell 3 for frozen foodstuffs, wherein the temperature is normally kept at temperatures below -18°C.

[0021] The cells are closed by means of doors 4a and 4b, and comprise a plurality of shelves 5, drawers 6 and containers 7 which can be used for placing foodstuffs inside the cells.

[0022] The cells are cooled in a known manner through a cooling system comprising a compressor capable of making a coolant circulate, typically R134a or R600a, within a circuit including several elements, among which there is an evaporator typically consisting of a metal duct bent in a winding shape.

[0023] As it flows in the evaporator, the coolant absorbs heat from the cells and then returns to the com-

pressor.

[0024] Since it is known, the cooling system is not shown in detail in the drawings for clarity.

[0025] In the example of Fig. 1, the evaporator 4 is arranged within both the cabinet and the cell for frozen foodstuffs, in particular on the shelves 5 supporting (directly or through drawers 6) the frozen foodstuffs, and on the ceiling of the cell 3.

[0026] Reference number 8 designates a control panel comprising in a known manner a plurality of control means such as displays, signalling LEDs, and control keys and knobs, through which the user can change the temperature in the cells and select special operating programs, such as the "super freeze" function.

[0027] Advantageously, the refrigeration appliance according to the invention comprises a number of control means through which the user can select a time during which the compressor of the cooling system should run non-stop in order to cool the foodstuffs.

[0028] Advantageously, the user can select said time among a plurality of times depending on his/her needs.

[0029] For this purpose, the refrigeration appliance comprises timer means which are connected to said control means and which are adapted to keep the compressor running for the period of time set by the user.

[0030] In particular, the timer means comprise a timer (or a clock) and a control unit.

[0031] When the user selects a period of time, he/she sets the timer means: the control unit receives the user's input and starts the non-stop operation of the compressor for the period of time selected by the user.

[0032] Preferably, the non-stop operation of the compressor is stopped by the control unit when the timer, set according to the user's selection, returns a signal indicating that a period of time equal to that selected by the user has elapsed.

[0033] The time selection through the control means may take place either directly (by entering a numerical value or by turning a knob) or indirectly (by selecting a cooling cycle associated with a preset period of time during which the compressor must run non-stop).

[0034] Thus the user can either select a cooling time, e.g. 18 minutes, or select one of a plurality of cooling cycles (through a key or a menu), a preset cooling time being associated with each cycle.

[0035] Tests carried out have shown that foodstuffs having different morphology or weight require different cooling times; the appliance according to the invention is prearranged for executing cooling cycles wherein the period of time during which the compressor must run non-stop depends on the type of foodstuffs to be cooled; as explained below, said period of time can be selected in the range from 5 to 90 minutes, so that a large number of foodstuffs having different morphology and weight can be preserved.

[0036] To this end, the refrigeration appliance may be fitted with a plurality of keys associated with an indication about the weight or nature of the foodstuffs to be cooled.

[0037] For example, refrigeration appliance 1 comprises a turning knob that allows to select the weight of the foodstuffs to be cooled. Following this selection, the appliance will turn on the compressor for a preset time corresponding to the weight selected by the user (e.g. in accordance with empirical tables).

[0038] In practice, after a weight value has been selected by means of the knob, the timer means will keep the compressor running for a preset time corresponding to said weight value.

[0039] For this purpose, the refrigeration appliance comprises a memory area containing at least a table wherein preset periods of time are associated with weight values.

[0040] The timer means are connected to said memory area and, following the selection of a weight value, they will access said memory area in order to determine a preset time value corresponding to the weight value selected by the user.

[0041] In this manner it is possible to cool different foodstuffs effectively and for different and appropriate times, either a single portion of foodstuffs (e.g. cooling in the freezer cell for 5 minutes) or a big roast (e.g. cooling in the freezer cell for 70 minutes).

[0042] According to one embodiment, the time can be set through a single key which selects a different preset time depending on how long it is pressed.

[0043] When the key is pressed for less than three seconds, a cooling cycle for vegetables will be selected wherein the compressor will be running non-stop for a period of time of 30 minutes. When the key is pressed for longer than three seconds, a cooling cycle for roasts will be selected wherein the compressor will be running non-stop for a period of time of 70 minutes.

[0044] Advantageously, refrigeration appliance 1 is provided with (visual and/or acoustic) alarm means which will be made go off by the control unit of appliance 1 at the end of the selected cooling cycle. These means will inform the user that the cooling cycle has been completed, thus allowing him/her to leave the appliance without having to keep track of the elapsed time in order to prevent the foodstuffs that he/she only wanted to cool from freezing.

[0045] Although the example of embodiment of Fig. 1 refers to a static combined refrigerator, the idea of the invention is also applicable to "no frost" type refrigeration appliances.

[0046] In "no frost" appliances, the cooling is provided by using an evaporating pack, located in the back of the appliance cabinet, on which air is circulated. The cooled air enters the cell for fresh foodstuffs and the cell for frozen foodstuffs in different quantities.

[0047] The air entering the cell for fresh foodstuffs is particularly cold, and therefore suitable for cooling foodstuffs quickly.

[0048] In a particularly advantageous embodiment, a "no frost" refrigeration appliance can operate according to cooling cycles having different lengths depending on

whether the user wants to cool the foodstuffs in the cell for frozen foodstuffs or those in the cell for fresh foodstuffs. This allows to cool foodstuffs even if the cell for frozen foodstuffs is full.

[0049] Referring back to the example of embodiment of Fig. 1, since the refrigeration appliance is of the static type, a portion of the evaporator is inside the cell for frozen foodstuffs.

[0050] In these appliances ice is often formed. Therefore, there is a risk that the ice will thaw if hot foodstuffs are placed in the appliance.

[0051] Advantageously, refrigeration appliance 1 comprises a support 10 which can hold a container 9 for hot foodstuffs at a certain height above a supporting shelf 5, where a section of the evaporator 4 is located.

[0052] The container for hot foodstuffs is preferably an oven-proof dish made of pirex® which can withstand sudden changes in temperature.

[0053] The hot foodstuffs to be cooled is placed in the container, which is initially at room temperature. Then the container is closed with a lid, e.g. made of plastic.

[0054] Several tests carried out by using different refrigeration appliances, such as the appliance by ARISTON® model BCB 313 AVEIC and the appliance BCS 312 AVEI, have shown that by keeping the compressor running non-stop and by keeping the container closed with a plastic lid at a distance greater than 35 mm from the shelf (and therefore from the evaporator within), it is possible to cool the foodstuffs without causing the ice on the evaporator to thaw. In particular, it has been ascertained with probes that a 35mm distance allows to keep the outer surface of the evaporator duct underneath the container at a temperature below 0°C.

[0055] In all tests carried out it was observed that the ice did not thaw when a closed container at room temperature filled with a cooked foodstuffs just taken from a pan or an oven was placed at a distance of 30-35 mm from the ice.

[0056] In other words, it is advantageous for the cooling function that there is a distance of at least 35 mm between the body of the container and the ice formed on the walls.

[0057] These tests were conducted on foodstuffs having different morphology and weight (rice, meat roast, sliced meat, spinach, etc.), and showed that at least two particularly advantageous cooling cycles can be selected:

- a long cycle lasting 70 minutes, which allows to bring more consistent and heavier foodstuffs (e.g. a 750g roast cooked in oven for 45 minutes at 200°C) from an initial outer temperature of 75-85°C to an outer temperature of 25-30°C,
- a short cycle lasting 30 minutes, which allows to bring low consistent thick and lighter foodstuffs (e.g. 500g of spinach boiled in a pan) from an initial outer temperature of 70-80°C to an outer temperature of 25-30°C.

[0058] At the end of the tests, the foodstuffs had been cooled and no ice had formed on the outer surface of the foodstuffs.

[0059] Under these closed-container conditions, tests conducted with foodstuffs of different types and weight allowed to identify a range of time between 15 and 90 minutes which can be used for the cooling function, though the 15-70min and 30-70min ranges turn out to be the most advantageous ones while still ensuring proper cooling and no icing.

[0060] In particular, it turned out that the two 25-35min and 65-75min ranges were particularly advantageous (in terms of cooling without icing) for the short cycle and the long cycle, respectively.

[0061] Independently of the type of refrigeration appliance used, whether static or "no frost", the support for lifting the container for hot foodstuffs from the evaporator is advantageous in any case because it allows to make better use, for cooling purposes, of the convective movements of the air around the container.

[0062] In a preferred embodiment, in order to reduce heat conduction from the container to the evaporator through the support, the latter has a very essential structure, which may even be just a suitably shaped metal bar, thus minimizing the contact between container and support.

[0063] Preferably, the support also comprises insulating means adapted to reduce the heat exchange between the support and the container.

[0064] In the example of Figs. 2a and 2b, support 10 has a PVC-coated iron structure 101 adapted to hold a container 9 for hot foodstuffs above the supporting shelf.

[0065] Fig. 2b shows the distance h between the container and the evaporator, which as aforesaid is preferably higher than 35 mm; even more preferably, it is such that a container cannot be located at a distance h1 below 35 mm from an evaporator located above the container, in particular on the cell ceiling.

[0066] For the purpose of minimizing the heat transfer occurring by conduction through the support, contact surface 102 between the support structure and the container preferably extends over less than 50% of the perimeter of the container, measured at a container section in correspondence of the contact area between support and container.

[0067] The advantages and features of the present invention are apparent from the above description.

[0068] It is also clear that several changes may be made to the above-described refrigeration appliance without departing from the scope of the present invention resulting from this description and from the appended claims.

[0069] For example, the container for hot foodstuffs and the support may be manufactured by using materials being different from those specified in the above description.

[0070] Furthermore, support 10 may be integrated or integratable into a structural element of said appliance,

such as the support ledges of the shelves or the shelves themselves.

Claims

1. Refrigeration appliance (1) comprising:

   - at least one cell (2,3) for foodstuffs,
   - a system for cooling said cell (2,3), comprising an evaporator (4) and means for circulating a coolant within said evaporator,
   - timer means connected to said coolant circulation means and adapted to keep said coolant refrigeration means operating for a preset period of time,
   - control means functionally connected to said timer means and activated by a user,

   characterized in that said control means are adapted to select said preset period of time among a plurality of periods of time.

2. Appliance according to claim 1, **characterized in that** said preset time can be selected in the range of time from 5 to 90 minutes.

3. Appliance according to claim 2, **characterized in that** said preset time can be selected in the range of time from 15 to 70 minutes, preferably from 30 to 70 minutes.

4. Appliance according to any of claims 1 to 3, **characterized in that** said control means are associated with indications relating to the type or weight of the foodstuffs to be cooled.

5. Appliance according to any of claims 1 to 4, **characterized in that** said control means comprise a key which can be pressed for different lengths of time in order to determine the selection of a different preset time.

6. Appliance according to any of claims 1 to 5, **characterized in that** said control means allow to select a weight value representing the weight of the foodstuffs to be cooled, and that said timer means are adapted to keep said means operating for a preset time corresponding to said weight value.

7. Appliance according to claim 6, **characterized in that** it comprises a memory area containing at least a table wherein weight values are associated with preset periods of time, and that said timer means are connected to said memory area for identifying a preset time value corresponding to said weight value selected by the user.

8. Appliance according to any of the preceding claims, **characterized by** comprising acoustic alarm means connected to said timer means which can go off at the end of said preset time.

9. Refrigeration appliance according to any of the preceding claims, **characterized by** comprising visual alarm means connected to said timer means which can set off at the end of said preset time.

10. Appliance according to any of the preceding claims, **characterized in that** said refrigeration appliance is of the "no frost" type.

11. Appliance according to any of the preceding claims, **characterized in that** said cell is a cell (3) for fresh foodstuffs.

12. Appliance according to any of claims 1 to 10, **characterized in that** said evaporator (4) is located at least partly on a shelf (5) of said cell, and that it comprises a closed container (9) for hot foodstuffs and a support (10) adapted to hold said container (9) at a distance (h) from said shelf (5).

13. Appliance according to claim 12, **characterized in that** said distance (h) is adapted to prevent a portion of said evaporator (4) located within said shelf (5), when operating, from reaching a temperature above 0°C.

14. Refrigeration appliance according to claim 12 or 13, **characterized in that** said distance (h) is higher than 35 mm.

15. Appliance according to any of claims 12 to 14, **characterized in that** said support (10) comprises insulating means adapted to reduce the heat exchange between said support and said container.

16. Appliance according to any of claims 12 to 14, **characterized in that** said support (10) comprises a structure (101) made of a conductive material and such that the contact surface between said structure (101) and said container (9) extends over less than 50% of the perimeter of said container (9).

17. Appliance according to claim 15 or 16, **characterized in that** said structure (101) is a metal bar.

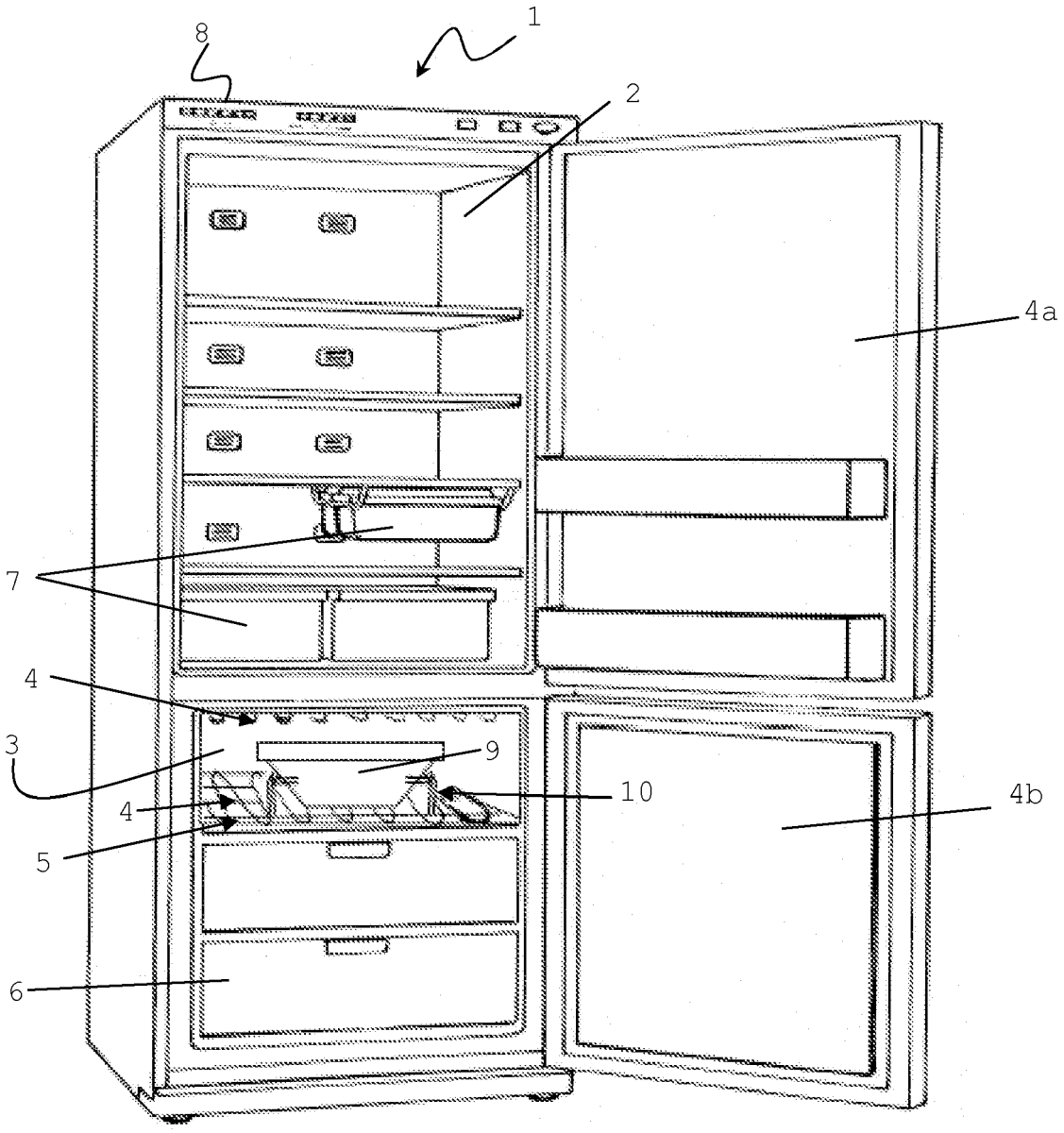

Fig. 1

Fig. 2a

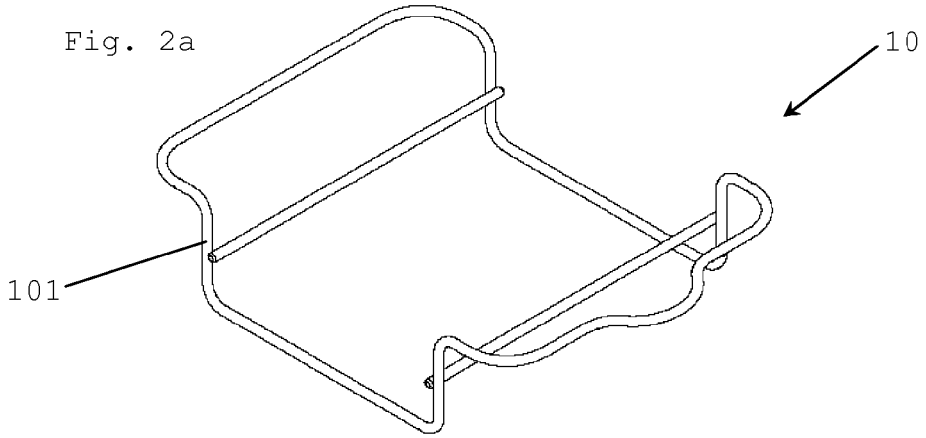

Fig. 2b