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Method and container for transporting or storing goods, in particular food products in a frozen and/or chilled state

5 The present invention relates to a method for refrigerating insulated containers by the use of a refrigerating medium and to containers refrigerated in accordance with the method.

In particular, the invention relates to containers for the transportation and storage of frozen and/or chilled products, where the temperature inside the container is maintained
10 at a desired level and for a specified period of time. Further, the invention makes possible that one type of container may be used for handling both chilled and/or frozen products, with minor modifications.

EP 0 591 047 B1 discloses an insulated container equipped with a refrigerant box in the
15 upper region of the container and a stack of products in a lower region of the container. Below the refrigerant box there is arranged an insulated panel having a horizontal extension that allows the formation of a slit between the panel and the inner walls of the container. The slit allows an even distribution of the cooling medium that passes towards the products and further downwards between the outer walls of the stack and the inner
20 walls of the container.

EP 0 631 096 B1 discloses a system for filling a receptacle or cell with CO₂-snow, the receptacle being arranged in an insulated chamber. The quantity of CO₂ injected in the receptacle is determined according to predetermined injection periods modified according
25 to climatic parameters.

EP 0 337 860 B1 discloses an isothermal container with an interior space divided horizontally by a screen into an upper area receiving an open reservoir of a sublimating refrigerant, and a lower area receiving at least one compartment of products to be kept
30 cold. The screen is produced from a thermally insulating material and is slightly smaller than the internal section of the container. The reservoir is produced in the form of a drawer.

WO 95/25253 discloses a double-sided releasable partition element for an isothermal
35 chamber, containing two adjacent compartments, i.e. a first unsealed compartment which



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can be filled with a solid sublimable coolant element and a second sealed compartment or housing filled with a eutectic or air. The two-compartment partition element maintains significantly different temperatures on opposite sides of said element. The element is further arranged to fit into grooves in the lateral sides of the chamber.

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US 1,997,936 discloses a refrigerator container where solid carbon dioxide is arranged in a bunker arranged in the top of the containers interior space. Beneath the bunker there is arranged a box-shaped partition which is disposed horizontally and spaced from the bottom of the base of the bunker to afford a narrow passage for the circulation of air.

10 The box-shaped partition is suspended from the roof of the container and has further therein a series of perforations, and is at its outside edge provided with a solid upturned flange substantially surrounding the base of the bunker. The bunker may be charged with solid carbon dioxide blocks through an opening arranged in the top-side of the container.

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One disadvantage that relates to the container described above is that the storage capacity of the carbon dioxide bunker can not be altered without major mechanical work as the bunker is an integrated part of the container construction. The same problem relates to the partition, that can not be replaced by an other partition having different

20 insulation properties without performance by skilled mechanical workers.

US 3,800,554 discloses a food storage and cooling apparatus including a housing defining a cavity. The housing is provided with a door at one side. Inside the housing there is arranged partition means for subdividing the cavity into first and second
25 chambers. In the first chamber there is arranged a receptacle for receiving a predetermined quantity of solidified carbon dioxide. The receptacle is thermally associated with the first chamber more intimately than with the second chamber. Further the cavity have provision to receive a removable shelf arranged at ledge projections in opposing side wall surfaces.

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One disadvantage relating to the solution disclosed is that the partition means is of a predefined size, which involves that the storage space of the cavity is predefined as well. Further the apparatus is defined as a combined refrigerator and freezer, and will not be

suitable for use in relation with transport and storage of frozen goods or chilled goods as a whole.

In accordance with the present invention there is provided a container that may serve
 5 plural requirements, namely the storage or transport of chilled and/or alternatively frozen products for a specified period of time. The container is of a thermally insulated type and comprises one or more top mounted refrigerating cells of different capacities co-operating with one or more insulated panels of different cold transfer characteristics which allows that the desired temperature and the duration of the conditioned climate
 10 inside the container can be adapted to meet a variety of demands.

In accordance with the present invention the same container can be used for different purposes by simple insertion of different cell/panel combinations. Cost reduction stems from considerations about level of investment, inventory/storage, etc. This may be
 15 advantageous both for the users and/or for the supplier, especially if the supplier will rent out containers for various purposes. Another topic is the flexibility with respect to today's changing requirements on temperature ranges accepted for different product categories, with new products emerging in the market, and with varying relative volumes of chilled/frozen goods. The present modular system allows fast reaction and high
 20 adaptability and flexibility. Further, the proposed cell/panel modular system is expected to be user-friendly by the warehouse operators. Its simplicity will help minimise incorrect use of transport conditions, which should give a reliable protection of the cold-chain.

The invention is further described in the following by examples and figures where:

25 Fig. 1 shows in perspective an exploded view of a container in accordance with the present invention,

Fig. 2(a-c) shows in a side view a cross section of a container in accordance with the present invention with its door arrangement open in three different positions.

30 As will be apparent from Fig. 1, the container 1 may be provided with wheels 2 for easy handling. The container has a rigid top and bottom, sidewalls and backwall. The container may preferably be of an insulated shell type, i.e. the shell forming the inner- and outer surfaces of the walls envelope a layer of insulating material such as polyurethane

foam. The shell may be produced for instance out of polyethylene or fibreglass, or out of any suitable material having good insulating properties. The front wall is provided by a flexible door, that may be of a two-part type with an upper door 4 and a lower door 3. The doors may be made out of a vinyl coated polyester and may further be sectioned in plural 5 hinged elements. The doors may be provided with fasteners, for instance of the VELCRO - type at its peripheral edges (not shown) that co-operates with similar fasteners at the front end sides of the container (not shown). In addition, the door may be provided with strip fasteners 5, 6, 7, 8, preferably of the VELCRO - type, that co-operates with pins 5', 6', 7', 8' in the front end sides of the container. The upper 4 and lower doors 3 may be 10 interconnected by a fastener system 9, preferably of the VELCRO - type.

The inner side walls of the container is provided with a slide system such as opposite grooves or recesses 10, 11, 12 at different vertical levels, to sustain one or more insulated panels 13, 14, 15, and one or more cells 16, 17. In the described embodiment, the 15 insulating panel has a transversal extension which allows that the panel co-operates with opposite recesses in the side walls of the container. However, it should be understood that other sliding systems known by those skilled in the art may be applied within the scope of the invention. When inserted in the container, the panel divides the interior of the container in an upper room 18 and a lower room 19. In the upper room the refrigerant 20 or sublimating agent is placed, while the lower room represents a space for the goods to be stored or transported. The refrigerant is contained in a cell which has a size adapted to the required cooling capacity. In some specific cases, the insulating panel may be incorporated into the cell construction for the purpose of practicality (not shown). In such an embodiment, the insulating panel is in fact a part of the cell where it serves the 25 additional purpose of being the bottom of the cell. The cell then further comprises side walls integrated upon the upper surface of the panel, and a top lid.

In the Figure, there is shown three insulating panels 13, 14, 15. Panel 13 is of a closed type, i.e. it is not provided with any perforations. In use however, gas falling downwards 30 from the sublimating agent is allowed in small amounts to enter the lower room 19 through small slits between the panel and the recesses in the side walls of the container, between the panel and the door and/or between the panel and the backwall of the container. In this situation, there is little direct cooling of the goods by the sublimating agent. Alternatively, the gas may be vented directly to the ambient space from the room 18 35 through venting openings that penetrate one or more walls of the container (not shown). The amount of indirect cooling, i.e. the cold transfer through the insulating panel, is very

much dependent on the insulating characteristics of the panel. When the goods in the lower room are to be chilled, i.e. the set temperature is about 0-5°C, the insulating panel should be of the closed type as described, to avoid direct contact cooling of the goods, to avoid damages of the goods. Further, when handling chilled goods, the insulating characteristics of the panel should be sufficiently large to avoid too much cold transfer between the upper and the lower room. On the other hand, the insulating characteristics of the panel should be sufficiently low to allow the temperature to be maintained at the required level together with the cold transferred by direct cooling.

10 The insulating panels of the type 14 and 15 are provided with openings, 14' and 15' respectively. In the Figure, the opening of panel 15 is of a larger size than that of the panel 14. In one embodiment these panels are adapted to carry or sustain one cell containing the refrigerant, in such a manner that the closed bottom (not shown) of the cell abuts the upper surface of the panel. In the combination with an open panel of the type 15 14 or 15, the cell then covers the opening and thus the area of the openings for the passage of sublimating gas between the upper and the lower room is of the same order as of that with the closed panel. In this situation, the amount of direct cooling should be similar to that of the situation with a closed panel. However, the effect of indirect cooling becomes higher as the opening in the panel results in that the insulating characteristics of 20 the panel becomes very low. The panel 15 then will represent a higher effect of indirect cooling than that of the panel 14 which has a smaller opening, and is very well suited for refrigerating frozen goods, i.e. the temperature in the lower room 19 should be in the order -18 to -30°C.

25 Alternatively, the cell may rest upon the panel in such a manner that there is maintained a little space between the bottom surface of the cell and the top surface of the panel, to obtain a slit for the passage of sublimating gas, and thus augmenting the effect of direct cooling of the goods in the lower room. Such a space may be obtained by providing the bottom surface of the cell or the top surface of the panel with protrusions or the like. 30 Alternatively the cells may be self-sustained by a sliding system co-operating with the inner side walls of the container similar to that of the panels (not shown). In this manner the cell and the panel may be sustained in such a manner that a space is maintained between them, similar to the situation as described above.

The cells containing the refrigerant may be of different sizes, in the Figure there is shown two sizes 16 and 17. This embodiment is designed for one-day and three-day storage/transport respectively. The cell is preferably of a shell-type construction, insulated by a polyurethane foam. The foam is maintained within the shell, where the shell forms the inner- and outer surfaces of the cell walls. The shell may be made out of fibreglass.

However, it should be understood that other suitable materials may be applied in the cell construction. Preferably the top side of the cell is designed as a removable lid made out of a non-insulated material, e.g. a mono-layer fibreglass material. The lid may be designed in such a manner that a slit or opening (not shown) is provided between the lid and the top end of at least one abutting side wall of the cell for the escape of sublimating gas. Further, the cell may be prevented from sliding out of the sliding system by the provision of swingable latches arranged at the front end sides of the container in such a manner that they will restrict outwardly movement of the cell in a locked position. This task can easily be handled by a man skilled in the art and is consequently not further described.

The cell is preferably adapted to be filled by a lance that delivers liquid CO₂. In the cell, the liquid is transferred to solid CO₂ under the filling operation as the pressure drops. Preferably the cell may have provisions that augments the density of the solid CO₂ when filling. Such provisions may be constituted by a bottomless, downward protruding chamber attached to the inside of the lid. In this embodiment, when performing the filling operation, the lance is entered through holes both in the cell wall 20, 21 and the chamber wall (not shown). Between the downward protruding chamber walls and the inner bottom of the cell, there is a little space which allows the solid CO₂ to be forced into the rest of the space in the cell as the cell becomes filled up. Thus, the restriction formed between the walls of the chamber and the bottom of the cell generates a compression of solid CO₂ which is supplied succeeding the filling up of the chamber. Preferably, the injection hole 20, 21 in the cell is in the front thereof. The hole is then effectively sealed by the inner surface of the upper door 4 when the door is in its closed position. By increasing the compaction and thus the density of the solid CO₂ (snow or dry-ice), it is possible to both utilise the cell volume at best, optimising the container volume available for loading products inside. By this, it may also be possible to slow down the sublimation rate of solid CO₂, because the surface area of the solid CO₂ is reduced by compaction. Following this, it is achieved a more gradual/efficient/reliable heat exchange.

It should be understood however, that the cell may be adapted to receive solid CO₂ in the shape of slices, pellets or the similar. CO₂ snow produced elsewhere may also be introduced into the cell. In such an arrangement, the cell may have provisions to fit the interior sliding system of the container similar to that explained above, but the cell may be constructed more like a drawer having insulated bottom and sides and further provided with a non-fixed lid.

The container may be further provided with compartment panels 30, 31 for dividing a stack of stored goods. The panels are open and are preferably of a two piece wire shelf type that secures good gas circulation properties. In addition, the container may be provided with a false floor 32, that provides a slit between the bottom surface of the goods and the surface of the container bottom. Still further, it should be understood that the stack of goods (not shown) may be restricted from contacting the inner wall surfaces of the container by an arrangement of spacers or the like arranged between the stack of goods and the inner walls of the container (not shown).

Alternatively, the compartment panels 30, 31 can be substituted by insulating panels dividing the room 19 into one upper and one lower compartment (not shown). The upper compartment will then receive more cold from the upper room 18 containing the cell than the lower compartment. By adapting the insulating characteristics of the insulating panel between the upper and the lower compartment in a proper manner analogous to that described above, there can be obtained a lower temperature in the upper compartment than that of the lower compartment. Followingly, both frozen and chilled goods can be handled at the same time in the container. As a further additional feature, the insulating panel dividing the room 19 into one upper and one lower compartment may itself comprise an internal cavity for the introduction of solid sublimable coolant (CO₂) (not shown), where the loading principle may be similar to that of the cell, as described above. The insulating panel then may have different insulating characteristics towards its upper side than towards its downward side. In this situation, the insulating panel will serve as an additional source of cold towards the compartments facing its upper- and downward sides. These features are expected to be handled by a man skilled in the art, and are followingly not further described here.

Figure 2 a-c shows in side view a cross section of the container with its door arrangement in three positions. In Fig. 2a the lower door 3 is semi-opened, i.e. the upper part of the

door 3 is folded downwards to give access to the upper part of the storage room 19. The upper door 4 is in its closed position, and thus the upper room 18 is closed. In Fig. 2b, the lower door is completely open, and rests upon the top side of the container. In this position, the whole room 19 is accessible while the door 4 and the upper room 18 is closed. In the embodiments shown in Figure 1 and 2, there is applied a one-day cell.

In Figure 2c, the door 4 is in its closed position, and one upper part of door 3 is closed, while the other part of the door is open and rests upon the top of the container. In this situation the panel 13 is arranged in its lowest position, and the size of the room 18 then allows the use of a three-day cell, while the room is sealed by the door arrangement 4 and partly by the door 3.

By the door arrangement as described above, the cell remains closed and protected during door opening for partial unloading of products, which makes this container uniquely suited to very frequent door opening situations like in the case of catering distributors.

Within the scope of the claimed invention it is possible to alter the number of insulating panels and the number of cells used in the container. It should be understood that the container may be provided with more grooves or recesses for the support of panels and cells. Thus, one or more cells can be applied in combination with one or more insulating panels, to achieve the optimum refrigeration capacity, duration and temperature, and for the purpose of handling chilled and frozen goods at the same time in the container.

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Claims

1. Method for storing or transporting products, in particular food products, in a frozen and/or chilled state comprising a conditioned room such as a container (1) where the products are placed, and where the room (19) is conditioned by means of a refrigerating medium (16, 17), for instance solid carbondioxide (CO₂), arranged above the room, the refrigerating medium and the room being divided by thermal partition means adapted to maintain a required amount of cold transfer between the refrigerant and the room,
characterised in that
the thermal partition means constitutes by insulating panels (13, 14, 15) having different insulating properties, where one panel can easily be replaced by another panel.
2. Method in accordance with claim 1-2,
characterised in that
the refrigerating medium is contained in an easily replaceable cell (16, 17) of appropriate size.
3. Container (1) for the storage or transport of goods, in particular food products in a frozen and/or chilled state, comprising at least one conditioned room (19) where the goods are placed and where the room being conditioned by means of a refrigerating medium such as solid carbondioxide (CO₂) arranged in a room (18) above the room (19) in one or more cells (16, 17), the refrigerating medium and the room (19) being divided by thermal partition means such as one or more insulating panel(s) (13, 14, 15) adapted to maintain a required amount of cold transfer between the refrigerant and the room (19),
characterised in that
the insulating panel(s) (13, 14, 15) have different insulating properties, the panel(s) and the container further being adapted for easy replacement of the panel(s) with respect to the container.

4. Container in accordance with claim 3,
characterised in that
the insulating panels (13, 14, 15) are provided with openings of different size.
- 5 5. Container in accordance with claim 3,
characterised in that
the insulating panel and the cell are integrated to form one single unit, that is
easy to change with respect to the container.
- 10 6. Container in accordance with claim 3,
characterised in that
the room (19) is divided into at least two compartments by one or more easy to
change insulating panels.
- 15 7. Container in accordance with claim 6,
characterised in that
the insulating panel(s) dividing the room (19) is provided with an internal cavity
that can be loaded with a solid sublimating medium (CO₂).
- 20 8. Container in accordance with claim 3-7, where the container has rigid top-,
bottom-, back- and sidewalls, and an opening at front sealed by a door
arrangement,
characterised in that
the door arrangement comprises an upper (4) and a lower door (3) of a flexible
25 material, where the upper door (4) seals the upper room 18, and the lower door
(3) seals the lower room (19), and where at least one of the doors may be
sectioned in plural hinged elements.
9. Container in accordance with claim 3-8,
30 characterised in that
the amount of refrigerant medium loaded in the container (1) can be adapted by
the use of cells (16, 17) of different size, that are of a easy to change type with
respect to the container.