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(54) **Insulated container and method for cooling cargo**

(57) The invention relates to an insulated container (100) comprising side walls (110, 120), a bottom wall (130), a top wall (140), a rear wall and a front wall, wherein the walls each comprise an inner face (112, 122, 132, 142) and an outer face (111, 121, 131, 141) and an insulating layer (150) of insulating material, the insulated container further comprising temperature control fluid distribution means (103) for distributing temperature control fluid in the insulated container (100), wherein the temperature control fluid distribution means (103) comprise at least two ducts (165, 175, 185, 195) being adapted to guide the temperature control fluid along the side walls (110, 120) of the container (100) and having each at least one orifice (164, 174, 184, 194) being adapted to allow a flow of temperature control fluid from one side wall (110) of the container (100) to the other side wall (120) of the container (100). Furthermore, the invention relates to a method for cooling cargo (25) in an insulated container (100).

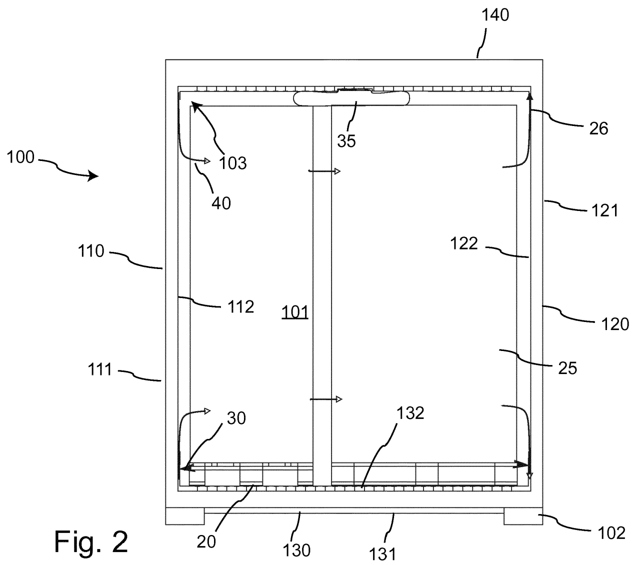

Fig. 2

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Description

[0001] The invention relates to an insulated container comprising side walls, a bottom wall, a top wall, a rear wall and a front wall, wherein the walls each comprise an inner face and outer face and an insulating layer of insulating material being located between the inner face and the outer face. The insulated container comprises further temperature control fluid distribution means for distributing temperature control fluid in the insulated container. Furthermore, the invention relates to a method for cooling cargo in an insulated container comprising sidewalls, a bottom wall, a top wall, a rear wall and a front wall, wherein the walls each comprise an inner face and an outer face and an insulating layer of insulating material, the insulated container further comprising temperature control fluid distribution means for distributing temperature control fluid in the insulated container, said method comprising the step of providing a temperature control fluid having a pre-defined temperature and/or humidity and providing a flow of said temperature control fluid inside the insulated container. The method and the container as cited above may be used for transportation of refrigerated or temperature-controlled cargo such as fresh fruit, flowers, fish or meat.

[0002] From EP 2 535 296 A1, an insulated container having sidewalls, a bottom wall, a top wall, a rear wall and a front wall is known. This known container is sized as an ISO freight container according to ISO 668 and has an appropriate thermal insulation. Furthermore, the container comprises an integral refrigeration unit for controlling the temperature inside the container. The temperature control of the goods to be transported with the insulated container is based on an air flow through the inner volume of the insulated container. The air is cooled by the refrigeration unit and flows through the volume of the container from the bottom to the top. Thus, cooled air is blown into the bottom wall of the insulated container, said bottom wall being provided with T-gratings.

[0003] There are several disadvantages to these known integral reefer containers. First, the cooling of the goods contained in the region opposite to the side where the refrigeration unit is located or the cooled air is introduced requires high energy input. Usually, the air speed at the door end or back wall is only 10 to 20 % of the air speed at the air guide inlet. Therefore, known containers need a high ventilation volume up to 6000 m^3/hour to compensate for this speed drop. Therefore, known containers have a very poor energy/effect ratio.

[0004] Furthermore, the open structure of the T-gratings and the uneven storage of the cargo inside the container create gaps between the cargo elements which constitute shortcuts for the blown air. Instead of passing through the goods, the air flows around the cargo elements directly back to the refrigeration unit. Thus, the cooling load of the blown air is not used efficiently. It has been shown that 83 % of the airflow lead to only 33 % of the cooling capacity whereas 17 % of the supplied airflow lead to 67 % of the cooling capacity.

[0005] Finally, the open structure of the T-gratings on the floor must be cleaned because it is in direct contact with the cargo. This is all the more important in the case that condensation occurs. However, the form of the T-gratings involves a difficult access to all areas of the floor with unreachable and uncontrollable cavities being difficult to be cleaned. Usually, the T-grating is made from extruded aluminum for structural purposes. Aluminum is in principle not desirable from a food safety point of view due to its ability to retain bacteria.

[0006] Accordingly, it is an object of the invention to optimize the cooling effect on the cargo while reducing the amount of energy spent for cooling. Furthermore, it is an object of the invention to provide an insulated container and a method for cooling cargo with a better cooling performance in areas remote from the refrigeration unit and/or remote from the temperature control fluid input. Finally, it is an object of the invention to provide an insulated container that allows better hygienic performance.

[0007] The object of the invention is solved by an insulated container according to claim 1 and a method according to claim 14.

[0008] According to the invention, an insulated container is disclosed comprising side walls, a bottom wall, a top wall, a rear wall and a front wall. The rear wall may comprise at least one door or gate such that the interior of the insulated container may be accessible in order to load or unload cargo. At the front wall, a refrigeration unit may be provided being adapted to provide a temperature control fluid having a predetermined temperature and/or humidity. Furthermore, the refrigeration unit may be adapted to control the air exchange rate between the interior of the insulated container and the surroundings.

[0009] While the invention is described by making reference to the exemplary embodiment of a temperature-controlled container, it should be clear that the invention may be used in conjunction with any cooled or air-conditioned room, in particular cold storage facilities.

[0010] The walls of the insulated container each comprise an inner face and an outer face and an insulating layer of insulating material. The insulating layer may comprise mineral wool, a rigid form or a vacuum insulation.

[0011] In some embodiments of the invention, the insulated container may comprise the size and/or the shape of an ISO freight container according to ISO 668.

[0012] The insulated container comprises temperature control fluid distribution means for distributing temperature control fluid in the interior of the insulated container. The temperature control fluid distribution means comprise at least two ducts being adapted to guide the temperature control fluid along the side walls of the container. If two ducts are present, one duct is used as a return duct to guide temperature control fluid from the interior volume of the container to the refrigeration unit. The other duct is used as a supply duct to guide temperature control fluid from the refrigeration unit to the interior volume of the container. In other embodiment of the invention, more than two ducts may be present, such that a plurality of supply ducts and/or a plurality of return ducts may be available to guide to the temperature control fluid inside the insulated container. These embodiments may allow for any of a more homogenous temperature distribution or faster cool down time.

[0013] The temperature control fluid may comprise a gas. In some embodiments of the invention, the gas may comprise ambient air. In other embodiments of the invention, the temperature control fluid may comprise a protective gas such as nitrogen or argon to a avoid ripening or oxidizing of the cargo inside the insulated container. In some embodiments of the invention, the temperature control fluid is heated or cooled to a predefined temperature by the refrigeration unit. In some embodiments of the invention, the temperature control fluid may be is loaded or unloaded with a predefined humidity by the refrigeration unit.

[0014] The at least two ducts each comprise at least one orifice or nozzle being adapted to allow a flow of temperature control fluid from one side wall of the container to the other side wall of the container. This feature has a plurality of advantages over known designs. Known containers use a flow from the bottom to the top of the container. Therefore, the container according to the invention has no need of a T-grating on the floor. Thus, no unreachable and uncontrollable cavities are present which are difficult to be cleaned.

[0015] Furthermore, the flow resistance of the temperature control fluid is only little affected by the amount of cargo present inside the insulated container. In known concepts, the flow of temperature control fluid from the T-grating to the interior volume is impeded by the cargo standing on the floor. This means, that a higher amount of cargo constraining a larger subsurface of the inner face of the bottom wall will lead to a lower flow of temperature control fluid and/or to an unwanted flow distribution. According to the invention, a flow from one side wall to the other side wall approximately perpendicular to the length of the insulated container is used which can easily penetrate the cargo stowed in crates or cradles.

[0016] Finally, the width of the insulated container between the side walls is usually smaller than the length or the height so that this shorter temperature control fluid flow can be easily controlled and the cooling capacity is used more efficiently.

[0017] In some embodiments of the invention, the invention relates to an insulated container comprising side walls, a bottom wall, a top wall, a rear wall and a front wall, wherein the walls each comprise an inner face and an outer face and an insulating layer of insulating material, the insulated container or the room further comprising temperature control fluid distribution means for distributing temperature control fluid inside the insulated container or room, comprising further an inflatable elastic bag being arranged on any of the top wall and/or the rear wall and/or the front wall and/or at least one side wall.

[0018] In some embodiments of the invention, the invention relates to a method for improving an insulated container comprising side walls, a bottom wall, a top wall, a rear wall and a front wall, wherein the walls each comprise an inner face and an outer face and an insulating layer of insulating material, the insulated container or the room further comprising temperature control fluid distribution means for distributing temperature control fluid inside the insulated container or room, said method comprising the step of providing an inflatable elastic bag on any of the top wall and/or the rear wall and/or the front wall and/or at least one side wall.

[0019] In some embodiments of the invention, the invention relates to an insulated container comprising side walls, a bottom wall, a top wall, a rear wall and a front wall, wherein the walls each comprise an inner face and an outer face and an insulating layer of insulating material, the insulated container or the room further comprising temperature control fluid distribution means for distributing temperature control fluid inside the insulated container or room, comprising further a sealing element being attached to a side wall.

[0020] In some embodiments of the invention, at least one upper duct is located at the intersection of the side wall and the top wall. In some embodiments at least one lower duct is located at the intersection of the side wall and a bottom wall. In the corners of the insulated container, the upper and lower ducts are protected from mechanical damage.

[0021] In some embodiments of the invention, at least one orifice is formed by a gap between the inner face of a side wall of the insulated container and the boundary of the duct. This feature will result in the temperature control fluid flow originating from the orifice flowing approximately parallel to the side wall. This will result in a high pressure at the side wall located at the at least one supply duct and a displacement flow will be build out towards the opposite side wall. At the opposite side wall, at least one return duct is arranged which results in a low pressure area adjacent to this side wall so that a flow parallel to the sidewall in direction to the return duct is formed.

[0022] In some embodiments of the invention, the orifice may include a baffle. Such a baffle may be used to guide the temperature control fluid in a predefined direction. Furthermore, the baffle may be used to protect the orifice from dust or dirt entering the ducts.

[0023] In some embodiments, the baffle adjacent to a lower duct is designed to overlap the height of a freight pallet. In some embodiments, the baffle adjacent to an upper duct overlaps the maximum loading line. This feature has the advantage, that a parasitic temperature control fluid flow on top of the cargo or below the freight pallet is avoided so that a larger portion of the temperature control fluid is flowing through the cargo.

[0024] In some embodiments, the insulated container comprises further at least one sealing element being attached to a sidewall. The sealing element will help avoiding parasitic temperature control fluid flows on top of the cargo or below the freight pallet so that the temperature control fluid flow is restricted to the cargo, thereby improving the use of the cooling capacity.

[0025] In some embodiments of the invention, the sealing element comprises a brush seal. A brush seal has low wear and is self-adjusting to different gap sizes between the side wall and the cargo.

[0026] In some embodiments, the sealing element is arranged at a distance from approximately 10 cm to approximately 20 cm from the inner face of the bottom wall. As a known pallet has usually a height of 15 cm, the sealing element will help to make a tight seal between the side wall and the freight pallet so that an unwanted and useless flow of temperature control fluid under the freight pallet can be avoided.

[0027] In some embodiments, the insulated container may comprise an inflatable elastic bag being arranged on any of the top wall and/or the rear wall and/or the front wall. Such an elastic bag can be in smooth contact with the cargo when inflated so that a tight seal between the cargo and the respective wall is made. This may avoid parasitic flows of the temperature control fluid around a block of cargo so that the cooling capacity is not only used at the outer surfaces of the cargo, but inside the cargo volume.

[0028] In some embodiments, the elastic bag is adapted to be filled with temperature control fluid. This allows the fully automatic operation of the elastic bag as the bag inflates automatically when the refrigeration unit is switched on and the flow of temperature control fluid forms inside the insulated container builds up. Additionally, this allows the elastic bag to provide radiant cooling when being filled with temperature control fluid at a controlled temperature. In some embodiments, the insulated container may comprise further a groove in any of the top wall and/or the rear wall and/or the front wall, said groove being adapted to receive the elastic bag when being deflated. The elastic bag is protected inside the groove when not in use so that a damage during cargo handling may be avoided.

[0029] In some embodiments of the invention, the insulated container may comprise further at least one closed channel running in the bottom wall and/or the top wall. Temperature control fluid may be guided through these closed channels so that a temperature exchange between the cargo and the temperature control fluid by radiant heat becomes possible. As the channel running in the bottom wall is a closed channel, the entrance of dirt and ingress is impossible and other than known T-grates, the channel does not need frequent cleaning.

[0030] In some embodiments of the invention, the container comprises further at least one closed channel running in the rear wall or in the side wall(s) in the proximity of the door end. In some embodiments, the closed channel running in the bottom wall connects to at least one closed channel running in the top wall by means of the closed channel running in the rear wall. Thus, a single closed flow path may be provided from the top wall through the rear wall to the bottom wall.

[0031] In some embodiments of the invention, any of the inner faces of the bottom wall and/or the rear wall and/or the top wall are flat. This allows for easy cleaning of the interior volume so that the hygienic performance of the insulated container is improved.

[0032] The invention will be explained in greater detail on the basis of the attached drawings wherein

Fig. 1 shows a cross-sectional view of an empty container according to the invention.

Fig. 2 shows a cross-sectional view of an insulated container according to the invention with cargo.

Fig. 3 shows an upper duct in greater detail.

Fig. 4 shows the top wall of Fig. 2 in greater detail.

Fig. 5 shows an upper supply duct in greater detail.

Fig. 6 shows an upper return duct in greater detail.

Fig. 7 shows a lower supply duct in greater detail.

Fig. 8 shows a lower return duct in greater detail.

[0033] Fig. 1 shows a cross-sectional view of an insulated container 100. The insulated container 100 comprises a first side wall 110 and a second side wall 120. Furthermore, the container comprises a bottom wall 130 and a top wall 140. A rear wall and a front wall are not shown in Fig. 1. Each wall comprises an inner face 112, 122, 132 and 142 respectively. The inner faces of the walls delimit an interior volume 101.

[0034] Additionally, each wall comprises an outer face 111, 121, 131 and 141. Between the inner faces 112, 122, 132 and 142 and the outer faces 111, 121, 131 and 141, an insulating layer 150 of insulating material is present. The insulating material may be selected from any of mineral wool and/or rigid form and/or a vacuum insulation in some embodiments of the invention. The insulated container may have a width, a length and a height of a standardized ISO freight container. At the bottom wall 130, feet 102 may be provided to allow easy handling of the insulated container by a fork lift.

[0035] The insulated container 100 comprises temperature control fluid distribution means 103. The temperature control fluid distribution means 103 comprise ducts 165, 175, 185 and 195 which are arranged in each corner of the interior volume 101. As can be best seen from Fig. 3, each temperature control fluid distribution means 103 comprises further an orifice 164 which is delimited against the interior volume 101 by means of a baffle 160. The baffle 160 may allow guidance of the flow emerging from the orifice 164 so that the temperature control fluid flows along the inner face 112 of the side wall 110.

[0036] Additionally, closed channels 105 are arranged on the inner face 142 of the top wall and the inner face 132 of the bottom wall 130 of the insulated container 100. Temperature control fluid flowing inside the closed channels 105 may allow cooling down the bottom and the ceiling of the insulated container so that radiant heat from the cargo may be removed from the insulated container 100.

[0037] In some embodiments of the invention, cargo such as bananas may be cooled down rapidly by providing a first flow of temperature control fluid penetrating the cargo by means of the temperature control fluid distribution means 103. After the cargo has reached its target temperature, the first flow of temperature control fluid may be stopped. Cooling power for steady state temperature control may be provided by circulating a second flow of temperature control fluid through closed channels 105. This method has the advantage that the cargo may not dry out as no first flow of temperature control fluid carrying humidity out of the interior 101 of container 100 has to be maintained fo prolonged periods of transportation.

[0038] Fig. 2 shows a container as detailed in Fig. 1 loaded with cargo 25. The cargo 25 is arranged on freight pallets 20. The container 100 may be loaded and unloaded in a known manner by means of a fork lift. As can be seen from Fig. 2, the seal 30 being arranged on the side walls 110 and 120 seals the freight pallet against the side walls so that an unwanted flow of temperature control fluid from one side to the other side under the cargo 25 is avoided.

[0039] Fig. 1 and Fig. 3 show an inflatable bag 35 being arranged on the top wall of the container 100. The inflatable bag 35 can be received in a groove 36 when deflated. Thus, damage of the inflatable bag 35 during loading and unloading of the container 100 can be avoided. Fig. 2 and Fig. 4 show the inflatable bag 35 during operation of the container 100. The inflatable bag 35 may be inflated with temperature control fluid so that a seal is provided between the cargo 25 and the inner face 142 of the top wall 140, thereby avoiding an unwanted flow of temperature control fluid over the cargo 25.

[0040] Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7 and Fig. 8 explain the flow of temperature control fluid during operation of the container in greater detail. In the exemplary embodiment shown, two supply ducts 165 and 185 are provided adjacent to the first side wall 110 and two return ducts 175 and 195 are provided adjacent to the second side wall 120. Temperature control fluid enters the container close to the first side wall 110 by means of the supply ducts 165 and 185 and the orifice 164 and 184. The temperature control fluid is guided by the baffles 160 and 180 along the inner face 112 of the first side wall 110.

[0041] From the first side wall 110, the temperature control fluid enters the cargo 25 and flows to the second side wall 120. On its way, the temperature control fluid exchanges heat and/or humidity with the cargo 25. The cargo 25 may be arranged in crates or other appropriate packaging material and form in order to allow the passage of the temperature control fluid therethrough.

[0042] Close to the inner face 122 of the second side wall 120, the temperature control fluid flow is bent towards the intersection of the bottom wall and the side wall and the intersection of the top wall and the side wall. The temperature control fluid flows along the second side wall 122 and is sucked by the orifice 174 and 194 in the return ducts 175 and 195. Optional baffles 170 and 190 are provided to guide the flow along the inner face 122 of the second side wall 120. The temperature control fluid is then guided by the return ducts 175 and 195 to the refrigeration unit. The refrigeration unit will bring the temperature control fluid to a predetermined composition and/or temperature and/or humidity before the temperature control fluid will enter the container 100 again by means of the supply ducts 165 and 185.

[0043] While the invention has been described in terms of several embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described, but can be practiced with modification and alteration within the spirit and scope of the appended claims. The description is thus to be regarded as illustrative instead of limiting. Therefore, it is intended that this invention be limited only by the claims and the equivalents thereof.

Claims

1. Insulated container (100) or room comprising side walls (110, 120), a bottom wall (130), a top wall (140), a rear wall and a front wall, wherein the walls each comprise an inner face (112, 122, 132, 142) and an outer face (111, 121, 131, 141) and an insulating layer (150) of insulating material, the insulated container or the room further comprising temperature control fluid distribution means (103) for distributing temperature control fluid inside the insulated container (100) or room,
wherein the temperature control fluid distribution means (103) comprise at least two ducts (165, 175, 185, 195) being adapted to guide the temperature control fluid along the side walls (110, 120) and having each at least one orifice (164, 174, 184, 194) being adapted to allow a flow (40) of temperature control fluid from one side wall (110) of the container (100) or room to the other side wall (120) of the container (100) or room.

2. Insulated container according to claim 1, wherein at least one upper duct (165, 175) is located at the intersection of a sidewall (110, 120) and the top wall (140) and/or wherein at least one lower duct (185, 195) is located at the intersection of a sidewall (110, 120) and the bottom wall (130).

3. Insulated container according to claim 1 or 2, wherein at least one orifice (164, 174, 184, 194) is formed

by a gap between the inner face (112, 122) of a sidewall (110, 120) and a boundary of the duct (165, 175, 185, 195).

4. Insulated container according to any of claims 1 to 3, wherein the orifice (164, 174, 184, 194) includes a baffle (160, 170, 180, 190).

5. Insulated container according to claim 4, wherein the baffle (180, 190) adjacent to a lower duct (185, 195) is designed to overlap the height of a freight pallet (20) and/or wherein the baffle (160, 170) adjacent to an upper duct (165, 175) overlaps the maximum loading line.

6. Insulated container according to any of claims 1 to 5 comprising further a sealing element (30) being attached to a side wall (110, 120).

7. Insulated container according to claim 6, wherein the sealing element (30) comprises a brush seal and/or wherein the sealing element (30) is arranged at a distance from 10 cm to 20 cm from the inner face (132) of the bottom wall (130).

8. Insulated container according to any of claims 1 to 7, comprising further an inflatable elastic bag (35) being arranged on any of the top wall (140) and/or the rear wall and/or the front wall.

9. Insulated container according claim 8, wherein the elastic bag (35) is adapted to be filled by temperature control fluid.

10. Insulated container according to any of claims 8 or 9, comprising further a groove (36) in any of the top wall (140) and/or the rear wall and/or the front wall, said groove (36) being adapted to receive the elastic bag (35) when being deflated.

11. Insulated container (1) according to any of claims 1 to 9, comprising further at least one closed channel (105) running in the bottom wall (130) and/or comprising further at least one closed channel (105) running in the top wall (140) and/or comprising further at least one closed channel running in the rear wall.

12. Insulated container according to claim 11, wherein said closed channel (105) running in the bottom wall (130) connects to said at least one closed channel (105) running in the top wall (140) by means of said at least one closed channel running in the rear wall.

13. Insulated container according to any of claims 11 or 12, wherein any of the inner faces (132, 142) of the bottom wall (130) and/or the rear wall and/or the top wall (140) are flat and/or wherein said at least one closed channels (105) running in any of the bottom wall (130) and/or the rear wall and/or the top wall (140) are sealed against the interior volume (101) of the container.

14. Method for cooling cargo (25) in an insulated container (100) comprising side walls (110, 120), a bottom wall (130), a top wall (140), a rear wall and a front wall, wherein the walls each comprise an inner face (111, 121, 131, 141) and an outer face (112, 122, 132, 142) and an insulating layer (150) of insulating material, the insulated container further comprising temperature control fluid distribution means (103) for distributing temperature control fluid in the insulated container (100), said method comprising the following steps:

- Providing a temperature control fluid having a predefined temperature and/or humidity, and
- Providing a flow of said temperature control fluid originating from one side wall (110) to the opposing side wall (120).

15. Method according to claim 15, wherein a predefined temperature of any of the bottom wall (130) and/or the top wall (140) and/or the rear wall is maintained by means of a temperature control fluid flowing in at least one closed channel (105) being located in any of the bottom wall (130) and/or the top wall (140) and/or the rear wall.

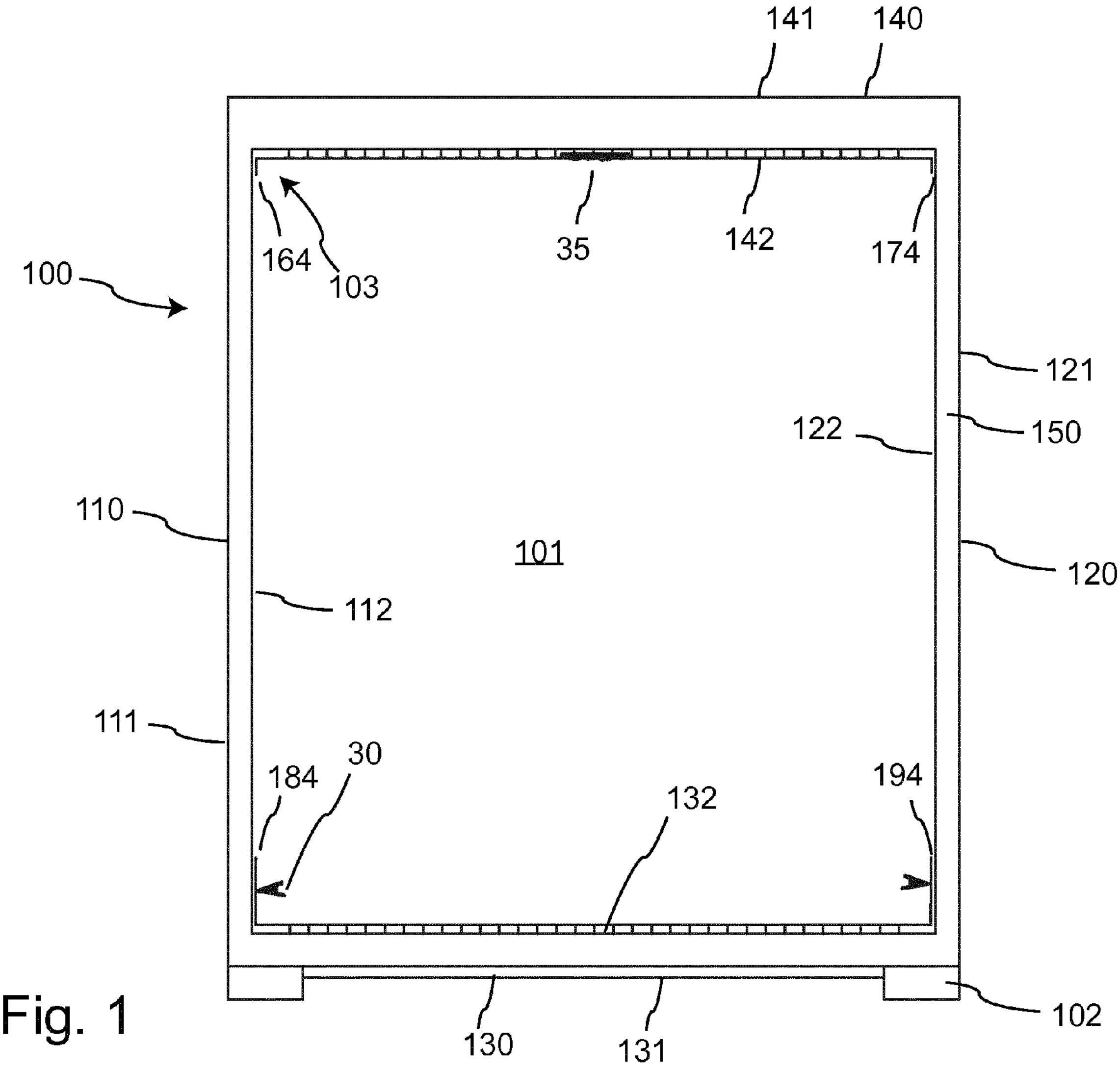
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Fig. 1

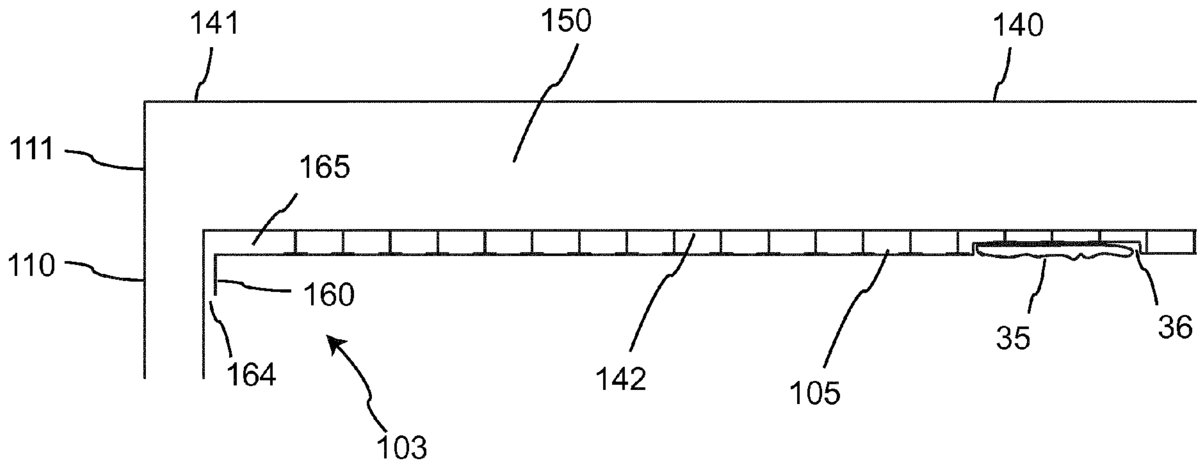
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Fig. 3

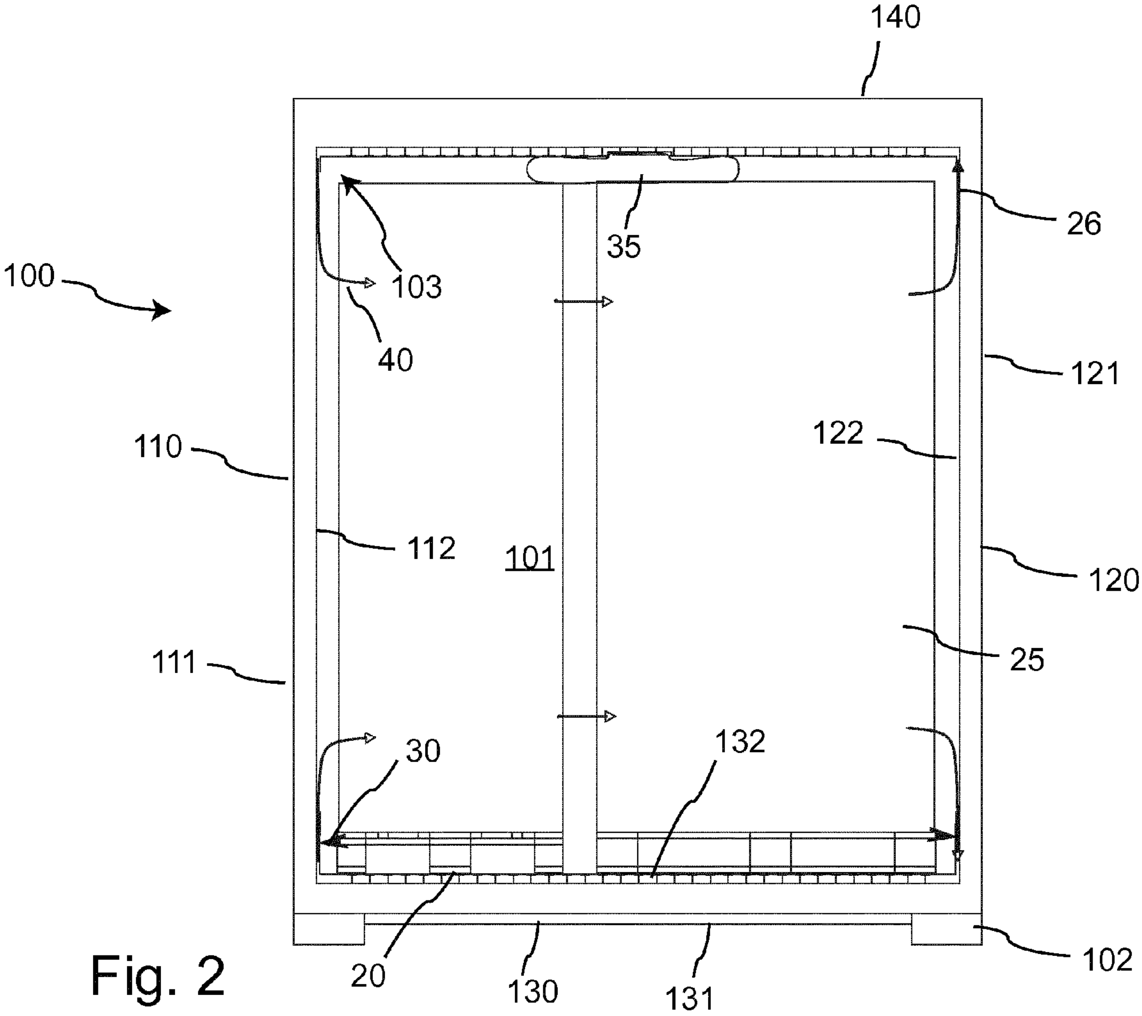
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Fig. 2

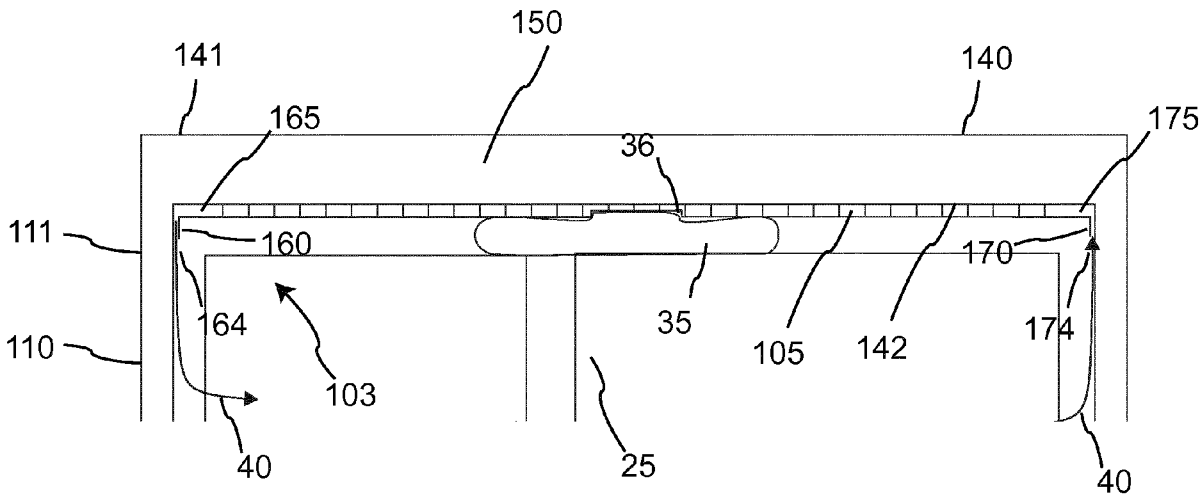
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Fig. 4

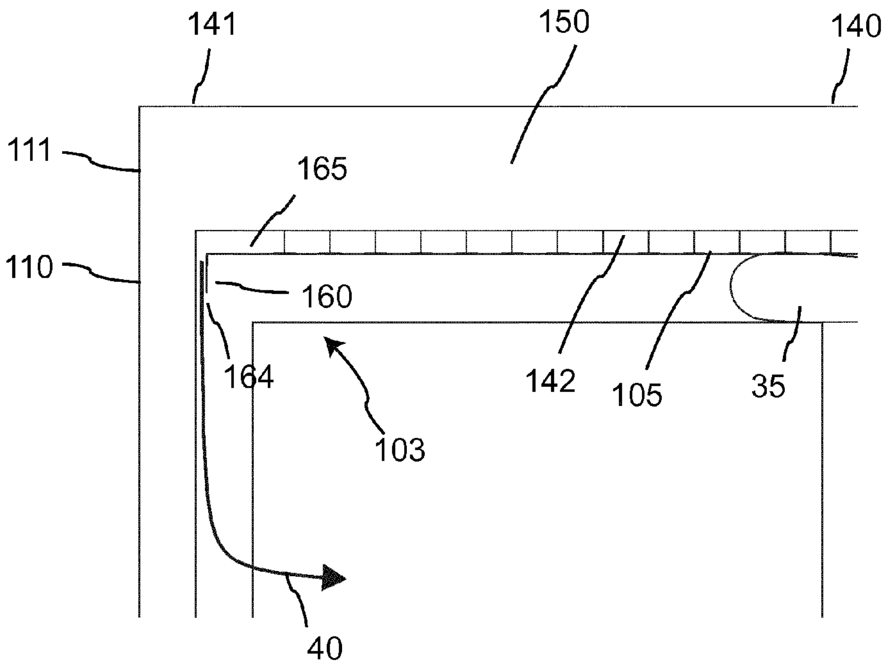
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Fig. 5

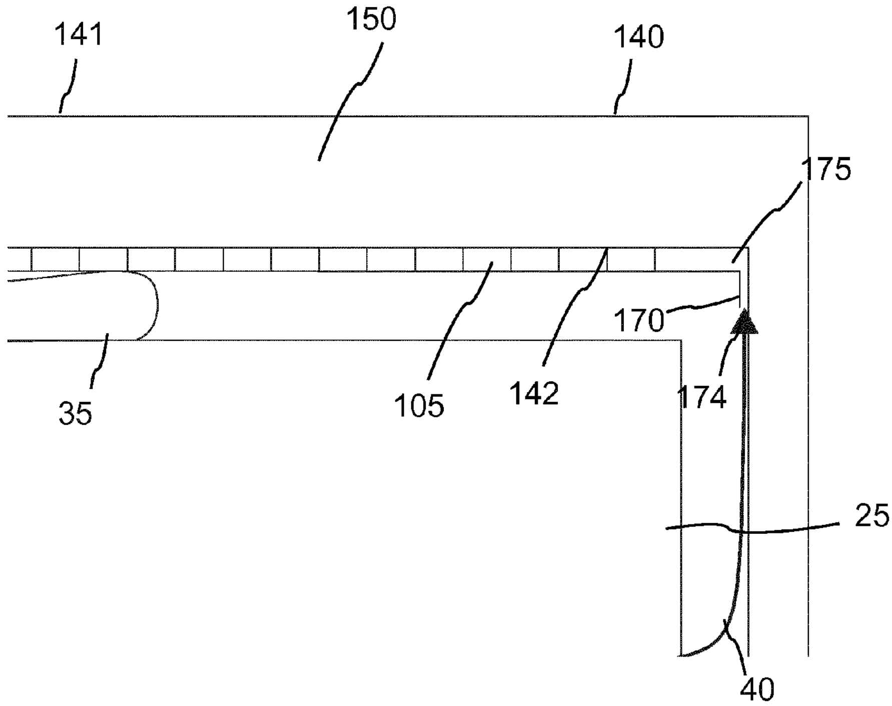
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Fig. 6

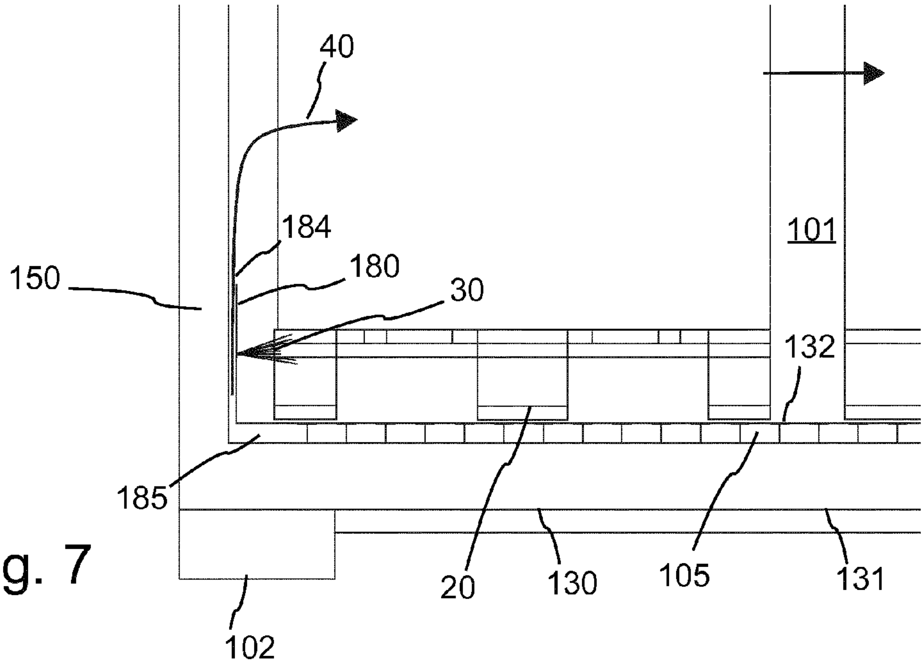
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Fig. 7

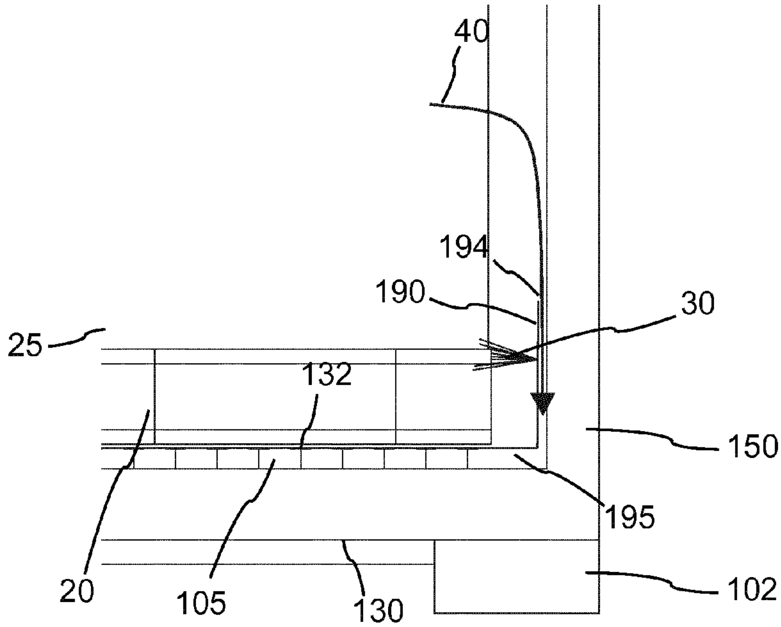
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Fig. 8

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 16 8761

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	FR 2 046 306 A5 (INTERFRIGO) 5 March 1971 (1971-03-05) * page 5, line 12 - page 11, line 39 * * figures 1-15 *	1-15	INV. B65D88/74 F25D11/00
X	US 4 899 554 A (KATO ISAO [JP] ET AL) 13 February 1990 (1990-02-13) * column 2, line 15 - column 3, line 26 * * figures 1, 2 *	1-5,11, 13-15	
X	US 2004/177895 A1 (DALE ROBERT [CA]) 16 September 2004 (2004-09-16) * page 1, paragraph 14 - page 2, paragraph 32 * * figures 1-9 *	1,4,11, 13,14	
A	WO 2007/129280 A1 (PERISHABLE PRODUCTS EXP CONTRO [ZA]; DODD MALCOLM CAULTON [ZA]; WORTHI) 15 November 2007 (2007-11-15) * page 4, line 24 - page 6, line 25 * * figures 1, 2 *	1,8	TECHNICAL FIELDS SEARCHED (IPC)
A	JP 2006 001401 A (MAEKAWA SEISAKUSHO KK) 5 January 2006 (2006-01-05) * abstract; figures 1-6, 13-16 *	1	B65D F25D B60P F24F
A	WO 94/28319 A1 (ACTIONENERGY LTD [GB]; GOMEZ ENRIQUE LLORENTE [ES]) 8 December 1994 (1994-12-08) * abstract; figure 1 *	12,15	

The present search report has been drawn up for all claims

2

Place of search	Date of completion of the search	Examiner
Munich	23 October 2014	Piolat, Olivier

CATEGORY OF CITED DOCUMENTS

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The members are as contained in the European Patent Office EDP file on
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23-10-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2046306 A5	05-03-1971	BE 731808 A	01-10-1969
		FR 2046306 A5	05-03-1971
		GB 1251471 A	27-10-1971
US 4899554 A	13-02-1990	NONE	
US 2004177895 A1	16-09-2004	US 2004177895 A1	16-09-2004
		US 2006060659 A1	23-03-2006
WO 2007129280 A1	15-11-2007	WO 2007129280 A1	15-11-2007
		ZA 200900716 A	30-12-2009
JP 2006001401 A	05-01-2006	NONE	
WO 9428319 A1	08-12-1994	AU 4725093 A	20-12-1994
		EP 0701677 A1	20-03-1996
		ES 2115775 T3	01-07-1998
		JP H0712442 A	17-01-1995
		WO 9428319 A1	08-12-1994

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2535296 A1 **[0002]**