

The invention relates to a cooled products container for cooling a cooled product in a container by means of a cooling medium which can be evaporated by the supply of heat, wherein the interior space of the container has a cooled product section with heat insulating walls and a cooling medium section accommodating the cooling medium, which are connected together via a pressure pipe system, the entry of which into the cooled product section is arranged remote from an outlet opening connected with the external surroundings. Cooled product containers for the receipt of a cooled product which work independently of the supply of energy from outside are known in various embodiments, above all as mobile and/or transportable containers as are used particularly in the transport area e.g. on the railways and in air transport to a very substantial extent. Using such cooled product containers, using a suitable cooling medium e.g. dry ice (solid CO_2) the cooled product should be able to be maintained over a given period of time below the temperature of the surroundings. Such containers are also used as meal time and foodstuffs containers which serve for taking care of passengers. In this connection normally current health regulations require that the meals or foodstuffs are maintained in a given temperature range.

The cooling action of such cooled goods containers depends on the fact that the dry ice which is overwhelmingly used as the cooling medium is, under a supply of heat from the surroundings or from the cooled goods container, brought to evaporate and the cold gas which thereby arises, which is heavier than air, is fed under the action of gravity into the interior of the cooled product container. Thereby, as long as the supply of dry ice is sufficient, the heat losses through the walls of the cooled products container can be wholly or at least partly compensated.

FR-A No: 2188122 shows a cooled products container in

which the interior space is divided into a cooling medium²⁶ portion for the receipt of the cooling medium and into a cooled product portion for the storing of the cooled products, wherein the cooling medium portion is located directly below the lid of the container. The cold gas arising from the cooling medium is fed in a channel on a side wall of the container downwardly to the cooled product portion and reaches this via guide flaps. The cooled product portion is connected with the exterior surroundings via openings.

The cooling medium portion itself is indeed insulated both with respect to the lid of the container and also relative to the cooled product portion, but otherwise the container has no further heat insulation so that the heat of evaporation (sublimation heat) of the cooling medium is extracted to a substantial degree to the surroundings, and no longer comes to act on the cooled products. Since the heat of evaporation in the case of dry ice can give rise to the substantially greater portion of the cooling action than the heating up of the cold carbon dioxide gas arising thereby, the losses in the known cooled products containers are large, and accordingly they show a worse degree of thermal efficiency quite apart from the fact that also no even cooling action comes to take place in the cooled product portion and accordingly cooled products stored in the neighbourhood of the cooling medium portion can be more strongly cooled or even too strongly cooled. Likewise isolation between the cooling medium portion relative to the cooled product portion reduces the cooling action.

From US-A No: 1880735 a cooled products container with separate cooling medium and cooled product portion is known in which the cooling gas is fed around the cooled product portion and enters into the cooled product portion oppositely from the cooling medium portion. Via openings the gas is fed back again into the cooling medium portion but it can also dissipate to the exterior via other openings.

US-A No: 2263522 also shows something similar. Both cooled containers have the disadvantage that they have essentially evenly insulated walls so that the circulation of the cooling gas depends solely on its density and the interaction with the outlet openings. Another thing is that because of the direct introduction of the cooling medium into the cooling medium portion this leads, on using up of the cooling medium, to contamination, which can only be avoided with difficulty. Herein lies the invention, which is underlain by the problem of so constructing a cooled products container of the initially described type that an improvement of its thermal efficiency is achieved, wherein simultaneously an increase of the circulation speed of the cold gases in the cooled product portion and a controlled outflow of this circulation are achieved.

This problem is solved in accordance with the invention in that the cooling medium portion is a tightly sealed pressure space which is connected via the pressure pipe system with the lower region of the cooled product portion and which has highly heat insulating wall portions and has against the cooled product portion non- or only weakly heat insulating wall portions, and that the walls of the cooled product portion arranged at a distance from one another are differentially heat insulated for the achievement or promotion of a thermo siphon action, wherein the wall in which the outlet opening is arranged in its upper region is more weakly insulated than the wall lying opposite it.

By means of the series circuit, cooling medium portion - cooled products portion - exterior surroundings, it is achieved at once that a pressure drop arises so that the cold gases arising are guided in a forced circulation mode. The mixing up is further promoted by means of the different temperature conditions between the differently insulated walls.

The invention is illustrated in an exemplary

embodiment in the accompanying drawing and described in what follows. The Figure shows a vertical section through a cooled products container without an external energy supply.

The cooled container illustrated has insulated walls, of which a floor 1, a rear wall 2 and a lid 3 are illustrated. The cooled container is divided into a cooling medium part 5 and into a substantially larger cooled product portion 6. The cooled products container is closed via a likewise heat insulated door 4. In the cooling medium part there is slid in a container 7 for the receipt of a cooling medium 8, the walls of which are closed off pressure tight, wherein only the part of the wall 9 lying against the cooled products part 6 is less strongly thermally insulated. The remaining wall portions of the cooling medium container 7 are in contrast highly insulated in order to extract no heat of evaporation from the exterior surroundings, which would be equivalent to a diminution of the thermal efficiency of the cooled products container.

In order that a really satisfactory functioning of such a cooled products container is achieved, an even distribution of temperature in the interior of the container is essential. Since the temperature difference present between the carbon dioxide gas, the sublimation temperature of which is -78.5°C at 760 Torr and the cooled products having a temperature of 6 to 18°C for foodstuffs and meals, is substantial, a circulation and mixing-up of the quantities of gas in the interior of the cooled products part 6 should be striven for. This is achieved by means of the measures mentioned in what follows.

In the cooling medium container 7 on the rear wall 2 there is arranged at least one opening 10 which is sealed pressure tightly against the rear wall 2 by means of soft seal 11, and which leaves free a connection to a pressure pipe system 12 which is integrated into the rear wall 2 of the cooled products container. By means of at least one opening 13 a connection is formed to the cooled product

portion 6 which for example lies in the region of the 29 floor'1. Above the door 4 at least one further opening 14 is provided.

Because of the fact that heat is fed to the cooling medium e.g. dry ice in the pressure tight closed cooling medium container 7, there arises on evaporation in the interior of container 7 an excess pressure which is used in order to set up a forced circulation in the interior of the cooled product portion. This is achieved by the pressure pipe system 12 with the openings 13, 14 to the cooled product portion 6 and to the exterior surroundings. Pressure conditions arise which lead to a forced passage with a forced circulation of the cooling agent in the cooled products part. The circulation of the quantities of gas is thereby improved in that the openings 13, 14 are arranged in oppositely set walls and additionally are arranged diametrically staggered.

Since in addition to this the rear wall 2 with the feed system 12 is colder than the less insulated wall of the door 4, the forced circulation mentioned is strengthened by a gravity circulation as a result of the thermo siphon action. Obviously the cold and warm walls can be arranged otherwise than in the example illustrated in the Figure.

By means of the construction of the cooled products container described it is accordingly achieved that the quantities of gas which arise by means of the sublimation of the cooling medium flow under a forced flow with forced circulation through the cooled product portion 6, that furthermore by the arrangement of "colder" and "warmer" walls this forced circulation is amplified by thermo siphon action and that the heat for the evaporation of the cooling medium 8 is taken from the cooled product portion 6. From this a cooled products container results in which an even cooling of the cooled product stored e.g. in portions 15 in the cooled product portion 6 can be guaranteed and which show a high thermal efficiency. If at individual positions of the cooled product portion 6

the cooling action should be too intensive, this can easily be alleviated by a screening 16 e.g. by plates or foils in the region of the cooling medium container 7 or of the opening 13.

The cooled goods container described can also be somewhat varied. The pressure feed system 12 can be constructed, instead of being in only one wall, in two or in several walls. Also two or more openings 13, 14 can be provided which additionally can be arranged at other places. Correspondingly also the arrangement of "warm" or "cold" walls can be different. The wall 9 can be lightly or non-insulated. In each case however the forced circulation and the thermo siphon action are effective.

Patent Claims

1. Cooled products container for cooling a cooled product in a container by means of a cooling medium (8) which can be evaporated by the supply of heat, wherein the interior space of the container has a cooled products portion (6) with heat insulating walls (1 - 4) and a cooling medium part (5) accommodating the cooling medium (8), which are connected with one another via a pressure pipe system (12), the entry (13) of which into the cooled product portion (6) is arranged remote from an outlet opening (14) connecting with the exterior surroundings, characterised in that the cooling medium part (5) is a tightly sealed off pressure space (7) which is connected via the pressure pipe system (12) with the lower region of the cooled product portion (6) and which has strongly insulating wall portions and relative to the cooled product portion (6) non or only weakly heat insulating wall parts (9), and that the walls (2 and 4) arranged at a distance to one another of the cooled product portion (6) are differentially heat insulated in order to achieve or promote a thermo siphon action, wherein the wall (4) in which the outlet opening (14) is arranged in its upper region, is more weakly insulated than the wall (2) lying

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opposite it.

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2. Cooled products container according to claim 1 characterised in that the pressure pipe system (12) is located in the more strongly insulated rear wall (2) of the cooled product portion (6) and that the lesser insulated wall is constructed as door (4), over which the outlet opening (14) is located.

