refrigerating part is located halfway the length of the galley container, the passage of trays from front to back or vice versa is blocked.

Additionally, the above described passive refrigerator unit, but also any active cooling element, will take up valuable space within the galley container, leaving less space for food products or any other contents of the galley container. A refrigerator unit that combines a relatively small volume with passive cooling of the interior of the galley container would be desired. Still further, because of its position within the interior of the galley container, the refrigerator unit must be inserted into the container before the container is sealed, which may occur long before the container is loaded onto the airplane.

It would therefore be desirable to provide an alternative way to passively control cooling of food product and/or the interior of a galley container that alleviates at least some of the perceived inconveniences of the prior art.

Summary of the invention

According to a first aspect of the invention, there is provided a galley container for an aircraft, comprising ~~a first shell having a peripheral rim defining an opening for access to an interior of the galley container, a second shell within the first shell, the second shell having a further peripheral rim, wherein each shell comprises a roof element, a floor element and at least two sidewalls. The galley container further comprises a thermally insulating layer, thermally insulating the second shell from an exterior of the galley container, a receiving portion for receiving a cooling element, which receiving portion is provided within the first shell, and at least one door provided at the opening to close the galley container in a closed position of the door, wherein the second shell and the receiving portion are insulated from each other and are provided with a thermally conductive connection such that heat is transferrable between the receiving portion and the interior of the galley container via the second shell.~~ a first shell having a peripheral rim defining an opening for access to an interior of the galley container; a second shell within the first shell, having a further peripheral rim, the second shell being formed of a material of high thermal conductivity, wherein the second shell encloses the interior of the galley container; wherein each shell comprises a roof element, a floor element and at least two sidewalls, the galley container further comprising: a thermally insulating layer, thermally insulating the second shell from an

exterior of the galley container; a receiving portion for receiving a cooling element or a coolant, which receiving portion is provided within the first shell and is thermally insulated both from the exterior of the galley container and from the second shell, wherein the second shell and the receiving porition are provided with a thermally conductive connection such that heat is transferrable between the receiving portion and the interior of the galley container through the thermal conductive connection and via the second shell; and at least one door provided at the opening to close the galley container in a closed position of the door. The thermally conductive connection comprises in one embodiment a direct metal-to-metal connection. Heat can also be transferred by means of one or several heat pipes specifically provided for this purpose.

The first shell is an outer shell, but not necessarily an outermost shell. The second shell is an inner shell, but not necessarily an innermost shell. The thermally insulating layer can be provided between the first and second shell. Alternatively, the first shell

and the thermally insulating layer can be integral, i.e. forming a single layer with the first shell being an exterior surface of the thermally insulating layer. The first shell can be manufactured from any lightweight material, preferably with good strength to weight ratio, such as aluminium or a composite material.

In the field of galley containers for aviation use, strict requirements are provided by the aviation authorities in terms of strength, hygiene and the like. In order to meet these requirements, galley containers generally include connecting elements between the respective panels that effectively form a conductive bridge between an interior and an exterior of the container. According to one ~~aspect~~ embodiment of the invention, the thermally insulating layer can be used to thermally separate, i.e. thermally insulate, the first and second shells from each other. In other words, the second shell can additionally be thermally insulated from the first shell. Preferably, the thermally insulating layer encloses or surrounds the second shell from a first end to a second end, the ends each being defined by a peripheral rim, respectively, to establish a thermal separation of the first and second shell. Most preferably, the first and second shells are insulated from each other without any metal-to-metal contact either between the respective roof, floor and sidewall elements or via the doors.

The receiving portion is provided within the first shell, for instance in an inside of the first shell, or between the first and second shell, or within the second shell that is in its turn within the first shell. Preferably, the receiving portion is enclosed or surrounded by the thermally insulating layer or by a further insulating layer to ensure that the receiving portion is itself adequately insulated from both the first shell and the second shell. The thermally conductive connection may be calibrated to transfer an amount of heat at least equal to the heat transferred from the exterior of the galley container to the interior of the galley container through the first and second shells at least during an initial period of use. In case of equal amount of transferred heat, the temperature within the galley container and thus of the food products will stay constant. If the heat transferred via the thermal connection is larger than the heat transferred from the exterior to the interior of the galley container, the temperature of the interior of the galley container, and thus the food products, will decrease. For only passive control of the temperature in the interior of the galley container, the thermally conductive connection may be designed such that the amounts of heat transferred can be kept equal

over the intended operating range. The galley container according to the invention may thus operate without active cooling or without any form of electrical cooling power.

The receiving portion is preferably located above the roof element of the second shell and thermally insulated by a separating wall to prevent or minimise direct heat transfer by conduction, convection or radiation from the roof element of the second shell. In prior designs, heat transfer from the roof of the second shell has been encouraged by the presence of direct conducting connections or by the provision of openings through which cold air may pass. This has led to an upper portion of the interior of the galley container becoming significantly colder than the lower portion. It will be understood that the thermally insulated separating wall will always allow some direct heat transfer but that the direct heat transfer may be significantly less than the case where the separating wall were not insulated. Furthermore, the separating wall may be hermetic whereby no air can pass between the interior of the second shell and the receiving portion. In general however, at least some openings may be required for drainage purposes on washing of the galley container. These small openings do not in this case have the primary function of heat transfer.

In one embodiment, the separating wall may partially insulate the receiving portion from the roof element of the second shell such that conduction only takes place at discrete points. According to an ~~aspect~~ embodiment of the present invention, the separating wall may insulate the roof element of the second shell over its entire surface. Primary heat transfer to the receiving portion may then take place by a thermally conducting connection to the sidewalls. Since the second shell is thermally conducting, the sidewalls can better collect heat from all regions of the interior of the galley container leading to a more even temperature distribution.

According to an embodiment, the thermally conducting connection between the receiving portion and the second shell comprises a heat transfer device. The heat transfer device may comprise heat conducting elements directly connected to and extending along the second shell. A preferred heat transfer device comprises a heat pipe that in use transfers heat from the interior of the galley container with a heat transfer fluid to the receiving portion, where the heat is transferred to the cooling element. Subsequently, the heat transfer fluid is cooled by the cooling element, and in its turn will cool the interior of the galley container. In the heat pipe, the heat transfer fluid changes phase constantly, from liquid to gas and from gas to liquid. A flat heat pipe is

According to an embodiment, a sealing element is provided between the side walls of the first shell and the roof element and the floor element, respectively, to prevent outside air entering the interior of the galley container. Additionally, leakages can occur within the connections between the side walls, the roof element and the floor element of the galley container. Exterior air may then enter the interior of the galley container and influence the cooling properties of the galley container, and the food quality. Preferably, the insulating and sealing functions are combined in one element. It will nevertheless be understood that for use on board airplanes, the galley container must not be completely sealed in order to compensate for pressure changes during the flight.

The second shell can be made of any material having a high thermal conductivity. Preferably, the material has a thermal conductivity comparable to aluminium, more preferably combined with a good strength to weight ratio like aluminium.

According to another embodiment, an inside of the second shell is provided with a further thermally insulating layer. In order to control the heat transfer from a cooling element or coolant receivable within the receiving portion, a further thermally insulating layer may be provided within the inside of the second shell, at least partly covering an inside surface of the second shell. Nevertheless, for airplane usage and in order to comply with aviation regulations an aluminium inside surface of the second shell is preferred.

~~The~~ According to a second part of the present invention, ~~further relates~~ there is provided ~~to~~ a cooling element for a galley container as described ~~above~~herein, the cooling element comprising a container for containing a coolant, and a heat transfer element to transfer heat between the container and an outside of the cooling element along at least part of the container and the outside of the cooling element, wherein the heat transfer element comprises a corrugated plate forming part of a peripheral wall of the cooling element, wherein corrugations are alternately tangential to at least part of an outside of the container along respective tangential regions, thereby establishing a thermal bridge between the container and the outside of the cooling element. The coolant may be dry ice, i.e. solid carbon dioxide, having a temperature of about -80°C. However, other coolants with comparable properties as dry ice may be used as well. The heat transfer element can comprise a heat transfer layer, thereby forming a contact

surface with the container and the outside of the cooling element along at least part of an outside surface of the cooling element and/or an outside of the container.

According to an embodiment, the cooling element comprises a thermally insulating layer to thermally insulate the container from an exterior of the cooling element. By thermally insulating the container from an exterior of the cooling element,

the rate of dissipation of the dry ice can be decreased in a controlled manner, such that the cooling ability of the dry ice can last for the desired length of time, for instance a long-haul flight of an airplane. For a controlled heat transfer, insulation may be necessary, as upon direct contact between the coolant and the second shell, the coolant will dissipate too rapidly due to the heat conductive properties of the second shell.

According to a preferred embodiment, the heat transfer element forms part of the thermally insulating layer. By combining the functions of heat transfer and thermal insulation, the required space for both can be limited.

According to another embodiment, the cooling element comprises a housing, the container being receivable in the housing. The housing could for instance be a cassette that in its turn can be put into the receiving portion of the galley container as described above. Additionally, by using a housing, the cooling element can be stored and/or transported separately from the galley container. Another advantage of using a housing is that further leakage can be prevented of the coolant to the exterior of the cooling element, for instance by providing an additional sealing element between the container and the housing. Preferably, the container is a drawer slideably receivable within a housing enclosing the container.

According to a further embodiment, wherein the heat transfer element comprises a corrugated plate forming part of a peripheral wall of the cooling element, wherein corrugations are alternately tangential to at least part of an outside of the container along respective tangential regions, thereby establishing a thermal bridge between the container and the outside of the cooling element. Preferably, the corrugated plate forms part of the peripheral wall of the housing and establishes a thermal bridge between the base of the housing and the base of the container or the roof of the second shell.

~~Furthermore,~~According to a third aspect of the invention, ~~relates~~ there is provided ~~to~~ an assembly of a galley container as described above and a cooling element as described above, wherein the cooling element is received within the receiving portion of the galley container, such that the heat transfer element of the cooling element and the second shell are connected to each other, thereby establishing a thermal connection between the cooling element and the second shell, such that heat is transferrable between the cooling element and an interior of the galley container via the second shell.

The advantage of such an assembly is that the temperature of the interior of the galley container can be kept constant over a longer period of time, such as the time needed for long-haul flight of an airplane.

With passive control of the temperature in the interior of the galley container according to the invention, the amounts of heat transferred is kept equal for at least part of a long-haul flight, such that until the end of the flight, the temperature within the galley container can be kept below 8°C. The galley container according to the invention may thus operate without active cooling or without any form of electrical cooling power. The skilled person will be well aware of the calculations and design criteria required to ensure that the thermally conductive connection is arranged to transfer an amount of heat at least equal to the heat transferred from the exterior of the galley container to the interior of the galley container through the first and second shells throughout the required operating range of the galley container.

The thermally conductive connection between the heat transfer element and the second shell can be an indirect connection, i.e. one or more elements can be placed in between, while still establishing a thermal connection between the cooling element and the second shell, or it can be a direct connection, i.e. the heat transfer element and the second shell are at least partly adjacent to each other. The direct connection then forms the thermally conductive connection between the cooling element and the second shell.

~~The invention further relates to~~According to a fourth aspect of the invention, there is provided a galley container for an aircraft, comprising an inner shell formed of thermally conducting material defining an interior of the galley container; a thermally insulating layer, thermally insulating the second shell from an exterior of the galley container; a receiving portion for receiving a cooling element; the receiving portion being insulated from the exterior of the galley container; a separating wall, thermally insulating the inner shell from the receiving portion; and a thermally conducting connection between the inner shell and the receiving portion. The thermally conducting connection is preferably an indirect connection that extends from the receiving portion to a part of the inner shell that is not adjacent to the receiving portion, such as the sidewalls, whereby the heat may be more effectively collected from the interior of the galley container. The galley container may include one or more of the features defined in the appended dependent claims.

Brief description of the drawings