

A GALLEY CONTAINER AND A COOLING ELEMENT TO COOL THE INTERIOR OF THE GALLEY CONTAINER

Field of the invention

- 5 The invention relates to a galley container, in particular a galley container for an aircraft. Additionally, the invention relates to a cooling element to cool the interior of the galley container. Furthermore, the invention relates to an assembly of such a galley container and such a cooling element.

10 Background of the invention

- During short or long journeys in a vehicle, in particular an aircraft, passengers are usually provided with at least a beverage or a snack. For this purpose, food products are carried on board of the vehicle, for example an airplane, in galley containers that can be stored in the onboard galleys. The galley container can be a galley trolley provided with
15 wheels for transportation. To be servable, food products should be kept at a temperature less than 8°C, preferably below 5°C, until they are served, to prevent spoilage. In case the temperature of the food is at a temperature above 8°C, the food will have to be distributed within a very short time period to be able to keep up with health regulations.

- Keeping food at a temperature at 8°C, preferably below 5°C, is particularly
20 problematic on long haul flights of 5-7 hours or longer. Even if the galley containers and their content are cool upon loading of the galley containers onboard of the aircraft, the interior of the galley containers and their contents will usually have reached a temperature above 8°C after a few hours or even less time. Food products that are still within the galley container will have to be disposed of, due to spoilage.

- 25 Galley containers have therefore been provided with all sorts of equipment to be able to cool their interior and content for longer periods of time. Active cooling using an active cooling element within the galley container requires electrical power, such as an electrical connection to the aircraft electronic system or a built-in electrical storage, e.g. a battery. Active cooling from outside, for instance by an active cooling element in
30 the galley itself during storage of the galley container, will require a cooling system connected to the electronic system of the aircraft.

The above-mentioned active cooling methods have the disadvantage that electricity is needed for the cooling element to cool the galley container and its

contents. In situations where electricity is not available, for instance if the aircraft's electrical system is shut down, or is defective, or if the battery is empty, cooling will not be possible and the temperature of the food product will rise, causing spoilage of the food products.

5 Another method of cooling a galley container is the use of passive cooling, i.e. cooling without the need of electricity. The passive refrigeration and preservation at serving temperature of food products and beverages transported in in-flight galley containers generally takes place by means of carbon dioxide ice, or dry ice, in a sheet or pellet form. As a refrigerant, carbon dioxide ice is very effective, but is often an
10 uneven substance that rapidly chills products and rapidly evaporates. At present, passive cooling of this type is used primarily during logistical transport of the galley container to the aircraft. Due to the inability of existing systems to maintain their temperature for a long period, such systems are not generally suitable for maintaining a low temperature during a long-haul flight. Galley containers that employ passive
15 cooling are disclosed in US2011/0248458 and in WO2006/093410. These containers are arranged to allow cold air produced in a dry-ice tray to propagate from the tray into the interior of the container where the food is stored. A delivery container for temperature sensitive goods that includes a partially insulated refrigerant support tray is disclosed in WO2013/024448.

20 International patent document WO2012/056086 describes a refrigerator unit for an aircraft comprising a casing manufactured from aluminium and foamed polypropylene to which an aluminium L-shaped plate acting as a thermal conductor is attached. The casing insulates dry ice and is covered by one leg of the L-shaped plate. As the casing and the L-shaped plate are slid into a galley container, the second leg of
25 the L-shaped plate acts as a refrigerating part to the rear and the lower parts of the galley container.

 A disadvantage of the above-described refrigerator unit is that the refrigerating part of the L-shaped plate forms an extra separation within the interior of the galley container. Usually a galley container can be accessed in its full length from both the
30 rear and the front side such that the galley container does not have to be fully turned in the limited space available in planes to be able to reach all of the interior. By inserting a refrigerator unit according to the prior art, either the front or rear side access openings are blocked by the refrigerating part of the L-shaped part. Furthermore, if the

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

5 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
10 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.

15 **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, having a further peripheral rim, the second shell being formed of a material of high thermal
20 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 located above the roof element of the second shell for receiving a cooling element or a coolant, which receiving portion is provided within the first shell and is thermally insulated from the exterior of the galley container and partially thermally insulated from the second shell, wherein the second
5 shell and the receiving portion 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
10 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.

5 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 embodiment of the invention, the
10 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
15 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
20 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
25 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
30 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 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

preferred so as to reduce the amount of volume within the galley container taken up by the heat transfer device. The heat pipe can be made from aluminium or copper or any other suitable heat conducting material. The heat transfer fluid or medium can be an alcohol, such as ethanol or methanol, or any other suitable heat transfer medium.

- 5 Preferably, the interior of the heat pipe is hollow to allow an optimal transport of fluid.

Preferably, the heat transfer device extends from the roof element of the second shell towards the floor element of the second shell along the interior of the second shell, i.e. over at least a surface of the side wall. The heat transfer device can be provided along the surfaces of the roof element and both side walls, thereby forming a
10 reversed U-shape within the interior of the galley container.

Alternatively, the heat transfer device can be provided between the thermally insulating layer and the second shell, wherein the heat transfer device is adjacent to the second shell. A cavity can be provided between the thermally insulating layer of the side wall and the second shell, in which cavity the heat transfer device, such as a heat
15 pipe, can be accommodated. Spacers can be used to separate the heat transfer device from the thermally insulating layer. Preferably, the heat transfer device is adjacent to the inner shell to allow good transfer of heat from the interior of the galley container to the heat transfer device. Alternatively, the heat transfer device can be connected to the inner shell by means of a connecting element. The connecting element can comprise a
20 material with a relatively high thermal resistance and can be used to adjust the amount of heat transferred to the heat transfer device and thus adjust the amount of cooling of the interior of the galley container. The heat transfer device can also be connected to the receiving portion directly or via one or several connecting parts. These connecting
25 parts can comprise a material with a relatively high thermal resistance in order to adjust the amount of heat transferred to the receiving portion and the cooling element or coolant, thus adjusting the amount of cooling of the interior of the galley container. In general however, the heat transfer device and any connecting elements will be of a material of high thermal conductivity such as aluminium in order to optimise the heat conduction from the second shell to the receiving portion, whereby the rate of heat
30 transfer is determined by the dimensions (i.e. length and cross-section) of the conductive path between these parts.

According to an embodiment, the receiving portion is provided between the first shell and the second shell. The receiving portion for the cooling element or coolant can

be placed at several alternative locations within the galley container. The receiving portion can be located within the second shell, i.e. in the interior of the galley container, and accessible when the door of the galley container is opened. Another location is between the first shell and the second shell, preferably between a first roof element of the first shell and a second roof element of the second shell. A further location is that the receiving portion is provided within the roof element of the first shell, for instance when the roof element of the first shell comprises a hollow panel.

According to a further embodiment, the at least one door comprises a first panel facing outwards, a second panel facing the interior of the galley container, and a thermally insulating layer between the first panel and the second panel to thermally separate the first and second panel and limit heat transfer between the interior of the galley container and an exterior of the galley container when the door is in a closed position.

In the case that the at least one door is provided only at the front side of the galley container, at a rear side of the galley container a thermally insulated panel is provided to thermally insulate the interior of the galley container from the exterior of the galley container. This thermally insulating rear panel can have a similar arrangement as the door. The galley container may have a door provided at both the front and the rear side to be able to access the interior of the galley container from both sides. Furthermore, the galley container may have several doors at at least the front side, for instance to allow access to different partitions of the galley container. The different partitions within the container can be formed by the receiving portion being placed within the second shell. Alternatively, the galley container can be provided with two or more second shells within the first shell to form separate partitions of the interior of the galley container that can be accessed from the exterior of the galley container by a door.

According to the above embodiment, the second panel of the door may comprise a thermally insulating element along at least a peripheral rim of the second panel to prevent thermal bridges between the interior of the galley container and the exterior of the galley container through abutment of the second panel with the peripheral rim of the second shell when the door is in the closed position. It is preferred that a thermally insulating material is provided between the peripheral rim of the second panel and a further peripheral rim of the first panel to prevent thermal bridges between the first and

second panels. Additionally, at least the second panel of the door can be provided with a sealant along the peripheral rim to prevent outside air entering the interior of the galley container when the door is in the closed position. Additionally, the further peripheral rim of the first panel can be provided with a thermally insulating element
5 and/or a sealant.

According to an embodiment, the receiving portion is accessible from an exterior of the galley container. In case the receiving portion is provided within the second shell, as described above, the receiving portion may be accessed via the door of the galley container. Preferably, the first shell is provided with an access opening to access
10 the receiving portion, wherein the cooling element or coolant is receivable in the receiving portion through the access opening. Opening of the door is then not necessary for access to the receiving portion, preventing unnecessary heating of the interior of the galley container. In the present context, exterior of the galley container denotes that part of the container that can be accessed when the container is sealed, i.e. when the
15 door is closed. Preferably, the access opening is provided with a closing lid to close the access opening, for instance when the access opening is provided in the roof element of the first shell. Alternatively, the access opening may be provided in at least one of a front side and a rear side of the galley container. Furthermore, the access opening may be provided in a side wall of at least the first shell of the galley container.

20 According to a further embodiment, wherein between a peripheral rim of the access opening and the cooling element a sealing element is provided to prevent leakage to the exterior of the first shell after insertion of the cooling element.

In addition, a thermally insulating connecting element may be provided between the side walls and the roof element and the floor element of the first shell, respectively,
25 to prevent thermal bridges between the interior of the galley container and an exterior of the galley container. To form the first shell, the roof element, floor element and side walls forming the separate panels of the first shell, can be connected to each other. The connection between these panels can lead to thermal bridges through which heat from the exterior may be conducted to the interior of the galley container. To prevent such
30 thermal bridges, a thermally insulating connecting element can be provided between each panel. Alternatively, each of the roof element, floor element and the sidewalls of the first shell can be formed of a hollow panel with an insulating material provided within the hollow panel.

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.

According to a second part of the present invention, there is provided to a cooling element for a galley container as described herein, the cooling element comprising a housing and a container for containing a coolant, the container being a drawer slideably receivable within the housing, wherein the housing (34) comprises 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

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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.

- 5 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
5 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
10 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
15 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
20 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.

25 According to a third aspect of the invention, there is provided 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
30 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
5 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
10 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
15 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.

20 According to another embodiment 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
25 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
30 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

An embodiment of an assembly of an insulated galley container and a cooling element and a second embodiment of the galley container will by way of non-limiting example be described in detail with reference to the accompanying drawings. In the drawings:

5 Figure 1 shows a schematic, perspective view of an embodiment of the assembly of a galley container and a cooling element according to the invention.

 Figure 2a shows a vertical longitudinal cross-section view of the assembly of Fig. 1 along line II-II.

 Figure 2b shows a detail of the top part of the assembly of Fig. 2a.

10 Figure 3a shows a vertical transversal cross-section view of the assembly of Fig. 1 along line III-III.

 Figure 3b shows a detail of the top and bottom part of the assembly of Fig. 3a.

 Figure 4a shows a horizontal transversal cross-section view of the assembly of Fig. 1 along line IV-IV in Fig. 2a.

15 Figure 4b shows a detail of Fig. 4a.

 Figure 5 shows a schematic perspective view of an embodiment of the cooling element according to the invention.

 Figure 6 shows a schematic, perspective view of another embodiment of the galley container according to the invention.

20 Figure 7a shows a vertical transverse cross-section view of the assembly of Fig. 6 along line VII-VII.

 Figure 7b shows a detail of the top part of the assembly of Fig. 7a.

 Figure 7c shows a detail of the bottom part of the assembly of Fig. 7a.

25 **Detailed description**

Figure 1 shows a perspective view of an embodiment of an assembly 1 of a galley container 2 in the form of an aircraft trolley with a support base 3 comprising wheels 4 for transport and a locking mechanism 5 to lock the wheels. The assembly 1 further comprises a cooling element 6 with a front side 7 comprising a locking and release element 50 for receipt in and release from the galley container 2 of the cooling element 6 from the receiving portion 29, see Figure 3b. The galley container 2 further comprises a first shell, here outer shell 20, and a second shell, here inner shell 21 (see Figure 2a), both comprising a roof element 8, 22, side walls 9, 23 and a floor element 10, 24. An

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interior 11 (shown in Fig. 2a) of the galley container 2 can be accessed through door 12, comprising a closure mechanism 13. The door 12 is hingedly connected to a side wall 9 of the galley container 2. The galley container 2 further comprises two handles 14, one at the front side, coinciding with the front side 7 of the cooling element 6, and one at the rear side, opposite the front side. These handles 14 are used to push, pull and steer the galley container 2 during use.

Figure 2a shows a longitudinal cross-section view of the assembly 1 of figure 1 along line II-II. As can be seen, the galley container 2 has a door 12a at the front side and a door 12b at the rear side of the galley container. The door 12 comprises a first panel 15 facing the front side of the galley container 2 and a second panel 16 facing away from the front side of the galley container 2. In between the first and second panels, 15, 16, a thermally insulating layer 17 is provided. Along a peripheral rim of the door 12 a sealing element 18, see Figure 2c, is provided between the front panel 15 and rear panel 16 of the door 12. The sealing element 18 is combined with a thermally insulating element 19 to prevent thermal bridges between the front panel 15 and the rear panel 16 of the door 12 and between the interior 11 and the exterior of the galley container 2, see Figure 2c.

Within the first shell 20, a second shell 21 is provided. Between the first and second shell, a thermally insulating layer 26 (see Figure 3a) is provided. A connection element 27 between first shell 20 and second shell 21 comprises a thermally insulating material such that thermal bridges between the first and second shells are prevented. The connection element 27 is provided along the peripheral rim 48 of the first shell 20 and the peripheral rim 45 of the second shell 21, see Figs. 2c and 4b.

The galley container 2 further has a receiving portion 29 situated between the roof element 22 of the inner second shell 21 and the roof element 8 of the outer first shell 20, shown in more detail in Fig. 2b. Within the receiving portion 29 the cooling element 6 is received. Between the roof elements, the thermally insulating layer 26 is present. The cooling element 6 is surrounded by this thermally insulating layer 26 present between the inner and outer shell to thermally separate the two shells. In addition, the thermally insulating layer 26 between the roof elements thermally insulates the cooling element 6 from the exterior heat. The thermal insulating layer 26 comprises a thermally insulating layer portion 30 provided against an interior side of the ceiling part 8 of the outer shell 20. The thermally insulating layer 26 can comprise

any material with a lower thermal conductivity than metal, such as a polymer material. Examples of thermally insulating material are expanded polystyrene (EPS), expanded polypropylene (EPP), an aerogel or a vacuum insulated panel (VIP).

Within the cooling element 6, a container 31 for containing the coolant 32, for instance blocks of dry ice, is provided. The container 31 further holds thermally insulating element 33 that surrounds the coolant 32 at four sides. The thermally insulating element 33 insulates the coolant from the surroundings of the cooling element 6 and thereby adds to the control of the dry ice dissipation rate. Additionally, the insulating material defines the space available for the coolant 32. In case a larger volume of coolant 32 is required, the amount of insulating material 33 can be reduced or even omitted if necessary.

Figure 3a shows a vertical transversal cross-section view of the assembly of figure 1 along line III-III and Figure 3b shows a detail of the top and bottom part of the assembly of Fig. 3a. The cooling element 6 is received within the receiving portion 29 between the parts of the thermally insulating layer 26 between the roof elements 8, 22 of the first and second shells 20, 21, respectively. The receiving portion 29 can be accessed through an access opening 28 between the roof elements 8, 22 of the first and second shells 20, 21, respectively, the access opening 28 having a peripheral rim 47. The peripheral rim 47 of the access opening 28 can be provided with a sealant (not shown) to seal the access opening 28 when the cooling element 6 is situated within the receiving portion 29. The cooling element 6 comprises a container 31 for containing the coolant 32, and a heat transfer element 35 to transfer heat between the container 31 and an outside of the cooling element along at least part of the container 31 and the outside of the cooling element 6. The container 31 is received within a housing 34 as a drawer sliding within the housing 34 enclosing the container 31, see Figure 5. To prevent leakage of exterior air to the coolant, a sealant 49 is provided between a peripheral rim 43 of the housing 34 and the front side 7 of the container 31. The heat transfer element 35 is formed by a corrugated plate forming the base of the housing, wherein corrugations 38 are alternately tangential to an outside of the container 31 or to an outside of the second shell 21, thereby establishing a thermal bridge between the base of the housing 34, the base of the container 31 and the second shell 21. In addition, a thermal insulating material can be provided within at least some of the respective

corrugations to adjust the heat transfer rate between the cooling element 6 and the second shell 21.

During use as a galley trolley or container on board of an airplane, trays (not shown) will be stored within the interior 11 of the galley container 2. The trays are then supported on tray supports 25 that are provided at or on an inside of the second shell 21. Figure 3a shows tray supports 25 that protrude outwardly from the inside of the second shell 21. However, tray supports that protrude inwardly from the inside of the second shell 21, i.e. protrude inside the thermally insulating layer 26, would be possible as well. An advantage of this arrangement is that the thickness of the thermally insulating layer 26 between the side walls 9, 23 of the first and second shells 20, 21, respectively, can be increased, obtaining an increased insulation of the galley container.

Fig. 3b shows that the second shell 21 comprises two layers of material, preferably being aluminium. Any other materials with good heat conductivity, preferably combined with a good strength to weight ratio, could be used as well. Additionally, the inner and outer layer could be of distinct materials. Furthermore, two or more material could be combined within at least one of the layers as well. The two layers increase the strength of the second shell 21, necessary to be able to support the trays during use. The inner layer 40 of the inner shell 21 is provided with the outwardly protruding tray supports 25, whereas the outer layer 41 of the inner shell 21 provides additional strength to the inner shell 21, see Figure 4b. However, it is possible to manufacture the inner shell of only one layer or more than two layers as well.

Figure 4a shows a horizontal transversal cross-section view of the assembly 1 of figure 1 along line IV-IV in Fig. 2a. Inner shell 21 can be manufactured as an integral unit, but it is also possible to manufacture inner shell parts 39 and then assemble these parts 39 to form the inner shell 21. The inner shell parts 39 are connected along connection line 42.

Figure 6 shows a schematic, perspective view of another embodiment of the galley container 2 in the form of an aircraft trolley with a support base 3 comprising wheels 4 for transport and a locking mechanism 5 to lock the wheels. The galley container 2 further comprises a first shell, here outer shell 20, and a second shell, here inner shell 21 (see Figures 7a-c), both comprising a roof element 8, 22, side walls 9, 23 and a floor element 10, 24. An interior 11 (shown in Figs. 7a-c) of the galley container 2 can be accessed through door 12, comprising a closure mechanism 13. The door 12 is

hingedly connected to a side wall 9 of the galley container 2. The galley container 2 further comprises two handles 14, one at the front side, and one at the rear side, opposite the front side. These handles 14 are used to push, pull and steer the galley container 2 during use. The roof element 8 of the outer shell 20 is formed as a lid part that is used to close the access opening 28 provided in the roof part of the galley container, of a receiving portion 29 (see fig. 7b) and is shown separate from the galley container in figs. 6 and 7a.

Figure 7a shows a vertical transversal cross-section view of the assembly of fig. 6 along line VII-VII, Figures 7b and c show a detail of the top and bottom part of the galley container of Fig. 7a, respectively. Within the first shell 20, a second shell 21 is provided. Between the first and second shell, a thermally insulating layer 26 (see figs. 7b and c) is provided. A connection element 27 between first shell 20 and second shell 21 comprises a thermally insulating material such that thermal bridges between the first and second shell are prevented.

The galley container 2 further has a receiving portion 29 situated between the roof element 22 of the inner second shell 21 and the roof element 8 of the outer first shell 20, shown in more detail in Fig. 7b. A thermally insulating separating wall 33 is provided between the receiving portion 29 and the roof element 22. A coolant can be received within the receiving portion 29 between the parts of the thermally insulating layer 26 between the roof elements 8, 22 of the first and second shells 20, 21, respectively. The coolant can be contained within a cooling container, such as the cooling element described above, or can be the cooling material itself. 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 device 35 is formed by heat transfer plate 52 that is in thermal connection with heat pipes 36 by means of a heat transfer connection element 55. The heat transfer plate 52 is connected to the heat transfer connection element 55 by means of a thermally conducting element, such as a metal screw 60. The heat pipes 36 transport the heat from the interior 11 of the galley container 2 via element 55 and heat transfer plate 52 to the coolant in the receiving space 29. The heat causes evaporation of the dry ice coolant, such that the heat energy is extracted from the interior 11 of the galley container 2 that is as such cooled or at least kept at a desired temperature. The preferred

material of the heat transfer elements 52, 55, 60 is aluminium or another material with similar light weight and heat conducting properties.

The heat pipe 36 is provided in a cavity 56 between the inner shell 21 and the thermally insulating layer 26. Spacers 57 are used to separate the heat pipes 36 from the thermally insulating layer 26. Additionally, a free end 58 of the heat pipe 36 is engaged by a recess 59 within the insulating connection element 27 that is provided along the periphery of the access opening 28. The connection element 27 prevents the formation of thermal bridges between the outer shell and the inner shell and/or the heat pipes by means of a thermally insulating connection. The heat pipe 36 extends from an underside of the connection element 27 towards the bottom part of the galley container (see fig. 7c). A number of heat pipes 36 can be provided in the cavity 56, depending on the amount of cooling needed. The heat pipes 36 can be evenly distributed or can be concentrated around one location. The heat pipes 36 are positioned in both side walls of the galley container 2, in symmetrical way, i.e. the distribution in a longitudinal direction in both side walls is similar such that a heat pipe in one side wall is opposite a heat pipe in the other side wall. In the illustrated embodiment, heat pipes are shown but it will be understood that other forms of thermally conductive connections may be applied in a similar manner to collect heat from the sidewalls 23.

The receiving portion 29 is closed by means of roof element 8 that is formed as a lid part of the top part of the galley container 2. The lid part is provided with a peripheral supporting rim part 54 that bears on the thermally insulating element 27. A sealing element 37 is provided along the periphery of the roof element 8 that seals the receiving portion 29 from the exterior of the galley container 2.

Fig. 7b furthermore shows a peripheral edge part 53 that is connected to an upper peripheral rim or edge 51 of the first shell 20 and the connection element 27. The edge part 53 protects the upper peripheral edge 51 against damage by bumping or sliding against a wall or other object.

Fig. 7c shows a detail of the bottom part of the galley container 2. It is shown that the side walls 9, 23 of the first and second shell, respectively, and the floor elements 10, 24 of the first and second shell, respectively, are connected by means of a connection element 27 that provides a thermally insulating connection between the respective side walls and floor elements, such that thermal bridges between the first and second shell and between the side walls and floor elements are prevented.

LIST OF PARTS

	1. Assembly	32. Coolant
	2. Galley container	33. Thermally insulating element
5	3. Support base	34. Housing
	4. Wheels	35. Heat transfer element
	5. Locking mechanism	36. Heat pipe
	6. Cooling element	37. Sealing element
	7. Front side of cooling element	38. Corrugation
10	8. Roof element of first shell	39. Second shell part
	9. Side wall of first shell	40. Inner layer of second shell
	10. Floor element of first shell	41. Outer layer of second shell
	11. Interior of galley container	42. Connection line of second shell
	12a + b. Door	43. Peripheral rim of housing
15	13. Closure mechanism	44. Peripheral rim of second panel
	14. Handle	45. Peripheral rim of second shell
	15. First panel of door	46. Peripheral rim of first panel
	16. Second panel of door	47. Peripheral rim of access opening
	17. Thermally insulating layer	48. Peripheral rim of first shell
20	18. Sealing element	49. Sealant
	19. Thermally insulating element	50. Locking and release element.
	20. First / outer shell	51. Upper peripheral edge
	21. Second / inner shell	52. Heat transfer plate
	22. Roof element of second shell	53. Peripheral edge part
25	23. Side wall of second shell	54. Peripheral supporting rim part
	24. Floor element of second shell	55. Heat transfer connection element
	25. Tray support element	56. Cavity
	26. Thermally insulating layer	57. Spacer
	27. Connection element	58. Free end of heat pipe
30	28. Access opening	59. Recess
	29. Receiving portion	60. Screw
	30. Thermally insulating layer portion	
	31. Container	

CLAIMS

1. Galley container (2) for an aircraft, comprising
 - a first shell (20) having a peripheral rim (48) defining an opening for access to
5 an interior (11) of the galley container;
 - a second shell (21) within the first shell, having a further peripheral rim (45),
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 (8, 22), a floor element (10, 24) and at
10 least two sidewalls (9, 23), the galley container further comprising:
 - a thermally insulating layer (26), thermally insulating the second shell from an
exterior of the galley container;
 - a receiving portion (29) located above the roof element (22) of the second shell
for receiving a cooling element (6) or a coolant (32), which receiving portion is
15 provided within the first shell and is thermally insulated from the exterior of the galley
container and partially thermally insulated from the second shell, wherein the second
shell and the receiving portion are provided with a thermally conductive connection
such that heat is transferrable between the receiving portion and the interior of the
galley container (11) through the thermal conductive connection and via the second
20 shell; and
 - at least one door (12) provided at the opening to close the galley container in a
closed position of the door.
2. Galley container according to claim 1, wherein the thermally conductive connection
25 is between the receiving portion and the sidewalls of the second shell.
3. Galley container according to claim 1 or 2, wherein the thermally conductive
connection comprises a heat transfer device that extends from the roof element of the
second shell towards the floor element of the second shell.
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4. Galley container according to claim 3, wherein the heat transfer device is
provided between the thermally insulating layer and the second shell, wherein the heat
transfer device is adjacent to the second shell.

5. Galley container according to any of the preceding claims, wherein the receiving portion is provided between the first shell and the second shell.

6. Galley container according to claim 5, wherein the receiving portion is provided
5 between a roof element (8) of the first shell and a roof element (22) of the second shell.

7. Galley container according to any of the preceding claims, wherein the at least one door (12, 12') comprises

- a first panel (15) facing outwards;
- 10 - a second panel (16) facing the interior of the galley container; and
- a thermally insulating layer (17) between the first panel and the second panel to thermally separating the first and second panel and limit heat transfer between the interior of the galley container and the exterior of the galley container when the door is in the closed position.

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8. Galley container according to claim 7, wherein the second panel comprises a thermally insulating element (19) along at least a peripheral rim (44) of the second panel to prevent thermal bridges between the interior of the galley container and the exterior of the galley container through abutment of the second panel with the
20 peripheral rim of the second shell when the door is in the closed position.

9. Galley container according to claim 7 or 8, wherein a further thermally insulating element (43) is provided between the peripheral rim of the second panel and a further peripheral rim (46) of the first panel to prevent thermal bridges between the first and
25 second panels.

10. Galley container according to any of claims 7 to 9, wherein at least the second panel of the door is provided with a sealant (18) along the peripheral rim to prevent outside air entering the interior of the galley container when the door is in the closed
30 position.

11. Galley container according to any of the preceding claims, wherein the receiving portion is accessible from an exterior of the galley container.

12. Galley container according to any of the preceding claims, wherein the first shell is provided with an access opening (28) to access the receiving portion, wherein the cooling element or coolant is receivable in the receiving portion through the access opening.

13. Galley container according to claim 12, wherein the access opening is provided with a closing lid to close the access opening.

14. Galley container according to claim 12 or 13, wherein the access opening is provided in the roof element of the first shell.

15. Galley container according to claim 12 or 14, wherein the access opening is provided in at least one of a front side and a rear side of the galley container.

16. Galley container according to any of claims 12-15, wherein between a peripheral rim (47) of the access opening and the cooling element a sealing element (49) is provided to prevent leakage to the exterior of the first shell after insertion of the cooling element.

17. Galley container according to any of the preceding claims, wherein an inside of the second shell is provided with a further thermally insulating layer.

18. Cooling element (6) for a galley container (2) according to any of the preceding claims, the cooling element comprising:

- a housing (34) and a container (31) for containing a coolant (32), the container being a drawer slideably receivable within the housing, wherein the housing (34) comprises
 - a heat transfer element (35) 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 (38) 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.

19. Assembly (1) of a galley container (2) according to any of the claims 1-17 and a
5 cooling element (6) according to claim 18, wherein the cooling element is receivable
within the receiving portion (29) of the galley container, such that the heat transfer
element (35) of the cooling element and the second shell (21) 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
10 of the galley container (11) via the second shell.
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