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(71) Applicants:
- **Air Liquide Deutschland GmbH**
  40235 Düsseldorf (DE)
  Designated Contracting States:
  DE
- **L'AIR LIQUIDE, Société Anonyme pour l'Etude et l'Exploitation des Procédés Georges Claude**
  75007 Paris (FR)
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(72) Inventor: **Lürken, Franz, Dr.**
47906 Kempen (DE)

(74) Representative: **Heine, Christian Klaus**
KNH Patentanwälte Kahlhöfer Neumann Rößler Heine PartG mbB
Postfach 10 33 63
40024 Düsseldorf (DE)

(54) METHOD AND COOLING BOX FOR TRANSPORTING PERISHABLE PRODUCTS

(57) Cooling box (1) for transporting heat-sensitive products, the cooling box (1) comprising: a thermally isolating cuboid housing (2) with at least one first (7) and one second storage chamber (8), wherein the housing (2) is closed on five sides by walls (9), and wherein the housing (2) comprises a commissioning opening (4) on an opening side (3), and a cover (5) to open and close the commissioning opening (4), the cover (5) containing an integrated cool pack (6), wherein the cooling box (1) comprises attachment points (12) for attaching at least one movable thermal isolation element (11) to a wall (9) of the cooling box (1).

A cooling box (1) is provided, wherein a flexible thermal isolation allows for adjusting the temperature levels inside at least two storage chambers (7, 8) separately. This is useful for transporting goods with different temperature requirements, e.g. to costumers.

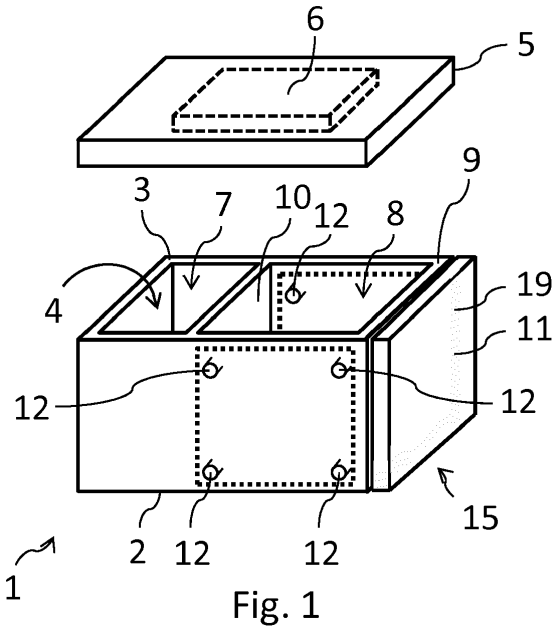

Fig. 1

EP 3 199 894 A1

Description

[0001] The present invention is directed to a cooling box for distributing heat-sensitive products to final customers. The invention also relates to a method for adjusting the temperature inside the cooling box.

[0002] It is known to transport and distribute goods, including food, in particular heat-sensitive products, from a distribution center to final customers. To organize an economic system, it is necessary to jointly transport many different goods for many customers in a transport vehicle to deliver at the same time, for example beverages, cooled products and other food and/or products for the daily life. This requires in particular cooling boxes, in which heat-sensitive products with different temperature requirements can be transported together. The heat-sensitive goods can be frozen goods and other perishable goods requiring a higher temperature, e.g. milk or butter.

[0003] Cooling boxes are known for a large variety of different applications. Boxes of different shapes and materials are commonly used. Further, it is known to provide thermal isolation from the environment by various methods, involving various materials. Also, active means for cooling are known that are capable of extending the time that goods remain sufficiently cold inside a cooling box.

[0004] However, prior art cooling boxes have the disadvantage that they cannot provide more than one temperature level within the same cooling box at the same time. Today, goods with different temperature requirements have to be transported separately in different boxes. Not only does this require a larger number of cooling boxes to be provided and transported, but it is also administratively elaborate to have more than one box per costumer, which is disadvantageous from an economical perspective.

[0005] It is, therefore, an object of the present invention to overcome at least in part the disadvantages known from prior art and in particular to provide a method and a cooling box for cooling and transporting goods with two different temperature requirements simultaneously in the same box.

[0006] These objects are solved by the features of the independent claims. Dependent claims are directed to preferred embodiments of the present invention.

[0007] The cooling box according to the present invention for transporting heat-sensitive products comprises:

- a thermally isolating cuboid housing with at least one first and one second storage chamber, wherein the housing is closed on five sides by walls, and wherein the housing comprises a commissioning opening on an opening side, and
- a cover to open and close the commissioning opening, the cover containing an integrated cool pack,

wherein the cooling box is characterized by attachment points for attaching at least one movable thermal isolation element.

[0008] The cooling box can be a container dimensioned as to be carried by a (single) person. For example, it can be essentially made of plastic. It can be used for transporting the above described heat-sensitive goods. In particular, the cooling box can be used for distributing these goods to final costumers. The thermally isolating cuboid housing of the cooling box thermally decouples or nearly thermally decouples the interior of the cooling box from the environment. Thereby, heat-sensitive products within the cooling box, which may be initially at a low temperature, can keep this low temperature at least for a limited time. The housing being cuboid enhances the ability to store a multitude of similarly shaped boxes, e.g. by stacking. The housing of the cooling box is divided into at least one first and one second storage chamber. Preferably, the cooling box comprises one first and one second storage chamber. Adjusting the temperature levels in the first and second storage chambers allows for a separate treatment of products with different temperature requirements. Preferably, the first storage chamber has twice the volume of the second storage chamber. The housing is closed on five sides. This leaves a sixth side being open or having an opening, which is the opening side, where the commissioning opening is situated. Through the commissioning opening, goods can be loaded into the box and unloaded from the box. The commissioning opening can be opened and closed by the cover. Therefore, the cover preferably fits to the size of the commissioning opening. It is further preferred to provide attachment means for fastening the cover. The cover preferably is thermally isolating similar to the housing.

[0009] The cool pack integrated into the cover can provide an active cooling of heat-sensitive products within the box. Preferably, the cool pack is designed such that it can be reused, e.g. by being cooled down before each cycle of usage. Preferably, the cool pack comprises a substance that maintains a low temperature for a reasonably long time. The substance can be, e.g., solid carbon dioxide. Alternatively, the cool pack can be suitable for single use, e.g. by providing ice or solid carbon dioxide as or in the cool pack, preferably as a piece or block.

[0010] Depending on details of the thermal isolation from the environment, the temperature inside the cooling box can increase with time at different rates. Adjusting the thermal isolation can influence this rate. Preferably, the temperature within the storage chambers is adjusted separately by adjusting the thermal isolation locally. Increasing the thickness of the thermal isolation, in particular by attaching one or more of the movable thermal isolation elements to a wall of the housing, can cause a reduction of the heat transfer into the cooling box. A multitude of movable thermal isolation elements can be used for a single cooling box. This provides a large variety of possibilities to adjust the temperature inside the cooling box.

[0011] In a different preferred embodiment, a single movable thermal isolation element is used. It is also possible to use the same cooling box with a varying number

of movable thermal isolation elements depending on the temperature requirements of the goods to be transported and/or the ambient temperature outside the cooling box. Preferably, there are two configurations of movable thermal isolation element(s), corresponding to two different temperature configurations. In a preferred embodiment, a first temperature configuration could be a freezing temperature (e.g. - 18 °C) in the first storage chamber and a higher temperature (e.g. + 7 °C) in the second storage chamber, while a second temperature configuration could be the freezing temperature in the second storage chamber and the higher temperature in the first storage chamber. Such two temperature configurations are especially advantageous in a preferred embodiment, in which the first storage chamber has a different volume than the second storage chamber, in particular twice the volume of the second storage chamber.

[0012] The attachment points are arranged to allow an attachment of the movable thermal isolation element. Depending on the method of attachment, the design of the attachment points may vary. Preferred attachment points are a hook, a screw, a hook and loop fastener, or any other means for a detachable connection.

[0013] In a preferred embodiment of the cooling box, at least one of the at least one movable thermal isolation element is a movable thermal isolation plate.

[0014] The movable thermal isolation plate preferably is a plate made of the same or a similar material as the cuboid housing of the cooling box. Preferably, the movable thermal isolation plate has a size that is adapted to the size of the cooling box.

[0015] In a preferred embodiment of the cooling box, a set of the attachment points is situated in at least one inside position, in which the movable thermal isolation plate can be attached to one of the walls at the inside of the cooling box.

[0016] A set of the attachment points is a multitude of attachment points needed simultaneously to attach one movable thermal isolation plate. Depending on the details of the attachment, it is possible that a set of the attachment points comprises a single attachment point only.

[0017] In a further preferred embodiment of the cooling box, a set of the attachment points is situated in at least one outside position, in which the movable thermal isolation plate can be attached to one of the walls at the outside of the cooling box.

[0018] As for identical materials of the thermal isolation the heat intake through the wall depends on the thickness of the thermal isolation, the preferred embodiments with the movable thermal isolation plate attached either to the inside or to the outside are equivalent with respect to thermal aspects. Having the movable thermal isolation plate attached to the outside may leave more space inside the cooling box, whereas the attachment of the movable thermal isolation plate in the inside may be more reasonable for transporting the cooling box as a movable thermal isolation plate attached to the outside of the cooling box might be more likely to be detached or displaced unintendedly. Further, for cooling boxes with a standardized size (e.g. adapted as to be a certain fraction of the size of a EURO-pallet and/or of the size of a transport vehicle), a movable thermal isolation plate attached to the outside could be disadvantageous.

[0019] It is preferred to have sets of attachment points provided both at the inside and at the outside of the cooling box. This way, both examples described above can be achieved with the same cooling box as desired by the user.

[0020] In a further preferred embodiment of the cooling box, at least one of the at least one movable thermal isolation element is a movable thermal isolation insert.

[0021] The movable thermal isolation insert preferably has a cuboid shape and is closed on five sides and open on the remaining sixth side. When attached to the attachment points and thereby mounted into the cooling box, this remaining sixth open side of the movable thermal isolation insert preferably faces the opening side of the cuboid housing of the cooling box. The movable thermal isolation insert provides for thermal isolation on five sides, which enhances the effect of thermal isolation compared to a single movable thermal isolation plate. Preferably, the size of the movable thermal isolation insert is adapted to the size of the cooling box. Preferably, the movable thermal isolation insert is made of the same or a similar material as the cuboid housing of the cooling box.

[0022] In a further preferred embodiment, the cooling box further comprises a separating wall separating the first storage chamber and the second storage chamber, wherein the separating wall comprises at least one set of the attachment points for attaching a movable thermal isolation element to the separating wall.

[0023] Preferably, the separating wall is arranged in such a way that it can be mounted into the cooling box in various positions (e.g. defined by a plurality of attachment positions), thus allowing for a flexible separation of the cooling box volume into the first storage chamber and the second storage chamber. The possibility to attach a movable thermal isolation plate to the separating wall enhances the flexibility of the usage of the cooling box.

[0024] In a further preferred embodiment of the cooling box, at least a part of the attachment points is configured to retain a movable thermal isolation element to a wall by a magnetic bonding.

[0025] The magnetic bonding preferably is realized by magnets, situated either inside the movable thermal isolation element, inside a wall of the housing of the cooling box, or in both locations combined. A respective counterpart preferably is metallic and magnetizable as to allow for a magnetic bonding. An attachment point then would be one of the magnets and/or of the counterparts.

[0026] Alternatively, the whole movable thermal isolation element and/or the respective wall might be magnetized. In that case, the attachment point would be a whole area that is suitable for attaching a movable thermal isolation element. A set of attachment points then would

only comprise a single attachment point. A magnetic bonding is advantageous because it is strong, flexible, durable, and it does not need fragile elements.

[0027] In a further preferred embodiment of the cooling box the cool pack comprises at least a first cooling section and a second cooling section.

[0028] The first cooling section and the second cooling section can be filled with a refrigerant independently. Preferably, the refrigerant is carbon dioxide (CO_2).

[0029] In a further preferred embodiment of the cooling box the first cooling section and the second cooling section of the cool pack each comprise at least one refrigerant inlet.

[0030] Through the refrigerant inlets, the refrigerant can be introduced into the cool pack, e.g. through nozzles. Preferably, this is done in a supply center, where the cooling box can be commissioned.

[0031] According to a further aspect of the invention, a method is provided for adjusting the temperature in a cooling box, characterized in that at least one movable thermal isolation element is attached to a set of the attachment points to locally reduce the heat flow through the housing into the cooling box, wherein each set of the attachment points defines a position for attaching at least one movable thermal isolation element, and wherein a first temperature level in the first storage chamber and a second temperature level in the second storage chamber are adjusted by at least one of the following steps:

a) attaching at least one movable thermal isolation element to a position,
b) removing at least one movable thermal isolation element from a position, and
c) varying the number of movable thermal isolation elements attached to the respective number of positions.

[0032] The positions preferably are each one of the inside positions or of the outside positions. There may be two or more such positions, e.g. a first position, a second position, a third position and a fourth position. Depending on the location of attachment of the movable thermal isolation element, different temperature levels in the first and in the second storage chamber can be achieved. By adding a further movable thermal isolation element, the number of realizable temperature levels in the first and in the second storage chamber can be increased.

[0033] In a preferred embodiment of the method, a first movable thermal isolation element is attached to a second movable thermal isolation element, wherein the second movable thermal isolation element is attached to a wall of the cooling box.

[0034] Two movable thermal isolation elements attached to each other increase the effect of thermal isolation. This increases the number of realizable temperature levels inside the storage chambers. In particular, if two movable thermal isolation plates with the same thermal properties are used, the thermal isolation is doubled compared to the case of a single movable thermal isolation plate being used. Attachment points are preferably provided on at least one movable thermal isolation element for connecting two movable thermal isolation elements together.

[0035] A further preferred embodiment of the method further comprises injecting a refrigerant into at least one of the first cooling section and the second cooling section of the cover. The first temperature level and the second temperature level are adjusted according to the amount of refrigerant injected into the first cooling section and the second cooling section.

[0036] By adapting the amount of refrigerant injected into the first cooling section and the second cooling section of the cover, the active cooling provided by the cover can be varied in order to adjust the temperature levels in the first storage chamber and the second storage chamber. If the volumes of the first and second storage chambers are varied, the active cooling provided by the cool pack is preferably adapted to the volume to be cooled. Besides the cuboid housing of the cooling box and the movable thermal isolation elements, also the cool pack contributes to the thermal isolation from the environment. This may depend on the amount of refrigerant injected into a particular cooling section. Accordingly, evaporation rates of the refrigerant may vary.

[0037] In a further preferred embodiment of the method, the movable thermal isolation element used in step a) is a first movable thermal isolation insert having a first size, and the movable thermal isolation element used in step b) is a second movable thermal isolation insert having a second size, which is different from the first size.

[0038] Using movable thermal isolation inserts of different sizes provides a possibility to adjust not only the temperature levels in the first storage chamber and the second storage chamber, but also the size (i.e. the volume) of the storage chambers. Preferably, the first size is one third of the cooling box volume and the second size is two thirds of the cooling box volume.

[0039] According to a further aspect of the present invention, a method is provided for transporting heat-sensitive products, comprising placing heat-sensitive products into a cooling box according to the present invention and/or wherein the temperature in the first and in the second storage chamber of the cooling box is adjusted by a method according to the present invention.

[0040] The cooling box according to the present invention and the method for transporting heat-sensitive products according to the present invention preferably are used for transporting heat-sensitive products and for distributing the goods to final customers. As described above, this can involve heat-sensitive products with different temperature requirements. Adjusting the temperature levels in the first storage chamber and in the second storage chamber separately facilitates this transport.

[0041] The details and advantages disclosed for the cooling box according to the present invention can be

applied to the method of the invention, and vice versa.

[0042] It should be noted that the individual features specified in the claims may be combined with one another in any desired technological reasonable manner and form further embodiments of the invention. The specification, in particular in connection with the figures, explains the invention further and specifies particularly preferred embodiments of the invention. Particularly preferred variants of the invention and also the technical field will now be explained in more detail on the basis of the enclosed figures. It should be noted that the exemplary embodiments shown in the figures are not intended to restrict the invention. The figures are schematic and may not be to scale. The figures display

Fig. 1: a schematic of a cooling box with a movable thermal isolation plate in a first position,

Fig. 2: a schematic of the cooling box of fig. 1, wherein the movable thermal isolation plate is attached in a second position,

Fig. 3: a schematic of a cooling box, wherein a first movable thermal isolation insert is attached in a first position, and

Fig. 4: a schematic of the cooling box of fig. 3, wherein a second movable thermal isolation insert is attached in a second position.

[0043] Fig. 1 shows a cooling box 1 with a housing 2 that has a commissioning opening 4 at an opening side 3. The commissioning opening 4 can be closed by a cover 5, in which a cool pack 6 is integrated. The cooling box 1 comprises a first storage chamber 7 and a second storage chamber 8. The housing 2 comprises walls 9 and a separating wall 10 between the first storage chamber 7 and the second storage chamber 8. A movable thermal isolation element 11 is attached in a first position 15. The movable thermal isolation element 11 is realized as a movable thermal isolation plate 19. Further, attachment points 12 are shown.

[0044] Fig. 2 shows the cooling box 1 from fig. 1. In fig. 2 all elements not mentioned in the following are the same as in fig. 1. Regarding their description, it is referred to the description of fig. 1. In fig. 2 a first movable thermal isolation element 20 is attached to a second movable thermal isolation element 21. Both the first and the second movable thermal isolation element 20, 21 are realized as movable thermal isolation plates 19. The second movable thermal isolation element 21 is attached to the cooling box 1 in a second position 16. It can be distinguished between inside positions 13 and outside positions 14. In each of the inside positions 13 and each of the outside positions 14 a set of attachment points 12 is provided. The first position 15, the second position 16 and a third position 17 are outside positions 14, while a fourth position 18 is an inside position 13.

[0045] Fig. 3 shows a cooling box 1 with a housing 2 that has a first storage chamber 7, a second storage chamber 8, walls 9 and an opening side 3 with a commissioning opening 4. The commissioning opening 4 can be closed by a cover 5 that comprises a cool pack 6. The cool pack 6 is divided into a first cooling section 25, a second cooling section 26 and a third cooling section 27. Each cooling section 25, 26, 27 comprises a refrigerant inlet 28, through which a refrigerant may be injected into the respective cooling section 25, 26, 27. Attachments points 12 are arranged in a first position 15 and in a second position 16, where a movable thermal isolation element 11 can be attached. The movable thermal isolation element 11 is realized as a movable thermal isolation insert 22. The movable thermal isolation insert 22 is a first movable thermal isolation insert 23 with a first size. The first size is about one third of the volume of the cooling box 1.

[0046] In Fig. 4 the same embodiment of the cooling box 1 is shown as in fig. 3. In fig. 4 all elements not mentioned in the following are the same as in fig. 3. Regarding their description, it is referred to the description of fig. 3. In this embodiment the movable thermal isolation insert 22 is realized as a second movable thermal isolation insert 24, which is attached in the second position 16. The second movable thermal isolation insert 24 has a second size, which is about two thirds of the volume of the cooling box 1.

[0047] A cooling box is provided, wherein a flexible thermal isolation on the one hand and a special layout of the cool pack on the other hand allows for adjusting the temperature levels inside at least two storage chambers separately. This is useful for transporting goods with different temperature requirements, e.g. to costumers.

List of reference numerals

[0048]

1	cooling box
2	housing
3	opening side
4	commissioning opening
5	cover
6	cool pack
7	first storage chamber
8	second storage chamber
9	wall
10	separating wall
11	movable thermal isolation element
12	attachment point
13	inside position
14	outside position
15	first position
16	second position
17	third position
18	fourth position
19	movable thermal isolation plate

20 first movable thermal isolation element
21 second movable thermal isolation element
22 movable thermal isolation insert
23 first movable thermal isolation insert
24 second movable thermal isolation insert
25 first cooling section
26 second cooling section
27 third cooling section
28 refrigerant inlet

Claims

1. Cooling box (1) for transporting heat-sensitive products, the cooling box (1) comprising:

- a thermally isolating cuboid housing (2) with at least one first (7) and one second storage chamber (8), wherein the housing (2) is closed on five sides by walls (9), and wherein the housing (2) comprises a commissioning opening (4) on an opening side (3), and
- a cover (5) to open and close the commissioning opening (4), the cover (5) containing an integrated cool pack (6),

wherein the cooling box (1) is **characterized by** attachment points (12) for attaching at least one movable thermal isolation element (11).

2. Cooling box (1) according to claim 1, wherein at least one of the at least one movable thermal isolation element (11) is a movable thermal isolation plate (19).

3. Cooling box (1) according to claim 2, wherein a set of the attachment points (12) is situated in at least one inside position (13), in which the movable thermal isolation plate (19) can be attached to one of the walls (9) at the inside of the cooling box (1).

4. Cooling box (1) according to one of the claims 2 or 3, wherein a set of the attachment points (12) is situated in at least one outside position (14), in which the movable thermal isolation plate (19) can be attached to one of the walls (9) at the outside of the cooling box (1).

5. Cooling box (1) according to claim 1, wherein at least one of the at least one movable thermal isolation element (11) is a movable thermal isolation insert (22).

6. Cooling box (1) according to one of the preceding claims, further comprising a separating wall (10) separating the first storage chamber (7) and the second storage chamber (8), wherein the separating wall (10) comprises at least one set of the attachment points (12) for attaching a movable thermal isolation element (11) to the separating wall (10).

7. Cooling box (1) according to one of the preceding claims, wherein at least a part of the attachment points (12) is configured to retain a movable thermal isolation element (11) to a wall (9) by a magnetic bonding.

8. Cooling box (1) according to one of the preceding claims, wherein the cool pack (6) comprises at least a first cooling section (25) and a second cooling section (26).

9. Cooling box (1) according to claim 8, wherein the first cooling section (25) and the second cooling section (26) of the cool pack (6) each comprise at least one refrigerant inlet (28).

10. Method for adjusting the temperature in a cooling box (1) according to one of the preceding claims, **characterized in that** at least one movable thermal isolation element (11) is attached to a set of the attachment points (12) to locally reduce the heat flow through the housing (2) into the cooling box (1), wherein each set of the attachment points (12) defines a position (15, 16, 17, 18) for attaching at least one movable thermal isolation element (11), and wherein a first temperature level in the first storage chamber (7) and a second temperature level in the second storage chamber (8) are adjusted by at least one of the following steps:

a) attaching at least one movable thermal isolation element (11) to a position (15, 16, 17, 18),
b) removing at least one movable thermal isolation element (11) from a position (15, 16, 17, 18), and
c) varying the number of movable thermal isolation elements (11) attached to the respective number of positions (15, 16, 17, 18).

11. Method according to claim 10, wherein a first movable thermal isolation element (20) is attached to a second movable thermal isolation element (21), wherein the second movable thermal isolation element (21) is attached to a wall (9) of the cooling box (1).

12. Method according to one of the claims 10 or 11, wherein a cooling box (1) according to one of claims 8 or 9 is used, wherein the method further comprises injecting a refrigerant into at least one of the first cooling section (25) and the second cooling section (26) of the cool pack (6), and wherein the first temperature level and the second temperature level are adjusted according to the amount of refrigerant injected into the first cooling section (25) and the sec-

ond cooling section (26).

13. Method according to one of the claims 10 or 11, wherein a cooling box (1) according to one of claims 5 to 9 is used, wherein the movable thermal isolation element (11) used in step a) is a first movable thermal isolation insert (23) having a first size, and wherein the movable thermal isolation element (11) used in step b) is a second movable thermal isolation insert (24) having a second size, which is different from the first size.

14. Method for transporting heat-sensitive products, comprising placing heat-sensitive products into a cooling box (1) according to one of claims 1 to 9, and/or wherein the temperature in the first storage chamber (7) and in the second storage chamber (8) of the cooling box (1) is adjusted by a method according to one of claims 10 to 13.

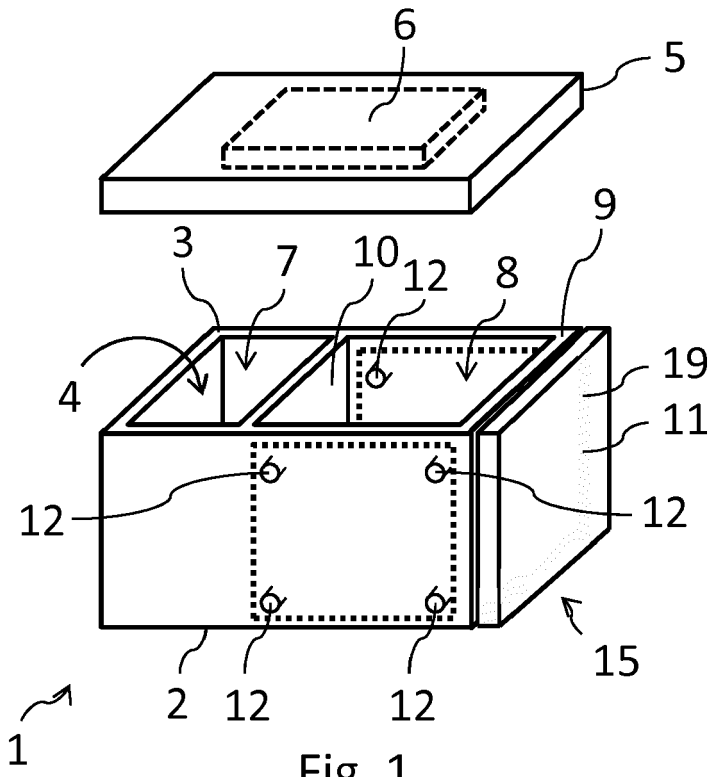
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Fig. 1

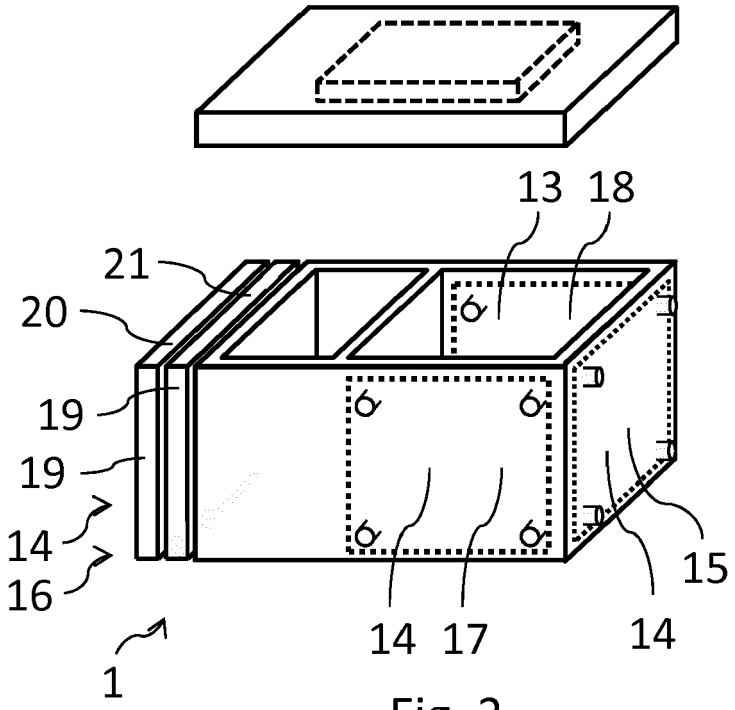
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Fig. 2

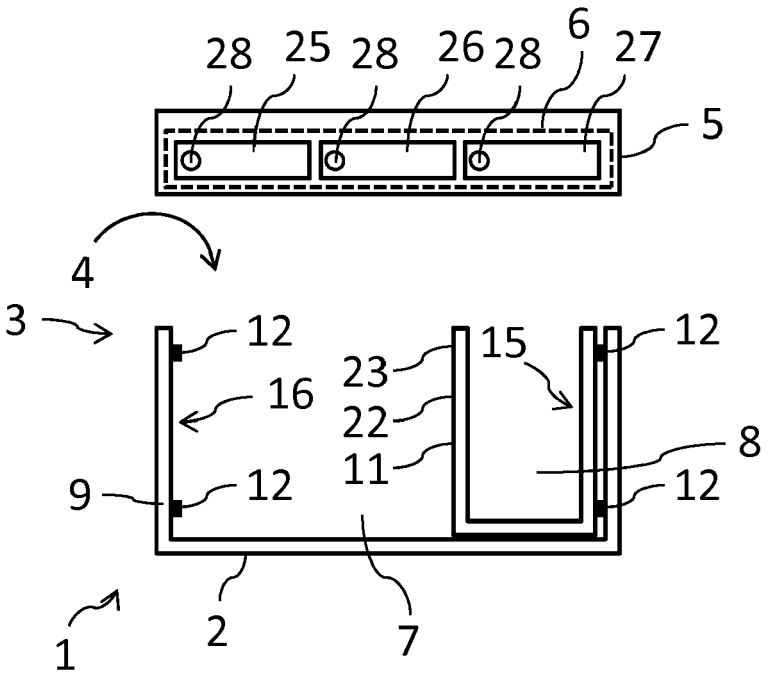

Fig. 3

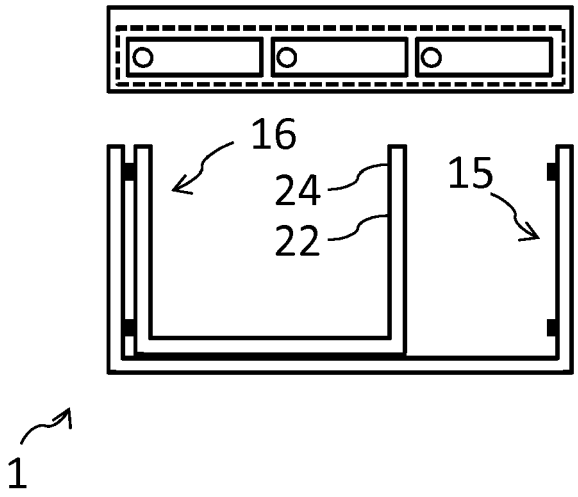

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 2756

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A	US 2015/166244 A1 (WOOD RICHARD [GB] ET AL) 18 June 2015 (2015-06-18) * figure 1 *	1	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 July 2016	Canköy, Necdet

CATEGORY OF CITED DOCUMENTS

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