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(54) Method and multipurpose container for transporting goods requiring different temperatures during their transport

(57) The present invention is directed to a container (1) for transporting goods (33, 34) requiring cooling during their transport. The container (1) comprises a housing (2, 3) basically having a cuboid outer shape and at least one outer door (5) to open an access (8) to at least two separate storage volumes (6, 7) in the interior (4) of the housing (2, 3), a cartridge (10) being fillable with a required amount of dry ice (22) arranged in the interior (4) of the container (1) and at least one of the following features:

- the cartridge (10) is placed between an upper storage volume (6) and a lower storage volume (7),
- the cartridge (10) can be placed at different heights in the housing (2, 3),
- the cartridge (10) has at least a first surface area (12) and a second surface area (13) with different thermal insulations (14, 15) versus adjacent storage volumes (6, 7),
- the cartridge (10) has an inhomogeneous thermal insulation (14, 15), such that during filling using liquid CO2 the better insulated parts are filled with dry ice (22) first,
- the housing (2, 3) contains at least one thermally insulating separating wall (16),
- the cartridge (10) has at least one outlet nozzle (11) for blowing an exhaust of CO2 in one or more predetermined directions or receiving storage volumes (6, 7),
- the housing (2, 3) contains at least one active ventilation means (19) to guide exhausted CO2 from the cartridge (10) on a certain exhaust gas flow path (21) through the housing (2, 3) to a housing outlet (20).

This allows to flexibly using transport containers cooled by dry ice for different kinds and amounts of goods to be transported. It particularly allows adapting containers to different transport tasks and transporting goods, especially fresh food and deep frozen food, with different transport temperatures in the same container.

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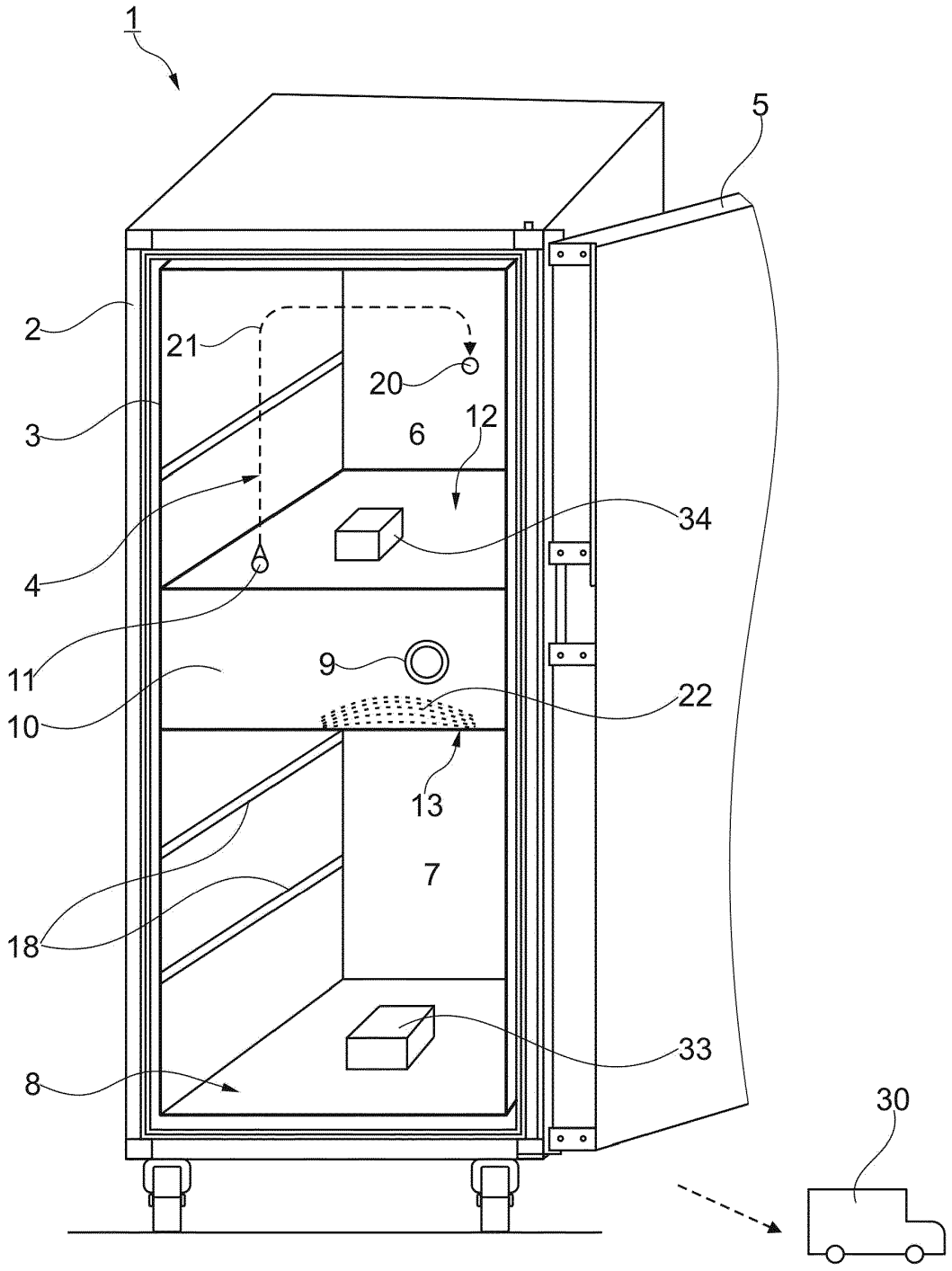

Fig. 1

Description

[0001] The present invention relates to a transport container for transporting heat-sensitive goods requiring cooling during their transport and storage. So far many differently equipped cooling containers are used to transport heat-sensitive products, especially to organize the transport from storage and distribution centers to groceries and other places, where cooled products are sold to final customers.

[0002] The present invention especially relates to cooling containers having a special chamber, in the following named cartridge, which can be filled with carbon dioxide snow (dry ice) to provide the necessary cold to keep the interior of the container on a required low temperature level for a certain period of time. The cartridge can be filled with dry ice by introducing liquid carbon dioxide in a filling process, which converts into dry ice and gaseous carbon dioxide during the filling process. Another method is to fill the cartridge with prefabricated dry ice in special enclosures or bags.

[0003] Although different containers for transporting different goods are known, for example from DE 10 2010 013 079 A1, and optional equipment for such containers is available, it is so far not possible to systematically transport goods in the same container, which require different transport temperatures, for example deep frozen food and fresh food. It is also not easily possible to adapt existing containers for different transport purposes, if the required temperatures and/or the required volume shares for different kinds of products change from time to time.

[0004] It is therefore an object of the present invention to provide a transport container, in which at least two different kinds of goods requiring two different transport temperatures can be transported and which optionally can be adapted to different shares and/or to different temperatures of the different kinds of goods to be transported.

[0005] It is also an object of the present invention to teach a method for jointly transporting goods requiring different temperatures during a transport in at least two separate storage volumes inside a housing of one cooling container only.

[0006] Solutions for the above objects are given by a multipurpose container as defined in independent claim 1 and by a method for jointly transporting goods requiring different transport temperatures according to independent claim 9. Preferred embodiments and advantageous features, which can be used separately or in technically meaningful combinations, are defined in the respective dependent claims.

[0007] According to the invention a container for transporting goods requiring cooling during their transport comprises:

- a housing basically having a cuboid outer shape and at least one outer door to open an access to at least two separate storage volumes in the interior of the housing
- a cartridge being fillable with a required amount of dry ice arranged in the interior of the container
- at least one of the following features:

  a. the cartridge is placed between an upper storage volume and a lower storage volume,
  b. the cartridge can be placed at different heights in the housing,
  c. the cartridge has at least a first surface area and a second surface area with different thermal insulations versus adjacent storage volumes,
  d. the cartridge has an inhomogeneous thermal insulation, such that during filling using liquid carbon dioxide the better insulated parts are filled with dry ice first,
  e. the housing contains at least one thermally insulating separating wall,
  f. the cartridge has at least one outlet nozzle for blowing its exhaust of carbon dioxide in one or more predetermined directions or receiving storage volumes,
  g. the housing contains at least one active ventilation means to guide exhausted carbon dioxide from the cartridge on a certain exhaust gas flow path through the housing to a housing outlet.

[0008] A multipurpose container according to the present invention makes use of the fact that the transfer of cold from a cartridge filled with carbon dioxide snow can be used and influenced in different ways. It was found that cold can be transferred by radiation, convection and/or conductivity. This means that it is well possible to establish by active or passive means two or more separate volumes in a transport container, in which different temperatures can be maintained during a transport. This can be achieved by one or more of the above given features. If the cartridge is placed somewhere in the container it can be used to establish an upper storage volume and a lower storage volume separated by the cartridge. If the cartridge is not fixed, but can be placed at different heights in the housing, the upper storage volume and the lower storage volume become variable. Already in this situation a certain temperature profile in the container will occur due to physical laws. There will be a tendency that the one of the storage volume becomes colder than the other storage volume due to the fact that the carbon dioxide snow rests on the bottom of the cartridge and that colder gas is heavier than warmer gas of a given gas mixture of gases. On the other hand the temperature in the storage volumes also depends on their outer surfaces, which may lose cold to the environment. In any case, the temperatures in adjacent volumes of the cartridge can also be influenced by using different thermal insulations on the upper and the lower side of the cartridge. The container according to the present invention there-

fore can contain layers of thermal insulation of different thicknesses, which can be used to provide the cartridge with any required thermal insulation on the upper or lower side. It is also possible to use such insulation layers only during filling of the cartridge to influence the amount of dry ice at different locations within the cartridge and to remove at least parts of the insulation after having terminated the filling process.

[0009] Moreover, it is possible to use at least one thermally insulating separating wall to divide the interior of the housing into two separate volumes. The quality of such insulation is decisive for the temperatures above and below such a separating wall.

[0010] Beside the described passive features it is also possible to use the exhaust gas of the cartridge for influencing the temperature profile in the container. One of the possibilities is to use at least one outlet nozzle for blowing the exhaust of carbon dioxide in one or more predetermined directions or receiving storage volumes. Already a very slow gas stream can significantly influence the homogeneity of the temperature distribution in the different storage volumes. A flow path can be designed to bring cold first to the colder volume and afterwards guides the gas through the volume of higher temperature. This way most of the cold from the carbon dioxide snow can be used for keeping the transported goods cool. Finally, it is possible to add further active ventilation means to guide exhausted carbon dioxide from the cartridge on a certain exhaust gas flow path through the housing to a housing outlet.

[0011] In a preferred embodiment the container comprises only one outer door, but at least one additional inner door, preferably two, to separately close one or more of the different storage volumes. This allows to fill one storage volume first, to close it, and then to fill the other volume(s). Especially for deep frozen goods, which may not be warmed up above a certain temperature during the whole transport, this feature is advantageous.

[0012] In another preferred embodiment the container comprises an active wall containing active ventilation equipment, in particular a battery accumulator, a motor, a fan and a control circuit. Such a wall can either be used to separate a certain volume from the rest of the container and to blow cold gas into this volume in a controlled way to maintain a certain temperature, or it can be used to simply produce a convection of gas in a separate volume, in which case the wall needs not to separate two volumes from each other, but only holds the ventilation equipment. Nevertheless, such ventilation equipment can be used to maintain a certain homogeneous distribution with a controlled temperature in a separate volume of the container.

[0013] In another embodiment of the invention, which actually can also be used for other kinds of containers, the housing is formed by a light weight inner housing with only thin or without thermal insulation, in particular for air freight, and an outer housing for including the inner housing, in particular for ground transportation. This design allows transporting heat-sensitive goods, especially also medical goods and drugs, by airplane and on the ground without loading them from one container to another. Usually cooling containers for airfreight have to be of light weight (for example made from Aluminum), but need not to be very stable and do not require extensive thermal insulation as the temperature of the environment during the flight is pretty low. On the other hand ground transportation of goods requires more stable containers and a more extensive thermal insulation as the temperatures of the environment may be high and the container may stand for a while in the sunshine. These situations can be mastered by a container according to the invention having an inner and an outer housing, wherein the outer stable and thermally insulating housing can be taken away during a transport by airplane.

[0014] In a special embodiment of the present invention, which however can also be used for other cooling containers, which not necessarily have separate storage volumes, the cartridge is designed to be filled with dry ice through the access, when the outer door is open. This is especially helpful for the case that the dry ice is not produced by filling liquid carbon dioxide into the cartridge, but is prefabricated and simply placed in the cartridge as a block or in a perforated bag or the like. Systems to prefabricate bags with a certain amount of dry ice are for example described in EP 1 186 842 B1.

[0015] If exhaust gas from the cartridge shall be used to maintain a certain flow path and if an outlet nozzle is used for this purpose, it is advantageous according to the present invention that the cartridge is designed (when filled and closed) to being stable under inner pressure up to at least 2 bars, preferably up to 4 bars. This allows using withhold exhaust gas in the cartridge as a kind of power source to maintain a certain flow and temperature profile in the container.

[0016] For cartridges to be filled with liquid carbon dioxide a certain filling time is required, which is mostly longer than the loading time of the storage volumes or the filling is done at a different location, what both requires additional time for preparing a container for the next transport. According to a preferred embodiment of the invention, which however can also be used for any other containers having a cartridge to be filled with carbon dioxide snow by supplying liquid carbon dioxide, the cartridge contains a cyclone tubing for separating carbon dioxide snow and gas during a filling process with liquid carbon dioxide through a filling coupling.

[0017] In the prior art so far liquid carbon dioxide is fed into a cartridge via a filling gun having at least one filling nozzle at its filling end. The filling end can be surrounded by a sucking channel with sucking openings to remove excess gaseous carbon dioxide from the cartridge directly or after having guided it through the container for cooling it completely down. To allow introducing the filling end into the cartridge the filling end has to be essentially straight, but the direction of the filling nozzle can point in any direction. Usually, it points in a perpendicular direc-

tion to the filling end, preferably sideward, to blow the snow into the cartridge. However, snow and gas form a turbulent mixture, what requires the use of filtering surfaces to keep the snow in the cartridge and only allow the gas to flow to an outlet. To avoid overpressure in the cartridge and/or cladding of the filtering surfaces, the filling intensity is limited and the filling process requires some time. To shorten the filling time, to avoid filtering surfaces and/or to better distribute dry ice in the cartridge the present invention also relates to the injection and distribution of carbon dioxide snow in the cartridge. According to this specific embodiment of the invention the cartridge has a distributor with a receiving end for introducing a usual filling end of a filling gun. The filling end with its filling nozzle is introduced into the receiving end for the filling process. The distributor is formed as to force the resulting carbon dioxide snow and carbon dioxide gas into a curved motion. In a preferred embodiment this is done by a curved tubing, in particular a ring-shaped channel. Thereby, the distributor separates carbon dioxide snow and carbon dioxide gas from each other due to centrifugal forces or forces of inertia, respectively. At a radially outer part along the curved tubing there are provided one or more outer openings for ejecting the separated carbon dioxide snow into the cartridge. At a downstream end of the distributor preferably a central suction opening is provided that collects gaseous carbon dioxide from the cartridge and the curved tubing to guide it to an container outlet or back to the suction channel of the filling end. The distributor allows to better distribute the dry ice in the cartridge and to reduce the filling time. It also makes it easier to completely close the cartridge after filling to establish a certain overpressure in the cartridge, which can be used to blow carbon dioxide gas through an outlet nozzle.

[0018] It should be noted that a multipurpose container according to the present invention needs not to be used for transporting goods with different temperatures. It also allows a use with only one temperature in the whole container. The described embodiments also allow to homogeneously distributing the cold in the container and/or to form only one chamber, for example by placing the cartridge in an uppermost or lowermost position, and to take profit from many of the described advantages also for the case that only one kind of goods has to be transported.

[0019] The present invention also relates to a method for jointly transporting different goods requiring different temperatures during a transport in at least two separate storage volumes in the interior of a housing of a container. The method comprises the following steps:

- filling a cartridge in the interior of the container with dry ice,
- placing the different goods in the at least two separate volumes in the container through an access, which is afterwards closed by an outer door,
- distributing the cold from the cartridge to the at least two separate storage volumes by active or passive measures such that different temperatures in the separate storage volumes are maintained,
- placing the container in a transport vehicle.

[0020] The method according to the invention does not require different containers for each temperature respectively kind of good to be transported, but allows to use one container only for different goods requiring different transport temperatures. The existence of at least two separate storage volumes in a container as described above, allows in a first step to place different goods in different storage volumes. These goods must already have the required temperatures and have not to be further cooled down in the container. It is only necessary to maintain the different temperatures in the different storage volumes, what only requires balancing the loss of cold of each volume to the environment by cold taken from the cartridge with dry ice. Usually, logistic systems try to avoid that transport containers are exposed to environmental temperatures, which are lower than a required temperature in the container as this cannot be balanced internally. If necessary, the containers are transported in heated transport vehicles so that only the situation of higher environmental temperatures has to be considered. The distribution of cold in the container to simply balance any loss of cold from one of the storage volumes can be done by one or more of the described measures.

[0021] One of the measures is to maintain an overpressure of carbon dioxide gas (which is exhausted from the dry ice) in the cartridge during the transport and to release gaseous carbon dioxide through at least one outlet nozzle, preferably a venturi nozzle, into the interior of the container and from there to a housing outlet such that the resulting gas flow path in connection with other properties of the cartridge and the container maintains different temperatures in the separate volumes.

[0022] It is also a preferred alternative or additional measure of the present invention that the cold transfer and distribution by conductivity, radiation, and/or convection from the cartridge into the separate volumes is influenced by different location and/or inhomogeneity of the insulation of the cartridge. Especially a combination of placing the cartridge between two storage volumes and to use different thermal insulations versus each volume can establish and maintain different temperatures in the volumes.

[0023] Another method according to the invention is to control the cold transfer and distribution by active equipment, in particular at least one fan driven by a motor supplied by a battery accumulator and controlled by a control circuit. This allows maintaining desired temperatures even under changing environmental conditions.

[0024] As mentioned above, it is possible to fill the cartridge with dry ice in at least one prefabricated bag, preferably through the access, which is also used for placing the goods in the separate storage volumes. This is a preferred solution, if separated time shall be saved and/or

separate steps for filling with dry ice and for loading goods shall be avoided.

[0025] If at least one prefabricated bag for a certain container is filled with an amount of dry ice, which is calculated according to the mass, kind and transport time of the goods to be transported in the certain container and is preferably placed in the cartridge when the goods are also placed in the separate storage volumes, the filling step can be adapted to the transport requirements and be done at the same time with the loading of goods. This allows treating the at least one prefabricated bag of dry ice during commissioning of the certain container as any other goods and picking and carrying it together with the other goods to the container, where the goods are distributed to the separate storage volumes according to their required transport temperatures and the prefabricated bag is placed in the cartridge. Preferred embodiments, features and examples of the invention are shown in the drawing. However, the invention is not restricted to these embodiments, and the features shown in the different figures can be applied according to the invention separately or in combination with each other.

Fig. 1 shows a schematic perspective view of a container according to the invention,
Fig. 2 shows a schematic perspective view of another embodiment of the invention in a container (without catridge),
Fig. 3 shows a schematic perspective view of a cartridge according to the invention,
Fig. 4 shows a schematic perspective view of an active wall according to the invention, and
Fig. 5 shows a schematic longitudinal section in a horizontal direction of a cyclone tubing in the cartridge.

[0026] Fig. 1 shows a container 1 to be transported in transport vehicles 30 according to the invention. The container 1 has an outer housing 2 and an inner housing 3. The inner housing 3 with the interior 4 of the container 1 can be transported separately, for example in an airplane, while the outer housing 2 is attached for ground transportation. This is especially helpful for transporting heat-sensitive medical goods. For usual transport tasks of ground transportation the housing 2, 3 can be made as one part. The container 1 has an access 8 to the interior 4, which can be closed by an outer door 5. A cartridge 10 to be filled with dry ice 22 is placeable in the interior 4 of the container 1 in a variable manner. For this purpose the container 1 has either a certain kind of holder 17 (not shown in fig. 1) being able to carry the cartridge 10 and other equipment at different heights in the interior 4 of the container 1 or for example insertion grooves 18 in side walls of the container 1. This allows placing the cartridge 10 as shown in such a way that it separates an upper storage volume 6 and a lower storage volume 7. The upper storage volume 6 may be used for example for deep frozen food 34, the lower volume 7 for fresh food 33. The cartridge 10 has in this embodiment a filling coupling, which allows filling with carbon dioxide snow 22 through the access 8, when the outer door 5 is open. An outlet nozzle 11 can blow exhaust gas (CO_2) into the upper storage volume 6 and produce an exhaust gas flow path 21 from the outlet nozzle 11 to a housing outlet 20. Such an exhaust gas flow path 21 can be designed more complicated by opening, channels and other flow influencing means in the container 1 to establish a desired temperature profile. The cartridge 10 has a first surface area 12 and a second surface area 13, which both are important for the transfer of cold to the adjacent volumes. The cold transfer can be increased by metallic surfaces, possibly having ribs or other kinds of profiles, while thermal insulations can reduce the cold transfer via the surfaces. This gives a lot of flexibility to adapt the container to different desired temperature profiles by adding or removing thermal insulations 14, 15 (not shown in fig. 1) or profiled metallic surfaces.

[0027] Fig. 2 shows another embodiment of the invention, which is similar to that of fig. 1 concerning the housing 2, 3 of the container 1 and the outer door 5. In fig. 2 the cartridge 10 of fig. 1 is taken away, but would be present, when using the container 1 for transport purposes. Fig. 2 shows an inner door 23, which can be used to close a partial volume, in this case an upper storage volume 6, after filling to avoid warming up already filled in goods. In a preferred embodiment the housing 2, 3 is provided with means to add inner doors 23 of a required size and number according to the intended use of different parts of the interior 4 of the container. Fig. 2 as well as fig 4 in more detail also show an active wall 19, which is inserted into one of the insertion grooves 18. The active wall 19 comprises in the present example a battery accumulator 24, a motor 25, a fan 26, and a control circuit 27. The body of the active wall 19 may be made of a grid or other material allowing a gas flow through the active wall 19. Such an active wall 19 or other ventilation equipment allows to homogenize the temperature even in bigger storage volumes and to support the transfer of cold from the cartridge 10 into a storage volume. In the same way as an active wall 19 a thermally insulating (passive) wall 16 can be inserted at any desired horizontal position.

[0028] Fig. 3 shows in more detail the cartridge 10 of fig. 1. In this figure the first surface area 12 is provided with a first thermal insulation 14, and the second surface area 13 is provided with a second (possibly different) thermal insulation 15. Two outlet nozzles 11 allow blowing exhaust carbon dioxide into a volume above the cartridge 10. A cyclone tubing, 28 which is shown in fig. 5 in more detail, allows a fast filling of the cartridge with dry ice 22. For this purpose a filling gun 31 connected to a supply system 32 is inserted with a filling end 40 into the filling coupling 9 of the cartridge 10. As an alternative, the cartridge 10 can have an inner door (not shown in fig. 3) to place bags 29 filled with dry ice in the cartridge.

[0029] Fig. 5 shows an exemplary downstream section of a filling gun 31 and an exemplary distributor 43. A filling

end 40 of said filling gun 31 may comprise at least one filling nozzle 41. The filling end 40 is surrounded by at least one, preferably several sucking openings 42. For injecting carbon dioxide snow into a cartridge 10 the filling end 40 has to be inserted into the distributor 43 being part of said cartridge 10. Hereby, the filling end 40 has to be moved into a receiving end 44 of distributor 43 until the at least one filling nozzle 41 is positioned within a curved channel 45 of distributor 43, wherein the at least one nozzle 41 points in a circumferential direction of said curved channel 45. Through rapid expansion of liquid carbon dioxide through the at least one nozzle 41 carbon dioxide snow and gaseous carbon dioxide are formed and forced on a curved path along said curved channel 45. The curved channel 45 may be a ring-shaped tubing. The accelerated carbon dioxide snow accumulates in an outer part, whereas gaseous carbon dioxide accumulates in an inner part of the curved channel 45. This is due to the snow experiencing a higher centrifugal force or force of inertia, respectively, compared to the gas. Along an outer circumferential part of the curved channel 45 at least one, preferably several, outer openings 46 may be positioned. The accelerated carbon dioxide snow and some gaseous carbon dioxide are ejected through the outer openings 46. That way less carbon dioxide gas is ejected into the cartridge 10 compared to injection methods for carbon dioxide snow known from the prior art. That little bit of gas ejected into the cartridge 10 is sucked back into the distributor 43 via a central suction opening 47. Subsequently, the carbon dioxide gas reentering the distributor 43 and the gas from the inner part of the curved channel 45 is sucked out through sucking openings 42. The dashed arrows 48 illustrate exemplary paths of carbon dioxide snow being ejected through outer openings 46 and the dotted arrows 49 illustrate exemplary paths of gaseous carbon dioxide being sucked out through central suction opening 47 and sucking openings 42.

[0030] The present invention can well be understood as a kit for flexibly establishing a container according to any required transport situation. The kit can contain different cartridges to be filled with liquid carbon dioxide or with prefabricated bags containing dry ice. It also can contain different active walls or other ventilation equipment as well as different thermal insulations or profiled metallic sheets for the cartridge. Thermally insulating layers or sheets can also be used as horizontal (passive) walls to define separate storage volumes. They can be inserted wherever required in the container. Moreover, all equipment can be placed at different heights in the container, and finally, the housing can be made of two parts for transportation by airplane or vehicle.

[0031] The present invention allows to flexibly using transport containers cooled by dry ice for different kinds and amounts of goods to be transported. It particularly allows adapting containers to different transport tasks and transporting goods, especially fresh food and deep frozen food, with different transport temperatures in the same container.

Reference List

[0032]

1	container
2	outer housing
3	inner housing
4	Interior of the container
5	outer door
6	upper storage volume
7	lower storage volume
8	access
9	filling coupling
10	cartridge
11	outlet nozzle
12	first surface area
13	second surface area
14	first thermal insulation
15	second thermal insulation
16	passive thermally insulating wall
17	holder
18	insertion grooves
19	active wall with ventilation equipment
20	housing outlet
21	exhaust gas flow path
22	dry ice
23	inner door
24	battery accumulator
25	motor
26	fan
27	control circuit
28	cyclone tubing
29	bag filled with dry ice
30	transport vehicle
31	filling gun
32	supply system
33	fresh good/food
34	deep frozen good/food
35	prefabricated bag
40	filling end
41	filling nozzle
42	sucking openings
43	distributor
44	receiving end
45	curved channel
46	outer openings
47	central suction opening
48	paths of carbon dioxide snow
49	path of gaseous carbon dioxide

Claims

1. Container (1) for transporting goods (33, 34) requiring cooling during their transport, the container (1)

comprising:

- a housing (2, 3) basically having a cuboid outer shape and at least one outer door (5) to open an access (8) to at least two separate storage volumes (6, 7) in the interior (4) of the housing (2, 3),
- a cartridge (10) being fillable with a required amount of dry ice (22) arranged in the interior (4) of the container (1)
- at least one of the following features to maintain different temperatures in the separate storage volumes (6, 7):

  a. the cartridge (10) is placed between an upper storage volume (6) and a lower storage volume (7),
  b. the cartridge (10) can be placed at different heights in the housing (2, 3),
  c. the cartridge (10) has at least a first surface area (12) and a second surface area (13) with different thermal insulations (14, 15) versus adjacent storage volumes (6, 7),
  d. the cartridge (10) has an inhomogeneous thermal insulation (14, 15), such that during filling using liquid carbon dioxide the better insulated parts are filled with dry ice (22) first,
  e. the housing (2, 3) contains at least one thermally insulating separating wall (16),
  f. the cartridge (10) has at least one outlet nozzle (11) for blowing an exhaust of carbon dioxide in one or more predetermined directions or receiving storage volumes (6, 7),
  g. the housing (2, 3) contains at least one active ventilation means (19) to guide exhausted carbon dioxide from the cartridge (10) on a certain exhaust gas flow path (21) through the housing (2, 3) to a housing outlet (20).

2. Container according to claim 1, comprising only one outer door (5), but at least one additional inner door (23), preferably two, to separately close one or more of the different storage volumes (6, 7).

3. Container according to claim 1 or 2, comprising an active wall containing active ventilation equipment (19), in particular a battery accumulator (24), a motor (25), a fan (26) and a control circuit (27).

4. Container according to one of the preceding claims comprising a light weight inner housing (3) with only thin or without thermal insulation, in particular for air freight, and an outer housing (2) for including the inner housing (3), in particular for ground transportation.

5. Container according to one of the preceding claims, wherein the cartridge (10) is designed to be filled with dry ice (22) through the access (8), when the outer door (5) is open.

6. Container according to one of the preceding claims, wherein the cartridge (10) is designed to being stable under inner pressure up to at least 2 bars, preferably up to 4 bars.

7. Container according to one of the preceding claims, wherein the cartridge (10) contains a cyclone tubing (28) for separating carbon dioxide snow and gas during a filling process with liquid carbon dioxide through a filling coupling (9).

8. Container according to one of the claims 1 to 6, wherein the cartridge (10) is designed to be equipped with at least one bag (29) containing dry ice (22).

9. Method for jointly transporting different goods (33, 34) requiring different temperatures during a transport in at least two separate storage volumes (6, 7) in the interior (4) of a housing (2, 3) of a container (1) comprising the following steps:

- filling a cartridge (10) in the interior (4) of the container (1) with dry ice (22),
- placing the different goods (33, 34) in the at least two separate volumes (6, 7) in the container (1) through an access (8), which is afterwards closed by an outer door (5),
- distributing the cold from the cartridge (10) to the at least two separate storage volumes (6, 7) by active or passive measures such that different temperatures in the separate storage volumes (6, 7) are maintained,
- placing the container (1) in a transport vehicle (30).

10. Method according to claim 9, wherein an overpressure of carbon dioxide is maintained in the cartridge (10) during the transport and gaseous carbon dioxide is released through at least one outlet nozzle (11), preferably a venturi nozzle, into the interior (4) of the container (1) and from there to a housing outlet (20) such that the resulting gas flow path (21) in connection with other properties of the cartridge (10) and the container (1) maintains different temperatures in the separate volumes (6, 7).

11. Method according to claim 9 or 10, wherein the cold transfer and distribution by conductivity, radiation, and/or convection from the cartridge (10) into the separate volumes (6, 7) is influenced by different location and/or inhomogeneous of the insulation (14, 15) of the cartridge (10).

12. Method according to one of claims 9 to 11, wherein the cold transfer and distribution is controlled by active means, in particular at least one fan (26), driven by a motor (25) supplied by a battery accumulator (24) and controlled by a control circuit (27).

13. Method according to one of claims 9 to 12, wherein the cartridge (10) is filled with dry ice (22) in at least one prefabricated bag (35), preferably through the access (8), which is also used for placing the goods (33, 34) in the separate storage volumes (6, 7).

14. Method according to claim 13, wherein the at least one prefabricated bag (35) for a certain container (1) is filled with an amount of dry ice (22), which is calculated according to the mass, kind and transport time of the goods (33, 34) to be transported in the certain container (1) and is preferably placed in the cartridge (10) when the goods (33, 34) are also placed in the separate storage volumes (6, 7).

15. Method according to claim 13 or 14, wherein the at least one prefabricated bag (35) of dry ice (22) is treated during commissioning of the certain container (1) as any other goods (33, 34) and picked and carried together with the other goods (33, 34) to the container (1), where the goods (33, 34) are distributed to the separate storage volumes (6, 7) according to their required transport temperatures and the prefabricated bag (35) is placed in the cartridge (10).

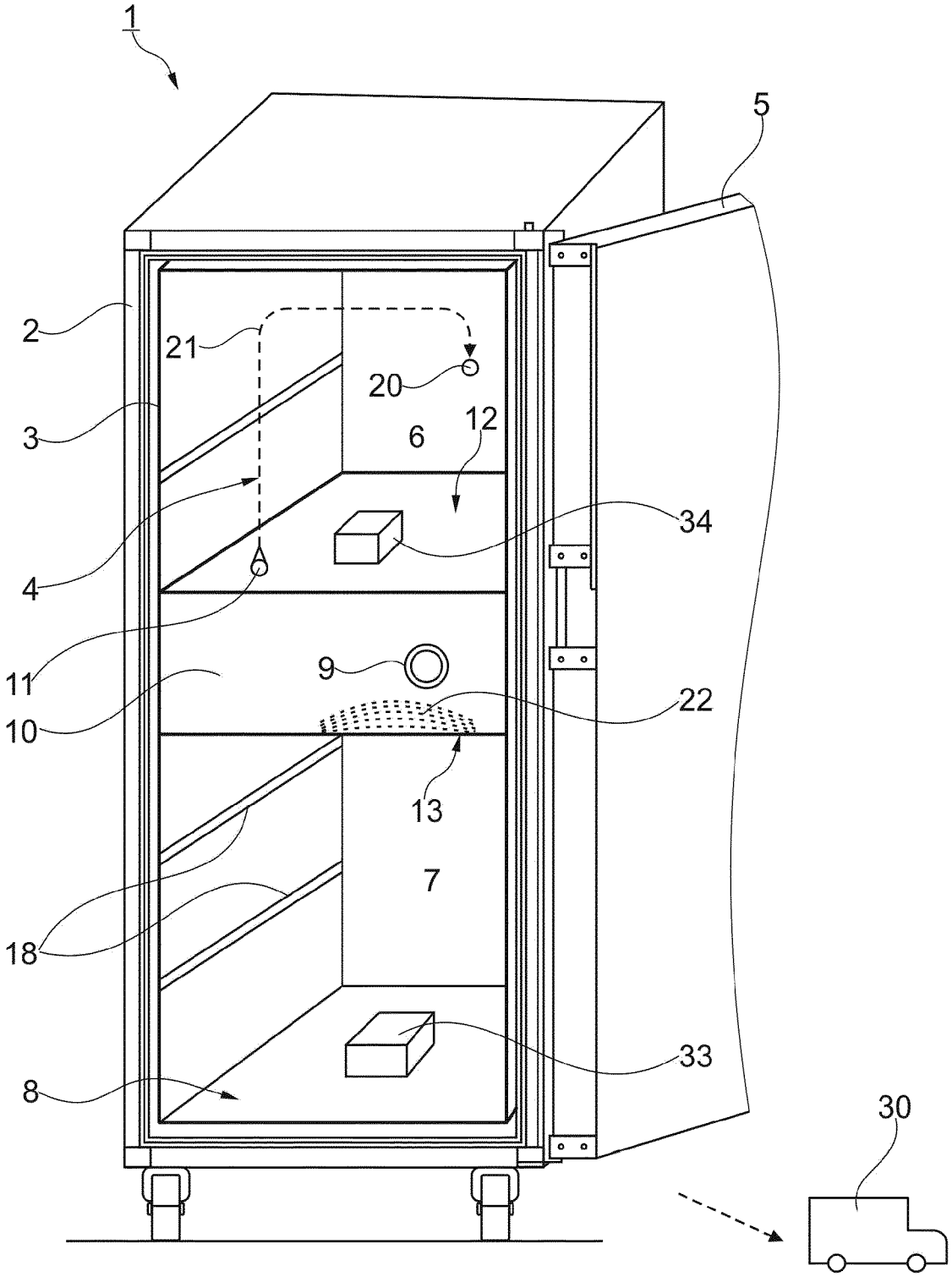

Fig. 1

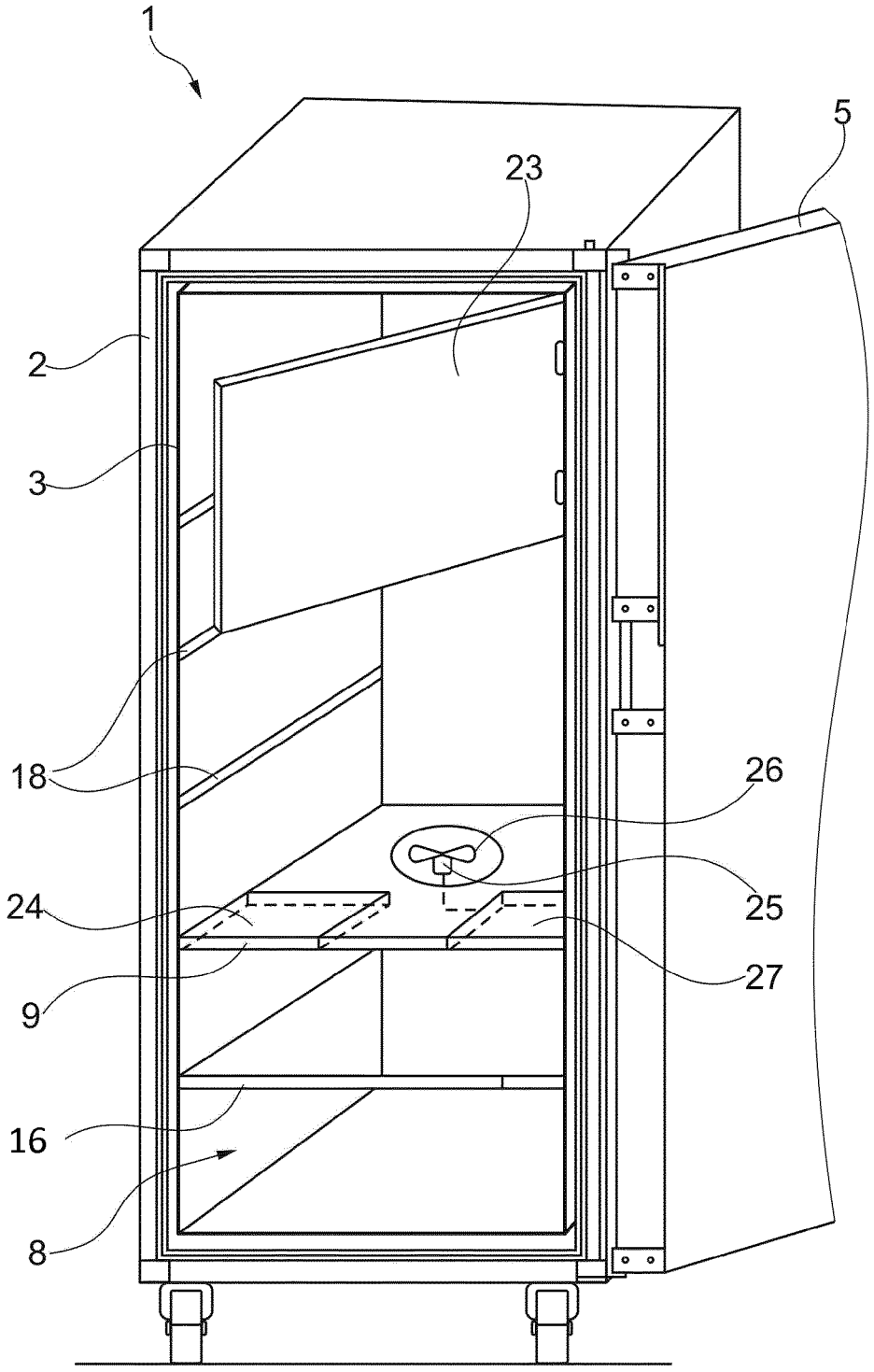

Fig. 2

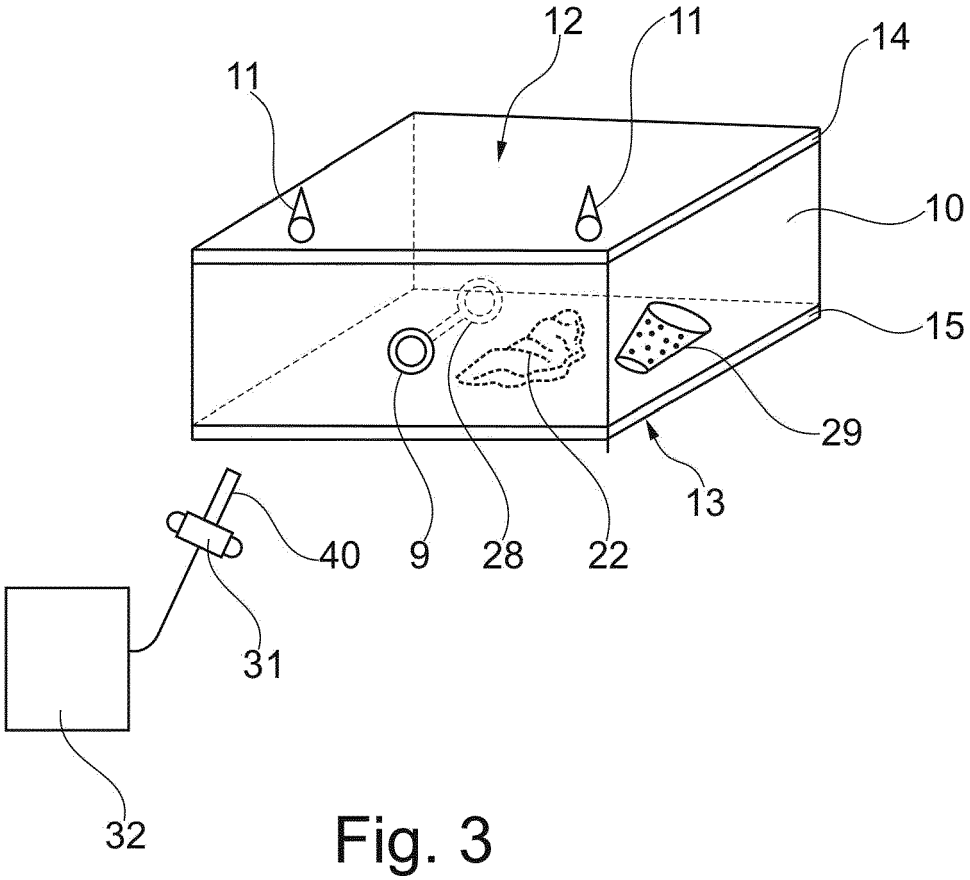

Fig. 3

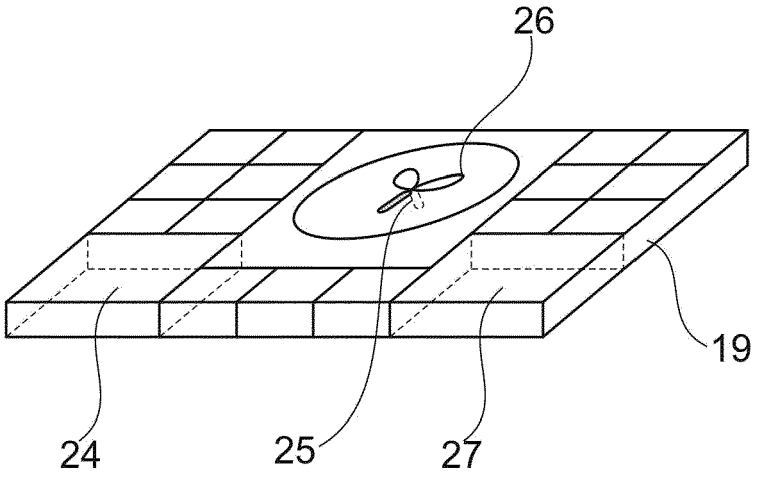

Fig. 4

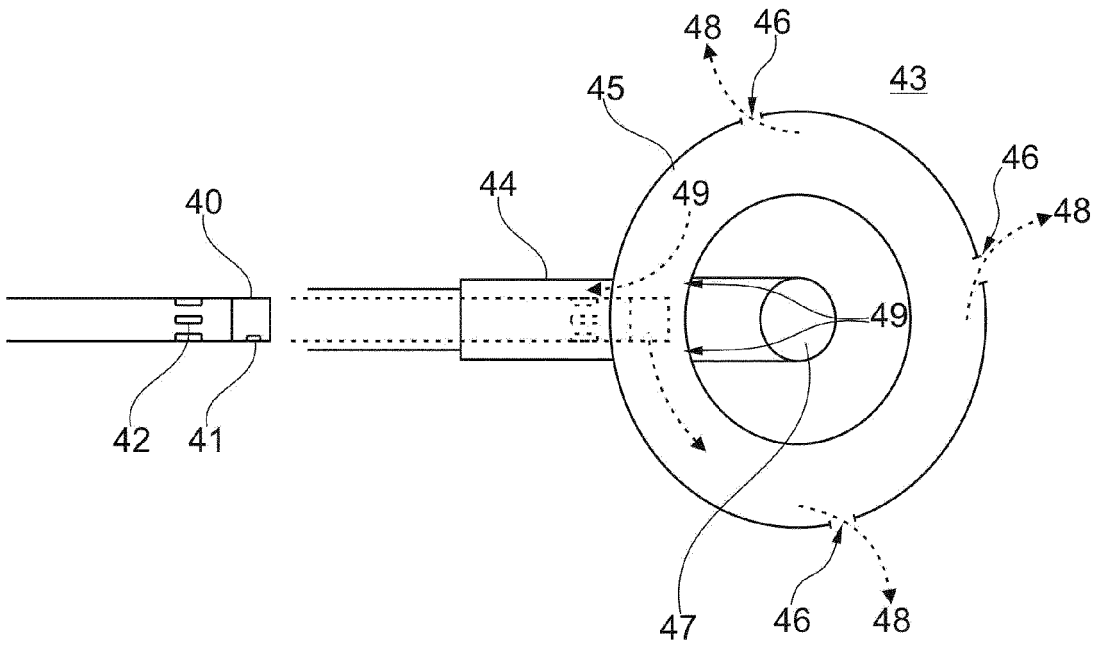

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 3078

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2013/219948 A1 (AUREKOSKI JARMO [FI]) 29 August 2013 (2013-08-29)	1,2,9,11	INV. F25D3/14
Y	* paragraphs [0015], [0045]; figure 3 *	8	
Y	WO 2010/128535 A2 (ZACCHI LUCA [IT]) 11 November 2010 (2010-11-11) * abstract; figure 2 *	8	

TECHNICAL FIELDS SEARCHED (IPC)

F25D

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	21 July 2015	Melo Sousa, Filipe

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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European Patent Office
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Application Number
EP 15 15 3078

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

2, 8, 11(completely); 1, 9(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 15 15 3078

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 2, 8, 11(completely); 1, 9(partially)

   A container with a dry ice cartridge placed at adjustable heights between an upper and lower storage volume

   ---

2. claim: 1(partially)

   A container with a dry ice cartridge with different surface insulation profiles

   ---

3. claim: 1(partially)

   A container with a dry ice cartridge and one thermally insulating separating wall

   ---

4. claims: 5-7, 10, 13-15(completely); 1(partially)

   A container with a dry ice cartridge and an outlet nozzle

   ---

5. claims: 3, 12(completely); 1, 9(partially)

   A container with a dry ice cartridge and active ventilation means

   ---

6. claim: 4

   A container with a dry ice cartridge and a light weight inner housing

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 3078

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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21-07-2015

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

REFERENCES CITED IN THE DESCRIPTION

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