(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 722 618 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.04.2014 Bulletin 2014/17

(51) Int Cl.:
F25D 3/08 *(2006.01)*

(21) Application number: **13004966.1**

(22) Date of filing: **17.10.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **19.10.2012 SI 201200314**

(71) Applicant: **Farmadent d.o.o.**
2000 Maribor (SI)

(72) Inventors:
- **Marolt, Robert**
  2000 Maribor (SI)
- **Verdel, David**
  3310 Zalec (SI)

(74) Representative: **Marn, Jure**
Ljubljanska ulica 9
2000 Maribor (SI)

(54) **Container with regulation of content temperature**

(57) A container with regulation of content temperature solves technical problem of value and oscillation of temperature of content (4) of container. Container is designed as room within a room. Both rooms are bounded by vacuum panels, which are otherwise known in state of the art whereby said vacuum panels form at least one outer (1) and and least one inner (2) envelope. Between both envelopes there are heat cold supply means and/or heat sources (3).

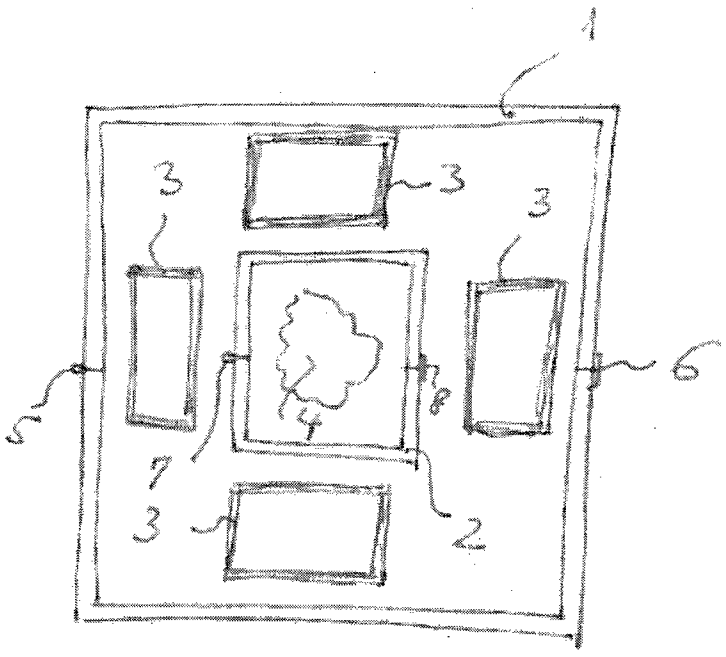


Fig. 1

EP 2 722 618 A2

Description

Field of technology

Transport, cooling technology

Technical problem

[0001] Technical problem to be solved according to this invention is a request that the temperature of temperature sensitive goods is retained within preset boundaries using preferably passive cooling means and/or heating means. Said goods undergoes a transport where the temperature of the immediate environment of a container is changes, and in some cases, temperature of the immediate environment must be much higher than that within the container. As such unfavorable conditions for retaining of temperature level and stability are created, and this corresponds to technical problem to be solved by this invention.

State of the Art

[0002] Vacuum insulation panels (VIP) are known, and used in different insulation containers when it is desired to keep food and other item temperatures within preset temperature range at the time of delivery. Such vacuum insulation panels are shown, for example, in US 5,950,450, US 5,943,876 and US 6,192,703, and the applicant herewith includes them into this application by reference to avoid retyping of description therein.

[0003] However, these vacuum insulation panels are insufficient due to problems associated with heat transfer. Therefore, the closest solution to technical problem as described above is shown in patent application EP 1 291 300 presenting multilayered core of vacuum insulation panel used for transport of food, medication and other temperature sensitive goods.

Description of New Invention

[0004] Container and method for regulation of content temperature solve above referenced technical problem.

[0005] Said container is designed as room within a room. Both rooms are bounded by vacuum panels, which are otherwise known in state of the art whereby said vacuum panels form at least outer and and least one inner envelope. Between both envelopes there are heat cold supply means or heat sources, whereby cold is defined as negative heat flow and known in cooling and refrigeration technology, and cold supply means can also be described as heat sinks.

[0006] Within the inner envelope there is an item (load) which is kept in desired temperature range. This invention was developed having in mind medications which require controlled environment, however, also food and other temperature sensitive materials may be transported in such container.

[0007] Heat sink is known in state of the art and can represent pieces of ice, dry ice, or other material having high enough heat capacity (result of multiplication of mass and specific heat), or when change of phase (i.e. melting or evaporation in case of heat transfer from the environment). Heat source is known in state of the art and can represent gas or liquid, and also solid giving up heat into the environment (also by condensation, or solidification). All of these sources or sinks are passive sources or sinks, and use of such sources represent additional novelty of invention described herein. Moreover, when heat sources or heat sinks taking advantage of phase change are used such sources or sinks represent essentially isothermal properties of such source or sink, i.e. it has essentially constant temperature during phase change (phase transition).

[0008] Heat sources and/or sinks are arranged into intermediate space between both envelopes, said envelopes comprised of vaccum panels. It should be immediatly stressed that such construction can be repeated continuously, and that said container mac be comprised of plurality of envelopes, each envelope comprising vacuum panel or plurality thereof.

[0009] Between adjacent envelopes comprising vacuum panel or plurality thereof there can be additionaly insulation mass introduced, said insulation mass known in state of the art, and in such case heat sources and/or heat sinks are inserted into such insulation mass. Of course, only air or other gas (e.g. Argon or other gases with insulation properties) can be between envelopes, or combination of insulation mass and insulation gas. It should also be mentioned that both solutions (insulation mass, and insulation gas) have advantages or disadvantages. The advantage of insulation mass is prevention of circulation of air (or gas) between envelopes, the disadvantage is temperature oscillation along envelopes with crests (or troughs, depending whether one deals with heat source and/or heat sink) in positions closest to heat sources and/or heat sinks. Insofar gas, preferably air is between the envelopes one experiences natural convection (subject to conditions known in state of the art, above critical Rayleigh number) resulting in mixing of gas, preferably air, in space between adjacent envelopes, and essentially equalization of temperature in whole space between said adjacent envelopes.

[0010] Heat sin kand heat source may be also active (actively controlled). The heat sink may be a refrigerator using outside source of energy (e.g. electrical energy) for its operation, while heat source may be a heater using outside source of energy (e.g. electrical energy) for its operation. Active heat sources or heat sinks provide for better control over temperature of container content while at the same time present problems during transport due to outside energy source connections.

[0011] Of course, active containers featuring heat sources and/or heat sinks connected to energy sources within the container (for example between said adjacent envelopes) are possible such as mini-turbines or like.

[0012] Below, the essence of this invention is further described using figures whereby said figures form part of this patent application, and show:

Figure 1 presents embodiment of said container in cross section, namely outer envelope (1) comprising vacuum panel or plurality thereof, inner envelope (2) comprising vacuum panel or plurality thereof, heat sources and/or heat sinks (3), goods subject to cooling and/or heating (4), hinge of outer envelope (5), lock of outer envelope (6), hinge of inner envelope (7), lock of inner envelope (8).

Figure 2 presents embodiment of said container in its closed position whereby only outer envelope (1) and outer envelope lock (6) are seen.

Figure 3 presents embodiment of said container with opened outer envelpe (1) showing outer envelope (1), inner envelope (2).

Figure 4 presents embodiment of said container with opened outer envelope (1) showing outer envelope (1), inner envelope (2), lock of outer envelope (6), lock of inner envelope (8).

[0013] In embodiment which is not limited to system of opening and closing as described herein as there are plenty of other systems of opening and closing known in state of the art an outer envelope (1) comprises vacuum panel or plurality thereof whereby some way of opening said outer envelope should be foreseen (opening means), in this embodiment using hinges (5), and further, some way of preventing unwanted opening should be foreseen (locking means), in this embodiment using a lock (6). Similarly, inner envelope (2) set up is presented by foreseeing some way of opening (opening means), in this embodiment using hinges (7), and in some way of preventing unwanted opening is shown (locking means), in this embodiment using a lock (8).

[0014] Within said inner envelope (2) there is an item (4) or plurality thereof, said item or plurality thereof temperature stability within limited temperature range provided for using this invention.

[0015] In this embodiment stability between 0 °C and 10°C, preferably between 2°C and 8°C should be provided for whereby the environment is at different temperature to temperature within the inner envelope, preferably between 18°C and 22°C. This stability is provided for with appropriate cooling and/or heating with appropriate heat sinks and/or heat sources (3), in this embodiment is such heat sink ice cooled to around -20 °C. Of course, this temperature does not present any kind of limitation.

[0016] A distance between outer envelope (1) and inner envelope (2) is provided with help of spacer or plurality therof, said spacer known in state of the art, however, the spacers can be formed in such a way to provide for sufficient space for heat sources and/or heat sinks.

[0017] In embodiment presented herein the test have shown that at controlled temperature of the environment 20°C +- 2°C and using eight heat sinks, filled with ice with initial temperature approximately -20 °C, there is a temperature within the inner envelope (2) temperature 5°C +- 1°C for 5 hours. The volume of the outer envelope (1) for this embodiment was 21,32 1, the volume of the inner envelope (2) for this embodiment was 9,1 1, volume of each heat sink for this embodiment was 0,291

[0018] The subject of this invention is therefore a container for passive temperature control of the content, **characterized in that** it comprises at least two envelopes contained one inside another, each envelope comprising vacuum panels, in particular at least one outer envelope (1) comprising opening means preferably hinges (5) and locking means for preventing of unwanted opening preferably a lock (6), and further at least one inner envelope (2) comprising opening means preferably hinges (7) and locking means for preventing of unwanted opening preferably a lock (8), whereby between envelopes of each adjacent envelope pair, each of said envelopes comprising vacuum panel or plurality thereof, there is at least one heat source and/or heat sink (3) inserted for regulation of temperature within said container.

[0019] Preferably, said heat source and/or heat sink (3) is passive, and even more preferably they use latent heat of phase transition, e.g. evaporation or melting as heat sink, and condensation or solidification as heat source.

Claims

1. A container with regulation of content temperature, comprising at least two envelopes contained one inside another, each of said envelopes comprising a vacuum panel or plurality thereof, in particular comprising at least one outer envelope (1), and further at least one inner envelope (2) whereby between envelopes of each adjacent envelope pair, each of said envelopes comprising vacuum panel or plurality thereof, there is at least one heat source and/or heat sink (3) inserted for regulation of temperature within said container.

2. Container according to claim 1, whereby said heat source and/or heat sink (3) is passive, preferably using latent heat of phase transition preferably evaporation or melting as heat sink, and/or condensation or solidificaiton as heat source.

3. Container according to any of previous claims whereby temperature stability of content (4) within the inner envelope (2) is provided for between 0 °C and 10°C, preferably between 2°C and 8°C, whereby the environment of the outer envelope (1) is at different temperature to said temperature within the inner envelope (2), preferably between 18°C and

22°C.

4. Container according to any of previous claims whereby heat sink (3) comprises ice preferably cooled below -10°C, even more preferably cooled below - 20°C.

5. Container according to any of previous claims whereby at least one outer envelope (1) comprises opening means preferably hinges (5) and locking means for preventing of unwanted opening preferably a lock (6), and further at least one inner envelope (2) comprises opening means preferably hinges (7) and locking means for preventing of unwanted opening preferably a lock (8)..

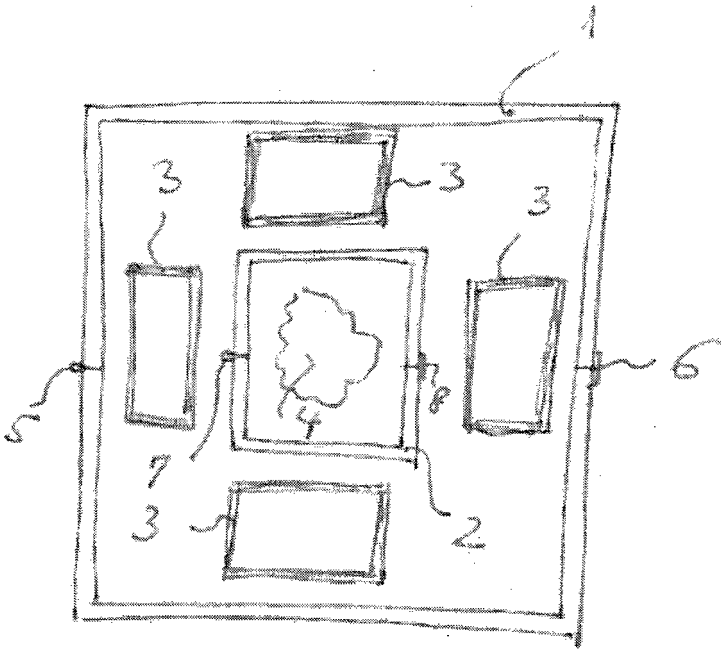


Fig. 1

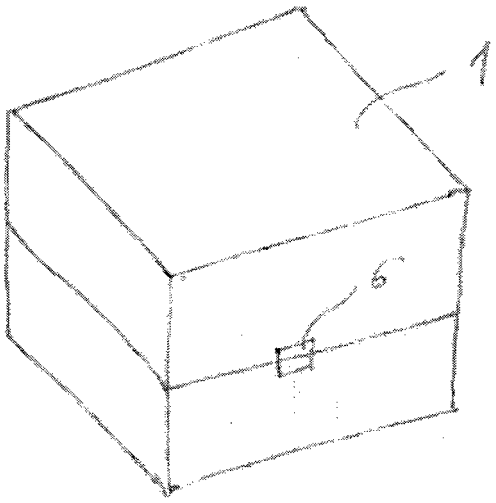


Fig. 2

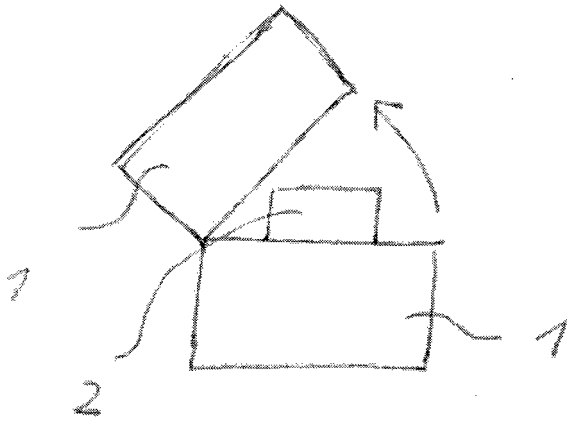


Fig. 3

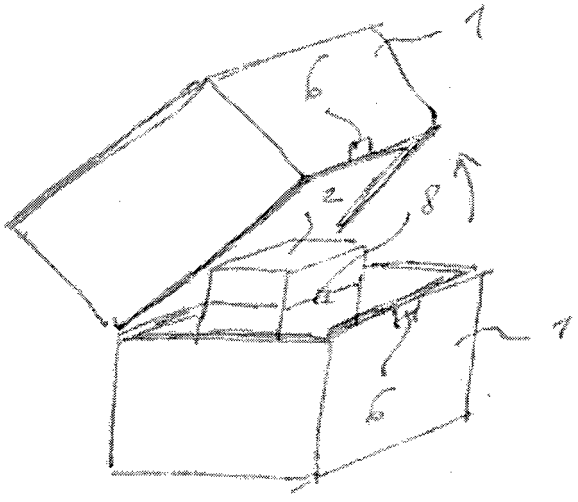


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5950450 A **[0002]**
- US 5943876 A **[0002]**
- US 6192703 B **[0002]**
- EP 1291300 A **[0003]**