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### (54) ISOTHERMAL CONTAINER, PARTICULARLY FOR KEEPING COLD BEVERAGES

(57) Isothermal container for keeping beverages, cold beverages in particular, consisting of a body with two walls - the outer wall (2) and inner wall (1), where between the walls there is a layer of phase-change material (4), is characterised in that the phase-change material used for the phase-change material (4) layer is of

the solid-liquid type, preferably paraffin solidifying under 8°C, preferably at 5°C. The thickness of the layer of the phase-change material (4) equals no less than 20% of the container's inner diameter. The outer wall (2) is covered with an insulating layer (5) made of polystyrene.

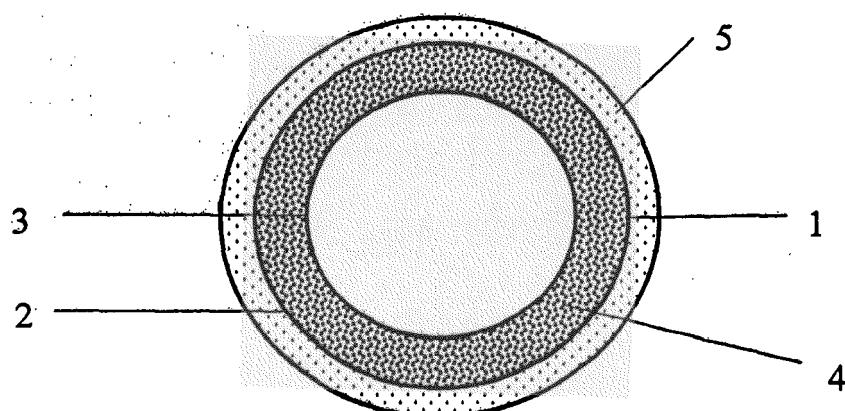


Fig. 1

## Description

**[0001]** The invention concerns an isothermal container, particularly for keeping cold beverages. The invention may be used for transporting, keeping, or serving cold beverages or meals, particularly at private homes, in catering outlets, or when in travel.

**[0002]** Known and used are isothermal containers such as vacuum flasks, designated for keeping both hot and cold beverages.

**[0003]** Known are isothermal containers designated for transporting food, consisting of a double wall body made of high pressure polyethylene, where polyurethane foam is placed in between the walls.

**[0004]** Known from Polish patent application No. P.395910 is an isothermal container for distribution of food, especially fresh fish, made of plastic, which has a spacer on the bottom shaped so as to correspond with the internal contour of the container. Between the edges of the spacer and the walls of the isothermal container there is a technological slit. The spacer is made of Styrofoam and fitted with tapered-cone-shaped feet.

**[0005]** Also known are market products used as heat buffers. The products take the form of closed profiles filled with phase-change material of the appropriate phase transition temperature. Initially, the phase-change material is solid and melts when heated. Solidifying again, it gradually releases the earlier accumulated heat, thus keeping the container temperature constant. Those products are placed in insulated vessels, cases, cardboard boxes, or bags used to keep and transport beverages and/or food.

**[0006]** Known from Polish patent application No. P.397975 is an isothermal container for keeping hot meals, consisting of a double wall body and an insulating layer in between those walls, where the inner wall of the body and the inner side of the lid are covered with a phase-change material.

**[0007]** Known from utility model description No. CN202919767 is an isothermal mug which retains heat of the beverages kept inside, consisting of the lid, body, and handle, where the inner layer of the body is made of stainless steel, and the protective outer layer is a plastic shell. The space formed between those two layers is filled with a phase-change material of the solid-solid type.

**[0008]** Majority of the known isothermal containers enable retaining higher temperature of the products kept inside. There is a need to develop a container which would enable long retention of lower temperatures of the products kept inside, especially liquids and in particular cold beverages, which in high temperatures warm up very quickly.

**[0009]** The invention concerns an isothermal container, particularly for keeping cold beverages, which consists of a body with two walls, the outer wall and inner wall, where between the walls there is a layer of a phase-change material characterised in that the phase-change material forming the phase-change material layer is a

material of the solid-liquid type, preferably paraffin solidifying in temperatures under 8°C, preferably at 5°C.

**[0010]** Preferably, the thickness of the layer of the phase-change material equals no less than 20% of the container's inner diameter.

**[0011]** Preferably, the inner wall is covered with an insulating layer, preferably of polystyrene.

**[0012]** Initially, the phase-change material is liquid and then solidifies when cooled down. With the cooled beverage inside, the container fitted with the phase-change material as described above can be transported over long distances retaining its content at constant low temperature for many hours.

**[0013]** The invention is described in further detail on the drawing, where Fig. 1 shows the isothermal contained in cross section, Fig. 2 provides a diagram of the structure of the isothermal container as compared with an ordinary container, in an axonometric view, and Fig. 3 shows a graph depicting mutual relationship between the temperature of the beverage kept inside the container and time for the containers depicted on Fig. 2.

## Example

**[0014]** An isothermal container for keeping cold beverages,  $V=0.5 \text{ dm}^3$  in volume, consists of a body 1 with two walls - the outer wall 2 and inner wall 3, in between which there is a layer of phase-change material 4, i.e. a layer of paraffin solidifying at 7°C.

**[0015]** The outer wall 2 is covered with an insulating layer 5 made of polystyrene and fitted with a lid. The thickness  $D_4$  of the layer of paraffin 4 is determined by the inner diameter  $D$  of the container. The thickness of the layer of paraffin 4 in the analysed container represents ~30% of the inner diameter of the isothermal container, i.e.  $D_4/D = 1.88 \text{ cm} / 6.36 \text{ cm}$ .

**[0016]** As shown on Fig. 2 and Fig. 3, the temperature was measured in two tests:

- 40 1) reference test - container devoid the phase-change material,
- 41 2) test with the phase-change material in the form of paraffin - isothermal container with a layer of paraffin solidifying at 7°C.

**[0017]** Before the temperature was measured, both containers had been cooled in a freezer for about 4 hours down to -4°C.

**[0018]** Ethyl alcohol in the container without the phase-change material warmed up to 8°C over 1 hour and 48 minutes at the average ambient temperature of 23,5°C. Ethyl alcohol in the container with the phase-change material warmed up to the same temperature over 6 hours and 54 minutes at the average ambient temperature of 23,5°C.

**[0019]** Using paraffin as a phase-change material allows to extend the time over which the desired low temperature of the beverage kept inside is retained by more

than three times.

### Claims

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1. Isothermal container for keeping beverages, cold beverages in particular, consisting of a body with two walls - the outer wall and inner wall, where between the walls there is a layer of phase-change material, **characterised in that** the phase-change material forming the phase-change material layer (4) is a material of the solid-liquid type, preferably paraffin solidifying in temperatures under 8°C, preferably at 5°C.

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2. Container according to Claim 1, **characterised in that** the thickness ( $D_4$ ) of the layer of the phase-change material (4) equals no less than 20% of the container's inner diameter (D).

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3. Container according to Claims 1-2, **characterised in that** the outer wall (2) is covered with an insulating layer (5), preferably made of polystyrene.

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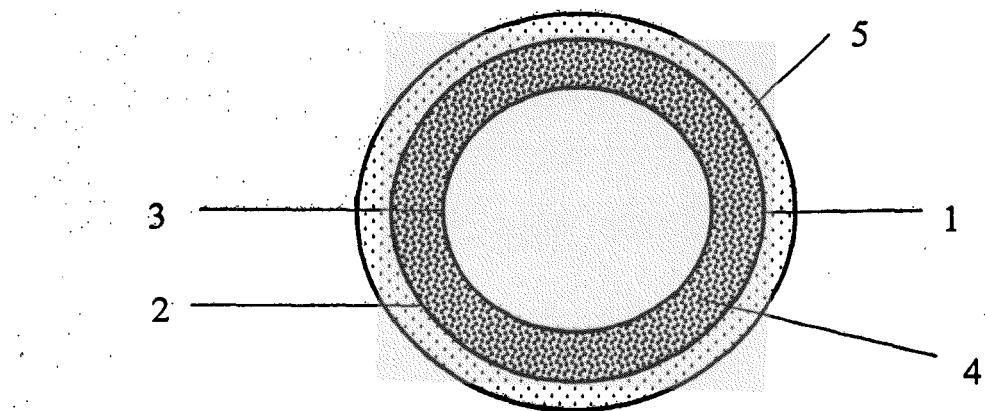


Fig. 1

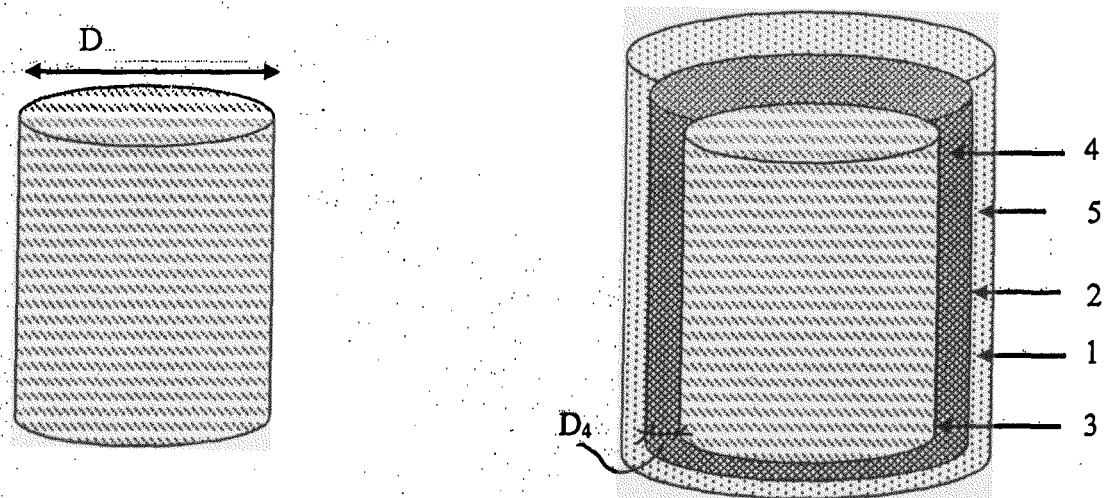


Fig. 2

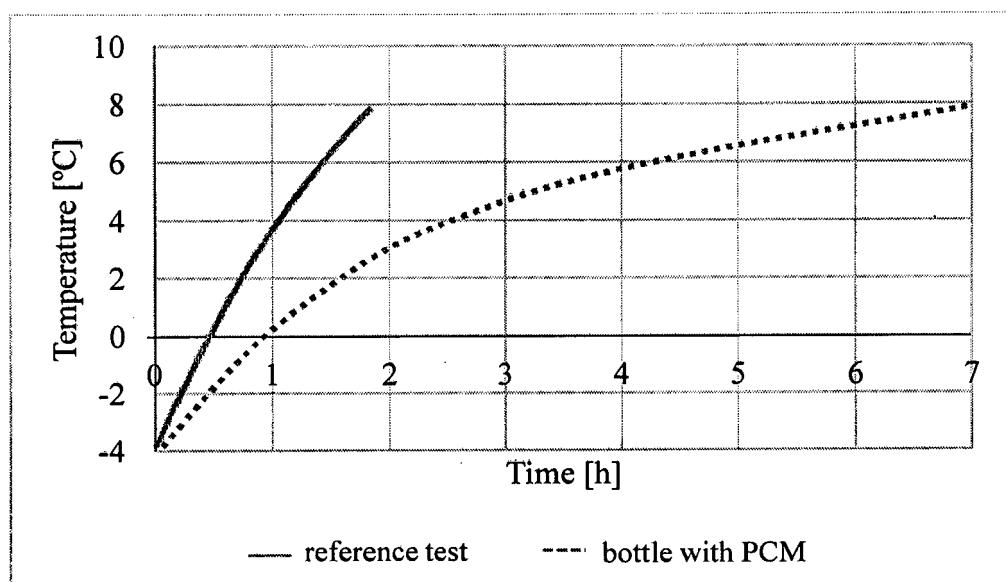


Fig. 3



## EUROPEAN SEARCH REPORT

Application Number

EP 15 46 0066

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35			TECHNICAL FIELDS SEARCHED (IPC)
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50	1 The present search report has been drawn up for all claims		
55	Place of search The Hague	Date of completion of the search 8 February 2016	Examiner Bidet, Sébastien
CATEGORY OF CITED DOCUMENTS		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	
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EP 15 46 0066

5 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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08-02-2016

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**REFERENCES CITED IN THE DESCRIPTION**

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- PL P397975 [0006]
- CN 202919767 [0007]