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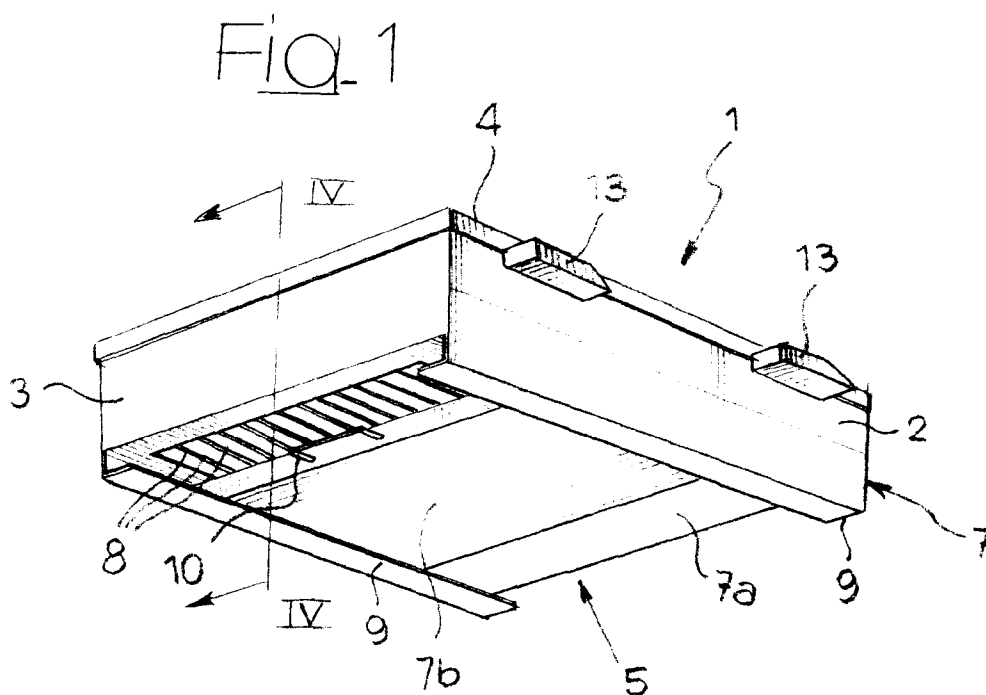
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(54) **Solid refrigerant reservoir for isothermal containers, particularly for the transportation of products under controlled temperature**

(57) Solid refrigerant reservoir for isothermal containers, particularly for the transportation of products under controlled temperature, comprising a drawer (1) having a generally parallelepipedal design whose bottom wall (5) defines a cooling plate (6) following subli-

mation of the solid refrigerant contained within the drawer. The bottom wall (5) comprises a thermally insulating structure (7) arranged beneath the cooling plate (6) and having at least one movable portion (7b) so as to vary the amount of outwardly exposure of the cooling plate (6).



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Description

The present invention is related to solid refrigerant reservoirs intended to be fitted within isothermal containers, particularly for transportation and storage of products (for instance foodstuff) under controlled temperature.

These reservoirs, for instance known from European Patent applications EP-A-0337860 and EP-A-0631096, conventionally comprise a drawer of a generally parallelepipedal design having lateral walls, a lid and a bottom wall defining a cooling plate following sublimation of the solid refrigerant contained within the drawer.

Traditionally, in the above known solutions all of the drawer component elements (lateral walls, lid and bottom wall) are made of a thermally conductive material (normally stainless steel), whereby in use thermal exchange with the outside - i.e. cooling operated by sublimation of the solid refrigerant contained within the drawer in turn fitted into the upper part of the isothermal container for transportation of products under controlled temperature - would be much greater than necessary. For this reason the isothermal container is conventionally provided with a thermally insulating baffle interposed between the upper environment housing the drawer with the solid refrigerant, and the lower environment containing the products.

This solution, besides involving a certain encumbrance and relative constructive complications of the isothermal container, is however inadequate in consideration of the fact that the isothermal container can indifferently be employed for transportation and/or storage of products requiring different cooling temperatures. For instance, in case of foodstuff, deep-frozen products must be kept at temperature of about -18°C or lower, while fresh products have to be kept at temperatures between 0°C and 8°C .

In order to give a solution to this problem, EP-A-0631096, already cited in the above, provides a system for varying and adjusting the amount of solid refrigerant (in particular CO_2 snow) introduced into the drawer, as a function of the requirements of the products for which the isothermal container equipped with the drawer is intended to be employed.

This solution, based upon the metered supply of liquid CO_2 injected into the drawer, is complicated and expensive since it involves availability of a sophisticated adjustment system associated with the injection installation of the liquid CO_2 .

The object of the present invention is to overcome the above drawbacks, and more particularly to provide a solid refrigerant reservoir of the type set forth at the beginning designed in a simple, functional and cheap way so as to be immediately adapted to the above-disclosed different needs of use, without involving metering of the solid refrigerant, whose amount within the reservoir can thus be solely related to the desired operating

life of the reservoir itself.

More particularly, the object of the invention is to provide a solid refrigerant reservoir of the above-referenced type which is designed to be employed, without provision of any expedients outside of the reservoir itself, with isothermal containers indifferently intended for transportation and/or storage either of fresh or, respectively, deep-frozen products.

A further object of the present invention is to provide a solid refrigerant reservoir of the type set forth in the above, which can be immediately adapted to the cooling requirements of the products intended to be transported and/or stored within the isothermal container, following a simple and quick manual operation.

According to the invention, the above objects are achieved by virtue of the fact that the bottom wall of the drawer comprises a high-thermal-exchange cooling plate and a thermally insulating structure arranged beneath said cooling plate and having at least one movable portion so as to vary the amount of outwardly exposure of said cooling plate.

In practice, due to this idea of solution, the drawing which constitutes the solid refrigerant reservoir according to the invention embodies a shutter system which enables, by means of a greater or lower exposure of the cooling plate provided at the bottom of the drawer, to adjust the cooling performance thereof as a function of the user's need. Accordingly, control of the cooling by sublimation of the solid refrigerant contained within the drawer allows use thereof indifferently for isothermal containers designated to transportation and/or storage both of fresh and deep-frozen products.

According to a preferred embodiment of the invention, the thermally insulating structure of the bottom wall of the drawer comprises a stationary section arranged in correspondence of a first portion of the cooling plate, and a movable section which is slidable relative to said stationary section, beneath a second portion of the cooling plate, between a closure end position and an open end position, in which said second portion of the cooling plate is completely covered and, respectively, completely exposed. For a more precise adaptation to any use requirement, said slidable section can be positioned in any intermediate condition comprised between said end positions.

According to a further feature of the invention, said second portion of the cooling plate is conveniently formed at the outside as a thermal dissipator. Accordingly in the partially or totally exposed condition of said second portion of the cooling plate, the cooling action due to sublimation of the solid refrigerant is made remarkably more efficient.

The invention will now be disclosed in detail with reference to the accompanying drawings, purely provided by way of non limiting example, in which:

- figure 1 is a diagrammatic perspective view from below of a solid refrigerant reservoir for isothermal

- containers according to the invention,
- figure 2 is a perspective exploded view of figure 1,
- figure 3 is an exploded perspective view from above of the reservoir,
- figure 4 is a vertically sectioned view along line IV-IV of figure 1, showing the reservoir according to the invention in a first operative configuration,
- figure 5 is a cross sectioned view along line V-V of figure 4,
- figure 6 is a view same as figure 4, showing the reservoir according to the invention in a second operative configuration, and
- figure 7 is a cross sectioned view along line VII-VII of figure 6.

Referring to the drawings, reference numeral 1 generally designates a reservoir according to the invention, intended to be partially or completely filled with a solid refrigerant R, and then to be fitted into the upper area of an isothermal container, for instance made as a wheeled closet, for transportation of fresh or deep-frozen products (namely foodstuff products).

The reservoir 1 is generally designed as a parallel-epipedal-shaped drawer having two pairs of opposite lateral walls 2 and 3, a lid 4 and a bottom wall generally designated as 5.

The bottom wall 5 comprises a metal sheet 6, normally made of aluminium, providing a cooling plate following sublimation of the solid refrigerant R contained within the drawer 1, and ideally subdivided into a first and a second portions indicated as 6a, 6b, respectively. The perimetral edge of the cooling plate 6 is sealingly fixed within the lower areas of the lateral walls 2, 3. Moreover the first portion 6a of the cooling plate 6 rests upon a lowermost stationary section 7a of a thermally insulating structure 7 forming in one piece, further to the stationary section 7a, also the four lateral walls 2, 3 of the drawer 1. The thermally insulating structure 7 may be formed, for instance, by outer and inner spaced-apart sheets made of polyethylene or like thermoplastic materials, with a polyurethane or like material foam filler layer.

In the case of the shown example, the section 7a and thus the first portion 6a of the cooling plate 6 extend over about one half of the entire bottom wall 5. The other half of the cooling plate 6, i.e. the second portion 6b thereof, is thus located in correspondence of the area where the section 7a is absent. Lowerly, i.e. on its face opposite to the lid 4, the second portion 6b is provided with a number of parallel projecting fins 8 designed to build up a thermal dissipator.

The bottom wall 5 is completed by a movable section 7b, also having a thermally insulating structure and slidably mounted along longitudinal guide appendages 9 projecting from the two lateral walls 2. The movable section 7b is thus slidable, immediately beneath the stationary section 7a, between completely closed and completely open end positions, shown in figures 4, 5 and in

figures 6, 7, respectively. To perform sliding, the movable section 7b may be conveniently provided with a manually operable front handle 10, or with any other suitable system for displacement thereof.

In the completely closed position shown in figures 4 and 5, the movable section 7b fully covers the second portion 6b of the cooling plate 6, while in the completely open position shown in figures 6 and 7 the movable section 7b overlaps the stationary section 7a, whereby the second portion 6b of the cooling plate 6, with the associated thermal dissipator constituted by the fins 8, is completely exposed to the outside.

The movable section 7b can be positioned in any intermediate configuration between the above disclosed end positions, for instance such as depicted in figure 1 in which the second portion 6b of the cooling plate 6 is partially exposed to the outside.

The lid 4 is normally made of metal, for instance of stainless steel, and can be provided with a series of through holes 11 in correspondence of which respective grids and associated filtering elements 12 may be applied. The lid 4 can simply rest upon the upper edges of the lateral walls 2, 3, or it can be rigidly secured thereto. Moreover the lid 4 may possibly be provided with a hinged portion which can be opened so as to enable access into the drawer 1, and may also be provided with a safety locking system, not shown in the drawings.

Reference numerals 13 designate outer support appendages projecting laterally of the two lateral walls 2 so as to allow slidable mounting of the drawer 1 along corresponding guides of an isothermal container, not shown in the drawing since of a conventional type. The appendages 13 may be provided along the entire length of the drawer 1, or may be made as sectors according to the shown example.

In use a suitable solid refrigerant R is supplied into the drawer 1. For instance, this solid refrigerant may be constituted by CO₂ snow fed in a liquid state into the drawer 1, which in this case shall be provided with a suitable injection nozzle not shown in the drawings, or it may consist of pieces or blocks of dry ice or other proper refrigerants, introduced from above into the drawer 1 after removing the cover 4 or after raising the hinged portion thereof, whenever provided. Then, after positioning the drawer 1 within the isothermal container, the movable section 7b of the bottom wall 5 shall be positioned in the condition corresponding to the requirements of use. Thus, in case the products housed in the isothermal container are constituted by fresh foodstuff, the movable section 7b shall be arranged in the closed position of figures 4 and 5, so as to minimize the cooling action performed by sublimation of the solid refrigerant. In case instead the products within the isothermal container are constituted by deep-frozen foodstuff, the movable section 7b shall be positioned in the open condition shown in figures 6 and 7, so as to maximize the cooling effect carried out by sublimation of the solid refrigerant. Intermediate conditions can be provided, even as a function

of the amount and of characteristics of the solid refrigerant, by adjusting the position of the movable section 7b between the completely closed and completely open conditions.

Naturally the details of construction and the embodiments may be widely varied with respect to what has been disclosed and illustrated, without thereby departing from the scope of the present invention, such as defined in the appended claims.

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Claims

1. Solid refrigerant reservoir for isothermal containers, particularly for the transportation of products under controlled temperature, comprising a drawer of a generally parallelepipedal design (1) having lateral walls (2, 3), a lid (4) and a bottom wall (5) defining a cooling plate (6) following sublimation of the solid refrigerant contained within said drawer (1), characterized in that the bottom wall (5) of the drawer (1) comprises a high-thermal-exchange cooling plate (6) and a thermally insulating structure (7a, 7b) arranged beneath said cooling plate (6) and having at least one movable portion (7b) so as to vary the amount of outwardly exposure of said cooling plate (6). 15 20 25
2. Reservoir according to claim 1, characterized in that said thermally insulating structure comprises a stationary section (7a) arranged in correspondence of a first portion (6a) of the cooling plate (6), and a movable section (7b) which is slidable relative to said stationary section (7a), beneath a second portion (6b) of the cooling plate (6), between a closed end position and an open end position, in which said second portion (6b) of the cooling plate (6) is completely covered and, respectively, completely exposed. 30 35 40
3. Reservoir according to claim 2, characterized in that said slidable section (7b) can be positioned in any intermediate condition comprised between said end positions. 45
4. Reservoir according to claim 2, characterized in that said second portion (6b) of the cooling plate (6) is outerly formed as a thermal dissipator (8). 50
5. Reservoir according to claim 1, characterized in that said thermally insulating structure (7) further defines said lateral walls (2, 3) of the drawer (1). 55
6. Reservoir according to claim 2, characterized in that said slidable section (7b) is mounted along guides (9) projecting inferiorly from a pair of opposite lateral walls (2) of the drawer (1).

7. Reservoir according to claim 2, characterized in that said slidable section (7b) is provided with a manually operable shifting member (10).

8. Reservoir according to claim 1, characterized in that said cooling plate (6) is made of a high thermal conductivity material.

Fig-1

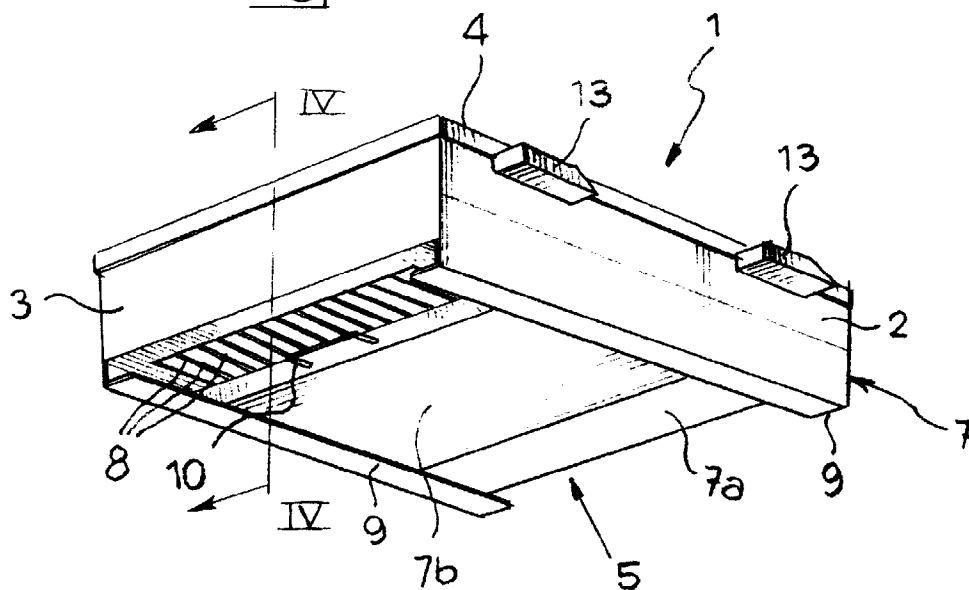
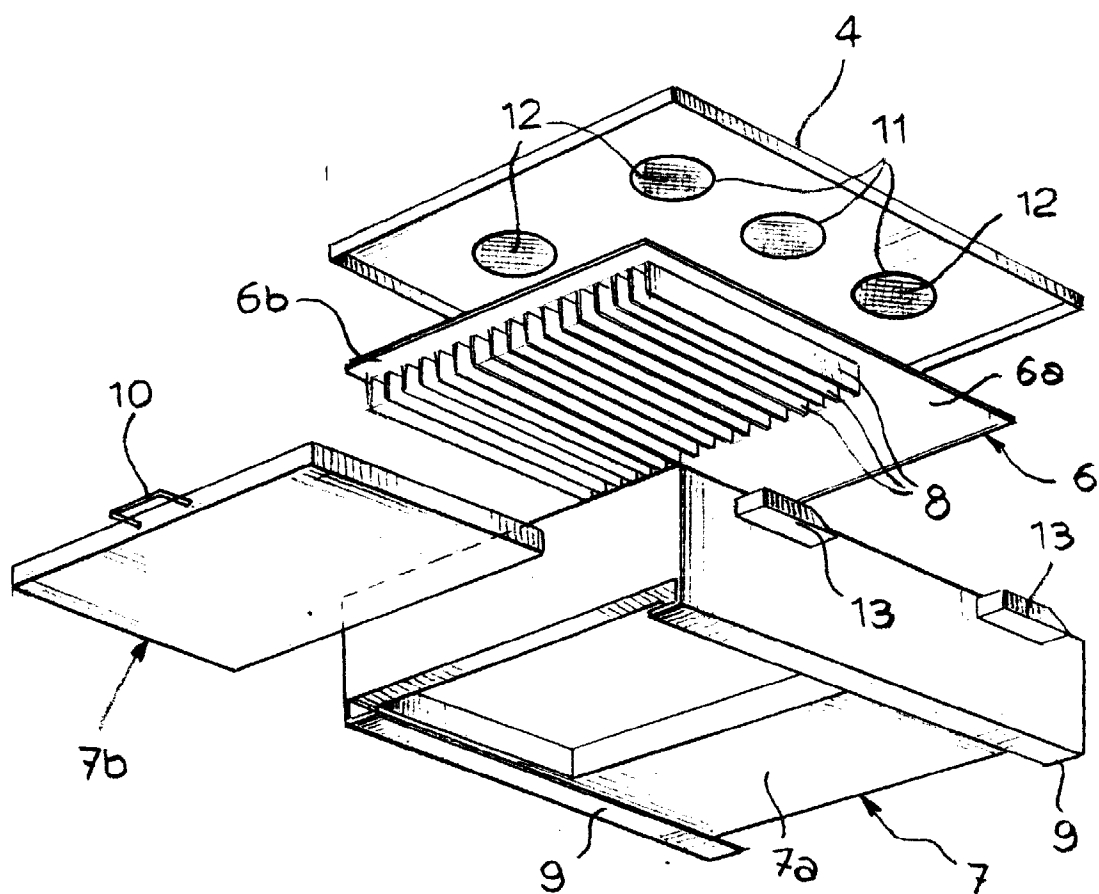


Fig. 2



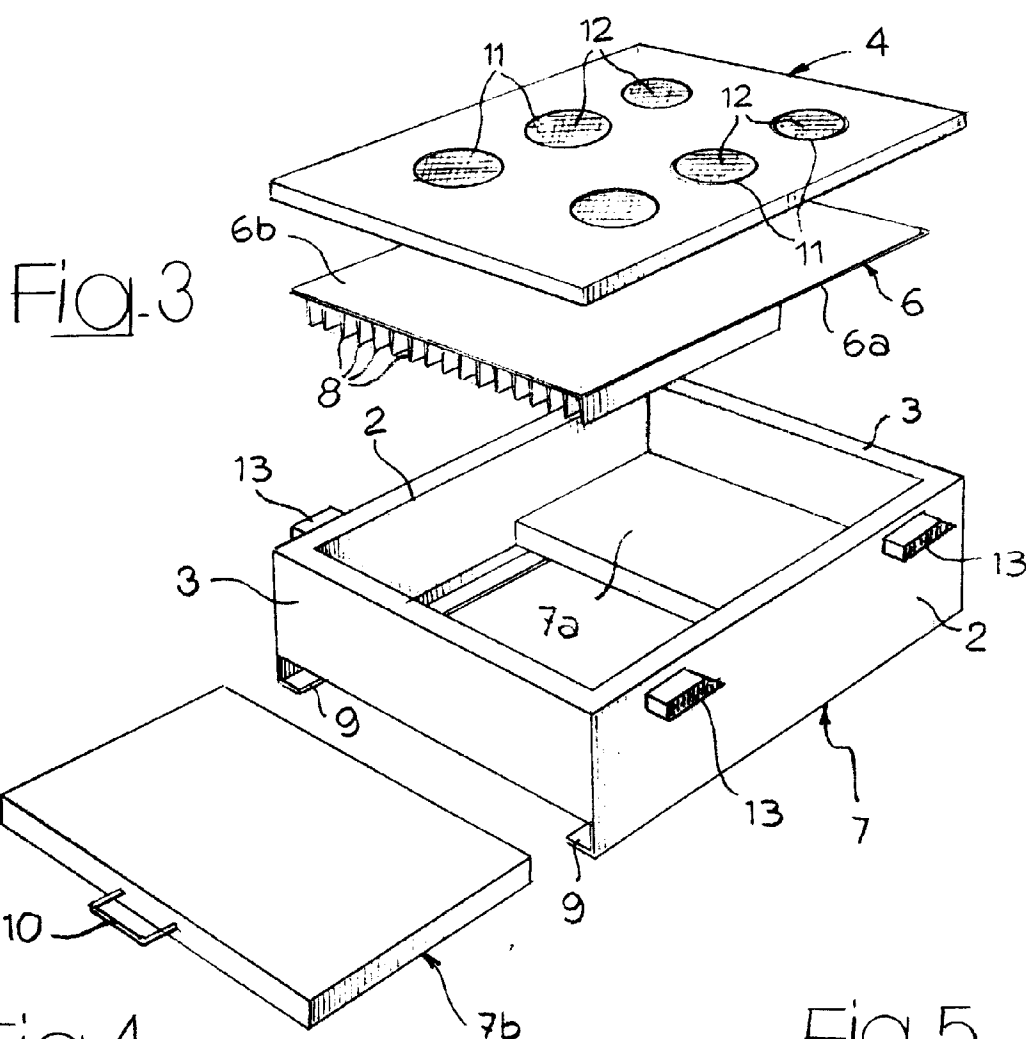


Fig. 4

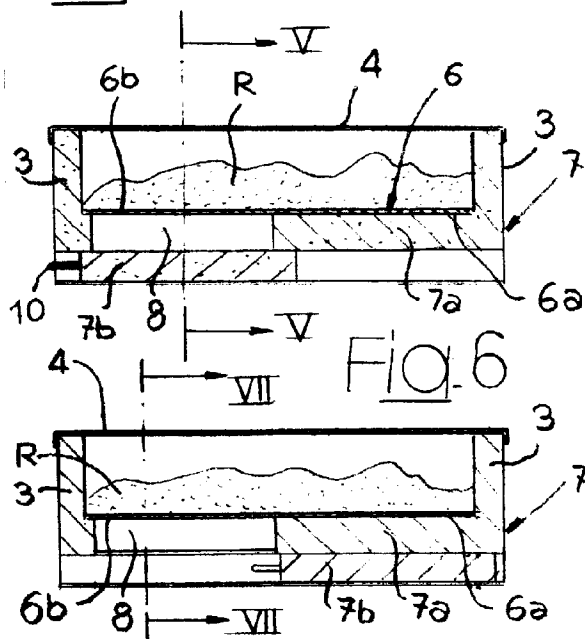


Fig. 5

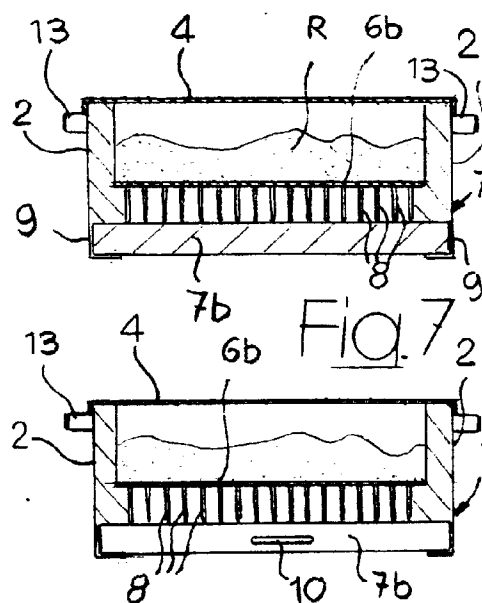


Fig. 6

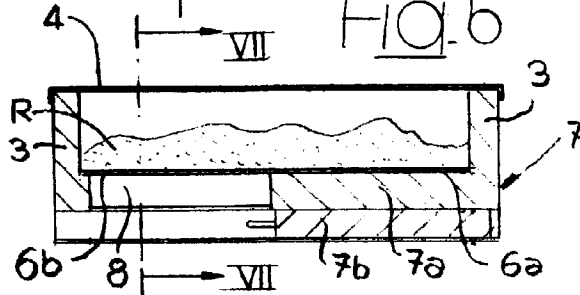


Fig. 7

