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(54) Heat insulating device.

(57) A heat insulating device comprises a closed flat body (10) having a continuous passage (13) formed by dividing walls (12). Adjacent dividing walls terminate short of a surrounding wall (11) at opposite ends to form the passage which has an inlet (131) at one end and an outlet (132) at the other end to which hoses (20) leading to a liquid supplying apparatus can be connected. The liquid supplying apparatus provides a constant flow of liquid through the passage (13) for cooling purposes.

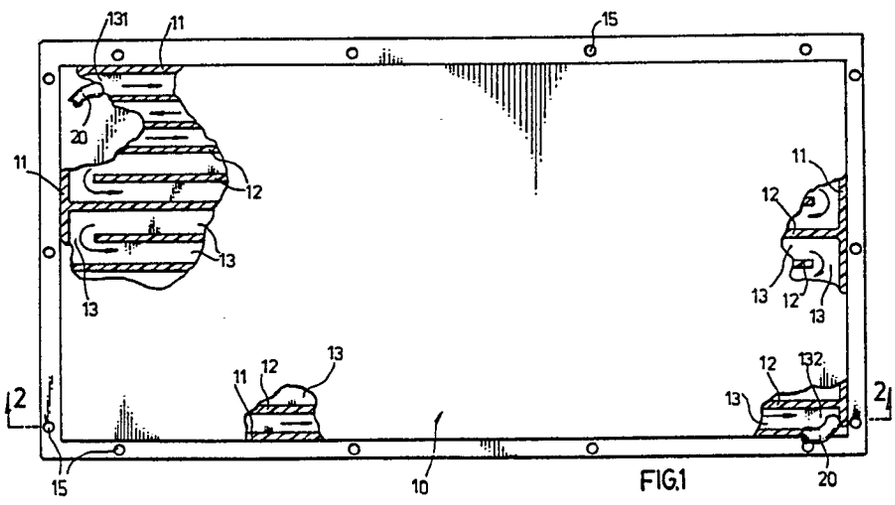

FIG.1

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HEAT INSULATING DEVICE

This invention relates to a heat insulating device primarily designed for use in buildings and is particularly concerned with laminated panels.

Wide use is made of steel frameworks in the construction of buildings such as factories or power plants since such construction methods are fast and inexpensive. Asbestos roof panels or sheets and wall claddings are frequently employed for the purposes of thermal insulation and reduction of fire risk. However, the use of asbestos panels or sheets is not particularly effective in providing thermal insulation and, in order to enhance the insulating effect, it has been proposed to install a water pipe system in which a large number of small holes are provided to create a sprinkler or spray effect when water is passed through the pipe system in order to cool the roof panels or sheets. However, this prior arrangement suffers from the following disadvantages:-

1. In the case of corrugated roof panels or sheets, the sprinkled water will flow into the grooves of the corrugations and only the groove parts, which make up only about one third of the roof, will be cooled so that the cooling effect of the sprinkled water will be reduced.

2. The cooling water is not recycled and a heavy duty pump is required in order to achieve the sprinkling effect so that a considerable amount of water and electrical power are used representing a considerable waste of natural resources and considerable expense.

3. The small holes in the pipe system can easily become blocked thereby reducing the sprinkling effect.

4. With streams of water running down a roof there are serious risks of leakage.

There are numerous ways of providing thermal insulation for the top floor of an apartment such as the use of thermally-insulating bricks or blocks or the growing of plants on the roof and appending a ceiling layer. However, these measure still lack an appropriate means of effectively lowering the temperature in the building or of reducing the radiant heat effect generated by the sun on side walls of a building, particularly the west wall which receives afternoon sun light.

Thus, in addition to the roof of a building which needs effective thermal insulation, the walls of a building needs the same if living in the building is to be comfortable in hot weather.

The present invention aims to provide an insulating device which effectively reduces the conduction of heat into a building.

A further aim is to provide an insulating device which can also serve as fire extinguishing apparatus. Conventional apparatus can only send out a warning in the event of a fire but does not serve to extinguish the fire or to separate the fire area from the remainder of a building. The present invention therefore also aims to provide a device which, in the event of a fire, can spray out water from the damaged parts caused by the fire and extinguish the fire thereby achieving a separation of the fire area and reducing the loss of property and life.

A still further aim of the present invention is to provide a heat maintaining device for keeping a steady temperature and preventing the heat insulating device from being unduly influenced by increase or decrease in temperature of the ambient surroundings. Providing such a device as an auxiliary interior construction will serve to maintain interior heat.

In order to achieve the above-stated aims, the present invention provides an insulating device comprising a continuous passage for liquid having an inlet at one end and an outlet at the other end which are adapted to be connected to a liquid applying apparatus having means for supplying a constant flow of liquid through the passage. The constant flow of liquid through the passage enables the insulating device to maintain a steady temperature.

Preferably, the liquid supplying apparatus comprises a tank connected to the inlet to the passage and a pump connected to the outlet from the passage for returning liquid to the tank.

The insulating device desirably comprises a closed flat body in which at least one passage is located. The body is preferably provided around its periphery with means to enable the installation of the body on a building or the like.

According to one embodiment of the invention, a single labyrinthine passage is provided in said body by a series of substantially parallel dividing walls, adjacent dividing walls terminating short of a surrounding wall of the body at opposite ends to form said passage.

Alternatively, the passage may be formed by a hose of soft material which is bent to form a series of substantially parallel straight lengths interconnected by curved portions of the hose, adjacent straight lengths being attached to one another.

According to another embodiment, a plurality of passages are provided in said body by a series of substantially parallel dividing walls spaced at each end from a surrounding wall of the body. Preferably, the inlet and outlet are provided, respectively, on an upper and lower part of the central region of the body and the spacing between adjacent dividing walls desirably increases with in-

creasing distance from the inlet and outlet.

The invention will now be further described, by way of example, with reference to the drawings, in which:-

Fig. 1 is a partly-sectioned plan view of one embodiment of an insulating device according to the invention;

Fig. 2 is a section taken on the line 2-2 in Fig. 1 in the direction of the arrows;

Fig. 3 is a side elevation of the device shown in Fig. 1;

Fig. 4 is a schematic perspective view showing the connection of the device shown in Fig. 1 to a liquid-supplying apparatus;

Fig. 5 is a partly-sectioned plan view of a second embodiment of an insulating device according to the invention;

Fig. 6 is a section taken on the line 6-6 in Fig. 5 in the direction of the arrows;

Fig. 7 is a partly-sectioned plan view of a third embodiment of an insulating device according to the invention; and

Fig. 8 is a section taken on the line 8-8 in Fig. 7 in the direction of the arrows.

In the drawings, like parts are denoted by like reference numerals.

Reference will first be made to Figs. 1 to 3 of the drawings in which the device comprises a closed flat body 10 made of laminated waterproof material and provided with a surrounding continuous wall 11 to form a closed chamber. A large number of dividing walls 12 is provided in the chamber, said walls extending parallel to one another and adjacent dividing walls being spaced from opposite ends of the chamber to form a continuous labyrinthine passage 13 in said chamber.

The passage 13 has an inlet 131 at one end of the body 10 and an outlet 132 at the opposite end of said body, connectors 14 being provided at the inlet 131 and outlet 132 for the attachment of hoses 20.

In order to facilitate the production of the insulating device according to the invention, the body 10 consists of two generally symmetrical plates which extend parallel to and spaced from each other being separated by the peripheral wall 11 and dividing walls 12. The walls may be secured to the plates by high-frequency heat-welding or other suitable methods. A series of holes 15 are provided at spaced intervals around the periphery of the plates so that the body 10 may be attached to other similar bodies to form a large-scale heat insulating device. The holes 15 also enable the body 10 to be attached by suitable means (not shown) to the roof or wall of a building.

Fig. 4 shows the device illustrated in Figs. 1 to 3 connected to liquid supplying apparatus. As shown in Fig. 4, the outlet from the body 10 is connected by a hose 20 to a pump P and the inlet to the body 10 is connected by a further hose 20 to a tank 21. The pump is arranged to pump the liquid up into the tank but the main pressure for supplying liquid to the body 10 is provided by arranging the tank at a suitable height above the device. The pump provides the means for recirculating liquid thereby avoiding waste.

The circulating liquid flows slowly in the body 10 and will be pumped into the tank 21 for heat transmission after which it flows back again to the body 10. As for the tank 21, it is preferable to employ a large water tower located in shade during summer but in winter, a tank which is able to absorb solar energy will be more preferable.

The liquid supplying apparatus of the present invention may dispense with a pump but in that case the pressure in the liquid supplying apparatus must be greater than that in the heat insulating device if the liquid is to start flowing. The speed of flow is related to the pressure difference between the heat insulating device and the liquid supplying apparatus.

Since the liquid in the heat insulating device according to the present invention flows constantly, when there is a fire and the device of the present invention is burned and damaged, the liquid in the present invention will spray out from the damaged parts and help to extinguish the fire. Such function is similar to the automatic sprinkling system of a fire apparatus, but is much more simple since it has no detecting and controlling device.

The heat insulating device shown in Figs. 5 and 6 comprises a hose 30 which is preferably made of soft rubber covered with fibercloth and which is suitable for bending and pressing such as a fire hose. The hose is bent to form a plurality of substantially parallel straight lengths interconnected at the ends by curved portions of the hose. Adjacent lengths are joined together on their facing sides, e.g. 31A and 31B, by a suitable adhesive or other appropriate materials or methods. The hose thus forms a flat case to serve as the body of the heat insulating device with a continuous internal passage having an inlet 32 at one end and an outlet 33 at the other end. In order to facilitate the installation of this device, rings 34 or similar attaching elements are affixed to the body.

The embodiment shown in Figs. 7 and 8 of the drawings is similar to the embodiment shown in Figs. 1 to 3 except that in this case the inlet 131 to the passage 13 is located on the upper part of the body 10 in the central region thereof and the outlet 132 is located on the lower part of the body in the same region. The dividing walls 12 are spaced at both ends from the wall 11 and are spaced apart from one another by increasing amounts with in-

creasing distance from the central regions at which the inlet 131 and outlet 132 are located. Such a construction achieves a plurality of short passages 13 which extend longitudinally from the inlet 131 to the outlet 132 and which allow liquid to pass through the body 10 at substantially equal flow rates in each passage. This embodiment of the heat insulating device according to the invention is preferably made of a soft bendable material, such as polyurethane, which enables the body to be folded, the passages 13 serving as fold lines.

All of the embodiments shown in the drawings are intended and adapted to be connected to a liquid supplying apparatus as shown in Fig. 4 in order to obtain a heat regulating effect. The liquid used will normally be water although other liquids may be used if desired. The device according to the invention is also applicable for a cushion, a mattress or the facilities in a motor vehicle.

The foregoing embodiments are taken as example for merely illustrating the practicability of the present invention and should not be treated as a limitation to the scope of the claims.

Claims

1. A heat insulating device comprising a continuous passage for liquid having an inlet at one end and an outlet at the other end which are adapted to be connected to a liquid supplying apparatus having means for supplying a constant flow of liquid through the passage.

2. A heat insulating device according to claim 1, wherein the liquid supplying apparatus comprises a tank connected to the inlet to the passage and a pump connected to the outlet from the passage for returning liquid to the tank.

3. A heat insulating device according to claim 1 or claim 2, wherein the device comprises a closed flat body in which at least one passage is located.

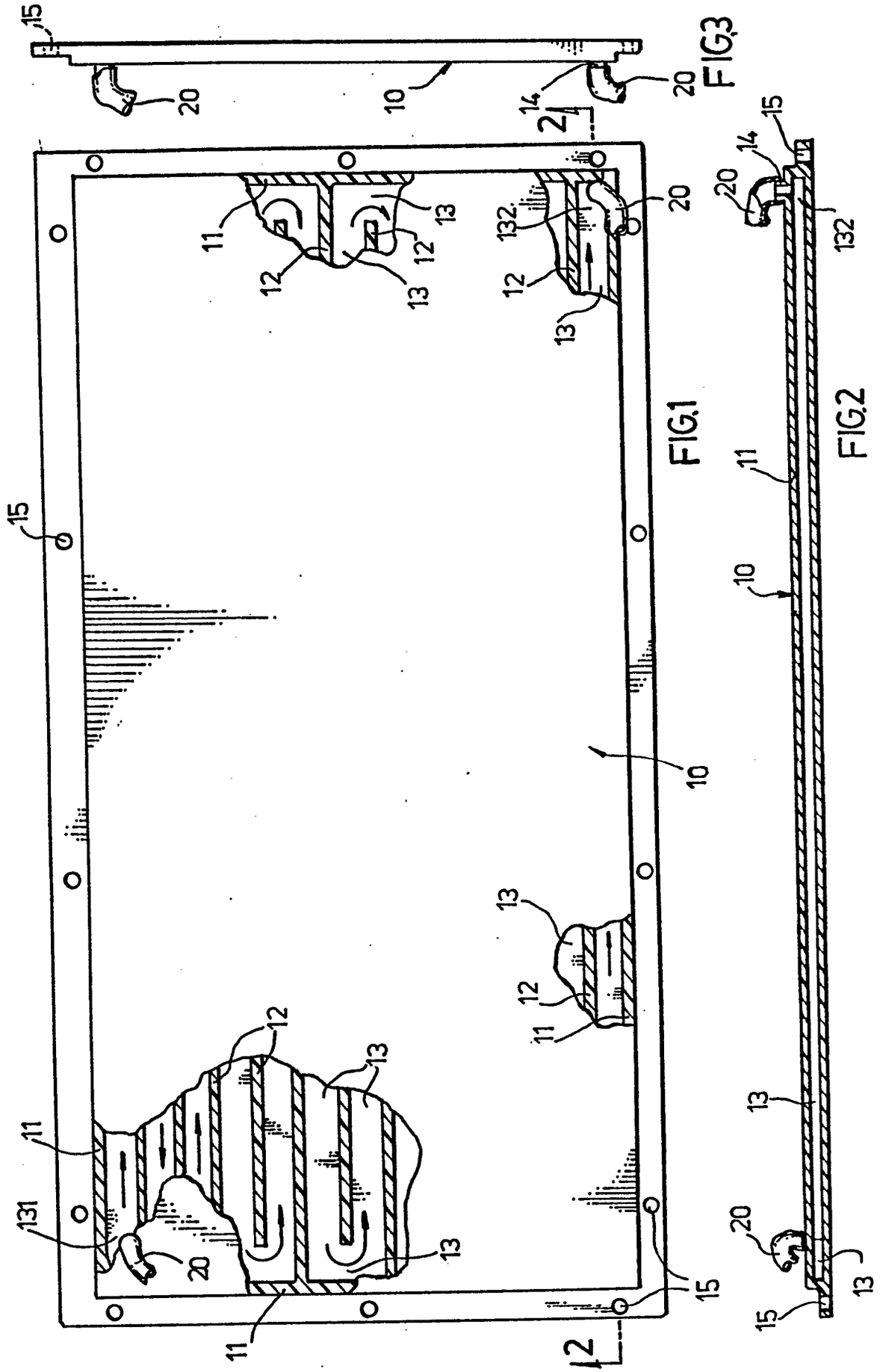
4. A heat insulating device according to claim 3, wherein the body is provided around its periphery with means to enable the installation of the body on a building or the like.

5. A heat insulating device according to claim 3 or claim 4, wherein a single labyrinthine passage is provided in said body by a series of substantially parallel dividing walls, adjacent dividing walls terminating short of a surrounding wall of the body at opposite ends to form said passage.

6. A heat insulating device according to claim 1 or claim 2, wherein the passage is formed by a hose of soft material which is bent to form a series of substantially parallel straight lengths interconnected by curved portions of the hose, adjacent straight lengths being attached to one another.

7. A heat insulating device according to claim 3 or claim 4, wherein a plurality of passages are provided in said body by a series of substantially parallel dividing walls spaced at each end from a surrounding wall of the body.

8. A heat insulating device according to claim 7, wherein the inlet and outlet are provided, respectively, on an upper and lower part of a central region of the body and wherein the spacing between adjacent dividing walls increases with increasing distance from the inlet and outlet.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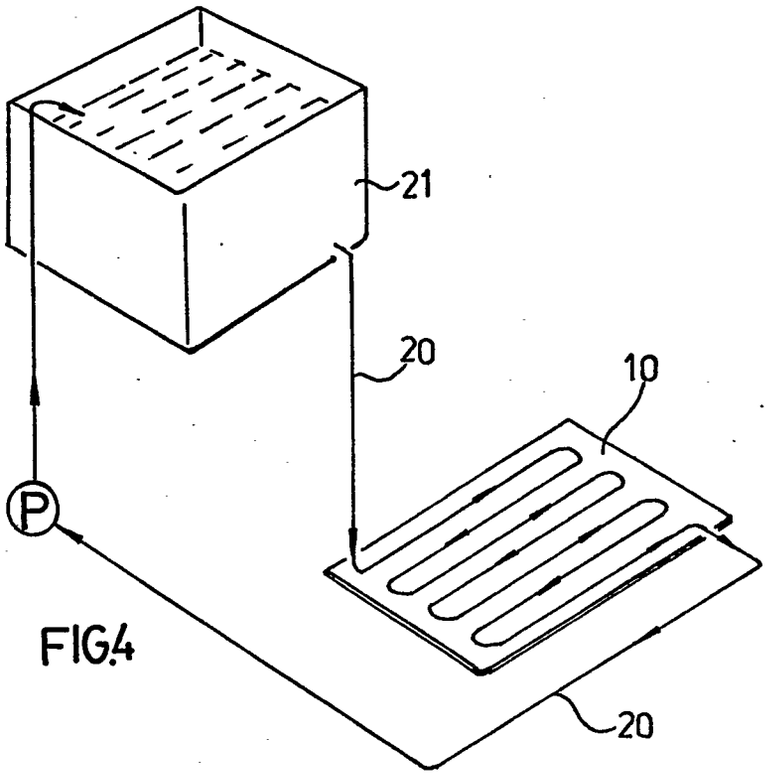

FIG.4

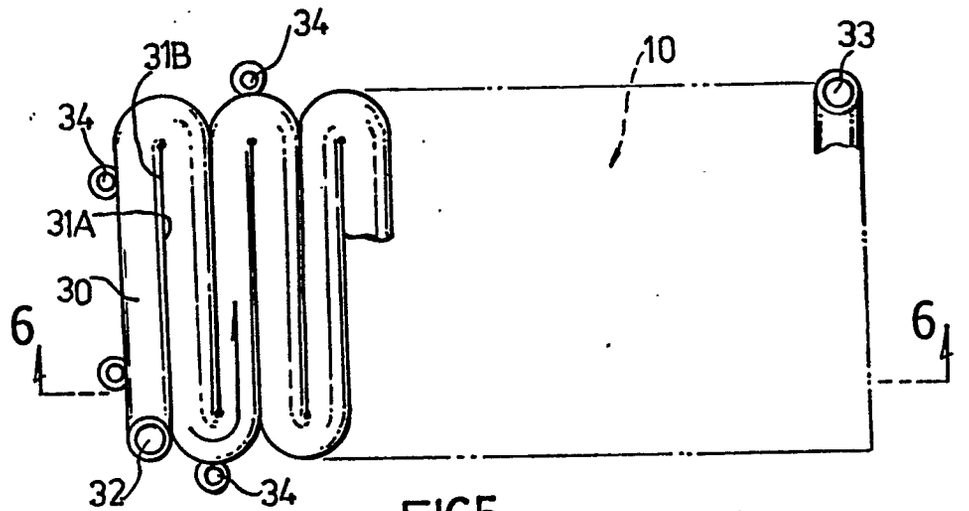

FIG.5

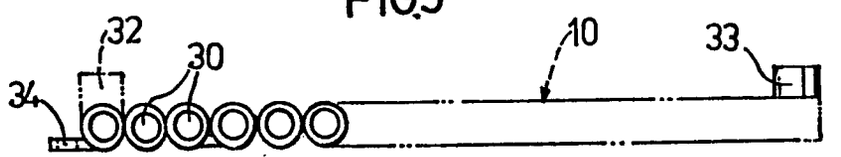

FIG.6

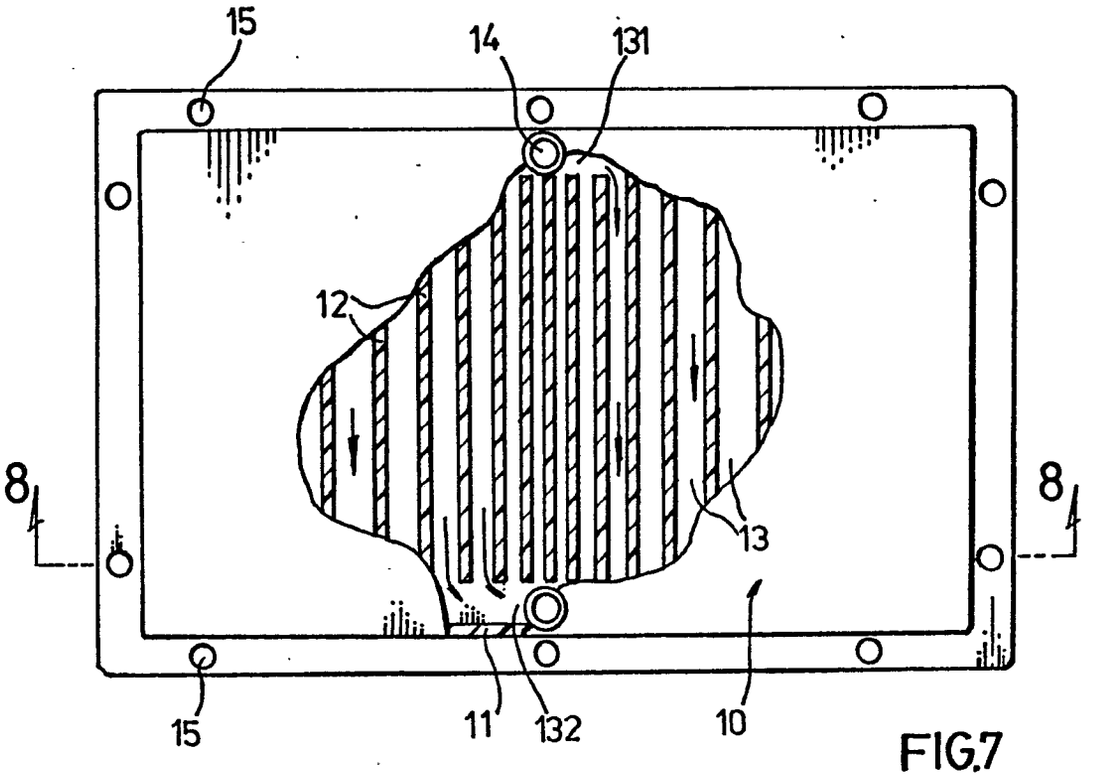

FIG.7

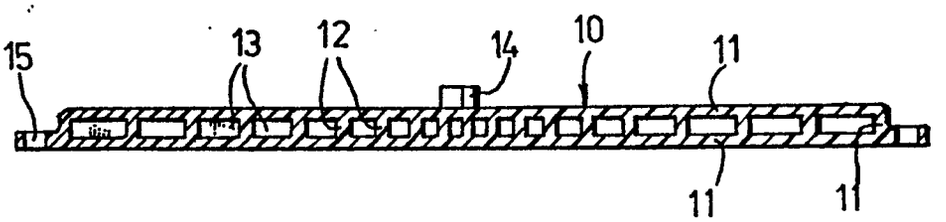

FIG.8

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EUROPEAN SEARCH REPORT

Application Number

EP 89 30 5025

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-2 179 977 (SHELL) * Page 1, lines 41-46; page 2, lines 67-84; page 3, lines 63-77; figures *	1,3	
Y		6	
X	US-A-3 978 916 (MEGUMI) * Column 2, lines 21-31,41-60; column 4, lines 26-45,47-57; column 5, lines 26-30; figures *	1-4	
Y		6	
Y	FR-A-2 555 724 (DUCOL) * Page 4, lines 3-16,28-31; claim 1 *	6	
A	FR-A- 802 433 (GÄBLER) * Page 1, line 52 - page 2, line 27; figures *	4,5,7	
A	US-A-3 050 134 (MULTIN) * Column 1, lines 27-40; column 2, lines 40-48,60-69; figures *	1,3	
A	GB-A-1 548 262 (DIGGS)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E 04 B
E 04 C
E 04 H
F 28 D
A 62 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-01-1990	LAUE F.M.

CATEGORY OF CITED DOCUMENTS

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