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

(11) Publication number : **0 317 009 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification : **29.01.92 Bulletin 92/05**

(51) Int. Cl.^{5} : **A61G 7/043**

(21) Application number : **88202536.4**

(22) Date of filing : **14.11.88**

(54) **Bed for therapeutic treatment of a patient.**

(30) Priority : **12.11.87 NL 8702712**

(43) Date of publication of application : **24.05.89 Bulletin 89/21**

(45) Publication of the grant of the patent : **29.01.92 Bulletin 92/05**

(84) Designated Contracting States : **AT BE CH DE ES FR GB GR IT LI LU NL SE**

(56) References cited :
US-A- 3 428 973
US-A- 4 564 965

(73) Proprietor : **CAREMEDIC B.V.**
2b, Spoorlaan
NL-3735 MV Bosch en Duin (NL)

(72) Inventor : **Kersten,Johannes Franciscus Maria**
Spoorlaan 2b
NL-3735 NV Bosch en Duin (NL)

(74) Representative : **Reynvaan, Lambertus Johannes, Ir. et al**
EXTERPATENT B.V. P.O. Box 90649
NL-2509 LP 's-Gravenhage (NL)

EP 0 317 009 B1

Description

The invention relates to a bed for therapeutic treatment of a patient, comprising a casing which is filled with small glass balls, and the bottom for the small glass balls is formed by an air-permeable sheet or plate, and which is covered at the top side by a filter cloth which forms the lying surface for the patient, an air chamber which is connected to an air supply line for causing fluidization of the glass balls being formed below the air-permeable sheet.

Such a bed is known, for example from DE-A-1566439 (US-A-3428973), and is intended in particular for use in hospitals for the care of patients with burns or bedsores.

The objects of the present invention are to improve this known bed in such a way that it is a light, of sturdy structure which is easy to assemble and take apart, and in which undesirable air leaks are prevented in an effective manner.

These objects are achieved according to the invention in that the bed comprises an outer casing containing a supporting rim which is provided along the inner periphery some distance away from the bottom of the outer casing, and on which the air-permeable sheet rests so that the air chamber is formed below it, while provision is made inside said outer casing at a distance from the upright outer side walls thereof for an upright circumferential inner wall which rests on the air-permeable sheet and encloses the glass balls, and in the space between the outer and inner walls means are present for preventing air leakage from the air chamber to this space.

The double-walled structure of the bed according to the invention provides a stable, light structure which is cheap to produce and with which undesirable air leakage can be effectively prevented.

The inner wall preferably rests on the air-permeable sheet with a flange directed towards the outer wall, and the means for preventing air leakage preferably comprise pressure elements which are fixed to the outer wall and act upon said flange.

According to a preferred embodiment of the invention, an air treatment plant is provided in the air supply line to the air chamber. In this way, air of which the temperature and pressure can be regulated, and which is thus independent of the temperature in the room where the bed is set up, can be fed through the bed.

According to another preferred embodiment of the invention, the bed contains a pressure gauge, which is intended for measuring the pressure under the patient, and which is connected to a control element which controls the fan unit depending on the measured value. In this way, the most suitable pressure can be achieved under the patient, which produces a clear improvement in lying comfort.

Further special features and details of the invention emerge from the description below with reference to the attached drawing, in which :

Fig. 1 shows a top view of the bed according to the invention ;

Fig. 2 shows a schematic cross section of the bed of Fig. 1 ;

Figs. 3a and 3b show the bottom and top part respectively of a section along the line III-III in Fig. 1, on a larger scale.

As can be seen in particular from Figs. 1 and 2 of the drawing, the bed comprises an outer casing which is indicated in its entirety by reference number 1, and comprises a bottom part 2 and a circumferential upright outer wall 3. Provision is made along the inner periphery, some distance away from the bottom 2, for a continuous supporting rim 4, which is stepped in the embodiment shown. On this supporting rim 4 rests an air-permeable sheet 5 which is made of, for example, a porous polymer. To support the air-permeable sheet 5, provision is also made for a number of supporting bars 6 extending in the crosswise direction of the bed (see Fig. 3a). An air chamber 7 is in this way formed between the air-permeable sheet 5 and the bottom 2 of the outer casing 1, into which air chamber a line 8 opens via the bottom 2, for the supply of air, which will be discussed in greater detail below.

Inside the outer casing, some distance away from the upright outer walls 3, provision is made for an upright circumferential wall 9 which with an outward-directed flange 10 rests on the air-permeable sheet 5. Small, perfectly round glass balls are placed inside this inner wall 9.

The space between the outer wall 3 and the inner wall 9 contains pressure elements which act on the flange 10 and press said flange firmly against the plate 5 and the latter in turn against the supporting rim 4, and prevent air leakage from the air chamber 7 to said space. As shown in Fig. 3a, the pressure elements comprise a bar 11 which is provided with external screw thread and is fixed in a drill hole provided with corresponding screw thread in a support 12 fixed on the outer wall 3. The top of the bar 11 has a control knob 13, and the bottom has a foot 14 which rests against the flange 10 of the inner wall 9. The flange 10 is pressed with force against the plate 5 by means of the knob 13, and said plate is in turn pressed against the stepped support 4. Strips of sealing material or sealing tape, not shown in the drawing, are provided between the flange 10 and the plate 5 and between the plate 5 and the support 4, in order to ensure an airtight connection between the plate 5 and the inner wall 9 or the support 4. This effectively prevents air leakage from the air chamber 7 to the space between the outer wall 3 and the inner wall 9.

As can be seen from Fig. 1, three pressure elements are provided along each long side of the bed, and two are provided along each short side of the bed. The supports 12 along the long sides of the bed each

have a part on the outside of the wall 3 on which a side rail 15 is fitted.

The glass balls provided inside the wall 9 are covered with a filter cloth or filter sheet 16 which is thrown over the top end of the inner wall 9 and fixed thereto by means of a clamping strip 17 (Fig. 3b). A clamping channel 18, which is U-shaped in cross section, and the free ends of the legs of which are each provided with an outward-directed flange 19, 20, is disposed between the outer wall 3 and the inner wall 9. The flange 19 here rests on the top of the outer wall 3, while the flange 20 rests on the clamping strip 17 pushed onto the inner wall 9. The channel is tensioned between the two walls, so that the two flanges exert slightly downward spring force on the outer wall 3 and the clamping strip 17 respectively.

A covering flange 21, engaging over the two walls and closing off the space between them, is then fitted. Said flange 21 is made of a flexible rubber or plastic material. In the top view of Fig. 1 said flange is left out for the sake of clarity, in order to show the pressure elements and the clamping channels. During use of the bed, it will be a regular occurrence for the nursing staff to take hold of the flange 21 to move the bed. The flange 21 can partially come away from the inner wall in the process. The clamping channels 18 are fitted in order to prevent the clamping strip 17 from being taken with the flange 21 and the filter sheet from coming off.

As can be seen from Fig. 2, the line 8 for the supply of air to the air chamber 7 is connected to an air treatment plant 22. This air treatment plant comprises in succession a filter unit 23, a fan unit 24, a cooling unit 25, and a heating unit 26. Air can be fed at a suitable temperature and/or pressure into the air chamber 7 by means of this plant, the air spreading in said chamber and then flowing via the plate 5 through the space filled with the small glass balls, and subsequently flowing out through the filter sheet 16. The glass balls are fluidized by the air, so that a patient resting on the filter sheet 16 is uniformly supported, and no local pressure concentrations occur. As shown in Fig. 1, the corner points of the bed are provided with fairly large rounded areas, which prevent the occurrence of dead corners through which insufficient or no air flows and, on the other hand, leave sufficient leg space free for the patient.

The pressure and the temperature of the infed air can be regulated by means of this air treatment plant, independently of the temperature obtaining in the room where the bed is set up. An electronic pressure gauge 27 could be fitted under the patient, to control the fan unit 24 via a control unit 28, so that ideal pressure can be achieved under the patient. Moreover, the filter unit 23 can be fitted with a bacteria filter, in order to prevent bacterial growth in the bed.

It will be clear that the present invention is not restricted to the embodiment shown and described here, but that many variations are possible within the scope of the invention. For example, the clamping channel 18 can be made integral with the covering flange, possibly together with the clamping strip 17. In this case, additional means do have to be provided to hold the clamping strip in place, and these could be magnetic strips and the like.

Claims

1. Bed for therapeutic treatment of a patient, comprising a casing which is filled with small glass balls, and the bottom for the small glass balls is formed by an air-permeable sheet or plate (5), and which is covered at the top side by a filter cloth (16) which forms the lying surface for the patient, an air chamber (7) which is connected to an air supply line (8) for causing fluidization of the glass balls being formed below the air-permeable sheet (5), **characterized in that** the bed comprises an outer casing (1) containing a supporting rim (4) which is provided along the inner periphery some distance away from the bottom (2) of the outer casing (1), and on which the air-permeable sheet (5) rests, so that the air chamber (7) is formed below it, while provision is made inside said outer casing (1) at a distance from the upright outer side walls (3) thereof for an upright circumferential inner wall (9) which rests on the air-permeable sheet (5) and encloses the glass balls, and in the space between the outer and inner walls (3, 9) means (11, 12, 13, 14) are present for preventing air leakage from the air chamber (7) to this space.

2. Bed according to Claim 1, **characterized in that** the inner wall (9) rests on the air-permeable sheet (5) with a flange (10) directed towards the outer wall (3), and the means for preventing air leakage preferably comprise pressure elements (11, 12, 13, 14) which are fixed to the outer wall (3) and act upon said flange (10).

3. Bed according to Claim 2, **characterised in that** the pressure elements (11, 12, 13, 14) comprise a screw-threaded bar (11) which is fixed in a drill hole provided with corresponding screw thread in a support (12) fixed on the outer wall (3), said screw-threaded bar (11) being provided at the top end with a control element (13) and resting with the bottom end (14) against the flange (10) of the inner wall (9).

4. Bed according to Claim 2 or 3, **characterized in that** sealing material is provided between the air-permeable sheet (5) and the flange (10) of the inner wall (9) and between the sheet (5) and the supporting rim (4) of the outer casing (1).

5. Bed according to one or more of the preceding Claims 1-4, **characterized in that** an air treatment plant (22) is provided in the air supply line (8) to the air chamber (7).

6. Bed according to Claim 5, **characterized in**

that the air treatment plant (22) comprises a filter unit (23), a fan unit (24), a cooling unit (25) and a heating unit (26) respectively.

7. Bed according to Claim 5 or 6, **characterized in that** a pressure gauge (27) is provided for the purpose of measuring the pressure under the patient, said pressure gauge (27) being connected to a control element (28) which controls the fan unit (24) depending on the measured value.

8. Bed according to one or more of the preceding Claims 1-7, **characterized in that** the filter cloth (14) is fixed at the top edge of the inner wall (9) by means of a clamping strip (17) which is fitted on the top edge of the inner wall (9) and grips a covering flange (21) of a flexible material round the top edges of the inner and the outer wall (9, 3) and closes off the space present between them.

9. Bed according to Claim 8, **characterized in that** a clamping channel (18), which is U-shaped in cross section, and the two free ends of the legs of which are provided with outward-directed flanges (19, 20), is disposed between the inner and outer wall (9, 3), said flanges (19, 20) resting on the top of the outer wall (3) and on the clamping strip (17), which clamping channel (18) is fitted under tension between the two walls (9, 3).

Patentansprüche

1. Bett zur therapeutischen Behandlung eines Patienten mit einem Gehäuse, welches mit kleinen Glaskugeln gefüllt ist, und der Boden für die kleinen Glaskugeln gebildet ist aus einer luftdurchlässigen Tafel oder Platte (5), und welches an seiner Oberseite durch ein Filtertuch bedeckt ist, welches die Liegefläche für den Patienten bildet, einer Luftkammer (7), welche an eine Luftzufuhrleitung (8) angeschlossen ist zum Erzeugen einer Fluidisierung der Glaskugeln, wobei die Luftkammer unterhalb der luftdurchlässigen Tafel (5) gebildet ist, **dadurch gekenzeichnet, daß** das Bett ein äußres Gehäuse (1) aufweist, das einen stützenden Rand (4) enthält welcher entlang der inneren Peripherie etwas entfernt von dem Boden (2) des äußeren Gehäuses (1) eingerichtet ist, und auf welchem die luftdurchlässige Tafel (5) ruht, so daß die Luftkammer (10) unter ihr ausgebildet ist, während für die Bereitstellung innerhalb des äußeren Gehäuses (1) etwas entfernt von der aufrechten äußeren Seitenwand (3) für eine aufrechte, entlang des Umfangs verlaufende innere Wand (9) gesorgt wird, welche auf der luftdurchlässigen Tafel (5) ruht und die Glaskugeln umschließt, und in dem Raum zwischen der äußeren und der inneren Wand (3, 9) sind Einrichtungen (11, 12, 13, 14) vorhanden, zum Verhindern eines Luftaustritts aus der Luftkammer (7) in diesen Raum.

2. Bett nach Anspruch 1, dadurch gekennzeichnet, daß die innere Wand (9) auf der luftdurchlässigen Tafel (5) ruht, und zwar mit einem Flansch (10), der zu der äußeren Wand (3) hin gerichtet ist, und die Einrichtung zum Verhindern eines Luftaustritts vorzugsweise Druckelemente (11, 12, 13, 14) aufweist, welche an der äußeren Wand (3) befestigt sind und auf den Flansch (10) einwirken.

3. Bett nach Anspruch 2, dadurch gekennzeichnet, daß die Druckelemente (11, 12, 13, 14) eine Stange (11) mit einem Schraubengewinde aufweisen, welche in einem Bohrloch befestigt ist mit einem entsprechenden Schraubengewinde in einem Träger (12), der an der äußeren Wand (3) befestigt ist, wobei die Stange (11) mit dem Schraubengewinde an ihrem oberen Ende mit einem Steuerelement (13) ausgestattet ist und mit dem unteren Ende (14) auf dem Flansch (10) der inneren Wand (9) ruht.

4. Bett nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß ein Dichtungsmaterial bereitgestellt ist zwischen der luftdurchlässigen Tafel (5) und dem Flansch (10) der inneren Wand (9) und zwischen der Tafel (5) und dem stützenden Rand (4) des äußeren Gehäuses (1).

5. Bett nach einem oder mehreren der vorhergehenden Ansprüche 1 bis 4, dadurch gekennzeichnet, daß eine Luftbehandlungsanlage (22) in der Luftzufuhr leitung (8) zu der Luftkammer (7) bereitgestellt ist.

6. Bett nach Anspruch 5, dadurch gekennzeichnet, daß die Luftbehandlungsanlage (22) eine Filtereinheit (23), eine Ventilatoreinheit (24) sowie eine Kühleinheit (25) und eine Heizeinheit (26) aufweist.

7. Bett nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß ein Druckmesser (27) bereitgestellt ist zum Zweck, den Druck unterhalb des Patienten zu messen, wobei der Druckmesser (27) an ein Steuerelement (28) angeschlossen ist, welches die Ventilatoreinheit (24) in Abhängigkeit von dem gemessenen Wert steuert.

8. Bett nach einem oder mehreren der vorhergehenden Ansprüche 1 bis 7, dadurch gekennzeichnet, daß das Filtertuch (16) an dem oberen Ende der inneren Wand (9) mittels eines Klemmstreifens (17) befestigt ist, welcher an der Oberkante der inneren Wand (9) eingepaßt ist, und umgreift einen Abdeckflansch (21) aus einem biegsamen Material um die Oberkanten der inneren und äußeren Wand (9, 3) und schließt den zwischen ihnen vorhandenen Raum ab.

9. Bett nach Anspruch 8, dadurch gekennzeichnet, daß ein Klemmkanal (18) mit U-förmigen Querschnitt um die zwei freien Enden, deren Beine mit nach außen gerichteten Flanschen (19, 20) versehen sind, zwischen der inneren und äußeren Wand (9, 3) angeordnet ist, wobei die Flansche (19, 20) auf dem Oberteil der äußeren Wand (3) und auf dem Klemmstreifen (17) ruhen und wobei der Klemmkanal (18) unter Spannung zwischen die zwei Wände (9, 3) eingepaßt ist.

Revendications

1. Lit pour traitement thérapeutique d'un patient, comprenant une enceinte qui est remplie de petites billes de verre, dont le fond, sous les petites billes de verre, est formé d'une feuille ou d'une plaque (5) perméable à l'air et qui est, sur le dessus, couverte d'un tissu de filtrage (16) qui forme la surface de couchage pour le patient, une chambre d'air (7), qui est reliée à un tuyau d'alimentation en air (8) pour entraîner la fluidisation des billes de verre, étant formée sous la feuille perméable à l'air (5), caractérisé en ce que le lit comprend une enceinte externe (1) contenant un rebord support (4) qui est prévu le long de la périphérie interne à une certaine distance du fond (2) de l'enceinte externe (1) et sur lequel repose la feuille perméable à l'air (5) si bien que la chambre d'air (7) se forme sous ce fond tandis qu'il est prévue, dans ladite enceinte externe (1) à une certaine distance de ses parois latérales externes verticales (3), une paroi interne circonférentielle verticale (9) qui repose sur la feuille perméable à l'air (5) et qui renferme les billes de verre, et que, dans l'espace entre les parois externe et interne (3, 9), sont présents des moyens (11, 12, 13, 14) pour empêcher la fuite d'air de la chambre d'air (7) vers cet espace.

2. Lit suivant la revendication 1, caractérisé en ce que la paroi interne (9) repose sur la feuille perméable à l'air (5) avec un rabat (10) dirigé vers la paroi externe (3) et en ce que les moyens pour empêcher la fuite d'air comprennent des éléments sous tension (11, 12, 13, 14) qui sont fixés à la paroi externe (3) et agissent sur ledit rabat (10).

3. Lit suivant la revendication 2, caractérisé en ce que les éléments sous tension (11, 12, 13, 14) comprennent une barre filetée (11) qui est fixée dans un trou percé muni d'un taraudage correspondant dans un support (12) fixé à la paroi externe (3), ladite barre filetée (11) étant munie à son bout haut d'un élément de commande (13) et reposant par son bout bas (14) sur le rabat (10) de la paroi interne (9).

4. Lit suivant la revendication 2 ou 3, caractérisé en ce qu'entre la feuille perméable à l'air (5) et le rabat (10) de la paroi interne (9) et entre la feuille (5) et le rebord support (4) du boîtier externe (1), est prévu un matériau de scellement.

5. Lit suivant l'une ou plusieurs de revendications précédentes 1 à 4, caractérisé en ce qu'un appareil de traitement d'air (22) est prévu sur le tuyau d'alimentation en air (8) relié à la chambre d'air (7).

6. Lit suivant la revendication 5, caractérisé en ce que l'appareil de traitement de l'air (22) comprend respectivement une unité de filtrage (23), une unité de ventilation (24), une unité de refroidissement (25) et une unité de chauffage (26).

7. Lit suivant la revendication 5 ou 6, caractérisé en ce qu'il est prévu une jauge de pression (27) dans le but de mesurer la pression sous le patient, ladite jauge de pression (27) étant reliée à un élément de commande (28) qui commande l'unité de ventilation (24) selon la valeur mesurée.

8. Lit suivant l'une ou plusieurs de revendications précédentes 1 à 7, caractérisé en ce que le tissu de filtrage (16) est fixé au bord haut de la paroi interne (9) à l'aide d'une bande de serrage (17) qui est adaptée au bord haut de la paroi interne (9) et fixe une bride de couverture (21) en matériau souple posée sur les bords hauts des parois interne et externe (9, 3) et ferme l'espace existant entre eux.

9. Lit suivant la revendication 8, caractérisé en ce qu'entre les parois interne et externe (9, 3), est prévu un canal de serrage (18) qui a une coupe en U et dont les deux extrémités libres des branches sont munies de rabats dirigés vers l'extérieur (19, 20), lesdits rabats (19, 20) reposant respectivement sur le haut de la paroi externe (3) et sur la bande de serrage (17), le canal de serrage (18) étant adapté sous tension entre les deux parois (9, 3).

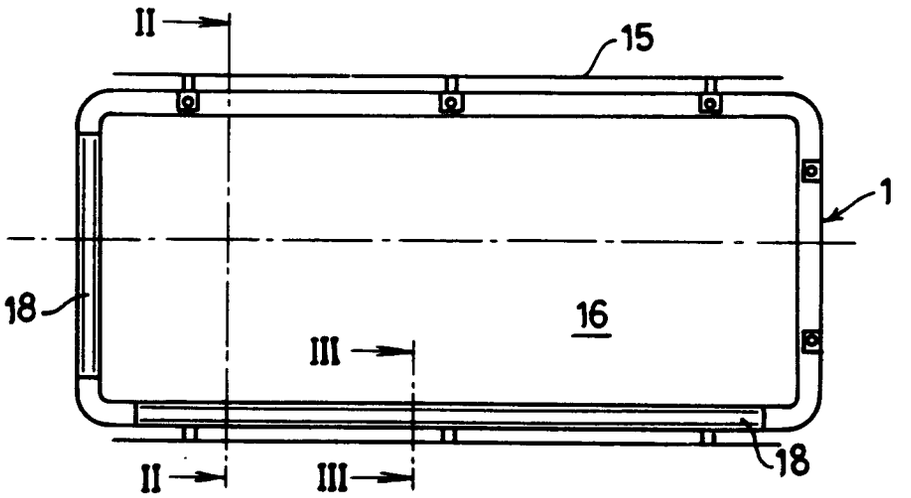

Fig: 1.

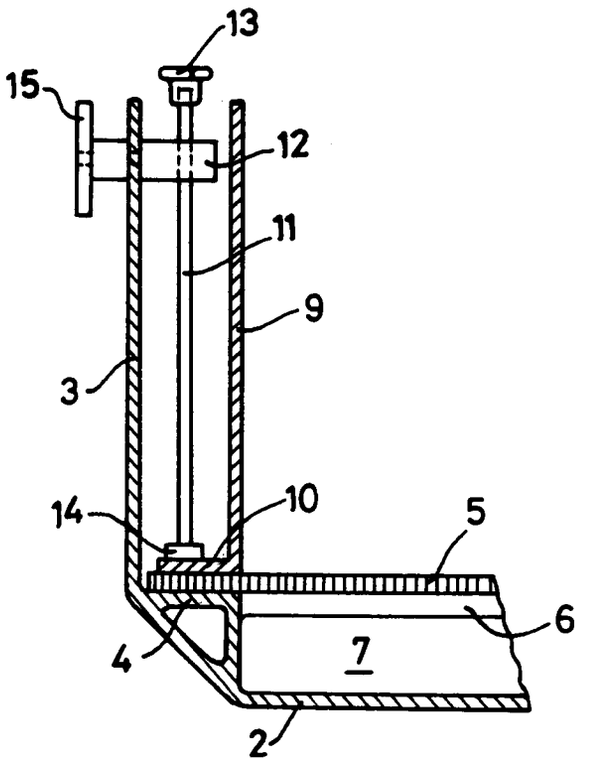

Fig: 3a.

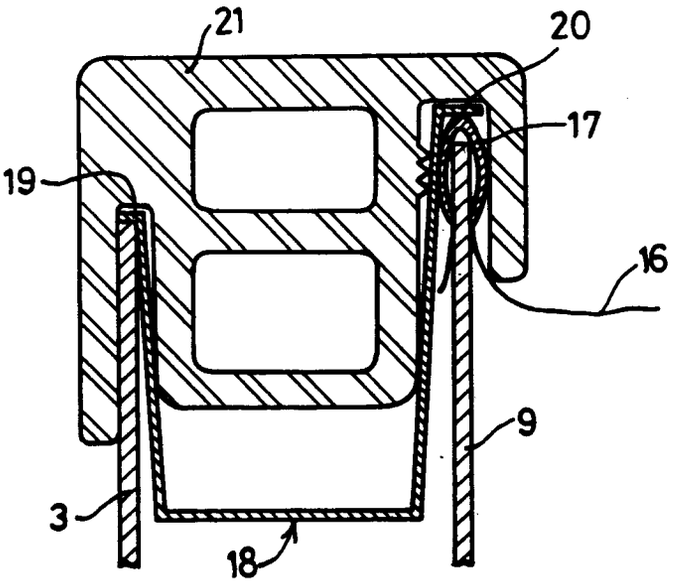
21
20
17
19
16
9
3
18

Fig: 3b.

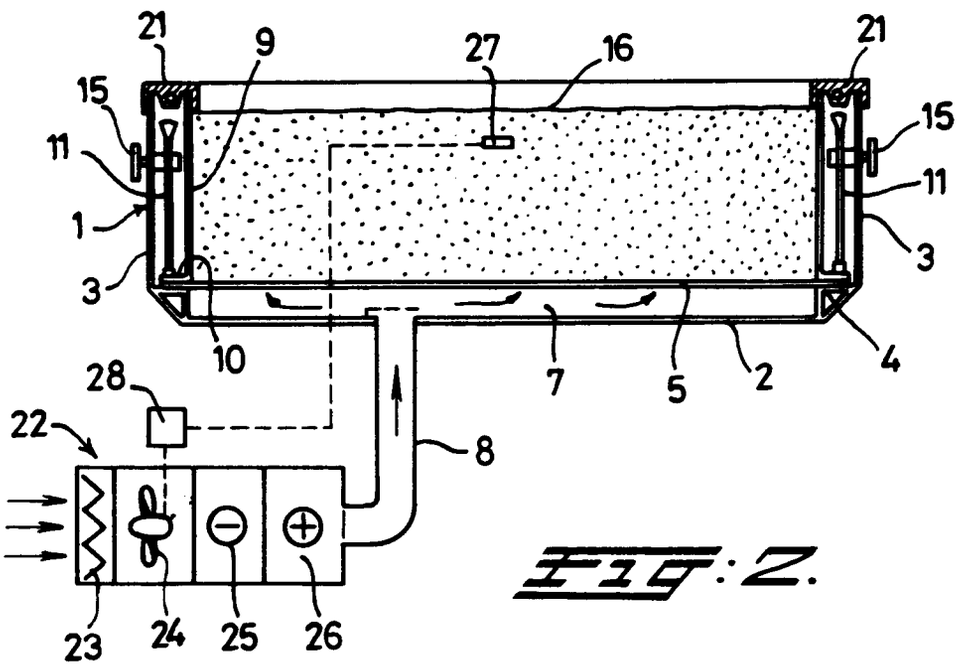
21
9
27
16
21
15
15
11
11
1
3
3
10
7
5
2
4
28
22
8
23
24
25
26

Fig: 2.