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**(54) Method of making a reinforced concrete structure and reinforcing assembly for carrying out said method**

(57) When making a reinforced concrete structure using a reinforcing assembly (1) consisting of a reinforcing network of rods (2,3) and dome-shaped filler bodies (4), the novel feature is the use of a reinforcing assembly (1) comprising filler bodies (4) with free spaces (6)

between their lower free edges (5). This makes it possible to achieve direct contact or continuity between concrete bodies above and below said lower free edges (5).

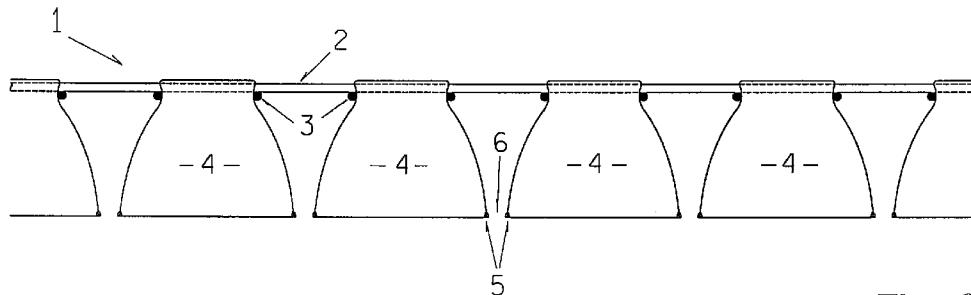


Fig 1.

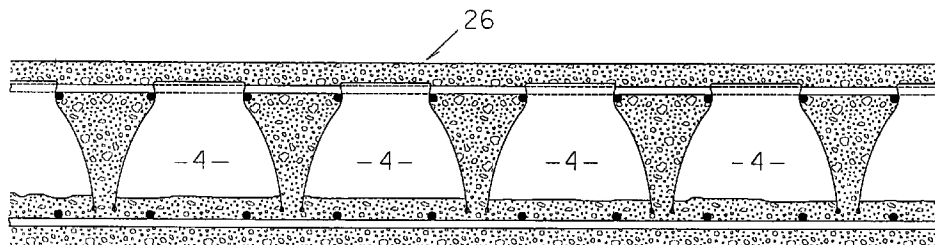


Fig 7.

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**Description**TECHNICAL FIELD

[0001] The present invention relates to a method of making a concrete structure of substantially planar shape, said method being of the kind set forth in the preamble of claim 1.

BACKGROUND ART

[0002] A method of the kind referred to above is disclosed in the International Application WO 95/24532 (B,S&Co. ref. 52986). According to this known method, the spaces between the lower free edges of the dome-shaped filler bodies are closed by flanges extending from the filler bodies and cooperating with each other so as to form a lower shuttering. This means, of course, that a direct connection between concrete bodies above and below said lower free edges cannot be established.

DISCLOSURE OF THE INVENTION

[0003] It is the object of the present invention to provide a method of the kind referred to above, with which it is possible to establish a direct or "monolithic" connection between concrete bodies above and below the lower free edges of the dome-shaped filler bodies, and according to the present invention, this object is achieved by using a reinforcing assembly exhibiting the features set forth in the characterizing clause of claim 1. By using such a reinforcing assembly, in which the spaces above and below the lower free edges of the dome-shaped filler bodies are in mutual continuity, it is possible to achieve a direct or "monolithic" connection between concrete bodies above and below said lower free edges.

[0004] The present invention also relates to a reinforcing assembly for use in carrying out the method of the invention. This reinforcing assembly is of the kind set forth in the preamble of claim 9, and according to the present invention, it also exhibits the features set forth in the characterizing clause of this claim 9.

[0005] Advantageous embodiments of the method and the reinforcing assembly according to the invention, the effects of which - beyond what is obvious - will be evident from the following detailed part of the present description, are set forth in claims 2-8 and 10-12, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the following detailed part of the present description, the invention will be explained in more detail with reference to the exemplary embodiments of a reinforcing assembly according to the invention shown diagrammatically in the drawings, in which

Figure 1 shows a first embodiment of a reinforcing assembly according to the invention,

Figure 2 shows a second embodiment of a reinforcing assembly according to the invention,

Figure 3 illustrates a method of making a reinforced concrete structure using the reinforcing assembly shown in Figure 2, and

Figures 4-7 show the successive stages and a method of making a reinforced concrete structure by using the reinforcing assembly shown in Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0007] Figure 1 shows a reinforcing assembly 1 consisting of a grid of reinforcing rods 2, 3 crossing each others at right angles and joined, e.g. by welding, at the crossing points, and a number of filler domes 4, the tops of which are engaged in alternate meshes in the grid 2, 3 so as to form a rigid body.

[0008] The filler domes 4 are open at the bottom with their lower free edges 5 spaced at a distance 6. As seen from above, the filler domes 4 may be round, square or rectangular or of any other suitable shape. They are preferably made from a suitable plastic material, such as polyethylene, and with a shape, e.g. as shown, making it possible to secure them in the grid 2,3 by simply pressing them into place in the meshes of the latter.

[0009] In the exemplary embodiment shown in Figure 2, the reinforcing assembly 11 consists - in the same manner as the assembly 1 shown in Figure 1 - of reinforcing rods 12 and 13, filler domes 14 having lower free edges 15 and spaced by distances 16, these reference numbers corresponding to those in Figure 1 with ten added.

[0010] An additional feature of the reinforcing assembly 11 shown in Figure 2 is a lower reinforcing grid consisting of reinforcing rods 17 and 18 forming meshes fitting loosely about the lowermost part of the filler domes 14. The reinforcing grid formed by the rods 17 and 18 is preferably secured to the outside of the filler domes 14 such as by means of suitable lugs formed on the latter in the manner described in the above international application No. WO 95/24532 (B,S&Co. ref. 52986).

[0011] Figure 3 illustrates one possible use of the reinforcing assembly 11 shown in Figure 2. In order to form a floor or similar horizontal concrete structure, the reinforcing assembly 11 is placed on a planar shuttering 19, after which unhardened concrete is poured into the spaces between the filler domes 14 and the space above them so as to form a monolithic structure 20 with a horizontal upper surface 21.

[0012] If the shuttering 19 is intended to be left in place as shown, it is preferably secured to the reinforcing rods 17 and 18 before pouring the concrete. If not, it can be removed and replaced by suitable ceiling panels

(not shown).

[0013] Figures 4-7 illustrate a possible use of the reinforcing assembly 1 shown in Figure 1.

[0014] Thus, Figure 4 shows the reinforcing assembly 1 being placed above a concrete layer 22, as yet unhardened, resting on a horizontal surface 23 and preferably having embedded therein a reinforcing grid 24, that may be of a conventional type.

[0015] Figure 5 shows the reinforcing assembly 1 lowered from the position shown in Figure 4, so that the lower edges 5 of the filler domes 4 are immersed at some depth in the concrete layer 22.

[0016] Figure 6 shows the situation after hardening of the concrete layer 22 and removal from the horizontal surface 23, a reinforcing and shuttering assembly 25 now having been formed. This assembly 25, which is preferably manufactured in the factory with the concomitant advantages of mass production and storage, may at a suitable moment in time be moved to a building site and placed in its final position of use, after which the spaces between the filler domes 4 and the space above them are filled with concrete, thus forming a finished floor with an upper surface 26, as shown in Figure 7.

[0017] It is, of course, possible to cast a finished floor element as shown in Figure 7 in the factory and then move it to the building site, but the procedure outlined above is preferred, partly because of the saving in transportation tonnage, partly because of the relative ease, with which a reinforcing and shuttering assembly 25 as shown in Figure 6 may be adapted to local conditions, such as by cutting off a corner or two.

#### LIST OF PARTS

#### [0018]

1	reinforcing assembly	
2	reinforcing rod	
3	reinforcing rod	
4	filler dome	
5	lower free edge	
6	distance	
11	reinforcing assembly	
12	reinforcing rod	
13	reinforcing rod	
14	filler dome	
15	lower free edge	
16	distance	
17	reinforcing rod	
18	reinforcing rod	
19	planar shuttering	
20	monolithic structure	
21	upper surface	
22	concrete layer	
23	horizontal surface	
24	reinforcing grid	
25	reinforcing and shuttering assembly	
26	upper surface	

#### Claims

1. Method of making a reinforced concrete structure of substantially planar shape by at least partly embedding in concrete a reinforcing assembly (1;11) of the kind comprising

a) a reinforcing network consisting of reinforcing rods (2,3;12,13,17,18), of which at least some are rigidly secured to each other, and

b) a number of discrete spaced filler bodies (4;14) shaped like inverted bowls or basins interengaging with said network so as to form a rigid body, in which said filler bodies (4;14) are arranged in a regular pattern and oriented with their open sides facing in the same direction as the lower side of said structure,

characterized by

c) the use of a reinforcing assembly (1;11), in which said filler bodies (4;14) are arranged in said regular pattern with spacing (6;16) between their lower free edges (5;15), the latter lying in or close to a common plane parallel to said lower side.

2. Method according to claim 1, characterized by placing said assembly (11) with said lower free edges (15) in liquid-tight abutment upon a shuttering (19) and filling with concrete the spaces between and above said filler bodies (14) so as to fully embed said reinforcing network (12,13,17,18).

3. Method according to claim 2, characterized by leaving said shuttering (19) in place so as to form a permanent lower part of said structure, e.g. a ceiling.

4. Method according to claim 3, characterized by securing said shuttering (19) to the concrete and/or the reinforcing network in the spaces between said filler bodies (14).

5. Method according to claim 1, characterized by  
a) on a substantially horizontal surface (23) forming a layer (22) of unhardened concrete (Figure 4),

b) lowering said reinforcing assembly (1) with said lower free edges (5) facing down into said layer (22) so as to embed said lower free edges (5) into said layer (22) while maintaining continuity between the concrete within and between said filler bodies (4) (Figure 5),

c) when said concrete has solidified, removing said assembly from said substantially horizontal surface (23) (Figure 6), and

d) placing the assembly in its final position of use and filling with concrete the space above said solidified concrete (Figure 7).

6. Method according to claim 5, characterized by using a reinforcing assembly in which said lower free edges (5) do not lie in a common plane, e.g. by having legs or recesses. 5
7. Method according to claim 5 or 6, characterized by before step a in claim 5 placing a reinforcing grid (24) spaced above said horizontal surface (23). 10
8. Method according to claim 5 or 6, characterized by after step a and before step b in claim 5 embedding a reinforcing grid (24) in said layer (22) of unhardened concrete, such as by lowering said grid into said layer. 15
9. Reinforcing assembly (1:11) for carrying out the method according to any one or any of the claims 1-8 and of the kind comprising
- a) a reinforcing network consisting of reinforcing rods (2,3; 12,13,17,18), of which at least some are rigidly secured to each other, and 20
  - b) a number of discrete spaced filler bodies (4;14) shaped like inverted bowls or basins interengaging with said network so as to form a rigid body, in which said filler bodies (4;14) are arranged in a regular pattern and oriented with their open sides facing in the same direction as the lower side of said structure, 25
  - characterized in 30
  - c) that said filler bodies (4;14) are arranged in said regular pattern with spacing (6;16) between their lower free edges (5;15), the latter lying in or close to a common plane parallel to said lower side. 35
10. Reinforcing assembly according to claim 9, characterized in that the spaces between and within said filler bodies (4) is occupied by a solid concrete body (22) extending upwardly from said lower free edges (5). 40
11. Reinforcing assembly according to claim 10, characterized in that said solid concrete body (22) extends downwardly to a level below said lower free edges (5). 45
12. Reinforcing assembly according to claim 10 or 11, characterized by a panel extending substantially in the full width and length of the assembly and secured to said solid concrete body (22). 50

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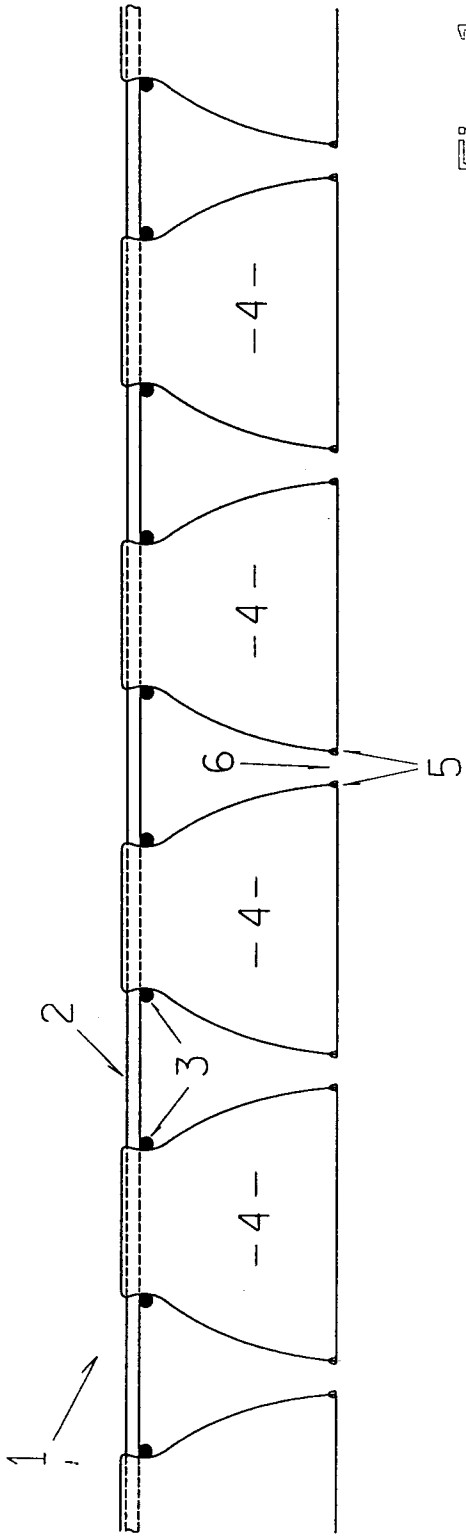


Fig 1.

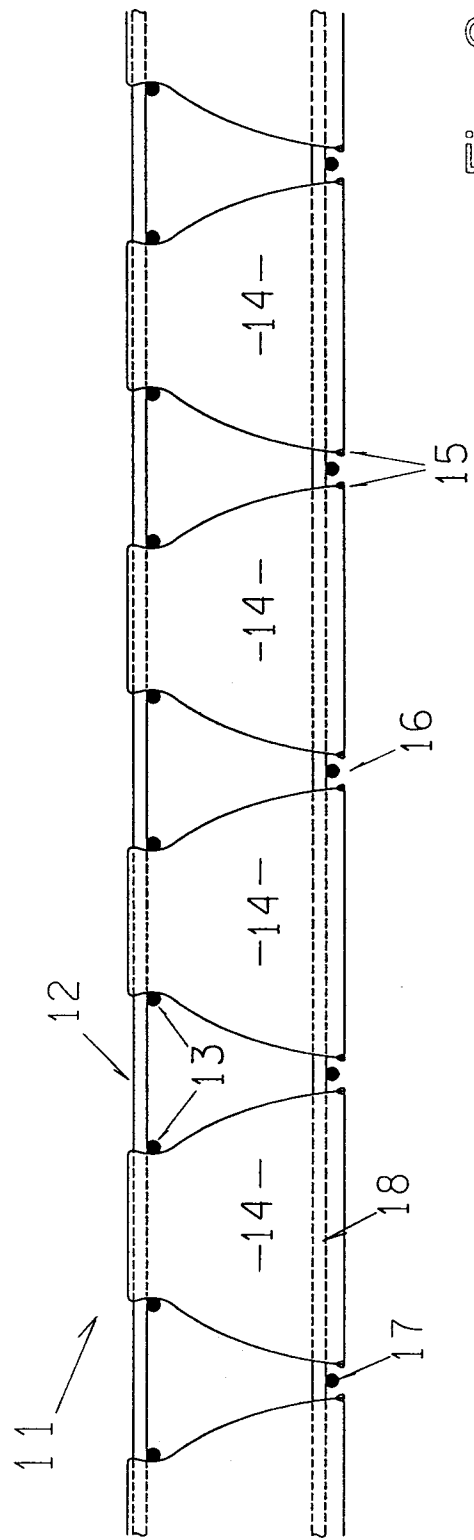
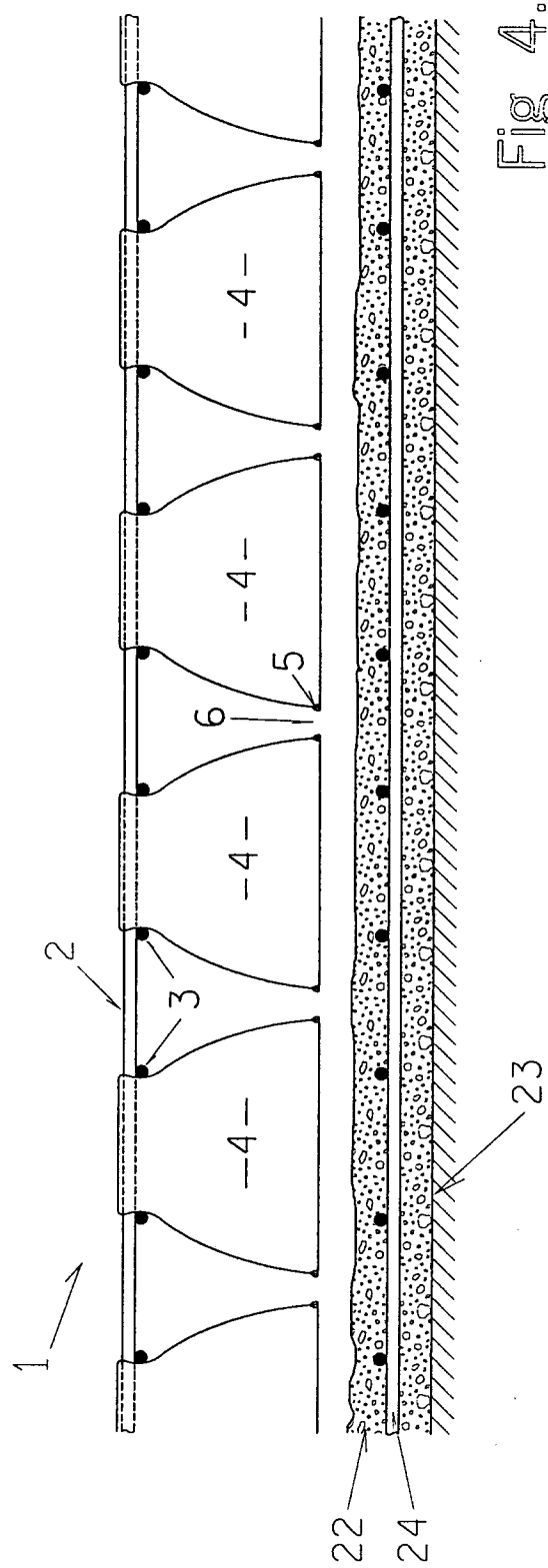
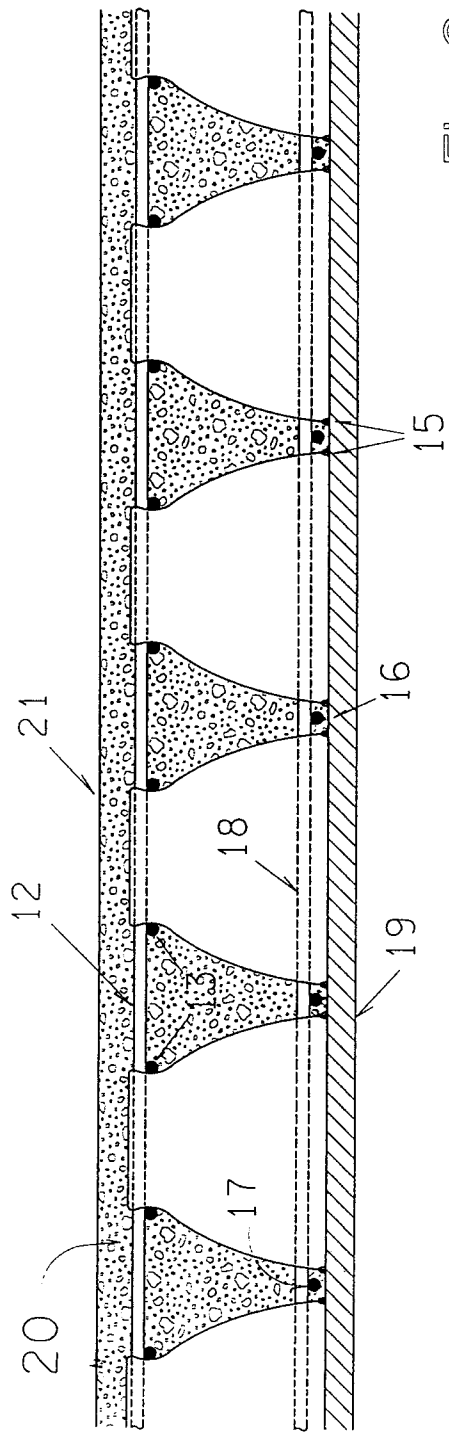


Fig 2.



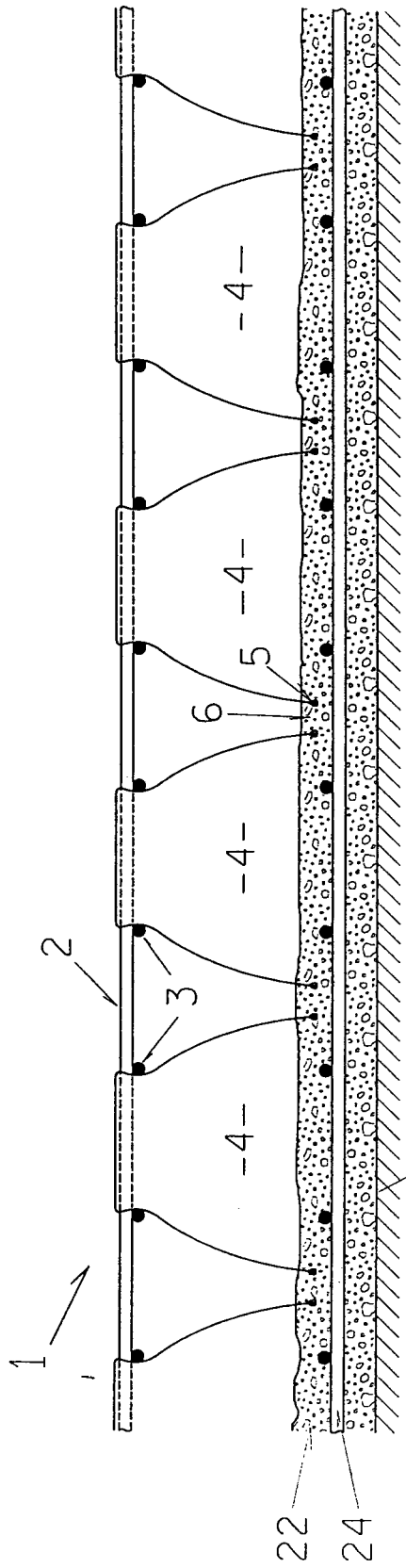


Fig 5.

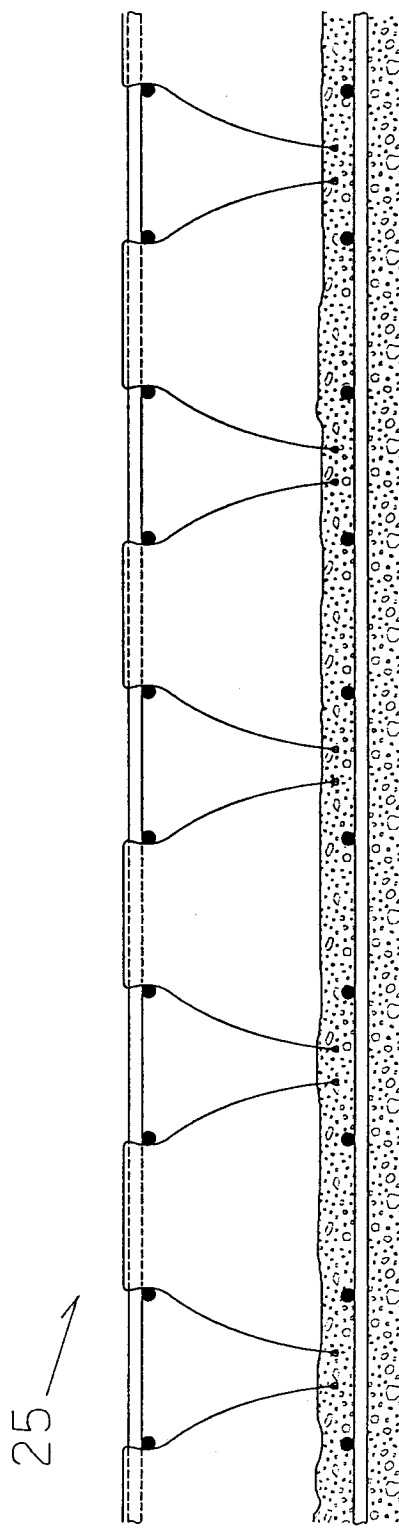


Fig 6.

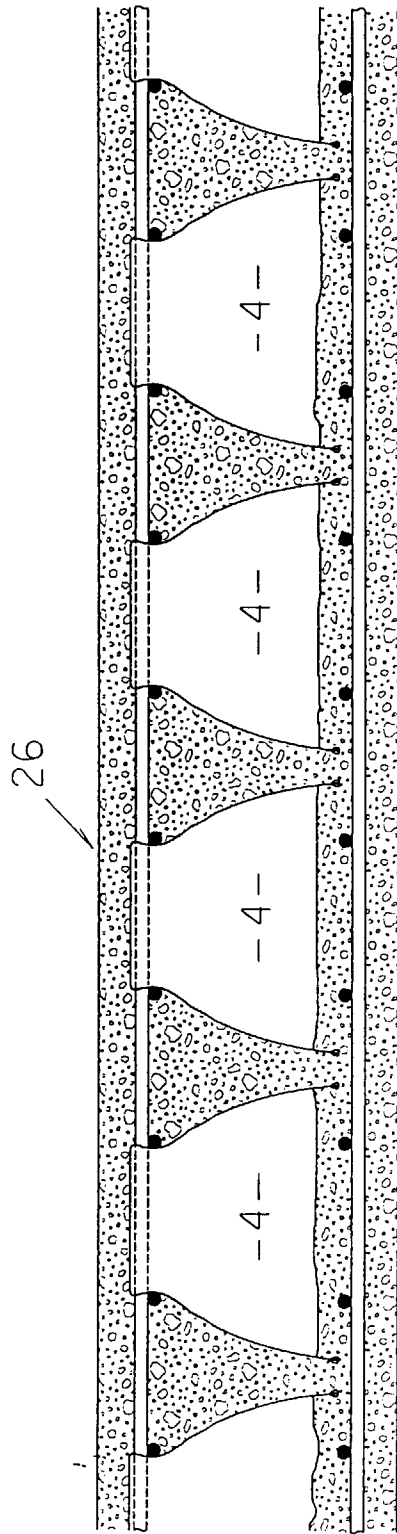


Fig 7.



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EUROPEAN SEARCH REPORT

Application Number  
EP 97 12 2338

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.6)
D,Y A	WO 95 24532 A (LASSEN ) 14 September 1995 * abstract; figures * ---	1,2,9 5	E04B5/21 E04B5/32
Y A	DE 26 33 526 A (FILIGRANBAU) 2 February 1978 * page 7, paragraph 2; figure 2 * ---	1,2,9 3-8, 10-12	
A	US 3 640 040 A (MACLEAN) 8 February 1972 * abstract; figures * ---	1	
A	DE 41 21 113 A (HAJEK ET AL.) 2 January 1992 * abstract; figures * ---	1	
A	WO 92 06253 A (BREUNING) 16 April 1992 * abstract; figures * ---	1	
A	US 3 213 581 A (MACCHI) 26 October 1965 * figures * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		28 May 1998	Righetti, R
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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