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(54) **Prefabricated modules for use in the building industry**

(57) A prefabricated module (10; 20), particularly for use in the building industry, comprising a three-dimensional wire structure (11) of welded steel wires which supports a plurality of panels (12-1, 12-2) in insulating material on either side. A filling space is provided between the panels on either side for introducing a filler material (13). The wire structure (11) comprising a series of plane nettings (16), which are held in spaced apart positions by a series of cross wires (18) welded to the nettings (16). Each plane netting (16) comprises a

plurality of lengthwise wires (21-1/2, 22-1/2, 23-1/2) and a plurality of brace wires (25) welded to the lengthwise wires. The plurality of lengthwise wires comprises at least a first pair (21-1/2) and a second pair (22-1/2), the first pair (21-1/2) forming an outer pair of lengthwise wires and the second pair (22-1/2) being positioned inwardly from the first pair (21-1/2). The first (21-1/2) and second pairs (22-1/2) form spaces on either side of the prefabricated module (10; 20) in which the panels (12-1, 12-2) in insulating material are supported.

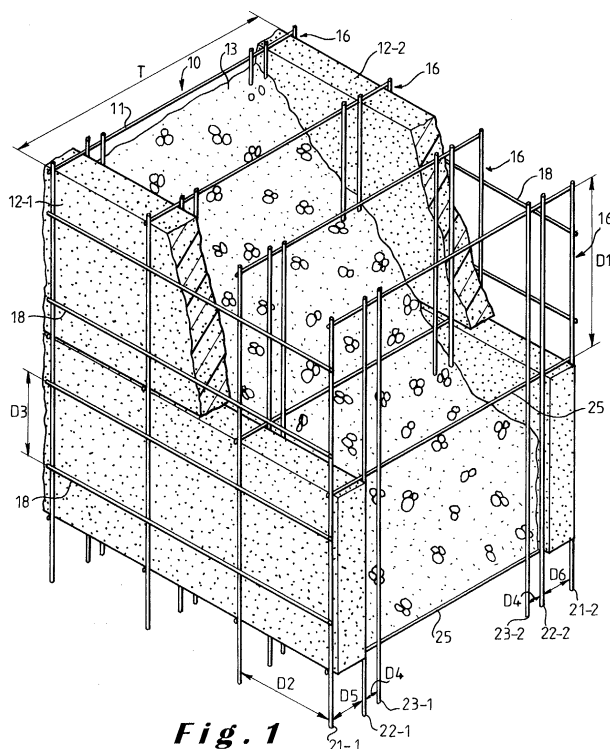


Fig. 1

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Description

[0001] The present invention relates to a prefabricated module, particularly for use in the building industry, according to the preamble of claim 1.

[0002] A prefabricated module is for example known from EP-A-0 061 100. The module comprises three-dimensional wire structure comprising a series of plane nettings, which are spaced apart a pre-determined distance by a series of cross wires welded to the nettings. All plane nettings have substantially the same form and comprise a plurality of pairs of lengthwise wires and a plurality of brace wires. For each plane netting, the plurality of pairs of lengthwise wires comprises first, second and third pairs, of which a first pair forms the outer pair of lengthwise wires. The second pair is positioned inwardly with respect to the first pair and the third pair is positioned inwardly from the second pair, so further inwardly than the second pair. In the assembled three-dimensional wire structure, the second and third pairs of lengthwise wires define spaces on both sides in which panels in insulating material are placed. As a result, a prefabricated module is achieved having a filling space between the panels, which can be filled with a filler material such as for example concrete.

[0003] The prefabricated module is used in the building industry for constructing walls, ceilings, floors or roofs of buildings. To this end, a plurality of prefabricated modules are mounted on the building site so as to form the general structure of the building, after which the filling space is filled with the filler material and the outer sides of the prefabricated module are covered with for example a plastering material.

[0004] It has been found that the prefabricated module of EP-A-0 610 100, when used in a building, provides insufficient sound insulation.

[0005] It is an aim of the present invention to provide a prefabricated module with which a better sound insulation can be achieved.

[0006] This aim is achieved according to the invention in that the prefabricated module comprises the technical characteristics of the characterising part of the first claim.

[0007] The prefabricated module according to the invention comprises a three-dimensional wire structure of welded steel wires which supports a plurality of panels in insulating material on either side. Between the panels, a filling space is provided for introducing a filler material. The wire structure comprises a series of plane nettings, which are spaced apart by a series of cross wires welded to the nettings. Each plane netting comprises a plurality of pairs of lengthwise wires and a plurality of brace wires welded to the lengthwise wires. The plurality of lengthwise wires comprises at least a first pair and a second pair, the first pair forming an outer pair of lengthwise wires and the second pair being positioned inwardly from the first pair. According to the invention, the panels in insulating material are supported in spaces be-

tween the first and second pairs on either side of the prefabricated module.

[0008] As a result, the panels of the module of the invention are supported between the outer pairs of lengthwise wires and the next pairs of lengthwise wires. In other words, the outer pairs of lengthwise wires and consequently also the cross wires of the module are located adjacent the panels.

[0009] In the prior art module, the outer pairs of lengthwise wires and consequently also the cross wires on both sides of the module are spaced apart from the panels, as these are supported between the second and third pairs of lengthwise wires. A consequence of this is that in a finished wall, the outer lengthwise wires and the cross wires, although covered with for example plastering, can vibrate as in response to sounds produced in the vicinity. It has been found that the plastering provides substantially no dampening effect to the vibrations of the wires. The vibrations created on one side of the module are transported via the brace wires of the nettings to the outer lengthwise wires and the cross wires on the other side of the module. In other words, the outer wires on the other side of the module resonate with the outer wires on the one side of the module, so that a large amount of sound can be transported through the module. The resonance effect can be compared to the resonance effect between strings of a musical instrument, the filling space between the modules acting as the sound box of the instrument.

[0010] In the module of the invention, the outer wires on both sides of the module are located adjacent the panels in insulating material, which provide more of a dampening effect to the wires as compared to for example plastering. Furthermore, it has been found that the introduction of filling material into the filling space between the panels causes the panels to be pressed against the outer wires, so that substantially all outer wires, i.e. substantially all outer pairs of lengthwise wires and substantially all cross wires of the module contact the panels after the filling space has been filled. This can lead to a substantial reduction in the sound conductivity of the module of the invention.

[0011] In a preferred embodiment of the prefabricated module of the invention, the first and second pairs of lengthwise wires comprise right-hand and left-hand first and second lengthwise wires, the first right-hand lengthwise wires being spaced from the second right-hand lengthwise wires by a right-hand distance and the first left-hand lengthwise wires being spaced from the second left-hand lengthwise wires by a left-hand distance, the right-hand distance being larger than the left-hand distance. This means that the panels on the right-hand side are wider than those on the left-hand side of this preferred embodiment of the module of the invention. Surprisingly, it has been found that this difference in width of the panels on one side with respect to those on the other side can further reduce the sound conductivity of the prefabricated module of the invention. Preferably,

the difference in width is a ratio of about 1.5, but it may also be more or less.

[0012] The invention will be further elucidated by means of the following description and the appended figures.

[0013] Figure 1 shows a first preferred embodiment of the prefabricated module of the invention.

[0014] Figure 2 shows a second preferred embodiment of the prefabricated module of the invention.

[0015] The prefabricated modules 10, 20 of figures 1 and 2 comprise a three-dimensional wire structure 11 formed by welded wires, and flat elements 12-1/2 made from insulating and/or heat-insulating material, held on either side of the three-dimensional wire structure 11 in such a way as to form a substantially continuous panel. A module 10, 20 may be used either in vertical position as shown in the figures, in horizontal position or in a slanting position, i.e. the module 10, 20 may be used for walls, ceilings, floors and roofs of buildings.

[0016] The three-dimensional wire structure 11 comprises a series of substantially identical nettings 16, each of which is substantially planar. The nettings 16 are arranged facing one another and are firmly held in their positions by two series of cross wires 18, located on either side of the module 10, 20.

[0017] Each netting 16 is comprises a plurality of lengthwise wire pairs: a first pair 21-1 and 21-2, a second pair 22-1 and 22-2 and a third pair 23-1 and 23-2. These lengthwise wires are welded to and held in position by a plurality of brace wires 25. The two wires 21-1, 21-2 are the outermost wires in the nettings 16, and the spacing therebetween determines the thickness T of the module 10. The two wires 22-1 and 22-2 are located inwardly from the wires 21-1 and 21-2 and the two wires 23-1 and 23-2 are located inwardly from the two wires 22-1 and 22-2. In figures 1 and 2, the two wires 23-1 and 23-2 are the innermost lengthwise wires of the module 10, but further lengthwise wires (not shown) may be welded to the brace wires 25 inwardly from the wires 23-1 and 23-2.

[0018] The complete wire structure 11 of the module 10, 20 is obtained by welding the cross wires 18 to the outermost lengthwise wires 21-1, 21-2. Particularly efficient methods for making the three-dimensional wire structure 11 comprising lengthwise wires, brace wires and cross wires are amongst others described in US-A-4 667 707, EP-A-162 183 and more recently in the international patent application with no. PCT/EP01/14852. The wire structure 11 may however also be constructed in any other way known to the person skilled in the art.

[0019] The modules 10, 20 of figures 1 and 2 are parallelepiped shaped, with the lengthwise wires 21-1/2 to 23-1/2 substantially at right angles to the brace wires 25, so that the nettings 16 are substantially rectangular in shape, and the cross wires 18 substantially at right angles to the nettings 16. The angles between the wires may however vary. The modules 10, 20 of figures 1 and

2 are substantially straight, but the modules 10 may also have a bent or arched shape or any other shape known to the person skilled in the art. Openings (not shown) may be provided in the modules 10 for providing spaces for doors or windows or the like.

[0020] In the modules shown in figures 1 and 2, the brace wires 25 of the plane nettings 16 are spaced apart by a first predetermined distance D1, the plane nettings 16 are spaced apart by a second predetermined distance D2 and the cross wires 18 are spaced apart by a third predetermined distance D3. The first predetermined distance D1 is preferably substantially twice the third predetermined distance D3. In this way, a three-dimensional wire structure 11 is achieved which has a regular structure. The distances D1, D2 and D3 may however also vary.

[0021] In figures 1 and 2, the lengthwise wires 21-1/2 to 23-1/2 of the plane nettings 16 are spaced apart by one or more times a fourth predetermined distance D4. The distance between the lengthwise wires 22-1 and 23-1 and the distance between the lengthwise wires 22-2 and 23-2 is each time once the fourth predetermined distance D4. The distance D5 between the lengthwise wires 21-1 and 22-1 and the distance D6 between the lengthwise wires 21-2 and 22-2 is each time a plural of the fourth predetermined distance D4. In the module 10 of figure 1, the distance D6 is substantially equal to D5 whereas in the module 20 of figure 2 the distance D6 is substantially 1.5 times the distance D5. The distances between each two lengthwise wires may however also be chosen differently as desired by the person skilled in the art.

[0022] Suitable distances for the module 10 of figure 1 are for example: D4 = 1 cm, D5 = D6 = 4 cm, D1 = 15 cm, D2 = 10 cm and D3 = 15 cm. Suitable distances for the module 20 of figure 2 are for example: D4 = 1 cm, D5 = 4 cm, D6 = 6 cm, D1 = 15 cm, D2 = 10 cm and D3 = 15 cm. As all these distances are a plural of 0.5 cm, the dimensions of the module 10 are easily adaptable to the requirements of the building construction by simply varying the plurals of 0.5 cm. It should however be clear that the distances may be varied further.

[0023] The three-dimensional wire structures 11 carry a plurality of panels 12-1/2 in an insulating material, preferably expanded polystyrene. These panels 12-1/2 are held on either side of the wire structure 11 between the first and second pairs of lengthwise wires 21-1/2 and 22-1/2 and have a width substantially equal to the distances D5 and D6 therebetween, so that they are supported by the lengthwise wires. More particularly, the panels 12-1 are held between the lengthwise wires 21-1 and 22-1 and have a width substantially equal to the distance D5 between these two wires. The panels 12-2 are held between the lengthwise wires 21-2 and 22-2 and have a width substantially equal to the distance D6 between these two wires. The panels 12-1/2 on both sides have a height substantially equal to the distance D1 between the brace wires 25, so that the panels 12-1 to-

gether and 12-2 together form a substantially continuous panel on either side of the module 10, 20. The space between the panels 12-1 and 12-2 is provided for introducing a filler material 13, such as for example concrete. The wires 22-1/2, 23-1/2 and 25 located within the filling space between the panels 12-1 and 12-2 form a reinforcement for the filler material 13.

[0024] The prefabricated modules 10, 20 of figures 1 and 2 are provided for use in the building industry in a similar way as those described in EP-A-180 667 and US-A-4 864 792. Therefore, the use of the modules 10, 20 in the building industry will not be repeated here in detail.

[0025] In the modules 10, 20 of figures 1 and 2, the panels are supported between the outer lengthwise wires 21-1/2 and the next lengthwise wires 22-1/2. In other words, the outer lengthwise wires 21-1/2 and consequently also the cross wires 18, which are welded to the outer lengthwise wires 21-1/2, are located adjacent the panels 12-1/2. It has been found that this construction reduces the sound conductivity of the modules 10, 20, since the panels 12-1/2 in insulating material have more of a dampening effect to the outer wires as compared to for example plastering (not shown), which is applied on the outer wires as covering material.

[0026] Furthermore, it has been found that the introduction of filling material 13 into the filling space between the panels 12-1/2 causes the panels 12-1/2 to be pressed against the outer wires 21-1/2 and 18, so that substantially all outer wires, i.e. substantially all outer pairs of lengthwise wires 21-1/2 and substantially all cross wires 18 of the module 10, 20 contact the panels 12 after the filling space has been filled. This can increase the dampening effect and lead to a substantial reduction in the sound conductivity of the modules 10, 20 of figures 1 and 2.

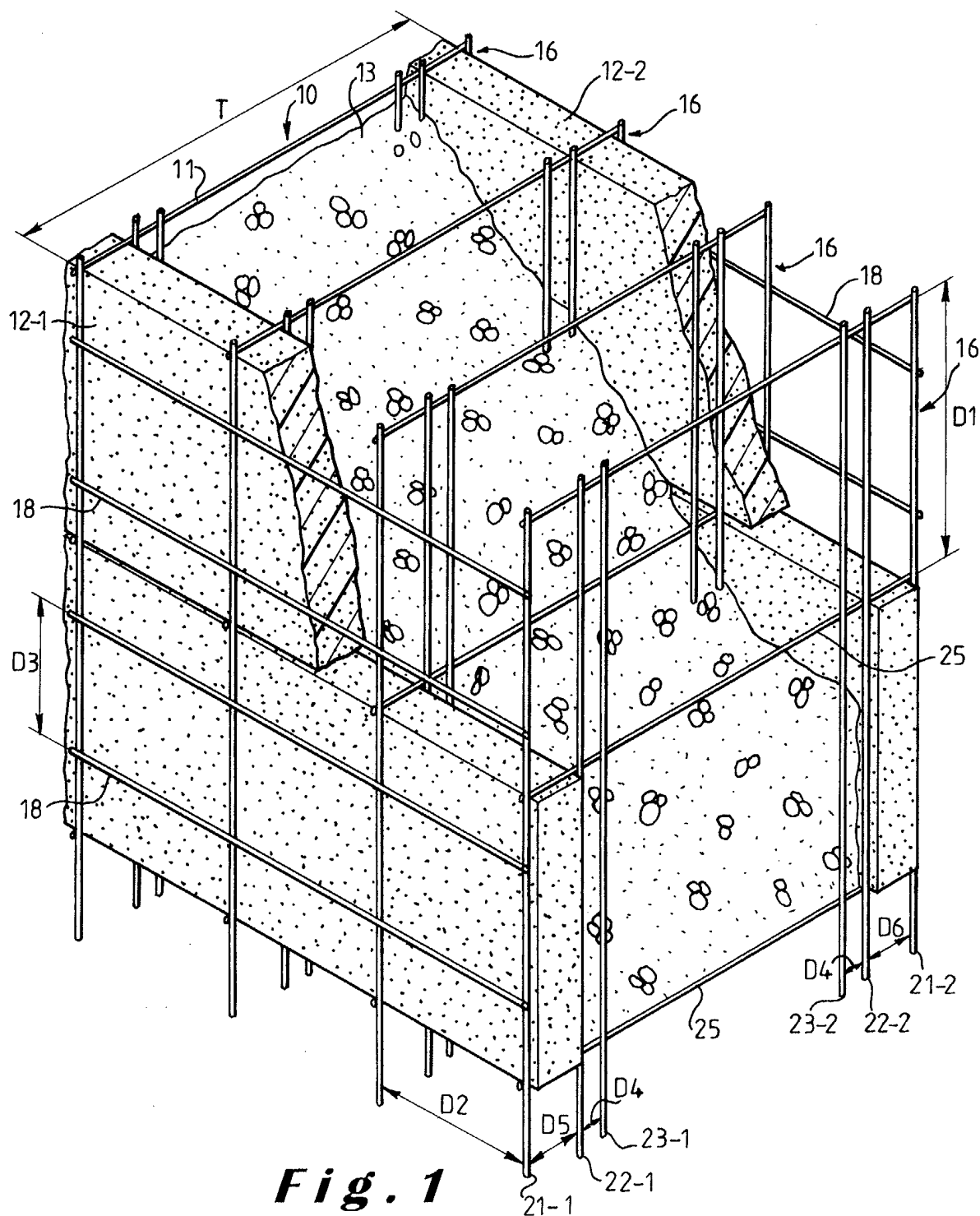
[0027] In the module 20 of figure 2, the panels 12-2 on the right-hand side are wider than the panels 12-1 on the left-hand side. Surprisingly, it has been found that this difference in width of the panels 12-1 on one side with respect to the panels 12-2 on the other side can further reduce the sound conductivity of the prefabricated module 20 of figure 2 with respect to that of figure 1.

Claims

1. A prefabricated module (10; 20), particularly for use in the building industry, comprising a three-dimensional wire structure (11) of welded steel wires which supports a plurality of panels (12-1, 12-2) in insulating material on either side, a filling space being provided between the panels on either side for introducing a filler material (13), the wire structure (11) comprising a series of plane nettings (16), which are held in spaced apart positions by a series of cross wires (18) welded to the nettings (16), each plane netting (16) comprising a plurality of length-

wise wires (21-1/2, 22-1/2, 23-1/2) and a plurality of brace wires (25) welded to the lengthwise wires, the plurality of lengthwise wires comprising at least a first pair (21-1/2) and a second pair (22-1/2), the first pair (21-1/2) forming an outer pair of lengthwise wires and the second pair (22-1/2) being positioned inwardly from the first pair (21-1/2), **characterised in that** the first (21-1/2) and second pairs (22-1/2) form spaces on either side of the prefabricated module (10; 20) in which the panels (12-1, 12-2) in insulating material are supported.

2. A prefabricated module according to claim 1, **characterised in that** the first (21-1/2) and second pairs (22-1/2) of lengthwise wires comprise right-hand and left-hand first and second lengthwise wires, the first right-hand lengthwise wires (21-2) being spaced from the second right-hand lengthwise wires (22-2) by a right-hand distance (D6) and the first left-hand lengthwise wires (21-1) being spaced from the second left-hand lengthwise wires (22-1) by a left-hand distance (D5), the right-hand distance (D6) being larger than the left-hand distance (D5).
3. A prefabricated module according to claim 2, **characterised in that** the right-hand distance (D6) is about 1.5 times the left-hand distance (D5).
4. A prefabricated module according to any one of the previous claims, **characterised in that** the brace wires (25) of the plane nettings (16) are spaced apart by a first predetermined distance (D1).
5. A prefabricated module according to any one of the previous claims, **characterised in that** the plane nettings (16) are spaced apart by a second predetermined distance (D2).
6. A prefabricated module according to any one of the previous claims, **characterised in that** the cross wires (18) are spaced apart by a third predetermined distance (D3).
7. A prefabricated module according to any one of the previous claims, **characterised in that** the lengthwise wires (21-1/2, 22-1/2, 23-1/2) of the plane nettings (16) are spaced apart by one or more times a fourth predetermined distance (D4).
8. A prefabricated module according to any one of the previous claims, **characterised in that** the module (10; 20) is parallelepiped shaped and that the wires (18, 21-1/2, 22-1/2, 23-1/2, 25) cross each other at substantially right angles.
9. A prefabricated module according to any one of the previous claims, **characterised in that** the module (10; 20) has a bent shape.



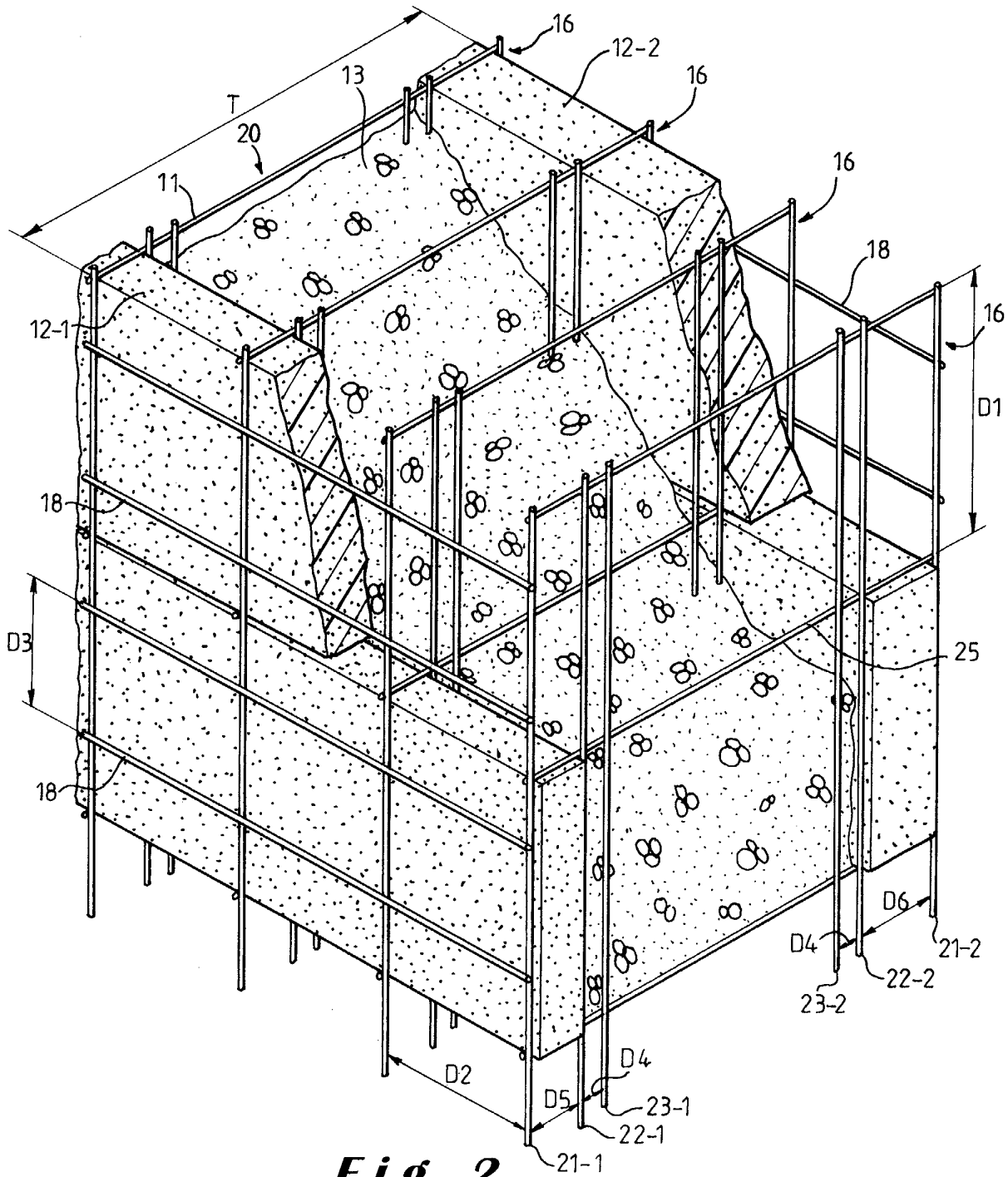


Fig. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 5395

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	US 2002/043045 A1 (MARINO DEL DIN MAURIZIO ATTILI) 18 April 2002 (2002-04-18) * the whole document *	1,4-8	E04B2/84
X	WO 94 19557 A (NTC SRL ; MARCHIORI SANDRO (IT)) 1 September 1994 (1994-09-01) * page 2, line 18 - page 4, line 144; figure 1 *	1,4-8	
X	GB 2 254 863 A (CAPOZZI MARIANO) 21 October 1992 (1992-10-21) * the whole document *	1,4-8	
X	FR 2 566 818 A (IMPRESA COSTRUZIONI CANDIRACCI) 3 January 1986 (1986-01-03) * the whole document *	1,4-8	
			TECHNICAL FIELDS SEARCHED (Int.CI.7)
			E04B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		16 July 2003	Fordham, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document 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			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 07 5395

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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16-07-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002043045 A1	18-04-2002	NONE	
WO 9419557 A	01-09-1994	IT PR930004 U1 WO 9419557 A1	26-08-1994 01-09-1994
GB 2254863 A	21-10-1992	AT 162872 T AU 1552092 A DE 69224288 D1 DE 69224288 T2 EP 0584093 A1 ES 2114935 T3 WO 9218718 A1	15-02-1998 17-11-1992 05-03-1998 24-09-1998 02-03-1994 16-06-1998 29-10-1992
FR 2566818 A	03-01-1986	DE 8518321 U1 ES 287749 U FR 2566818 A3	22-08-1985 01-01-1986 03-01-1986