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

(11) EP 1 624 128 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.02.2006 Bulletin 2006/06

(51) Int Cl.:
E04C 5/06 *(2006.01)* ***E04C 5/16*** *(2006.01)*
E04C 5/20 *(2006.01)*

(21) Application number: **04425595.8**

(22) Date of filing: **03.08.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(71) Applicant: **C.S.E. Centro Strutture Edili S.r.l.**
45030 Calto (Rovigo) (IT)

(72) Inventor: **Losi, Giuliano**
45030 Calto (Rovigo) (IT)

(74) Representative: **Gotra, Stefano**
BUGNION S.p.A.
Via Emilia Est 25
41100 Modena (IT)

(54) Metal reinforcement for worksite realisation of reinforced concrete constructions

(57) The reinforcement is especially suitable for on-site realisation of large-dimension vertical structures, such as walls of sheds, buildings in general, warehouses and so on. The reinforcement comprises two electrowelded mats (1, 2) exhibiting vertical rods (1a, 2a) and horizontal rods (1b, 2b), the mats (1, 2) connected one to another by connection bars (3) which enable a reciprocal translation of the mats (1, 2) on parallel planes. The connection bars (3) are structural elements of the reinforcement and each comprises two end grommets (3a, 3b) which are wound, with a slight degree of play, on either mat (1, 2) on reciprocal horizontal rods (1b, 2b) thereof. With a single raising motion by means of a crane, the connection bars (3) enable the mats (1, 2) to be contemporaneously positioned at a correct reciprocal distance. Stop elements (4) are included to keep the connection bars (3) in a correct position and to obtain a predetermined reinforcement-outside concrete surface distance, as in a projected design for a finished wall.

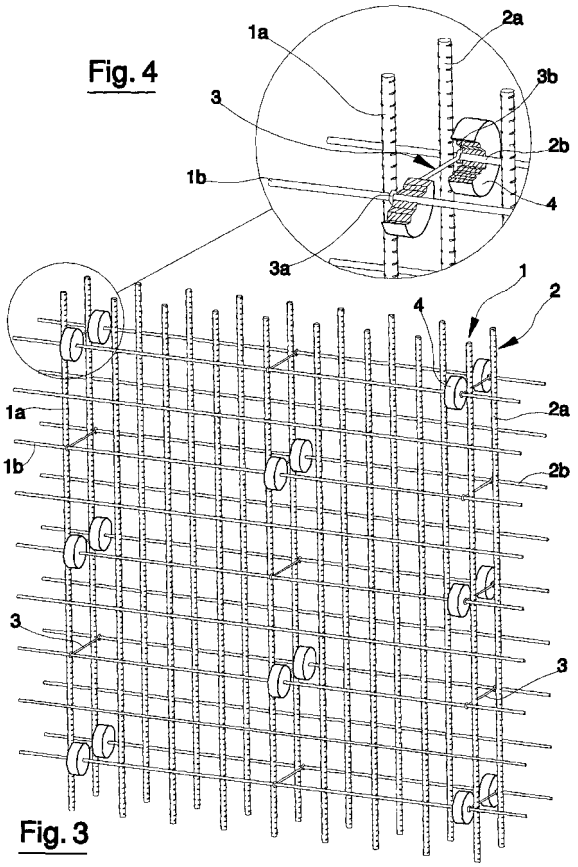

Fig. 3

Fig. 4

EP 1 624 128 A1

Description

[0001] Reference is made in particular to metal reinforcements for worksite realisation of large-size vertical structures, such as walls for large sheds, buildings in general, warehouse structures and the like.

[0002] As is known, vertical structures made of reinforced concrete, such as for example walls, require longitudinal and transversal metal reinforcements, to be arranged on both parallel faces, and to be connected by link elements.

[0003] The metal used in these reinforcement structures are of diameter, shape and position which are the fruit of precise structural calculations.

[0004] In the prior art reinforcements for vertical structures in general were made at the worksite following one of two methods: connecting up the single rods already in position, ready for the drop on both faces, with a subsequent positioning of special spacers, after which the forming caissons are positioned; or positioning the reinforcements and positioning them ready for the drop, positioning the spacers and mounting the forms.

[0005] Naturally for both methods connection elements were necessary between the two mats arranged on parallel faces.

[0006] From the description it is clear than both methods require a considerable amount of man-hours of work, with much activity and an increased risk to safety in the workplace, as well as a not-always-guaranteed quality of the final product.

[0007] Recently use has been made of electro-welded mats, which for the structures as above-mentioned are usually flat panels, constituted by longitudinal and transversal rods of a desired diameter, deriving from calculations made, which constitute the reinforcements to be arranged on either face of the vertical element.

[0008] These mats, transported to the worksite, are as single panels which have to be connected by special transversal "hook or pin" systems in order to complete the full reinforcement structure. The correct distance of the mats must be respected, as in the original design, so that they are positioned on either side of the structure; the correct number of spacers must also be fitted to guarantee the correct finished reinforced concrete structure dimension.

[0009] The connection operation of the electrowelded mats with the hooks and pins is done at the worksite, only after having positioned and blocked the electrowelded mat panels one by one. While the transport of the electrowelded mats is easily done, as they are flat structures, the transport of a complete reinforcement would be considerably difficult, as it is a spatial structure having dimensions which are about the same as those of the wall which is to be built, and therefore has a volume, mostly filled by space, which is extremely large. The connecting-up operation of the electrowelded panels with hooks and pins is in any case long and complex; and there is the risk of not respecting the number of connections as required by the statistical calculations.

[0010] The main aim of the present invention is to obviate the above-indicated drawbacks by providing a metal reinforcement which is easily transportable and at the same time is immediately usable in the worksite, with a smaller need of man-hours, but with greater static and operative safety levels.

[0011] A considerable advantage of the invention is that it enables an immediate and correct positioning of the reinforcement, which by a single crane operation is arranged with both faces correctly positioned at the correct distance and which provides a correct measure of the concrete cover breadth for application of the forms.

[0012] A further advantage of the invention is that it provides a metal reinforcement which complete structure is exactly as defined in the structural calculations, especially as regards the connection elements.

[0013] These aims and advantages and more besides are all achieved by the invention, as it is characterised in the claims that follow.

[0014] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of the invention, illustrated purely by way of a non-limiting example in the accompanying figures of the drawings, in which:

figure 1 is a view in section, according to a line which is perpendicular to the faces of the vertical structure, of the reinforcement in a closed position, for transport;
figure 2 is a view in section, according to a line which is perpendicular to the faces of the vertical structure, of the reinforcement in an open use configuration;
figure 3 is an axonometric view of the reinforcement in an open configuration; figure 4 is a detail of figure 3 in enlarged scale.

[0015] The metal reinforcement of the invention is used in the work-site realisation of walls in reinforced concrete, in particular for large-dimension vertical structures, such as walls of large sheds, buildings in general, warehouses and the like.

[0016] The reinforcement of the invention comprises two flat panels of electrowelded mats 1 and 2, which constitute the reinforcement of both faces of the unit, i.e. the lateral walls of the reinforcement, which are made of vertical rods, respectively 1a and 2a, and horizontal rods, respectively 1b and 2b, which are normally made using steel rod elements. The number and diameter of the vertical and horizontal rods are determined using structural calculations relating directly to the unit under construction. Electrowelded units are referred to in the present description as this technology offers greater guarantees with respect to mats built of vertical and horizontal rods connected by mechanical ties; obviously however, nothing would change if mat elements of this type were to be used.

[0017] It is also worth mentioning that the following de-

scription is valid in reference also to single reinforcements, i.e. a module formed by two panels, and also to reinforcements destined to be connected up to one another by overlapping, to realise larger-size structures requiring more than one module.

[0018] Because of transport problems the maximum sizes of the reinforcements and electrowelded panels are limited in length and height (generally being also flat for this type of use).

[0019] The reinforcement of the invention comprises connection bars 3 between the mats 1 and 2 which are conformed and arranged so as to enable, apart from a solid connection between the mats 1 and 2, a reciprocal translation between the mats which is achieved by maintaining the mats themselves on parallel planes even when the mats are being neared and distanced one from another.

[0020] In particular, reciprocal translation afforded by the connection bars 3 to the mats 1 and 2 is about equal to the breadth of the designed opened cage of the reinforcement when in use.

[0021] As will be better described herein below, thanks to the movement allowed by the conformation of the connection bars 3, the mats 1 and 2 can be translated from one position, suitable for transport, in which the mats 1 and 2 rest one upon another, into a use position, in which the mats 1 and 2 are arranged at a reciprocal distance as required by the design specifications. The connection bars 3 each comprise a metal rod which is provided with two end grommets 3a and 3b which are placed, with a small amount of play, one on a horizontal rod of one of the mats and the other on the corresponding horizontal rod of the other mat. The connection bars 3, which are structural elements of the reinforcement, are realized using steel bars; the diameter of the section of the bars, the number thereof and the length thereof depend on the structural calculations made for the reinforcement element to be built. The manufacture of the connection bars 3 and the connection thereof to the metal mats 1 and 2 is extremely simple as the grommets 3a and 3b are in fact ends of the metal bar used to make the rods, which ends are bent around the horizontal rods of the mat to which the grommets 3a and 3b are to be connected.

[0022] A plurality of stop elements 4 are also comprised, each of which is fixed to a rod of a mat in proximity of a grommet 3a and 3b of the connection rod 3 in order to prevent any sliding of the grommets 3a and 3b in an axial direction to the rod of the mat to which the grommets 3a and 3b are connected. In particular, the stop elements 4 are connected in proximity of the relative grommet so as to fix the grommet against a vertical bar crossing a horizontal bar of the mat 1 and 2 on which the grommet is fixed. The crossing point, then, is also a stop element preventing translation of the connection bar 3 in one direction, and thus only one other element, stopping translation in the other direction, is necessary. The connection bars 3, which are, as has been mentioned, a structural part of the reinforcement element, are constantly kept in the correct position.

[0023] The connection bars 3 are also arranged so that when they are in a perpendicular position to the mats 1 and 2, which is the position of maximum distance between the mats, the lower edges 1c and 2c of the mats 1 and 2 are on a same perpendicular plane as the mats 1 and 2. In other words, the connection bars 3 are arranged so that when the whole reinforcement cage is formed, the lower edges 1c and 2c of the mats 1 and 2 constitute a flat rest base for the reinforcement as a whole.

[0024] At least some of the stop elements 4 project externally of the reinforcement with respect to the plane defined by the mat to which the stop elements 4 are connected. The distance of this projection of the stop elements 4 is the same as the distance which is desired between the reinforcement and the walls of a containment structure, not illustrated, which is destined to contain the drop of concrete. In this way the reinforcement already defines the exact distance between the rods of the reinforcement and the containment structure, i.e. the exact breadth of the concrete which will cover the rods of the metal reinforcement.

[0025] The normally-circular-section conformation of the connection bars 3, the grommets of which can rotate on the horizontal rods 1b and 2b, render the reinforcement a hinged structure, in which the lateral walls (mats 1 and 2) can translate, either towards or away from one another, while remaining parallel to each other.

[0026] The reinforcement, which is made in special factories away from the worksite, can easily be transported to the site in the transport position, illustrated in figure 1, in which the mats are resting one on the other. In this position the volume of the reinforcement is extremely contained and is indeed practically the same as a single mat.

[0027] Once at the worksite, the reinforcement is raised, for example by a crane which, in figure 2, is schematically represented by a hook 5; during the raising the reinforcement automatically opens, with a movement of the mats in a vertical direction (the only direction allowed by the reinforcement structure) into the use position, illustrated in the figure 2, in which it assumes the shape required by the projected design of the reinforcement. In this position the reinforcement is rested on the foundation of the projected wall and is clad in the form very rapidly and precisely thanks to the projection of the stop elements which guarantee the required reinforcement-external concrete surface thickness. The concrete drop can then be performed with having to perform any operation on the reinforcement, which is in effect ready to use, being structured exactly as projected by calculations. During the drop operations the reinforcement cannot move in any way as horizontal movements are prevented, as are downwards movements due to the fact the reinforcement is resting on the foundations (obviously the reinforcement is unable to move in an upwards direction).

Claims

1. A metal reinforcement for worksite realisation of reinforced concrete constructions, comprising two electrowelded mats (1, 2) provided with vertical rods (1a, 2a) and horizontal rods (1b, 2b) which define the reinforcement on both faces thereof, **characterised in that** it comprises connection bars (3) for connecting the mats (1, 2) which connection bars (3) are conformed and arranged in such a way as to enable a translation between the mats (1, 2) which occurs on parallel planes and in a reciprocal nearing and a distancing direction of the mats (1, 2).

2. The reinforcement of claim 1, **characterised in that** the connection bars (3) are structural elements of the reinforcement and each comprises a bar exhibiting at each end thereof a grommet (3 a, 3b) wound with a small degree of play about a horizontal rod (1b, 2b) of either mat (1, 2).

3. The reinforcement of claim 2, **characterised in that** it comprises a plurality of stop elements (4), each of which is fixed to a rod of a mat (1, 2) in proximity of a grommet (3a, 3b), which plurality of stop elements (4) prevents sliding of the grommets (3a, 3b) in an axial direction of the horizontal rods (1b, 2b) to which the grommets (3a, 3b) are connected.

4. The reinforcement of claim 3, **characterised in that** the stop elements (4) are connected in proximity of the grommets (3 a, 3b) in order to fix the grommets (3a, 3b) against points where the horizontal rods (1b, 2b) cross with the vertical rods (1a, 2a).

5. The reinforcement of claim 3, **characterised in that** at least some of the stop elements (4) project externally from the reinforcements with respect to the mats (1,2) to which they are connected, by a distance which is equal to a thickness with which concrete is to cover the reinforcement, being a desired distance between the reinforcement and a wall surface of a containment structure destined to contain the concrete during a forming operation.

6. The reinforcement of claim 1, **characterised in that** a length of the connection bars (3) is such as to enable a maximum translation of the mats (1, 2) by an amount equal to a desired full open width of the reinforcement.

7. The reinforcement of claim 6, **characterised in that** when the connection bars (3) are in a perpendicular position to the mats (1, 2), the lower edges (1c, 2c) of the mats (1, 2) are on a same perpendicular plane, perpendicular to the mats (1, 2).

Fig. 1

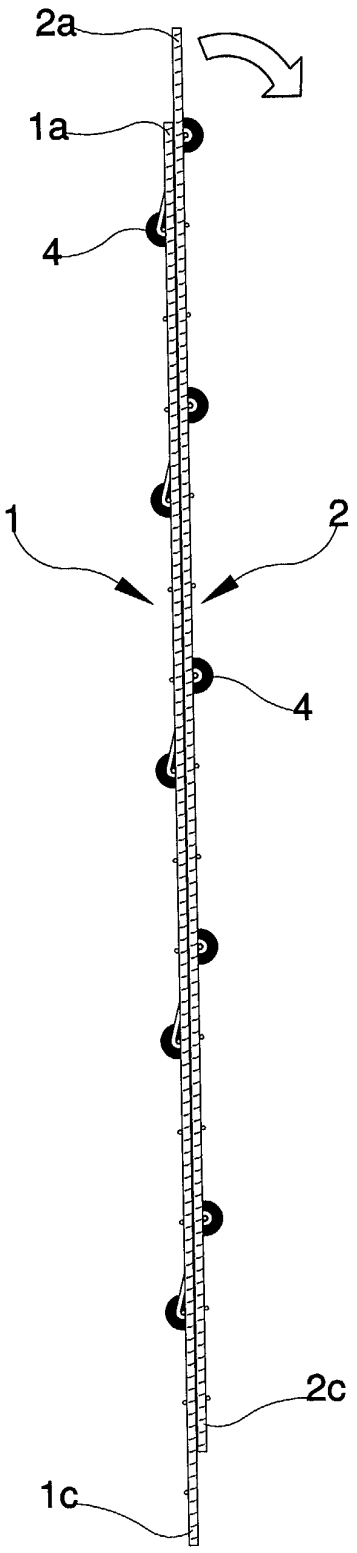

Fig. 2

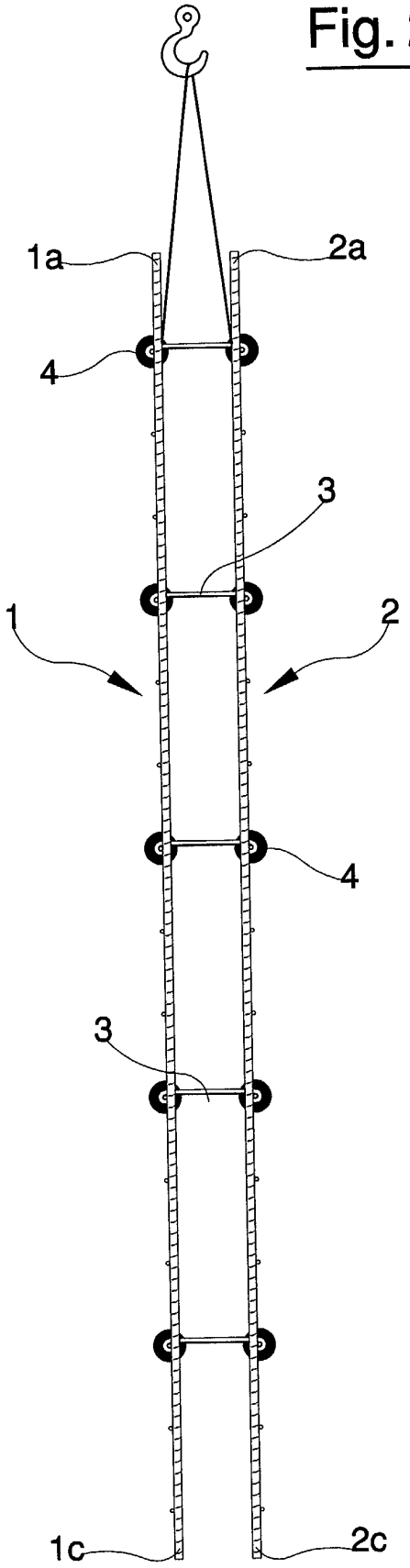

Fig. 4

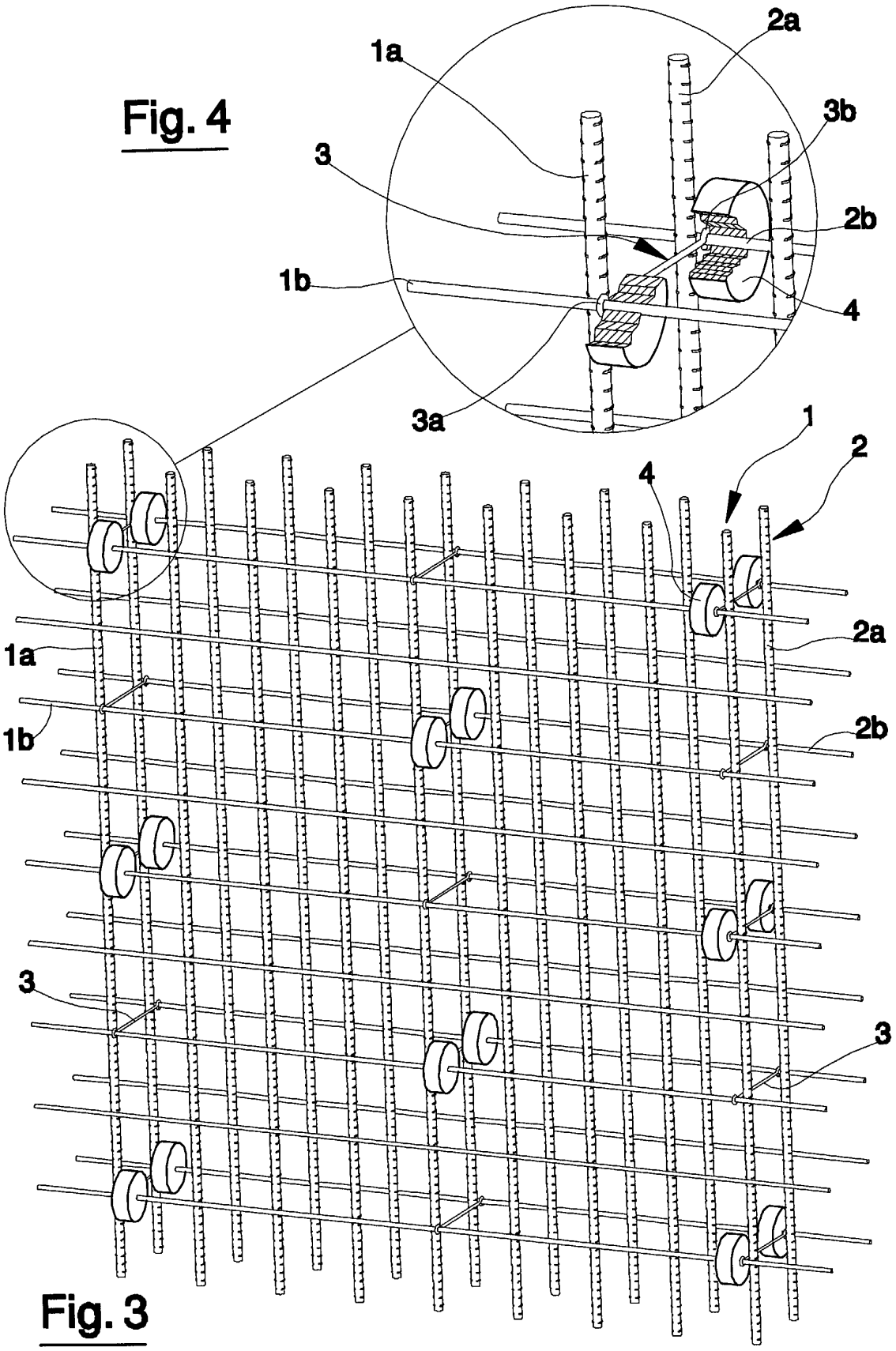

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5595

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.7)
X	GB 212 328 A (MAJOR & COMPANY LTD; WALTER SANGWIN) 13 March 1924 (1924-03-13) * page 3, last line - page 4, line 39; figures 6,7 * * page 4, line 102 - line 129 *	1-4,6,7	E04C5/06 E04C5/16 E04C5/20
X	GB 184 050 A (HORACE JOHN NOWLAN) 10 August 1922 (1922-08-10) * page 2, line 32 - line 51; claim 2; figure 4 *	1,6,7	
X A	US 6 691 486 B1 (DURAND PHILIPPE) 17 February 2004 (2004-02-17) * column 2, last paragraph; figures 3,6 *	1,6,7 2,3	
A	US 4 999 965 A (SCHMIDGALL JON A ET AL) 19 March 1991 (1991-03-19) * abstract; figures *	1,2,5	
A	DE 23 42 979 A (MERRETTIG PAUL) 13 March 1975 (1975-03-13) * figure 2 *	5	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 4 989 388 A (METZGER GALEN G ET AL) 5 February 1991 (1991-02-05) * abstract; figures *	5	E04C E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 December 2004	Demeester, J

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 04 42 5595

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-12-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 212328 A	13-03-1924	NONE	
GB 184050 A	10-08-1922	NONE	
US 6691486 B1	17-02-2004	FR 2800112 A1	27-04-2001
		AT 265590 T	15-05-2004
		AU 1031901 A	30-04-2001
		CA 2387977 A1	26-04-2001
		CN 1382241 T	27-11-2002
		DE 60010306 D1	03-06-2004
		EP 1222344 A1	17-07-2002
		WO 0129346 A1	26-04-2001
		JP 2003512547 T	02-04-2003
		MA 25504 A1	01-07-2002
		MX PA02004018 A	25-09-2003
		PL 354517 A1	26-01-2004
US 4999965 A	19-03-1991	CA 2035430 A1	19-10-1991
DE 2342979 A	13-03-1975	DE 2342979 A1	13-03-1975
US 4989388 A	05-02-1991	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82