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(54) **System of modular elements for making raised and/or aerated reinforced concrete floor**

(57) The invention is a new system of combined modular elements comprising a flat top modular element, a base or bottom modular element and a column-shaped element. The base or bottom modular element is composed of a flat form, in the shape of a star with two or more arms, having at least one seat for the column element. The ends of the arms are provided with suitable fastenings for connection to adjacent identical base elements. The column-shaped elements are composed of common straight tubular elements. The top flat

modular elements comprise a top part, generically square and substantially flat, and four supports located in the corners of said top part. The bottom ends of the support corners of the top flat modular elements, corresponding to a right angle, are shaped in such a way as to be housed and to fit onto the top edge of the column element. Said bottom ends are provided with fastening elements for connection to the corresponding bottom ends of the support corners of the adjacent top flat modular elements inserted on the same column-shaped element.

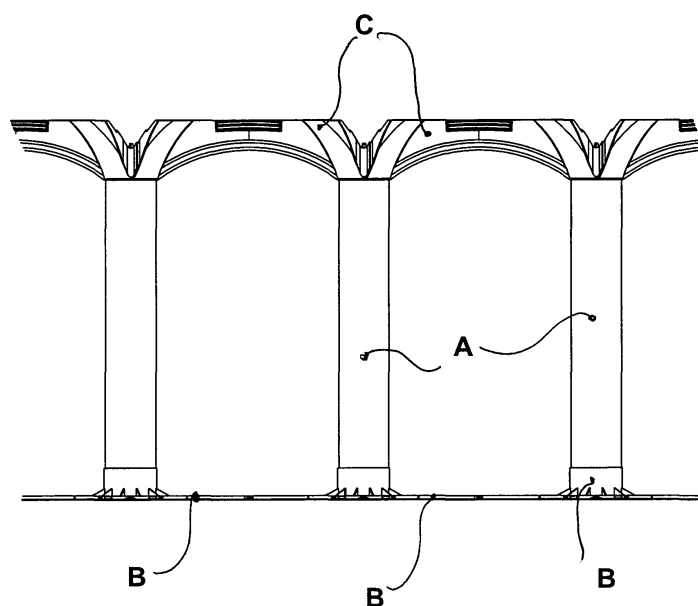


Fig. 5

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Description

[0001] The present patent concerns elements for making raised and/or aerated floors and in particular it concerns modular elements for making raised and/or aerated floors on columns.

[0002] Pre-formed monolithic elements or disposable formworks for making aerated and/or raised floors are known.

[0003] These monolithic plastic elements are generally dome-shaped with four legs and are set next to one another and connected to form a continuous structure with a square mesh. Iron reinforcing rods are laid on this structure (such as the electrically-welded mesh or ribbed bars) and then the concrete is cast. A monolithic floor is thus obtained, aerated at the bottom, the lower aeration cavity of which may be used for laying pipes, conduits and cables.

[0004] Said monolithic modular elements for making raised and/or aerated floors allow raised and/or aerated floors to be carried out with a modest height above the laying level.

[0005] To make raised and/or aerated floors with greater heights above the laying level, flat modular elements are currently used, the corners of which rest on generically cylindrical or column-shaped elements.

[0006] The corner edge of these flat modular elements is shaped in such a way as to allow stable fastening to the column-shaped elements.

[0007] The cylindrical or column-shaped elements have the upper end with a specific shape to allow fastening to the flat modular elements. In particular, the upper edge of said cylindrical or column-shaped elements is enlarged to form a sort of cup, so as to hold the fastening edge of the flat modular elements.

[0008] The same flat modular element is also used as a base on which to rest the cylindrical or column-shaped elements, so as to prevent the bottom end of the cylindrical elements themselves from shifting laterally during the application phase and also so as to space said bottom ends of said cylindrical elements correctly, guaranteeing the perfect vertical positioning of the columns.

[0009] This system, comprising both flat modular elements and cylindrical elements for making raised and/or aerated floors, presents various drawbacks.

[0010] The construction of the column-shaped elements as described above is expensive, because special moulds must be prepared for making the cup-shaped end.

[0011] The use of the flat modular elements as base elements for spacing the bottom ends of the column-shaped elements and holding them in the correct position involves a lot of wastage. In fact, the whole particular structure of the flat modular elements is completely useless when they are utilised as simple spacing elements.

[0012] To overcome all the above mentioned drawbacks, a new system of modular elements has been de-

signed and implemented for making aerated concrete floors raised above the laying level.

[0013] The aim of the new modular elements is to decrease the construction costs of the elements themselves and to decrease the cost of installation of raised and/or aerated floors.

[0014] Another aim of the new modular elements is to simplify and reduce the production costs of the cylindrical or column elements.

[0015] These and other aims, both direct and complementary, are achieved by the new system of combined modular elements comprising a flat top modular element, a base or bottom modular element and a column-shaped element.

[0016] The base or bottom modular element is composed of a flat form, in the shape of a star with two or more arms, having at least one seat, for the column element. The ends of the arms are provided with suitable fastenings for connection to adjacent identical base elements.

[0017] The column elements are composed of common straight tubular elements with a constant diameter, suited to be housed in said seat in the base element and to be connected with the top modular elements.

[0018] The top flat modular elements comprise a top part, generally square and substantially flat, and four supports located in the corners of said top part.

[0019] In particular the flat top part is provided with shaped arched edges so as to mate with the corresponding shaped arched edges of adjacent flat modular elements and to connect them with one another.

[0020] The bottom ends of the support corners of the top flat modular elements, corresponding to a right angle, are shaped such as to be housed and to fit onto the top edge of the column element. Said bottom ends are provided with fastening elements for connection to the corresponding bottom ends of the support corners of the adjacent top flat modular elements inserted on the same column-shaped element.

[0021] The characteristics of the new modular elements of the new system for making raised and/or aerated reinforced concrete floors will be explained in greater detail in the following description with reference to the drawings, enclosed purely as examples without limitation.

[0022] Figures 1a and 1b are two orthogonal views of a top flat modular element (C) comprising a substantially flat top part (C1) and four supports (C2) located on the corners of the top part (C1).

[0023] The substantially flat top part (C1) is substantially square.

[0024] The supports (C2) of the flat modular element (C) are in the shape of a quadrant, with the convex part facing towards the centre of the flat modular element (C) so as to be housed and fit onto the top edge of the column element (A) so that, when four flat modular elements (C) rest on the same column element (A), their adjacent corner supports (C2) form a general circular

ring.

[0025] At the ends of the quadrant-shaped wall of the supports (C2) there are further radial walls (C2a) facing towards the centre of the arched shape of the support (C2) so as to keep in a circular position the supports (C2) of the flat top modular elements (C) resting on the same column-shaped element (A).

[0026] The side edges (C1a) of the flat top part (C1) have an arched shape.

[0027] In particular, said arched edges (C1a) of the top part (C1) are shaped, like diametrically opposed male and female elements, in such a way as to mate with the corresponding arched edges (C1a) of adjacent flat modular elements (C) and to connect them together.

[0028] Said bottom ends (C2) are also provided with male and female fastening or connecting elements (C2b) for connection to corresponding fastening or connecting elements (C2b) of identical flat modular elements (C) of the same column element (A).

[0029] Figures 2a, 2b, 2c show three examples of fastening or connecting elements (C2b), while figures 2d, 2e, 2f and 2g show the details of the coupling between the fastening or connecting elements (C2b) of two flat modular elements (C).

[0030] Figure 3 shows a column-shaped element (A), composed of a classic tube, preferably made of plastic, with a constant diameter and suited to be housed in the seat (B2) of the base element (B) and to be connected with the flat modular elements (C).

[0031] Figure 4 is an axonometric view of a modular base element (B) composed of a flat form having four arms (B1) arranged radially for connection to similar adjacent elements.

[0032] Figure 5 shows the elements (A), (B), (C), which have been assembled.

[0033] At the centre of the modular base element (B), that is, at the centre of the four arms (B1), there is a seat (B2) for housing the column-shaped element (A). the same module both for the base elements (B) and for the top flat modular elements (C).

[0034] At the end of each arm (B1) there are fastening elements (B1a) for connection to corresponding fastening elements (B1a) of identical adjacent base elements (B).

[0035] It is possible to arrange for the arms (B1) of the base element (B) to be provided with ribs (B1b) so as to increase their rigidity, and/or with lightening elements (B1c) so as to decrease the quantity of plastic material needed to produce them.

[0036] Figures 4a and 4b show respectively a base element (B) with asymmetric arms (B1), which makes it easier to store and lay said adjacent base elements (B).

[0037] The new modular elements for making raised and/or aerated floors composed as described above offer notable advantages.

[0038] As the modular base elements (B) do not perform load-bearing functions, they require a reduced quantity of plastic material.

[0039] Each modular base element (B) anchors one or more column elements (A), with no need to join or lay other modular base elements (B).

[0040] The column-shaped elements (A) are easy, fast and economic to produce, and they do not need any kind of mould as they may be obtained through the simple extrusion of plastic material in lengths of a few metres and then cut into portions/pieces of the necessary length.

[0041] The bottom ends of the support corners (C2) of the flat modular elements (C) with a fixed joint (C2a) hold in position the various flat modular elements (C) fitted on the same modular column element (A).

[0042] The fastening or connecting elements (C2b) of the flat elements (C) allow the connection of the various flat elements (C) resting on the same column element (A), thus obtaining a top structure composed of elements connected to one another.

[0043] The assembly of the system described above is very rapid and precise.

[0044] In fact, the base elements (B) are laid on the support surface, correctly spaced from one another and coupled, the column elements (A), which are at an exact modular distance and in a stable, vertical position, are inserted in the seats (B2), and lastly the top modular elements (C) are placed on top of them.

[0045] The following claims are therefore expressed with reference to the above description and to the enclosed drawings.

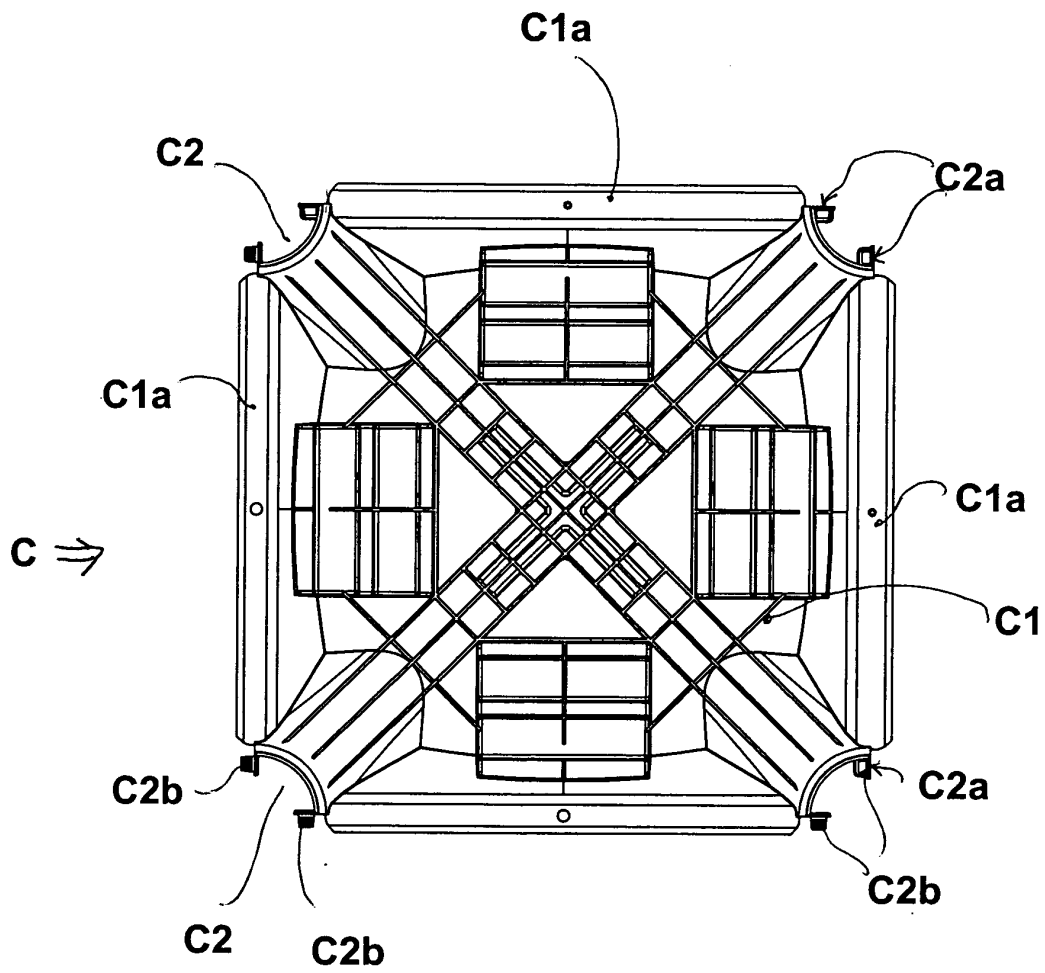
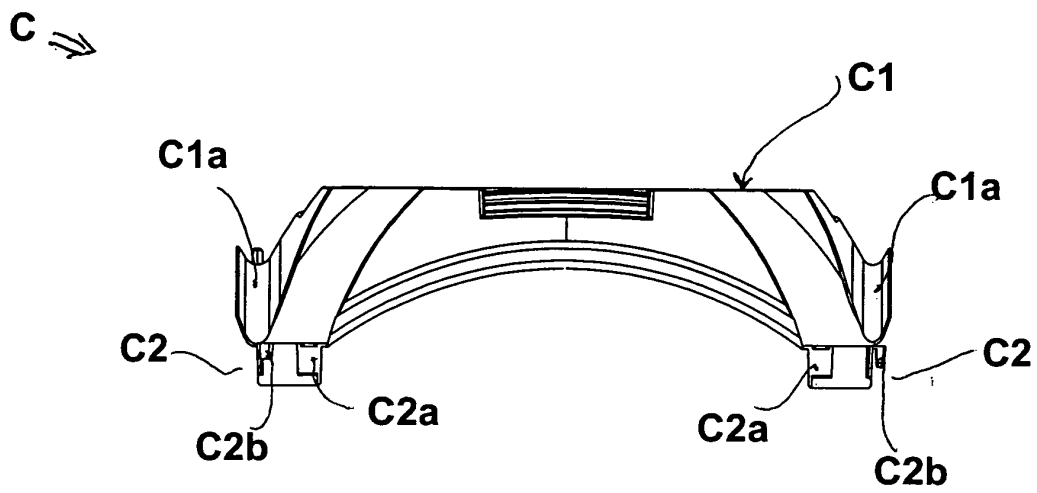
Claims

1. System of modular elements for making raised and/or aerated floors, **characterised in that** it comprises:

- at least one base element (B) composed of a flat and/or ribbed form with one or more seats (B2) for housing the column-shaped element (A), and provided at the edges with elements (B1a) for connection to corresponding adjacent base elements (B),
- at least one column-shaped element (A) composed of a tubular element suited to be housed in said seats (B2) in the base element (B) and to be connected with the flat top modular elements (C),
- at least one top modular element (C) composed of a substantially flat top part (C1) and of four supports (C2), located in the corners of the top part (C1) and which may be fitted on the top edge of the column elements (A), the flat top part (C1) having arch shaped side edges (C1a), as diametrically opposed male and female elements, so as to mate with the corresponding arched edges (C1a) of adjacent top modular elements (C).

2. System of modular elements according to claim 1, **characterised in that** the base element comprises two or more arms (B1) having the connecting elements (B1a) at their ends. 5
3. System of modular elements for making raised and/or aerated floors according to claims 1, 2, **characterised in that** the useful distance between the ends of said arms (B1) is such as to obtain the same module both for the base elements (B) and for the top modular elements (C). 10
4. System of modular elements for making raised and/or aerated floors according to claims 1, 2, 3, **characterised in that** the column-shaped element (A) has a constant diameter for its whole length. 15
5. System of modular elements for making raised and/or aerated floors according to claims 1, 2, 3, 4, **characterised in that** the side edges (C1a) of the flat top part (C1) of the top modular element (C) have an arched shape. 20
6. System of modular elements for making raised and/or aerated floors according to claims 1, 2, 3, 4, 5, **characterised in that** the bottom ends of the support corners (C2) of the top modular elements (C) have walls in the shape of a quadrant, so that the support corners (C2) of four top modular elements (C) fitted on the same column element (A) form a round angle and cooperate in the reciprocal correct positioning. 25 30
7. System of modular elements for making raised and/or aerated floors according to claims 1, 2, 3, 4, 5, 6, **characterised in that** the ends of the bottom quadrant-shaped walls of the support corners (C2) of the top flat modular elements (C) are provided with further radial walls (C2a), facing towards the centre of the arched form of the support (C2), suited to fit next to identical radial walls (C2a) of the supports (C2) of the top modular elements (C) resting on the same column-shaped element (A). 35 40
8. Modular elements for making raised and/or aerated floors according to claims 1, 2, 3, 4, 5, 6, 7, **characterised in that** the support corners (C2) of the top modular elements (C) are provided with male and female fastening elements (C2b) for connection to corresponding fastening or connecting elements (C2b2) of identical flat modular elements (C) resting on the same column-shaped element (A). 45 50

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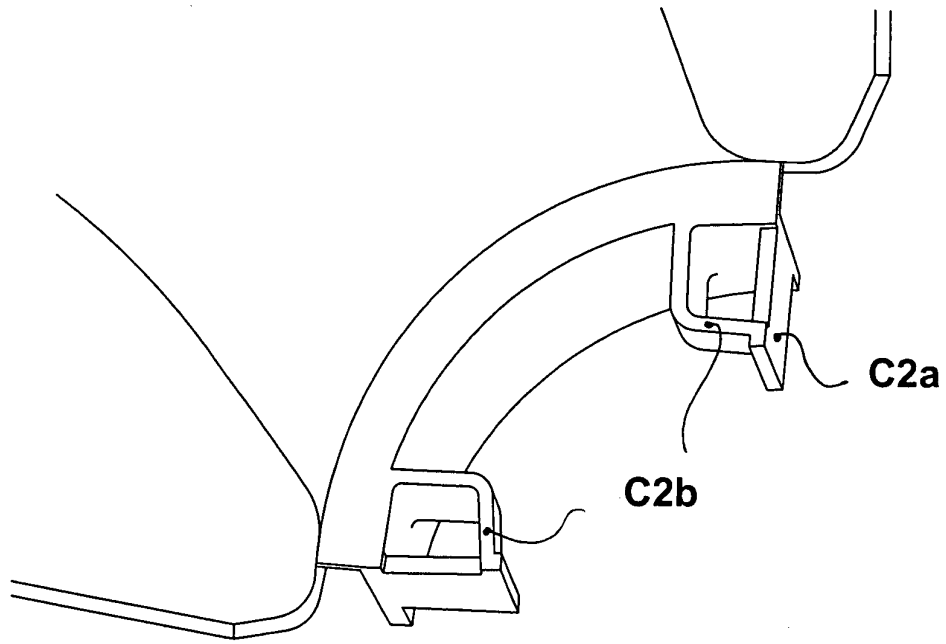


Fig. 2a

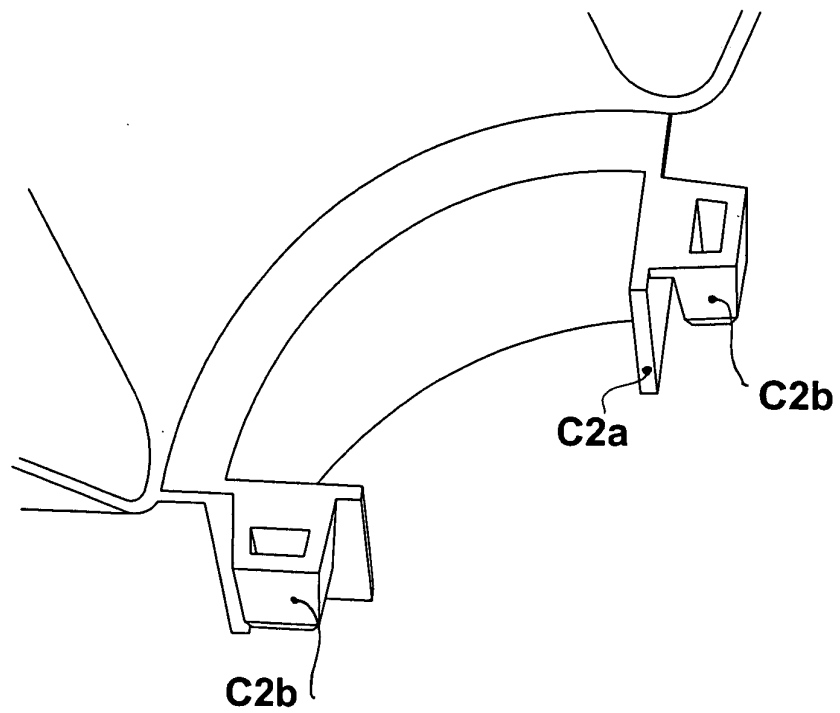


Fig.2b

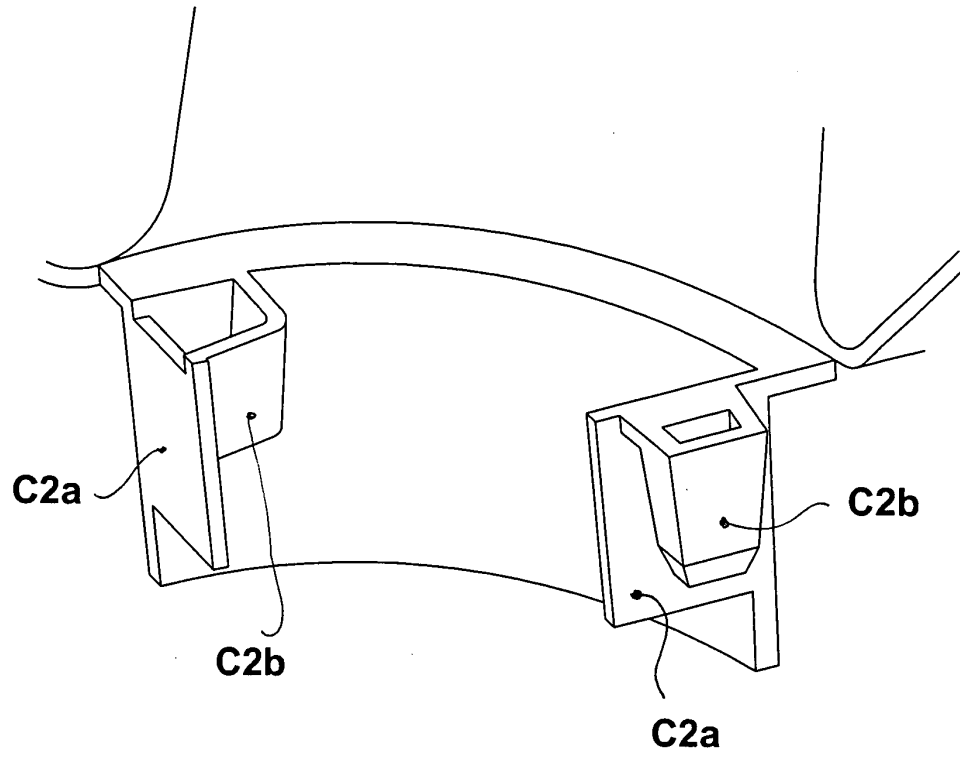


Fig. 2c

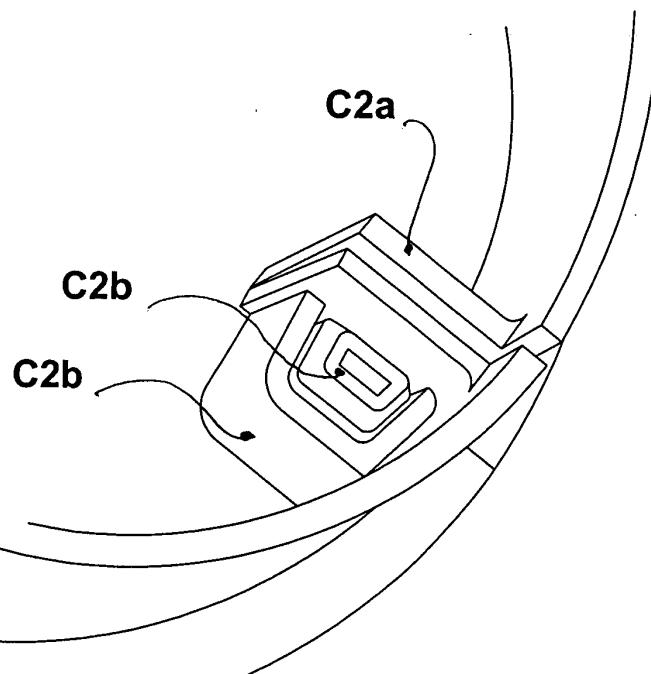


Fig. 2d

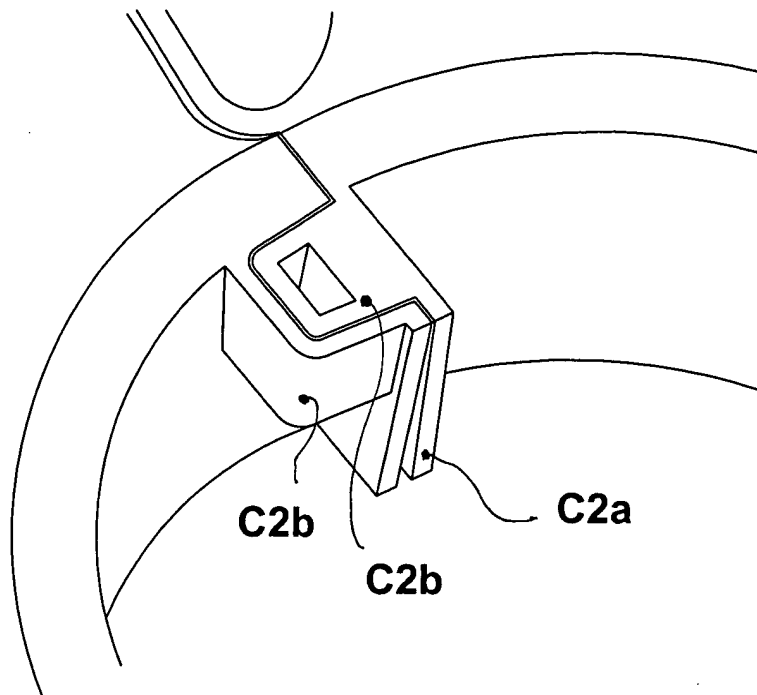


Fig. 2e

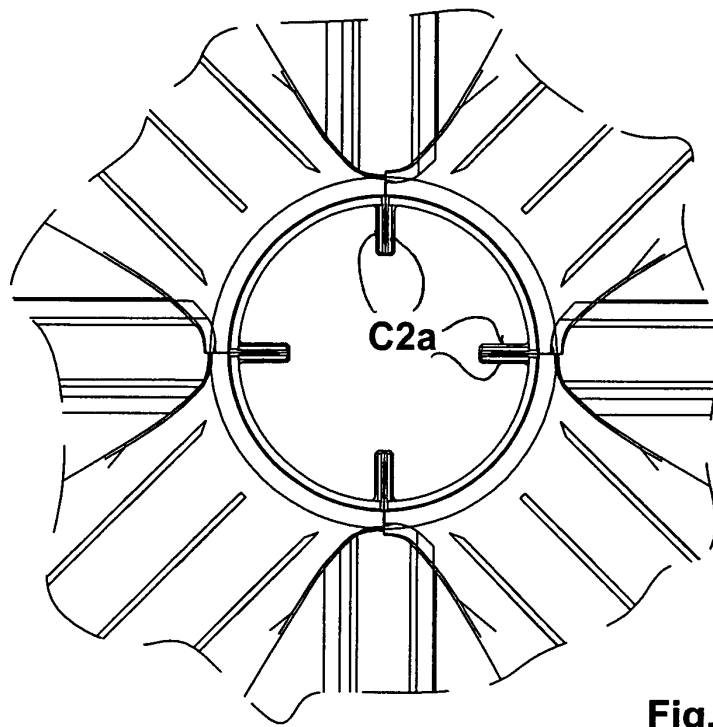


Fig. 2f

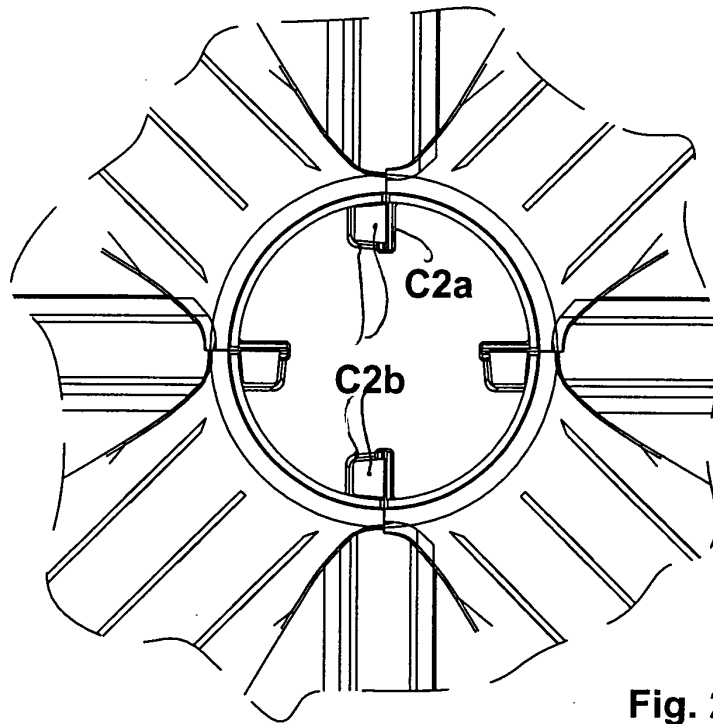
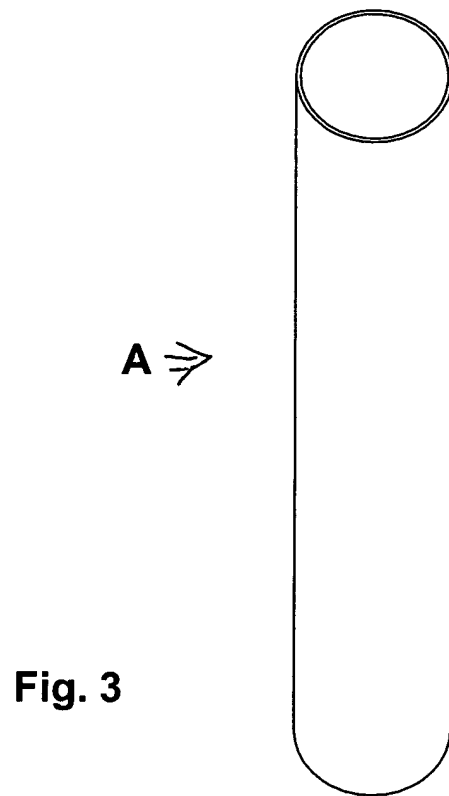


Fig. 2g



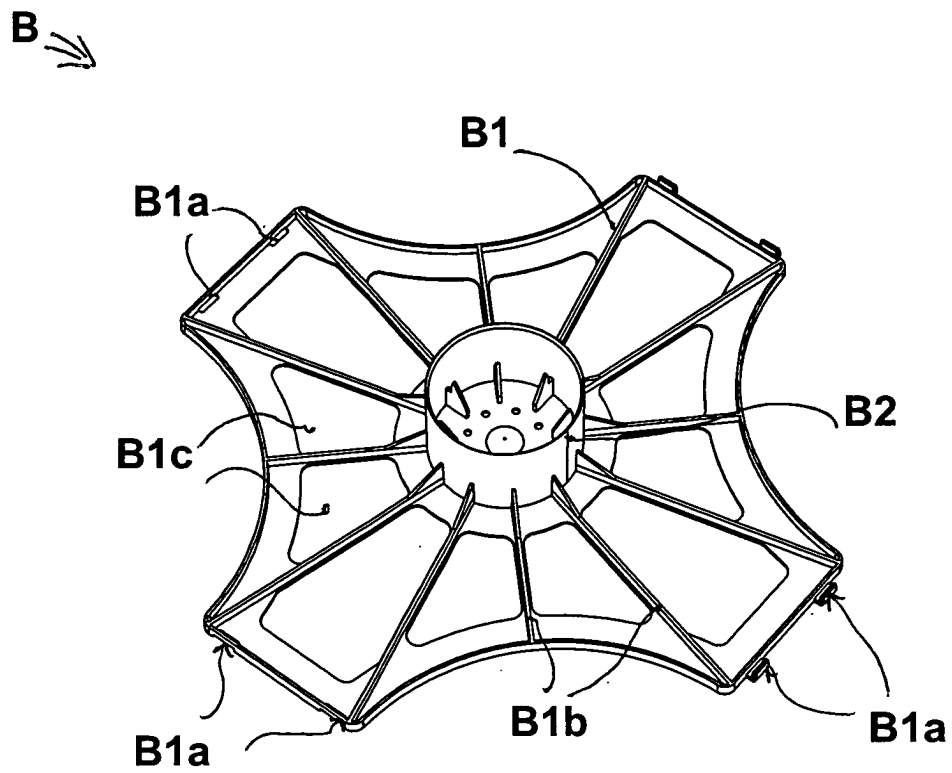


Fig. 4

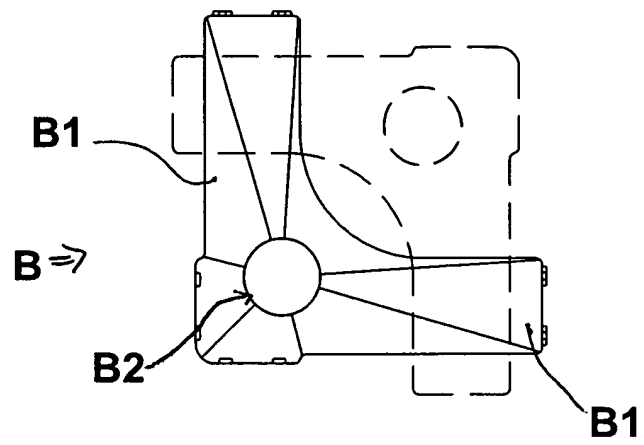


Fig. 4a

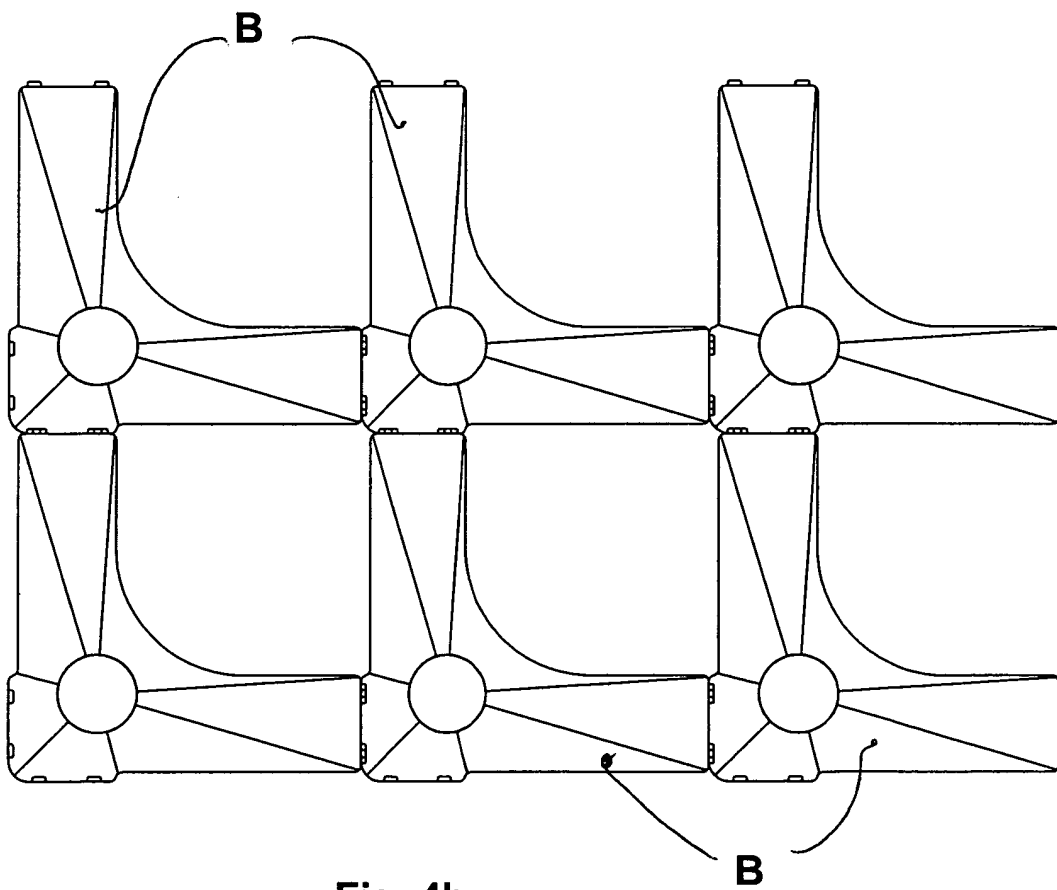


Fig. 4b

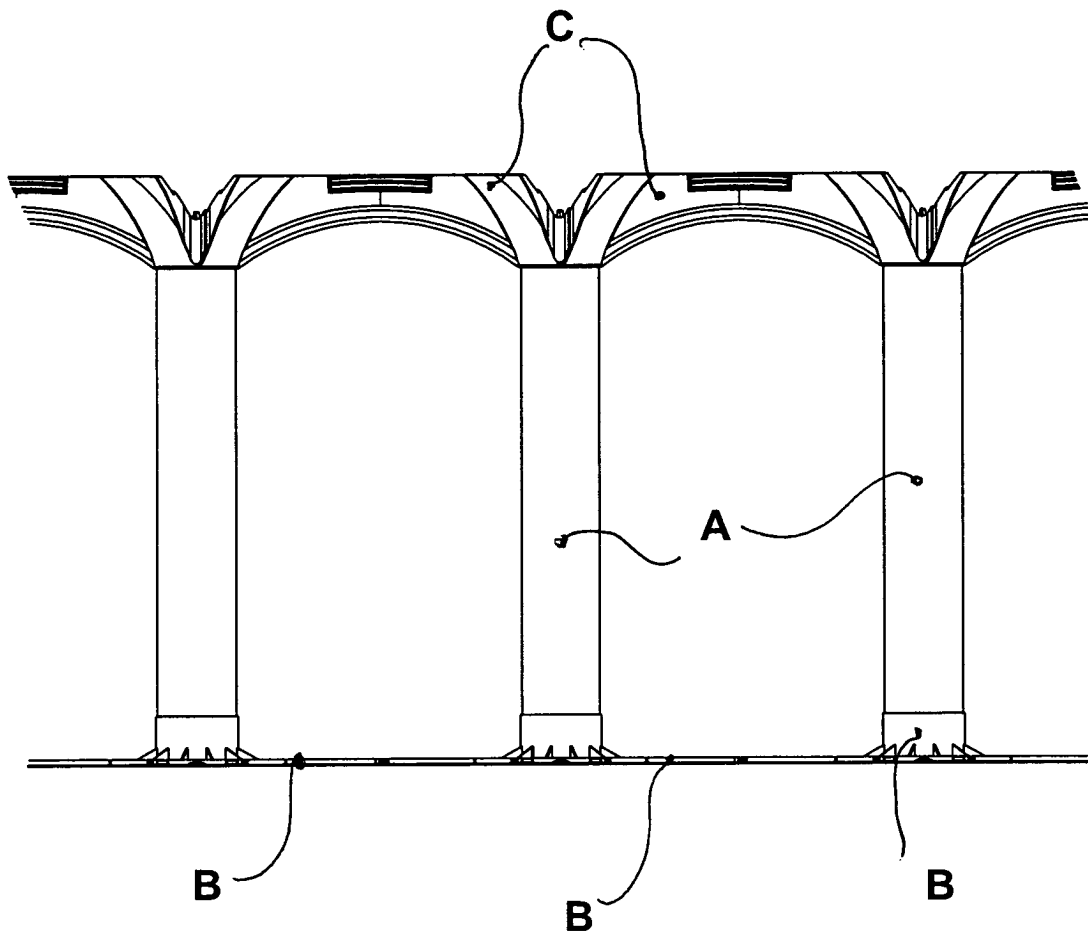


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5299

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	* paragraph [0013]; figures * -----	2-4,7,8	
A	EP 0 803 618 A (V. PONTAROLO) 29 October 1997 (1997-10-29) * abstract; figures * -----	1	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 September 2005	Examiner Righetti, R
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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