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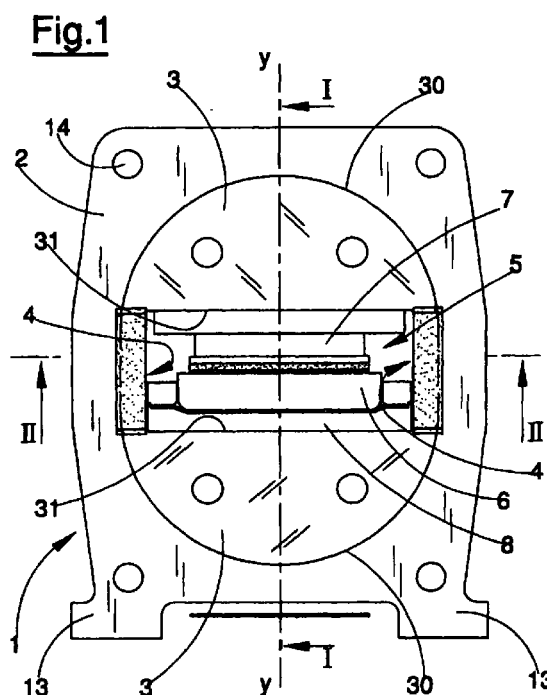
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(54) **A structure for presses, in particular for forming ceramic products**

(57) The invention relates to a structure for presses which comprises: a resistance structure constituted by at least one resistance element (1) which comprises an annular element (2) internally to which in opposite positions two segments (3) are housed. The segments (3) exhibit a first portion (30) of edge which is shaped to couple with a correspondingly-shaped portion of an internal edge of said annular element (2). The segments also exhibit a second portion (31) of edge which is opposite to the first portion (30). Spacers (4) are provided for maintaining said segments (3) at a predetermined distance one from another. A power tool (5) exerts a pressing action by compressing an object or powder material for pressing between two bodies, which power tool (5) is inserted between the facing second portion (31) of edges of said segments (3) in such a way as to transfer to said second portion (31) equal and opposite reactions resulting from said pressing action.



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Description

[0001] The invention relates to a structure for presses, in particular for forming ceramic products.

[0002] The field of application of the invention is very wide and certainly comprises all possible applications where a forming or plastic deformation is to take place by pressing with the force being applied in a preferably vertical direction.

[0003] Specifically though not exclusively the invention can be utilised in forming ceramic products, especially tiles.

[0004] The prior art teaches hydraulic presses for forming tiles which exhibit a structure connecting all the mobile and fixed parts. These presses are particularly rigid and have a typically closed frame shape, normally with two uprights with access to the work plane from two opposite sides.

[0005] Commonly these tile-forming presses exhibit a free space (as large as possible) between the two uprights or columns (which space constitutes the inlet mouth for the material to be formed). This space is dimensioned on the largest dimension of the rectangle to be pressed, which is the flat surface on which the pressing action is carried out, necessarily discontinuously and intermittently.

[0006] The fact of having a broad introduction face which corresponds to a decidedly smaller depth, is caused largely by the fact that the run of the usual powder material loading truck has to be kept to a minimum in order not to penalise production speed.

[0007] Owing to the considerable space between the two uprights or columns, in the prior art the resistance structure of the press develops in a perpendicular plane with respect to the direction of input of the material to be pressed. This structure is therefore rather wide and high, so much so as in some cases to require partial interment so as to give the structure sufficient stability.

[0008] The height of structures such as the one described above is substantially due to the technical/constructional characteristics, which require the use of a base and an upper crossbeam, connected by the uprights, which have to be very thick - vertically - to guarantee that the two planes absorbing the reactions deriving from the pressing force have a sufficient resistance to deformation.

[0009] These planes are in fact those on which the bottom and top die act.

[0010] For example, in hydraulic presses used in ceramic tile forming which can exert up to a 7000 tonne pressing force, and having a free space between the uprights which is in excess of 2 metres, the total height of the structure can reach above 7 metres, of which about a third is interred.

[0011] In order to guarantee adequate deformability characteristics to these structures, necessary so that they can adapt to any powder loading defects, various

technical solutions have been adopted, some of which are constructionally complex but which are not fully satisfactory.

[0012] The main aim of the present invention is to overcome these limitations in the prior art by providing a compact, light and structurally simple press.

[0013] A further aim of the invention is to realize a press which is structured according to a modular concept by virtue of which the maximum pressing force can be varied simply and without having to change the input mouth.

[0014] An advantage of the invention consists in the fact that a structure is provided which in comparison with other structures having a similar maximum compression potential is characterized by its considerable lightness and very contained mass.

[0015] A still further advantage of the invention is that it is generally speaking constructionally very simple and, more in particular, its modularity makes it very easy to assemble.

[0016] A yet further advantage of the invention is its compactness, both in terms of transportability and in terms of locatability in the plant of destination.

[0017] Another advantage is that the invention can be used in a ceramic tile production plant, for powder pressing, and more specifically it can be incorporated into a continuous forming line comprising a mobile transport plane for supporting both the material (powders) to be pressed and the formed material ready for pressing by crossing through a forming device (die) coupled to the invention.

[0018] These aims and advantages and more besides are all attained by the object of the invention, as it is characterised in the appended claims.

[0019] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of a non-limiting example in the accompanying figures of the drawings, in which:

figure 1 shows a schematic front view in vertical elevation;

figure 2 is the same schematic view as in figure 1, relating to a different operative configuration;

figure 3 is a schematic section made according to line I-I of figure 1, with some parts removed better to evidence others;

figure 4 is a schematic section made according to line II-II of figure 1, with some parts removed better to evidence others;

figure 5, in the same section as in figure 3, shows an application of the invention to a ceramic product forming line, especially with regard to ceramic tiles.

[0020] With reference to the above-mentioned figures, 1 denotes in its entirety a resistance element which comprises an annular element 2 internally of

which two segments 3 are located in diametrically opposite positions.

[0021] The entire element 1 exhibits a flat configuration in which the first two dimensions, width and height, are much greater than the third dimension, depth, which is constant.

[0022] In the plane identified by the first two dimensions, breadth and height, the configuration of the resistance element 1 is symmetrical with respect to two reciprocally perpendicular axes.

[0023] The internal profile of the annular element 2 is substantially constituted by two symmetrical arcs of circumference, reciprocally connected up, to which the first parts of shaped edges 30 of the two opposing segments 3 are coupled.

[0024] In the example, the first portions of the shaped edges 30 have convex profiles and are geometrically shaped such as to be contactingly couplable to the symmetrically opposite corresponding arc-shaped portions constituting part of the internal edge of the annular element 2.

[0025] Constructionally, the annular element 2 and the segments 3 are made from a single sheet of steel cut accordingly.

[0026] The segments 3 are half-moon shaped and exhibit a straight second portion of edge 31 which is opposite to the first portion 30.

[0027] In particular, the second portions 31 are predisposed to be opposite and facing each other at a predetermined distance, in such a way as to identify a space in which a power tool 5 can be housed, which in the example is a press for powder materials. The tool 5 discharges the equal and opposite reactions of the pressing action on the second portions 31.

[0028] The coupling of the first portions 30 in the corresponding arc-shaped portions constituting part of the internal edge of the annular element 2 confers freedom of oscillation on the segments 3 with respect to the annular element 2, so that in any situation a relative adjustment is possible of the segments 3 themselves, which brings them into a position at which the respective first portions 30 are both facing one another and parallel. The illustrated embodiment comprises a plurality of identical said resistance elements 1, arranged facing one another and consecutively aligned at predetermined reciprocal distances.

[0029] Special means maintain the second portions 31 of each resistance element 1 at a predetermined distance. These means also maintain the various resistance elements 1 aligned and at predetermined distances. The means comprise two parallelepiped spacers specially dimensioned and suitable for being interposed between reciprocally facing second portions 31 of the two segments 3 and against opposite tracts of each annular element 2 in such a way that a chamber or free space is defined in which the power tool 5 can be housed.

[0030] The spacers 4 are dimensioned in such a

way that their interpositioning with respect to the second portions 31 is fixed by interference.

[0031] The spacing of the resistance elements 1 is realised by virtue of the fact that the spacers 4 exhibit, at the faces thereof turned towards the tracts of the annular elements 2 they are set against, first hollow seatings 40, each of which is predisposed to receive in a joint-arrangement the internal end of a said tract of annular element 2. In the example, the first hollow seatings 40 are equally spaced one from another.

[0032] The spacers 4 further exhibit, at their opposite ends destined to couple with the second portions 31 of the segments 3, second hollow seatings 41, each of which joint-fits with the end portion of a segment 3 bearing a second portion 31. The second hollow seatings 41 are arranged in succession at predetermined distances - in the present example, equal - so that each of them is perfectly centred on a corresponding first hollow seating 40.

[0033] The symmetry of the plurality of resistance elements assembled in the above fashion is obviously equal to the symmetry of each of the resistance elements.

[0034] The vertical axis y-y of symmetry of the element or elements identifies the direction of the resultant of the forces transmitted by the power tool 5 to the two opposite segments 3 of each resistance element. The power tool 5 comprises a lower body 6 and an upper body 7 between which objects or the material to be pressed can be inserted, and a pneumatic piston comprising a chamber 9 into which pressurised fluid is sent and a base 8.

[0035] The chamber 9 is superiorly closed by a diaphragm 10 on an upper surface of which the lower body 6 is situated and bears down.

[0036] The base 8 rests on the surface generated by the second portions 31 of the lower segments 3, while the upper body 7 is maintained in contact with the surface generated by the second parts 31 of the upper segments 3.

[0037] The pressing action is actuated by sending pressurised fluid into the chamber 9 and can be performed on powder material arranged on an upper branch 11 of a ring-wound conveyor belt 10. The upper branch 11 longitudinally crosses the whole press and exhibits a part which is upstream of the press itself, constituting the support on which the powder loads destined to be formed by pressing are prepared, and a part which is downstream of the press, which acts as a conveyor for removing the products (tiles). In the central part, comprised between the upstream and the downstream zones, the branch 11 is comprised between the lower body 6 and the upper body 7, against which the powder material is compressed and formed during the pressing action. During this operation the portion of branch 11 which finds itself between the lower and upper bodies 6 and 7 functions as the lower closure or bottom die of the die. The conveyor is returned via the

lower branch 12 housed freely below the body of the press between the two rest feet 13 provided on each resistance element 1, fashioned out of the annular elements 2.

[0038] In addition to the spacing achieved through the spacers 4, second spacers 14 can be provided, located between the facing surfaces of any two consecutive annular elements 2.

[0039] The structure of the press is free of welded joints and bolts. In rest condition it is held together by the spacers 4 which not only constitute a forced joint, but also hold in position the segments 3 and the annular elements 2 through the joint-couplings with the hollow seatings 41 and 40.

[0040] Mounting the structure is conceptually very simple and requires external equipment for positioning the various elements up until the spacers are forced into place. The interference between the couplings is calculated so as to achieve a pre-load on the annular elements 2 which is usually beneath the maximum pressing force the structure has been designed for. Zeroing the pre-load by application of the pressing force will not modify the reciprocal positioning of the various elements, so the relative positions are guaranteed by the spacers 4.

[0041] The second portions 31 generate the planes to which the base 8, with the piston 6, and the upper body 7, comprising the special die between which the powder is formed and pressed are fixed.

[0042] This enables an equal distribution of the stress load over the annular elements 2 and thus improves the overall resistance capacity of the whole structure, which is in effect modular, and can absorb a total stress load which can be calculated as the sum of the stress loads that each annular element 2 can absorb.

[0043] The special conformation of the single resistance elements 1, determined by the coupling of the segment pairs 3 with the corresponding annular elements 2, enables a particularly advantageous distribution of the stress loads (applied in the y-y axis direction) which induces on each annular element 2 a state of tension distributed so as to exploit the material to the full.

[0044] Thus the resultant structure is 4-5 times lighter than traditional presses.

[0045] The constructional simplicity of the assembly, which requires neither welding nor bolts, leads to considerable economic savings, as costs are reduced.

[0046] The modular structure, while bringing no change to the mouth of the press, enables, for example, the maximum pressing force to be increased simply by adding further resistance elements, thus increasing the productive capacity of each pressing cycle.

[0047] The total stress load that the whole structure can bear is given by the sum of the load capacity of each of the resistance elements 1.

[0048] Further, the small dimensions of the structure mean that it can be easily transported, located and

installed in the production plant.

Claims

1. A structure for presses, especially for forming ceramic tiles, comprising:

a resistance structure constituted by at least one resistance element (1) which comprises an annular element (2) internally to which in opposite positions two segments (3) are housed; said segments (3) exhibiting a first portion (30) of edge which is shaped to couple with a correspondingly-shaped portion of an internal edge of said annular element (2); said segments also exhibiting a second portion (31) of edge which is opposite to the first portion (30); means being provided for maintaining said second portions (31) of edge at a predetermined distance one from another;

at least one power tool (5) which exerts a pressing action by compressing an object or powder material for pressing between two bodies, which power tool (5) is inserted between the facing second portion (31) of edges of said segments (3) in such a way as to transfer to said second portion (31) equal and opposite reactions resulting from said pressing action.

2. The structure of claim 1, characterised in that said means for maintaining the segments (3) at a predetermined distance one from another are interposed between facing second portions (31) of surface of the two segments (3).
3. The structure of claim 1 or 2, characterised in that it comprises a plurality of said resistance elements (1) arranged facing one another and aligned consecutively at a predetermined reciprocal distance.
4. The structure of claim 3, characterised in that the resistance elements (1) can be assembled in a modular arrangement and organisation by virtue of which a variation in a number of the elements (1) assembled enables a proportional variation in a maximum absorbable pressing force.
5. The structure of claim 4, characterised in that said means comprise two parallelepiped spacers (4), which can be interposed between the facing second portions (31) of the two segments (3) and set against two diametrically opposite tracts of each said annular element (2) in such a way that a space is created between opposite sides of the two spacers (4) and the second portions (31), in which space the power tool (5) is housed.
6. The structure of claim 5, characterised in that the

two spacers (4) are dimensioned in such a way that coupling thereof by interposition between the second portions (31) is a fixed interference coupling.

7. The structure of claim 6, characterised in that said spacers (4) exhibit, at faces thereof turned towards the annular elements (2), first hollow seatings (40) each of which is predisposed to receive perfectly in a joint connection an internal edge of a tract of annular element (2); said first hollow seatings (40) being predisposed in succession at predetermined distances one from another. 5
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8. The structure of claim 7, characterised in that said spacers (4) exhibit, at opposite edges thereof and destined to couple with the facing second portions (31) of the segments (3), second hollow seatings (41), each of which is predisposed to receive in a joint-connection an end of a segment (3) bearing said second portion (31); said second hollow seatings (41) being predisposed in succession at predetermined distances one from another, each thereof being centred on a corresponding first hollow seating (40). 15
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9. The structure of claim 6, 7 or 8, characterised in that said first portion (30) of a shaped edge of each segment (3) can have a convex curved shape. 30

10. The structure of claim 9, characterised in that at least a part of the first portion (30) of shaped edge of each segment (3) exhibits a profile shaped as an arc of circumference. 35

11. The structure of claim 9 or 10, characterised in that the resistance elements (1) of the plurality of resistance elements (1) each exhibit a flat configuration in which two dimensions, breadth and height, are much more important than a third dimension, depth, which is practically constant; the configuration of each resistance element (1) in each plane of the two prevalent dimensions being symmetrical with respect to two orthogonal axes of symmetry, one of which identifies a direction of stress transmitted from the power tool (5) to two opposite segments (3). 40
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12. The structure of claim 11, characterised in one of the two orthogonal axes of symmetry is vertical; being the vertical axis of symmetry which identifies the direction of the stress transmitted from the power tool (5) to the two opposite segments (3). 50

13. The structure of claim 12, characterised in that said power tool (5) comprises a lower body (6) and an upper body (7) in between which objects or material to be pressed are inserted; a hydraulic piston being present, comprising a base (8) on which is situated 55

a chamber (9), into which chamber (9) pressurised fluid is sent; said chamber (9) being superiorly closed by a diaphragm (10) on an upper external face of which the entire lower body (6) bears down; said base (8) lying on a surface generated by the second portions (31) of the lower segment (3); the upper body (7) being maintained in contact with a surface generated by the second portions (31) of the upper segments (3).

Fig.1

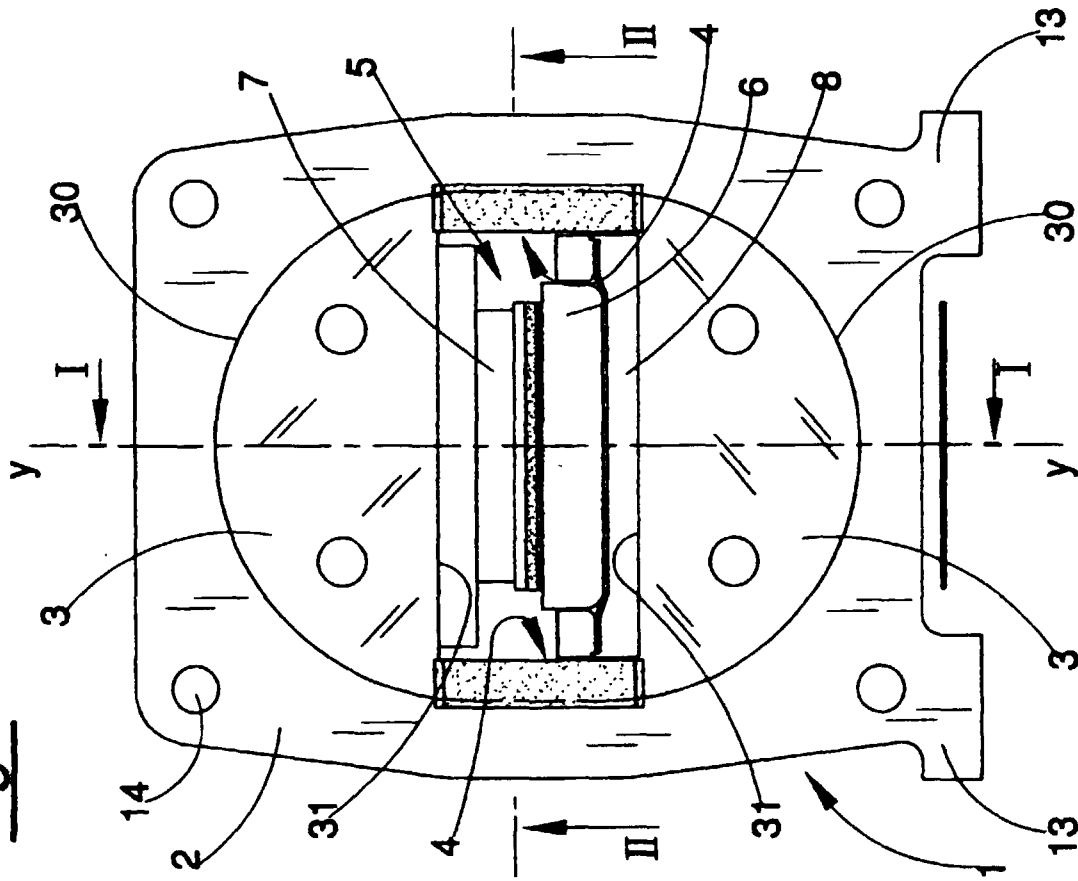
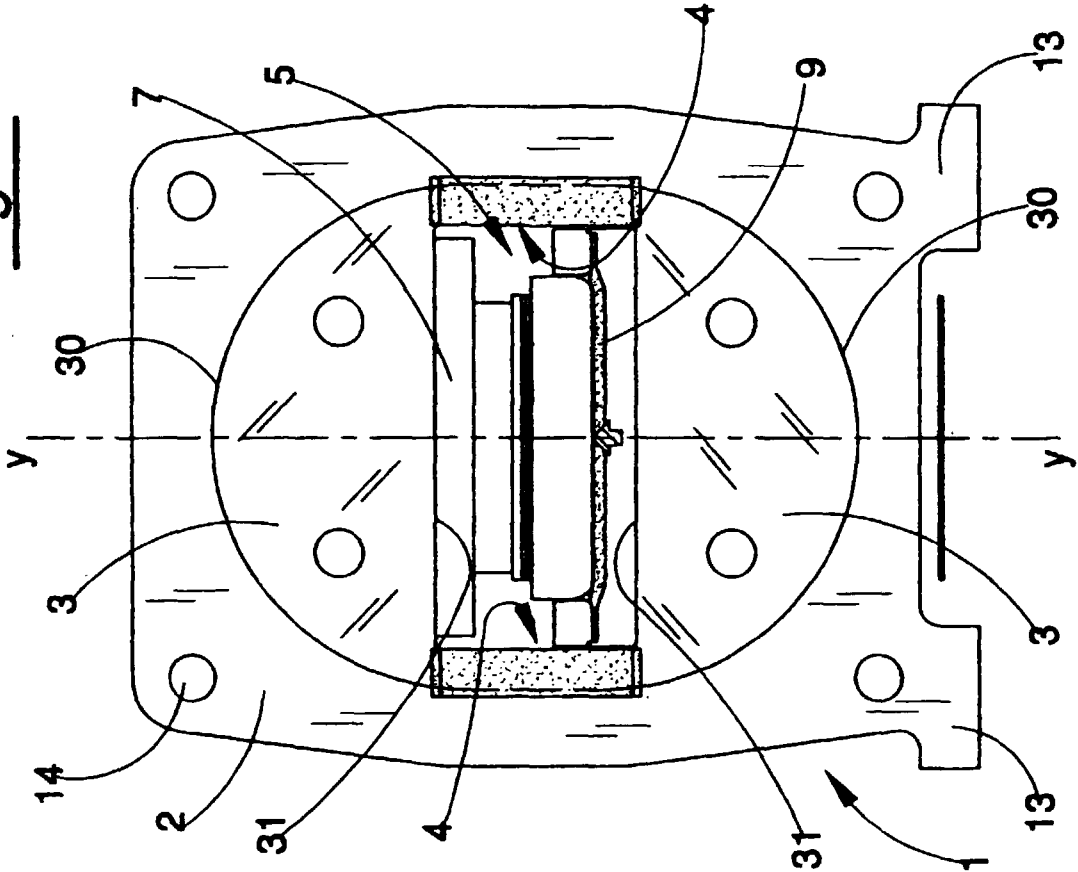
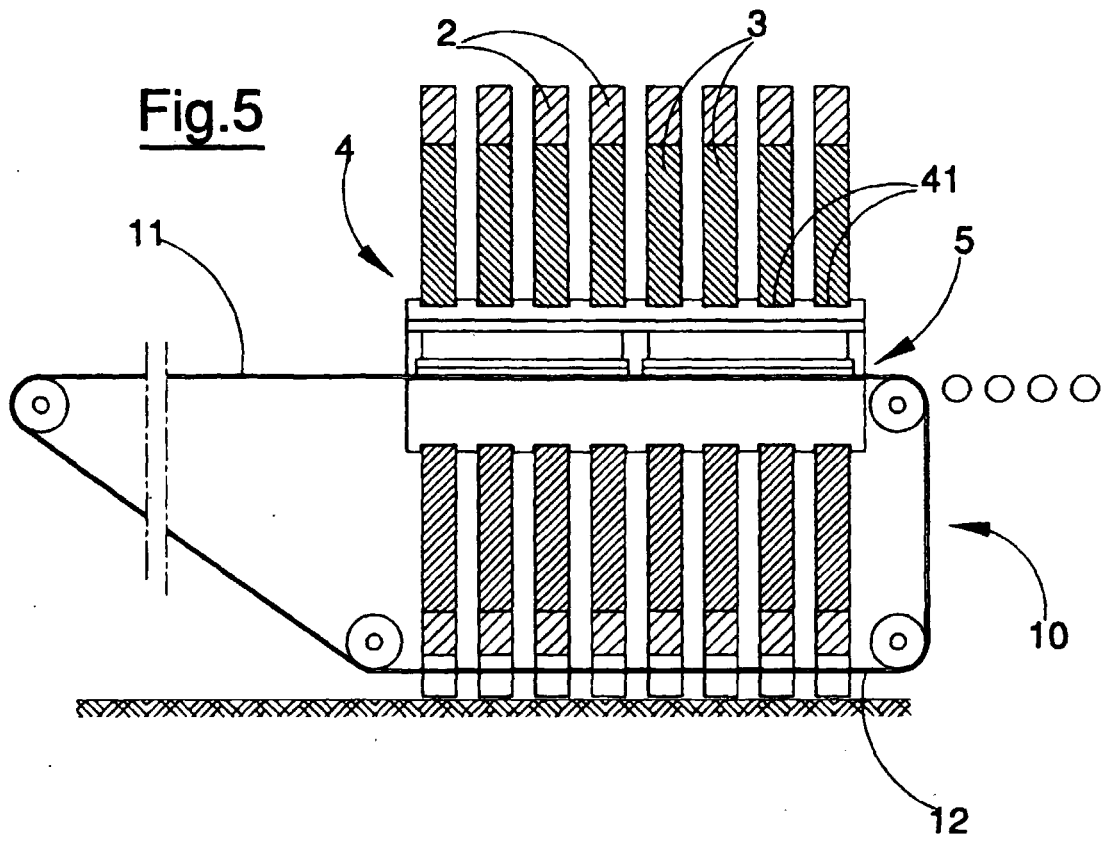
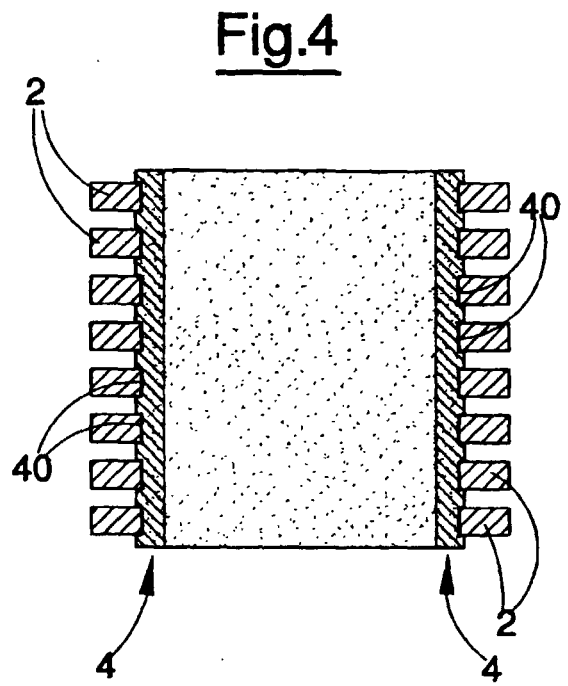
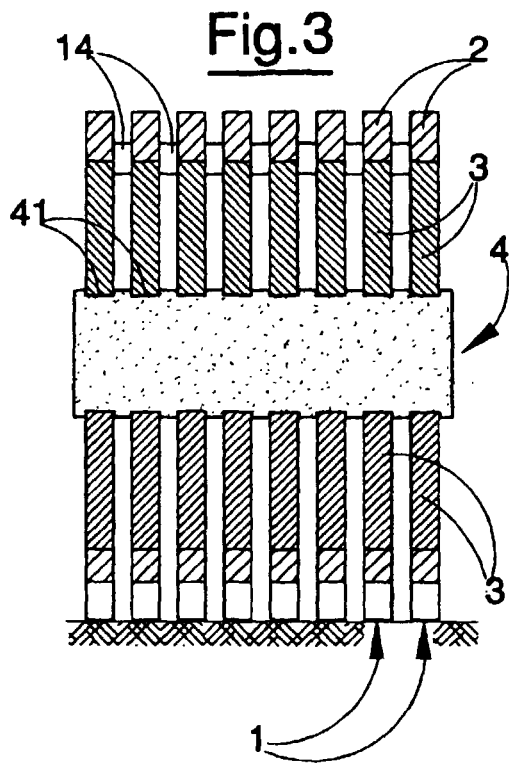


Fig. 2







European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 12 3386

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)
A	GB 809 361 A (FIELDING & PLATT LIMITED) * the whole document * * figures 1,3 * ----	1-3,7, 9-13	B30B15/04 B28B3/02
A	US 4 615 208 A (HAILEY ROBERT W) 7 October 1986 * the whole document * * column 3, line 30 - column 3, line 42 * * figures 1,11 * -----	1-3,5,7, 11-13	
A	EP 0 736 363 A (ALGERI MARIS) 9 October 1996 * the whole document * -----	1,13	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B30B B28B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 May 1999	Examiner Gourier, P
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			

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

EP 98 12 3386

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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11-05-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 809361 A		NONE	
US 4615208 A	07-10-1986	NONE	
EP 0736363 A	09-10-1996	IT 1262594 B	04-07-1996
		IT 1262621 B	04-07-1996
		IT 1262666 B	04-07-1996
		IT 1262688 B	04-07-1996
		EP 0720896 A	10-07-1996
		AT 146115 T	15-12-1996
		DE 69401084 D	23-01-1997
		DE 69401084 T	10-07-1997
		EP 0620089 A	19-10-1994
		ES 2097607 T	01-04-1997
		ES 2111409 T	01-03-1998
		ES 2112073 T	16-03-1998