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Architectural Column And Method And Apparatus For Production

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ABSTRACT

A column comprising courses of building blocks such as bricks is arranged with the long axis of each block parallel to the axis of the column and filled with a substrate such as concrete with an axial structural member. The column may be produced with the aid of a cage including spaced apart hoops or rings used to position blocks during column construction. The cage includes indenters for offsetting some of the blocks in order to form aesthetically pleasing grooving along the finished column.

ARCHITECTURAL COLUMN AND METHOD AND APPARATUS FOR PRODUCTION

Field of the Invention

This invention relates to columns for buildings. This invention also extends to an apparatus for use in making the columns for buildings and also to a method of making the columns using the apparatus.

This invention relates particularly but not exclusively to an apparatus and method for making building columns for residential homes that exhibit highly aesthetic and stylish features. It will therefore be convenient to hereinafter describe the invention with reference to this example application. However it is to be clearly understood that the invention is capable of broader application.

In the specification the term "comprising" shall be understood to have a broad meaning similar to the term "including" and will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps. This definition also applies to variations on the term "comprising" such as "comprise" and "comprises".

Background to the Invention

Some simulated decorative columns or pillars are known in the prior art. For example in US Patent No. 5,568,709 there is described a column comprising an axial member surrounded by a jacket composed of a plurality of wedge shaped elongated rigid foam members. Upon assembling the jacket around the axial member the outer surface of the jacket is sanded to provide a smooth surface and the smooth surface is provided with an overcoating resembling a cut surface of stone. A problem with this system is that the columns are not particularly sturdy or weatherproof, composed as they are of foam, so that their longevity is limited. Furthermore a special manufacturing process is required to produce the columns prior to their transportation to the site where they are to be installed.

Alternatively in US Patent No. 5,934,035 there is described a modular column of rectangular cross section assembled by overlaying precast brick layers, one on top

of the other to form a column. A problem with this column and system of construction is that it is not aesthetically pleasing as the resulting column has an appearance somewhat similar to that of a typical rectangular brick chimney stack.

The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the referenced prior art forms part of the common general knowledge in Australia.

Traditionally columns have been produced of circular stone cross-sections stacked upon each other. While columns produced by such a method are regarded as being aesthetically pleasing, they can be expensive and difficult to construct.

Clearly it would be advantageous if a column could be devised which ameliorates at least some of the problems described in the prior art and provides a useful alternative to known column structures and methods of forming same.

Summary of the Invention

According to one aspect of this invention there is provided a column for a building or structure, the column including:

a plurality of courses of blocks, each course comprising a plurality of blocks arranged in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, wherein each block has a longitudinal axis that is substantially parallel to the longitudinal axis of the column, and wherein the interior space is filled with a settable material that has been introduced into the space and then allowed to set, and wherein the blocks are also adhered to each other by a settable material.

The blocks may be adhered to each other by being mortared to each other by a cementitious material. The settable material in the interior space may also be a settable cementitious material.

Each block may have an upper end and a lower end, and the upper ends and the lower ends of all blocks in each course may be substantially aligned with each other. The blocks may be formed with between one and three different basic configurations. Each of the blocks having the same basic configuration may have substantially the same size and shape.

In one form substantially all of the blocks arranged in the closed figure may have a wedge-shaped block configuration. In another form the blocks arranged in the form of a closed figure comprise blocks having a rectangular configuration alternating with blocks having a wedge-shaped configuration. Further in one form the outer ends of the wedge-shaped blocks may be recessed inwardly from outer ends of the rectangular blocks so as to define longitudinal channels in the peripheral surface of the column. Alternatively outer ends of the wedge-shaped blocks may be broadly radially aligned with outer ends of the rectangular blocks so as to form a substantially smooth peripheral surface of the column.

The column may further include an axial member passing through the interior space of the column and projecting out through the ends of the column and the column may be effectively built onto the axial member.

The column may further include a render coating on the peripheral surface of the column and a base mounted on the lower end of the column and a head mounted on the upper end of the column. Both the base and the head may project radially outwardly of the peripheral surface.

The column may have a uniform cross-section along its length. Alternatively it may have a non-uniform cross-section along its length, eg with a tapering profile.

According to another aspect of this invention there is provided an apparatus for use in forming a column from a plurality of courses of blocks, the apparatus including:

a plurality of elongate members extending longitudinally with respect to the column to be built and spaced apart from each other around the column to be built;

a plurality of retaining members extending transverse to the longitudinal members and mounted thereto, the retaining members being spaced apart from each other by not more than the length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members assisting in vertically aligning and positioning the blocks.

At least some of the retaining members may be vertically positioned so as to straddle the point of separation of adjacent courses of blocks intermediate the ends of the column. This thereby assists with the vertical alignment of the course of blocks above the point of separation and the course of blocks below the point of separation.

The apparatus may further include locating means on each retaining member for correctly locating the position of each block in the associated course of blocks relative to the retaining member and to the other blocks. The locating means may comprise a plurality of rigid elements that are permanently mounted on the inside of each retaining member. Instead the locating means may comprise a plurality of pins that are removably inserted through each retaining member in a radially inward direction and are positioned between adjacent blocks of a said course of blocks in the column thereby to correctly position the adjacent blocks. Each retaining member may have said pins extending through it on each side of each block in the column whereby to correctly position all blocks.

The apparatus may further include indenters for indenting or setting a block radially inwardly from an adjacent block and also from the associated retaining member so as to create a column with longitudinal grooves or indentations. The radial position of the indenters may be adjusted so as to vary the depth of the offset and thereby the depth of indentation in the formed column.

The retaining members may be in the form of rings having a substantially circular configuration. In the apparatus the longitudinal members and the retaining members in the form of said rings may together form a cage.

In order to form columns of a generally circular cross section the rings will be circular. Alternatively columns of other cross sections, such as rectangular, may be formed by means of a cage having retaining members of corresponding cross-sections.

The cage may have top and bottom retaining members and also at least one intermediate retaining member positioned between said top and bottom retaining members. The top retaining member may be positioned to overly the upper edge of the top course of blocks and the bottom retaining member may be positioned to overly the lower edge of the bottom course of blocks. Each intermediate retaining member may be positioned to overly the point of separation of adjacent courses of blocks.

Preferably the rings are spaced apart no further than the long dimension of the building components used to produce a column.

In a preferred embodiment the column formation apparatus is configured to allow adjustment of the spacing between rings along the longitudinal members.

Each of the retaining members may be slidably mounted on the longitudinal members so as to be longitudinally slidable at least to some extent along the length of the longitudinal member. Each longitudinal member may have a slot aperture and each retaining member may be attached to each longitudinal member by passing a bolt through an aperture in the retaining member and then through the longitudinal slot aperture. The longitudinal member may then be clamped to the retaining member by means of a nut passed over the free end of the bolt.

According to another aspect of this invention there is provided a method of forming a column for use in a building structure, the method including:

a. providing a column forming apparatus as defined in the aspect of the invention immediately above and a plurality of blocks;

b. positioning the apparatus where the column is to be formed;

c. laying one or more courses of blocks in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, the blocks being located by the retaining members of the column forming apparatus; and

d. filling the interior space with a settable material and allowing it to set.

The laying step may include adhering the blocks to each other by mortaring them to each other with a cementitious material. The settable material that is used to fill the interior space may also be a cementitious material.

The positioning step may comprise locating the apparatus around an axial support member, and rigidly mounting the apparatus to the axial member by means of a stabiliser extending between the apparatus and the support member.

The longitudinal members and the retaining members may form a cage that can be opened and closed along an axis extending in a longitudinal direction, and the step of positioning the apparatus may include either opening up the cage or else lowering it over the axially extending support member.

The column may have a plurality of courses of blocks and the method may comprise laying a first course of blocks then filling the interior space of the first course with a settable material. The method may also include repeating this sequence of steps of laying a course and then filling the interior space of said course with a settable material for one or more succeeding courses of blocks. Said

sequence of steps to lay a course and then fill the interior space may be repeated until a column of desired height has been formed.

The method may include the yet further step (once the column has been formed) of separating the cage from its attachment to the support member. This is done by removing the stabiliser and then opening up the cage and moving it out from its position surrounding the column.

This invention extends to a column for a building or structure produced according to the method described in the preceding aspect of the invention.

In the column the longest dimension of each block may extend in the longitudinal direction. Further substantially all of the blocks may be made of autoclaved aerated concrete. The column may further include an axial member passing through the interior space of the column and projecting out through the ends of the column and the column may be permanently and rigidly fixed to the axial member.

According to another aspect of the invention there is provided a column including blocks, wherein the longest dimension of each block is arranged parallel to the axis of the column.

In one embodiment the courses are of square or rectangular cross section.

According to yet another aspect of this invention there is provided a combination comprising:

a column comprising a plurality of vertically stacked courses of blocks, each course comprising a plurality of blocks that are arranged in horizontal alignment with each other and in the form of a closed figure defining an interior space radially inward of the blocks, and wherein the blocks are adhered to each other by a settable material which is also used to fill in the interior space; and

an apparatus for forming the column comprising:

a plurality of elongate members extending longitudinally with respect to the column and adapted to be spaced apart from each other around the column; and

a plurality of retaining member extending transverse to the elongate members and mounted thereto, the retaining members spaced apart from each other by not more than a length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members assisting in vertically aligning and

positioning the blocks in an adjacent course and also holding the blocks in place while the column is being built.

At least one of the retaining members may be vertically positioned so as to straddle a point of separation of adjacent courses of blocks intermediate the ends of the column thereby to assist in the vertical alignment of the course of blocks above the point of separation and the course of blocks below the point of separation.

The combination may further include locaters on each retaining member for laterally locating the position of each block with each associated course of blocks. Each locater may project into a space between adjacent blocks in the course of blocks, thereby to laterally position the blocks on either side of said space. Each locater may comprise a pin that is removably inserted through each retaining member in a radially inward direction and into each said space between adjacent blocks and each said retaining member may have said pins extending into each said space between adjacent blocks in the course to correctly position all the blocks in the course.

The combination may further include indenters for indenting or setting a block radially inwardly from an adjacent block and also from the associated retaining member so as to create a column with longitudinal grooves or indentations.

The radial position of the indenters may be capable of adjustment so as to vary an offset depth of an indented block.

The retaining members may be in the form of rings each having a substantially circular configuration and the elongate members and retaining members may together form a cage.

The combination may have an intermediate retaining member overlying each point of separation of adjacent courses of blocks up the height of the column whereby to align and position the blocks of all the courses in the column.

The plurality of retaining members may comprise top and bottom retaining members and also at least one intermediate retaining member positioned between said top and bottom retaining members. The top retaining member may be positioned to overlie a top course of blocks and the bottom retaining member may be positioned to overlie a bottom course of blocks. At least one intermediate retaining member may be positioned to overlie a said point of separation of two adjacent courses of blocks.

The combination may further include slide formations on the elongate members for permitting the retaining members to slide longitudinally on the elongate members at least to some extent, so as to permit the retaining members to be positioned straddling a point of separation of the adjacent courses of blocks.

The combination may include slide formations on the elongate members for permitting the retaining members to slide longitudinally on the elongate members. Each slide formation may be formed by each elongate member having a slot aperture, and the retaining members may be mounted to the elongate members by a bolt passed through an aperture in the retaining member and then through the slot aperture in the elongate member. A fastening nut may be passed over the free end of the bolt whereby loosening of the nut permits relative movement of the retaining member and the elongate member.

According to yet another aspect of this invention there is provided a method of forming a column for use in a building structure, the method including:

providing an apparatus for use in forming a column from a plurality of courses of blocks, the apparatus including a plurality of elongate members adapted to extend longitudinally with respect to the column and adapted to be spaced apart from each other around the column; a plurality of retaining members extending transverse to the elongate members and mounted thereto, the retaining members adapted to be spaced apart from each other by not more than the length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members adapted to assist in vertically aligning and positioning the blocks; and indenters for indenting or setting a block radially inwardly from an adjacent block and also from an associated retaining member so as to create a column with longitudinal grooves or indentations, and wherein the radial position of an indenter can be adjusted so as to vary an offset depth of an indented block;

providing a plurality of courses of blocks;

positioning the apparatus where the column is to be formed;

laying one or more of the courses of blocks in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, the blocks being located by the retaining members of the column forming apparatus; and

filling the interior space with a settable material and allowing it to set.

In the specification the term "block" is to be understood as including any building component suitable for the construction of a column of the type described herein. Accordingly, and without limitation, the term "block" refers at least to a brick, including a glass brick, a tile or a stone slab such as a marble slab. Furthermore the term "wedge" is to be understood to encompass trapezoidal shapes and generally will not taper to a point at one end.

Brief Description of the Drawings

An apparatus for making building columns in accordance with the invention and the columns produced thereby may manifest themselves in a variety of forms. It will be convenient to hereinafter describe in detail several preferred embodiments of the invention with reference to the accompanying drawings. The purpose of providing this detailed description is to instruct persons having an interest in the subject matter of the invention how to carry the invention into practical effect. It will be clearly understood that the specific nature of this detailed description does not supersede the generality of the preceding broad description. In the drawings:

Figure 1 is a perspective view of a column formed in accordance with the present invention;

Figure 1A is a perspective view of a block, being a brick, used in the formation of the column of Figure 1;

Figure 1B is a perspective view of a further block, being a wedge, used in the formation of the column of Figure 1;

Figure 2 is a cross-section through a column similar to that of Figure 1 and in accordance with the present invention;

Figure 3 is a simplified perspective view of a cage in accordance with a first embodiment of the invention used in the production of the column of Figure 1 in which for ease of clarity some of the longitudinal members have been omitted;

Figure 4 is a plan view of a hoop or ring of the cage of Figure 3;

Figure 5 is a plan view of the hoop or ring of Figure 4 in place around a column;

Figure 5A is a plan view of a hoop or ring similar to that of Figure 4 wherein the longitudinal members are of a size facilitating placement of wedges against the inner periphery of each ring;

Figure 6 is a perspective view of a cage according to a further embodiment of the invention;

Figure 7 is a plan view of a cage according to yet a further embodiment of the invention;

Figure 8 is a close-up of part of the cage of Figure 7 showing details of the attachment of longitudinal members to the ring and also indenters for indenting the blocks;

Figure 9 is a perspective view of a longitudinal member of the cage of Figure 7;

Figure 10 is a perspective view showing detail of part of the cage of Figure 7;

Figure 11 is a perspective view of a portion of a ring of the cage of Figure 7;

Figure 12 is a simplified perspective view of a cage used in the production of a column of non-uniform cross-section;

Figure 13 is a perspective view of a column in accordance with another embodiment of the invention also for making a column of non-uniform cross-section;

Figures 14A and 14B are perspective views of another embodiment of a cage for making a column of constant cross-section along its length with some detail omitted for clarity;

Figure 15 is a perspective view showing part of a ring of the cage of Figure 14;

Detailed Description of Preferred Embodiments

Referring now to Figure 1, there is depicted a column indicated generally by the reference numeral 10.

Column 10 is composed of a number of courses of blocks on top of each other with their long dimensions vertical and parallel to the longitudinal axis of the column. Figure 2 shows a plan view of a single course 12. It will be noted that between rectangular blocks 2 are wedge blocks 4 formed by cutting square rectangular standard blocks in the appropriate fashion. For example ceramic bricks may be cut with a diamond-saw, so that they have a trapezoidal cross-section.

A building material which is particularly convenient to use in the formation of columns of the type discussed herein is Autoclaved Aerated Concrete such is as available under the trade mark HEBEL manufactured in Australia by CSR Limited of 9 Help Street Chatswood, NSW 2067, Australia. This material is considerably lighter than bricks or other masonry material.

An axial steel structural member 6 that is centrally positioned extends through the column.

Typically about 10mm of mortar separates the wedges 4 from the adjacent blocks 2. The interior of the course is filled with a settable material which is concrete 8. In the embodiment of Figure 2 the wedges 4 are offset radially inwardly from the blocks thereby producing decorative vertical channels in the finished column 10. As will be explained, the courses may also be formed without this offset so that the finished column would not include the vertical channels but would have a smoothly curving outer surface.

Referring now to Figure 3 there is shown an apparatus or "cage" 20 for forming the column of Figure 1. Cage 20 comprises a number of rings 22 supported by a plurality of longitudinal members 24. Apart from the top and bottom rings the ring spacing corresponds to the height of each course of column 10, that is the dimension "B" of the blocks and wedges shown in Figures 1A and 1B. The top and bottom rings of cage 10 are located closer to their neighbouring rings as will be explained further shortly.

At Figure 4 there is shown a plan view of the cage 20. Each ring 22 comprises two hinged portions 26 and 28 including hinges 30 and 32. Portions 26 and 28 are bolted together at flanges 36 and 34 by means of bolts. Nineteen longitudinal members 24 comprising, for example steel rods of square cross-section, are welded or otherwise attached, for example by riveting, to the inner periphery of the rings 22. The rods 24 are spaced in order to align the blocks and wedges that will be used to construct a column. They therefore have a function of positioning the blocks relative to each other and to the rings 22. The rods 24 also act to indent the wedges.

With reference to Figure 5 there is shown a plan view of cage 20 around a completed column 10. It will be noted that the inner surface of ring 22 prevents blocks 2 from falling out of the column prior to setting of the concrete 8. Other settable materials apart from concrete may also be suitable. Longitudinal members 24 act to hold blocks vertical and retain wedges 4 from falling outwards from the cage. It will be noted that a longitudinal member is omitted from the position indicated at 38. This is to make it easier for a blocklayer to insert blocks and wedges into the cage through the resulting gap, when forming the courses.

The members 24 may optionally be designed so that the ring spacing can be adjusted. This will be discussed in more detail below with reference to Figure 10.

In use cage 20 is mounted in a position where a column 10 is to be erected such as on a base (Figure 1). Typically internal column structural member 6 is already in place and the cage 24 is placed around the structural member by undoing either set of bolts so that the cage may be opened and placed about member 6. As previously mentioned clips or other removable fixing means may be used in place of bolts and flanges. Preferably the uppermost ring is bolted to the top of member 6 to stabilise the cage. If required, other stabilisation methods are also possible, such as tethering of the cage to pegs fixed in the surrounding ground.

A first course of blocks and wedges is then formed to produce an arrangement as shown in Figure 5. The lowermost ring 22 of cage 20 is spaced from the next ring a distance such that the upper limit of the first course is situated halfway up the wall of the second ring. Apart from the uppermost ring, subsequent rings are then spaced apart the height of a course so that each course ends halfway up the wall of the associated ring. The uppermost ring is half a ring-height closer to the ring beneath it, so that the uppermost course of blocks ends flush with the top of the uppermost ring. After arranging and mortaring the wedges 4 and blocks 2 in position, with the assistance of the rings and longitudinal members 22, 24 as positioning and retaining guides, the interior of the course is filled with concrete which acts to push the wedges 4 and blocks 2 out against the rings and retaining members 22, 24. Consequently the cage 20 facilitates the accurate and regular arrangement of the blocks and wedges in order to form a column such as that shown in Figure 1.

Once the first course has been laid a second course is formed upon it with the guidance of a further retaining ring 22 and the longitudinal members 24. A mortar layer separates the adjacent courses. After the blocks and wedges of each layer have been mortared into place the internal void is filled with concrete. The process is continued until the column is completed.

Preferably after sufficient time has been left for the concrete and mortar to set, cage 20 is removed from the newly formed column. In order to remove the cage the bolts securing each of the two halves of each ring together are unfastened. Each half of the cage is then pivoted about the hinges of the rings thereby freeing longitudinal members 24 from the column. The two halves of the cage 20 are then removed leaving the column 10 in place.

It is convenient that a cage be formed in two hinged portions in order that longitudinal members 24 may be readily swung free of the vertical channels of the column which are formed by the offsetting of the wedges.

If it is desired to construct a very tall column then the cage may be used to initially form a first lower stage of the column and then be raised to form a subsequent stage. This procedure avoids the necessity of having a cage of unwieldy length. Alternatively a cage of increased height or length may be provided. This can be done fairly easily by adding additional modules of cage structure to create the additional length.

Using ten standard size blocks, which, with reference to Figure 1A have dimensions of A=110mm, B=230mm and C=76mm and ten wedges a column with an outer diameter of 570mm will result. The cage of Figure 5 is designed for production of a such a column. It will be understood that larger numbers of blocks and wedges may be used in each course in order to produce columns with larger diameters if required. In each case a cage of suitable diameter and number of rods or spacers will be required.

It will be realised that in the embodiments of the cage discussed thus far the depth to which a building component such as wedge 4 has been indented relative to adjacent building block 2 has depended on the dimensions of longitudinal rods 24. An embodiment of the apparatus in which the distance between adjacent rings and the indentation depth is adjustable will be explained with reference to Figures 7 to 11.

In the event that it is desired to produce a column in which wedges 4 are not indented from blocks 2 then the rods 24 may be reduced in cross section so that wedges 4 may be placed between the rods 24 and up against the inner wall of ring 22. This is illustrated in Figure 5A where rods with a width of 8mm have been used. In that case mortar joints of approximately 10mm result between adjacent wedges and blocks.

An alternative construction of the cage is shown in Figure 6. In the interests of clarity the hinges 30, 32 and retaining bolts and flanges 36 shown in Figure 5 have been omitted from Figure 6. It will be noted that indenters 23 are positioned around the inner wall of the ring 22 at the positions occupied by rods 24 in the embodiment of Figure 3. Indenters 23 comprise short rod sections that are preferably dimensioned so that they are shorter than the height or width of the rings. By so

dimensioning the rods an offset between their upper and lower limits and the upper and lower edges of the rings is produced, preferably of about 5mm. This offset, while not essential, acts as an aid to bricklayers when positioning blocks about the rings. The rings 22 are interconnected by means of longitudinal members 37. An advantage of the cage of this embodiment is that it affords bricklayers ready access to the interior of the rings in order to facilitate easy placement of blocks and wedges during column construction.

In Figures 7 to 11, there is depicted a plan view of a cage according to a further embodiment. The cage includes rings 40, the uppermost one of which is visible in Figure 7. Adjacent rings 40 are interconnected by longitudinal members 42 in the form of U-channels located on the outside of the rings. Figure 8 illustrates a close-up view of region "A" identified in Figure 7.

Each ring 40 is made up of two identical semi-circular portions which are bolted or clipped together at flange pairs 44 and 46.

A radial portion of a ring is depicted in Figures 10 and 11. It will be noted that paired slots 54, 56 are present in the portion depicted. The inner wall of each slot is lipped to engage a square nut. The arrangement of slots depicted continues around the circumference of the ring. Adjustable indenters 48 are slideable about each groove. The indenters are each comprised of square nut 52, screw 50 and wing nut 58 (visible in Figure 8). Screw 50 may be rotated to vary its depth of insertion through bolt 52. Once the desired depth is achieved the screw is locked in place by tightening wing-nut 58 against the outer surface of the ring. By providing paired grooves at different levels each with an indenter it is possible to vary the indentation of wedges of adjacent courses of a column formed with the aid of the cage.

With reference to Figure 9, the U-channels 42 include a series of longitudinally spaced slots 60. As shown in Figure 8, each ring is attached to the U-channels by means of bolts 62 and wing-nuts 64. The bolt heads 62 may be accommodated in the lipped slots 56, 54 so that the head of each bolt does not protrude into the circle defined by the inner circumference of the rings. Alternatively countersunk holes may be recessed in the ring for bolts 62. For the purposes of stability and accuracy it is preferable that at least four equally spaced U-channels be used to space the rings as is shown in Figure 7.

The finished column may be left with the blocks exposed as shown in Figure 1, or may be covered with a render to produce a stonework or stucco, or other desired, finish. Finishes suitable for application to brickwork are well known in the field of building and so will not be discussed in detail here.

Figures 14A and 14B show yet another cage suitable for producing a column of constant cross-section. This column is structurally and functionally very similar to the column illustrated in Figure 3. Accordingly the following description will focus on the features of this column that are different to that of the column in Figure 3.

The cage broadly comprises a set of four longitudinal members 24 spaced apart from each other around the circumference of the column that are interconnected by a plurality of transverse retaining members 22. In the illustrated embodiment there are three said retaining members 22 which are rings spaced apart from each other. One is positioned towards the top of the column, one towards the bottom of the column, and an intermediate ring is positioned mid way up the height of the column.

Each longitudinal member 24 comprises a U-shaped channel section opening outwardly and having a web portion that is attached to the rings or retaining members 22. Each member has a plurality of apertures, eg slot apertures, defined therein through which one or more bolts can be passed to attach the longitudinal members 24 to the rings 22.

Each ring 22 comprises two half circle ring elements 91, 92 which overlap each other at each end and are attached to each other via the overlapping ends. Each ring element 91, 92 has a plurality of pairs of apertures 93 defined therein at spaced intervals around its circumference.

As illustrated in some detail in Figure 15 the overlapping ends of the elements 91, 92 are attached to each other by passing a locating element 94 having pins 95 through the pairs of apertures which are aligned in both elements to attach them together. This attachment mechanism is in some respects analogous to the attachment of ends of a belt. The pairs of apertures 93 on the two elements 91, 92 are aligned and then the pins are passed through both elements 91, 92 to attach them together.

Further the locating elements 94 with pins 95 are also passed through the remaining apertures in the ring element. The pins 95 project through the ring

elements 91, 92 into the space defined by the rings 22 and correctly position the blocks 80 within the cage 20. Each block 80 is positioned with such a pin 98 on either side thereof in the space between the block and the adjacent block. This way the blocks 80 are accurately positioned on the column to form a precise and symmetrical column.

The pins 95 of the locating elements 94 that attach the two ring elements 91, 92 to each other also perform this function of locating and aligning the individual blocks within the column. Therefore these particular elements 94 perform two functions, namely attaching the two elements to each other and locating the blocks with respect to each other and the cage.

In Figures 14A and 14B the pole or member around which the column is built has deliberately not been shown in full detail to keep the illustration as simple as possible.

In use the cage is constructed by attaching two longitudinal members 24 to three ring elements 91, 92 to form a half cage. Two half cages are then attached to each other by passing the pins 95 of the locating elements 94 through the overlapping ends of the ring elements 91, 92 as described above. This attachment is illustrated in some detail in Figure 15. This produces an assembled cage ready for use in forming a column. The cage is mounted around the pole or elongate member that is not shown in detail in the illustration.

The column construction process is commenced by placing blocks 80 sequentially into the column to form a lower course of blocks extending between the bottom ring and the intermediate ring. Each block is placed carefully in position with the pins of the adjacent locating elements on either side thereof. The space between the adjacent blocks is filled with a settable material, eg mortar. Once the first course has been built up the interior space defined by the blocks is filed with a settable material, eg concrete, to form a solid column as shown in Figure 14. The process is then repeated for a second course of blocks.

In Figure 14 the blocks have longitudinal grooves in their outer surfaces. These provide fluting on the outer surface of the column which is an optional aesthetic feature.

Applicant also points out that the blocks used with the apparatus in Figures 13 and 14 are considerably longer than the blocks used in the column of Figure 1 and

illustrated in Figures 1a and 1b. The blocks in these drawings would have a length at least three times that of the blocks illustrated in Figure 1. The blocks 80 illustrated in Figure 14 typically have a length of about 1.2 metres. An obvious advantage of using longer blocks is that the number of courses provided to produce a column of given height is reduced and therefore the manual labour involved in producing a column is substantially reduced.

Applicant has found that HEBEL is a convenient material to use in the formation of the columns. HEBEL is a building material that can be supplied in sections having a suitable square rectangular cross-sectional profile. The blocks are then cut by a saw to produce a wedge shaped cross-section as shown in Figure 16. The sections are provided in lengths of 2.4 metres. These are cut into two blocks each having a length of 1.2 metres.

In the illustrated embodiment each block has a length of 1.2 metres and the column that is built has a height of 2.4 metres. If additional height is required for the column to be erected then a cage of increased height can be provided and a column having more courses is built up in the same way as described above.

Figure 12 illustrates a cage that is adapted to make columns of non-uniform cross-section. Unless otherwise indicated the same reference numerals will be used to refer to the same components.

Typically such columns taper outwardly and then inwardly along their length with an hour glass or undulating profile. Mexican style columns in particular embody this stylisation.

The cage 20 comprises broadly a plurality of spaced longitudinal members 24. In the illustrated version there are four said members 24 spaced equidistantly apart from each other and surrounding a plurality of rings 22. The rings 22 are positioned at spaced intervals along the length of the members 24.

Different rings 22 have different diameters. As one progresses from the top of the cage in a downward direction the rings decrease in diameter up to a point three rings down where the diameter is at a minimum. Further down the cage the diameter of the rings increase in steps to a maximum diameter six rings down. The rings then decrease once more in diameter to the bottom of the cage.

Each of the rings of less than maximum diameter is held in place by support arms 27 extending radially from each longitudinal member to the associated ring 22.

The support arms 27 comprise a bolt that is passed through the ring, then through a spacer spacing the longitudinal member from the ring, and then through an aperture, eg a slot aperture, in the longitudinal member. The bolt has a screw thread formation towards its free end over which a nut defining a complementary screw threaded bore, eg a wing nut, is passed. The wing nut is manually tightened onto the free end of the bolt to hold the assembly tightly and securely together.

The rings 22 of different diameter are accommodated by having bolts and spacers of different lengths. For example the third ring down from the top of the column has longer support arms than the ring immediately above it. The ring at the top of the cage has no support arms to speak of. The ring is mounted directly onto the longitudinal members 24 by means of a bolt and associated wing nut.

Figure 13 shows another cage having rings of different diameter for forming a column of non-uniform cross-section. This cage is a variation on that shown in Figure 12.

Broadly the cage 20 comprises three rings 22 supported by a plurality of longitudinal members 24. Some of the rings comprise an outer ring element 26 having a diameter that positions it in proximity to the longitudinal members for attachment thereto, and an inner ring element 25 spaced radially in from the outer ring element 26. The diameter of the inner ring element 25 is determined by the diameter of the column design at that particular point.

Each inner ring element 25 is attached to and supported by its associated outer ring element 26 by means of a plurality of support arms 27. Each support arm is rigid and extends between the inner and outer ring elements. Generally there will be at least two said support arms 27 supporting each inner ring element 25. In the illustrated embodiment there are four said support arms 27 supporting each inner ring element 25 spaced equidistantly around the circumference of the column. The support arms 27 are typically constructed such that the inner ring element 25 is detachable from the outer ring element 26.

While most rings comprise an inner and outer ring element, some of the rings may comprise only a single ring element. These points correspond to the points along the column having maximum diameter. In the illustrated embodiment the middle ring is such a ring.

An exploded view of the support arms 27 is shown in Figure 13. It comprises a bolt 28 having a head which is passed in an outward direction through an aperture in the inner ring element 25 from the inner side thereof, then through a spacer 29 that spaces the inner and outer ring elements the correct distance apart, and then through an aperture in the outer ring element 26 and through an aperture in the longitudinal member. The free end of the bolt has a screw thread formation defined thereon and a nut 67 having a complementary screw threaded bore defined therein is passed over the free end of the bolt. Typically the nut 67 is a wing nut which can be manually tightened by an operator. This tightening urges the longitudinal member 24 onto the outer ring 22 and the other components thereby clamping all the components tightly and securely together.

When using the cages 20 illustrated in Figures 12 and 13, the individual blocks are tapered in a longitudinal direction along one side thereof so as to reproduce the desired tapering profile of the column. Each of the blocks that is to be used in building the column of varying cross-section is tapered or shaped before it is placed in the cage 20. This is accomplished by removing or cutting material away from one side of a blank having a rectangular block shape. Various jigs and templates can be used to assist in removing this material from the blocks to form the correct shape.

An advantage of the method and apparatus described above is that the cage is very simple and can be easily transported to a building site. The cage is assembled with a length that corresponds to the height of the column to be built. The column can then be manufactured on site and used to form an integral column of a building. This way the formed column does not need to be transported to the actual building site. This avoids the complexity and attrition that one would expect in transporting such a column over large distances. Despite the simple manufacturing procedure that is carried out on the site a finely engineered column having close tolerances is produced and that will satisfy the most discerning customer. Yet further the method and apparatus provides a flexibility in column height. A cage is formed having a length corresponding to the height of the column desired to be built on and a column having this height is then built. This is simply not possible with precast products.

Further the column illustrated in Figure 14B comprises only two courses of blocks and as such can be manufactured fairly rapidly using a minimal amount of

labour. The advantages of the reduction in labour cost using blocks of the size illustrated in Figure 14 are obvious.

While the cages described above have been of circular cross-section it is also possible to produce cages having square rings in order to form columns of square cross section. Square cross section columns do not require the incorporation of wedges but only of regular blocks. Polygonal rings may also be used in order to produce columns of polygonal cross-section.

It will of course be realised that the above has been given only by way of illustrative example of the invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is herein set forth.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A column for a building or structure, the column including:

a plurality of courses of blocks, each course comprising a plurality of blocks arranged in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, wherein each block has a longitudinal axis that is substantially parallel to the longitudinal axis of the column, and wherein the interior space is filled with a settable material that has been introduced into the space and then allowed to set, and wherein the blocks are also adhered to each other by a settable material.

2. A column according to claim 1, wherein the blocks are adhered to each other by being mortared to each other by a cementitious material, and the settable material in the interior space is also a settable cementitious material.

3. A column according to claim 1 or claim 2, wherein each block has an upper end and a lower end, and the upper ends and the lower ends of all blocks in each course are substantially aligned with each other.

4. A column according to any one of claims 1 to 3, wherein the blocks are formed with between one and three different basic configurations, and wherein each of the blocks having the same basic configuration has substantially the same size and shape.

5. A column according to claim 4, wherein substantially all of the blocks arranged in the closed figure have a wedge-shaped block configuration.

6. A column according to any one of claims 1 to 3, wherein the blocks arranged in the form of a closed figure comprise blocks having a rectangular configuration alternating with blocks having a wedge-shaped configuration.

7. A column according to claim 6, wherein outer ends of the wedge-shaped blocks are recessed inwardly from outer ends of the rectangular blocks so as to define longitudinal channels in the peripheral surface of the column, or alternatively outer ends of the wedge-shaped blocks are broadly radially aligned with outer ends of the rectangular blocks so as to form a substantially smooth peripheral surface of the column.

8. A column according to any one of claims 1 to 7, further including an axial member passing through the interior space of the column and projecting out through the ends of the column, and wherein the column is effectively built onto the axial member.

9. A column according to any one of claims 1 to 8, further including a render coating on the peripheral surface of the column and a base mounted on the lower end of the column and a head mounted on the upper end of the column, both the base and the head projecting radially outwardly of the peripheral surface.

10. An apparatus for use in forming a column from a plurality of courses of blocks, the apparatus including:

a plurality of elongate members extending longitudinally with respect to the column to be built and spaced apart from each other around the column to be built;

a plurality of retaining members extending transverse to the longitudinal members and mounted thereto, the retaining members being spaced apart from each other by not more than the length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members assisting in vertically aligning and positioning the blocks.

11. An apparatus according to claim 10, wherein at least some of the retaining members are vertically positioned so as to straddle the point of separation of adjacent courses of blocks intermediate the ends of the column thereby to assist in

the vertical alignment of the course of blocks above the point of separation and the course of blocks below the point of separation.

12. An apparatus according to claim 10 or claim 11, further including locating means on each retaining member for correctly locating the position of each block in the associated course of blocks relative to the retaining member and to the other blocks.

13. An apparatus according to claim 12, wherein the locating means comprises a plurality of rigid elements that are permanently mounted on the inside of each retaining member.

14. An apparatus according to claim 12, wherein the locating means comprises a plurality of pins that are removably inserted through each retaining member in a radially inward direction and are positioned between adjacent blocks of a said course of blocks in the column thereby to correctly position the adjacent blocks.

15. An apparatus according to claim 14, wherein each retaining member has said pins extending through it on each side of each block in the column whereby to correctly position all blocks.

16. An apparatus according to any one of claims 10 to 15, further including indenters for indenting or setting a block radially inwardly from an adjacent block and also from the associated retaining member so as to create a column with longitudinal grooves or indentations.

17. An apparatus according to claim 16, wherein the radial position of the indenters can be adjusted so as to vary the depth of the offset and thereby the depth of indentation in the formed column.

18. An apparatus according to any one of claims 10 to 17, wherein the longitudinal members and retaining members together form a cage, and the retaining members are in the form of rings having a substantially circular configuration.

19. An apparatus according to claim 18, wherein the cage has top and bottom retaining members and also at least one intermediate retaining member positioned between said top and bottom retaining members, and the top retaining member is positioned to overly the upper edge of the top course of blocks and the bottom retaining member is positioned to overly the lower edge of the bottom course of blocks, and each intermediate retaining member is positioned to overly the point of separation of adjacent courses of blocks.

20. An apparatus according to any one of claims 10 to 19, wherein each of the retaining members is slidably mounted on the longitudinal members so as to be longitudinally slidable at least to some extent along the length of the longitudinal member.

21. An apparatus according to claim 20, wherein each longitudinal member has a slot aperture and each retaining member is attached to each longitudinal member by passing a bolt through an aperture in the retaining member and then through the longitudinal slot aperture and then clamping the longitudinal member to the retaining member by means of a nut passed over the free end of the bolt.

22. A method of forming a column for use in a building structure, the method including:

a. providing a column forming apparatus as defined in claim 17 and a plurality of blocks;

b. positioning the apparatus where the column is to be formed;

c. laying one or more courses of blocks in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, the blocks being located by the retaining members of the column forming apparatus; and

d. filling the interior space with a settable material and allowing it to set.

23. A method according to claim 22, wherein the laying step includes adhering the blocks to each other by mortaring them to each other with a cementitious material and the settable material that is used to fill the interior space is also a cementitious material.

24. A method according to claim 22 or claim 23, wherein the positioning step comprises locating the apparatus around an axial support member, and rigidly mounting the apparatus to the axial member by means of a stabiliser extending between the apparatus and the support member.

25. A method according to claim 24, wherein the longitudinal members and retaining members form a cage that can be opened and closed along an axis extending in a longitudinal direction, and the step of positioning the apparatus includes either opening up the cage or else lowering it over the axially extending support member.

26. A method according to any one of claims 22 to 25, wherein said column has a plurality of courses of blocks and the method comprises laying a first course of blocks then filling the interior space of the first course with a settable material, and then repeating this procedure of laying the course and filling the interior space for succeeding courses of blocks until a column of desired height has been formed.

27. A method according to claim 26, further including the step of separating the cage from its attachment to the support member by removing the stabiliser and then opening up the cage and moving it out from its position surrounding the column.

28. A column for a building or structure produced according to the method claimed in claim 22.

29. A column according to claim 28, wherein the longest dimension of each block extends in the longitudinal direction.

30. A column according to claim 29, wherein substantially all of the blocks are made of autoclaved aerated concrete.

31. A column according to any one of claims 28 to 30, further including an axial member passing through the interior space of the column and projecting out through the ends of the column, and wherein the column is permanently and rigidly fixed to the axial member.

32. A column according to any one of claims 28 to 31, further including a render coating on the peripheral surface of the column, and further including a base mounted on the lower end of the column and a head mounted on the upper end of the column, both the base and the head projecting radially outwardly of the peripheral surface.

33. A combination comprising:

a column comprising a plurality of vertically stacked courses of blocks, each course comprising a plurality of blocks that are arranged in horizontal alignment with each other and in the form of a closed figure defining an interior space radially inward of the blocks, and wherein the blocks are adhered to each other by a settable material which is also used to fill in the interior space; and

an apparatus for forming the column comprising:

a plurality of elongate members extending longitudinally with respect to the column and adapted to be spaced apart from each other around the column; and

a plurality of retaining member extending transverse to the elongate members and mounted thereto, the retaining members spaced apart from each other by not more than a length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members assisting in vertically aligning and positioning the blocks in an adjacent course and also holding the blocks in place while the column is being built.

34. The combination according to claim 33, wherein at least one of the retaining members is vertically positioned so as to straddle a point of separation of adjacent

courses of blocks intermediate the ends of the column thereby to assist in the vertical alignment of the course of blocks above the point of separation and the course of blocks below the point of separation.

35. The combination according to claim 33, further including locaters on each retaining member for laterally locating the position of each block with each associated course of blocks.

36. The combination according to claim 35, wherein each locater projects into a space between adjacent blocks in the course of blocks, thereby to laterally position the blocks on either side of said space.

37. The combination according to claim 36, wherein each locater comprises a pin that is removably inserted through each retaining member in a radially inward direction and into each said space between adjacent blocks and each said retaining member has said pins extending into each said space between adjacent blocks in the course to correctly position all the blocks in the course.

38. The combination according to claim 33, further including indenters for indenting or setting a block radially inwardly from an adjacent block and also from the associated retaining member so as to create a column with longitudinal grooves or indentations.

39. The combination according to claim 38, wherein the radial position of the indenters can be adjusted so as to vary an offset depth of an indented block.

40. The combination according to claim 33, wherein the retaining members are in the form of rings each having a substantially circular configuration and the elongate members and retaining members together form a cage.

41. The combination according to claim 40, having an intermediate retaining member overlying each point of separation of adjacent courses of blocks up the

height of the column whereby to align and position the blocks of all the courses in the column.

42. The combination according to claim 33, wherein the plurality of retaining members comprises top and bottom retaining members and also at least one intermediate retaining member positioned between said top and bottom retaining members, and the top retaining member is positioned to overlie a top course of blocks and the bottom retaining member is positioned to overlie a bottom course of blocks, and at least one intermediate retaining member is positioned to overlie a said point of separation of two adjacent courses of blocks.

43. The combination according to claim 33, further including slide formations on the elongate members for permitting the retaining members to slide longitudinally on the elongate members at least to some extent, so as to permit the retaining members to be positioned straddling a point of separation of the adjacent courses of blocks.

44. The combination according to claim 33, further comprising:

slide formations on the elongate members for permitting the retaining members to slide longitudinally on the elongate members, wherein each slide formation is formed by each elongate member having a slot aperture, and the retaining members are mounted to the elongate members by a bolt passed through an aperture in the retaining member and then through the slot aperture in the elongate member, and a fastening nut passed over the free end of the bolt whereby loosening of the nut permits relative movement of the retaining member and the elongate member.

45. A method of forming a column for use in a building structure, the method including:

providing an apparatus for use in forming a column from a plurality of courses of blocks, the apparatus including a plurality of elongate members adapted to extend longitudinally with respect to the column and adapted to be spaced apart from each other around the column; a plurality of retaining members extending transverse to the elongate members and mounted thereto, the retaining members adapted to be

spaced apart from each other by not more than the length of the blocks such that there is at least one retaining member for each course of blocks, the retaining members adapted to assist in vertically aligning and positioning the blocks; and indenters for indenting or setting a block radially inwardly from an adjacent block and also from an associated retaining member so as to create a column with longitudinal grooves or indentations, and wherein the radial position of an indenter can be adjusted so as to vary an offset depth of an indented block;

providing a plurality of courses of blocks;

positioning the apparatus where the column is to be formed;

laying one or more of the courses of blocks in the form of a closed figure forming a peripheral surface of the column and defining an interior space radially inwardly of the blocks, the blocks being located by the retaining members of the column forming apparatus; and

filling the interior space with a settable material and allowing it to set.

46. A column for a building or structure substantially as herein described in the detailed description of the preferred embodiments with reference to the drawings.

47. An apparatus for use in forming a column from a plurality of courses of blocks substantially as herein described in the detailed description of the preferred embodiments with reference to the drawings.

48. A method of forming a column substantially as herein described in the detailed description of the preferred embodiments with reference to the drawings.

DATED THIS THIRTIETH DAY OF SEPTEMBER 2005

CLASSIC COLUMNS AUSTRALIA PTY LTD

BY

PIZZEYS PATENT AND TRADE MARK ATTORNEYS

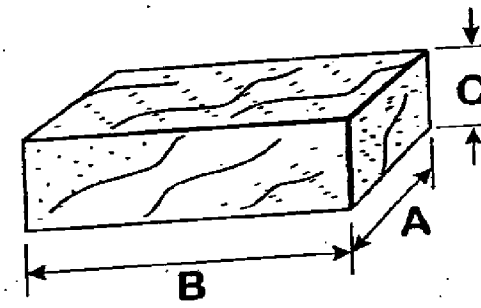

Fig. 1A

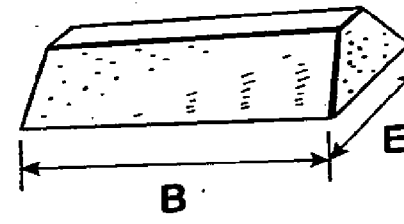

Fig. 1B

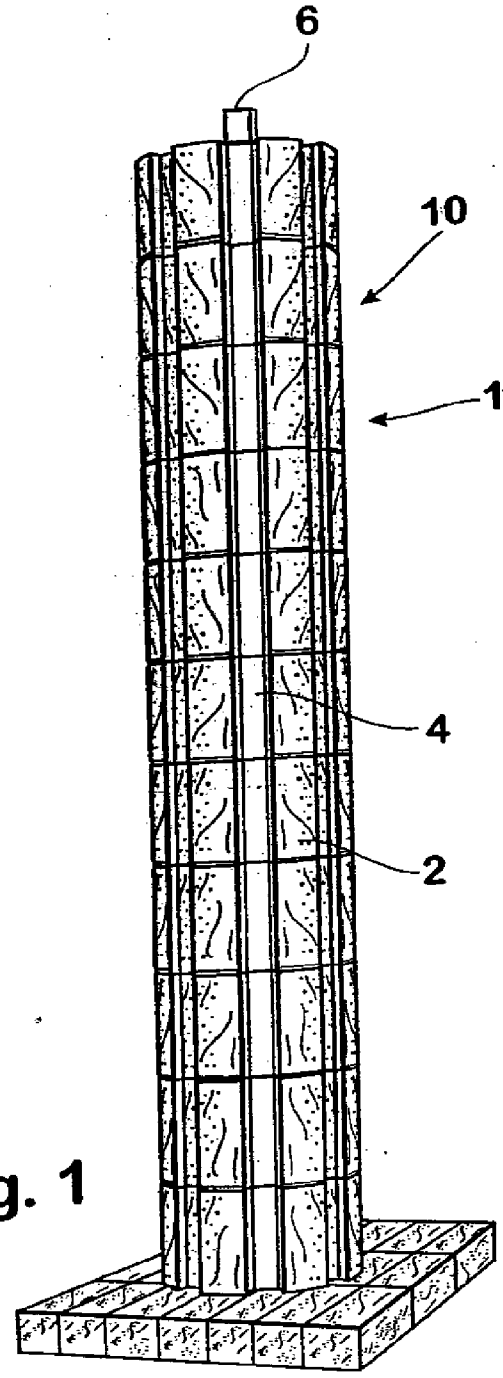

Fig. 1

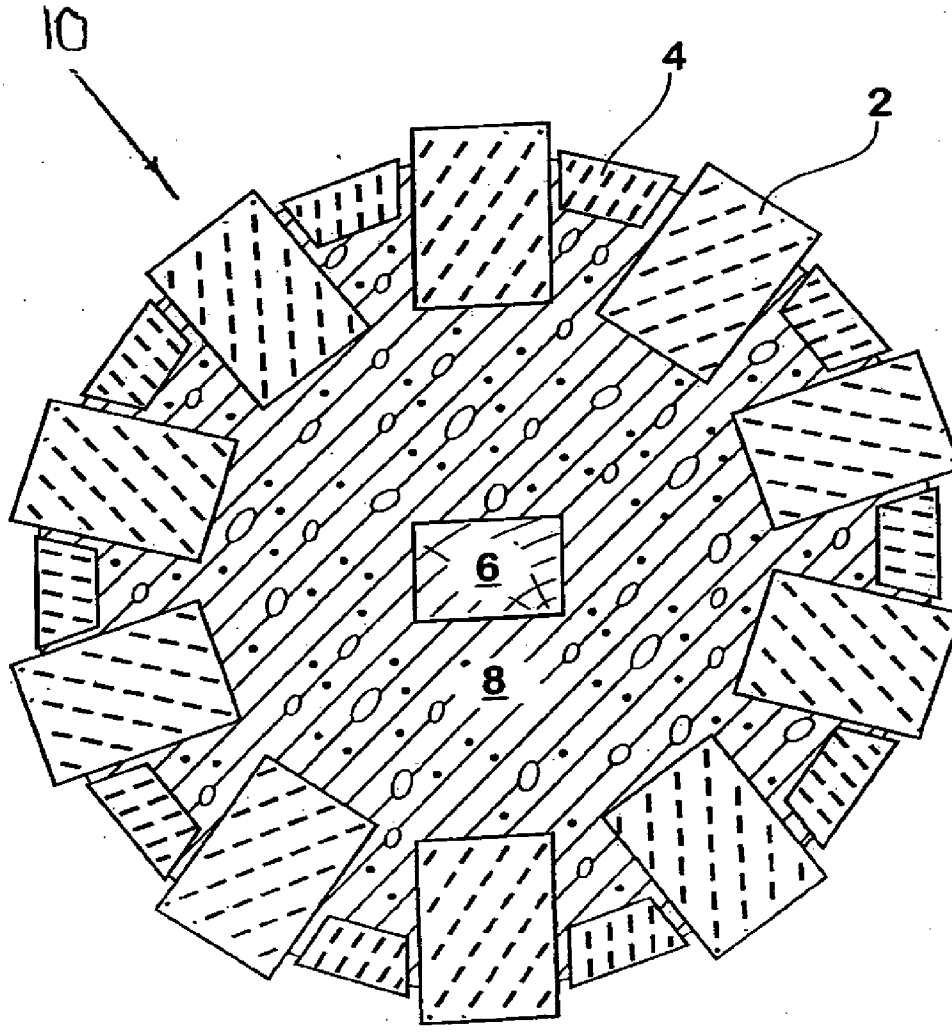

Fig. 2

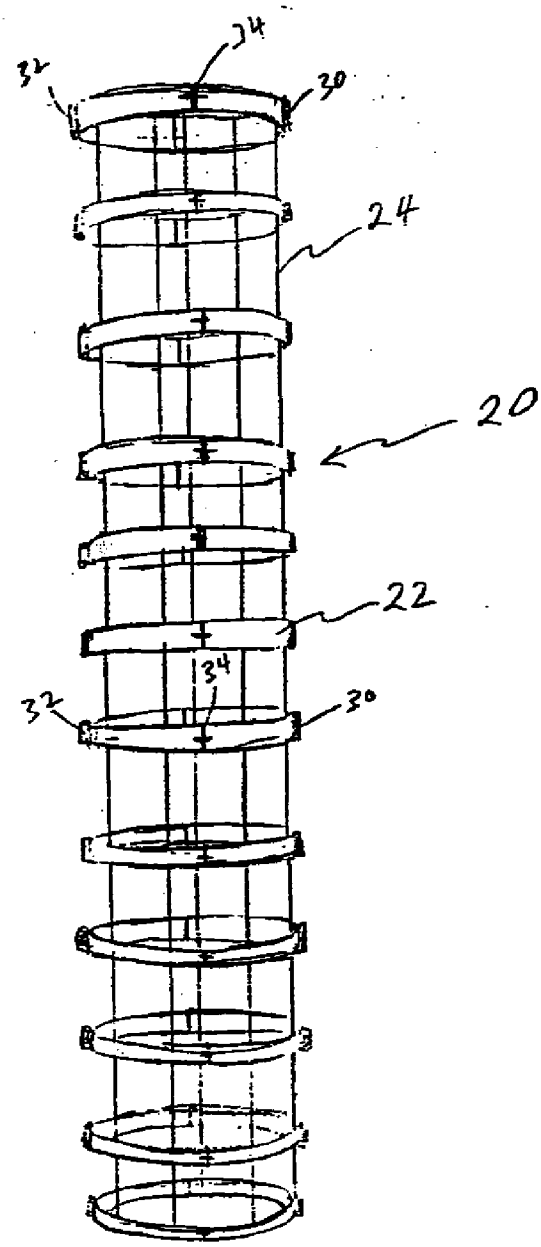

Fig 3

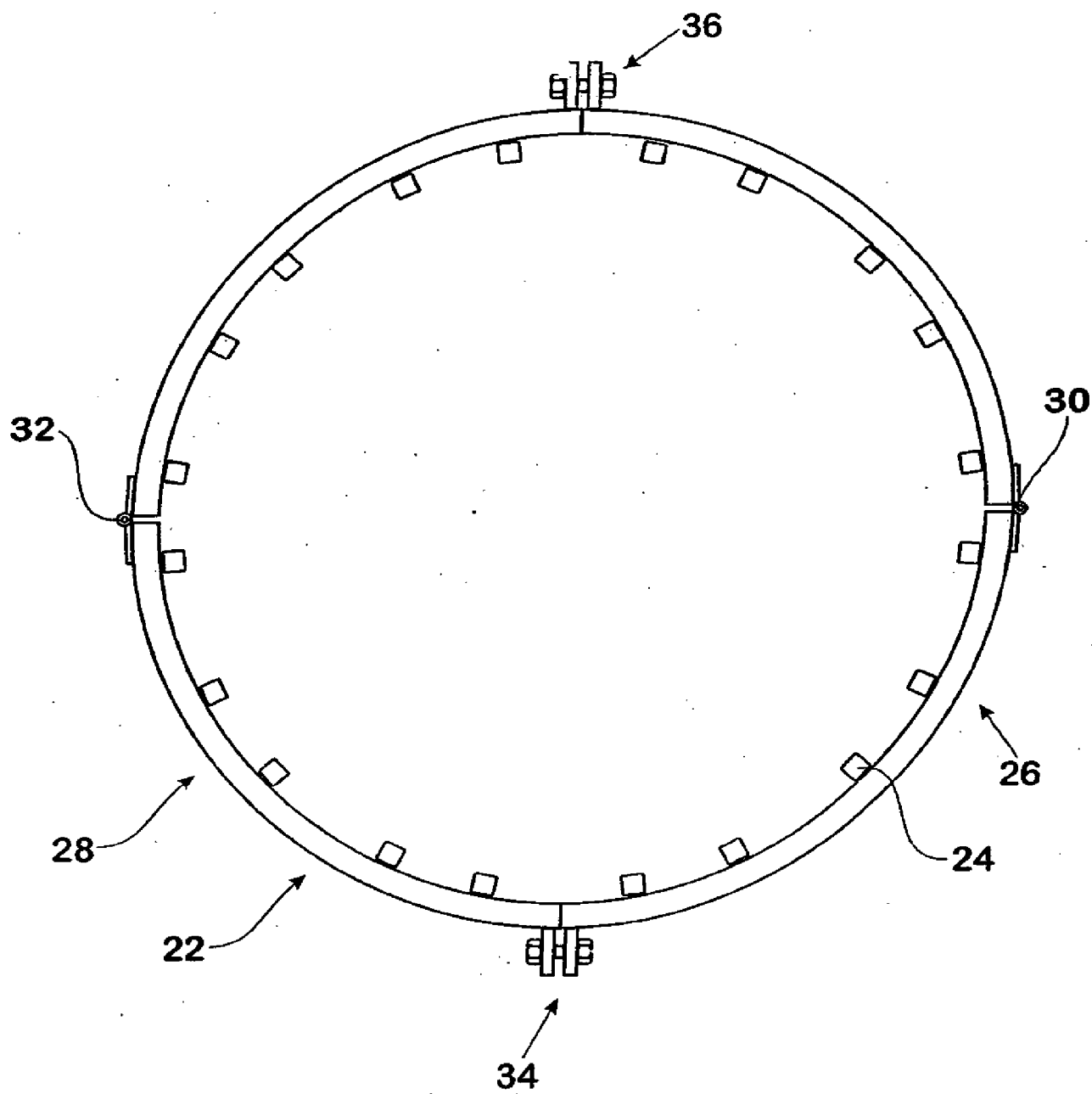

Fig. 4

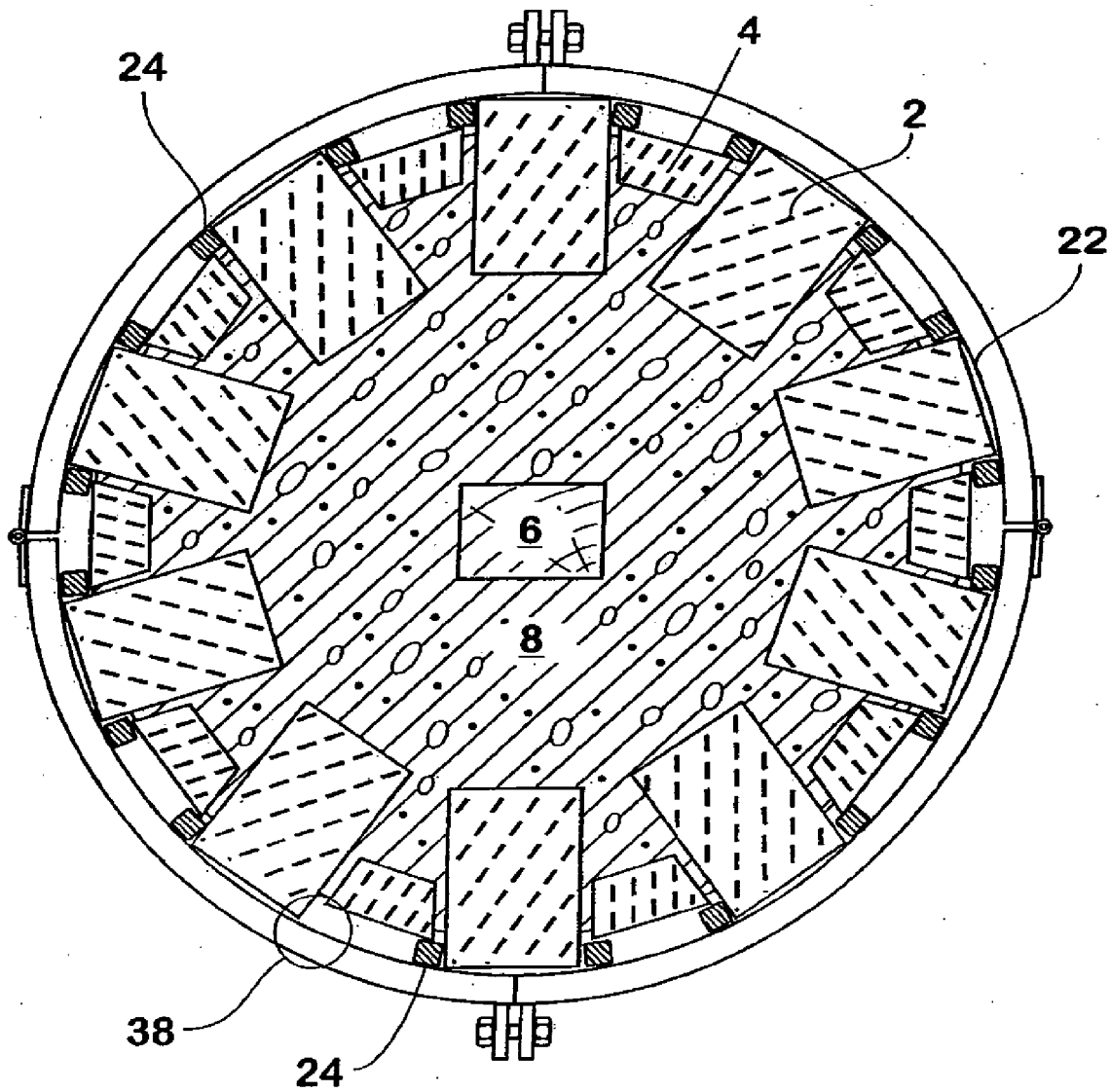

Fig. 5

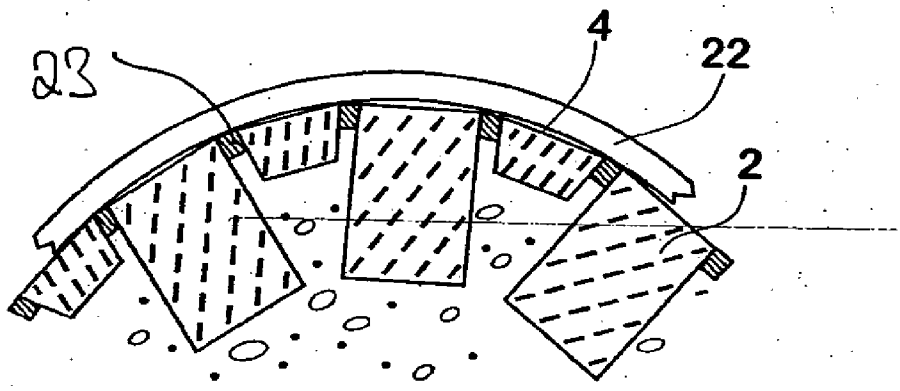

Fig. 5A

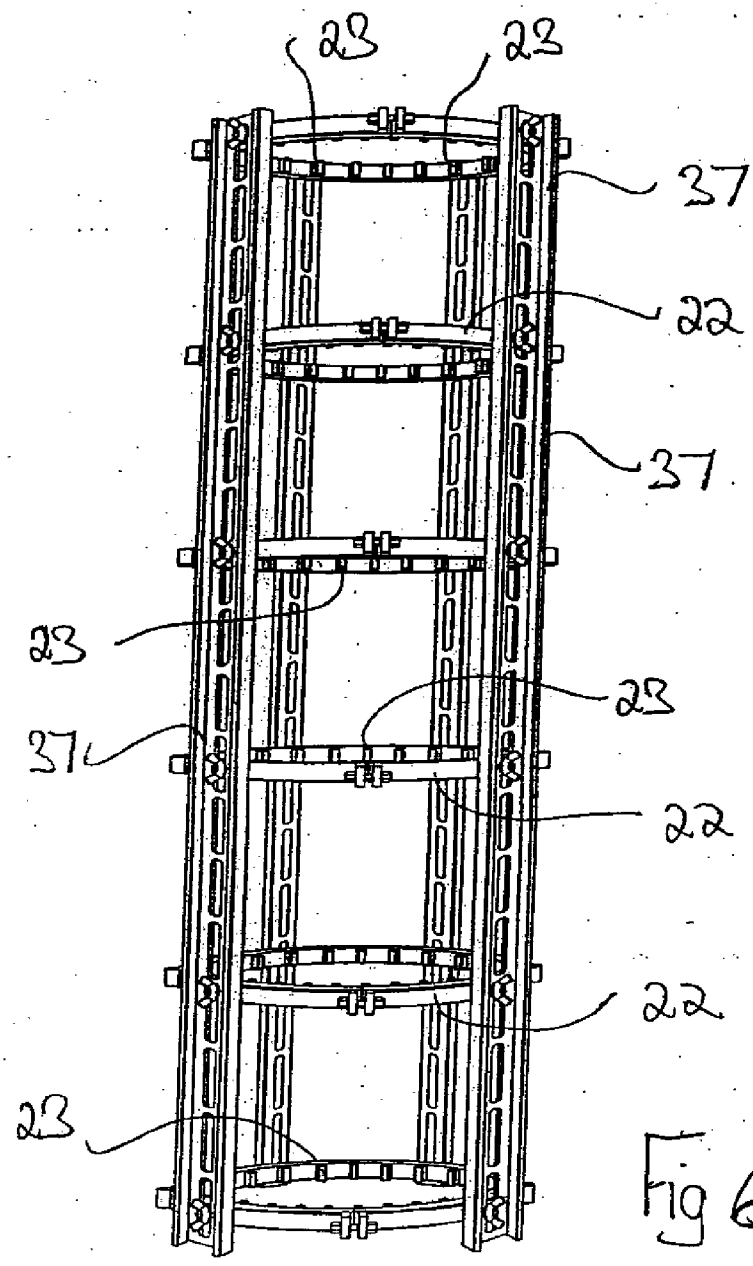

Fig 6

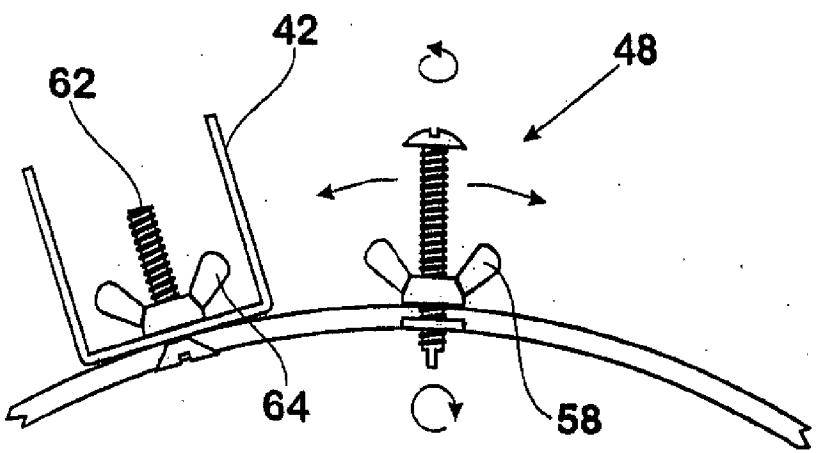

Fig. 8

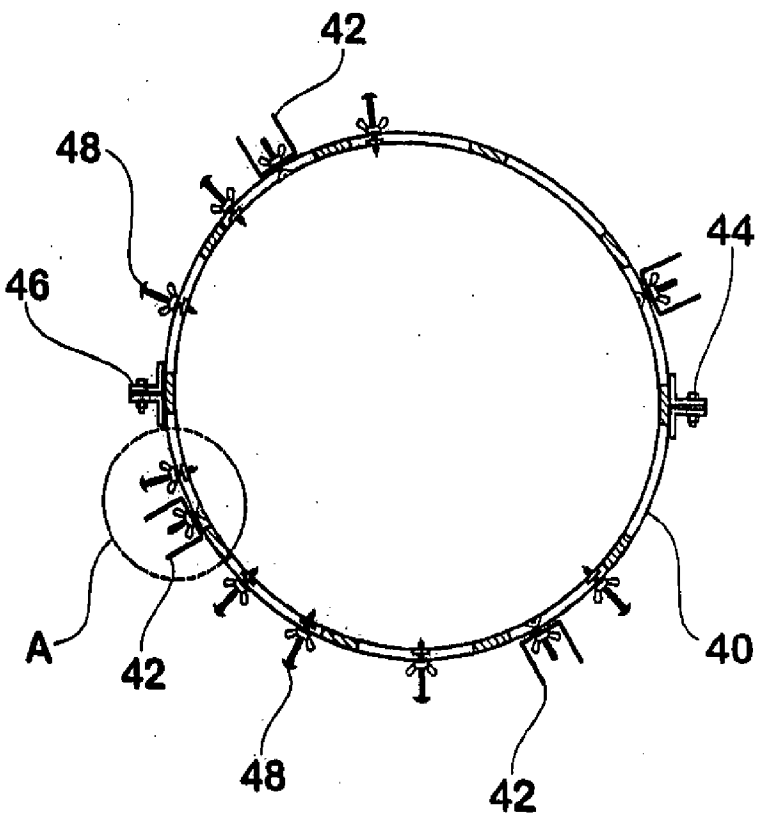

Fig. 7

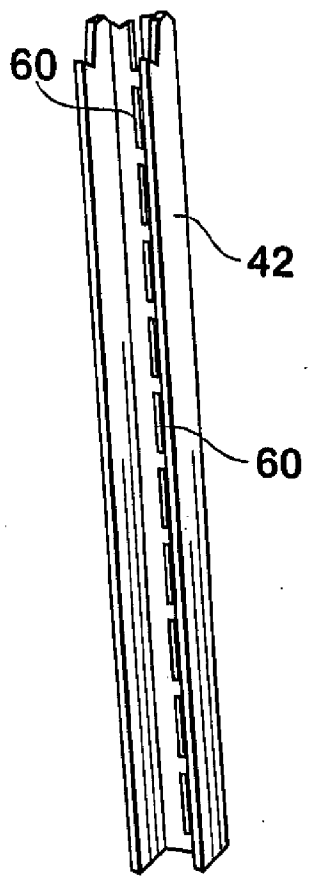

Fig. 9

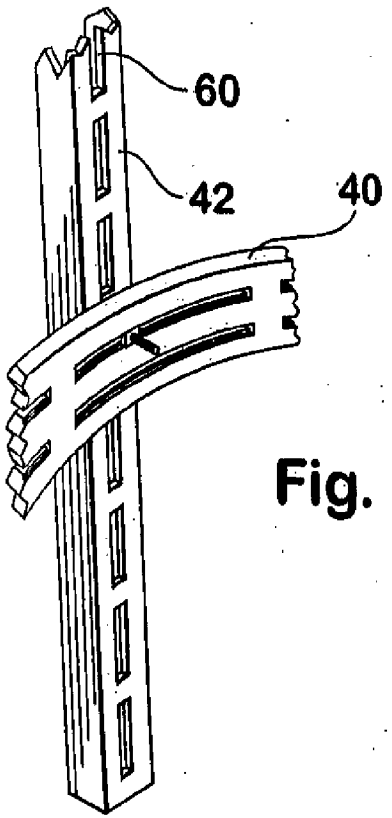

Fig. 10

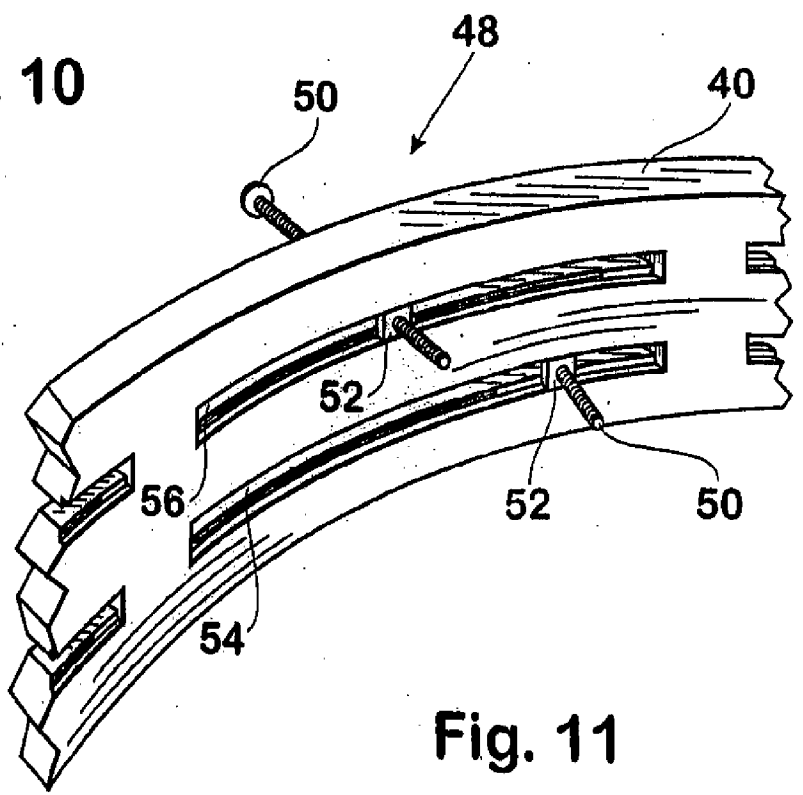

Fig. 11

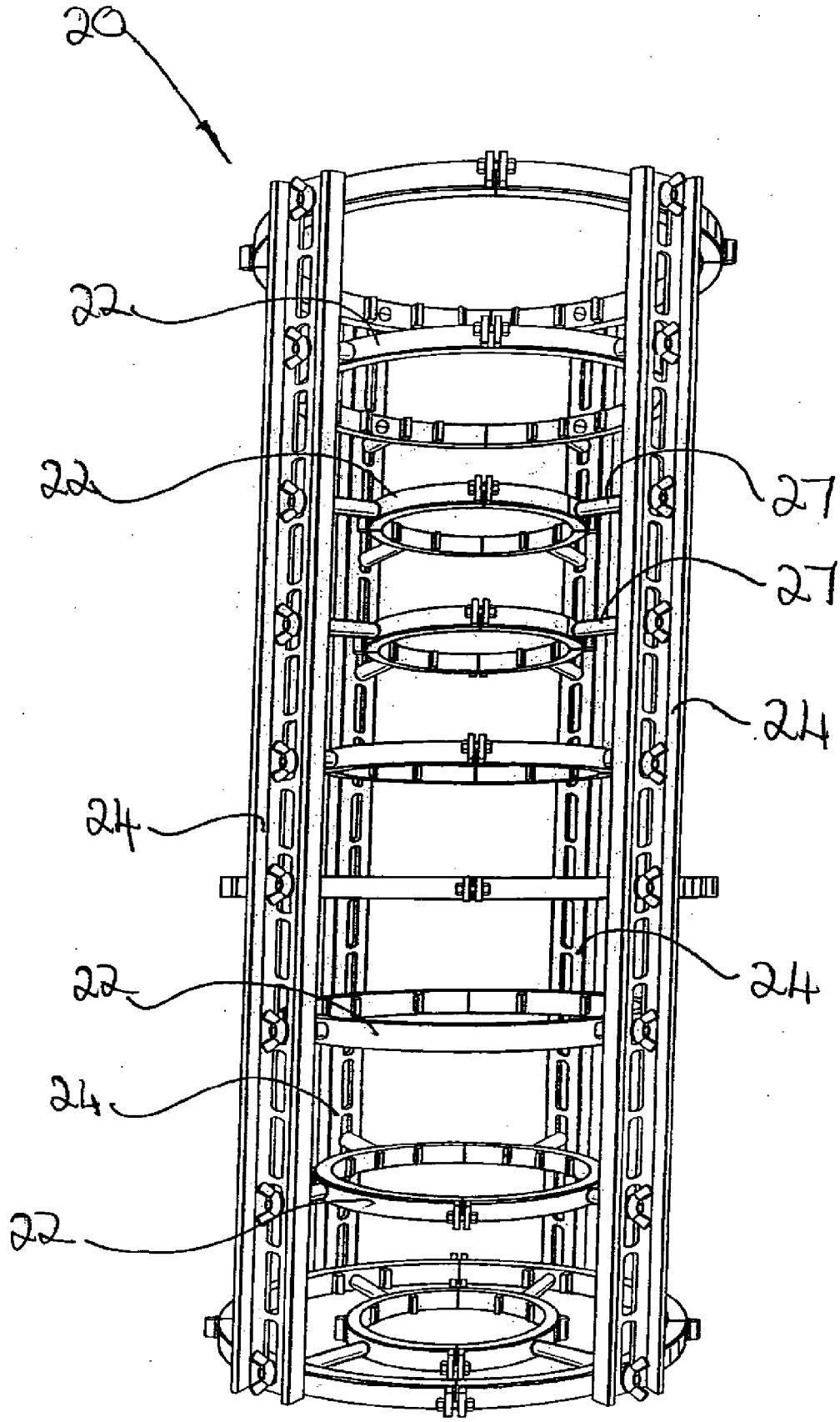

Fig 12

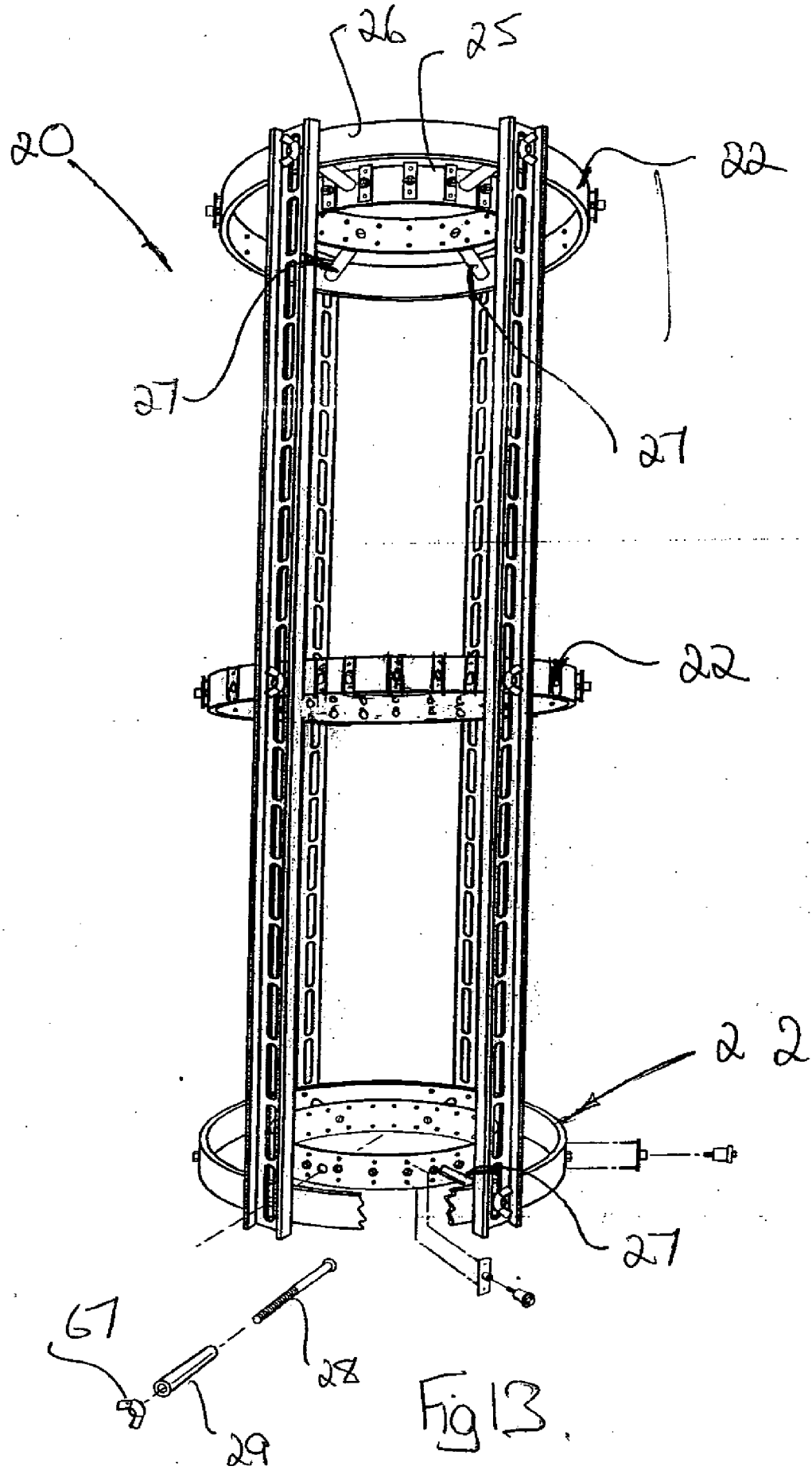

Fig 13.

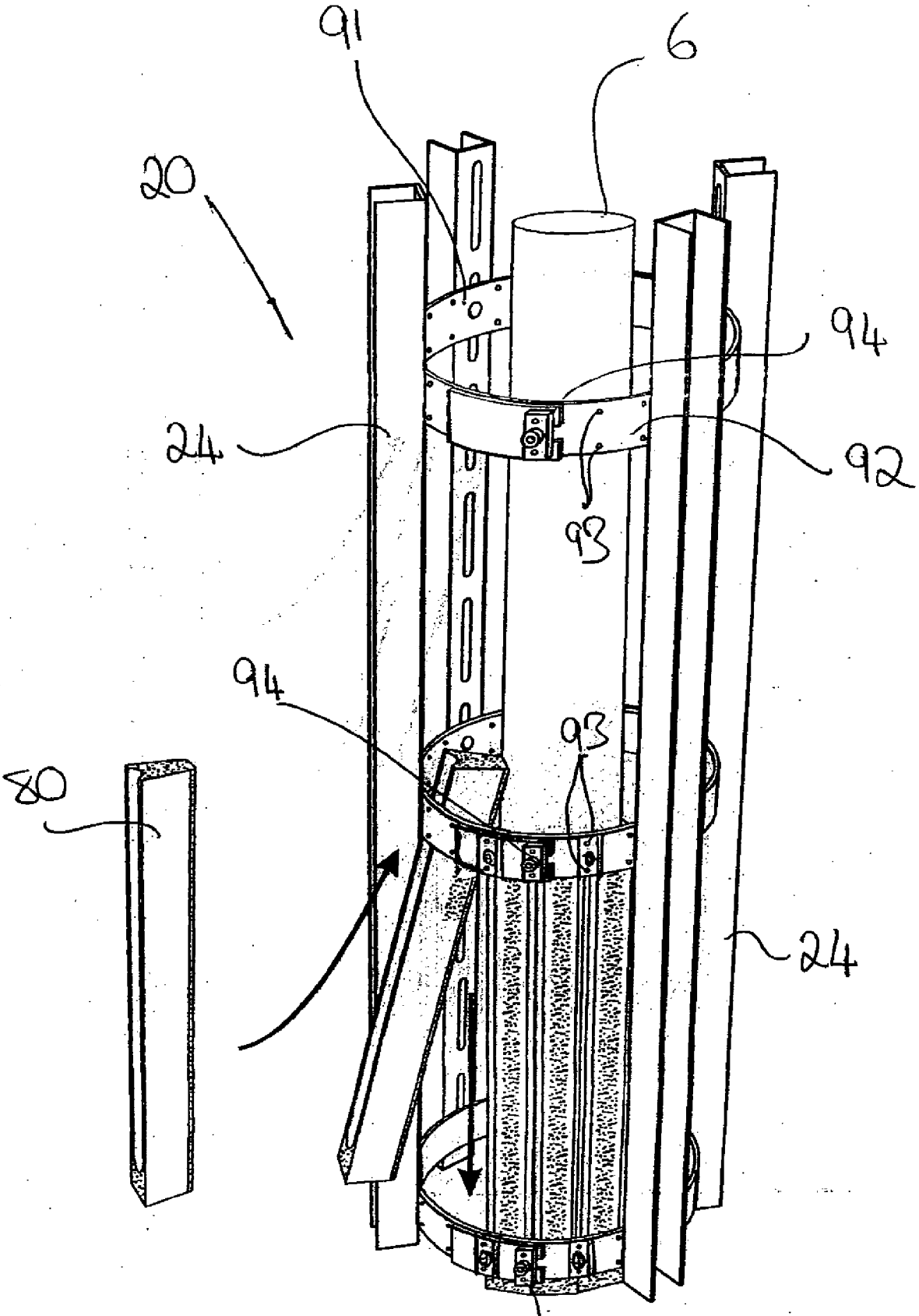

Fig 14A.

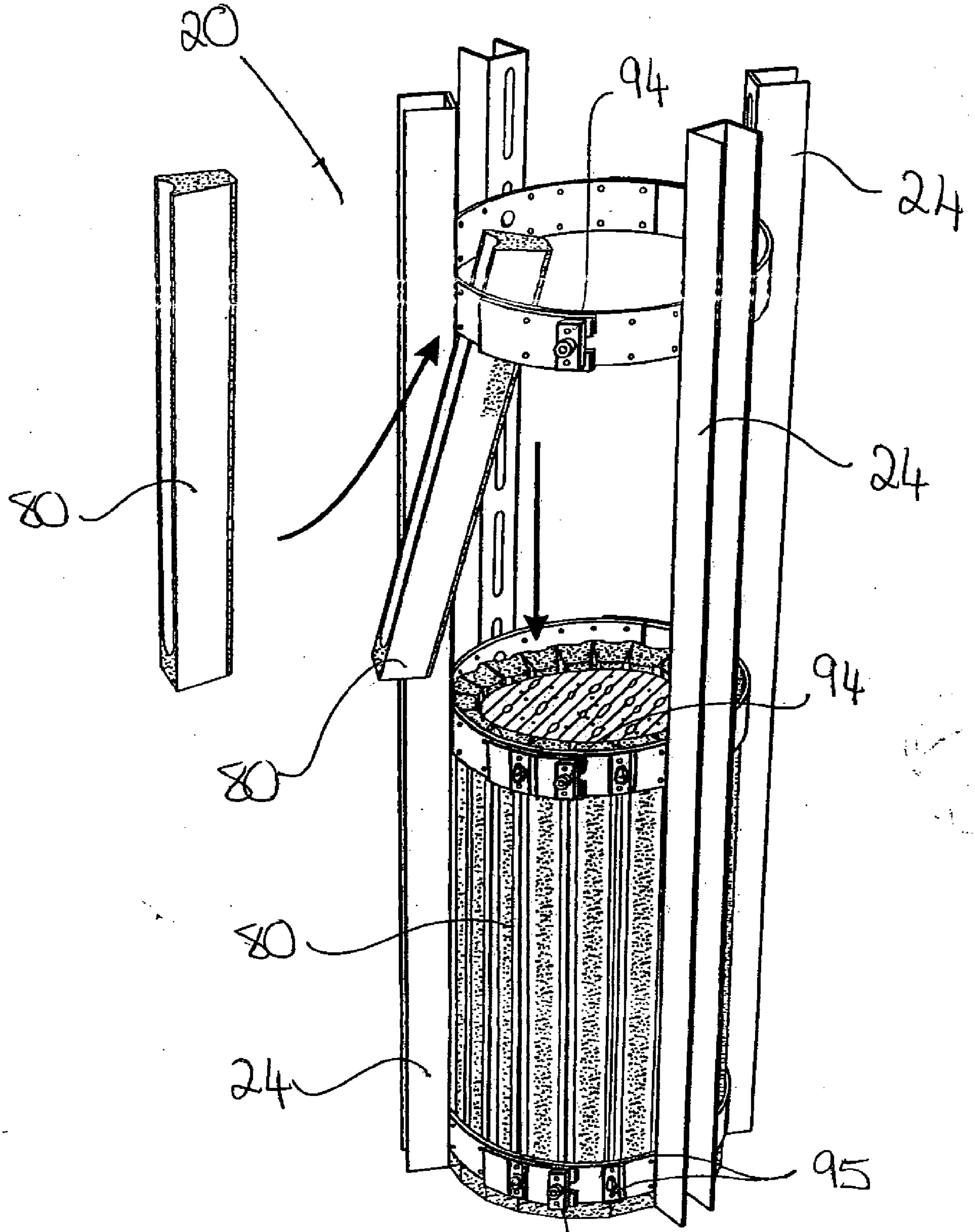

Fig 14B

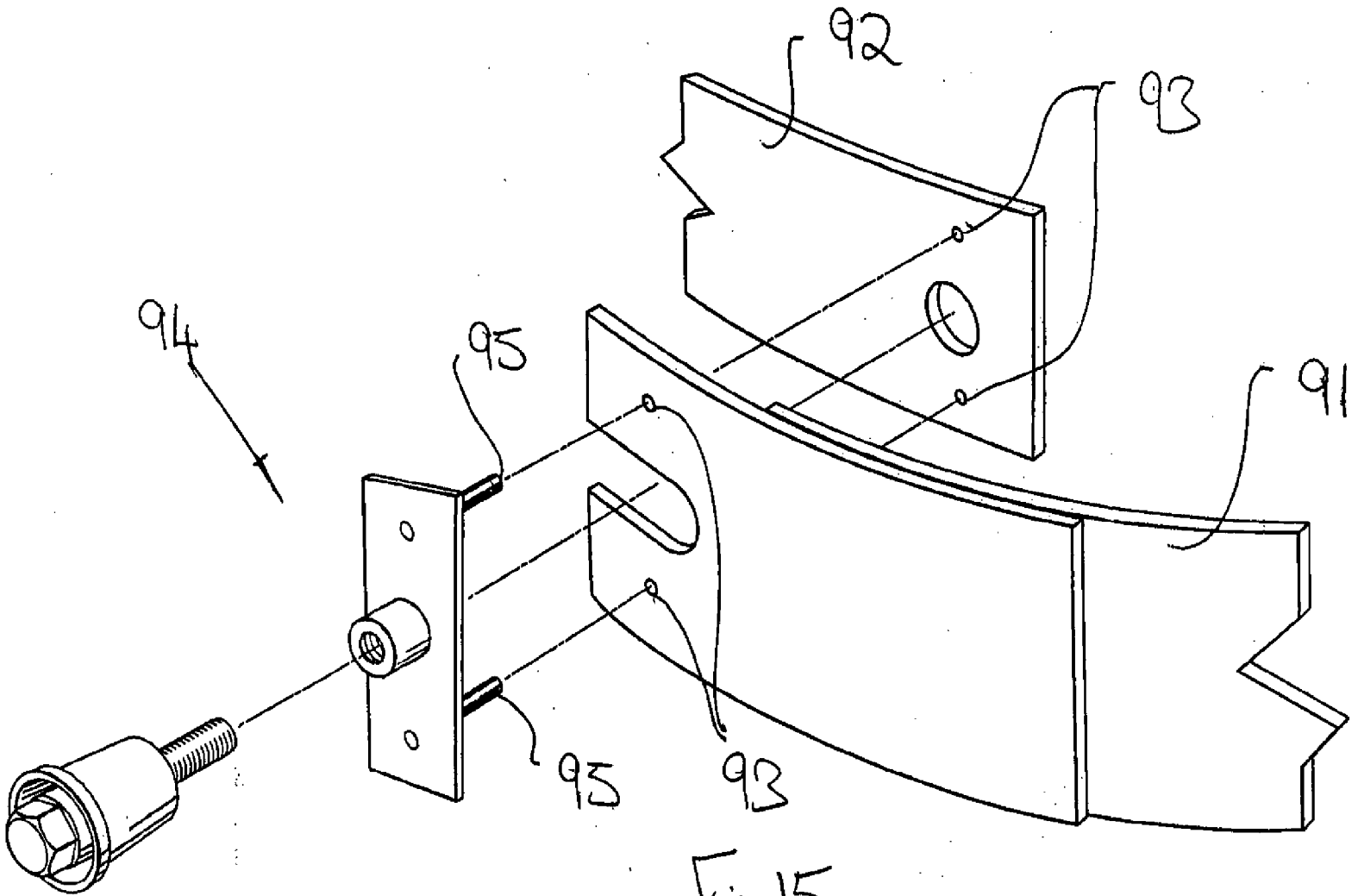

Fig 15