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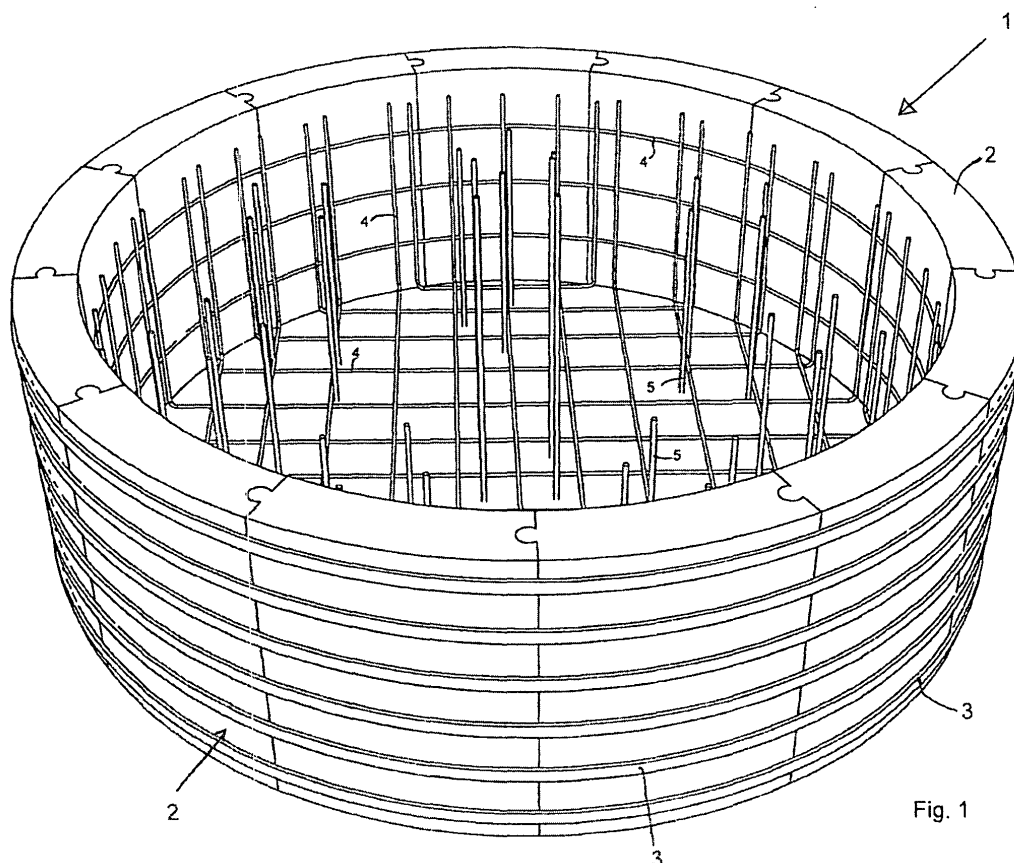
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(54) **Method and device for constructing a base or pouring a column**

(57) The present invention relates to a method for constructing a base or pouring a column, comprising the steps of placing a formwork and pouring concrete into

the formwork, wherein a formwork of foam material is provided. The invention further relates to a formwork and to a formwork element for use in such a method.



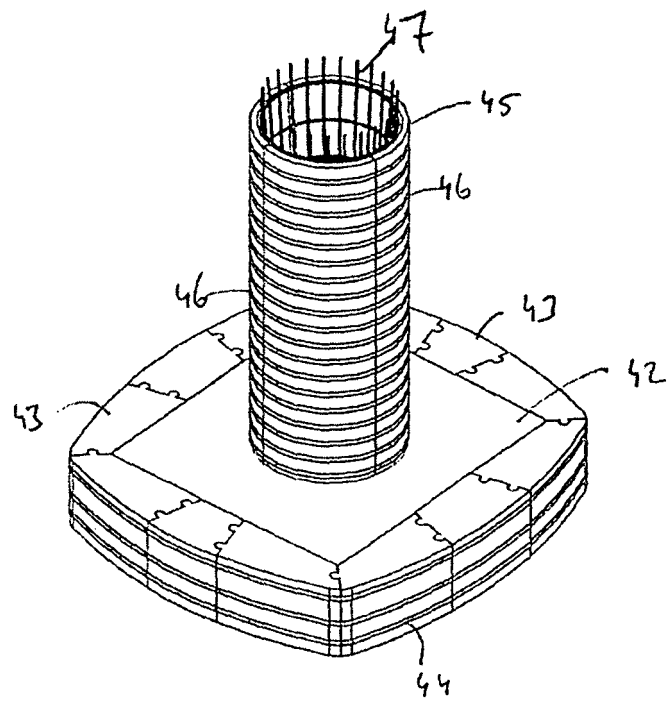


Fig 6

Description

[0001] The present invention, according to a first aspect thereof, relates to a method for constructing a base or pouring a column, comprising the steps of placing a formwork and pouring concrete into the formwork.

[0002] In a known method for constructing a base, a formwork of wood and metal is constructed on-site, into which formwork concrete in the form of mortar is subsequently poured. After the concrete has set, the formwork is removed.

[0003] A drawback of the known method is that the construction and subsequent removal of the formwork is labour-intensive and heavy work. Moreover, the placing of a formwork takes relatively much time.

[0004] Accordingly it is an object of the present invention, according to a first aspect thereof, to provide a method as described in the introduction which makes it possible to construct a base in a less labour-intensive manner and/or with a relatively short lead time. This object is accomplished by the present invention in that a formwork at least substantially of foam material is provided. Foam material is easy to produce in desired shapes, so that a formwork can be prepared such that it can be quickly erected at the desired location. Add to this the fact that a mould of any desired shape, including complex shapes, for a column having a relatively complex shape can be made of foam material in a simple manner, for example by milling a desired shape from a column of foam material. The circumferential edge of the column can be left intact in that case, so that it can provide sufficient resistance against the pressure exerted by the mortar for the column that is poured into the mould. In addition, foam material is light in weight and thus easy to transport to the building site, even if the ground surface surrounding the location in question is not suitable for transporting relatively heavy loads over said surface. When the known method is used, heavy equipment is frequently needed for transporting the materials and/or cranes are used in practice for moving the materials to the desired location. The object of the invention is thus accomplished.

[0005] It is preferable if the formwork is made of at least one circumferentially closed formwork element. A formwork element whose circumferential wall is not interrupted offers a first resistance against the force exerted on the circumferential wall by the concrete mortar in the formwork in question. Thus, no additional support, or at least less than in the case of formwork not having a closed circumferential wall, is needed to prevent the mortar from driving the formwork apart.

[0006] If the formwork comprises an integral formwork element, the formwork can be filled up with mortar after being positioned. Because a formwork of a foam material having a low specific weight is relatively light in weight, it is possible to construct a relatively large formwork which is nevertheless relatively easy to handle. This makes it possible to take maximum advantage of the benefits provided by a formwork element according to the present

invention at least upon placing a formwork.

[0007] In a preferred embodiment of the present invention, the formwork is built up of formwork elements. Although it is possible to provide the formwork as one whole, of course, it is often preferable, in view of the frequently relatively large dimension, the transportation and handling of such a formwork, to use a formwork of modular construction.

[0008] In a preferred embodiment of the present invention, the formwork is built up of formwork elements which are at least substantially identical in shape. If the formwork elements are substantially identical in shape, the formwork elements can be arranged in random order for forming the formwork.

[0009] To prevent leakage between two formwork elements, the side walls of the formwork elements are preferably provided with a contour for realising a form-locked connection. In a preferred embodiment, the contour of one formwork element interlocks with the contour of the adjacent formwork element, with adjacent formwork elements being moved one into another from the top down.

[0010] To support the formwork when mortar is being poured, it is preferable if at least one bracing strap is provided around the formwork before mortar is poured into the formwork. Said at least one bracing strap will possibly hold the formwork elements even better in place than in the situation in which a bracing strap is not used.

[0011] If the formwork is used as a permanent formwork, no operations for dismantling and carrying off the formwork will be required. A formwork of foam material can even function as insulation material in such a case.

[0012] After the mortar has set, it is possible to remove formwork elements only at those locations where a connection of the base with another building element is to be realised. When the bracing strap is slightly slackened, for example, a formwork element can be slid vertically out of the formwork from its position between two adjacent formwork elements, exposing set mortar at the circumferential edge of the base so as to realise such a connection, for example with a concrete foundation.

[0013] In a preferred embodiment of the present invention, a formwork having an at least substantially circular outer circumference is placed. In the case of a circular outer circumference, the largest distance between the centre of the base or the column and the outer circumference of the formwork is minimal, so that there is no need to take up unnecessarily high forces when mortar is being or has been poured into the formwork.

[0014] If the formwork is made in the form of a prefab element and placed as one whole, the number of operations to be carried out on-site is minimised.

[0015] In a preferred embodiment of the present invention, a formwork for a structure to be supported by the column is positioned at the same time. The formwork for the structure to be supported may also comprise foam material, but it may just as well be made of another material. The formwork of plastic material for the column can (help) support the formwork for the structure to be

supported by the column.

[0016] An effective method is provided if the mortar for the structure to be supported by the column is poured together with the mortar for the column, or after the mortar for the column has set. It is just as well possible, of course, to pour a foundation for the column as well as the column itself in one operation.

[0017] The present invention, according to a second aspect thereof, relates to a formwork for constructing a base or pouring a column. Such a known formwork has already been discussed in the introduction of the present document with reference to the known method and the drawbacks thereof. Accordingly it is an object of the present invention, according to the second aspect thereof, to provide a formwork as referred to in the first sentence of this paragraph by means of which the aforesaid drawbacks can be eliminated. According to the invention, this object is accomplished in that the formwork comprises one or more formwork elements at least substantially made of foam material, which, in use, at least substantially define(s) the circumference of a base to be constructed or a column to be poured. Formwork elements at least substantially made of foam material, for example EPS, offer a very great freedom of design. The second aspect of the present invention thus makes it possible to configure the formwork elements such that, in use, a formwork for a base to be constructed or a column to be poured is formed in a simple and reliable manner by said elements. In addition, formwork elements of foam material are relatively light in weight. Thus the construction of a formwork for a base or a column can be simplified and made easier to a significant degree.

[0018] To provide a substantially seamless joint between two adjacent formwork elements, it is preferable if two adjacent formwork elements have corresponding boundary surfaces. This can be realised, for example, by removing an inner portion of the circumferential wall of one of the formwork elements over a certain height and removing an outer portion of the circumferential wall of the corresponding formwork element over the same height, so that the two portions fit together.

[0019] It is preferable in that case if opposite boundary surfaces interlock in such a manner as to offer resistance against the force exerted by mortar which is being or has been poured into the formwork and which tends to force the formwork outwards.

[0020] To achieve a good, reliable and durable connection of two adjacent formwork elements, it is preferable if two adjacent formwork elements are connected by means of a projection/groove joint.

[0021] Preferably, the formwork elements are at least substantially made of EPS. EPS exhibits a combination of properties which are advantageous for use as formwork, such as a low specific weight, durability, moisture resistance and a high compressive strength and shape stability, so that it is capable of taking up pressures of up to 10 tonnes per square metre.

[0022] Preferably, the formwork elements are provided

with a coating, for example consisting of plastic material, preferably polyurea, at least on the side facing the base or the column. Said coating, which may in fact consist of any material that reduces the adhesion between the mortar and the formwork elements, functions to prevent the formwork from adhering to the mortar, so that the formwork elements can be readily removed after the mortar has set so as to enable repeated use of the formwork elements.

[0023] To provide an adequate resistance against the pressure exerted by mortar being poured into the formwork, the wall of the formwork is preferably at least 180 mm thick.

[0024] The present invention will now be explained in more detail with reference to the appended drawings, in which:

Figure 1 is a perspective view of a preferred embodiment of a formwork according to the present invention;

Figure 2 is a perspective view of the formwork of figure 1 being built;

Figure 3 and figure 4 show different variants of embodiments of the present invention;

Figure 5A is a perspective view of a column according to the present invention;

Figure 5B is a perspective view of an alternative embodiment of a column according to the present invention;

Figure 6 is a perspective view of a formwork for a column according to figure 1A;

Figure 7 is a perspective view of a column with reinforcement after the formwork has been removed; and

Figure 8 is a perspective top plan view of columns supporting a formwork for a road surface to be supported by the columns.

[0025] With reference to figure 1, there is shown a preferred embodiment of a formwork 1 for a round base according to the present invention. Formwork elements 2 are surrounded by bracing straps 3. Reinforcement 4 is provided within the formwork, and reinforcing bars 5 project from piles (not shown in figure 1) present in the ground.

[0026] Figure 2 shows a phase in the construction of the formwork 1 of figure 1 from formwork elements 2 around piles 6 with reinforcing bars projecting therefrom. In figure 2, lateral surfaces 7, 8 provided with a recess 9 and a projecting part 10 can be distinguished.

[0027] Figure 3 and figure 4 show alternative embodiments of a formwork 21, 31 for a square base and a triangular base, respectively.

[0028] Now referring to figures 1 and 2, there is shown a formwork 1 for a base to be constructed. The formwork 1 is built up of identical, interlocking EPS (Expanded Polystyrene) formwork elements 2. The formwork elements 2 are arcuate in shape, so that a series of connected

formwork elements 2 form a formwork 1 having the shape of a circular arc. At their abutting lateral surfaces 7, 8, the formwork elements 2 are provided with a recess 9 and with a projecting part 10 corresponding to said recess for forming a so-called projection/groove joint between two adjacent formwork elements 2. A formwork element must be vertically slid into the recess 9 of the adjacent formwork element 2 with its projecting part 8, at least in the embodiment shown in figure 2. As a result, two adjacent formwork elements 2 are secured in horizontal direction relative to each other.

[0029] Once all the formwork elements 2 have been placed, a closed EPS formwork 1 having the shape of a circular arc is constructed around the piles 6. In the illustrated embodiment, bracing straps 3 are arranged around the formwork 1 (see figure 1) for the purpose of strengthening the formwork additionally against an outward pressure exerted by concrete to be poured. In addition, reinforcement 4 for the base to be constructed is provided in the formwork. The reinforcing bars 5 projecting from the piles 6 within the formwork 1 function to provide a solid connection between the piles 6 on the one hand and the base to be constructed on the other hand. Once the formwork 1, possibly provided with bracing straps 3 and reinforcement 4, has been provided, mortar can be poured into the formwork 1. After the mortar has set, the base is complete and the formwork 1 can be entirely or partially removed, if desired.

[0030] The invention is not limited to formwork for circular bases. Figures 3 and 4 show two variants of a formwork 21 and 31, respectively, for constructing a square base and a triangular base, respectively. Also differently shaped bases can be constructed using a formwork according to the present invention. In the embodiments of figures 3 and 4, the formwork elements 22 and 32, respectively, are not identical in shape. Because it is preferable to use a formwork having a circular outer circumference for a base, inter alia with a view to taking up the pressure exerted by the concrete to be poured, the formwork elements 22, 23 of this embodiment are relatively thick. However, because EPS has a very low specific weight, this is hardly a problem. The formwork elements 22, 23 are larger than in the embodiment shown in figures 1 and 2, to be true, but because of the low weight they are nevertheless easy to handle.

[0031] Now referring to figure 5A, there is shown a perspective view of a downwardly tapering column 41 of circular cross-section constructed in accordance with the present invention. The column 41 is supported on a square base 44, which is surrounded by EPS formwork elements 43, around which bracing straps are provided.

[0032] Figure 5B shows an alternative embodiment of a column 51 of square cross-section according to the invention. The column 51 has the shape of a so-called twisted beam. Such a shape is difficult to realise by means of traditional formwork elements. The column 51 is also supported on a base 52, which is surrounded by formwork elements 53, around which bracing straps 54

are provided.

[0033] The column 41 shown in figure 5A is built on a base 42 constructed by means of formwork elements 43, as is shown in figure 6. After the concrete mortar poured into the formwork of the base 44 had set, a formwork 45 for the column was placed. The formwork 45 is in the form of a hollow tube, whose outer circumference increases from the top down and whose inner circumference decreases from the top down. As a result, the wall of the formwork element 45 increases in thickness from the top down. The reason for this is that, prior to setting, concrete poured into the formwork 45 will exert a larger pressure on the wall of the formwork 45 at the bottom of the formwork 45 than at the top of the formwork 45. The formwork is surrounded by bracing straps 46, which impart extra strength to the EPS formwork against the pressure of concrete mortar to be poured into the formwork 45. Suitable reinforcement 47 is provided inside the formwork 45.

[0034] It will be understood that a column as shown in figure 5B, or a column of any shape can be constructed in a simple, comparable manner using an EPS formwork. A skilled person in the field of EPS will know how to "cut" a desired internal and external shape from a block of EPS. Although a single formwork in the form of one tube is shown and described in the examples, it is possible to build up the formwork from formwork elements. This can be done in a similar manner as with the formwork for the base. If formwork elements having a continuous circumferential edge are used, however, said formworks will as a rule be better able to withstand the pressure exerted by the concrete mortar.

[0035] Figure 7 shows the column 41 after the removal of the bracing straps 46 and the formwork 45.

[0036] Figure 8 shows a perspective top plan view of a supporting structure for a road surface, which has been constructed by using a method according to the present invention. A number of columns 41 supported on bases 44 have been constructed in a manner as described in the foregoing. Furthermore, columns 61 on bases 62 have been constructed in a similar manner as the columns 41 and the bases 42. The columns 61 extend over a greater length than the columns 41, however. Accordingly, a formwork similar to the formwork used for the bases 42 has been used for these columns. That is, side-by-side, interlocking formwork elements, around which bracing straps are provided. After setting of the concrete of the columns 41, 61, a supporting surface was provided on the columns 41, 61 using wooden panels 43 (only a small part of which is shown in figure 8). An EPS formwork is glued on the wooden panels 63. The formwork has two relatively high parts 64, 66 and a relatively low strip 65, into which concrete for a road surface is to be poured. A pattern for a horizontal support has been cut from the formwork 64, 65, 66. As a result, the wooden panels and the short sides of the columns 41 on which the wooden parts are partially supported are visible. When concrete is poured into the recesses in the formwork 64, 65, 66,

said concrete will flow out over the pattern for the horizontal supports and the recessed strip formed by the formwork 65, after which it will set into an integral structure of horizontal members and a road surface. It will be understood that suitable reinforcement for the structure will be provided prior to the pouring of the concrete.

[0037] The appended drawings and the above description only show and describe, respectively, a few embodiments of the present invention. It will be understood that many variants, which may or may not be obvious to a person skilled in the art, are possible within the scope of the invention, which is defined in the appended claims. Thus, a different foam material than EPS can be used for the formwork elements. Furthermore, the outer circumference of a formwork according to the invention need not be circular, but it may also be oval, for example, or comprise surfaces arranged at an angle relative to each other. The formwork can also be used for constructing bases on piles as well as on footings. The formwork elements used in the above-described embodiments are connected by means of projection/groove joints, but also other types of joints such as a tongue and groove joint, for example, or simply a corrugated profile are conceivable. Bracing straps may or may not be provided, depending on the connections between the formwork elements and the force that will be exerted on the formwork.

[0038] Although no dimensions for the height or the circumference of the formwork or the base to be constructed or a column to be poured are mentioned in the description, bases or columns having usual dimensions, for example for a foundation of columns, can be constructed by means of such a formwork. The formwork in particular for bases can have an inner circumference of up to 10 metres or even more. Also formworks having a height of more than 1 metre or even more than 3, 4 or 5 metres up to even 8 metres can be used. When relatively large circumferential or height dimensions are used, the formwork may have a greater wall thickness.

Claims

1. A method for constructing a base or pouring a column, comprising the steps of placing a formwork and pouring concrete into the formwork, **characterised in that** a formwork of foam material is provided.
2. A method according to claim 1, **characterised in that** the formwork is made of at least one circumferentially closed formwork element.
3. A method according to claim 1 or 2, **characterised in that** the formwork is built up of formwork elements.
4. A method according to claim 3, **characterised in that** the formwork elements comprise side walls provided with a contour for realising a form-locked connection and **in that** adjacent formwork elements are

moved one into another from the top down.

5. A method according to claim 4, **characterised in that** said side wall or said side walls of a formwork element is respectively are provided with a contour for realising a form-locked connection and **in that** adjacent formwork elements are moved one into another from the top down.
6. A method according to any one of the preceding claims, **characterised in that** at least one bracing strap is provided around the formwork before concrete is poured into the formwork.
7. A method according to any one of the preceding claims, **characterised in that** a formwork having an at least substantially circular outer circumference is placed.
8. A method according to any one of the preceding claims, **characterised in that** a formwork for a base or a column having an outer circumferential shape deviating from a circle is built.
9. A method according to any one of the preceding claims, **characterised in that** a formwork for a structure to be supported by the column is positioned at the same time.
10. A formwork for constructing a base or pouring a column according to any one of the preceding claims, **characterised in that** the formwork comprises one or more formwork elements at least substantially made of foam material, which, in use, at least substantially defines respectively define the circumference of a base to be constructed or a column to be poured.
11. A formwork according to claim 10, **characterised in that** the formwork elements are at least substantially made of EPS.
12. A formwork according to claim 10 or 11, **characterised in that** the formwork elements are provided with a coating at least on the side facing the base or the column.
13. A formwork according to one or more of claims 10-12, **characterised in that** the wall of the formwork is at least 180 mm thick.
14. A formwork element for use in a formwork according to one or more of claims 10-13.

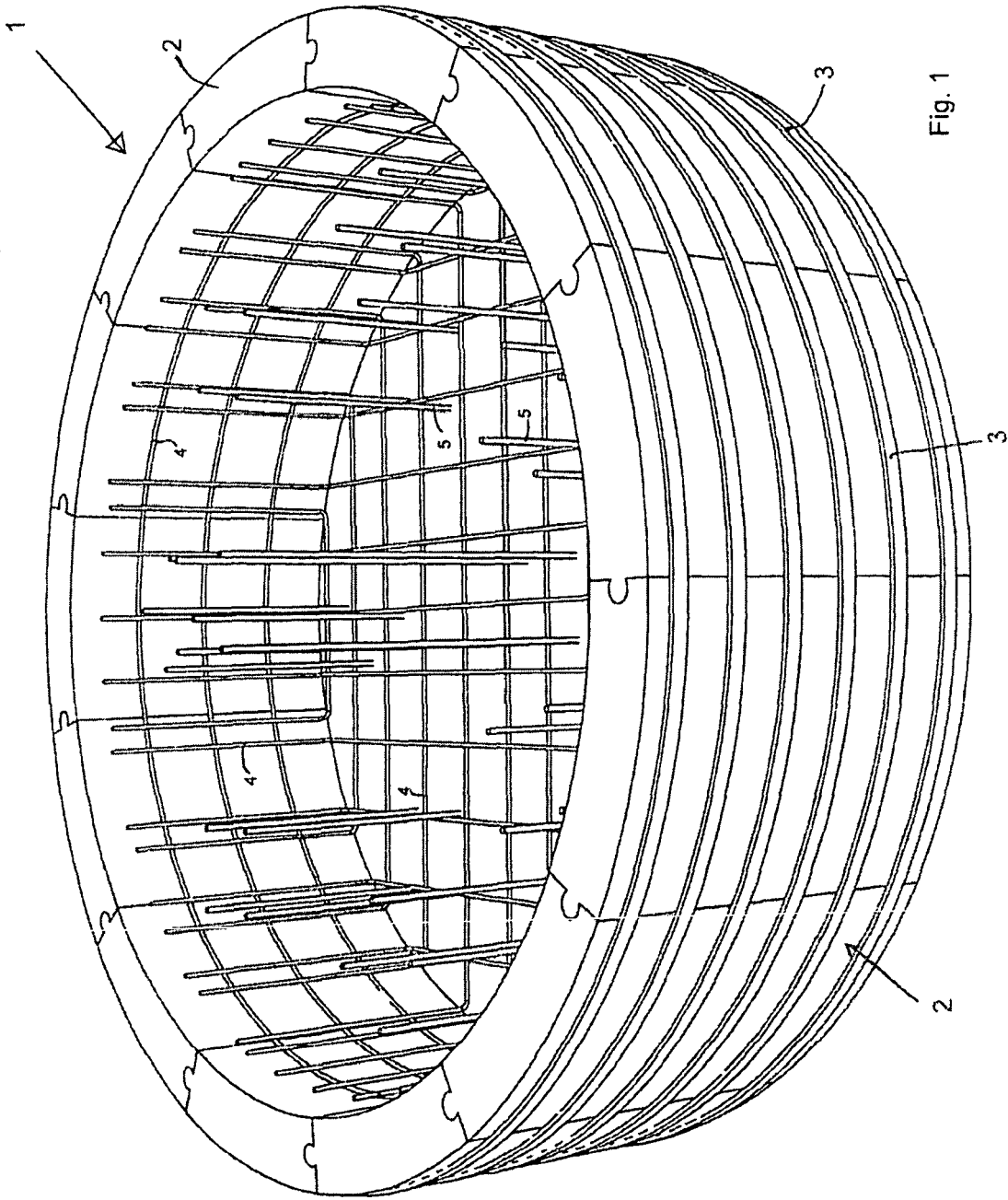


Fig. 1

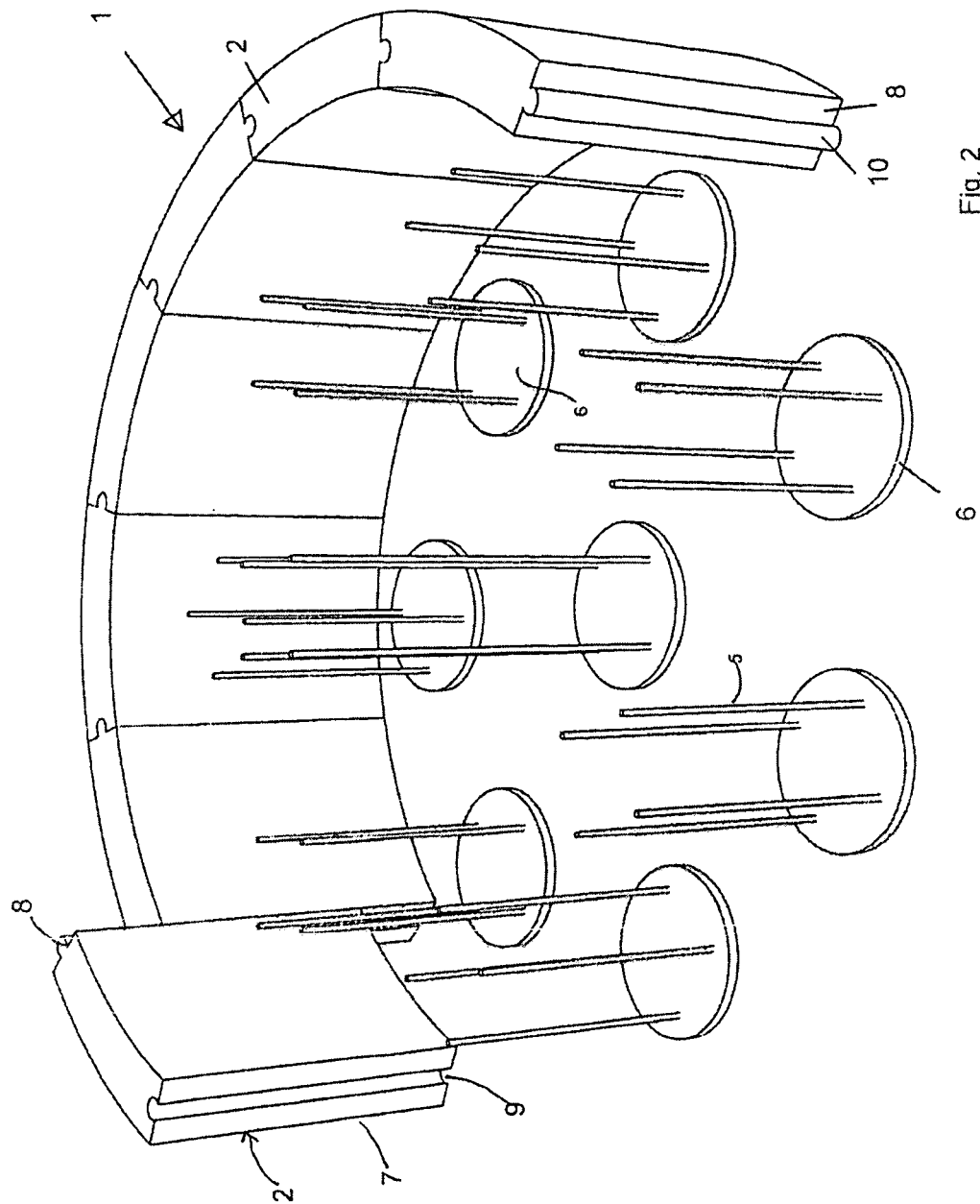


Fig. 2

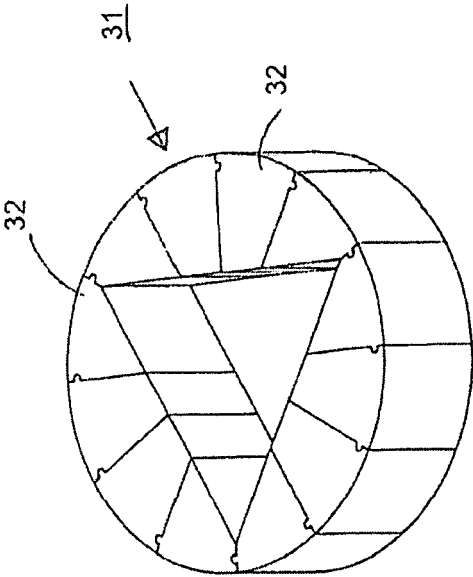


Fig. 4

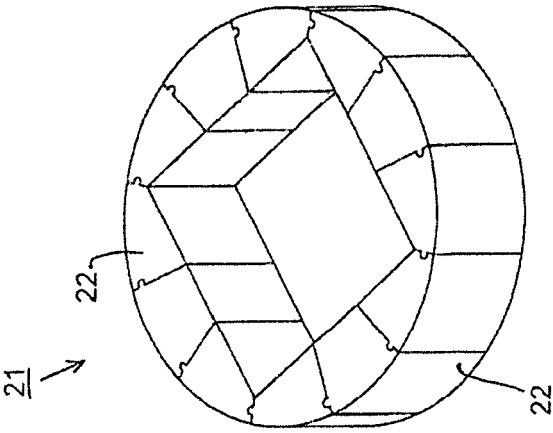
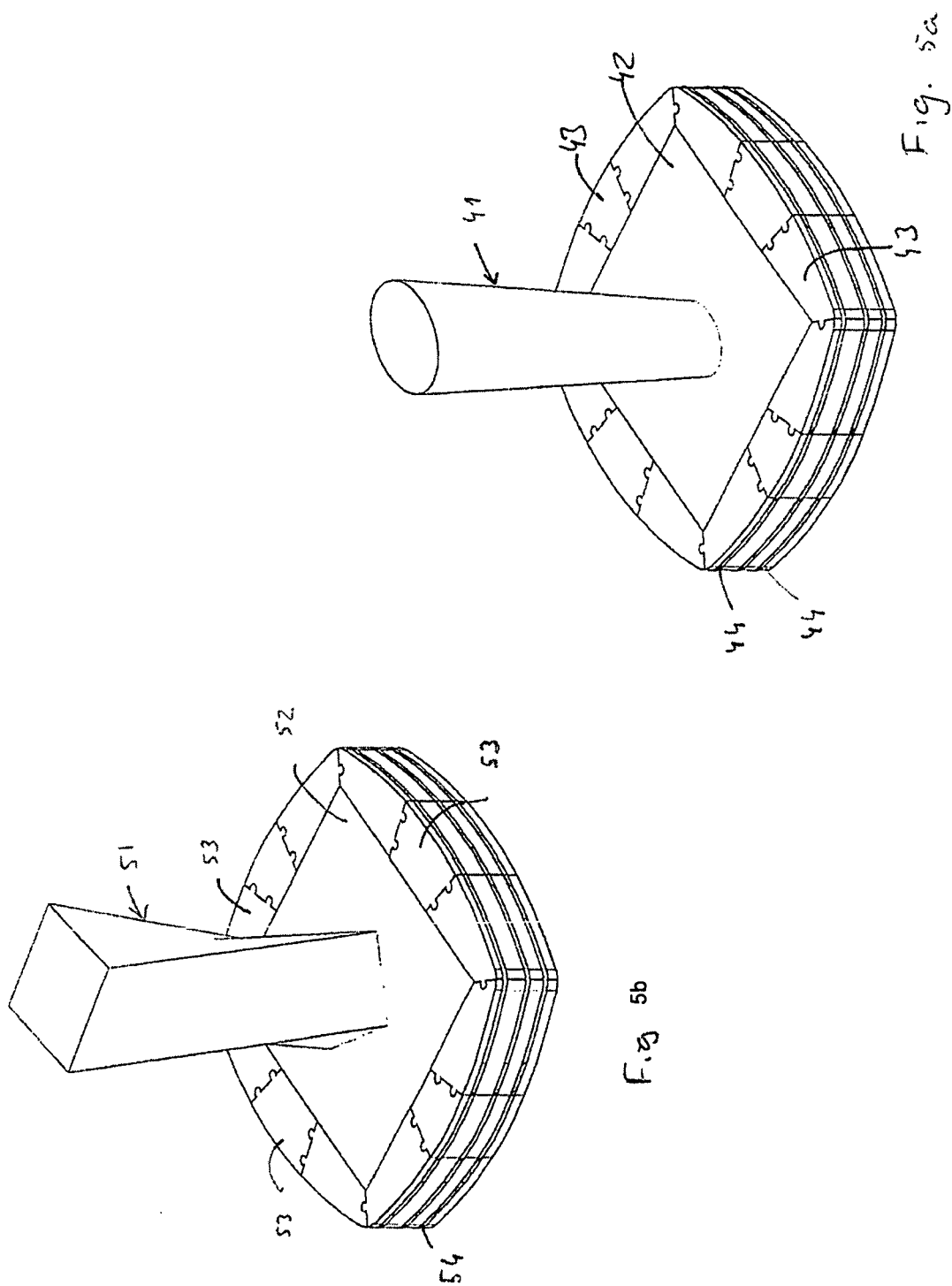
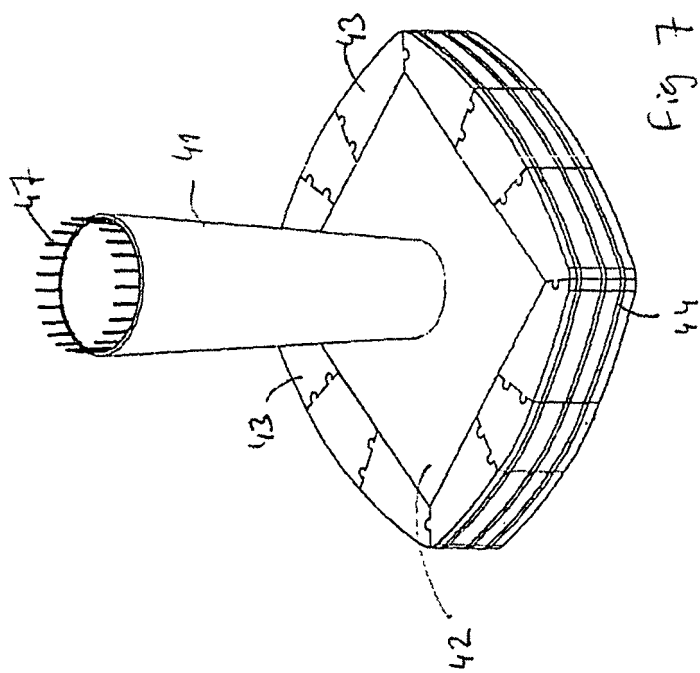
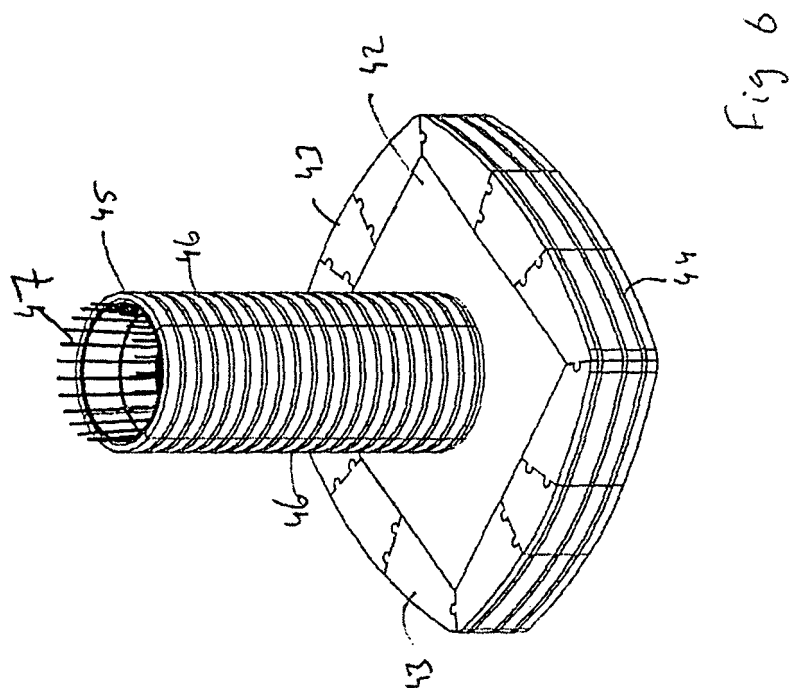
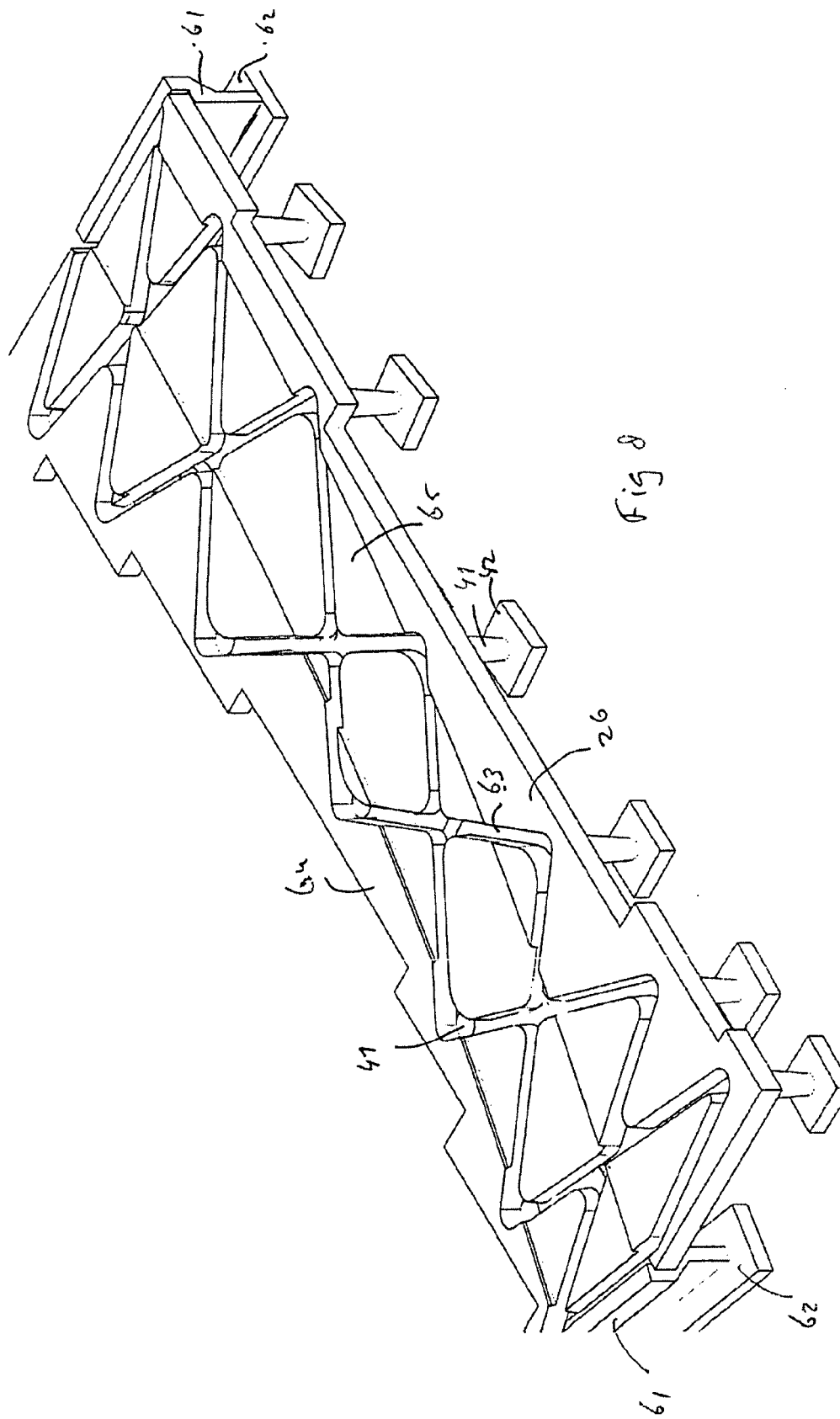


Fig. 3









EUROPEAN SEARCH REPORT

Application Number
EP 10 00 2791

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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 30 June 2010	Examiner Righetti, Roberto
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
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EP 10 00 2791

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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