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(54) **Prefabricated building, building element for such a prefabricated building, method for fabricating a floor element and method for extending a building**

(57) The invention relates to a prefabricated building, comprising a system of floors (1) and columns (2), to which wall elements and roof elements can be attached. The corner points of floor elements (1) are supported

by columns (2) and the floor elements (1) and columns (2) are provided with ducts (6,7,8), via which cables can be conducted and heated air can be transported.

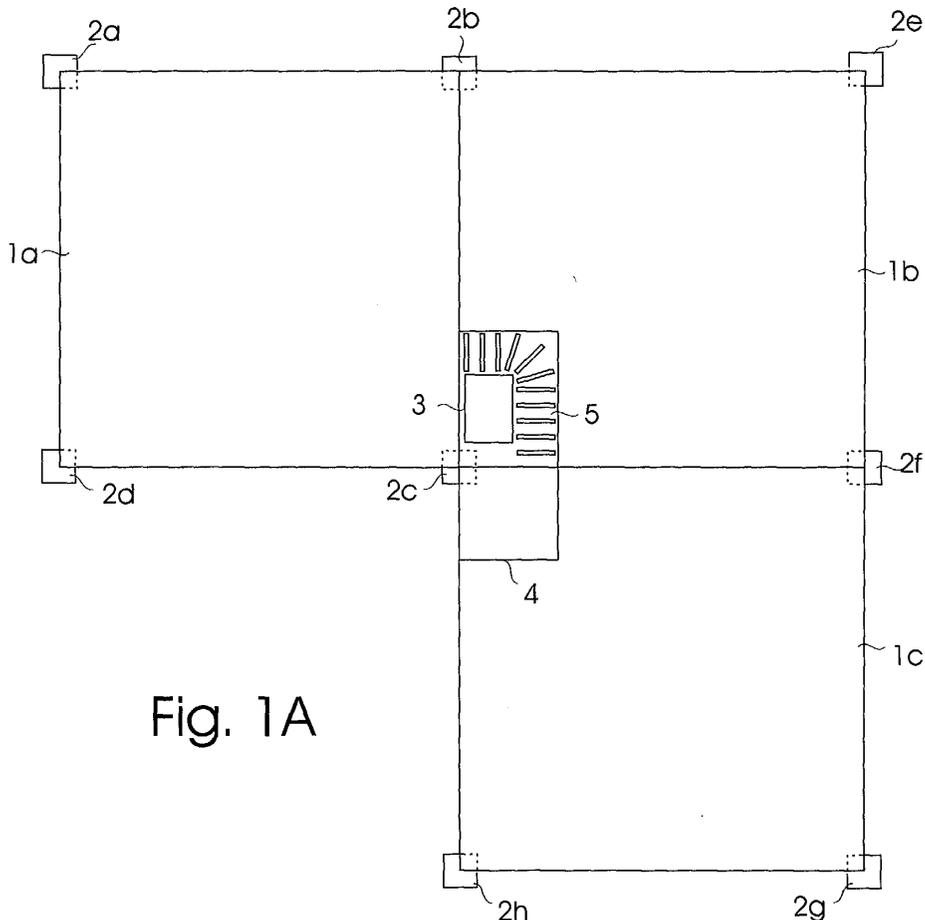


Fig. 1A

## Description

**[0001]** The invention relates to a prefabricated building, comprising a system of floors and columns placed on a foundation, to which wall elements and roof elements are connected. Prefabricated buildings of this type are known. Usually, a traditional foundation is casted, after which the floors and columns are placed. The disadvantage is that the building site must be made ready for building first, in the process of which the existing vegetation is removed. This is especially undesirable when the prefabricated building is built in or near a nature reserve. The prefabricated building according to the invention substantially obviates this disadvantage and is according to an aspect of the invention characterised in that the foundation comprises a number of columns onto which a first floor is placed, onto which columns and at least one storey floor is placed and that the first floor and the at least one additional storey floor are made up of floor elements of which the corners rest on columns. The columns onto which the first floor rests may rest on a traditional foundation or on the solid ground, for example by using prefabricated concrete pedestals, but preferably they are anchored directly in the ground, as a result of which the prefabricated building in fact stands on columns. In that case, the vegetation between the columns can be retained. An important additional advantage is that on substantially every location can be built now, without levelling the site and without making a foundation. The prefabricated building may for example be built partly or entirely standing in a water.

**[0002]** In a favourable embodiment, the first floor is made L-shaped, which makes it possible to realise an apparent variety in a row of further identical prefabricated buildings, just by giving them different orientations. A further advantage of an L-shaped first floor is that by extending it, it may be given a number of different shapes.

**[0003]** A further favourable embodiment is characterised in that the prefabricated building is provided with a central unit, from which heat, electricity and the like are distributed. A central unit of this type, which is at least substantially equal for all prefabricated buildings, may be mass-produced and will thus be cheap. It may contain for example a central heating unit and an interface with various facilities, like the electricity network and the gas mains.

**[0004]** A further favourable embodiment is according to another aspect of the invention characterised in that each floor element is provided with a system of ducts across its length and across its width. The ducts make it possible to install piping and wiring in a simple manner from the central unit and they may moreover be used as a guiding system for heated air coming from the central unit.

**[0005]** A further favourable embodiment is characterised in that the central unit is housed inside an at least

substantially U-shaped or cylindrically shaped building element, which may substantially contribute to the stability of the prefabricated building. In this U-shaped or cylindrically shaped building element, for example a staircase to the first floor may be accommodated. Also a toilet unit or a bathroom unit is preferably combined with the U-shaped or cylindrically shaped building element, which may further reduce the number of pipes to be installed in the prefabricated building.

**[0006]** A favourable embodiment is according to a further aspect of the invention characterised in that a circumference of the first floor and a circumference of the at least one storey floor are each at least partly provided with coupling means for linking up additional floor elements. In this way, additional floor elements can simply be added cantilevered, without the need for additional foundation or other types of support, which makes it possible to further individualise a prefabricated building but which makes it also possible to easily extend the building afterwards.

**[0007]** A further favourable embodiment is characterised in that each additional floor element is provided with a system of ducts extending across its length and across its width, placed in such way that when an additional floor element is linked up to a system of floor elements, its system of ducts links to the system of ducts in the first floor or the at least one storey floor.

**[0008]** A further favourable embodiment is characterised in that the coupling means comprise at least one steel profile having an L-shaped cross section, mounted to an edge of a floor element or an additional floor element to be coupled and connected to a reinforcement of this floor element or additional floor element. A coupling element of this type may easily be added during fabrication of the floor elements and additional floor elements and is, hardly cost increasing. A coupling of an additional floor element to a floor element may consist now of a welded joint between two abutting steel profiles having an L-shaped cross section, which can be made fast and cheap. Such a welded joint may also be removed easily, which makes it possible to make the prefabricated building smaller. Removed floor elements, roof elements and wall elements may then be reused for extending other prefabricated buildings.

**[0009]** A favourable alternative embodiment is characterised in that the coupling means comprise at least two threaded ends, mounted to an edge of a floor element or an additional floor element to be coupled and connected to a reinforcement of this floor element or additional floor element. A coupling of for example an additional floor element to a floor element may take place then by coupling the threaded ends in a way well known in the art. Preferably, a coupling of an additional floor element to a floor element comprises a screwed joint, for coupling pairs of threaded ends.

**[0010]** A further favourable embodiment is characterised in that columns are provided with at least one duct, extending in a longitudinal direction, via which piping

and wiring between different floors may run. Moreover, columns made in this way may easily be provided with standard connections for example switches and sockets, which obviates the need to mill slots afterwards.

**[0011]** The invention also relates to a floor element, an additional floor element or a column, to be used as part of a prefabricated building as described in the previous chapters.

**[0012]** The invention also relates to a method for manufacturing a floor element. The inventive method, according to which a floor element can be manufactured which needs no further finishing, is characterised in that a central layer is cast into which a system of ducts across its length and across its width is made, after which the central layer is provided with a finished top layer, with coupling means and with a finished bottom layer.

**[0013]** The invention also relates to a method for extending a building, put together of columns, floor elements, wall elements and roof elements. The inventive method is characterised in that at least one additional floor element is connected with at least one side to a floor element, in such a way that this at least one side rests on at least two columns which are part of the building. According to the invention, the other sides may be cantilevered, which means that the prefabricated building may be extended without adding foundation.

**[0014]** A favourable embodiment of the inventive method is characterised in that the at least one additional floor element is welded or screwed to the floor element.

**[0015]** The invention will now be further explained with reference to the following figures, in which:

- Fig. 1 schematically represents a part of a possible embodiment of a prefabricated building according to the invention in top view;
- Fig. 1B schematically represents this part in side view;
- Fig. 2 schematically represents a floor element in top view;
- Fig. 3A schematically represents an edge of a floor element in top view;
- Fig. 3B schematically represents an edge of a floor element in side view;
- Fig. 4A schematically represents a first floor, extended with an additional floor element in top view;
- Fig. 4B schematically represents a part of a first floor, extended with an additional floor element in side view;
- Fig. 5A schematically represents a coupling of a floor element with an additional floor element with threaded ends;
- Fig. 5B represents this coupling more in detail;
- Fig. 6 schematically represents a floor element and an additional floor element with threaded ends in cross section;

- Fig. 7A schematically represents a possible embodiment of a connection between a floor element and a column in side view;
- Fig. 7B schematically represents this embodiment after the floor element has been placed;
- Fig. 7C schematically represents four floor elements, placed on a column in top view;
- Fig. 7D schematically represents a column, provided with a coupling part.

**[0016]** Fig. 1 schematically represents a part of a possible embodiment of a prefabricated building according to the invention in top view, consisting of three floor elements 1a, 1b, 1c which have been placed on a number of columns 2a,...,2g and which together form a first floor of the prefabricated building. Columns 2a,...,2g are preferably anchored directly in the ground, but they may also be placed on a foundation plate or a foundation tray if desired. A prefabricated building set up in this way may be extended simply by adding columns and additional floor parts. This may be done in the building phase, for example when the prospective occupant desires a more spacious house, with additional space in the form of a balcony, a bay, a lean-to or for example an office space, but it may also take place afterwards. Special is that the prefabricated building can also be extended without adding columns, by coupling additional floor parts to floor elements 1a, 1b, 1c.

**[0017]** Onto floor element 1b, a central unit 3 is placed in which a central heating boiler, a mains supply and the like are placed. Round central unit 3, a U-shaped or cylindrically shaped building element 4 is placed, which forms a backbone from which the prefabricated building derives an important part of its rigidity. In the embodiment shown here, the U-shaped building element is also used as a basis for a flight of stairs 5, leading to a first floor.

**[0018]** Fig. 1B schematically represents this part in side view, with floor elements 1a, 1b, 1c which are placed on a number of columns 2a,...,2g and which together form a first floor for the prefabricated building. Onto floor elements 1a, 1b, 1c a number of columns 6a,..., 6g is placed, which support a first floor, as well as central unit 3 and the U-shaped or cylindrically shaped building element 4.

**[0019]** Fig. 2 schematically represents a floor element 1a in top view, placed onto columns 2a, 2b, 2c, 2d. Floor element 1a is a prefab floor part in which a number of ducts 6a,...,6g, extending in a longitudinal direction have been made and perpendicular to it a number of smaller ducts 7a,...,7i. These ducts reduce the weight of the floor element, substantially without reducing its strength, but they also form a system of ducts for distributing cables and pipes. Moreover, the ducts may be used to guide air, heated in central unit 3, to any desired place. For a number of mutually connected floor elements that are put together, a connection is obtained automatically, while also a floor element that is placed afterwards can

be provided with heat in this way. Columns 2a,2b,2c,2d are provided with ducts 8 which connect to the ducts 6,7 in the floor elements and can be used to guide cables and pipes from one floor to another floor. Floor elements 1 are preferably produced in standard sizes, for example with a width of 3 meter and with lengths of 3,4 and 6 meter. The advantage is that surplus floor elements can simply be exchanged and reused.

**[0020]** Fig. 3A schematically represents an edge of a floor element 1 in top view, which edge is provided with a steel profile 9, which forms a whole with floor element 1 and which has been connected, for example welded, to a steel reinforcement present in floor element 1 before it is cast. Fig. 3B schematically represents an edge of a floor element 1 in side view, which edge is provided with an alternative embodiment consisting of steel profile parts 9a,...,9h, which have been connected to the reinforcement in floor element 1.

**[0021]** Fig. 4A schematically represents a first floor, as shown in Fig. 1, extended with an additional floor element 10 in top view. Floor element 10 rests exclusively onto the columns 2g,2h and the connection between the first floor and floor element 10 consists of a welded joint 11, which connects the edges of the profiles, attached to floor element 1c and additional floor element 10. Fig. 4B schematically represents a first floor, extended with an additional floor element 10 in side view, together with the profiles 9 which have been incorporated in the edges and welded joint 11. Moreover, the reinforcement 12, present in the floor elements is schematically shown together with their connections to profiles 9. In the embodiment shown here, the floor elements are moreover provided with profiles 13, incorporated in the lower edges of the floor elements, which distribute the occurring pressure load and to which adjusting means 14 may be attached if desired.

**[0022]** Fig. 5A schematically represents a coupling of a floor element 1 with an additional floor element 10 with threaded ends. Floor element 1 is provided with pairs of threaded ends 15a,15b which are accessible with the aid of a recess 16 made in floor element 1. Additional floor element 10 is also provided with pairs of threaded ends 17a,17b which are accessible with the aid of a recess 18 made in additional floor element 10. The threaded ends 15a,15b and 17a,17b can be connected to the reinforcement of floor element 1 and additional floor element 10 respectively, for example in a way shown in Fig. 4B. In the figure, floor element 1 and additional floor element 10 are shown slightly separated for reasons of clarity. If they are put together, then the recesses 16,18 form one single recess in which the ends of the threaded ends 15a,17a,17b,15b are positioned parallel to one another. Over these threaded ends, a comb-shaped strip made of for example steel can be placed, after which the threaded ends can be fastened with the aid of nuts. Fig. 5B represents more in detail this coupling in side view, with a steel comb-shaped strip 19 and the threaded ends 15a,17a,17b,15b which are fastened with nuts

20a,20b,20c,20d.

**[0023]** Fig. 6 schematically represents a floor element 1 and an additional floor element 10 with threaded ends in cross section. Floor element 1 as well as additional floor element 10 consist of a central layer 21 in which a system of ducts 6,7, extending across its length and across its width are made, in such a way that these ducts are mutually connected. During production, both central layers 21 have been provided with a finished top layer 22 in which the threaded ends 15,17 are accommodated. Top layer 22 is finished such that it may be used as a floor, without any further finishing. During production, the bottom side of both central layers 21 is also provided with a finished layer 23, such that they can be used without any further finishing. After the threaded ends have been coupled, the small recesses 16,18 in floor part 1 and additional floor part 10 are filled with a mortar that may be removed again and finished with a small plastic shield. Obviously, the floor elements may be produced in different thicknesses, dependent upon the application.

**[0024]** Fig. 7A schematically represents a possible embodiment of a connection between a floor element 1 and a column 2 in side view. The four corners of floor element 1 are here provided with a steel corner element 24, which covers one quarter of the top side of column 2 when floor element 1 is placed upon column 2. Corner element 24 is provided with an opening 25, which provides an entry to the system of ducts in floor element 1, so that cables can be conducted to duct 8 in column 2 to via this opening. For that purpose, column 2 is provided with an opening 26, which forms a connection between opening 25 and duct 8 in column 2 after floor element 1 is placed upon column 2. In this embodiment, both a top side and a bottom side of column 2 are provided with steel end plates, respectively 27a,27b, which leave duct 8 open. Corner element 24 is moreover provided with a recess 28, which is designed so as to keep the entry of duct 8 on the top side of column 2 accessible after floor element 1 is placed upon column 2. Fig. 7B schematically represents this embodiment after the floor element 1 has been placed.

**[0025]** Fig. 7C schematically represents four corner elements 24a,24b,24c,24d, being parts of four floor elements 1a,1b,1c,1d, placed on a column 2. The four recesses 28 in the corner elements 24a,24b,24c,24d form a circular opening which connects to recess 8 in column 2. Fig. 7D schematically represents a column 6, provided with a coupling part 29, mounted inside duct 8. Column 6 may now be placed on top of column 2, whereby the top sides of corner elements 24a,24b,24c,24d are clamped between column 2 and column 6 and whereby the coupling part enters duct 8 in column 2 and may be secured in it, for example doweled via a hole 30. In order to secure a free passage between the system of ducts in floor element 1 and duct 8 in column 2, coupling part 29 is provided with four holes 31, corresponding with the holes 25 in corner elements 24a, 24b,24c,24d.

In a situation in which less than four corner elements rest on column 2, the free space between column 2 and column 6 may be filled up with the aid of a fitting washer plate, so that column 2 supports column 6 all round.

[0026] After the framework for the prefabricated building has been built up with the aid of floor elements and columns, wall elements and roof elements may be placed in a way as such well known in the art. Preferably, the wall elements are placed such that they may be removed and reused if desired, for example for extending another prefabricated building.

### Claims

1. Prefabricated building, comprising a system of floors and columns placed on a foundation, to which wall elements and roof elements are connected, **characterised in that** the foundation comprises a number of columns onto which a first floor is placed, onto which columns and at least one storey floor is placed and that the first floor and the at least one additional storey floor are made up of floor elements of which the corners rest on columns.
2. Prefabricated building according to claim 1, **characterised in that** the prefabricated building is provided with a central unit, from which heat, electricity and the like are distributed.
3. Prefabricated building according to claim 2, **characterised in that** each floor element is provided with a system of ducts, extending across its length and across its width.
4. Prefabricated building according to claim 2 of 3, **characterised in that** the central unit is housed inside an at least substantially U-shaped or cylindrically shaped building element.
5. Prefabricated building according to claim 3, **characterised in that** a circumference of the first floor and a circumference of the at least one storey floor are each at least partly provided with coupling means for linking up additional floor elements.
6. Prefabricated building according to claim 5, **characterised in that** each additional floor element is provided with a system of ducts, extending across its length and across its width, placed in such way that when an additional floor element is linked up to a system of floor elements, its system of ducts links to the system of ducts in the first floor or the at least one storey floor.
7. Prefabricated building according to claim 5 or 6, **characterised in that** the coupling means comprise at least one in steel profile, having an L-shaped cross section, mounted to an edge of a floor element or an additional floor element to be coupled and connected to a reinforcement of this floor element or additional floor element.
8. Prefabricated building according to claim 7, **characterised in that** a coupling of an additional floor element to a floor element comprises a welded joint between two steel profiles having an L-shaped cross section, fitted together.
9. Prefabricated building according to claim 5 or 6, **characterised in that** the coupling means comprise at least two threaded ends, mounted to an edge of a floor element or an additional floor element to be coupled and connected to a reinforcement of this floor element or additional floor element.
10. Prefabricated building according to claim 9, **characterised in that** a coupling of an additional floor element to a floor element comprises a screwed joint, for coupling pairs of threaded ends.
11. Prefabricated building according to one of the previous claims, **characterised in that** columns are provided with at least one duct, extending in a longitudinal direction.
12. Floor element, additional floor element or column, to be used as part of a prefabricated building according to one of the claims 1 to 9.
13. Method for manufacturing a floor element, **characterised in that** a central layer is cast into which a system of a system of ducts across its length and across its width is made, after which the central layer is provided with a finished top layer, with coupling means and with a finished bottom layer.
14. Method for extending a building, put together of columns, floor elements, wall elements and roof elements, **characterised in that** at least one additional floor element is connected with at least one side to a floor element, in such a way that this at least one side rests on at least two columns which are part of the building.
15. Method according to claim 14, **characterised in that** the at least one additional floor element is welded or screwed to the floor element.

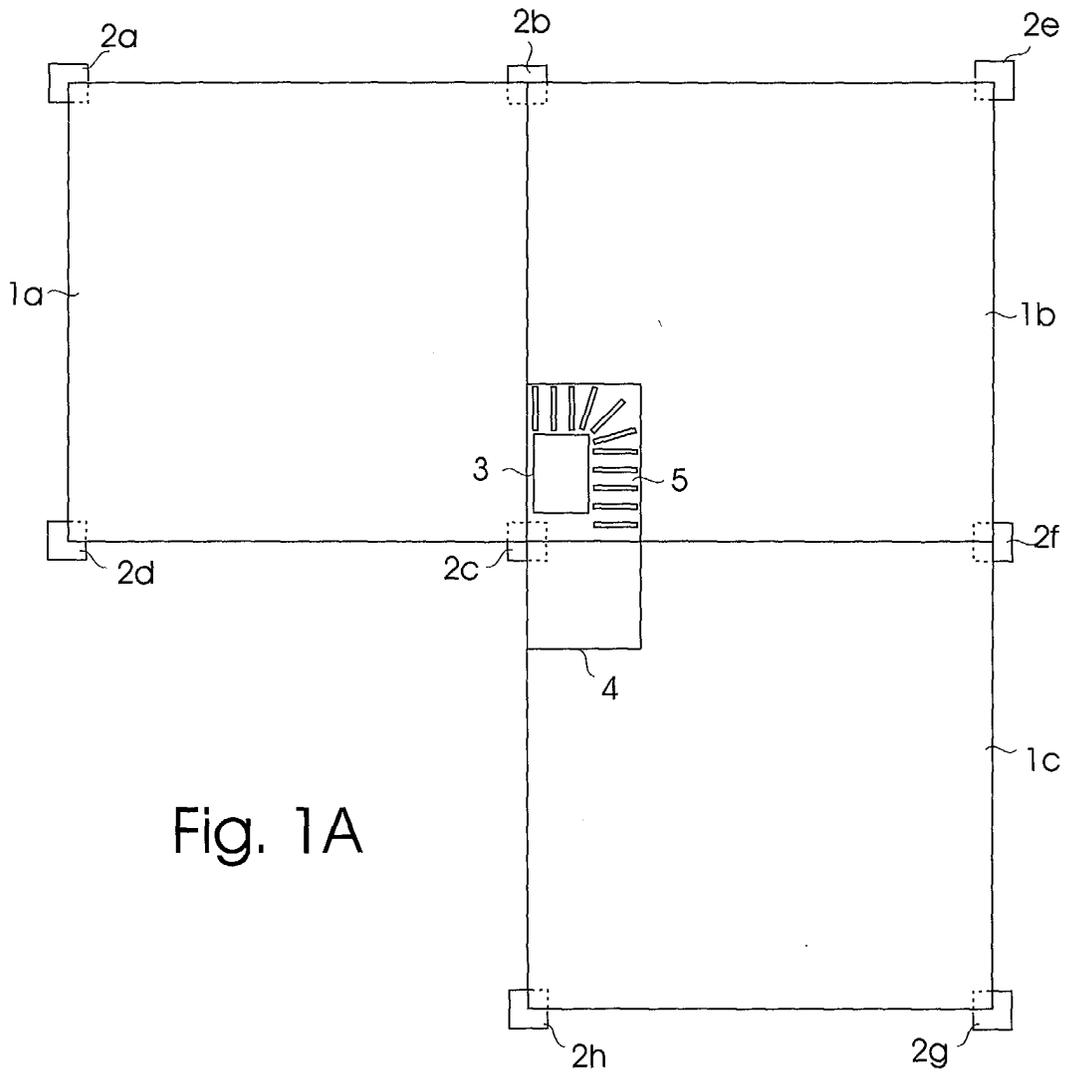


Fig. 1A

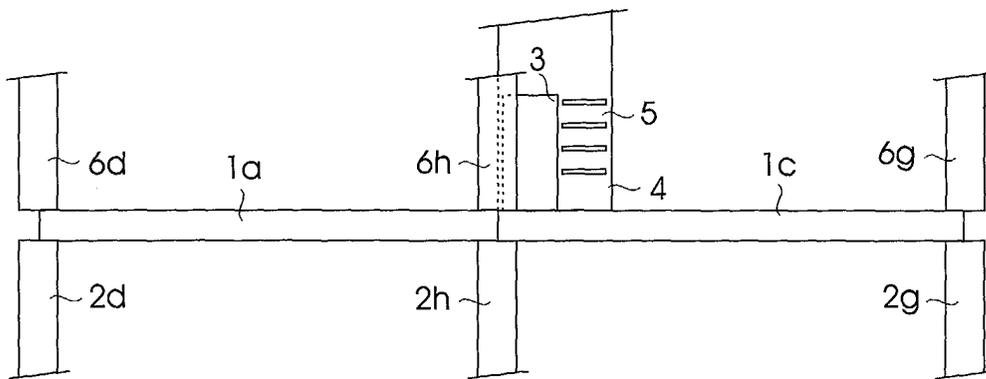


Fig. 1B

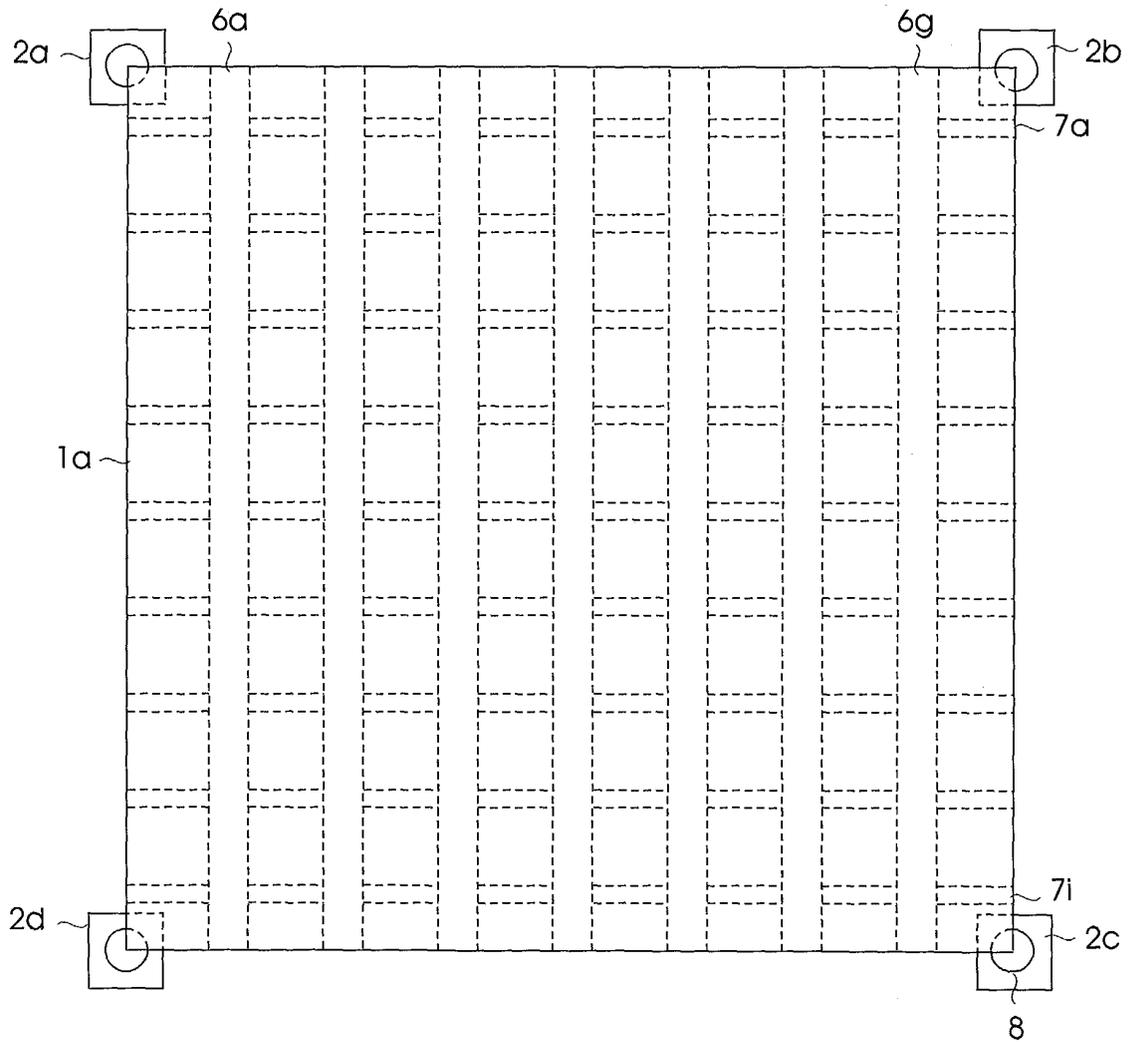


Fig. 2

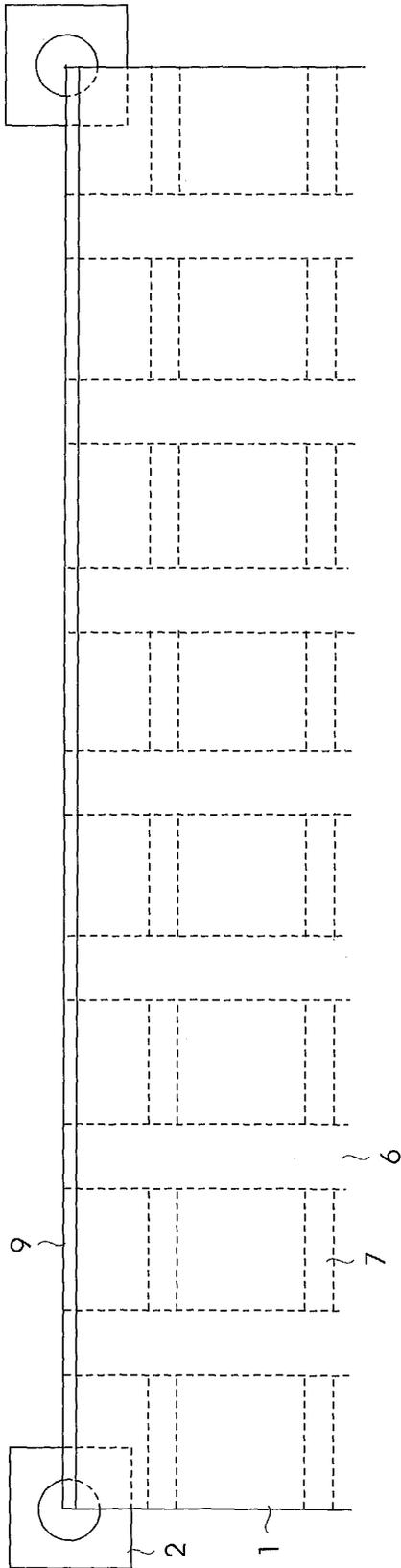


Fig. 3A

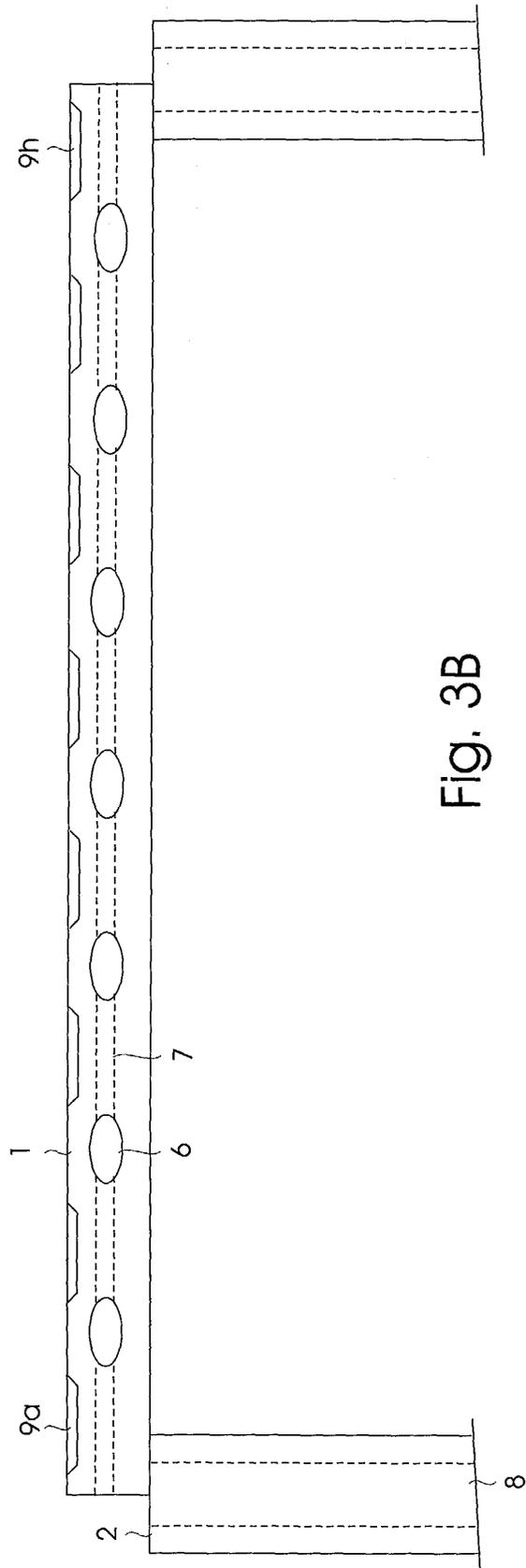


Fig. 3B

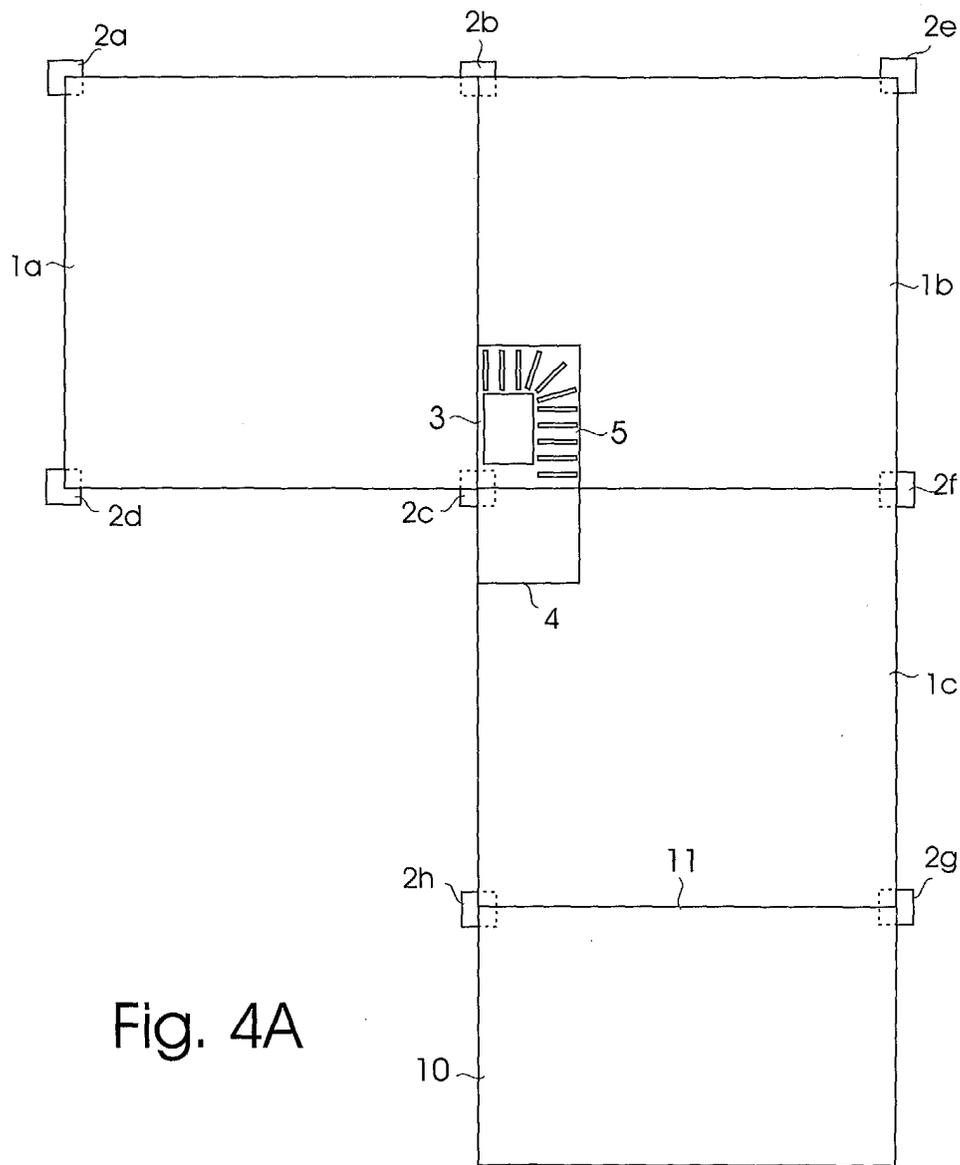


Fig. 4A

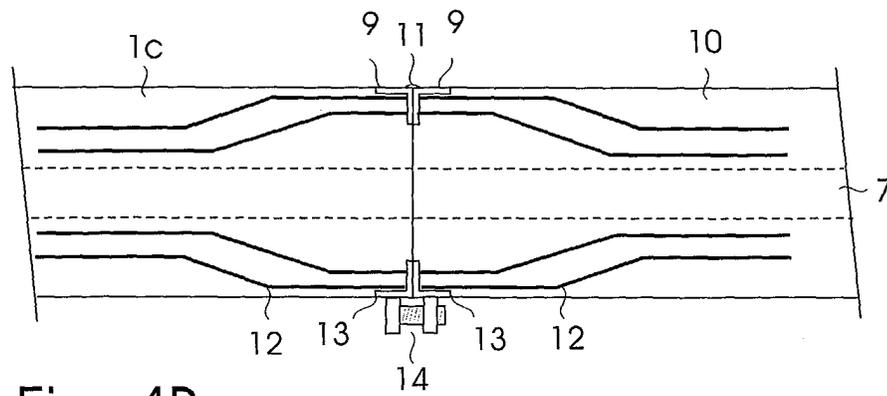


Fig. 4B

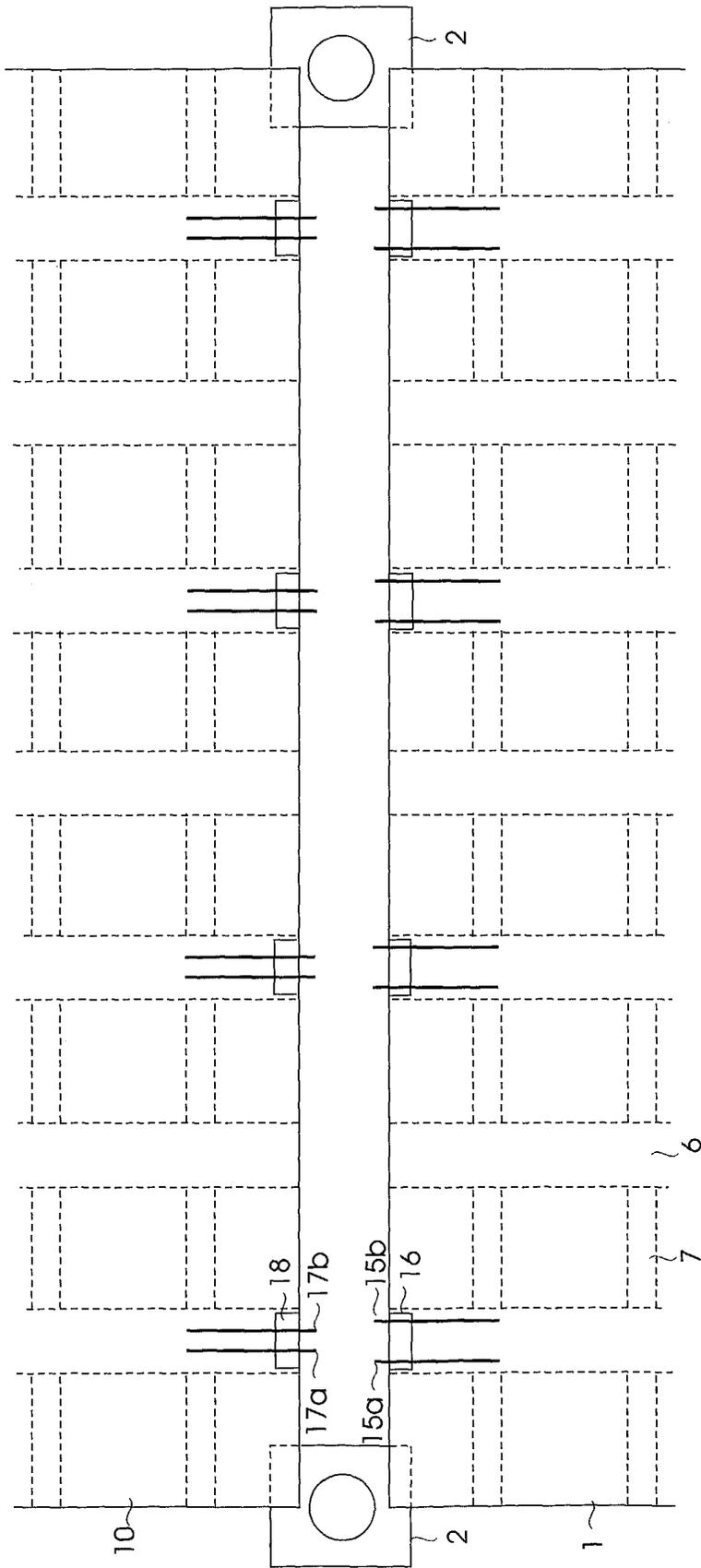


Fig. 5A

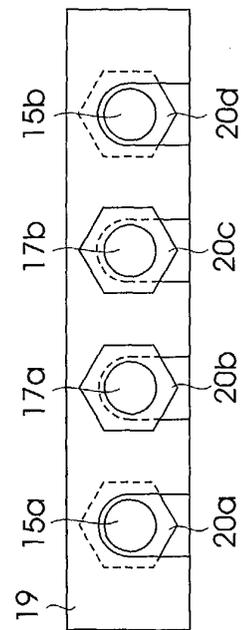


Fig. 5B

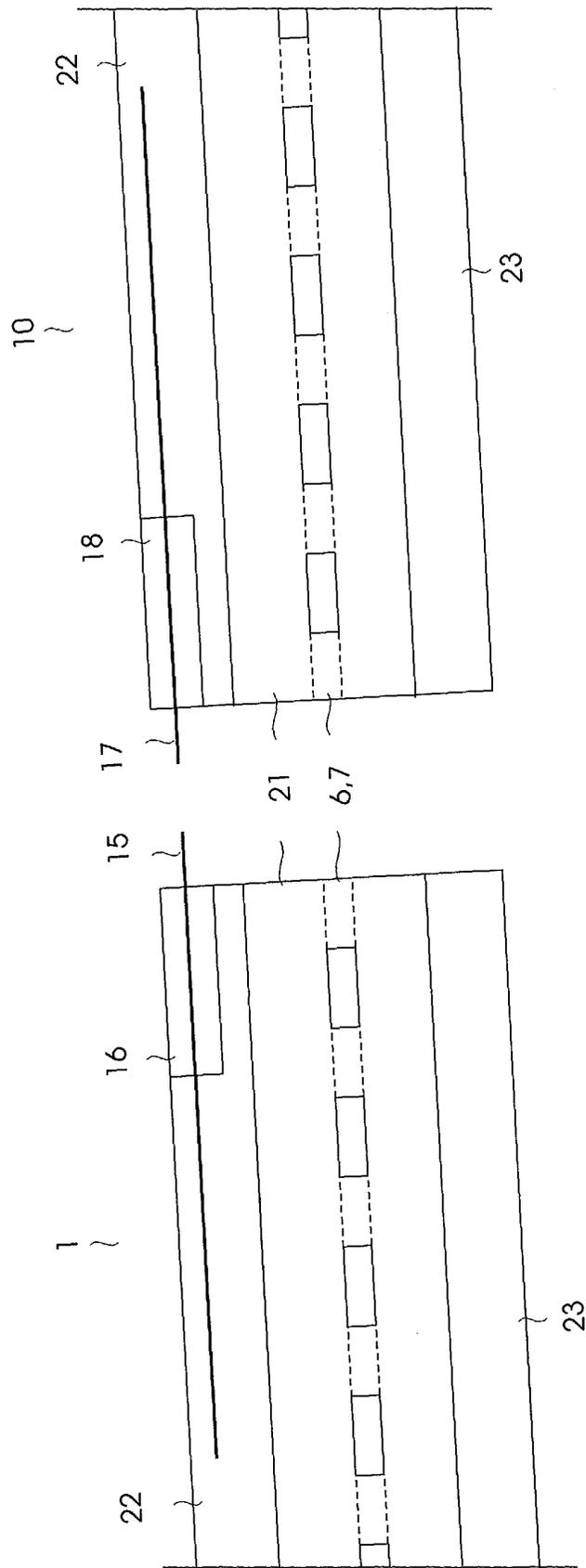


Fig. 6

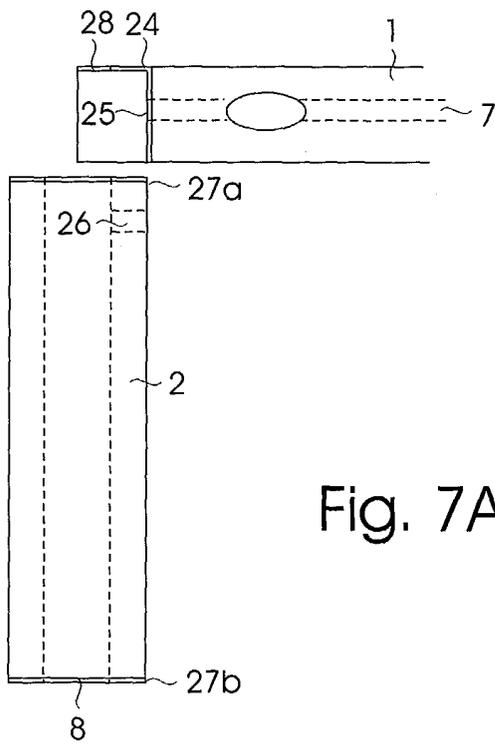


Fig. 7A

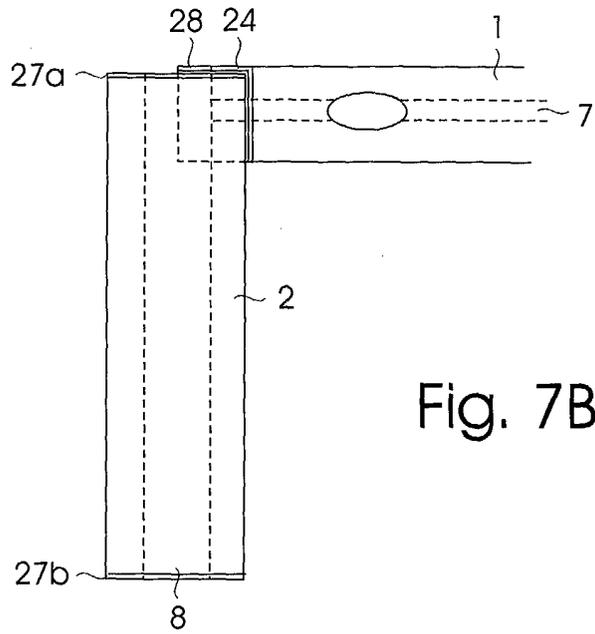


Fig. 7B

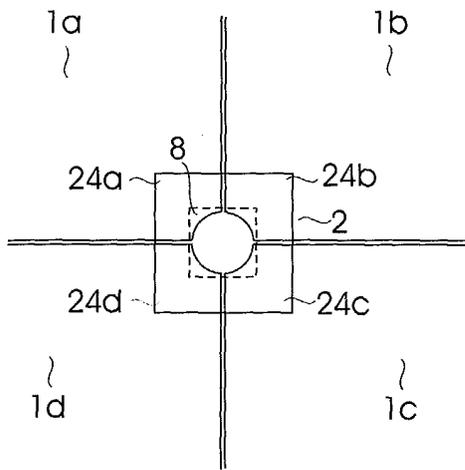


Fig. 7C

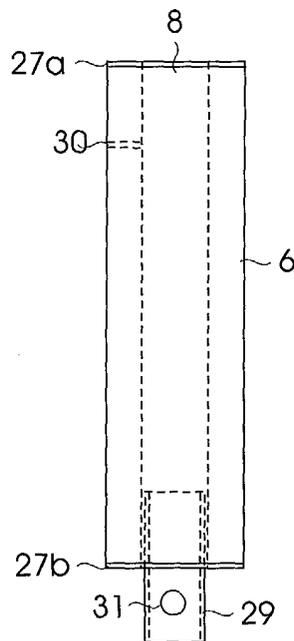


Fig. 7D



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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 September 2004	Demeester, J
CATEGORY OF CITED DOCUMENTS			
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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