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(54) Concrete wing floor element

(57) A prefabricated concrete floor element, consisting of a cantilever beam-shaped part (2) provided with longitudinally extending hollow cores (4) and reinforcing wires (5) parallel thereto, which beam-shaped part (2) is on one or both sides provided with (a) laterally projecting wing(s) (3) whose bottom face (11) aligns with the bottom face of the beam-shaped part (2) and whose thickness (d) is considerably less than that (D) of the beam-shaped part (2). The wings (3) and the interposed bottom layer (8) of the beam-shaped part (2) are provided with longitudinal and transverse reinforcing wires (6, 7) and with reinforcing elements (10) that project from the top face (12) of the wing(s) (3) and have their bottom sides connected to the longitudinal and transverse reinforcement (6, 7) of that (those) wing(s) (3).

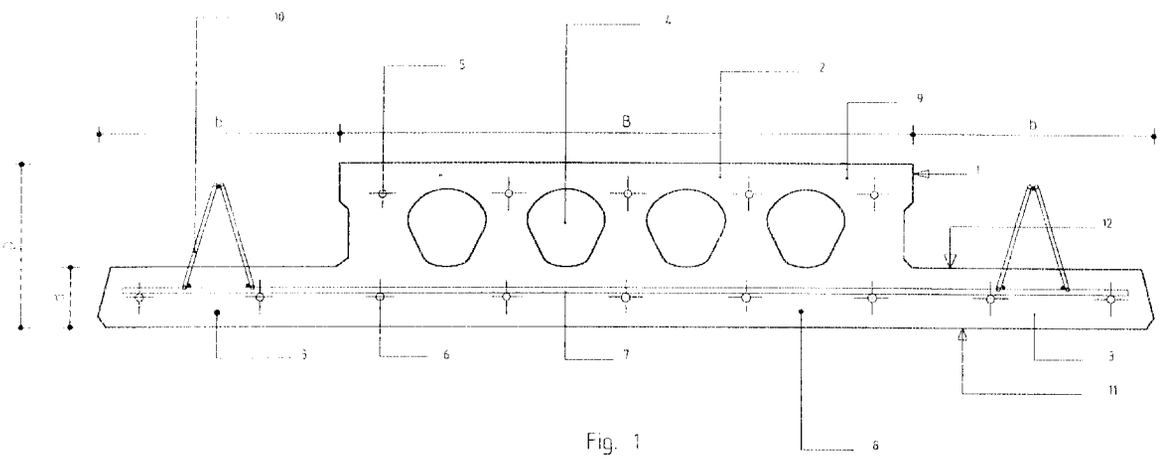

Fig. 1

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Description

The invention relates to a prefabricated concrete floor element, at least consisting of a cantilever beam-shaped part, provided with longitudinally extending, hollow cores and reinforcing wires parallel thereto.

Such floor elements are known from practice by the name of "hollow-core slab floors" and are for instance shown in Fig. 1B of EP-B-0.634.966. The maximum width of these hollow floor slabs is 1200 mm, because a greater width requires the provision of transverse reinforcement, which is problematic in the production techniques that are hitherto known.

Apart from great advantages such as the speed of fitting and the instant passableness of the floor elements laid on a supporting construction, the use of "hollow-core slab floors" in the building of houses and public utilities offers the following major drawbacks:

- the joints or seams between adjoining floor slabs must be closed in one way or another. Without additional measures, this in course of time results in shrinkage cracks.
- pipes must be fixed on the floor, they can hardly be concealed in the floor, if at all.
- due to the dimensioning in designs, it is usually not possible to use a limited number of floor slabs that are standardized in respect of width dimension. In terms of production, a width adjustment of hollow floor slabs is difficult to perform. Providing in the floor a substantial hole, such as for instance a stairwell and the like, requires additional constructional measures, such as for instance the use of trimmer irons.

Another type of prefabricated concrete floor element is known from practice by the name of "shuttering floor slab". This floor element consists of a relatively thin and consequently not cantilever floor slab having longitudinal and transverse reinforcement and reinforcing elements projecting from the top face. These floor elements are provided as a shuttering floor, on which, subsequently, a layer of concrete including additional reinforcement is poured. The shuttering floor should be propped up. The entire floor has no continuous seams and therefore remains flat, while pipes can be concealed in the floor. Changing the width and/or the incline of the floor elements is relatively simple, and holes, such as for instance a stairwell, can also be provided in the floor in a relatively easy manner. However, the propping-up operations slow down the building process and the thus composed floor is only passable and capable of carrying a load after the concrete poured in situ has sufficiently hardened.

The object of the invention is to provide a prefabricated floor element which overcomes the drawbacks of the two above-mentioned, known floor elements and combines the advantages thereof. According to the invention, this object is realized by providing a floor element of the above-described type, wherein the beam-shaped part is on at least one side provided with a laterally projecting wing whose bottom face aligns with the bottom face of the beam-shaped part, while the thickness of the wing is considerably less than that of the beam-shaped part, which wing is provided with longitudinal as well as transverse reinforcing wires, of which the transverse reinforcing wires continue into the bottom layer of the beam-shaped part, while the wing is provided with upwardly directed reinforcing elements that project from the top face of the wings and are connected, at the bottom side thereof, to the longitudinal and transverse reinforcement respectively of that wing.

When a floor built up from prefabricated floor elements is being provided, the floor elements are laid with the lateral edges of the wings against one another. Consequently, a channel is formed above these wings, in which channel all types of pipes can be fitted, after which this space is filled up in situ with concrete. Unlike adjoining hollow-core slabs, the top face of the concrete poured in situ can properly connect to the top faces of the adjoining beam-shaped parts of the floor elements. In the case of a small wing width, a transverse reinforcement can possibly be left out, the maximum wing width is then determined by the allowable deflection of the wings. With the wide wings, which are preferably employed and which may have a width of for instance half the width of the beam-shaped part, a longitudinal as well as a transverse reinforcement is necessary. The transverse reinforcement, not present in the above discussed hollow-core floor slabs for the reason specified, can in fact be provided in the floor elements according to the invention, because the method for the manufacture thereof has been divided into two steps. During the first molding operation, a continuous layer is formed with the thickness of the wings, in which layer a reinforcement can be provided, while subsequently, in a second step, the top layer of the beam-shaped part is provided on the bottom layer formed in the first step.

It is observed that FR-A-2,660,952 discloses a prefabricated concrete floor element consisting of a cantilever, beam-shaped part, provided with a longitudinally extending hollow core, which beam-shaped part is on either side provided with laterally projecting wings. This floor element is manufactured by means of a continuous molding process, so that transverse reinforcement is lacking. Hence, the wings have a slight width.

DE-C-816.598 teaches a built-up floor consisting of a relatively thin shuttering floor slab stiffened by means of lattice girders provided on this floor slab. The floor slab must be propped up. Inserted between the lattice girders are loose, hollow shuttering beams, over which, next, concrete is poured.

Finally, DE-A-29.46589 discloses a prefabricated concrete floor element consisting of a cantilever beam-shaped part comprising at least one longitudinally extending hollow core and reinforcing wires parallel there-

to or reinforcement grids at the location of the dams of the beam-shaped part. This part has its bottom side provided with laterally projecting wings in which longitudinal as well as transverse reinforcing wires are present, which transverse reinforcing wires continue into the bottom layer of the beam-shaped part.

The hollow cores are partly filled with synthetic displacement bodies serving as shuttering mold during the production of the beam-shaped part. The top layer of the beam-shaped part is formed by a concrete slab that is likewise provided with longitudinal and transverse reinforcement, of which the transverse reinforcing bars project laterally from the beam-shaped part over a length that is approximately equal to the width of the wing. Hence, the open space above this wing is at the top side bounded by a grid of reinforcing bars, which seriously complicates the provision of pipes in that space to be filled up later on. In this known floor element, the width of the wings is slight relative to the width of the beam-shaped part.

Further particulars of the floor element according to the invention are described in the subclaims.

Embodiments of the floor element according to the invention will be specified with reference to the accompanying drawings. In these drawings:

Fig. 1 shows a floor element according to a first embodiment;

Fig. 2 shows a floor element according to a second embodiment, which, in comparison with the floor element of Fig. 1, has a considerably greater width;

Fig. 3 is an isometric drawing of a floor element with a constructional detail according to the invention;

Fig. 4 is an example of a floor field built up from floor elements according to the invention, with a stairwell provided therein; and

Fig. 5 shows a section taken on the line V-V in Fig. 3.

The wing floor element 1, as shown in Fig. 1, consists of centrally located beam-shaped part 2 having wings 3 formed thereon on either side thereof. The width B of the beam-shaped part is for instance 600 mm, while the width b of the wings is 300 mm. Provided in the beam-shaped part 2 are four hollow cores 4 for saving material and weight. In the top part 9 of the beam-shaped part 2, longitudinal reinforcing wires 5 are provided, parallel to the hollow cores 4. The bottom face 11 of the wings 3 aligns with the bottom face of the beam-shaped part 2. The thickness D of the beam-shaped part can for instance be 180-200 mm and the wing thickness d is 50-70 mm. The thickness dimensions D and d depend on the desired degree of fire resistance of the floor element 1, or other requirements in terms of building physics and construction.

By means of a molding process, in a first step, a layer of concrete is formed having the width of the wing floor element 1 at the location of the wings 3. In this first layer, a longitudinal reinforcement 6 as well as a transverse reinforcement 7 is provided. Then, the top layer 9 of the beam-shaped part 2 is formed on the top face 12 of this first layer. Projecting from the top face 12 of the wings 3 are reinforcing elements 10 for supporting additional reinforcement and taking up possible shearing forces in the concrete to be poured in situ for filling up the space bounded by two abutting wings 3 of adjacent wing floor elements 1 and the upwardly directed lateral sides of the beam-shaped parts 2 of those wing floor elements 1.

The wing floor element as shown in Fig. 2 differs from the wing floor element according to Fig. 1 in that the width B of the beam-shaped part 2 as well as the width b of the wings 3 has been increased by a factor 2. Accordingly, the number of longitudinally extending hollow cores 4 in the beam-shaped part 2 has been doubled.

The width b of the wings can readily be adjusted and this width may also be zero, so that only one laterally projecting wing is formed on the beam-shaped part 2. It is also possible to provide the wings 3 with a certain incline in longitudinal direction, if so desired. The length of the wing floor element 1 can be chosen arbitrarily. In principle, the lengths of the beam-shaped part 2 and the wings 3 will be equal. An inclined end face is possible. The top layer 9 of the beam-shaped part 2 can be given a shorter length than the wings, as shown in Fig. 3, in which the wings project in longitudinal direction over a distance R from the end of the beam-shaped part 2, at least on one side thereof. This length difference R is extremely useful with wing floor elements that are used at the location of a hole in the floor, for instance a stairwell, in that this provides the possibility of providing a transversely extending reinforcement that can be incorporated into the concrete to be poured in situ.

Fig. 4 shows, by way of example, a floor field 20 built up from wing floor elements, of which floor field the dimensions are 8300 x 5330 mm. In the floor, an opening is made for a stairwell 26 whose dimensions are 2060 x 1050 mm. The floor 20 is built up from five wing floor elements 22-25 having their end edges resting on a circumferential supporting edge 21 of a supporting construction, for instance formed by walls. The outermost floor elements 22 have their longitudinal sides resting on this edge 21 as well.

The two floor elements 22 have a beam-shaped part having a width B of 600 mm, to which one single lateral wing connects having a width of 130 mm. The floor element 23 connecting thereto has a beam-shaped part having a width of 1200 mm, on which, on either side, wings having a width of 600 mm are provided. The floor element 24 has a beam-shaped part which also has a width of 1200 mm and wings of a width of 600 mm provided on either side thereof. The wings and the bottom layer 8 of the beam-shaped part continue to the stairwell, the top part 9 of the beam-shaped element ends at a certain distance from the end edge of the wings. Hence, the floor element 24 is of the type as shown in

Fig. 3. Connecting to the floor element 24, the floor element 25 is provided, of which the width of the beam-shaped part 2 is likewise 1200 mm, on either side provided with wings having a width of 420 mm. Hence, all beam-shaped parts of the floor elements 22-25 have a width of 600 or 1200 mm. The wing width of the floor elements 22 and 25 is adapted to the design depth of the floor and the location of the stairwell 26. One end of the floor element 24 finds no support on the circumferential edge 21 and should therefore be temporarily supported in a different manner, for instance by the possibly supported shuttering of the stairwell 26 to be shuttered in situ.

After the floor elements 22-25 have been placed, with the wing edges against each other, and the necessary pipes have been provided in the spaces located above the wings, these spaces are filled up with concrete, which is levelled to the height of the adjoining floor elements. Beforehand, adjacent the stairwell, the reinforcing elements 27 are provided to obtain a firm support of the end of the floor element 24 by the adjacent floor elements 23 and 25. The reinforcing elements 27 may have the shape of so-called concealed consoles or of a continuous trimmer strip. The hatched regions in Fig. 4 indicate the concrete poured in situ. The dashed lines present in those hatched regions indicate where adjoining floor elements have their wing edges abutting against one another.

The embodiment according to Fig. 5 shows a floor element which does not only have longitudinally extending hollow cores 4, but also transversely extending hollow cores 4'. These transverse hollow cores 4' facilitate the provision of continuous pipes on either side of the beam-shaped part 2 of the floor element.

Claims

1. A prefabricated concrete floor element, at least consisting of a cantilever beam-shaped part, provided with longitudinally extending hollow cores and reinforcing wires parallel thereto, characterized in that the beam-shaped part (2) is at least on one side provided with a laterally projecting wing (3) whose bottom face (11) aligns with the bottom face of the beam-shaped part (2), while the thickness (d) of the wing (3) is considerably less than that (D) of the beam-shaped part (2), said wing (3) being provided with longitudinal as well as transverse reinforcing wires (6, 7), of which the transverse reinforcing wires (7) continue into the bottom layer (8) of the beam-shaped part (2), while the wing (3) is provided with upwardly directed reinforcing elements (10) that project from the top face (12) of the wings (3) and have their bottom sides connected to the longitudinal and transverse reinforcement (6, 7) of said wing (3).

2. A floor element according to claim 1, characterized in that the beam-shaped part (2) is on both sides provided with laterally projecting wings (3) having equal, unequal or varying widths.

3. A floor element according to claim 1 or 2, characterized in that one end of the beam-shaped part (2) located above the top face (12) of the wings (3) ends at a distance (R) from the adjacent edge of the wings (3).

4. A floor element according to any one of claims 1-3, characterized in that the width (b) of the wings (3) is half the width (B) of the beam-shaped part (2).

5. A floor element according to any one of claims 1-4, characterized in that the beam-shaped part (2) is also provided with continuous, transversely extending hollow cores.

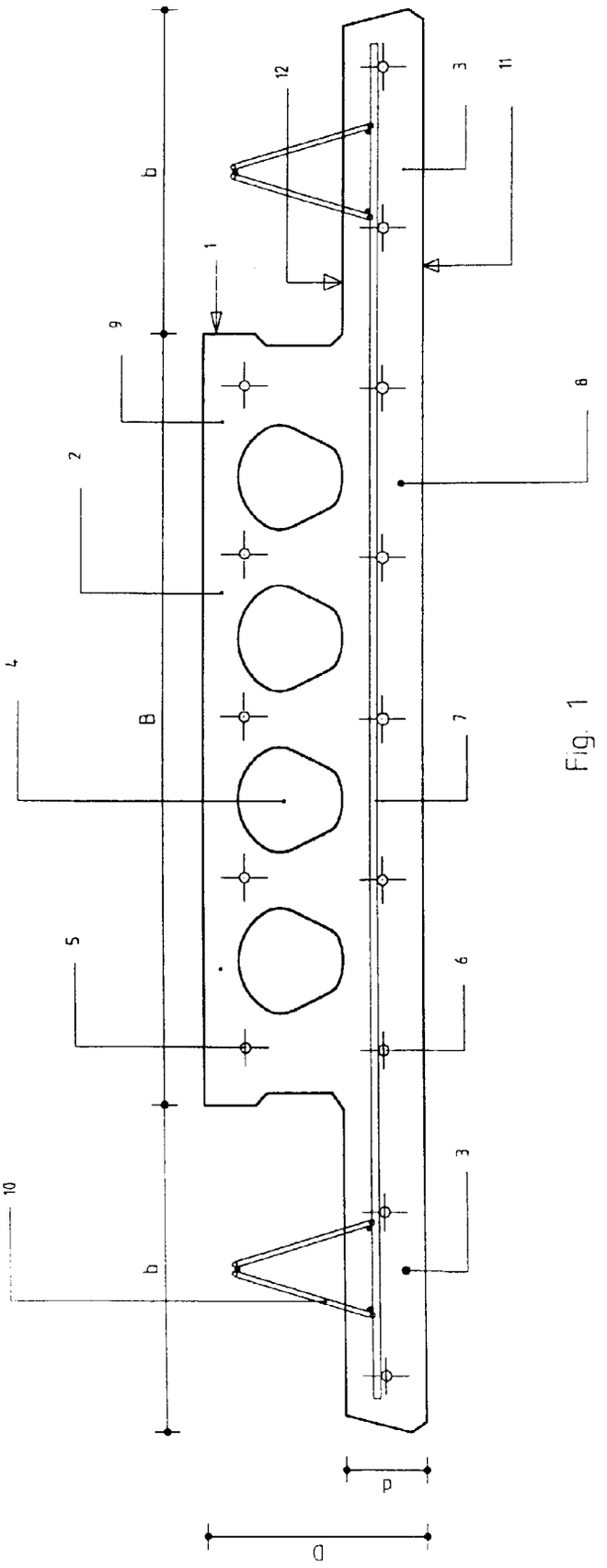

Fig. 1

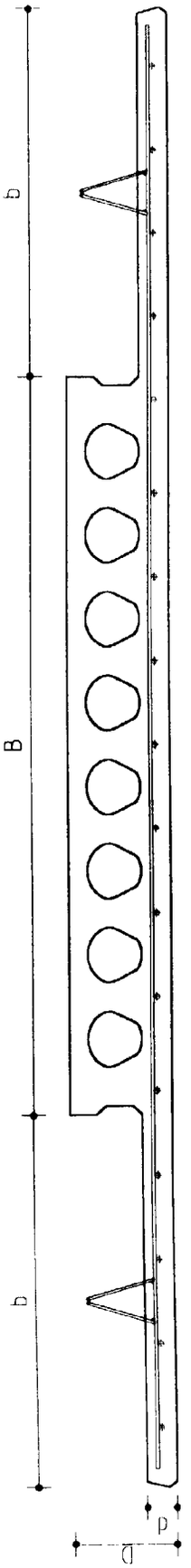

Fig. 2

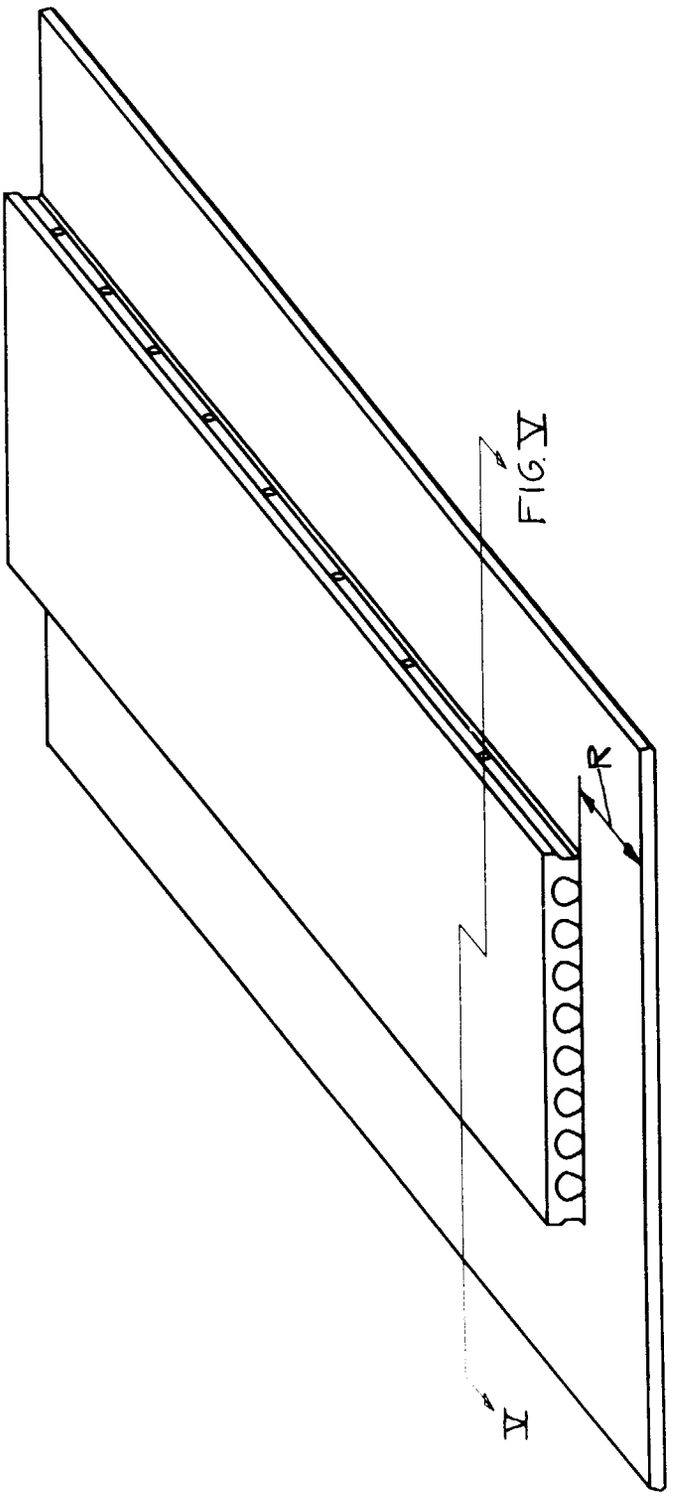

FIG.3

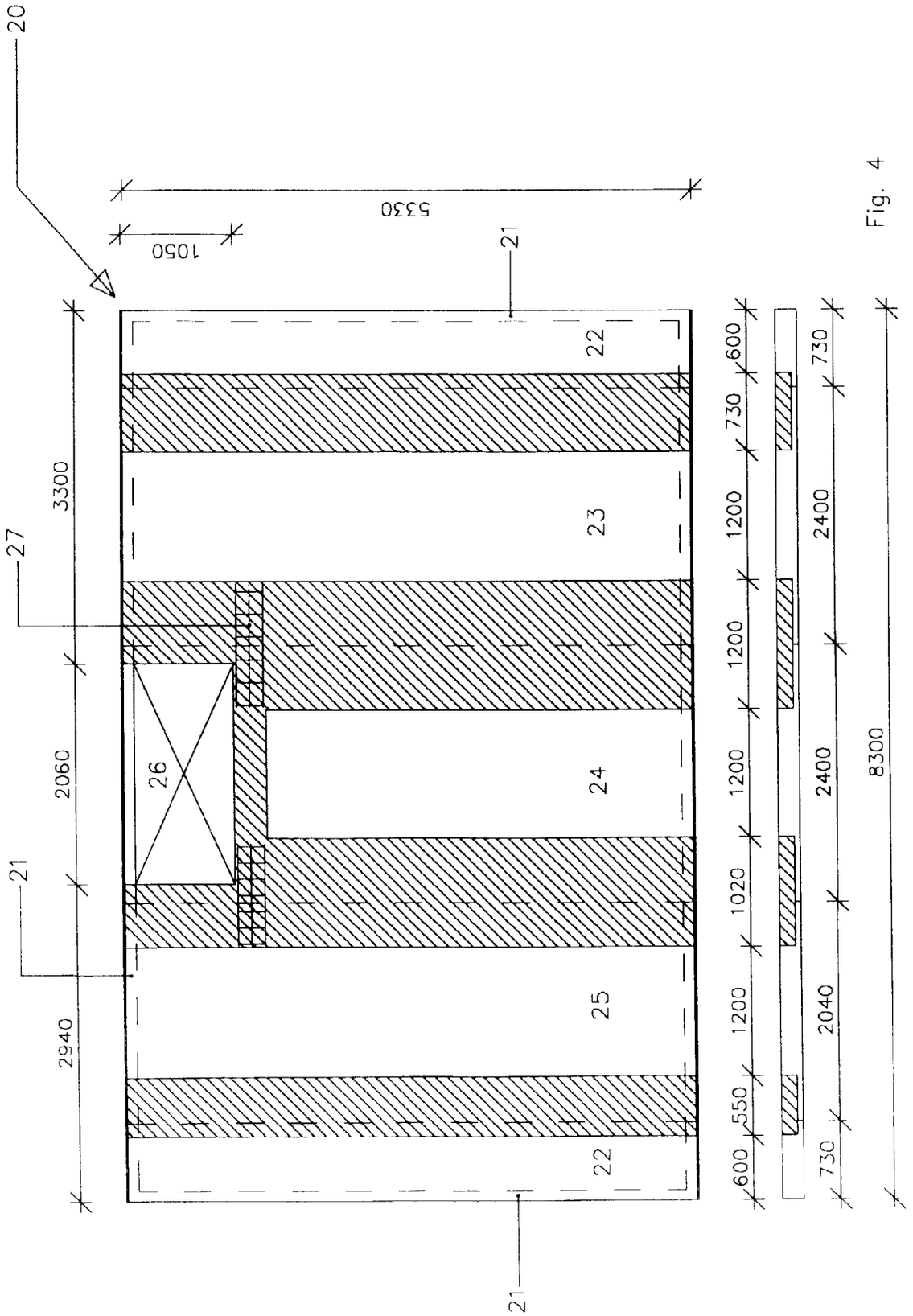
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Fig. 4

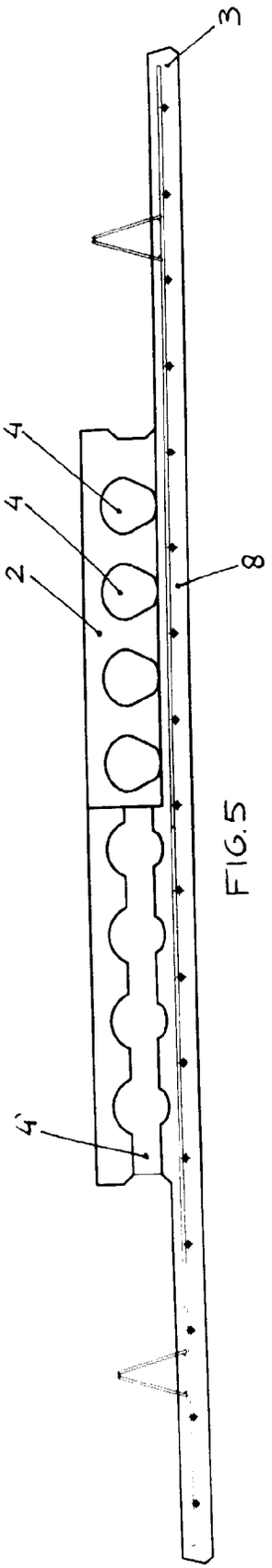

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2572

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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	6 November 1997	Righetti, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)

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