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(54) **A BEAM-LIKE BUILDING COMPONENT OF CURABLE MATERIAL, A METHOD OF MANUFACTURING SUCH A BUILDING COMPONENT, AND A METHOD FOR PRODUCING A FRAME OR STRUCTURE FOR A BUILDING OR PART OF A BUILDING WITH THE USE OF SUCH BUILDING MATERIAL.**

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Description

Technical Field

The present invention relates to beam-like building components comprising a first beam-part made of a castable and curable material, such as concrete, and having longitudinally extending reinforcement means embedded therein, and a second beam-part which is spaced from the first beam-part and connected thereto by means of a wire-like element extending rearwardly and forwardly i.e. back and forth between said beam-parts.

The invention also relates to a method for manufacturing such building components, and is also instructive in various usages thereof, for example the use of such building members in constructing frames or structures for a building, or a part of a building, in a simple and ready fashion.

Background Art

A beam-like building component of the aforedescribed kind is described and illustrated in DE—C—812 206.

DE—A—2 929 350 can also be said to describe a building component of the kind mentioned, although in this case it is a question of a concrete slab and not a concrete beam-part connected to a further beam-part via a forwardly and rearwardly extending wire.

In the beam-like building component of DE—C—812 206, the second beam-part comprises two iron angles welded together to form a T-shaped profile. The building component is intended to form part of a floor structure, which also includes other profiled components. The use to which this building component can be put is thus very limited.

In the beam-like building component of DE—A—2 929 350, the second beam-part is also made of metal, such as steel, and is welded to the forwardly and rearwardly extending wire. Consequently, this type of building slab also has a very restricted use. Other kinds of building components are described, for example, in the published PCT-Application with the number WO 80—01297, which describes a building component comprising two mutually parallel wooden strips, which are joined together with a wire extending rearwardly and forwardly between said strips.

CH—A—547 927 describes a concrete slab which is joined to a plurality of parallel metal components by means of wire-like elements.

DE—A—1 784 828 describes three triangularly arranged wooden beams, which are joined together by braces to form a truss or lattice structure.

US—A—4 125 981 describes a building structure comprising two parallel, composite boards on which concrete is applied, so that the boards are incorporated in the concrete structure.

Object of the Invention

The object of the present invention is to provide a lightweight and rigid beam-like building component, whose dimensions can be readily varied in dependence upon prevailing requirements, which is simple to manufacture without requiring complicated equipment therefor, and which finds miscellaneous use within the building field, where said component can be used for both vertical and horizontal members in the erection of building structures.

Brief Disclosure of the Invention

The present invention comprises a beam-like building component of the aforementioned kind which is mainly characterized in that the second beam-part is also made of a castable and curable material, such as concrete, having a longitudinally extending reinforcement means embedded therein; and in that the wire-like means extending back and forth between the beam-parts is joined with the longitudinally extending reinforcement means of each beam-part while connecting said beam-parts to form a lightweight, torque-rigid force-absorbing unit provided with integral reinforcement means. The back and forth extending wire-like means — which can be said to form a reinforcement spacer means between the beam-parts, determining the width or height of the building component — is statically significant since it connects the longitudinally extending reinforcement means of respective beam-parts together. In this way, it is possible to adjust such beam properties as static bearing capacity, section modulus and moment-absorbing capacity to prevailing requirements in a simple fashion.

The shape of the beam and its low weight per running meter, coupled with its material, steel and concrete, in static combination enables the beam to be used over a wide field.

Thus, with the use of vertical and horizontal building components constructed in accordance with the invention it is possible to erect a building frame or a building structure, the building components being connected together by means of bolts and nuts, in a simple fashion. The central vacant space between the beam-parts, in the region of the forwardly and rearwardly extending wire-like means can be put to a number of purposeful uses. For example, the space can be used for accommodating the doorframes and windowframes of the building. The vacant space can also be used to accommodate insulating material, in which case the building walls will be substantially constantly insulated along the whole of said walls, without the occurrence of thermal bridges.

A structure erected from building components according to the invention can also be provided with front and back mould walls, enabling concrete to be cast to form a substantially continuous wall or floor structure, the building component in this case being used as a so-called loss mould.

Building components constructed in accordance with the invention can be used, to advan-

tage, for erecting body structures for such buildings as private houses, low and high rise buildings, schools and industrial buildings. The said building components can, in addition, be used to erect other building structures, such as roofs, balconies, baluster etc., in a ready and simple fashion.

The design of the beam facilitates the application of elements for attaching facade elements, such as bricks or other facade covering elements.

The use of building components according to the invention for the erection of a building structure also enables water-supply lines and electrical-supply lines to be drawn through the building much more readily.

In practice it is preferred that the two beam-parts comprise the same material, optionally with intermediate parts joining the beam-parts.

According to a preferred embodiment, at least one side of the beam-parts is provided with a longitudinally extending wooden strip, which is cast into said beam-part or joined thereto in some other way, and intended to facilitate connection of the beam-part to another building component, by means of nails or screws. This embodiment affords many advantages. Despite the fact that the building frame or structure is built of concrete building components constructed according to the invention, thereby providing a firm, strong structure, it is relatively easy to install internal walls, floor structures, and roof trusses made of wood.

Alternatively, instead of casting a wooden strip into one or both of said beam-parts, it is possible to provide on the building component a separate wooden strip, to afford corresponding advantages.

A method for manufacturing a beam-like, reinforced building component comprising two reinforced beam-parts in spaced apart parallel relationship and made of a castable and curable material, such as concrete, is mainly characterized by introducing into a mould provided with side and end bulkheads and a central, upwardly tapering form body having a height which corresponds approximately to half the thickness of the finished component, a reinforcement ladder or tied-mesh reinforcement which includes a longitudinally extending reinforcement for each beam-part and a reinforcement rod which connects said each beam-part and which extends forwardly and rearwardly between said longitudinally extending reinforcement means; by introducing into the form subsequent hereto a similar, downwardly tapering form body having a height which corresponds approximately to half the thickness of the building component and being anchored relative to the first form body; and by casting concrete or some other curable material into the form and vibrating said form, and permitting the concrete or other curable material to set. The method according to the invention does not require any complicated mould or form equipment, and hence building components according to the invention can be manufactured on a factory scale without necessitating high investment costs. Thus, in many instances it may be economically rewarding to arrange for the building components to be manufactured in the immediate vicinity of a building site on which a building is to be erected, the body structure of which building shall comprise building components according to the invention.

On the other hand, since the running-meter weight of a building component constructed in accordance with the invention is relatively low, no difficulties are experienced in transporting the building components from a manufacturing location to a building site.

In practice, the tied-mesh reinforcement is placed on strips of foamed plastics or like material on the bottom form body, these strips being compressed under the weight of the tied-mesh reinforcement and the upper form body, to form a seal for the cast concrete or like material, so that the central area of the tied-mesh reinforcement is substantially free of concrete.

When erecting a frame structure or body structure of a building or part of a building with the use of beam-like building components according to the invention, the building components can be used as vertical wall supports, horizontal bearing elements and roof trusses, which are joined together by screw joints, and the vacant space between parts of the building components in the region of the central portions of the tied-mesh reinforcement can be used for mounting window frames and door frames and the like between the building components, for drawing electrical conduits, water-supply lines, and for housing insulating material and the like.

Thus, a building component according to the invention has a more or less universal function with a multiplicity of uses. In addition, the free space between the parts of the building components can be utilized in different ways to facilitate the erection of the building and to make said erection less expensive.

Further aspects of the invention will be understood from the following description of a number of embodiments of the invention. The description is made with reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1a is a perspective view of a beam-like building component according to the invention.

Figures 1b—1e are side and end views of four further types of beam-like building components, where at least one of the parallel, longitudinally extending beam-parts is provided with one or two cast wooden strips, to enable the building components to be nailed or screwed to another building component in a ready fashion.

Figures 1f—1k illustrate building components according to the invention whose ends are of mutually different configuration, enabling the building components to be used as vertical support members or carrying members.

Figure 1l illustrates an example of a roof truss

comprising two building components according to the invention cast together.

Figure 1m is a side view of a building component according to the invention for use as a horizontal supporting beam.

Figures 2a—2f illustrate a form for the manufacture of a beam-like building component according to Figure 1a, and also illustrates the procedural steps taken in said manufacture. All of the views, with the exception of Figure 2e, are end views, while Figure 2e is a perspective view of a foam and a cast building component during the curing process.

Figure 3 is a perspective view illustrating a building frame structure comprising beam-like building components according to the invention.

Figures 4a—4d are perspective views illustrating the procedural steps when casting basement-slab footings, and the initial stage of erecting a building structure thereupon.

Figure 5 is a perspective view illustrating the erection of part of a building body structure directly on footings.

Figure 6a is a perspective view illustrating the procedure when securing window frames and door frames to a part of a building body structure comprising building components according to the invention.

Figure 6b is a side view of a mould mounted against beams for casting walls and floor supports, so-called lost form, for a high-rise apartment building.

Figures 7a—7f illustrate detail arrangements when erecting the lower part of a building body structure.

Figures 8a—8d are detail views illustrating separate support arrangements when such are required in the erection of a building body structure.

Figures 9a and 9b are plan views illustrating two different arrangements for casting the walls of a building without separate forms while using concrete planks which connect to beam-like building components according to the invention.

Description of Preferred Embodiments

In Figure 1a there is shown a beam-like building component 1 comprising a first concrete beam-part 2 provided with a longitudinally extending reinforcement 4, and a second concrete beam-part 3 which extends parallel with said first beam-part 2 and which is provided with a longitudinally extending reinforcement 5. Extending forwardly and rearwardly between the beam-parts is a wire-like means 6, which is welded to each of the reinforcements 4 and 5 of respective beam-parts, to join the beam-parts together to form a light-weight, moment-rigid, force-absorbing unit provided with an integral reinforcement.

The height or thickness of the beam-part can be varied in dependence upon the requirements placed on the building component when used. The longitudinally extending reinforcement 4 and 5 in respective beam-parts may also having varying diameter, as can also the forwardly and rearwardly extending reinforcement 6, which serves as a distance-means reinforcement between the beam-parts and thus determines the height of the building component in a horizontal position.

As illustrated in more detail hereinafter, the building component 1 can be used as a horizontal or vertical structural member when erecting different building frame structures or body structures, and can be connected to other building components through suitable bolt-nut joints.

The building component, however, can also be joined to other building components by nails or screws, in which case the building component suitably has the form of one of the embodiments illustrated in Figures 1b—1e.

In the Figure 1b embodiment two wooden strips 8 are cast into each beam-part 2, 3. The outer side surfaces of the wooden strips 8 coincide with the side of respective beam-like elements 2, 4 facing away from opposite beam-like elements.

Each wooden strip 8 can be provided with a waist 8a for anchoring the strips in respective beam-parts when cast therein. In addition, respective wooden strips can be through-passed by a plurality of transverse steel anchoring pegs (not shown) arranged at a given distance apart, e.g. 400 mm in corresponding beam-parts 2 and 4 respectively.

In the Figure 1c embodiment, each beam-part 2 and 4 has a wooden strip 8 whose width is greater than the corresponding wooden strips illustrated in Figure 1b.

The embodiment shown in Figure 1c differs from the embodiment of Figures 1a and 1b insomuch as two reinforcing rods 6 extend forwardly and rearwardly between the beam parts. Further, each beam part 2 and 3 is provided with two longitudinally extending reinforcements 4 and 5 respectively. In the Figure 1d embodiment, the second beam part has a smaller height and width than the first beam-part 2, which in turn has two wooden strips 8.

The embodiment according to Figure 1e is similar to the Figure 1c embodiment, insomuch as the two beam-parts 2 and 3 are joined by two forwardly and rearwardly extending reinforcing rods 6. Since, however, one beam-part 3 has smaller dimensions than the other beam-part 2, the reinforcement rods 6 extending between the beam-parts to form spacer means form an angle with each other. The beam-part 2 of larger dimensions also has a wooden strip 8 cast therein.

Figures 1f—1k illustrate embodiments of beam-like building components according to the invention for use as vertical support or carrying members. The embodiments illustrated in Figure 1i and Figure 1j each have an open bottom end, to enable them to be fitted onto a horizontal support beam (see Figure 5).

The beam-like building members of these two embodiments, and also the embodiment according to 1h, are also open upwardly, for receiving an upper support beam (see Figure 6a).

Some embodiments, for example the embodi-

ments shown in Figures 1g, 1h and 1k, are instead, or in addition, provided with upper and lower closed recesses, for accommodating support beams, which in this case are inserted into the vertical building components laterally.

Figure 1f illustrates an embodiment of a building component according to the invention provided with an upper and a lower laterally directed recess for co-operation with upper and lower support beams respectively (not shown).

Thus, the embodiments according to Figures 1f—1k illustrate that support or carrying beams constructed in accordance with the invention can be provided with recesses of varying design and of varying locations for co-operation with horizontal support beams, roof trusses or the like.

Figure 1l illustrates an embodiment of a roof truss comprising two coherently cast beam-like building components according to the invention, said components forming an angle therebetween.

Figure 1m illustrates an embodiment of a building component according to the invention for use as a horizontal beam and intended to be assembled together with, for example, one of the support or carrying beams illustrated in Figure 1f—1k.

All of the building components according to the invention illustrated in Figures 1f—1m are provided with two or more holes 1c, which enable the building components to be readily bolted together by means of bolt-nut joints 25 (shown for example in Figure 3).

The procedural steps taken when manufacturing beam-like building components according to Figure 1a are shown in Figures 2a—2f. To this end, there is used a simple form 10 having a form bottom 11 which rests on two iron angles 12. The vertical sides of the angles are provided with side bulkheads 13, which are pivotally connected to the angles 12 by means of longitudinally extending pivots 14.

The form is also provided with end bulkheads (not shown).

Placed on the form bottom is an upwardly tapering form body 15 made of steel plate and having a height which corresponds approximately to half the thickness of the finished component. As shown in Figure 2b, two parallel strips 16 of foamed plastics are placed on the form body 15.

As shown in Figure 2c, a reinforcement ladder or tied-mesh reinforcement comprising a longitudinally extending reinforcement 4 and 5 and an interconnecting reinforcement rod 6 extending forwardly and rearwardly therebetween is then placed on top of the form body 15.

When the reinforcement 17 is placed on the foam-plastics strip 16, the strips 16 are compressed by the weight of said reinforcement.

A downwardly tapering form body 18 provided with two mutually parallel foam-plastics strips 16 is then placed on the reinforcement 17, the form bodies being anchored by means of a plurality of bolts 19 arranged in suitable spaced relationship, as illustrated in Figure 2d.

The weight of the upper form body 18 and the reinforcement ladder 17 compresses the foam-plastics strip 16, to form seals which prevent concrete from penetrating into the space between the form bodies, when concrete is poured into the form.

Figure 2e is a perspective view of the form with a cast building component therein. The form and building component can, in this state, be moved, for example on a carriage, to a station where the building component is allowed to harden or set, whereafter the mould is stripped (Figure 2f).

Building components according to the invention can be manufactured in series by means of the described method, and the illustrated form can be constructed in a rapid and simple manner, with low investment costs for the form equipment. The use of a loose bottom-form according to Figure 2 enables it to be removed from the mother form, when the concrete begins to set, thereby enabling the mother form to be cleaned and provided with a new bottom-form for a further casting operation.

Figure 3 is a perspective view which illustrates schematically a building body structure erected from building components according to the invention. In this case, the building components form both vertical wall supports and horizontal support beams, floor structures orso-called ground plates. In addition, in the illustrated embodiment slightly modified building components 1 of approximately the kind illustrated in Figure 1l form roof trusses. These roof trusses can be described as having legs 1b which extend from a central part 1a and which form angles with one another.

Figure 3 also illustrates, among other things, how a simplified foundation can be made with the use of beam-like building components according to the invention. Instead of casting a skirting having a height, for example, of 40—50 cm there is used downwardly extending recessed vertical support beams, e.g. according to Figure 1h, at a distance from the level of the ground, said vertical beam being provided with recesses for accommodating a horizontal support beam, e.g. according to Figure 1m, which supports a floor structure, which may also comprise beams according to Figure 1m.

This possibility of producing a simplified foundation structure represents a substantial saving in costs, among other things because the groundwork required is reduced and because no skirting or substrate need be cast.

The building components can be joined together by bolt-nut joints 25, this being facilitated by the free space in the central part of the building component. However, as shown in Figure 4c for example, through-passing holes 1c may also be provided in respective building components, for the passage of bolts.

Figures 4a—4d illustrate schematically an embodiment of a method of building a foundation and of anchoring the bottom part of the frame body structure to basement or foundation slabs.

In this method, there is first provided in a ground foundation 20 holes 20a for accommodating skirting foundations, which are reinforced and cast in concrete. Before the concrete has set, holders 22 for beam supports in the form of building components 1 are inserted into the cast footings 21, which components are anchored in the manner illustrated in Figure 4b when the concrete sets.

Figure 4c illustrates a mould side 23 mounted to holders 22. Subsequent to mounting said form side 23, the foundation is filled and packed to the correct height.

Basement slabs 24 are then cast and when the form sides 23 are removed the holders 22 remain cast in the basement slabs 24.

Building components 1 forming vertical wall supports can then be mounted in position and connected to the holders 22 by means of bolts and nuts 25.

As illustrated in Figure 4d, the wall supports carry horizontal building components 1 serving as support beams, which in turn support building components 1 serving as horizontal floor beams or so-called ground plates.

The horizontal floor beams 1 are joined to the wall supports by means of a bolt and nut joint 25.

Figure 5 illustrates a modified foundation-laying method, in which some basement slabs 24 are omitted. In the location of these omitted basement slabs, the lower portions of vertical wall supports in the form of building components 1 are instead cast directly into spot footings 21 cast in the ground, whereafter horizontal support beams, also in the form of building components 1, are inserted in recesses in the vertical wall supports. Ground plates or a floor structure comprising building components 1 according to the invention are then mounted on the horizontal support beams, said ground plates or floor structure being joined to the vertical wall supports by means of bolt-nut joints 25. The structure can then be continued vertically, to build a multi-level building, optionally a so-called high rise building.

Figure 6a illustrates by way of example a method of installing window frames and door frames in a building body structure. Window frames 27 and door frames 28 are secured to vertical stays in the form of building components 1, which are provided with upper and lower recesses which enable said stays to be connected to upper and lower horizontal support beams prior to installing said frames 27 and 28. It will be readily seen that a reliable construction is obtained which enables the vertical position of the window and door frames to be varied in a simple fashion.

Figure 6b illustrates a method of erecting a multiple-floor building with the use of building components 1 according to the invention. Upper load-carrying beams in the form of building components 1 of smaller dimension extend perpendicularly to the plane of the paper, in upper recesses arranged in vertical wall supports, which supports may comprise building components of the kind illustrated in Figure 1i. Resting on the load-carrying beams are horizontal beams, for example according to Figure 1m, which form floor structures and which are joined to the vertical support beams by bolt-nut joints 25.

Screwed to the outer and inner surfaces of the vertical support beams by means of screw joints 33 are form boards or shuttering 32, e.g. made of plywood, so-called plyfaform.

The outer form extends right up to the upper edge of the wall support, while the inner form board extends to a level corresponding to the sealing height of the room.

The horizontal floor-structure members are also clad on the underside thereof with form material 32, which is also screwed firmly to the said members by means of screw joints 33.

The space between the form sides is filled with concrete to the level of the lower edge of the upper floor structure. The vertical support beams are then placed in position for erecting the following floor — indicated in the upper margin of Figure 6b — in preparation for the next day's casting operation. These wall supports are placed on the horizontal load-bearing beams and are screwed thereto and to the beams of the floor structure. Concrete is then poured-in, up to the upper edge of the floor structure.

The forms are stripped on the following day, and the next floor to be erected is made ready for casting etc.

The building components 1 located between the form sides 32 will be cast in the concrete wall, and thus form so-called lost moulds.

Figure 7a illustrates an arrangement for providing compartment recesses for skirting in conjunction with a support beam for a building body structure erected from building components according to the invention. A horizontal building component 1 according to the invention is accommodated in the skirting and carries floor-structure members which also comprise building components 1 and which extend perpendicularly.

Figure 7b illustrates how two support beams in the form of building components 1 are arranged side by side in the skirting, to permit additional loading.

Figure 7c illustrates a principal method of procedure when applying load-bearing members for facade elements, e.g. bricks. In this case, there is used load-bearing components 30 of particular design, as illustrated in Figures 7e and 7f. In the method illustrated in Figure 7c, these bearing members 30 are hooked onto horizontal support beams 1 accommodated in the skirting, at a given spacing apart.

Figures 8a—8d illustrate a number of different arrangements of support members against spot-footings and basement slabs respectively (Figure 8a) for beams of long span, where two or more building components 1 are arranged adjacent one another (Figure 8b), and supports for beams when splicing or joining. Figure 8c is a side view of a suitable support element, while Figure 8d illustrates how two horizontal building com-

ponents are joined or spliced together by means of horizontal splicing or connecting iron 38.

Figures 9a and 9b illustrate two examples of how a concrete plank is mounted to a building component according to the invention, to produce a so-called lost form. Pre-fabricated wall elements 34 in the form of concrete planks or slabs are provided with shoulders 34a defined by an inclined surface corresponding to the slope of respective beam-parts 2. The inner wall element 35, which also comprises a concrete plank or slab, is provided with corresponding shoulders 35a.

The configuration of shoulders 34a and 35a on the outer and inner walls 34 and 35 respectively is such that when concrete is cast between the outer and inner walls, the pressure exerted by the concrete is transmitted to the building components. In this case, the wall elements 34, 35 will be anchored to the building components 1 to form a so-called lost form.

Figure 9b illustrates an arrangement which is a modification of the Figure 9a embodiment and in which the outer and inner walls 34' and 35' respectively exhibit instead mutually abuting surfaces 34'a and 35'a respectively which are straight instead of being inclined. The abutment surfaces abut mutually opposed side surfaces of the building component 1. In this embodiment, the outer and inner walls 34', 35' are anchored to respective building components 1 by means of ties 40.

The fact that the building component 1 exhibits a recess in the region of its central part facilitates concreting of the walls and ensures an improved end result. Thus, there is obtained a continuous concrete core along the whole of the wall.

As will be understood, instead of concrete, the space between the outer and inner walls 34, 35 and 34', 35' respectively can be filled with insulating material, thereby to obtain an unbroken insulation in the region of the building element 1, without the presence of thermal bridges.

Industrial Applicability

As will be readily understood, the aforedescribed embodiments merely represent conceivable examples of the invention and how the invention can be put into practice in the erection of different building constructions. It will also be readily understood that the invention can be applied in a number of other ways and can be accorded a wide range of use within the building technique.

In particular, the building component need not have the form illustrated in Figure 1, but can be modified in different ways, in which the two beam-parts 2 and 3 along given parts of the building component are joined together and/or form given angles with one another. It is essential with respect to the invention that the building component exhibits two reinforced beam-parts which are joined together by a rearwardly and forwardly extending wire-like means which forms a distance-reinforcement means and which exhibits those properties described above. It will be readily understood to one of normal skill in this art, however, that different types of special members or elements designed for particular purposes can be produced and, independence upon the requirements set, given a form different to the basic form of the building component without departing from the basic concept of the invention.

Claims

1. A beam-like building component comprising a first beam-part (2) made of a castable and curable material such as concrete, and having a longitudinally extending reinforcement (4) embedded therein and a second beam-part (3) which extends at a distance from the first beam-part and which is joined to said first beam-part by means of a wire-like means (6) extending back and forth between said beam-parts, characterized in that the second beam-part (3) is also made of a castable and curable material,such as concrete, having a longitudinally extending reinforcement (5) embedded therein; and in that the wire-like means (6) extending back and forth between said beam-parts is joined to the longitudinally extending reinforcement (4, 5) of the respective beam-parts to connect the beam-parts together so as to form a lightweight, moment-rigid, load-absorbing unit provided with an integrated reinforcement.

2. A building component according to Claim 1, characterized in that the two beam-parts (2, 3) are made of the same curable material with portions connecting intermediate beam-parts.

3. A building component according to Claim 1 or Claim 2, characterized in that at least one side of the beam-parts exhibits a longitudinally extending wooden strip (8) which is cast in its respective beam part or joined thereto in some other way, and which is intended to facilitate connection of said beam-part to a further building component, by means of nail or screw joints.

4. A building component according to any one of Claims 1—3, characterized in that the side surfaces of the beam-parts (2, 3) and surfaces remote from one another are substantially planar.

5. A building component according to Claim 4, characterized in that the beam-parts (2, 3) taper in a direction towards one another.

6. A method of manufacturing a beam-like reinforced building component (1) comprising two mutually spaced and mutually parallel reinforced beam-parts (2, 3) made of a curable and castable material, such as concrete, characterized by

introducing into a form (10) provided with side and end bulkheads (13) and a central, upwardly tapering form body (15) whose height corresponds approximately to half the thickness of the finished component, a reinforcement means (17) comprising a longitudinally extending reinforcement (4, 5) for each beam-part and a reinforcement wire-like means (6) which connects said beam-parts together and which extends back and forth between said longitudinally extending reinforcements (4, 5);

by then inserting into the form a similar, downwardly tapering form body (18) whose height corresponds approximately to half the thickness of the beam-member and which is anchored relative to the first form body, and

by pouring concrete or some other hardenable material into the form, vibrating said concrete or material and permitting the same to set.

7. A method according to Claim 6, characterized by placing the reinforcement means (17) on strips (16) of foamed plastic or like material on the lower form body (15), the arrangement being such that said strips are compressed under the weight of the reinforcement means and the upper form body, to form a seal for the cast concrete or the like, so that the central part of the reinforcement means (17) is substantially free from concrete.

8. A method of erecting a building frame structure or building body structure, or a part of such a structure, with the use of beam-like building components (1) according to any one of Claims 1—5, characterized in that the building components (1) are used both as vertical wall supports and horizontal load-carrying members, which are joined together by means of screw joints (25); and in that the free space between the parts of the building components in the region of the central part of the reinforcement wire-like means (6) is utilized to facilitate the mounting of window frames and door frames (27; 28) or the like between said building components, or for passing electrical conduits, water lines, insulation or the like therebetween.

9. A method according to Claim 8, characterized in that when screwing the building components together there is mounted thereto form sides (32; 34, 35), optionally in the form of pre-manufactured wall elements, and pouring concrete therebetween, the arrangement being such that concrete flows between the beam-parts to form a substantially unbroken wall, in which the building components form so-called lost forms.

10. A method according to Claim 8, characterized in that outer walls, insulation and inner walls are mounted to the building-frame structure or building-body structure erected from said building components, the insulation being passed through the space between parts of the building components, to form a substantially continuous insulation with the absence of thermal bridges along the wall.

11. A method according to any one of Claims 3—10, characterized in that screwed to the frame structure or body structure is a roof truss comprising mutually similar building components, the outer surfaces and inner surfaces of which are provided with a covering of concrete elements.

12. A method according to Claim 8 in which there is used a building component (1) whose beam-parts (2, 3) taper towards one another, characterized by mounting between the building components (1) false-ceiling elements, flooring elements, false-floor elements or the like, provided with projections (34a, 35a) having a sloping and/or abutment surface corresponding to the shape of the beam-parts (2, 3) at the point of contact therewith, the members and elements in question being held to the building components (1) by the force exerted against said building components (1), without the use of an externally located form or the like (Figure 9a).

Patentansprüche

1. Balkenähnliches Bauteil, bestehend aus einem ersten Balkenteil (2) aus einem gießbaren und härtbaren Material, z.B. Beton, mit einer sich in Längsrichtung erstreckenden, darin eingebetteten Bewehrung (4) und einem zweiten Balkenteil (3), das sich im Abstand vom ersten Balkenteil erstreckt und durch ein zwischen genannten Balkenteilen sich hin und her erstrekkends drahtähnliches Mittel (6) mit dem ersten Balkenteil verbunden ist, dadurch gekennzeichnet, daß das zweite Balkenteil (3) auch aus gießbarem und härtbarem Material, z.B. Beton, mit einer sich in Längsrichtung erstreckenden Bewehrung (5), die darin eingebettet ist, besteht, und daß das zwischen genannten Balkenteilen sich hin und her erstreckende drähtähnliche Mittel (6) mit der in Längsrichtung sich erstreckenden Bewehrung (4, 5) der jeweiligen Balkenteile verbunen ist und die Balkenteile dadurch so miteinander verbindet, daß eine leichte, momentsteife, lastaufnehmende, mit einer integrierten Bewehrung versehene Einheit gebildet wird.

2. Bauteil nach Anspruch 1, dadurch gekennzeichnet, daß die zwei Balkenteile (2, 3) aus demselben härtbaren Material mit dazwischenliegende Balkenteile verbindenden Partien besteht.

3. Bauteil nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß wenigstens eine Seite der Balkenteile eine in Längsrichtung sich erstreckende Holzleiste (8) aufweist, die in ihr jeweiliges Balkenteil gegossen oder auf andere Weise mit diesem verbunden und vorgesehen ist, den Anschluß genannten Balkenteils an ein weiteres Bauteil mit Nagelung oder Schraubung zu erleichtern.

4. Bauteil nach einem der Ansprüche 1—3, dadurch gekennzeichnet, daß die Seitenoberflächen der Balkenteile (2, 3) und die voneinander abgewandten Oberflächen im wesentlichen plan sind.

5. Bauteil nach Anspruch 4, dadurch gekennzeichnet, daß die Balkenteile (2, 3) sich in Richtung zueinander verjüngen.

6. Verfahren zur Herstellung eines balkenähnlichen bewehrten Bauteiles (1), bestehend aus zwei parallel mit Abstand zueinander sich erstreckenden bewehrten Balkenteilen (2, 3) aus einem gießbaren und härtbaren Material, z.B. Beton, dadurch gekennzeichnet, daß in eine Form (10), die mit Seiten- und Endschotten (13) und einem mittigen, aufwärts sich verjüngenden Formkörper (15) mit einer ungefähr der halben Dicke des fertigen Bauteiles entsprechenden Höhe versehen ist, ein Bewehrungsmittel (17) eingeführt wird, das aus in Längsrichtung sich erstrek-

kender Bewehrung (4, 5) für jedes Balkenteil und einem bewehrungsdrahtähnlichen Mittel (6) besteht, das genannte Balkenteile miteinander verbindet und sich zwischen genannten in Längsrichtung sich erstreckenden Bewehrungen (4, 5) hin und der erstreckt, daß in die Form ein ähnlicher, abwärts sich verjüngender Formkörper (18) eingeführt wird, dessen Höhe ungefähr der halben Dicke des Balkengliedes entspricht und in Beziehung zum ersten Formkörper verankert ist, daß Beton oder ein anderes härtbares Material in die Form gegossen, und der Beton oder das andere Material gerüttelt und zum Härten gebracht wird.

7. Verfahren nach Anspruch 6, dadurch gekennzeichnet, daß das Bewehrungsmittel (17) auf Leisten (16) aus Schaumstoff oder ähnlichem Material auf dem unteren Formkörper (15) so angeordnet wird, daß genannte Leisten unter dem Gewicht des Bewehrungsmittels und des oberen Formkörpers zusammengedrückt werden und eine Dichtung für den gegossenen Beton o. dgl. bilden, so daß das mittlere Teil des Bewehrungsmittels (17) im wesentlichen frei von Beton ist.

8. Verfahren zur Errichtung eines Baugerippes oder einer Hauskörperkonstruktion, oder eines Teiles solch einer Konstruktion, unter Anwendung von balkenähnlichen Bauteilen (1) nach einem der Ansprüche 1—5, dadurch gekennzeichnet, daß die Bauteile (1) sowohl als vertikale Wandstützen als auch als horizontale tragende Glieder angewendet werden, die durch Schraubverbindungen (25) zusammengefügt werden, und daß der freie Raum zwischen den Teilen der Bauteile im Bereich des mittleren Teiles des bewehrungsdrahtähnlichen Mittels (6) zur Erleichterung des Einbaus von Fensterrahmen und Türrahmen (27; 28) o.dgl. zwischen genannten Bauteilen oder zum Hindurchführen von elektrischen Leitungen, Wasserleitungen, Isolierung o.dgl. dazwischen angewendet wird.

9. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß beim Zusammenschrauben der Bauteile Formseiten (32; 34, 35), ggf. in Form vorgefertigter Wandelemente, an ihnen angebracht werden, und Beton dazwischen gegossen wird, so daß Beton zwischen die Balkenteile fließt und eine im wesentlichen durchgehende Wand bildet, in der die Bauteile sog. verlorene Schalung bilden.

10. Verfahren nach Anspruch 8, dadurch gekennzeichnet, daß Außenwände, Isolierung und Innenwände am Baugerippe oder Hauskörper, die aus genannten Bauteilen errichtet sind, angebracht werden, und die Isolierung durch den Raum zwischen Teilen der Bauteile so hindurchgeführt wird, daß sich eine im wesentlichen durchgehende Isolierung ohne Kältebrücken längs der Wand ergibt.

11. Verfahren nach einem der Ansprüche 3—10, dadurch gekennzeichnet, daß am Baugerippe oder Hauskörper ein Dachstuhl angeschraubt wird, der aus zueinander gleichen Bauteilen besteht, und dessen äußere und innere Oberflächen mit einer Verkleidung aus Betonelementen versehen sind.

12. Verfahren nach Anspruch 8 unter Anwendung eines Bauteiles (1), dessen Balkenteile (2, 3) sich zueinander verjüngen, dadurch gekennzeichnet, daß zwischen den Bauteilen (1) Unterdeckenelemente, Geschoßdeckenelemente, Unterbodenelemente o.dgl. angebracht werden, die mit Ansätzen (34a, 35a) versehen sind, die eine schräge und/oder Anliegefläche entsprechend der Form der Balkenteile (2, 3) am Berührungspunkt damit haben, und die Glieder und Elemente durch die gegen genannte Bauteile (1) ausgeübte Kraft an den Bauteilen (1) ohne die Anwendung von außen liegender Form o.dgl. (Fig. 9a) gehalten werden.

Revendications

1. Elément de construction en forme de poutre, comprenant une première partie de poutre (2) réalisée dans un matériau moulable durcissant tel que du béton et comportant un renfort longitudinal (4) noyé dans celui-ci, et une seconde partie de poutre (3) placée à une certaine distance de la première partie de poutre et se reliant à celle-ci par des moyens en forme de fil (6) allant et venant d'arrière en avant entre ces parties de poutres, élément caractérisé en ce que la seconde partie de poutre (3) est également réalisée dans un matériau moulable durcissant tel que du béton comportant un renfort longitudinal (5) noyé dans celui-ci d'arrière en avant, et en ce que les moyens en forme de fil (6) s'étendant entre les parties de poutres, sont reliés aux renforts longitudinaux (4, 5) des parties de poutres respectives pour les associer de manière à former un poids léger, un moment indéformable, un bloc d'absorption de charge, muni d'un renfort intégré.

2. Elément de construction selon la revendication 1, caractérisé en ce que les deux parties de poutres (2, 3) sont réalisées dans le même matériau durcissant et comportent des parties intermédiaires les reliant entre elles.

3. Elément de construction selon l'une quelconque des revendications 1 et 2, caractérisé en ce que l'un au moins des côtés des parties de poutres comporte une bande de bois longitudinale (8) moulée dans la partie de poutre correspondante ou reliée à celle-ci de toute autre manière, cette bande de bois étant destinée à faciliter la liaison de cette partie de poutre à un autre élément de construction par des joints à clous ou à vis.

4. Elément de construction selon l'une quelconque des revendications 1 à 3, caractérisé en ce que les surfaces latérales de parties de poutres (2, 3) et les surfaces les plus éloignées l'une de l'autre, sont sensiblement planes.

5. Elément de construction selon la revendication 4, caractérisé en ce que les parties de poutres (2, 3) sont taillées en cônes s'amincissant dans le sens où elles se font face.

6. Procédé de fabrication d'un élément de construction renforcé en forme de poutre (1) comprenant deux parties de poutres espacées parallèles (2, 3) en matériau moulable et durcissant tel que du béton, procédé caractérisé par une introduction dans une forme (10) munie de cloisons latérales et de nervures (13), et d'un corps central chanfreiné vers le haut (15) dont la hauteur correspond approximativement à la moitié de l'épaisseur de l'élément terminé, d'un dispositif de renforcement (17) constitué d'un renfort longitudinal (4, 5) pour chaque partie de poutre et d'un renfort en forme de fil (6) reliant ensemble les parties de poutres et allant et venant d'arrière en avant entre les renforts longitudinaux (4, 5); par l'introduction ensuite dans la forme d'un corps chanfreiné analogue vers le bas (18) dont la hauteur correspond approximativement à la moitié de l'épaisseur de l'élément de poutre et s'accrochant au premier corps; et au versement du béton ou tout autre matériau durcissant dans la forme en le faisant vibrer pour lui permettre de prendre.

7. Procédé selon la revendication 6, caractérisé en ce qu'il consiste à placer les moyens de renforcement (17) sur les bandes (16) de mousse de plastique ou autre matériau posé sur le corps inférieur (15), la disposition étant telle que les bandes se compriment sous le poids des moyens de renforcement et du corps supérieur pour former un joint du béton moulé ou autre, de façon que la partie centrale des moyens de renforcement (17) soit pratiquement exempte de béton.

8. Procédé de construction d'une structure de corps ou de charpente de bâtiment, ou d'une partie de cette structure, au moyen des éléments de construction en forme de poutres (1)selon l'une quelconque des revendications 1 à 5, procédé caractérisé en ce qu'on utilise les éléments de construction (1) aussi bien comme supports de parois verticales que comme éléments horizontaux de support de charge reliés ensemble par des joints à vis (25); et en ce qu'on utilise l'espace libre compris entre les parties d'éléments de construction situées dans la zone centrale des moyens de renforcement en forme de fil (6), pour faciliter le montage des châssis de portes ou fenêtres ou autres (27, 28) entre ces éléments de construction, ou pour faire passer entre eux des conduites d'électricité ou d'eau, ou des isolants ou autres.

9. Procédé selon la revendication 8, caractérisé en ce que, lorsqu'on visse ensemble les éléments de construction, on monte en même temps sur ceux-ci des formes latérales (32, 34, 35) se présentant éventuellement sous la forme d'éléments de parois préfabriqués, puis on verse du béton entre ces éléments, la disposition étant telle que le béton coule entre les parties de poutres pour former des murs ininterrompus dans lesquels les éléments de construction forment ce qu'on appelle des formes noyées.

10. Procédé selon la revendication 8, caractérisé en ce que les murs extérieurs, les murs d'isolation et les murs intérieurs, sont montés sur la structure de charpente ou sur la structure de corps de bâtiment construite à partir de ces éléments de construction, l'isolation passant dans l'espace compris entre les parties d'éléments de construction pour former une isolation parfaitement continue et sans ponts thermiques le long du mur.

11. Procédé selon l'une quelconque des revendications 3 à 10, caractérisé en ce qu'on visse à la structure de charpente ou à la structure de corps, des fermes de toiture constituées d'éléments de construction analogues dont les surfaces extérieures et intérieures sont munies d'une couverture d'éléments de béton.

12. Procédé selon la revendication 8, dans lequel on utilise un élément de construction (1) dont les parties de poutres (2, 3) vont en s'amincissant l'une vers l'autre, caractérisé en ce qu'on monte entre les éléments de construction (1) des éléments de faux plafond, de plancher, de faux plancher ou autres, munis de projections (34a, 35a) présentant une surface inclinée et/ou de butée correspondant à la forme des parties de poutres (2, 3) au point de contact avec celles-ci, les éléments en question étant maintenus fixés aux éléments de construction (1) par la force exercée contre ceux-ci, sans utilisation d'une forme extérieure ou autre (figure 9a).

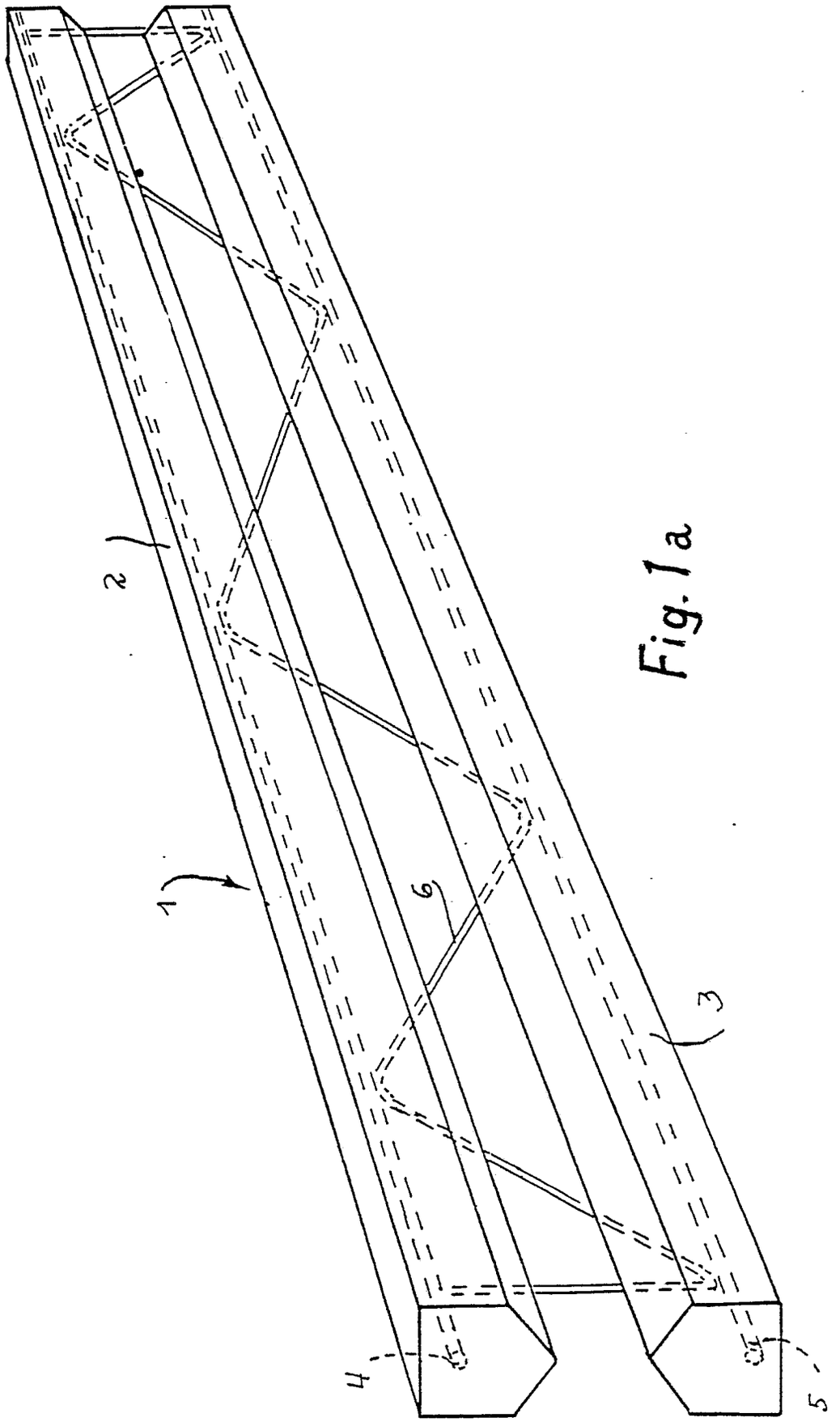
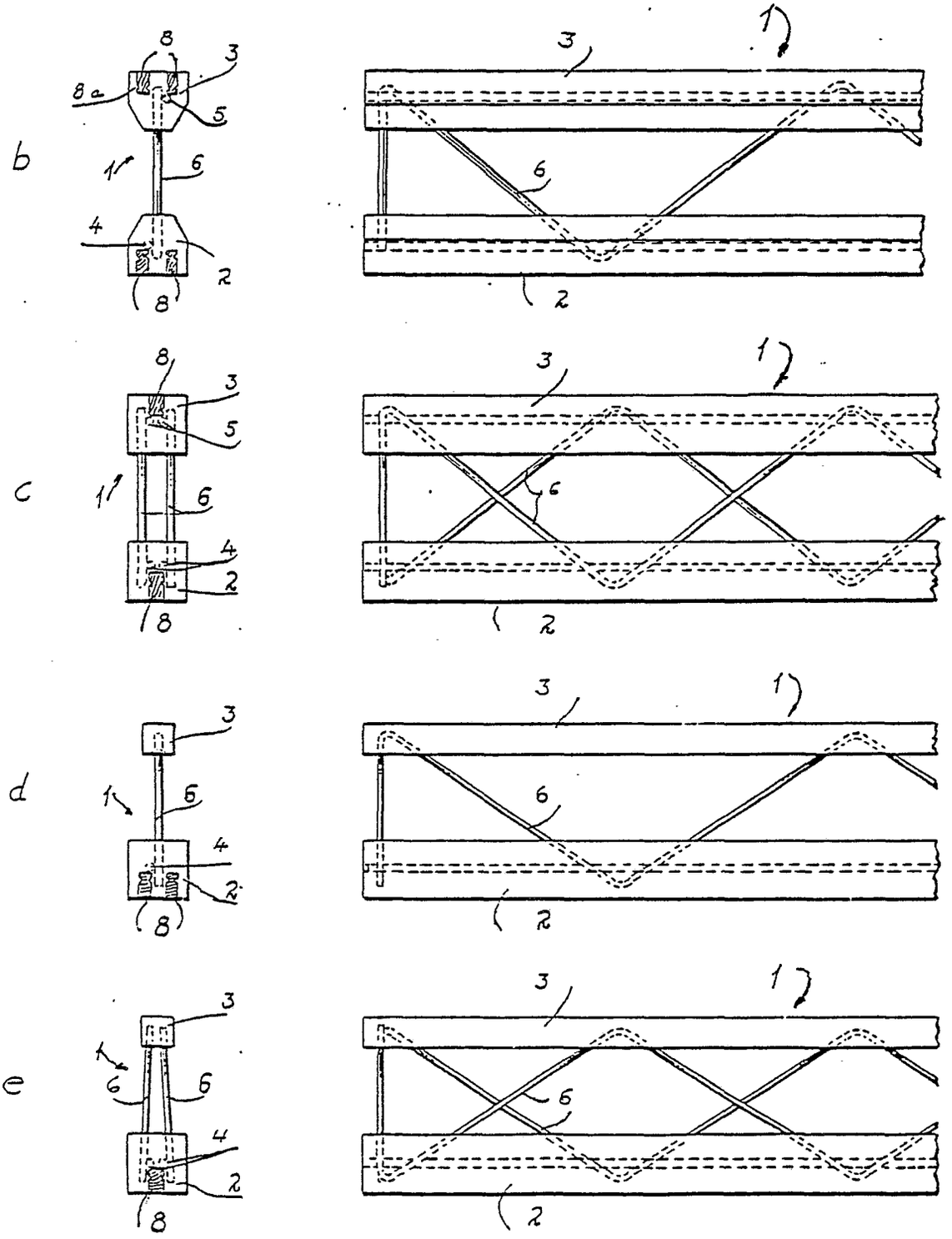


Fig. 1a

Fig.1b - e



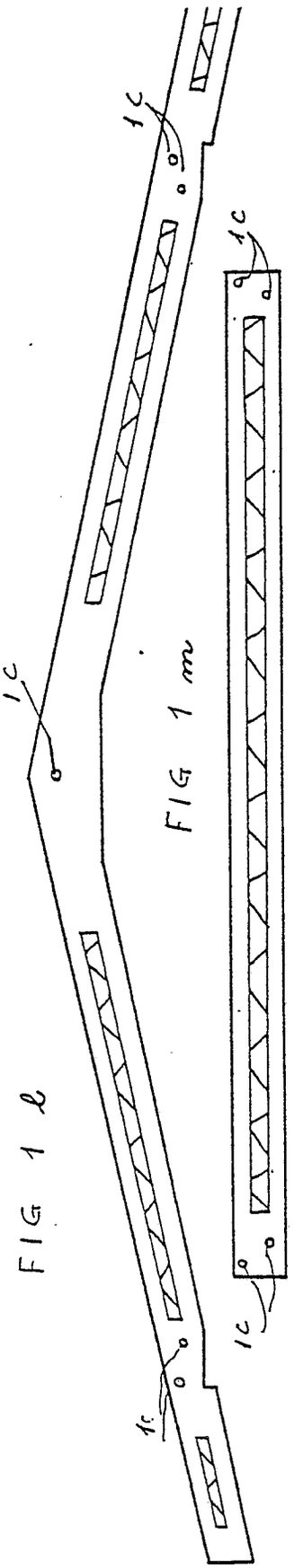


FIG 1 l

FIG 1 m

FIG

1 k

1 j

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1 h

1 g

1 f

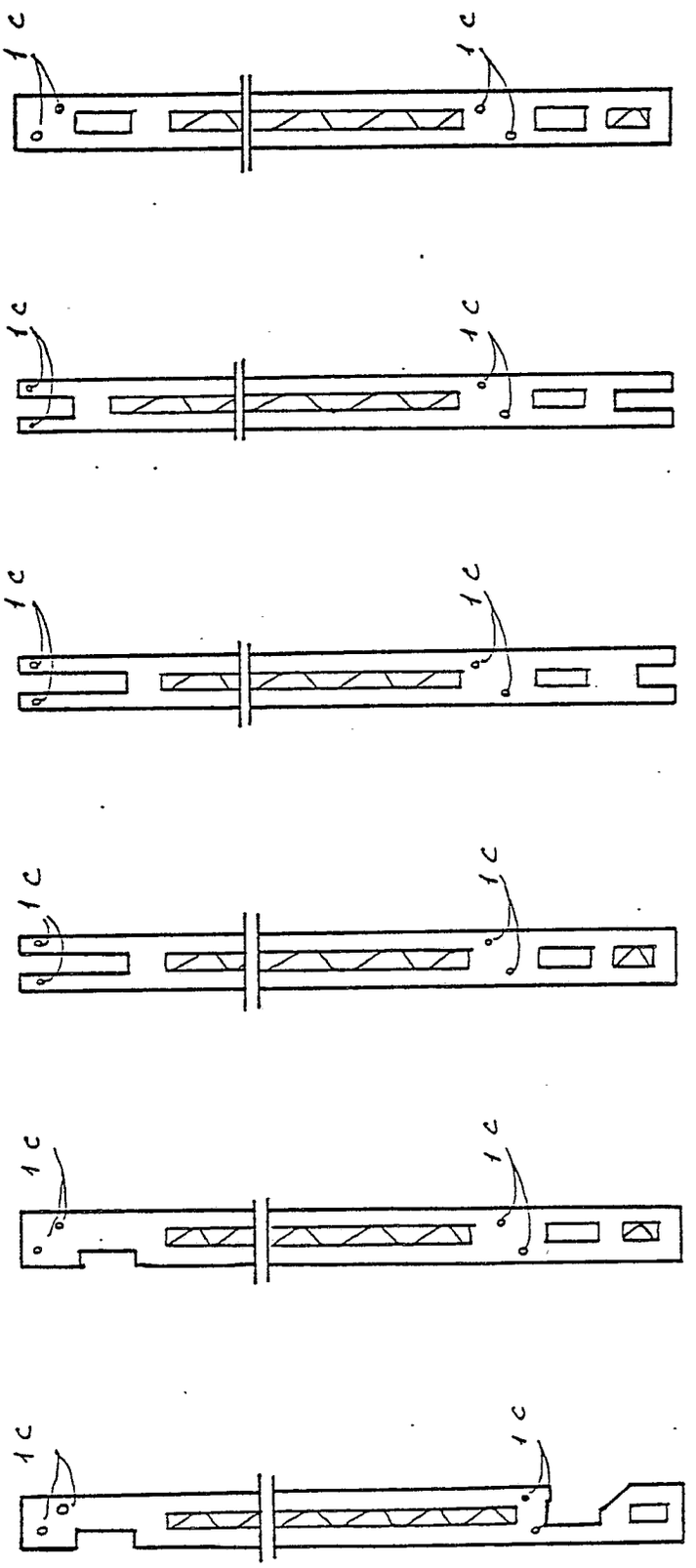


FIG 2a

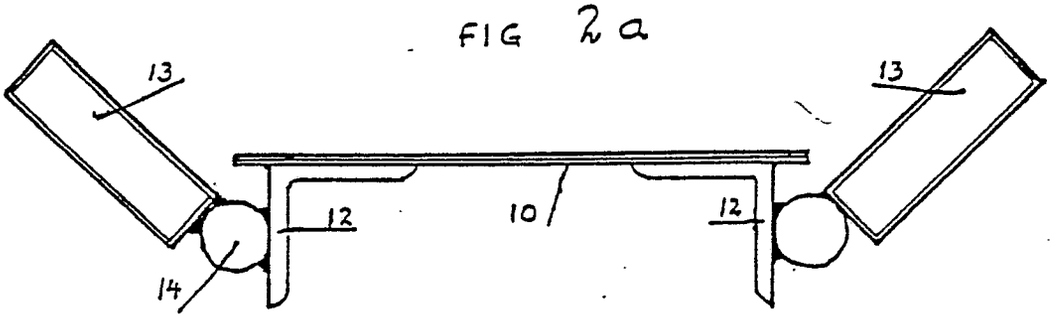


FIG 2b

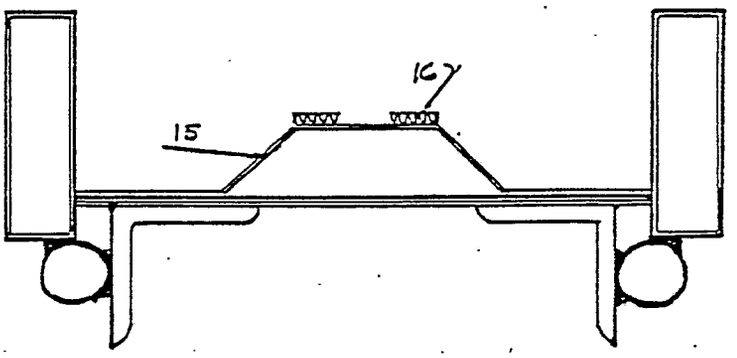


FIG 2c

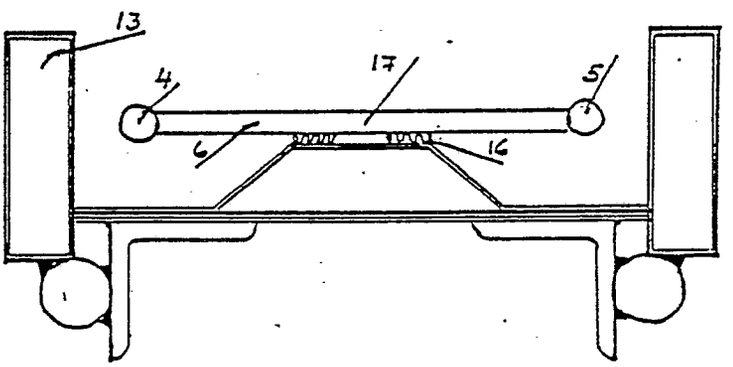


FIG 2d

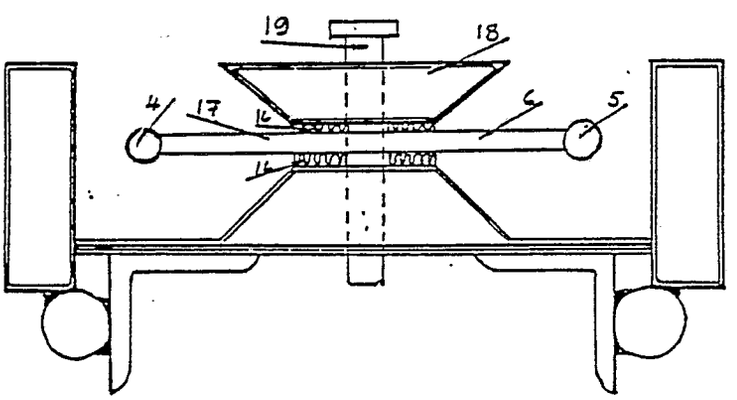


FIG 2 f

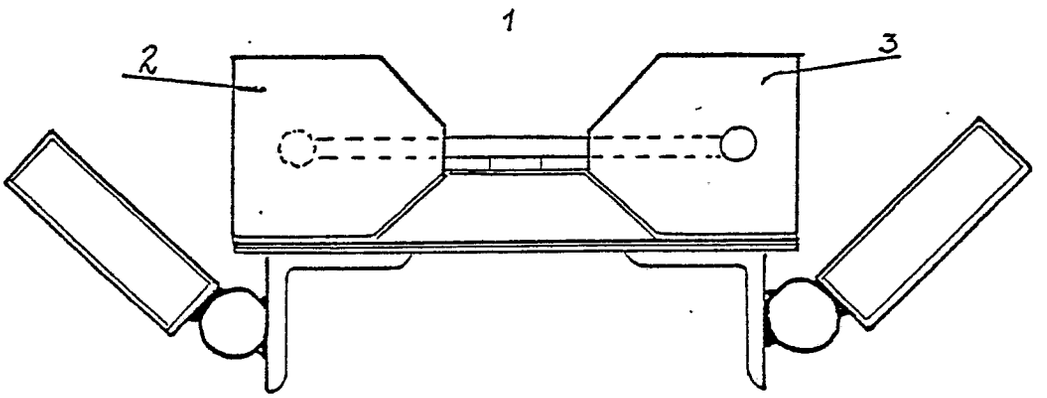
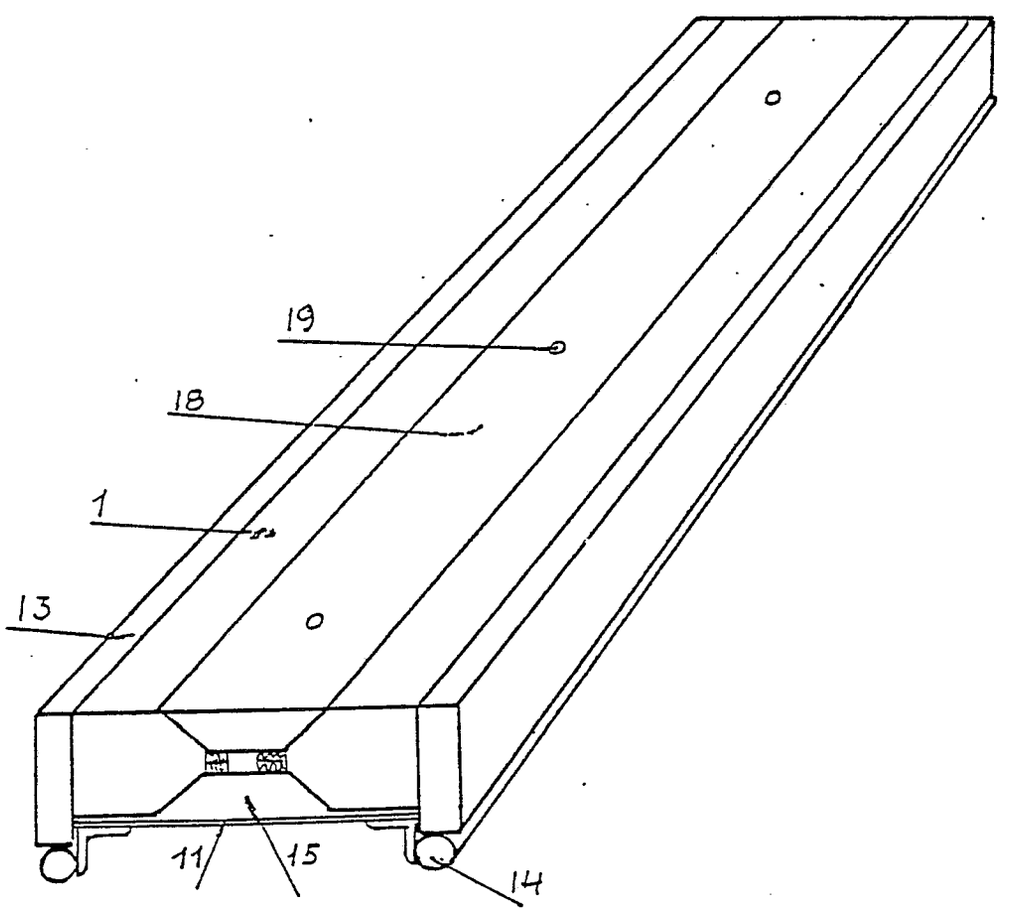


FIG 2 e



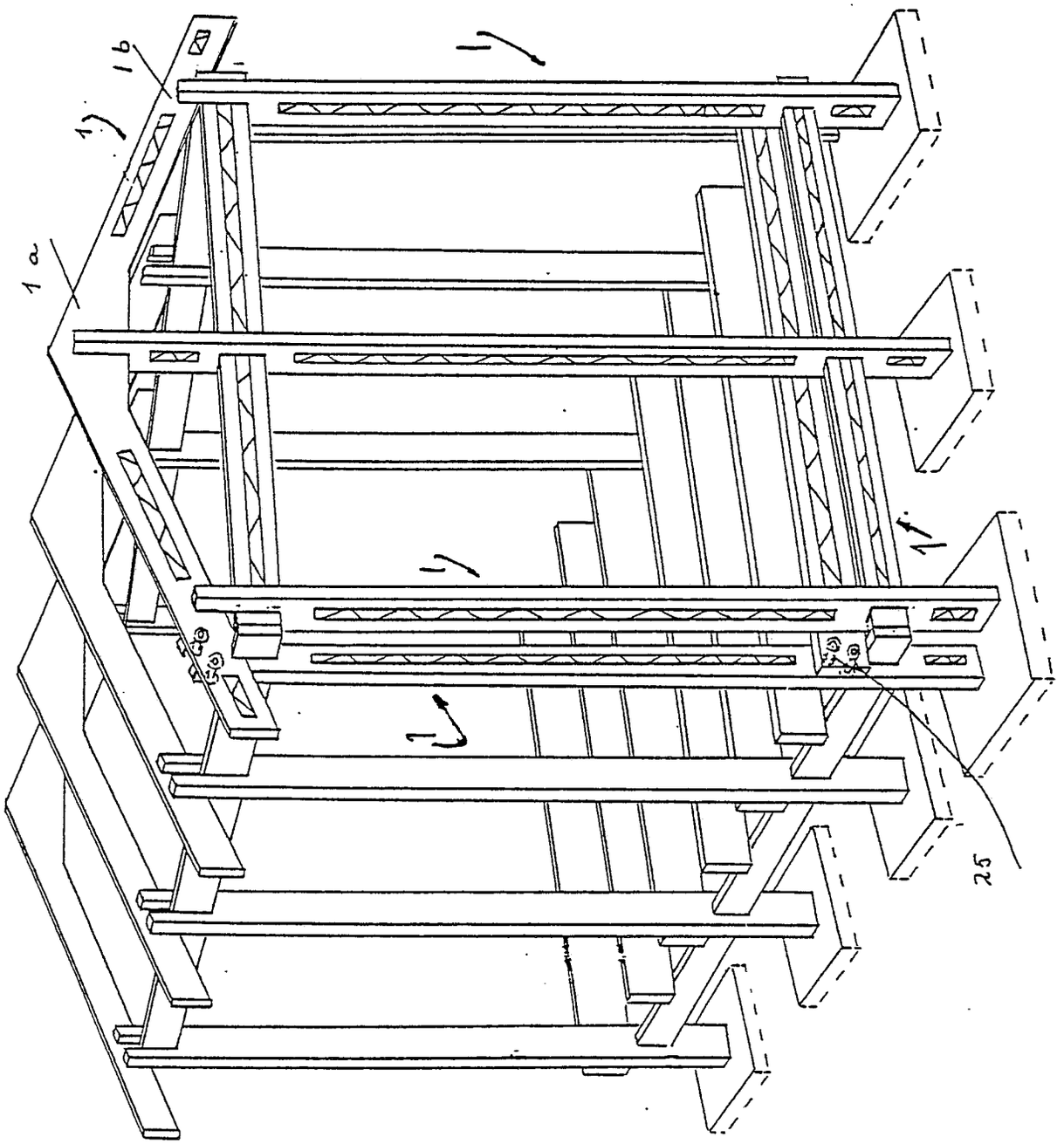


FIG 3

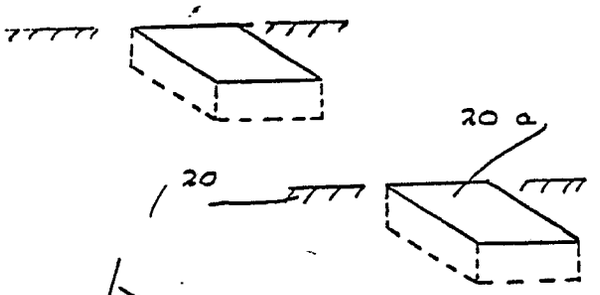


FIG 4 a

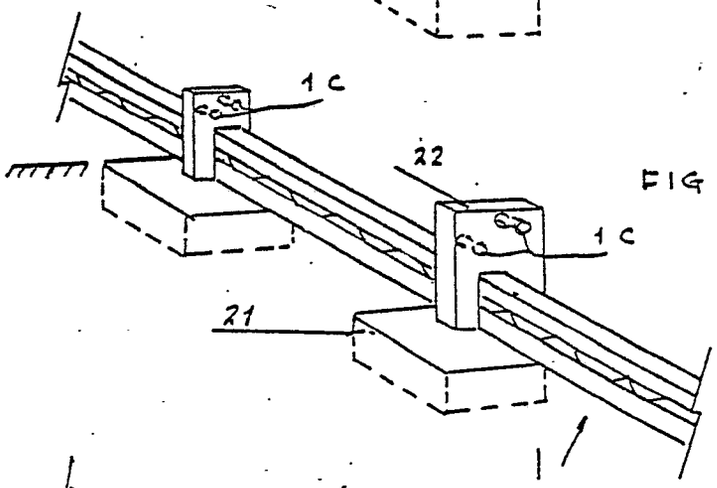


FIG 4 b

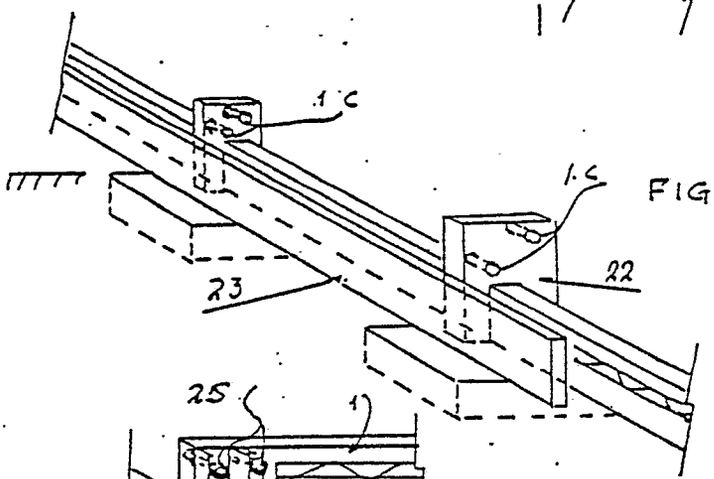


FIG 4 c

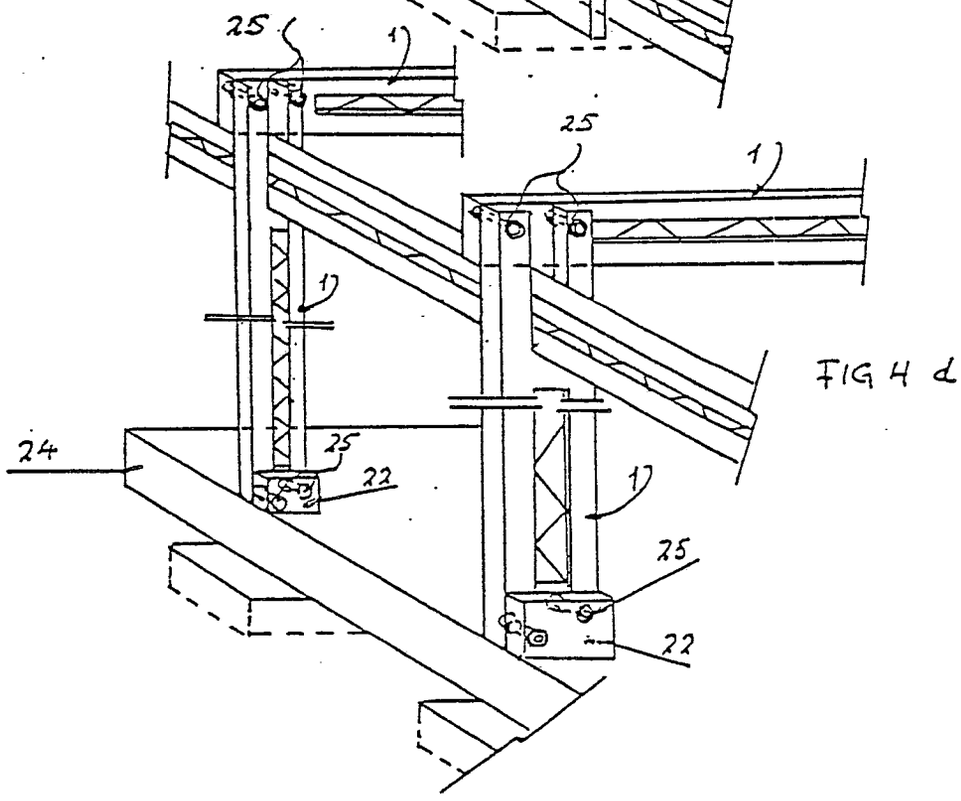


FIG 4 d

FIG 6a

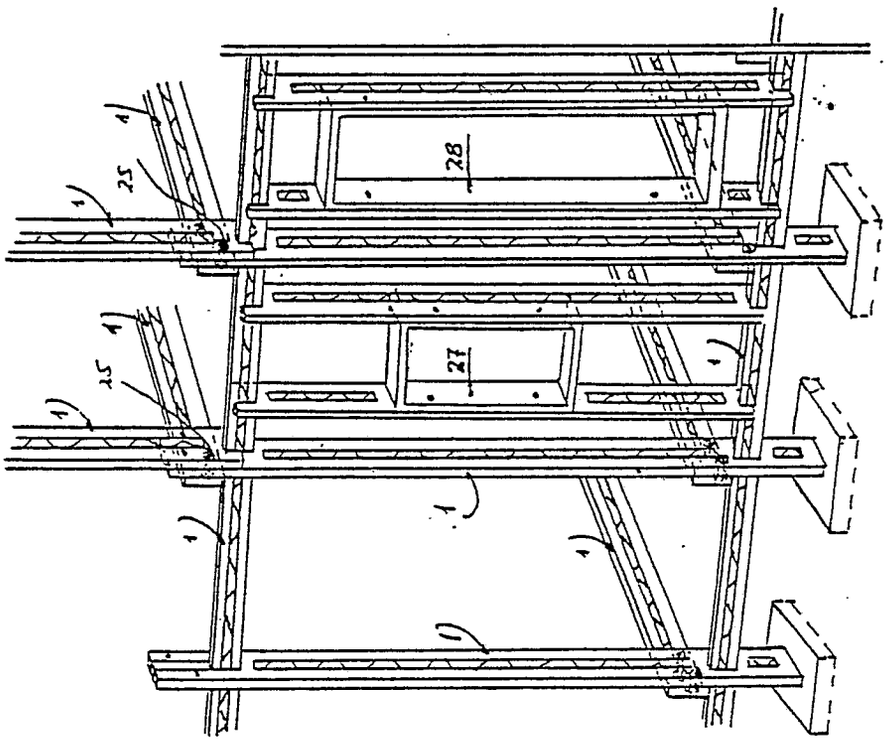
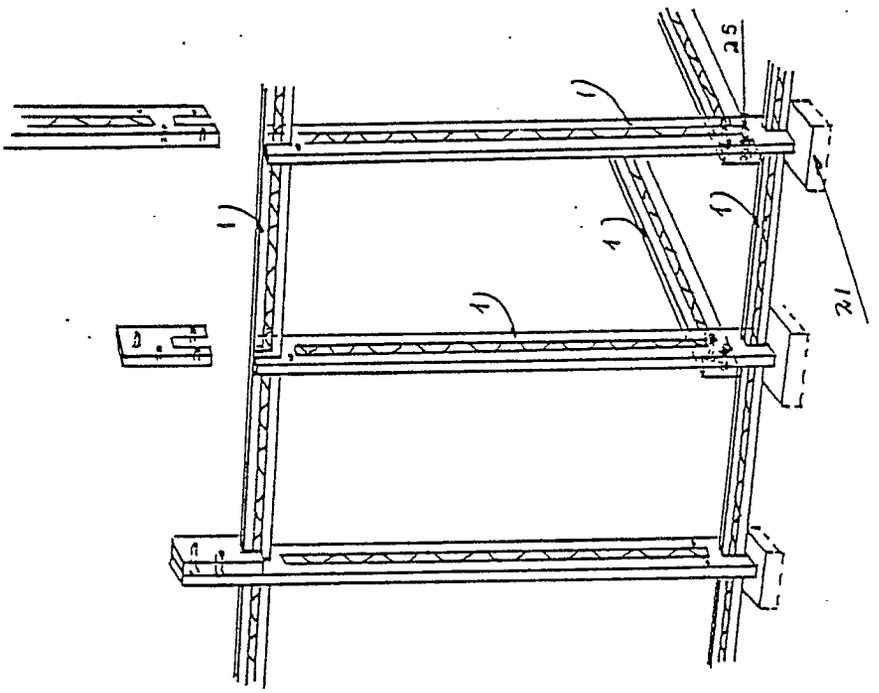


FIG 5



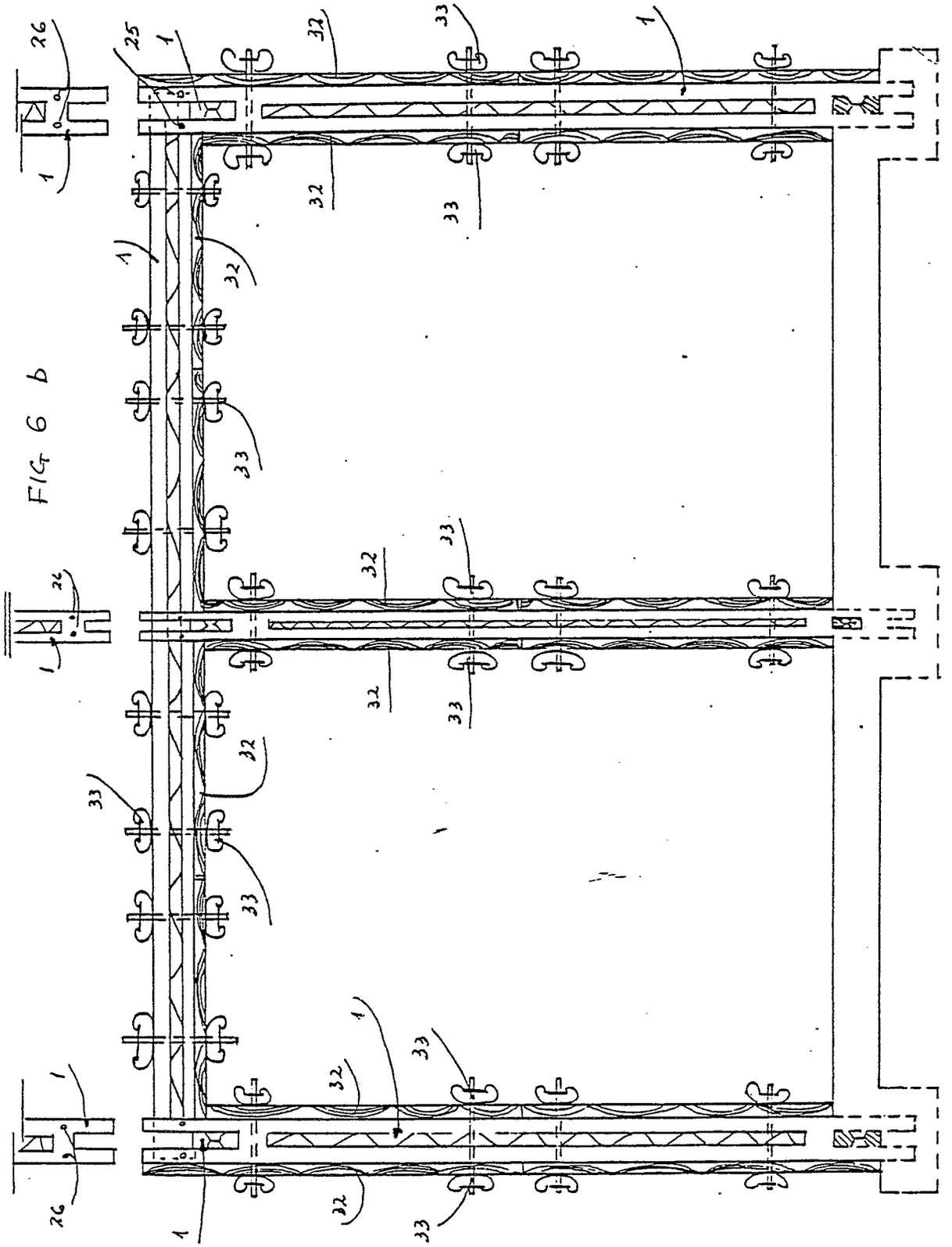


FIG 6 b

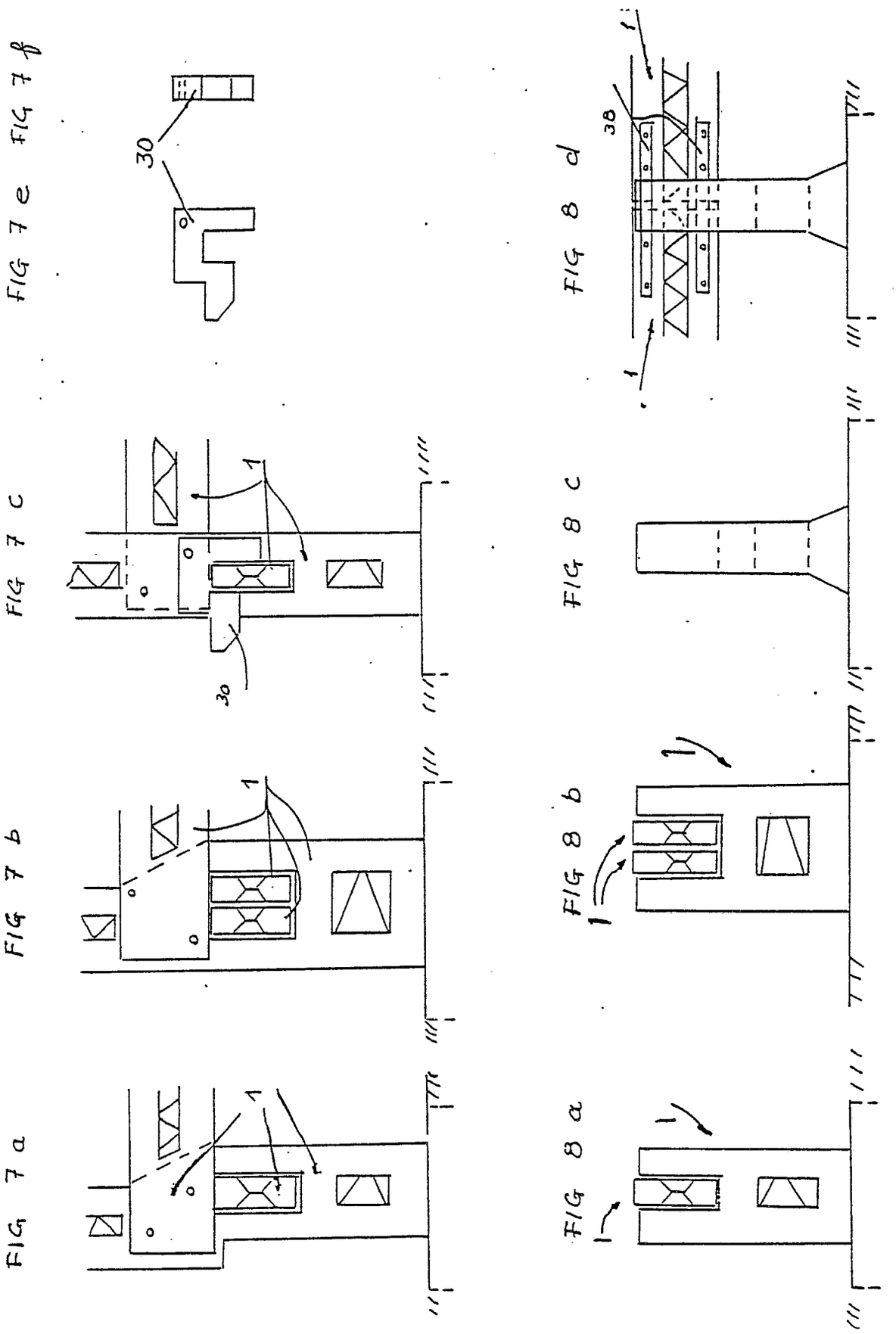

FIG 7 a
FIG 7 b
FIG 7 c
FIG 7 e
FIG 7 f
FIG 8 a
FIG 8 b
FIG 8 c
FIG 8 d
1
30
38

FIG 9 a

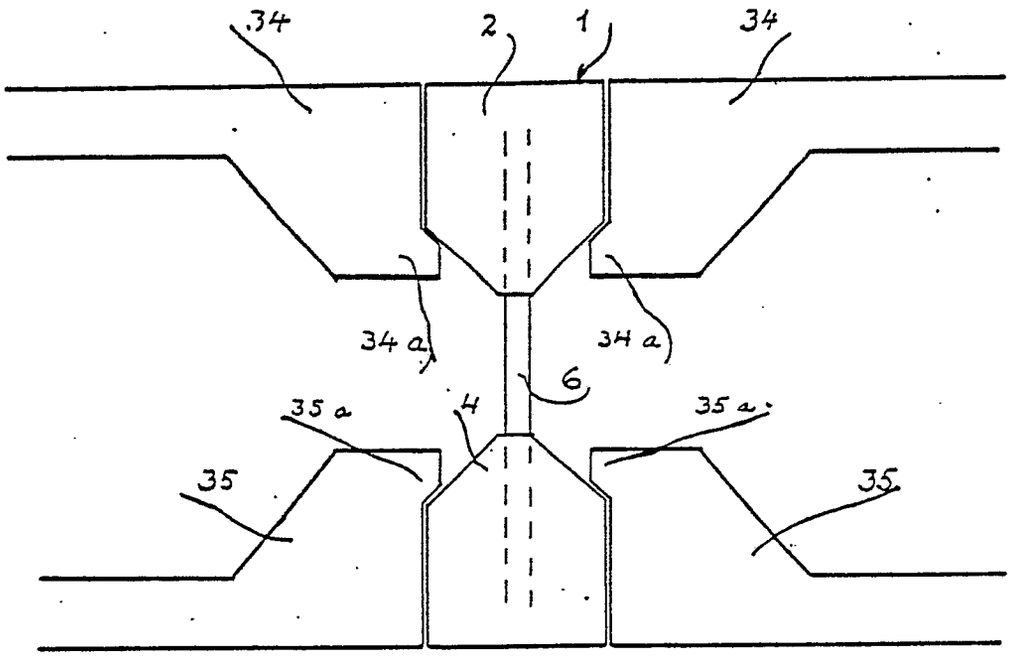


FIG 9 b

