United States Patent [19]

Zucht

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[54] **BUILDING ELEMENTS FOR MODELS**

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[51] **Int. Cl.** **E04b 5/08;** E04c 1/30

[58] **Field of Search** 52/234, 586, 591, 280, 52/284, 460, 607–611, 564, 300; 29/470.1; 46/19; 35/16

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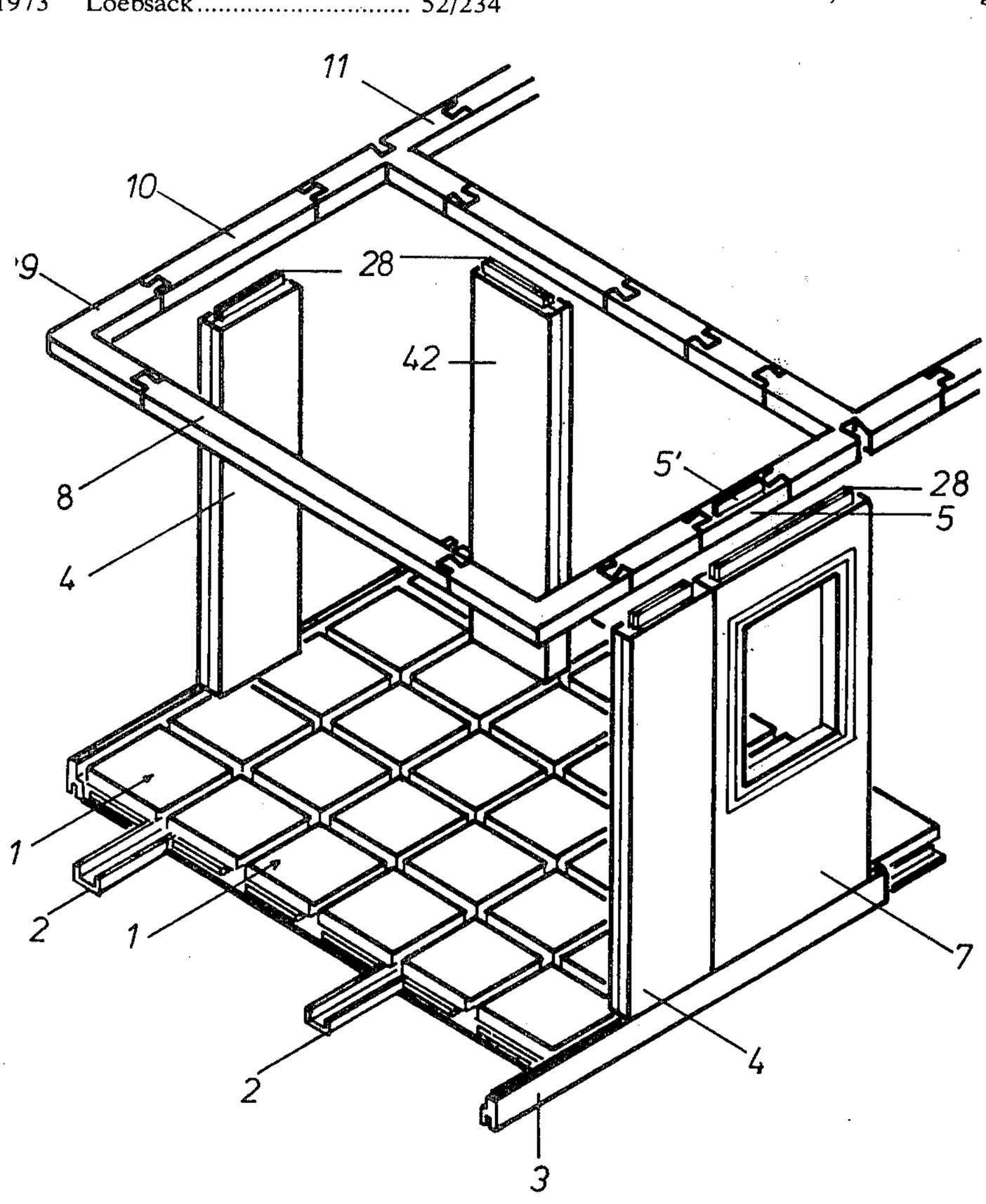
Attorney, Agent, or Firm—Michael S. Striker

[57] **ABSTRACT**

The invention provides a set of building elements for assembling building models to a reduced scale in which the main load bearing areas such as the floor and ceiling surfaces are built up from elements which are positively locked together. This is achieved by providing the elements of plate-like form with grooves extending around their edges which have an increased internal cross-section into which complementary tongue fillets are inserted.

An important feature of this invention provides anchoring elements which can be connected to the upper edges of the wall elements and positively connected together to form a stabilising frame for the top of the said wall elements.

6 Claims, 16 Drawing Figures



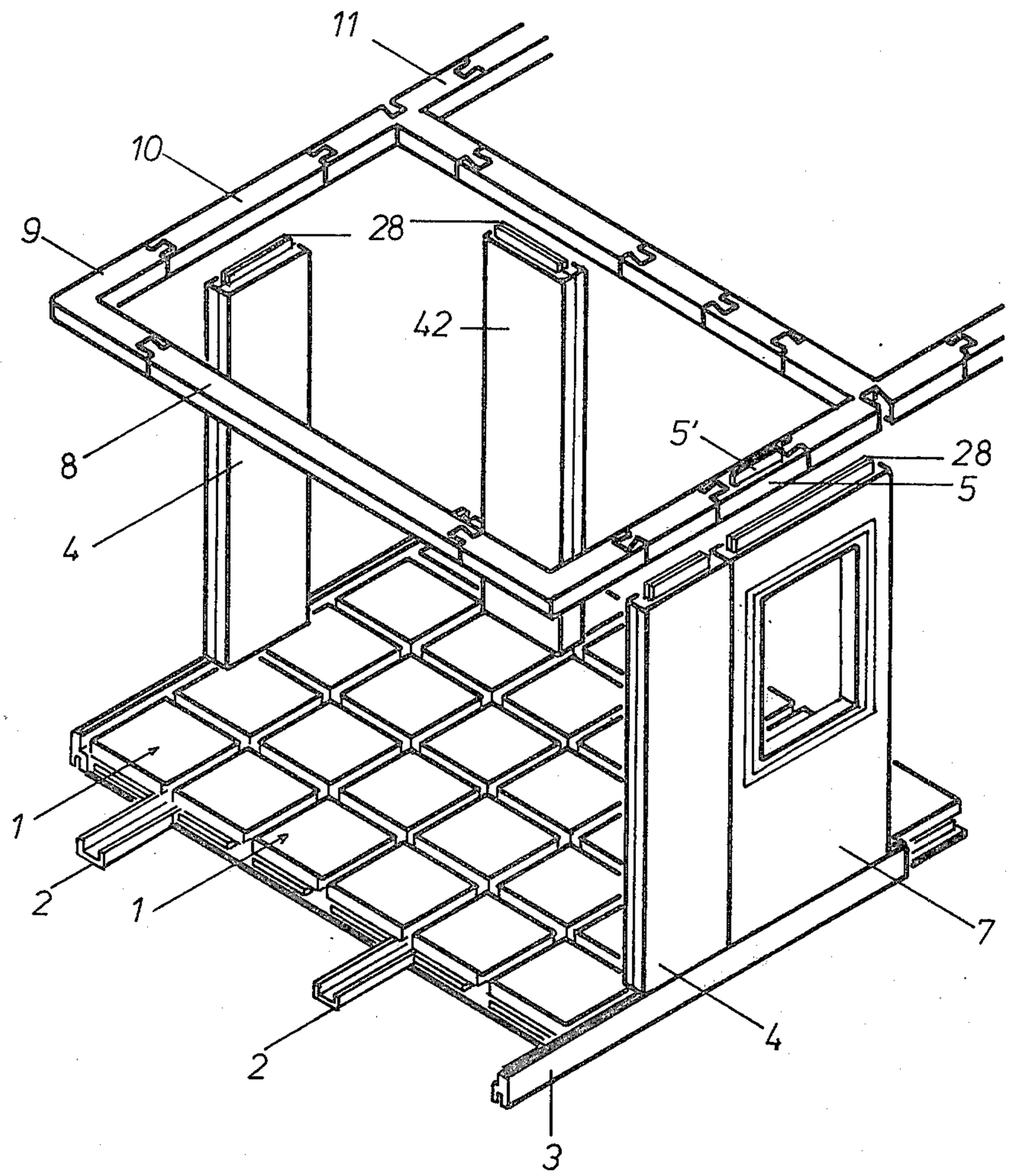


Fig 1

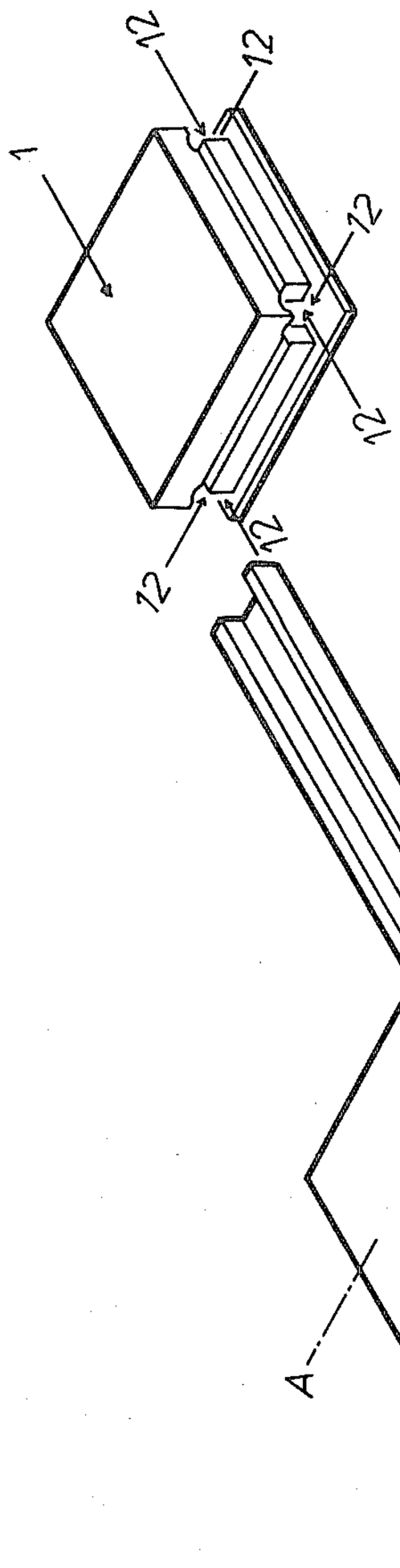


Fig 2a

Fig 2b

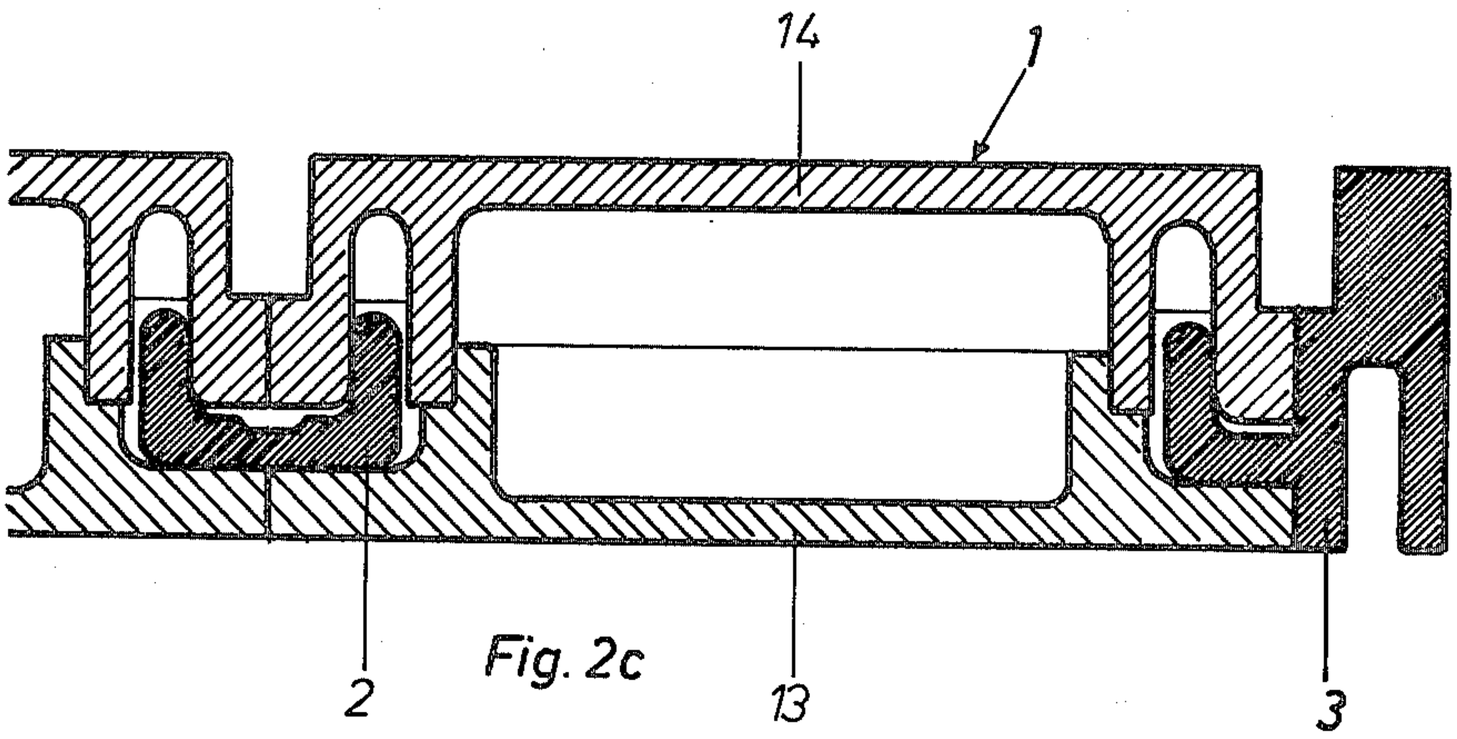


Fig. 2c

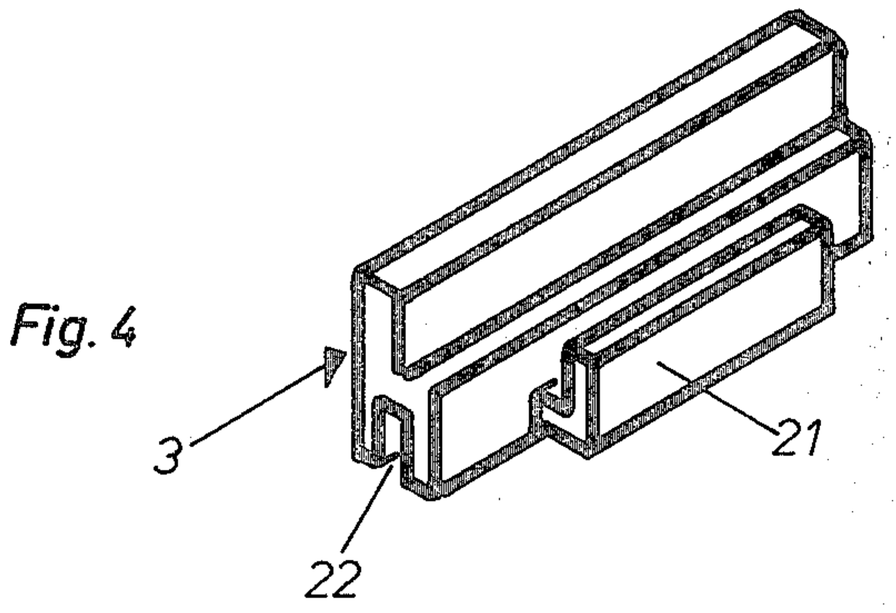


Fig. 4

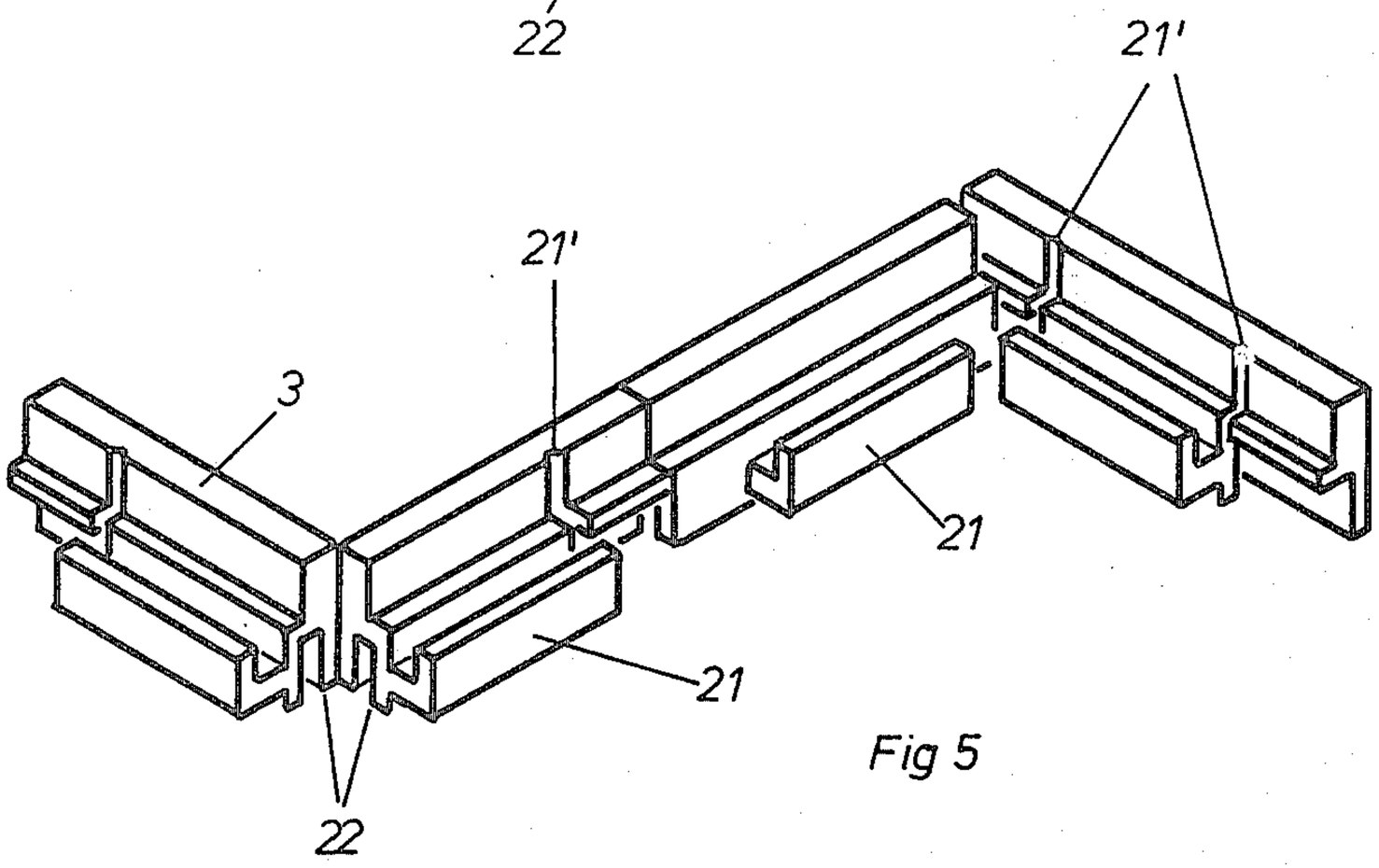
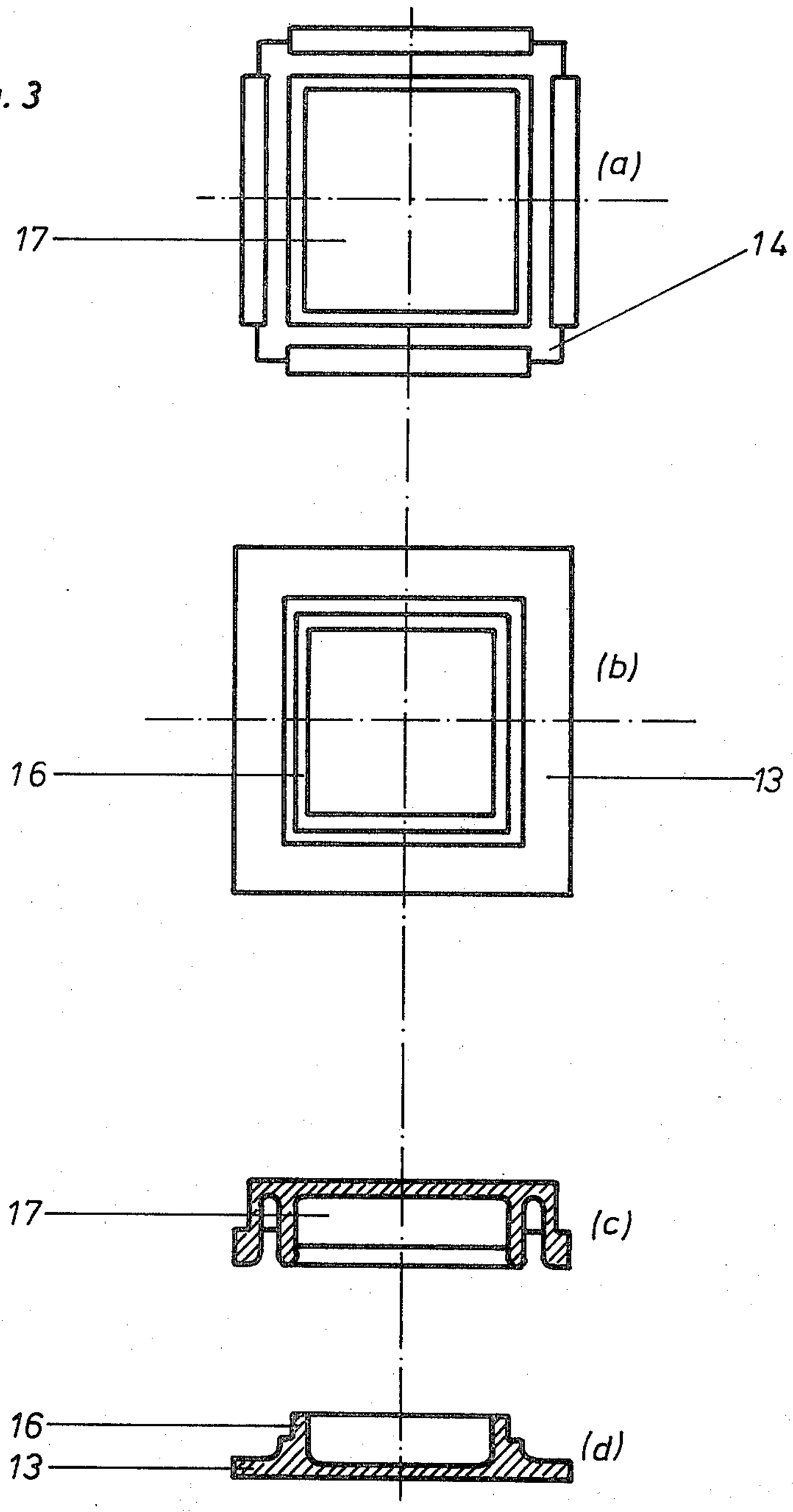


Fig 5

Fig. 3



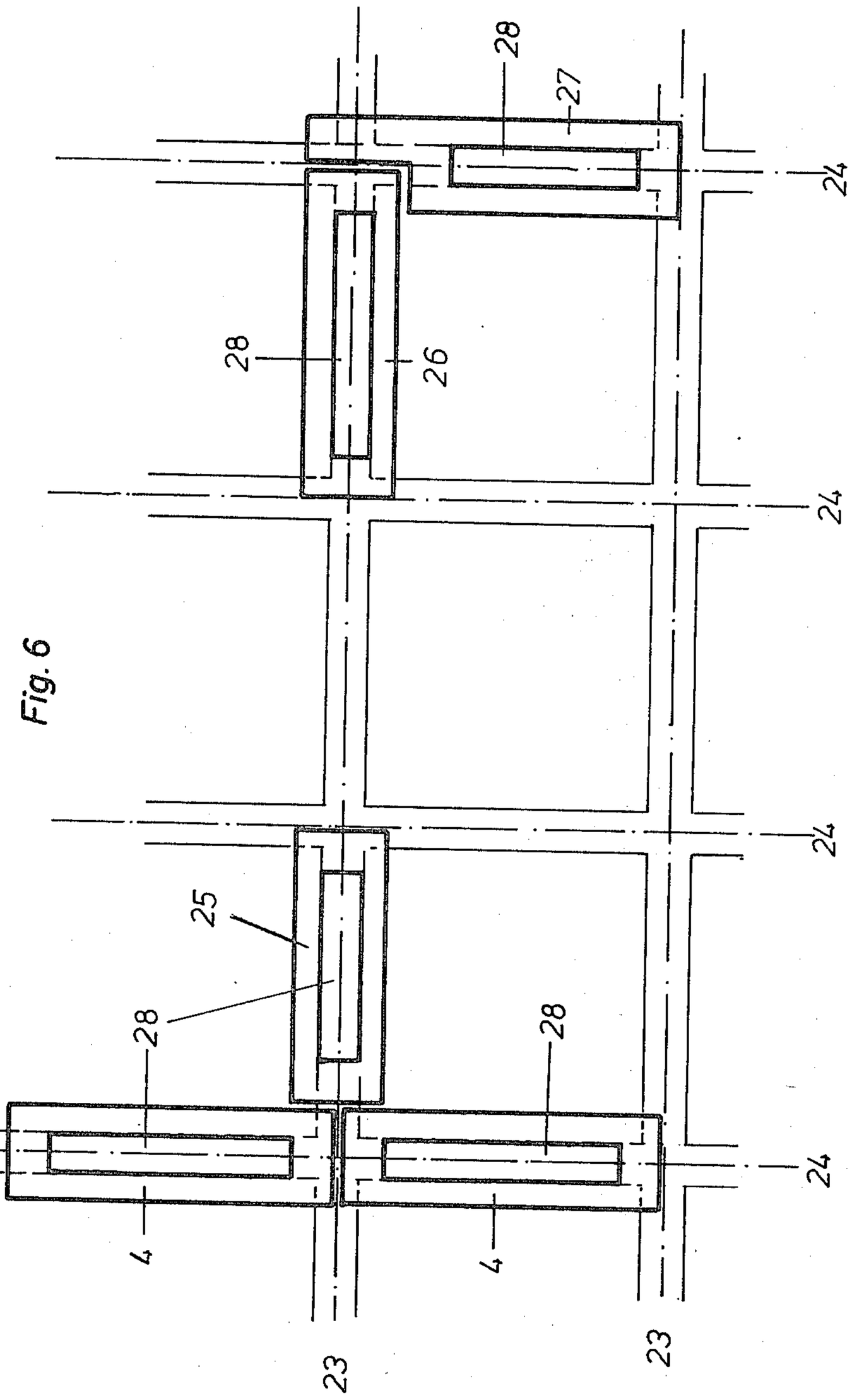


Fig. 6

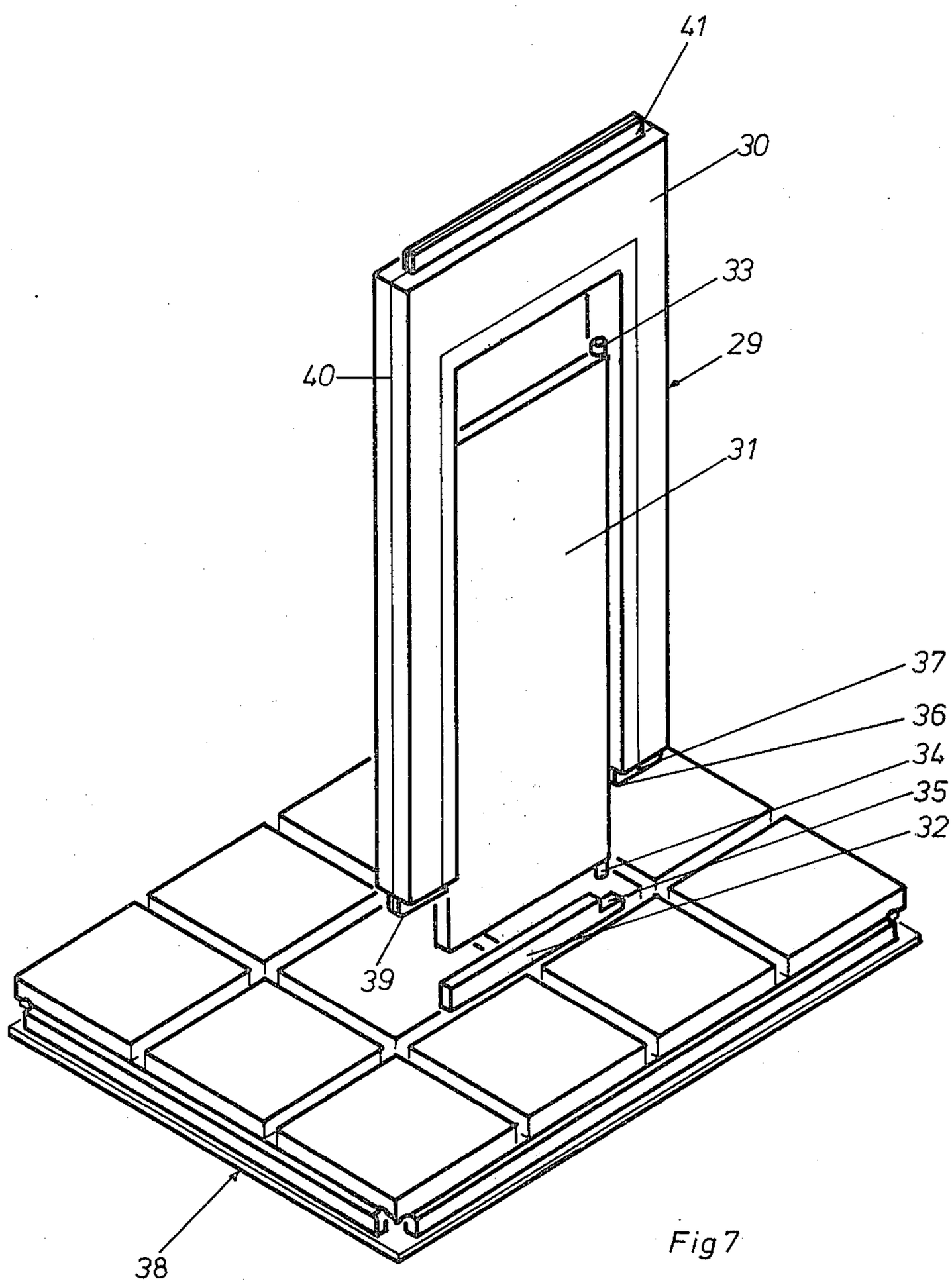


Fig 7

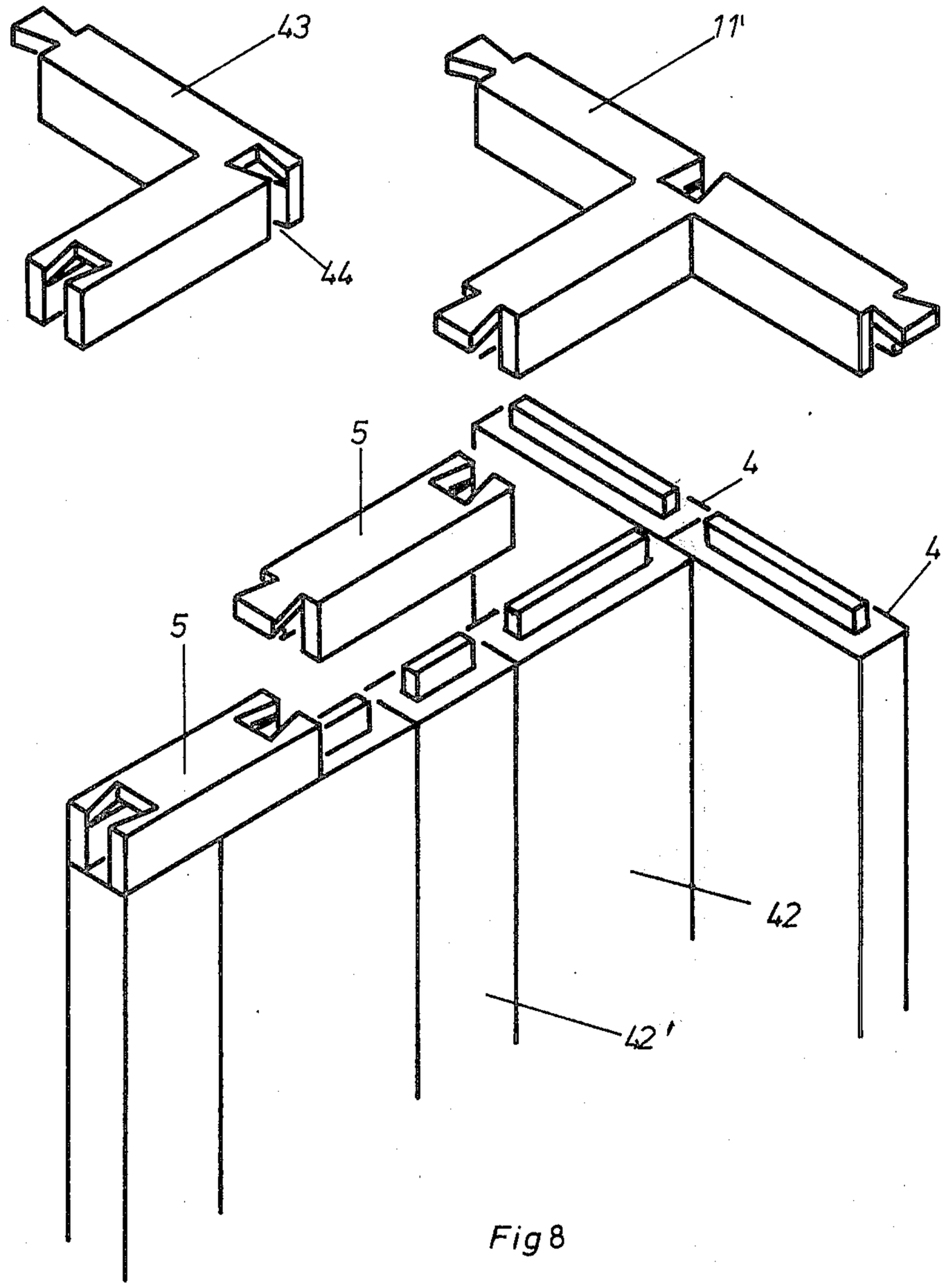


Fig 8

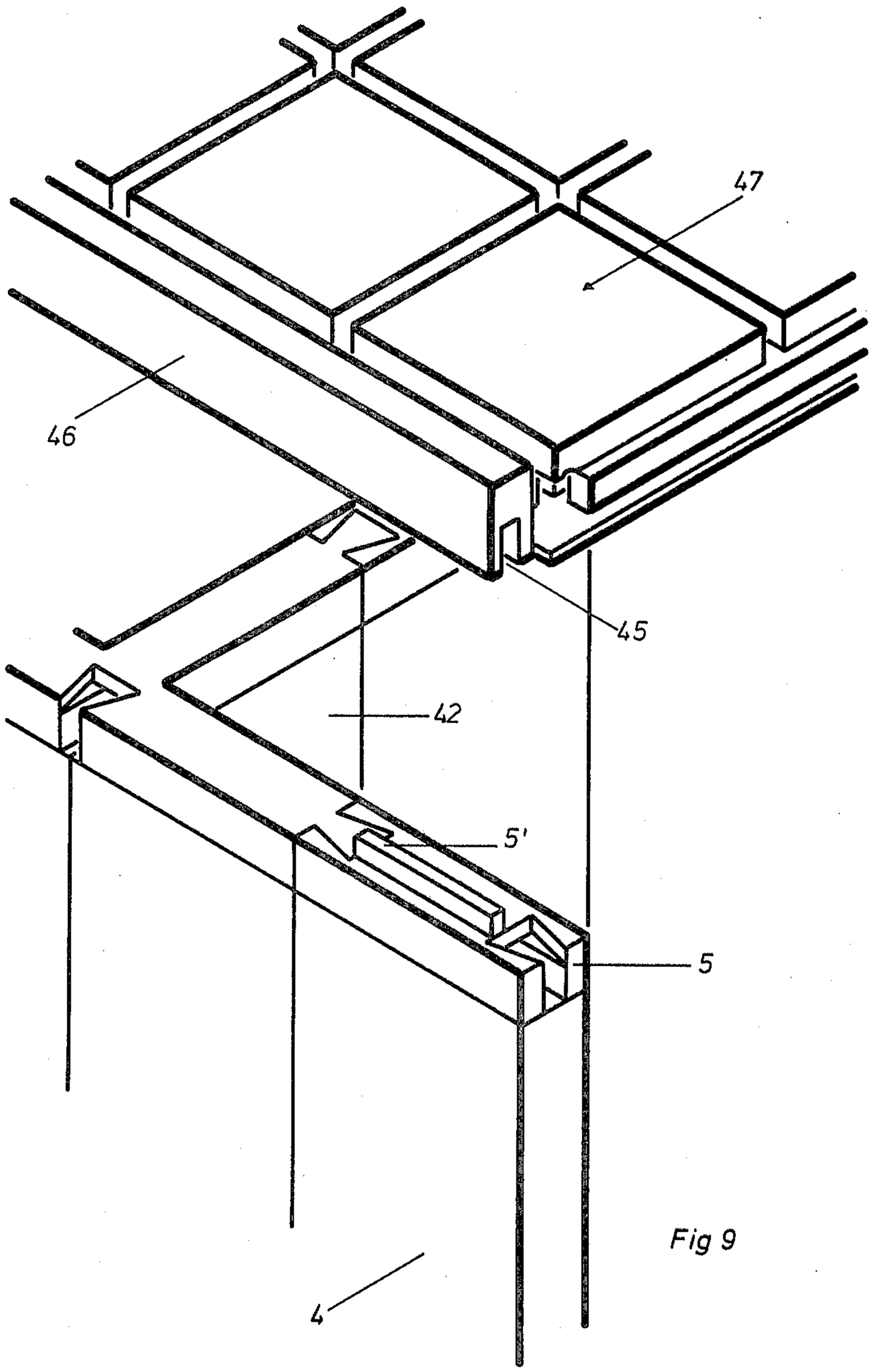


Fig 9

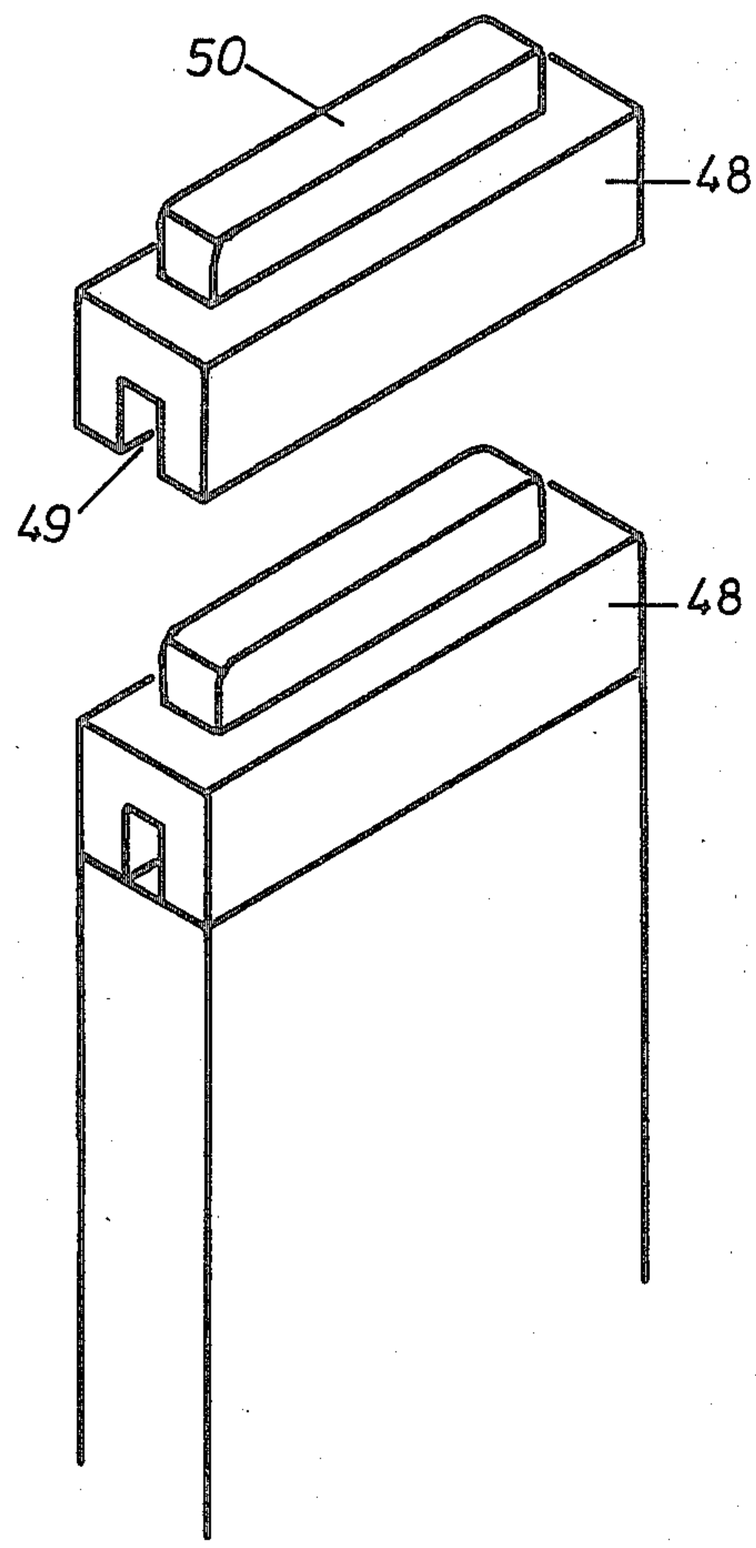


Fig 10

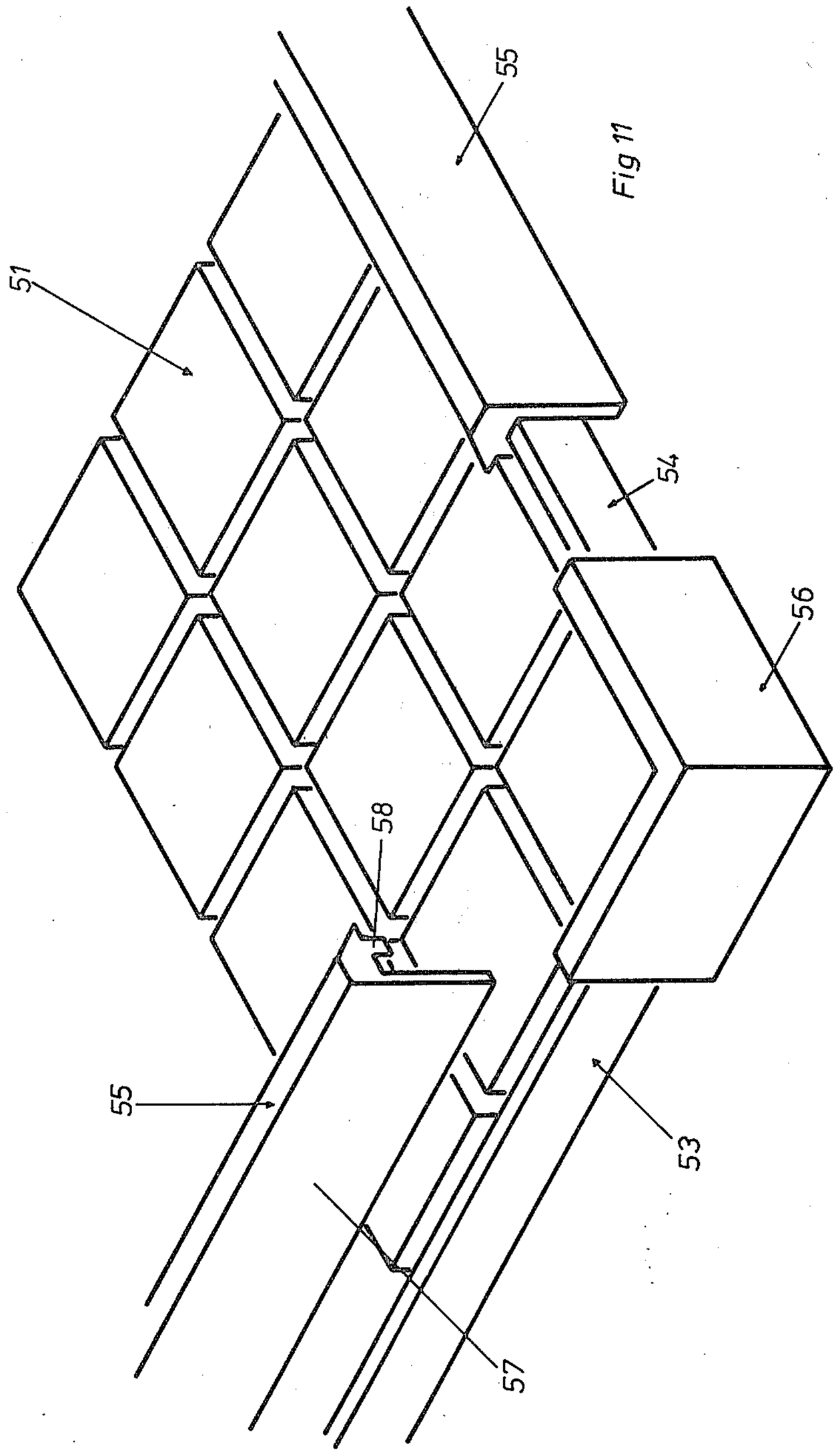


Fig 11

BUILDING ELEMENTS FOR MODELS

The invention relates to a set of building elements for models of buildings for assembly to a reduced scale according to a co-ordinate system and having building elements arranged to be assembled into floor- or ceiling surfaces (hereinafter referred to as floor elements) and building elements arranged to be assembled in grooves in the surfaces formed for walls, doors, windows and the like (hereinafter referred to as wall elements).

Sets of building elements of this kind are referred to hereinafter as being of the kind specified and serve as planning building kits for architects for making up models of buildings to thereby facilitate the spatial representation in the course of planning operations; they are also used for demonstration on buildings and at exhibitions. Furthermore, they find application in model railway installations and the like.

In known sets of building elements a serious disadvantage is that unintentional detachment of the individual building elements cannot be avoided, particularly in the case of the floor plates, which have to bear the entire weight of the remainder of the parts of the building model, when it is being handled.

An object of the invention is to provide a set of building elements of the kind specified in which the floor elements cannot inadvertently become detached.

Thus, in accordance with the invention, in a set of building elements of the kind specified the floor elements are plate-like, the edges of which define grooves, the walls of each groove define an internal portion of the groove of increased cross-section, and tongue fillets are provided having a pair of correspondingly shaped limbs for positively connecting adjacent floor elements so as to form a floor plate.

By reason of the positive connection of the floor elements by means of the shaped tongue fillets to define floor- or ceiling surfaces, any unintentional detachment of individual floor elements is rendered impossible, appreciable stability and rigidity being obtained at the same time. It is precisely these characteristics which are essential requirements for building models, since their dimensional and other stability is determined almost entirely by the floor- and, if desired, the ceiling surfaces.

According to a feature of the invention the set of building elements includes elongated anchoring elements which are positively interconnectible at their ends and which have longitudinal grooves in one face thereof for receiving tongues provided in the upper edges of the wall elements, the anchoring elements thereby providing, when assembled, an anchoring frame for the upper edges of the wall elements.

Such a feature provides the advantage that the wall elements can be connected to form aligned units of stable shape, which, if desired, can support a further storey or a roof and which, if desired, may be lifted off for the purpose of more detailed explanation.

The invention also provides for only a small number of types of building elements, which moreover are easy to manufacture whilst providing a large range of sizes of the model.

Conveniently, the set may include marginal fillets for forming a margin around a floor plate, said marginal fillets having a single shaped limb for positive connection with respective adjacent floor elements.

In one preferred form of the invention edges of the floor elements define a groove of re-entrant L-shape and the tongue fillets are of U-shaped cross-section.

According to a further feature of the invention wall elements are provided with further tongues along their lower edges and the margins of the upper portion of each floor element are rabbeted relative to the margins of its lower portion in plan view by half the thickness of said further tongues of the wall elements, the floor elements, when assembled, thereby providing a grid of grooves with a width equal to the thickness of said further tongues.

Thus, it will be appreciated that to build a model the elements are inserted by means of the tongue at their lower end into the groove grid of the floor plate; and anchoring elements are assembled on individual wall elements corresponding to the perimeter of the floor plate and the internal walls of the model, a positive interconnection between the anchoring elements being provided by a plugged connection, e.g., dovetail joints.

Thanks to the anchoring frame thereby provided, it is not necessary to interconnect the wall elements at their vertical adjacent ends, which considerably simplifies assembly of the model.

In this way it is possible to build up individual storeys of a multi-storey building model and also roofs in the form of units which are accurately to scale, and thanks to their stability, to dismantle them without attachment of individual building elements and also to swap them around.

The building elements may consist of two dish-shaped interengaging parts. By reason of this two-part construction, the elements can, in simple manner, be injection moulded in plastics, without the need for the grooves to be cut in the plate-shaped blocks; the two parts may then be interconnected by ultrasonic welding.

A wall element in the form of a door may be assembled as a unit from individual parts, from a frame consisting of two essentially like halves, advantageously joined by ultrasonic welding, and which has two lower tongues for insertion into a groove of the grid, as well as one upper tongue, for engagement in the groove of an anchoring element, as well as a door threshold with a step insertable in the grid groove between the lower tongues and a panel with plugs extending therefrom, one of which is accommodated in a bore of the frame and the other of which abuts against the step of the door threshold. By these means, on the one hand, the individual parts of the door can be produced in a rational manner and, on the other hand, a very simple construction of the door results. Advantageously the two identical halves of the frame can be provided with extensions and bores which facilitate centering and for many applications provide a connection of adequate strength, so that if desired any additional ultrasonic welding can be dispensed with.

In order to increase the number of possible variations of the models, the building set, in accordance with the invention, may have wall elements which have a groove at their lower end and a tongue at their upper end. Depending on the number of wall elements arranged one above the other, different heights of storeys result. In this arrangement the groove of the lowest element accommodates the tongue of a wall element; the tongue of the topmost element engages a groove on the underside of an anchoring element.

In order that the invention may be readily understood, characteristics and advantages thereof will be explained in greater detail, by way of example, with reference to embodiments in the drawings, in which:

FIG. 1 shows an exploded view of a storey of a building model, whose floor surface consists of quadrilateral floor elements;

FIG. 2*a* is a perspective representation of a two-part floor element according to FIG. 1;

FIG. 2*b* shows the joint between floor elements by means of U-shaped tongue fillets in perspective representation;

FIG. 2*c* shows an enlarged section on the line A—A in FIG. 2*b*;

FIGS. 3*a–d* show an elevation of the sides facing each other of a two-part floor element according to FIG. 2 as well as sections through these parts;

FIG. 4 shows a marginal fillet;

FIG. 5 shows a further embodiment of marginal fillets;

FIG. 6 shows the arrangement and construction of the wall elements;

FIG. 7 shows an embodiment of a building element for doors;

FIG. 8 shows an embodiment of anchoring elements;

FIG. 9 shows a further embodiment of an anchoring element as well as a part of an anchoring frame mounted on the wall elements;

FIG. 10 shows an embodiment of a superimposable wall element;

FIG. 11 shows an embodiment of a parapet fillet for flat roofs.

In accordance with FIG. 1, the floor surface of the storey consists of floor elements **1,** which are positively connected by tongue fillets **2** and which are bounded at their margins by marginal fillets **3.** The groove grid which is formed when these elements are connected receives the wall elements, of which a solid wall element **4** and a window element **7** are shown. The anchoring frame consists of individual anchoring elements, some of which are designated **6, 8, 10, 11,** which are shown in greater detail in FIGS. **8** and **9,** and which will be explained later. The anchoring frame is mounted on the upper tongues of the wall elements. A further storey can be built up as described hereinbefore and mounted on the anchoring frame. A second plate corresponding to the floor surface may also be laid on the anchoring frame, which, for example, then defines the flat roof of a bungalow. For this purpose some of the anchoring elements have tongues on their upper sides, which engage the grooves on the underside of the marginal fillets. Such an anchoring element is referenced **5** in FIG. **1** and the tongue is referenced **5′**.

In accordance with FIGS. 2*a–c* each floor element has at each of its edges a longitudinally extending, reentrant L-shaped groove **12,** the horizontal or leg section thereby opening from the respective edge and the inner end of the groove being effectively of increased cross-section. The upwardly directed or upright section terminates approximately at the level at which the upper portion **14** of the floor element is rabbetted; the rabbets are provided around the edge of the upper portion of the floor element and are half the thickness of tongues provided on the wall elements (FIG. 2*c*). By reason of their rabbetted upper portions, when assembled, adjacent floor elements form a grid of grooves which intersect at right-angles and whose width is equal to the thickness of tongues provided on the wall elements.

In accordance with FIGS. 3*a–d*, each floor element consists of two dished parts, one part providing a stepped wall **16** extending from the lower portion **13,** the upper edge of which fits within an inner wall of a double-wall section **17** extending from the upper portion **14.** The lower edge of said inner wall engages the step of wall **13***a*. Thus the upright of the L-shaped groove is provided by the space between the double wall section **17,** whilst the leg section is provided by the spacing of the lower and upper portions **13, 14** respectively. This two-part configuration rationalises the manufacture in plastics, without the need for producing grooves by a cutting operation. It will be appreciated that the upper and lower portions can be in the form of like dished parts, which are welded together at their ends with the L-shaped grooves formed therein.

The adjacent floor elements are interconnected by means of complementary U-shaped tongue fillets **2** (FIGS. **1** and **2**), whilst marginal fillets **3** (FIGS. **1,** 2*c*, 5) are arranged along the margins of the floor- and ceiling surfaces. Referring to FIG. 4, the marginal fillets have L-shaped tongues 21 and are rabbetted at the level of the top of the upright section of the L-shaped tongues by half the tongue thickness of the wall elements. The rabbetted sections of the marginal fillets cooperate with the rabbets of adjacent outer floor elements to define a marginal groove. As shown in FIG. 4, the tongues do not extend over the entire length of a marginal fillet, so that the marginal fillets which abut each other at right-angles at a corner of the floor plate can be arranged flush one above the other. As shown in FIG. 5, the length of the marginal fillets advantageously corresponds to a multiple of the elementary grid length. Regions of weakness 21′ enable subdivision of an element, in order to achieve corner connections with a flush finish.

As shown in FIG. **5,** the undersides of the marginal fillets have continuous grooves **22** and these grooves receive the tongues **5′** of the anchoring elements **5.**

In FIG. **6** a plurality of wall elements are shown in plan view inserted into the grooves which intersect at right-angles, i.e., the groove grid. The width of the wall elements **4** (FIG. **1**) is equal to the distance between the centre lines **23** of two adjacent grooves in FIG. **6,** i.e., also equal to the elementary grid length of the floor elements. The width of the wall element **25** for an interior wall is equal to the distance between the centre lines **24** of two adjacent grooves, reduced by half the wall thickness of the wall elements **4.** Correspondingly the width of the adjacent wall element **26** may be equal to the distance between two centre lines **24,** so that in the case of a square groove grid as in FIG. **6** the length of wall element **26** is identical to that of elements **4,** whilst the abutting wall element **27** has a recess whose depth is equal to half the wall thickness and whose width is equal to the full wall thickness. By means of wall elements, whose width is equal to half the grid length, it is possible to transpose window elements and the like.

All the wall elements have at their upper and lower ends tongues of substantially the same cross-section. The upper tongues referenced **28** in FIGS. **1** and **6** engage with the grooves formed in the undersides of the anchoring elements, whilst the lower tongues (not shown in FIGS. **1** and **6**) are received by the groove

grid. The wall elements shown consist of two ultrasonically welded together halves. In the same way as the floor elements, they may consist of two dish-shaped inter-engaging portions.

FIG. 7 shows a door element **29** in accordance with the invention, which consists of a door frame **30,** a door panel **31** and a door threshold **32.** The door frame consists of two identical halves, which are also ultrasonically welded together. This is indicated by the welding seam **40.** The upper peg **33** of the door panel protrudes into a bore (not shown) in the frame, whilst the lower peg **34** is received by a channel formed by a shoulder **35** of the door threshold **32** inserted into the grid groove, the walls of the grid groove concerned as well as the end **36** of the tongue **37** of the door frame after the latter has been inserted in the grid groove. Furthermore, the door frame has tongues **39** and **41** which are received by the groove grid and the groove on the underside of an anchoring element respectively.

As shown in FIG. 7, a number of floor elements defining plate-like elements may each be combined into a major floor element **38** thereby reducing the time taken in assembling a like number of individual floor elements. By reason of the grid configuration, further major elements as well as individual floor elements may be connected to these major elements.

As shown in FIG. 1, the anchoring elements have different lengths and configurations: the L-shaped elements **9** are used for the corners of the outer wall elements **4,** their ends being provided with dovetail grooves and dovetail tongues respectively, which are positively connected to dovetail tongues and dovetail grooves respectively of adjacent anchoring elements. The anchoring elements **10** are of twice the grid length and are mounted on two aligned adjacent outer wall elements **4.**

The T-shaped anchoring element referenced **11'** in FIG. **8** has ends which are complementary to the element referenced **11** in FIG. **1** and, in the same way as the latter, serves to fix the inner wall element **42** (FIG. **8**) in its position relative to the outer wall element **4.** For this purpose L-shaped anchoring elements **43** may also be provided, which have a dovetail groove **44.** Reference **42'** designates a wall element of half the grid length, which makes it possible, for example, to transpose the door of FIG. **7** by half the grid length.

FIG. **9** shows the anchoring element **5** of FIG. **1** to an enlarged scale. It has a tongue **5'** which is received by the groove **45** on the underside of the marginal fillet **46** of the ceiling surface **47.**

The height of the wall elements is such that it corresponds to the height of the anchoring frame of the lowest height of the storey reproduced to scale. For the purpose of producing models of taller storeys as well, the set of building elements has wall crown elements **48,** (see FIG. **10**), whose length is equal to an elementary grid length or a multiple thereof and whose wall thickness is the same as that of the wall elements. On their undersides they have grooves **49** by which they are mounted on the tongues of the wall elements or the next wall crown element, and on their upper sides tongues **50,** by which they engage the grooves on the undersides of the anchoring elements. Thus a plurality of these wall crown elements may be arranged one above the other, so that models of different storey heights may be produced.

FIG. **11** shows the flat roof of a bungalow. It consists of a ceiling surface **51** on the marginal fillets **53** and **54** of which parapet elements **55** and **56** are mounted. The parapet element **55** consists of an L-shaped fillet, a tongue **58** extending parallel to the upright section **57** and provided on the inside of the leg section, which engages the grid groove formed by the marginal fillet and the ceiling surface **51** at the margin. The length of the two sections is such that on the one hand the marginal fillet and on the other hand the grid groove are overlapped. The parapet element **56** consists of two relatively angled adjacent parapet fillets **55,** the length of each of which is equal to the elementary grid length. Such elements are mounted on the corners.

The set of building elements is not limited to the quadrilateral floor elements. Defining the floor elements, there may also be used polygonal floor elements, e.g., hexagonal ones together with triangular ones, which have to be provided on their upper sides with additional grid grooves, so that the wall elements may be arranged at right-angles to each other.

The positive interconnection of the floor elements may also be achieved by means of tongue fillets of other appropriate shapes complementary to the shape of the grooves in the edges of the floor elements, for example, where these grooves are of re-entrant T-shape, the tongue fillets would be of H-shaped cross-section. These variations, apparent to an expert, are encompassed within the scope of the invention as is a construction of the floor elements in such a way that the margins of their upper portions are not rabbetted relative to those of the lower portions, and have semicylindrical portions, which together with those of the adjacent elements, form a grid-like arrangement of bores, in which pegs of the wall elements engage.

I claim:

1. In a model building erected from a set of building elements, a combination comprising a plurality of floor plates of right-angular outline each having a bottom portion circumferentially bounded by first edge surfaces, and a top portion having a top surface and circumferentially bounded by second edge surfaces parallel to and offset with respect to said first edge surfaces in direction toward the center of said top surface, each of said floor plates being formed with a peripheral L-shaped groove along each side, each of said grooves having one leg which opens on the respective first edge surface and another leg which extends upwardly toward said top surface of said floor plate inwardly of said first and second edge surfaces, said floor plates of said plurality being arranged adjacent one another with the associated first surfaces of any associated two of said floor plates juxtaposed with one another and with the legs which open on said associated first edge surfaces facing one another so that the respective L-shaped grooves together form a U-shaped channel, said bottom portions and said second edge surfaces of said associated floor plates simultaneously defining an upwardly open channel of a predetermined width at said top surfaces between said associated floor plates; a plurality of tongue fillets of U-shaped configuration inserted into the respective U-shaped channels of said associated floor plates and interconnecting the same to form a floor of a selectable configuration and circumferentially bounded by the marginal ones of said floor plates; a plurality of elongated marginal fillets each formed with an L-shaped projection inserted into the

respective L-shaped grooves of said marginal floor plates and interconnecting the same in the circumferential direction of said floor and with an upstanding strip-shaped projection extending along the juxtaposed second edge surfaces of the respective marginal floor plates to form therewith an additional upwardly open channel of said predetermined width; and a plurality of wall elements having spaced parallel top and bottom edge surfaces, at least said bottom edge surface of each wall element being provided with at least one tongue projecting therefrom and having a width substantially corresponding to said predetermined width of said upwardly open channel, said tongues of at least certain of said wall elements being received in said additional upwardly open channels so that said certain wall elements form a center peripheral wall of said model building.

2. A set as defined in claim **1,** and further comprising a parapet element for engaging a respective marginal fillet of said plurality of interconnected floor plates forming a flat roof, said marginal fillet defining at least a part of a marginal channel and said parapet element having at least one projection engaging said marginal channel.

3. A set as defined in claim **1,** wherein said top edge surface of the respective wall element is provided with at least one additional tongue similar to said longitudinal tongue and projecting from said top edge surface;

and further comprising a plurality of top anchoring elements each provided with at least one anchoring groove having a width substantially corresponding to the width of said additional tongue for engaging the same.

4. A set as defined in claim **3,** and further comprising at least one wall crown element provided with a crown groove similar to said anchoring groove for engaging the respective additional tongue and having a crown projection similar to said longitudinal tongue for engaging the respective anchoring groove, whereby the upright dimension of a respective wall element may be extended.

5. A set as defined in claim **3,** wherein each top anchoring element has at least two end portions; and wherein each of said end portions is provided with a dovetail-type connector for cooperation with a complementary dovetail connector of an adjacent end portion of an associated top anchoring element.

6. A set as defined in claim **3,** wherein at least one of said wall elements is a door element comprising a frame provided with a hole, a threshold, and a door having two spaced and axially aligned pegs on the upper and lower edge surfaces of said door and engaging said hole and said threshold for pivoting said door about said axis with respect to said frame.

* * * * *