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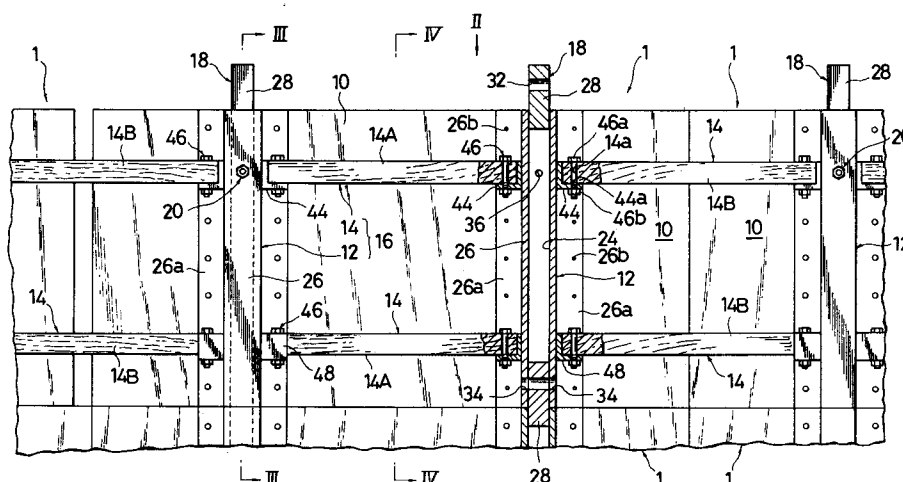
(54) **Form panels.**

(57) A form panel (1) characterized in that one or more post members (12) are longitudinally fixedly mounted on one side of a flat plate-like side plate (10), and longitudinal connectors (18) for connecting post members with each other are fixedly mounted on a head portion and a leg portion of the post member (12).

Horizontal lateral sash members (14) are mounted on post members (12), the post member and the

lateral sash members constituting a framework body.

Form panels (1) are vertically and laterally placed in the same phase state. The form panels at the vertical position are fixed by longitudinal connectors (18) of the post members (12), and the form panels positioned relatively thereto are maintained in spacing therebetween by a separator (20) and the form is assembled.

FIG. 1**EP 0 473 135 A1**

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a form used when concrete structures such as walls, fences, etc. are constructed, and more specifically to a form panel as a constituent element for the form.

Description of the Prior Art

In conventional construction and execution of forms, form panels are placed laterally and vertically and connected by connectors such as clamps.

However, the aforesaid prior art poses various problems in that assembling of form panels each other is irregular, fastening operation using the connectors is troublesome and a rigidity of an assembled form is small.

SUMMARY OF THE INVENTION

The present invention has been achieved in view of the aforementioned actual circumstances. An object of the present invention is to provide a form panel which can be built up simply and rapidly and without occurrence of irregularity, and can improve an efficiency of execution.

It is a further object to provide a form panel which has a withstanding force against pressure of placed concrete and can be built up to a high level.

A form panel according to the present invention is characterized in that one or more post members are longitudinally fixedly mounted on one side of a flat plate-like side plate, and longitudinal connectors for connecting the post members with each other are fixedly mounted on a head portion and a leg portion of the post member.

In assembling a form using the form panels, form panels are placed vertically and laterally in the same phase state, and the form panels at the vertical position are fixed by longitudinal connectors of the post members therefor.

The side plates are oppositely provided in a predetermined spaced relation, said spacing being maintained by a separator. Panels laterally adjacent to each other are connected by lateral sash members.

Pressure of placed concrete is received by the side plate, and stress thereof is transmitted to the post member but the post member is vertically rigidly joined together and withstands the stress.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view partly in section of one embodiment (a first embodiment) of a form panel

according to the present invention.

Fig. 2 is a view taken at II in Fig. 1.

Fig. 3 is a sectional view taken on line III-III of Fig. 1.

Fig. 4 is a sectional view taken on line IV-IV of Fig. 1.

Fig. 5 is a sectional view of a longitudinal connector.

Fig. 6 is a part used for the longitudinal connector.

Fig. 7 is a modified view of a longitudinal connector.

Fig. 8 is a side view partly in section of a further embodiment (a second embodiment) of a form panel according to the present invention.

Fig. 9 is a view taken at IX of Fig. 8.

Fig. 10 is a sectional view taken on line X-X of Fig. 8.

Fig. 11 is a sectional view of a longitudinal connector.

Fig. 12 is a side view of a still another embodiment (a third embodiment) of a form panel according to the present invention.

Fig. 13 is a view taken at XIII of Fig. 12.

Fig. 14 is a sectional view taken on line XIV-XIV of Fig. 12.

Fig. 15 is a view showing another mode of a post member 12.

Fig. 16 is a view showing another mode of a longitudinal connector 18.

Fig. 17 is a view showing a still another mode of the longitudinal connector 18.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(First Embodiment)

Figs. 1 - 7 show a form panel according to one embodiment (a first embodiment).

As shown in Figs. 1 to 4, a form panel 1 includes, as principal members, a rectangular flat plate-like side plate 10, post members 12 longitudinally disposed along the side of the side plate 10, and lateral sash members 14 extended between the post members 12. The post member 12 and the lateral sash member 14 constitute a framework body 16. The form panel 1 further includes longitudinal connectors 18 disposed at upper and lower portions of the post member 12, and a separator 20 used when a form is built up.

The detailed construction of each of sections will be described hereinbelow.

The side plate 10 forms a main body of a form and is formed from a thin flat plate, and suitable materials such as steel, light metal (aluminum), synthetic resin, wood, etc. are selected therefor. Synthetic resin and steel are recommended in view

of reuse. It is to be noted that the side plate 10 is not limited to a rectangular shape as shown but those with a corner cut are not excluded. Any shape may be used as far as a flat plate-like shape is substantially maintained.

The side plate 10 is formed on two sides adjacent to each other with convex portions and formed on another two sides thereof with concave portions to receive the convex portions. In use, the convex portion is closely fitted into the concave portion so as not to form a clearance therebetween.

The post member 12 mainly comprises a post body 26 in the form of a square column having therein a through-hollow portion 24 and includes a projecting member 28 firmly fitted in and secured to the upper hollow portion 24 of the post body 24. A flange 26a is extended on the side placed in contact with the side plate 10, and the flange 26a is bored with a mounting hole 26b through which the flange 26a is fixedly mounted on the side plate 10. A nail, a wood-screw, etc. are placed through the mounting hole 26b.

The projecting member 28 of the post member 12 forms a constituent element of the longitudinal connector 18 and is closely inserted into a hollow portion 24, that is, a portion to be fitted, at the lower portion of the post body 26 of a separate form panel 1s disposed thereabove. The projecting member 28 is bored with a wedge-insertion hole 32 into which a wedge described later along lengthwise of the side plate 10. On the lower side of the post body 26, a wedge-insertion hole 34 is bored at a position corresponding to the wedge-insertion hole 32 of the projecting member 28.

The post member 12 is bored at an upper portion thereof with an insertion-hole 36 into which the separator including the side plate 10 is inserted.

Figs. 5 and 6 show one example of a longitudinal connector 18 joined to a wedge body.

More specifically, after the projecting member 28 has been inserted into the portion to be fitted 24 of the post member 12, a wedge body 40 is inserted into the wedge-insertion holes 32 and 34 of the post body 26 and the projecting member 28, and an engaging element 42 is inserted into a hole 40a thereof to fix the wedge body 40.

Fig. 7 shows a further mode of the longitudinal connector 18. In this mode, the projecting member 28 is mounted on the lower portion of the post member 12 and is inserted into the portion to be fitted 24 at the upper portion of the post member 12 of the form panel 1 located at a lower level.

Turning again to Figs. 1 to 4, the lateral sash member 14 comprises a lateral sash member 14A for framework disposed between the post members 12 of the same form panel 1 and a lateral sash member 14B for connection disposed between the

post members 12 of the form panels 1 adjacent to each other, said members 14A and 14B being installed between the post members 12 through an angle material 44 fixedly mounted on the post member 12. More specifically, a bolt 46a of a fastener 46 formed from a bolt and nut is inserted into a bolt-insertion hole 14a bored in the lateral sash member 14 and a bolt-insertion hole 44a bored in the angle material 44, and a nut 46b is tightened to fasten the lateral sash member 14. Reference numeral 48 designates a further angle material. The lateral sash member 14 is fitted into a pocket portion of the angle material 48.

The lateral sash member 14 maintains a predetermined section rigidity, resists to a horizontal bulge of the form panel 1, that is, has a function of auxiliary rigidity, and connects the form panels 1 and 1 adjacent to each other.

The separator 20 comprises a rod body 20a formed from a lengthy steel rod, a nut 20c threadedly engaged with threaded portions 20b on opposite ends of the rod body 20a, and a spacer 20d also serving as a joint portion from which the rod body 20a is separated and placed in contact with the side plate 10. With this, a spacing between two spacers 20d is determined, and the nut 20c is tightened to thereby locate the form panels 1 opposed to each other. It is to be noted that the construction of the separator 20 is well known.

One example of the construction method for the concrete structure carried out by use of the form panels 1 will be described hereinbelow in accordance with the execution procedure.

(1) First, a form at a base portion is assembled. To this end, a form panel 1 of a lower layer (a first stage) is assembled while maintaining a predetermined spacing between the side plates 10 by means of the separator 20. This form panel 1 is provided with the projecting member 28 at the upper portion of at least the post member 12.

The form panels 1 are successively arranged in a lateral direction and laterally connected by the lateral sash members 14B for connection. The internal surface of the side plate 10 is coated with a release agent.

(2) A form panel 1 of a second stage is stacked on the form panel 1 of a lower layer with the post members 12 registered with each other. First, the hollow portion 24 of the post member 12 of the form panel 1 of an upper layer is fitted into the projecting member 28 of the post member 12 of the form panel 1 of a lower layer, after which the wedge body 40 is inserted into the wedge-insertion holes 32 and 34. Thereby, upper and lower form panels 1 are integrally assembled with each other.

It is to be noted in the present embodiment

that as the stacking mode of the form panels 1, both mode in which the side plates 10 are stacked in the same phase and mode in which they are stacked in a zigzag fashion may be employed.

(3) At the same time, form panels 1 are disposed also in a lateral direction. Upper and lower form panels 1 and 1 are joined together in the procedure similar to that of the aforementioned step (2). These form panels 1 and 1 adjacent to each other are connected together by the lateral sash members 14B for connection.

(4) Arrangement and joining of form panels 1 in a lateral direction are successively carried out, and a predetermined spacing between the form panels 1 opposed to each other is maintained by the separator to prevent shaking.

(5) Assemblings of form panels after a third stage are also carried out in accordance with the procedure described in the steps (2) to (4).

It is to be noted that a form panel of the uppermost stage need not be particularly prepared, in which case, the projecting member 28 of the longitudinal connector 18 may be omitted.

(6) Concrete is placed into the thus assembled form.

Fluid pressure of unset concrete presses the assembled form outwardly. However, the longitudinal connector 18 between the form panels 1 constitutes a resistance against the vertical buldge pressure. The lateral sash member 14 between the form panels 1 constitutes a resistance against the buldge pressure in a horizontal direction to maintain a shape of the form.

(7) When concrete is set, the form panels 1 are removed. This removing work is easily accomplished by removing the wedge body 40 of the longitudinal connector 10, removing the nut 20c of the separator 20, reversely turning the separator body 20a to separate it from the spacer 20d and pulling out it from the separator insertion-hole, then removing the lateral sash member 14B for connection, and raising the form panel 1.

As described above, according to the form panels 1 of the present embodiment, the form panels 1 can be built up simply and rapidly and without occurrence of irregularity, and the efficiency of execution can be improved.

Furthermore, the form panels display a large withstanding force against the pressure of placed concrete and can be built up to a high level.

(Second Embodiment)

Figs. 8 to 11 show a further embodiment (a second embodiment) of a form panel according to

the present invention.

This embodiment is characterized by a configuration of framework body and addition of a lateral connector.

This form panel 3 comprises, as principal constituent members, a rectangular flat plate-like side plate 100, and a framework body 106 comprising a lateral sash member 102 horizontally fixedly mounted on the side plate 100 and a post member 104 fixedly mounted crossing the lateral sash member 102, and further includes lateral connectors 108 disposed on opposite ends of the lateral sash member 102, longitudinal connectors 110 disposed at upper and lower portions of the post member 104 and a separator 112 used when a form is assembled.

The side plate 100 is similar to the side plate 10 in the first embodiment previously described.

The lateral sash member 102 is formed from a square beam member, formed of a suitable material, having a hollow portion 120, and has the same length as that of the side plate 100. A single or plural stages (two stages in the present embodiment) of the lateral sash members 102 are horizontally fixedly mounted on the side of the side plate 100 by welding, bolts, etc.

The lateral sash member 102 maintains a predetermined section rigidity, and performs a function of a resistance, that is, auxiliary rigidity against a buldge of a form panel K in a horizontal direction.

The lateral connectors 108 are disposed on opposite ends of the lateral sash member 102. The lateral connector 108 employs a telescopic construction, and the paired connectors 108 are mounted on the opposite ends of the lateral sash member 102.

More specifically, in the lateral connector 108, a sliding engaging element 122 is disposed within the hollow portion 120 of the lateral sash member 102 slidably along the hollow portion 120, at one end of the lateral sash member 102. A tapped rod 124 is secured at its base perpendicularly to the side of the sliding engaging element 122, said tapped rod 124 extending through a guide hole 126 bored in the side of the lateral sash member 102, and a fastening nut 128 is threadedly engaged with a projecting portion thereof. The sliding engaging element 122 is fixed by tightening the fastening nut 128.

The lateral connector is not limited to the mode as described above. A lateral connector 108A disposed on the lower lateral sash member 102 shown in Fig. 8 is designed so that splice plates 130 extended over the lateral sash members 102 adjacent to each other are fastened by bolts 132.

The post member 104 comprises a square post body 142 having a hollow portion 140, upper and lower end surface plates 144 and 146 fixedly

mounted on upper and lower portions (a column head portion and a column leg portion) of the post body 142, and a projecting member 148 firmly fitted in and secured to the hollow portion 140 of the column leg portion of the post body 142.

The post member 104 is formed of a suitable material similar to the lateral sash member 102 and crosses the lateral sash member 102, the post member 104 being fixedly mounted directly by welding or by bolts through an angle material 150 (a lateral angle material 150a and a longitudinal angle material 150b). That is, if the lateral sash member 102 and the post member 104 are formed of steel, weld-joining is employed, and if they are formed of light metal such as aluminum, joining means using the angle material 150 is employed.

The projecting member 148 of the post member 104 of the upper form panel 3 is closely inserted into the upper hollow portion 140 of the lower post body 142 to serve as a guide when the post members 104 of the upper and lower form panels 3 are connected together and forms an auxiliary rigidity mechanism for a bulging of the form panel 3 in a vertical direction.

The projecting member 148 is bored with a wedge-insertion hole 156 in which a wedge 154 is inserted along the lengthwise of the side plate 100. The post body 142 is bored in an upper side thereof with a wedge-insertion hole 158 at a position corresponding to the wedge-insertion hole 156 of the projecting member 148.

Fig. 11 shows one example of a longitudinal connector joined by a wedge.

In Fig. 11, reference numeral 154a designates a hole formed in a wedge 154, and reference numeral 160 designates an engaging element to be extended through the hole 154a.

End plates 144 and 146 of the post member 104 are placed in contact with each other, and an enlarged contact area thereof is intended to decrease contact stress to increase a support withstanding force. It is of course that they can be omitted in a case where the post body 142 has a sufficient thickness.

The post member 104 is bored in its upper portion with an insertion hole 162 into which a separator 112 including the side plate 100 is inserted.

The separator 112 comprises a rod body 112a formed from a lengthy steel rod, nuts 112c threadedly engaged with tapped portions 112b on opposite ends of the rod body 112a, and a spacer 112d, as in the first embodiment previously described.

According to the feature of the present embodiment, the lateral sash member 102 and the post member 104 are rigidly joined to constitute a framework body 106.

More specifically, rigid coupling means between the lateral sash member 102 and the post member 104 is suitably selected according to materials thereof. For example, if material comprises steel, fixing means by welding is used, and in case of light metal, fixing means by way of a bolt and nut through the angle material 150 is used. While in the illustration, four angle materials 150 are used at one intersection, it is to be noted that the longitudinal angle material 150b can be suitably omitted.

The framework 106 is fabricated at a factory whereby a framework which is constant in quality and strong can be obtained.

The construction procedure for the concrete structure using the form panels 3 in the present embodiment is basically in accordance with that of the first embodiment.

In this case, according to the form panel 3 of the present embodiment, the assembling of the form is easily and rapidly carried out by using the lateral connectors 108 and the longitudinal connectors 110.

Since the lateral sash member 102 and the post member 104 are solidly crossed and rigidly fixed, the joining construction at the intersection is simplified, and the respective members will have sufficient strength. As the result, the whole form panel 3 increases in strength and has a large resistance against the force applied to a plane of the side plate 100.

(Third Embodiment)

Figs. 12 to 14 show a still another embodiment (a third embodiment) of a form panel according to the present invention.

In these figures, reference numeral 200 designates a side plate; 202, a lateral sash member; 204, a post member; 206, a framework body; 208, a lateral connector; 210, a longitudinal connector; 212, a projecting member; and 214, a separator.

In this embodiment, the lateral sash member 202 and the post member 204 constitute the framework body 206, as in the second embodiment previously described, but the post member 204 is fixedly mounted along the side plate 200, the lateral sash member 202 being fixedly mounted externally of the post member 204 crossing the lateral sash member 202.

The present invention is not limited to the aforementioned embodiments but various changes in design can be made within the scope of the basic technical idea of the present invention. That is, the following modes are included in the technical scope of the present invention.

(1) The arrangement of the post members 12, 104 and 204 and the lateral sash members 14,

102 and 202 is not limited to two locations for one side plate 10, 100 and 200 but they can be disposed at one or more than three locations.

(2) The sectional shape of the post members 12, 104 and 204 and the lateral sash members 14, 102 and 202 is not limited to the square as in the above-described embodiments but other shapes including a H-shape and a circle may be freely employed.

(3) With respect to the post member 12 in the first embodiment, an arrangement can be employed in which as shown in Fig. 12, the post member 12 is divided into an upper end 12A and a lower end 12B, between which is fitted a wood intermediate member 12C.

The intermediate member 12C is inserted into the hollow portion 24 of the upper end 12A and the lower end 12B of the post member 12 and is fixed by placing nails and wood-screws or the like through the mounting hole 60 or by adhesives or the like. Since the intermediate member 12C is made of wood, it can be processed and adjusted in height freely at the site. It is to be noted that in a case where a large stress acts on the intermediate member 12C, architectural materials having a strength such as steel, aluminum or the like can be used.

(4) The mode of the longitudinal connectors 18, 110 and 210 is not limited to those shown in the aforementioned embodiments but other suitable modes having the function equal thereto are employed. Figs. 16 and 17 show one example thereof.

In the longitudinal connector 18A shown in Fig. 16, H-steel is used for the post member 12, and a pair of engaging elements 70 are fixedly mounted on the upper end of the post member 12 to receive a web portion of the upper post member 12. Reference numerals 72 and 74 designate insertion holes, into which a wedge (not shown) is inserted. Reference numeral 76 designates an anti-slip element.

In the longitudinal connector 18B shown in Fig. 17, connecting plates 80 and 82 are fixedly mounted on upper and lower ends of the post member 12 and are formed with bolt insertion holes 86 and 88 for receiving a bolt 84a of a fastener 84 comprising a bolt 84a and nut 84b.

(5) An arrangement can be employed in which the separator 20 is disposed at a location other than the post member 12, for example, at the lateral sash member 14.

and longitudinal connectors for connecting post members with each other are fixedly mounted on a head portion and a leg portion of the post member.

2. A form assembled while maintaining a spacing between opposed side plates by a separator, in claim 1.
3. A form assembled assembled with lateral sash members mounted on form panels laterally adjacent to each other, in claim 1.
4. A form panel characterized in that one or more lateral sash members are horizontally fixedly mounted along one side of a flat plate-like side plate while maintaining a predetermined spacing between upper and lower portions and over the same length as that of said side plate, and a post member is vertically rigidly placed in contact with the outside of said lateral sash member crossing the latter, said post member having vertically mutually connected longitudinal connectors at a column head portion and a column leg portion.
5. A form panel characterized in that one or more post members are vertically fixedly mounted along one side of a flat plate-like side plate, and lateral sash members having the same length as that of said side plate are horizontally rigidly placed in contact with the outside of said post member crossing the latter, said post member having vertically mutually connected longitudinal connectors at a column head portion and a column leg portion.
6. The form panel according to claim 4 or 5, wherein laterally mutually connected lateral connectors are provided on opposite ends of the lateral sash member.

Claims

1. A form panel characterized in that one or more post members are longitudinally fixedly mounted on one side of a flat plate-like side plate,

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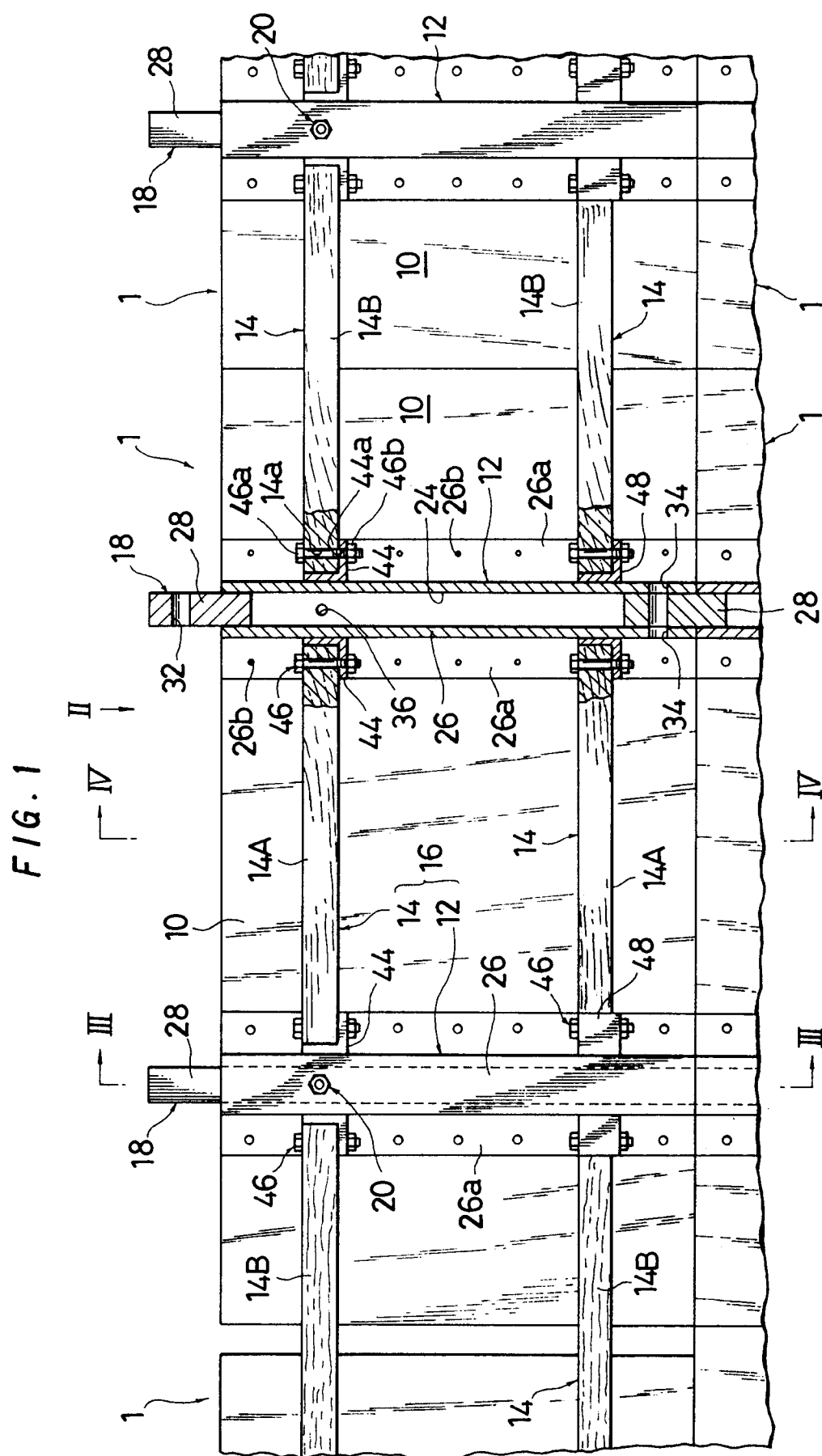


FIG. 2

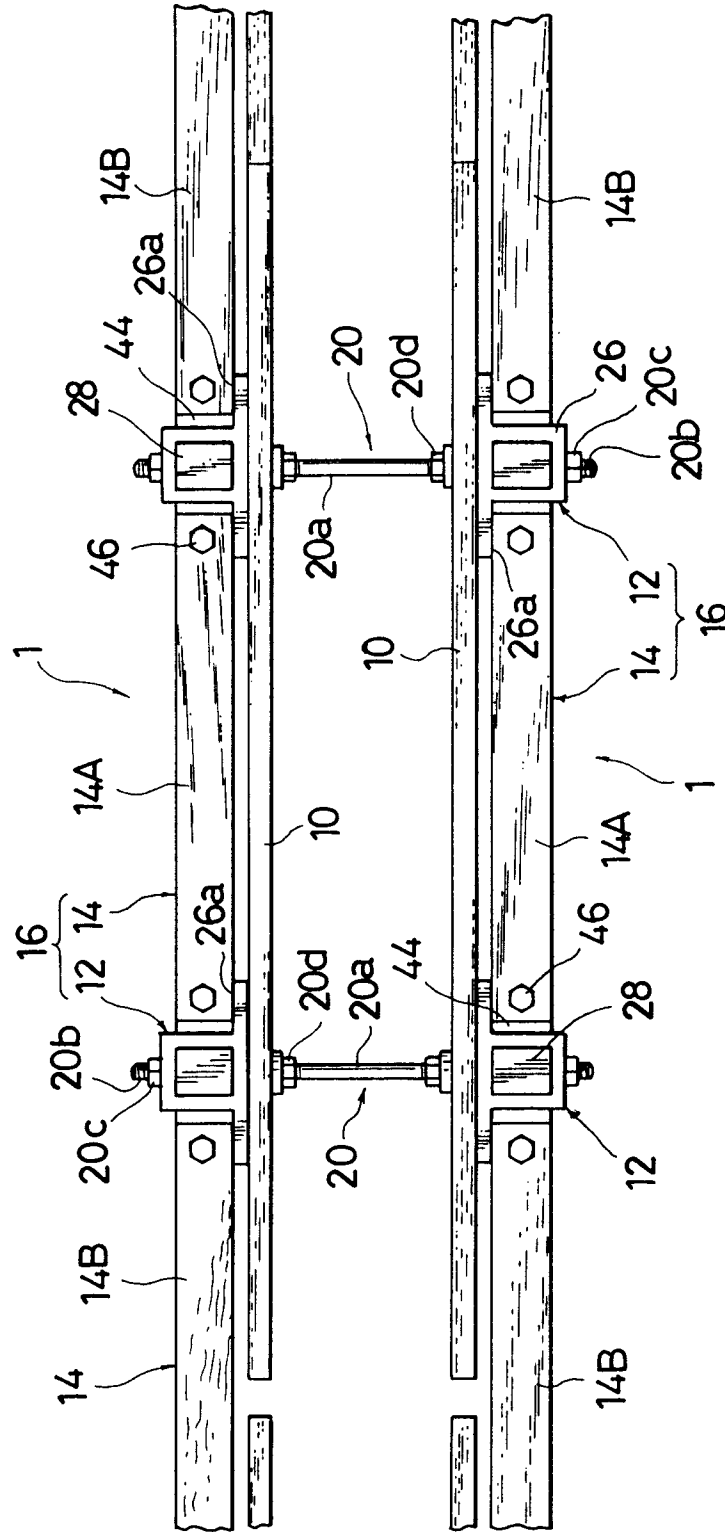


FIG. 3

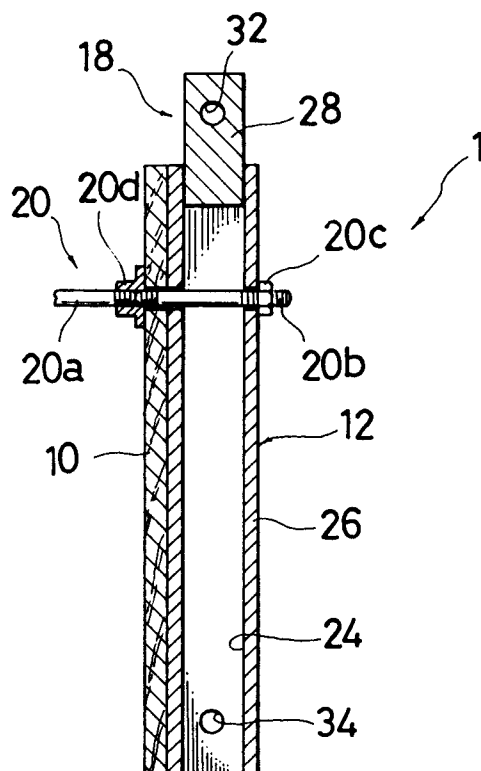


FIG. 4

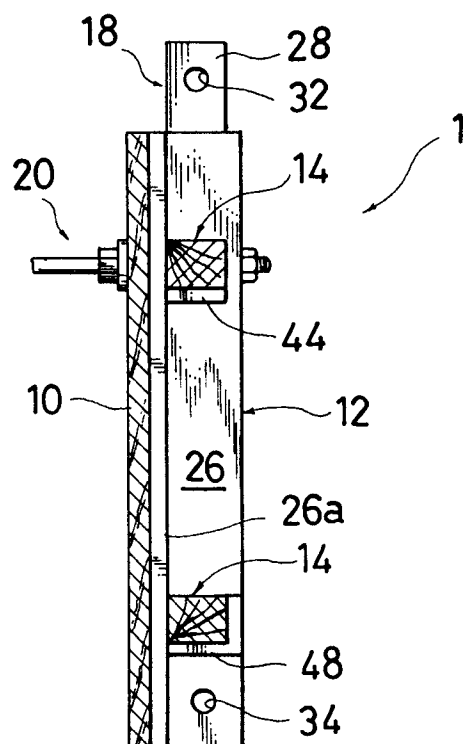


FIG. 5

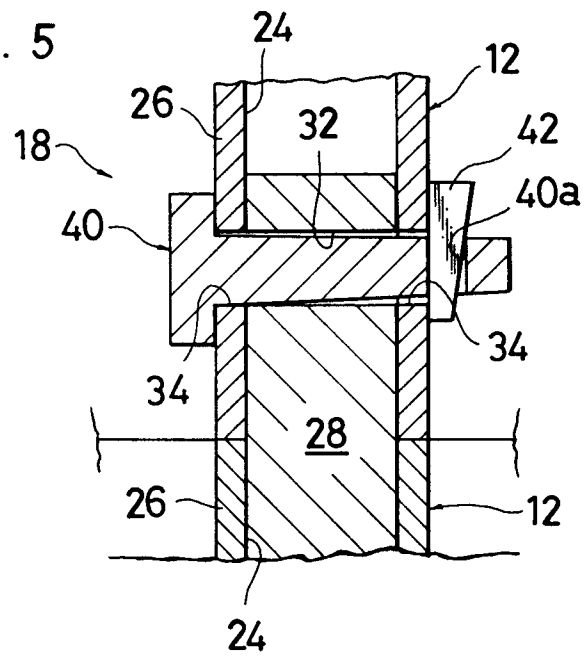


FIG. 6

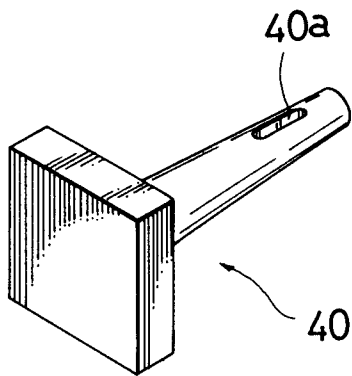


FIG. 7

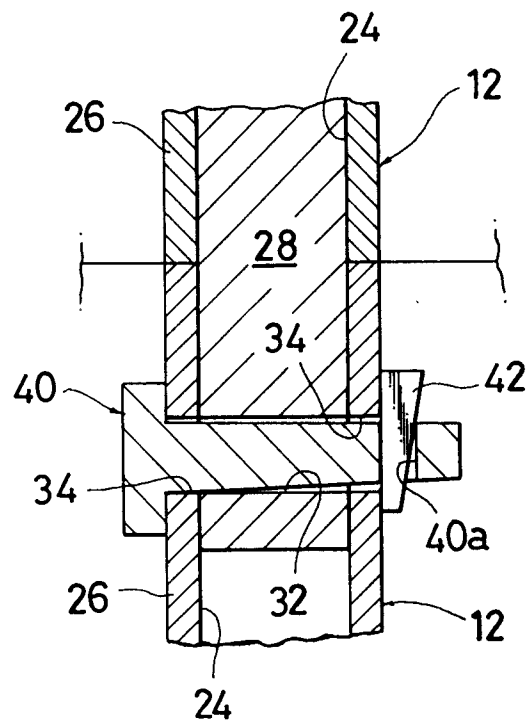


FIG. 8

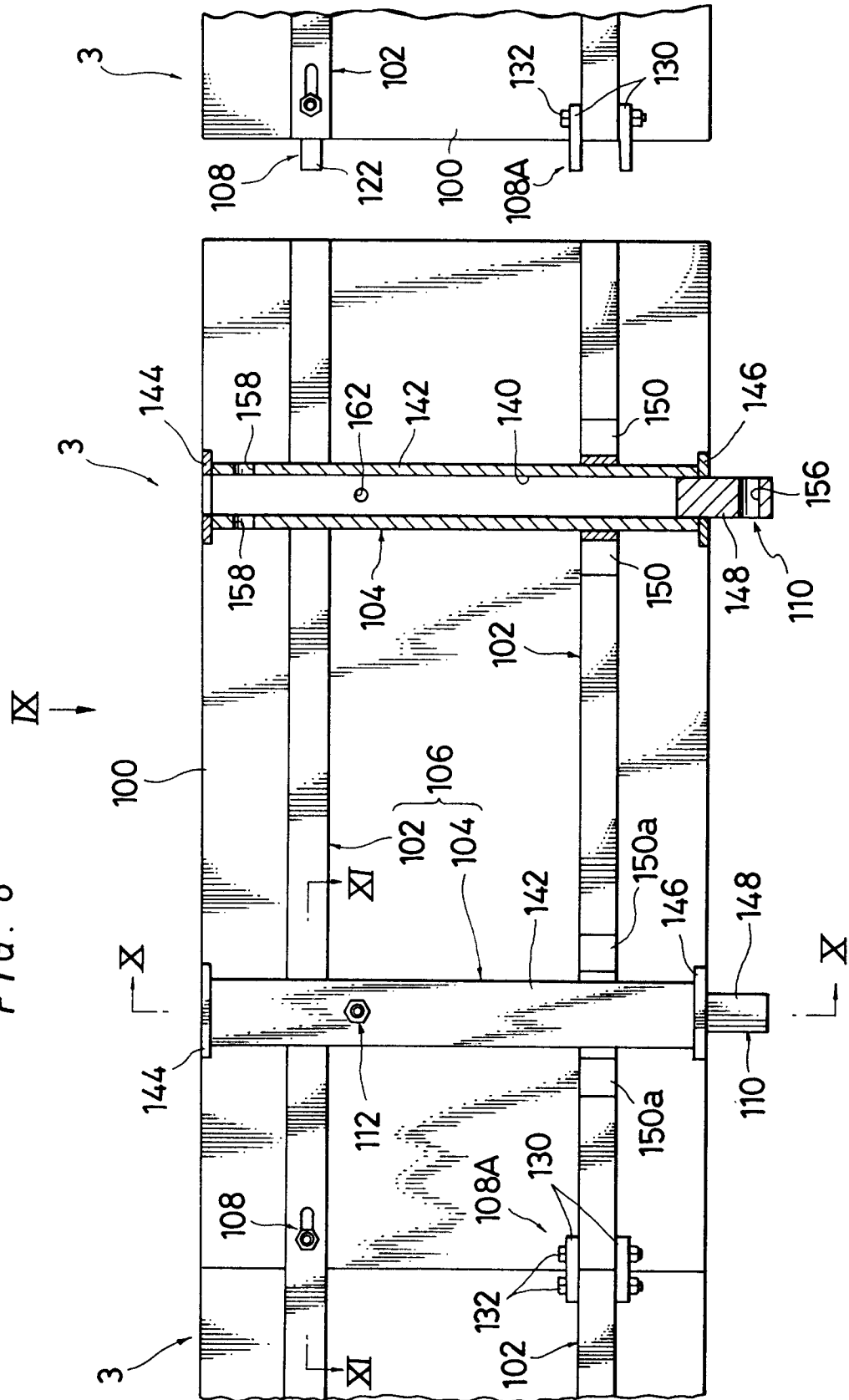


FIG. 9

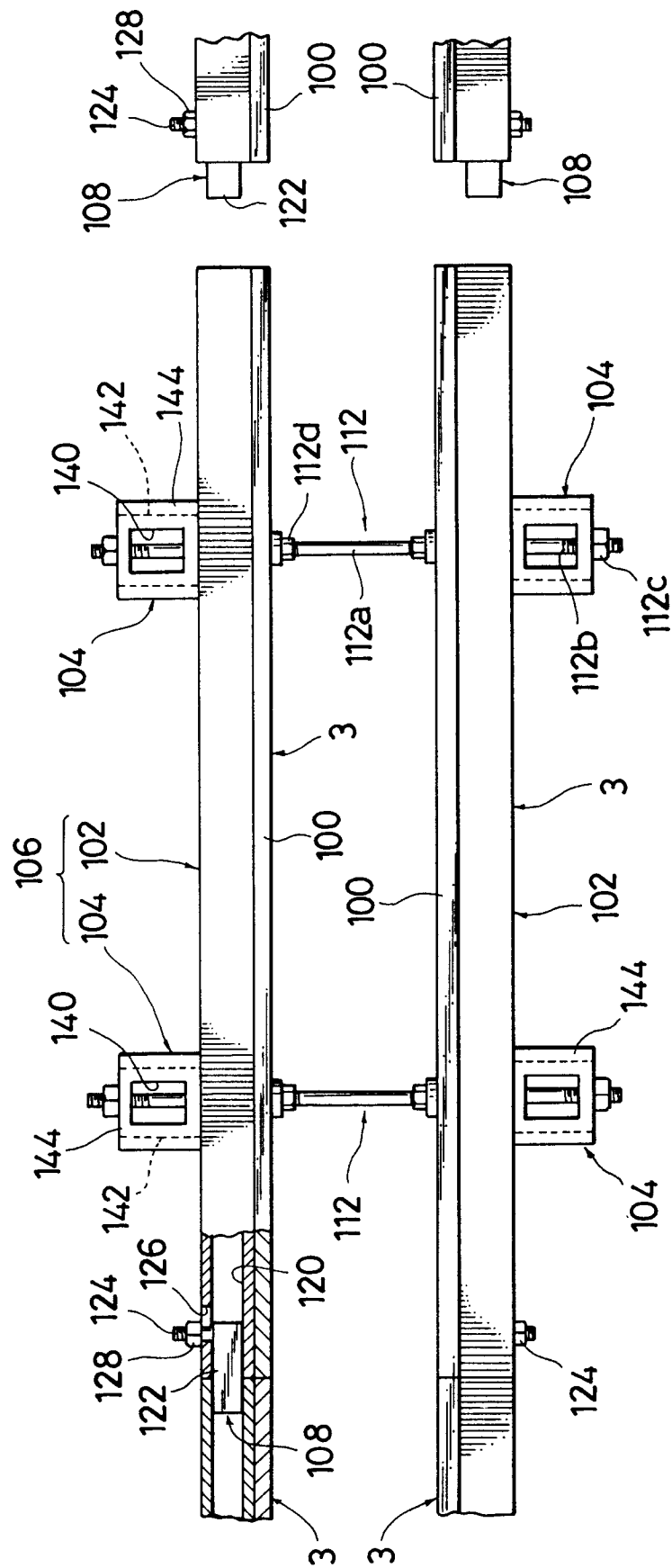


FIG. 10

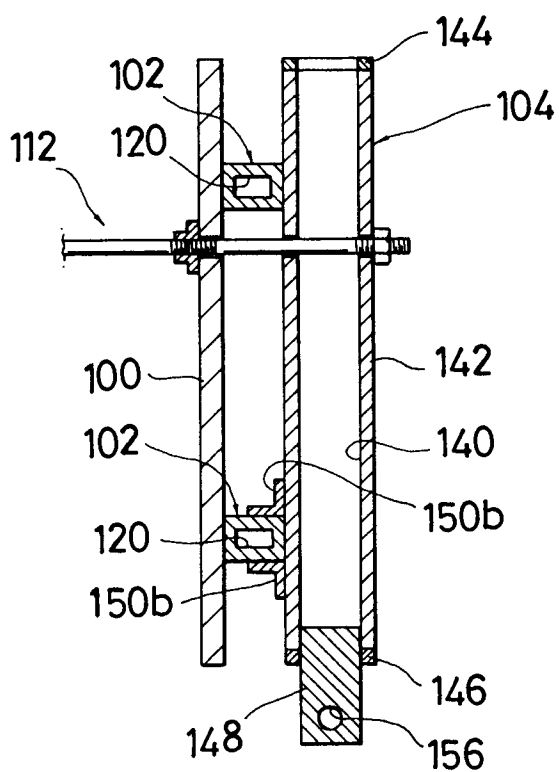


FIG. 11

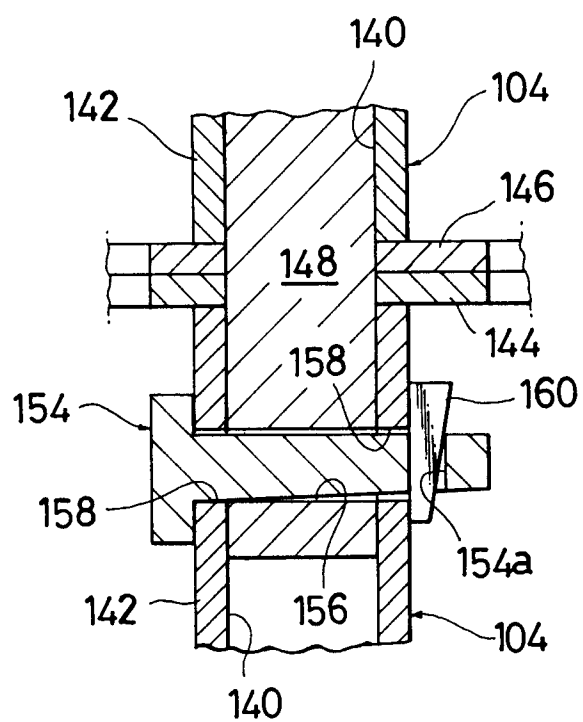


FIG. 12

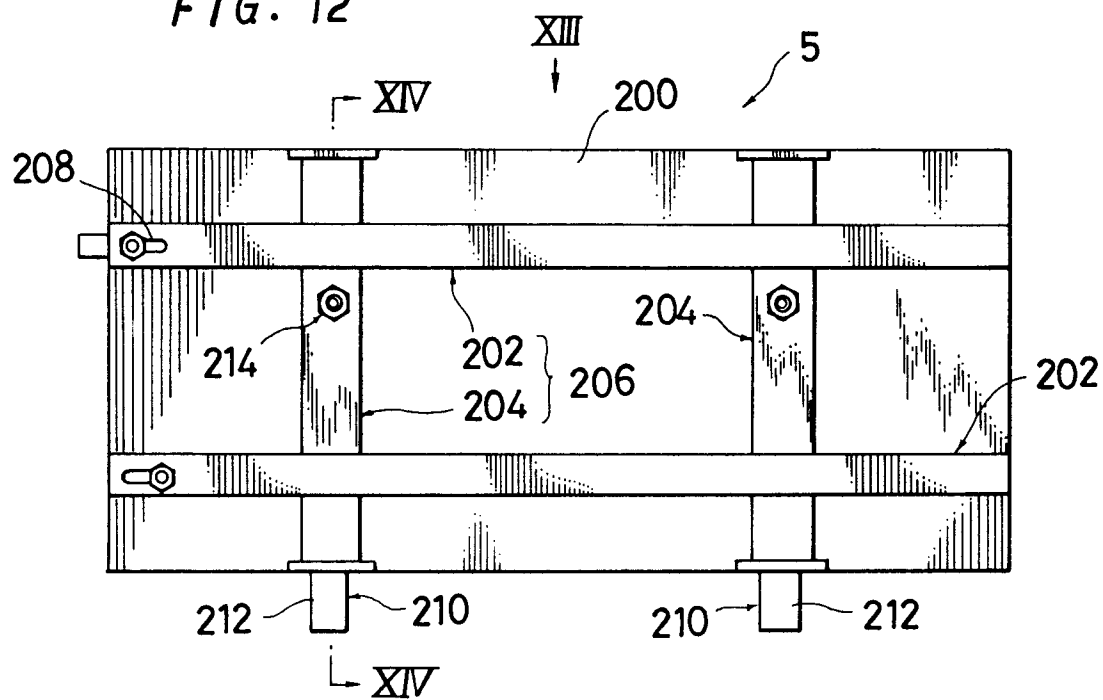


FIG. 13

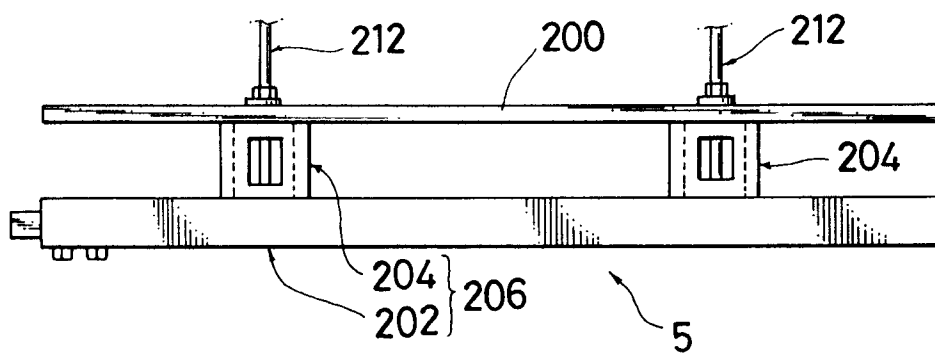


FIG. 14

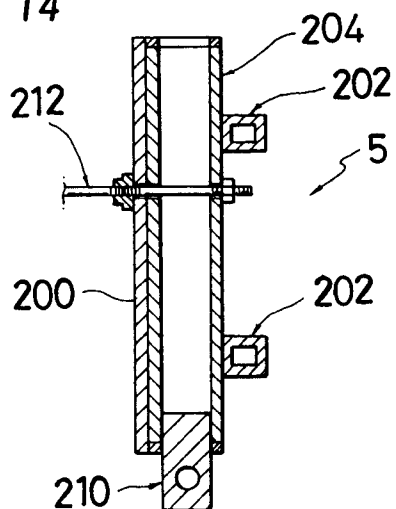


FIG. 15

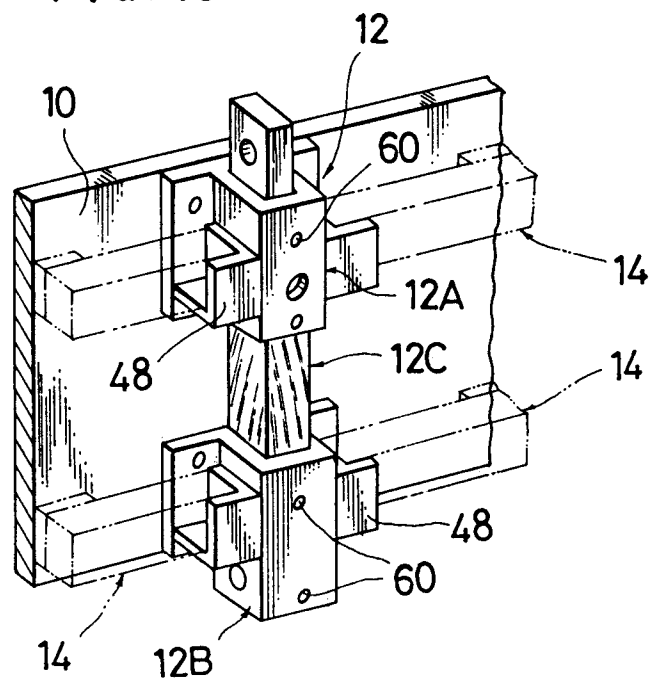


FIG. 16

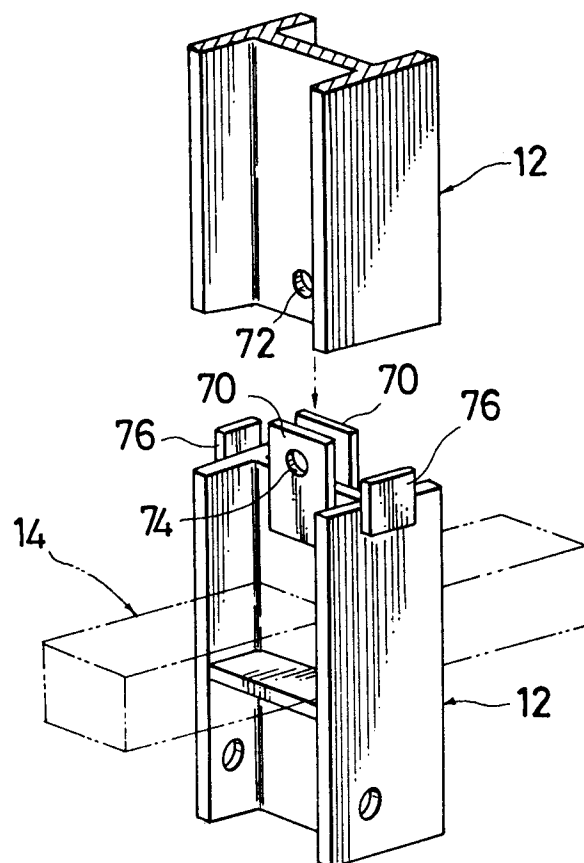
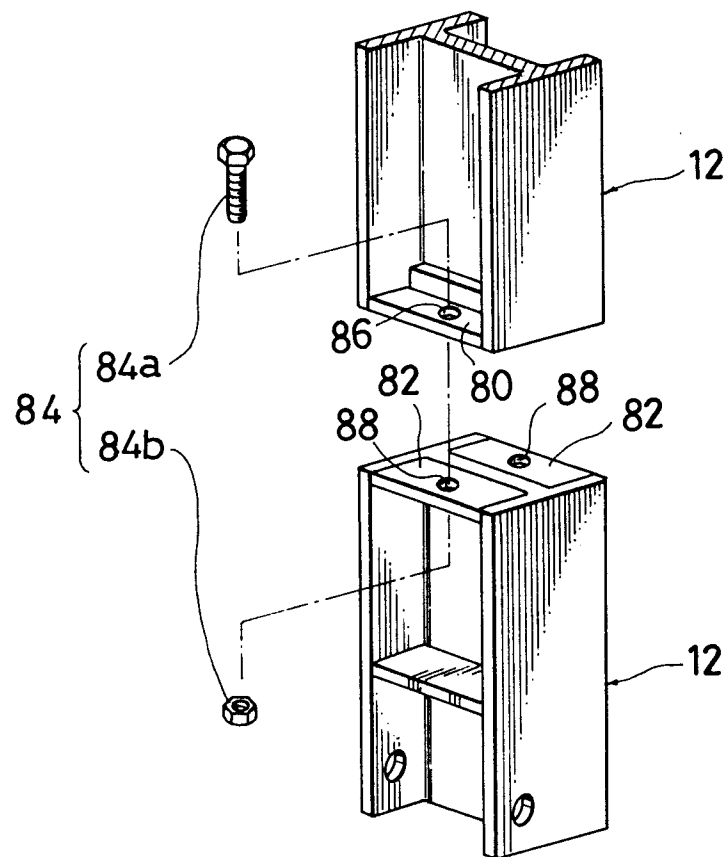


FIG. 17





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 4451

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.5)
X	FR-A-2 609 488 (ALCAN) * page 6, line 2 - page 9, line 20; figures 1-4 * ---	1-4	E04G11/10 E04G17/04
X	FR-A-2 598 453 (R. HUSSON & CIE) * page 6, line 8 - line 37; figures 1-4 * ---	1,2	
X	FR-A-2 158 600 (SOC. SITRABA) * page 3, line 9 - page 4, line 37; figures 1,2 * ---	1,4,6	
A	DE-A-2 342 093 (HÜNNEBECK) * the whole document * ---	6	
A	DE-A-2 551 462 (MAQUINARIA Y UTILES PARA LA CONSTRUCCION) ---		
A	DE-A-2 009 813 (MÜLLER & BAUM) ---		
A	DE-C-727 391 (LUCHTERHAND) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02 DECEMBER 1991	Examiner VIJVERMAN W. C.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			