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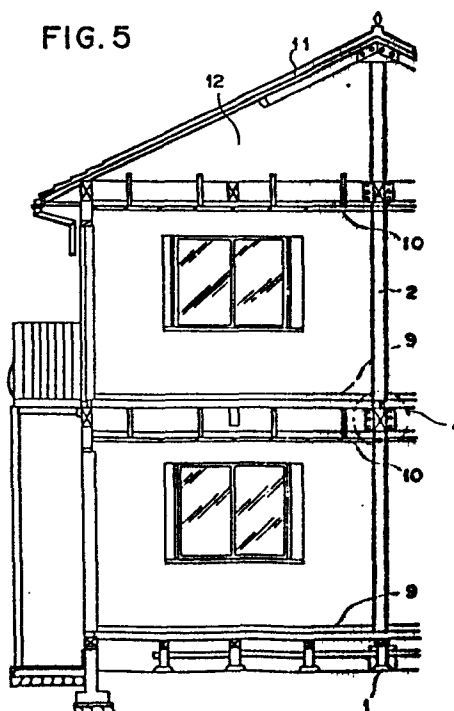
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(54) House construction.

(57) A substantially wooden house having a single central pillar constituted by a tubular steel pillar (2). The house is constructed by the steps of erecting the pillar (2) on a foundation (1); forming outer walls (6) around and apart from the pillar; and forming a floor (9) without providing any further pillar in the space within the outer walls. The floor is laid on beams (16) which are secured to the pillar directly, or indirectly through arm members 17.

FIG. 5



EP 0 183 541 A2

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HOUSE CONSTRUCTION

5 This invention relates primarily to a novel method of constructing substantially wooden houses.

 So far, it is a common practice in building a house to commence with a basic design, prepare a ground plan, draw plans and start the construction.

10 In the case of building wooden houses, prefabricated houses and houses by the two-by-four method it is conventional for a room arrangement plan to be made out first and the house is built in accordance with the room arrangement.

15 That is, a client makes out a room arrangement plan and a builder builds the house on the basis of this room arrangement plan. When the client demands an alteration, e.g., in the size of a room or of the location of a living room, for example, it is
20 generally difficult to comply with such a demand by changing the size or position of the room. Such alteration is not possible without partial amendment of the structural calculation, otherwise some structural parts will be stressed undesirably.

25 An alteration, such as an increase or decrease in a room size, is also difficult in rebuilding or extending a house. The alteration requires, e.g., removal of inner walls which is improper for, or conflicts with, the structural arrangement, or fails
30 to meet the remodelling plan.

 Further, the alteration requires a high building cost, for example constructing reinforcements which are often necessary in such cases.

35 This problem is also encountered in the case of a prefabricated house as well as a wooden house and an alteration of a plan is difficult and cannot be

done without adversely affecting the building.

Building a wooden house with a minimal number of pillars is generally difficult, not to mention the case of a reinforced concrete structure.

5 A two-by-four constructional method is known, which uses no pillars, by using panels bonded by adhesives. According to this method, an alteration of a plan, such as removal of inner walls, is difficult and often causes an undesirable effect on
10 the structure.

 An object of the invention is to provide a constructional method for a substantially wooden house, which enables an alteration of the size of a room, either larger or smaller, an increase in the
15 number of rooms by sectioning a room, or other free alteration of the room arrangement so that the house is variously remodelled according to a family make-up, or owner's needs.

 Another object of the invention is to provide a
20 constructional method for a substantially wooden house, which enables easy alteration as mentioned above, not only when a house is being constructed, but also when rebuilt or extended.

 Still another object of the invention is to
25 provide a substantially wooden house, which can be constructed at a low cost, and which can be altered without causing any structural influence, and without any additional reinforcing construction, when an alteration of the room arrangement or remodelling or
30 extension as mentioned above, are required to be performed, e.g., even by pulling down all inside room walls.

 A further object of the invention is to provide
35 a substantially wooden house which can follow the recent open plan tendency of installing less walls and sectioning a room by furniture, and to provide a constructional method which offers, in addition to

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the above-described advantages such as free rearrangement of rooms, an adaptability to future needs and styles of house utilization.

5 A still further objection of the invention is to provide a constructional method for a substantially wooden house which permits a variety in the shape and size of the peripheral walls, thus enabling building of wooden houses of a variety of design.

10 According to one aspect of the invention, a method of constructing a substantially wooden house comprises erecting a vertical steel pillar on a foundation; forming an outer wall around and spaced apart from the pillar; and providing a floor without
15 providing any further vertical support in the space inside the outer wall.

According to another aspect of the invention, there is provided a constructional method for a substantially wooden house having a single
20 full-length-pillar constituted by a steel pipe comprising: vertically situating the steel pipe on a foundation; forming outer walls around and apart from the steel pipe; joining at least one arm member to the full-length-pillar, the arm member having a means
25 for adjusting the distance between the full-length-pillar and the associated outer wall; and forming a floor without providing any pillar in the space defined by the outer walls except the full-length-pillar constituted by the steel pipe.

30 The invention also includes a substantially wooden house comprising a steel pillar which is, or is arranged to be, erected vertically on a foundation; outer wall parts which are, or are arranged to be, erected around, but spaced from, the
35 pillar; and a floor which is, or is arranged to be, supported by and between the pillar and the outer wall parts without any further vertical support

inside the outer wall parts.

Some examples of houses constructed in accordance with the invention are illustrated in the accompanying drawings, in which:-

5 Figure 1 is a plan view of an essential part of a house;

Figure 2 is a schematic illustration of the framework structure of a first example of house;

10 Figure 3 is a partly-sectioned side elevation of an example of a foundation used in the house shown in Figure 2;

Figure 4 is a plan of an outer wall arrangement;

Figure 5 is a side elevation of a house which is a modification of the first example;

15 Figure 6 is a perspective view of a house of the type shown in Figure 5;

Figure 7 is a plan of the house showing an example of the room arrangement;

20 Figure 8 is a perspective view of an essential portion of another example of house;

Figure 9 is a side elevation of an essential portion of the house of Figure 8;

Figure 10 is a section taken on the line II-II in Figure 9;

25 Figure 11 is a sectional view of a modification of the second example of house;

Figure 12 is a plan view showing an example of a beam arrangement in the second example of house;

30 Figure 13 is a sectional view of an essential portion of a house constructed in accordance with a conventional method.

In the first example of house, one steel pipe 2 is installed as a full height pillar on a foundation 1, as shown in Figure 2. This steel pipe may be hollow and have a circular section, as shown in Figure 1, or may have rectangular section as shown in Figure 4. Figure 3 shows the details of the

foundation 1. A ground still 3 is fastened by anchor bolts 4 on the foundation 1 placed on the ground, and the steel pipe 2 is connected thereto. In Figure 3, lines 5 represent foundation reinforcement. Outer walls 6 are erected around the above steel pipe 2, as shown in Figure 1. Outer walls 6, e.g. panels of plywood or other essentially wooden construction, are arranged in a regular square, as shown in Figure 1, and supported by eight pillars 7, e.g. of wood, as shown in Figure 4 wherein four pillars are respectively located at four corners and another four pillars are respectively located at the middle of the four sides. The outer walls 6 are, for example, arranged in a 7.2 m square, with the pillars 7 arranged at an interval of 3.6 m. The walls are preferably constructed in the manner of prefabricated houses, from wall panels of 3.6 m width.

In a preferred form of the invention, as shown in Figure 1 the steel pipe 2 forming the pillar is installed vertically at the very middle, and the outer walls 6 are in the regular square around the steel pipe 2. In an inner space 8 defined by the outer walls 6, no pillar is provided except the steel pipe 2, as will be seen from Figure 1. Essentially wooden floors 9 extend from the steel pipe 2, as shown in Figure 2 and Figure 5. That is, the floors 9 are constructed and secured to the steel pipe 2 with fastening bolts.

The invention provides a basic constitution wherein the one steel pipe 2 is vertically installed at the centre, as shown in Figure 2, followed by finishing the outer walls 6 and the floors 9. Accordingly, the inner space 8 is not provided with any pillar except the steel pipe 2 so that the space can be used in accordance with any desired room arrangement.

The central steel pipe 2 therefore sustains

with surplus strength the load including the weights of the floors 9 and a ceiling 10 which are constructed as shown in Figure 5.

5 Furthermore, an attic space 12 (refer to Fig. 5) defined by the ceiling 10 of the second floor and a roof 11 is constructed so as to provide a storage space.

10 Figure 6 shows the finished state of the essentially wooden house, but partially having a steel construction. Conventional timber structure for wooden houses can be applied for the finish.

15 Thus, a steel member is provided at the middle of a house around which outer walls are finished, whereby the space includes no pillars except the steel member, so that it is possible for the space to be freely varied according to choice and needs.

20 The space can be partitioned and varied from its basic form to optional forms. For example, the second floor may be partitioned into rooms 13, 14 and a living room 15, as shown in Figure 7 and it is possible for the space 8 to be provided with a variety of different sections (not shown).

25 The method of the invention ensures that the inner space of the house is easily rearranged according to the change of a family make-up or house owners' needs, the basic form of the space being divided into a smaller or larger number of rooms.

30 It is a recent tendency that movable types of furniture are set in a room for the purpose of dividing an open plan room, instead of walls. Thus, the invention enables the residential space matching present and future life styles to be provided by properly siting partition furniture and by partitioning the space to taste, because the space
35 includes no pillars.

Even if it is necessary to alter a room arrangement after it is once set up, the remodeling

can be readily performed and for this reason performed at a low cost.

The same is true in the case of rebuilding and extension of a house.

5 In the case of rebuilding and extension, even removal of all inner walls, for example, does not conflict with a structural arrangement and causes minimal influence on the building. It is possible because the steel member can sustain at least half of
10 the whole load of the building, the rest of the load being taken by the outer walls. The rebuilding and extension can then be carried out at low cost because they do not require any additional reinforcement.

15 The same is true with respect to subsequent alterations of a room arrangement.

 The invention thus provides a substantially wooden house, which has a partial steel construction and is durable and advantageous. Conventional wooden houses are sometimes provided with especially thick
20 and long wooden pillars, as well as a multiplicity of studs, resulting in high building cost, and cannot be altered without undesirably influencing, the structural state of the house.

25 The invention thus also provides a house which can be constructed in the manner of semi-prefabrication by using members of 3.6 m width for the outer walls and furniture for partitions, thus shortening the construction period remarkably by virtue of the simple construction method.

30 On constructing the house, it is possible for the builder to construct it in the manner of semi-prefabrication, without any chisel work which is essential in the conventional method for building wooden houses.

35 This also contributes to the shortening of the construction term.

 The full height pillar may be a hollow pipe

having circular section, which can then advantageously be utilized for ventilation.

Modifications are possible. Thus the outer walls need not be arranged in a regular square, but
5 may be arranged in a circle, a polygon such as an octagon, or a rectangle.

Additionally, while the construction method described above is suitable for a wooden house of 100 m² floor area, the house according to the invention
10 is not restricted within this size and the floor area can be further increased by devising a bearing means for flooring to a steel member.

It is thus possible to construct an essentially wooden house incorporating a steel pillar, in which
15 the high strength of the heavy-duty steel pillar, capable of bearing heavy load of, for example, 56 tons, is effectively combined with the merits of wooden houses of framework type structure.

The first example, however, has shortcomings in
20 that the outer configuration of the house tends to be limited to a square shape as shown in Figure 1, and in that it is rather difficult to comply with a demand for a variation in the house size.

These shortcomings are attributable to the fact
25 that the floors and ceiling are laid on beams which are directly jointed to the central pillar by welding.

A detailed explanation will be made in this regard with reference to Figure 13 which is a partial sectional view of the portion marked at "A" in Figure
30 5 as viewed from the upper side thereof. The floor 9 is omitted from this Figure for the purpose of clarification. It will be seen that four beams 16 are directly welded to the full-length-pillar and extend in all four directions. This arrangement does
35 not allow free change of the outer configuration and the size of the house.

This problem is overcome by the second example,

which is characterized by the use of at least one arm member directly joined to the full-length-pillar, the arm member having a means for adjusting the distance between the central pillar and the outer wall of the house. Figure 8 is a detailed perspective view of the portion marked at B in Figure 9 which in turn shows, possibly steel but preferably wooden, beams combined with arm members. In Figure 8, a beam is shown in a state separated from the arm member. More specifically, Figure 9 shows a portion of the house shown in Figure 5, wherein beams 16 are inserted and connected to arm members 17 which are joined to the pillar 2, which is similar to that of the first example. The pillar 2 is constituted by a heavy-duty steel pillar having a substantially square cross-section and capable of withstanding a heavy vertical load of, for example, 56 tons. The arm member 17 may be made of tubular steel having a rectangular cross-section as illustrated. Figure 10 shows a section taken on the line II-II of Figure 9.

In constructing the second example of house, the arm members 17 are joined to the pillar 2 by, for example, welding. The length and the number of the arm members 17 are suitably selected in accordance with the configuration and size of the house to be constructed. The upper wall portion of each arm member 17 is partially removed at its end such as to provide a receptacle portion of U-shaped cross-section as shown in Figure 8, and the beam is inserted into the receptacle portion from the upper side thereof. Then, the beam 16 is fixed to the arm member 17 by means of, for example, bolts.

In order to ensure a high strength at the juncture between the pillar 2 and the arm members 17, it is useful to secure a plate member 18 as shown in Figure 11. Needless to say, for attaining a higher rigidity of the connection, a plate member 18 may be

secured at both the upper and lower sides of the connection, although in the illustrated case the plate member 18 is provided only on the upper side of the arm members 17.

5 This second example offers the following advantages.

 The beams are connected to the central pillar through the intermediaries of arm members which permits a free selection in the distance between the
10 pillar and the outer walls and, hence, a free selection in the outside dimensions and configuration of the house, thus allowing construction of a variety of house designs.

 For instance, even though the beam length is
15 unchanged, the distance between the pillar and the outer wall can be increased such as to allow the overall house size to be upwards from a minimum size of, for example, 100 m². The essentially wooden house constructed in accordance with this second
20 method can have a generally rectangular plan, provided that two types of arm members 17 having different lengths are used as shown in Figure 12. It is possible even to obtain a polygonal plan, such as octagonal, or a substantially circular plan by
25 suitably selecting the number and positions of the arm members, thus meeting a variety of demand.

 The provisions of the arm members facilitate the connection of the beam to the central pillar and contributes to the shortening of the construction
30 period.

 It is possible to construct a house the planar area of which is gradually decreased towards the top of the house, by suitably selecting the lengths of the arm members such that the arm members for the
35 ceiling level has a length smaller than that for the respective floor level.

CLAIMS

1. A method of constructing a substantially wooden house, the method comprising erecting a vertical steel pillar (2) on a foundation (1); forming an
5 outer wall (6) around and spaced apart from the pillar; and providing a floor (9) without providing any further vertical support in the space inside the outer walls.
- 10 2. A method according to claim 1, wherein the steel pillar (2) has a square, or a rectangular, cross-section.
- 15 3. A method according to claim 1 or claim 2, wherein at least one arm (17) is joined to the steel pillar (2) and extends outwards towards the outer wall (6).
- 20 4. A method according to claim 3, wherein a floor beam (16) is attached to the arm (17) and extends to the outer wall.
- 25 5. A method according to any one of the preceding claims, wherein the steel pillar is tubular.
- 30 6. A substantially wooden house comprising a steel pillar (2) which is, or is arranged to be, erected vertically on a foundation (1); outer wall parts (6,7) which are, or are arranged to be, erected around, but spaced from, the pillar (2); and a floor which is, or is arranged to be, supported by and between the pillar (2) and the outer wall parts (6,7) without any further vertical support inside the outer
35 wall parts (6,7).

FIG. 1

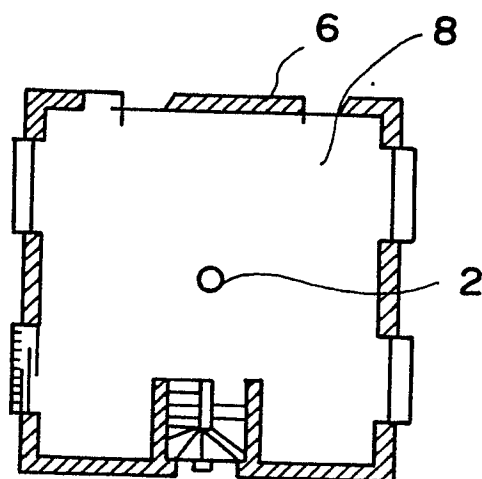


FIG. 2

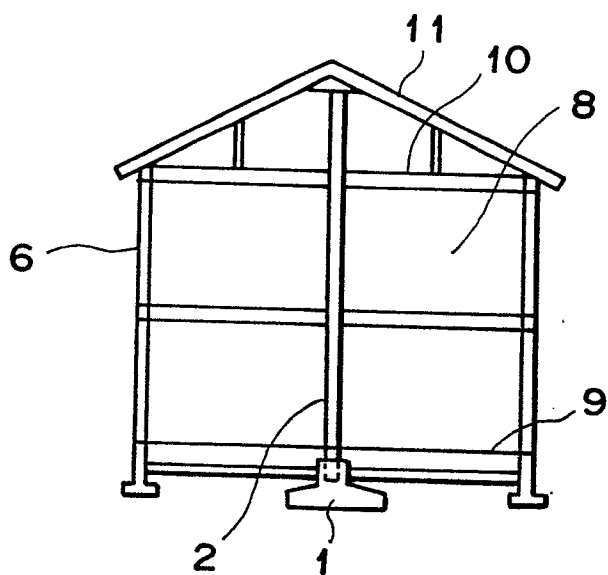


FIG. 3

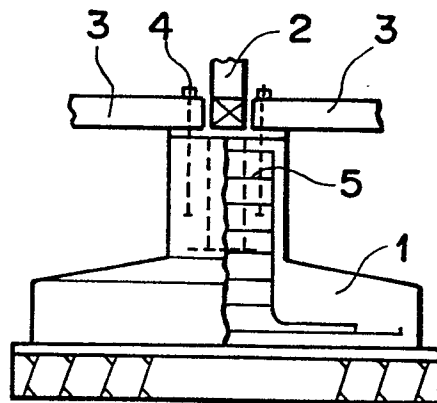


FIG. 4

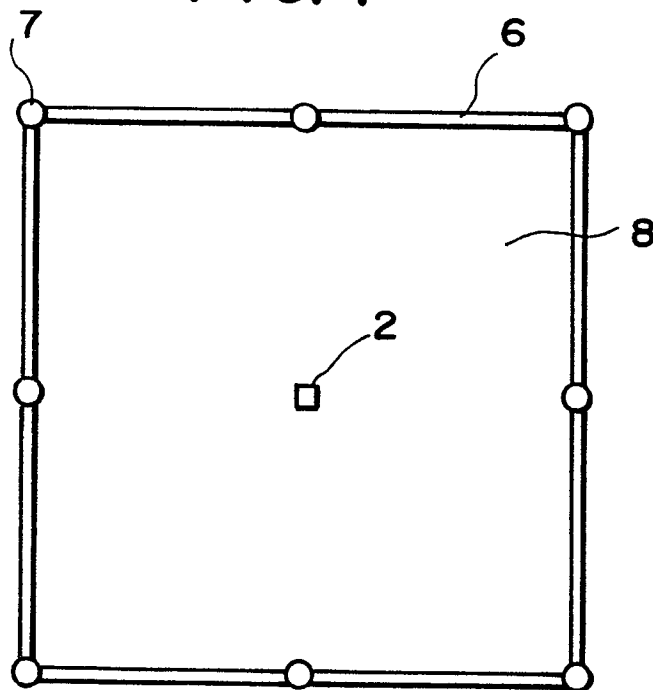


FIG. 5

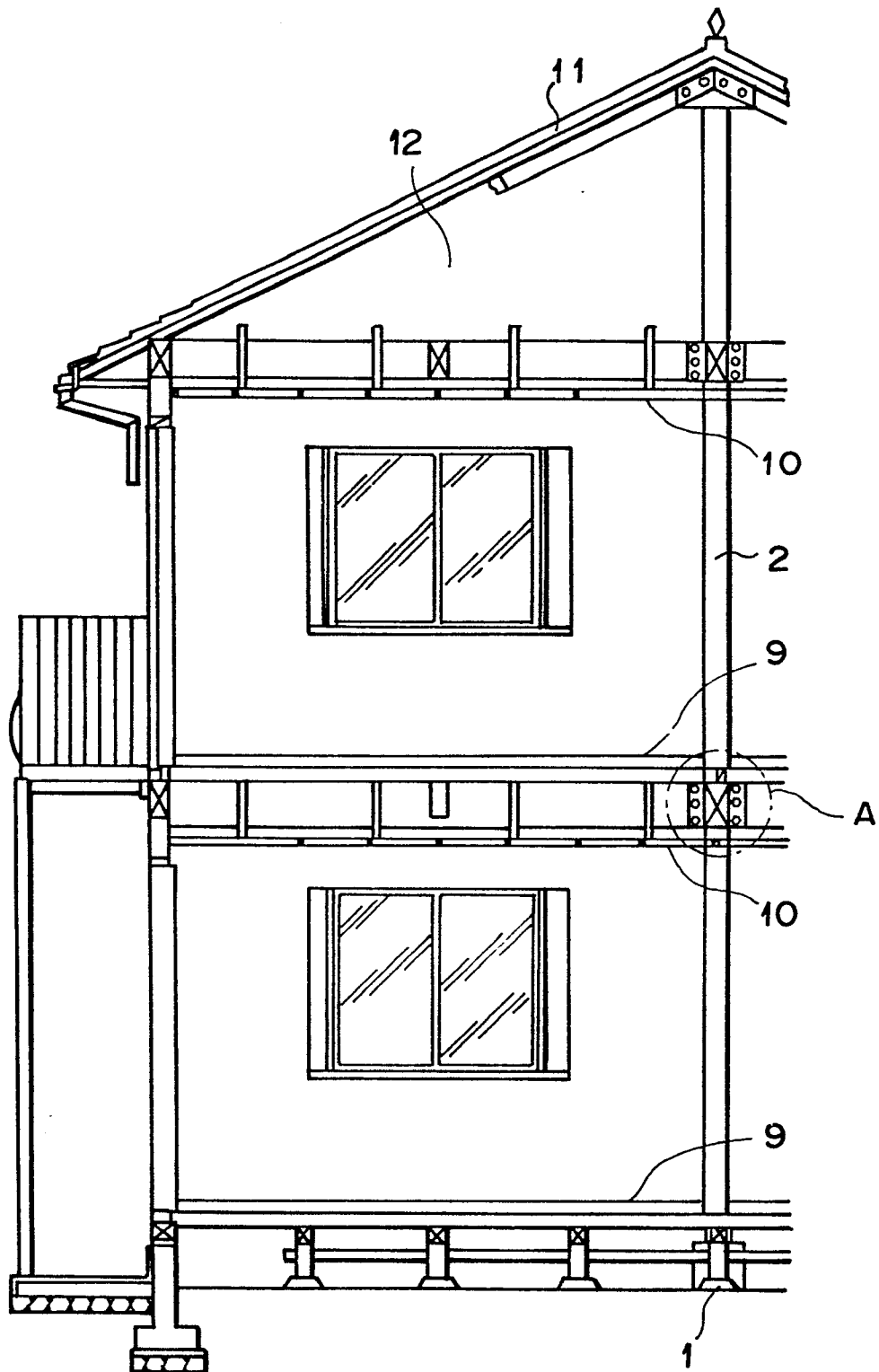


FIG. 6

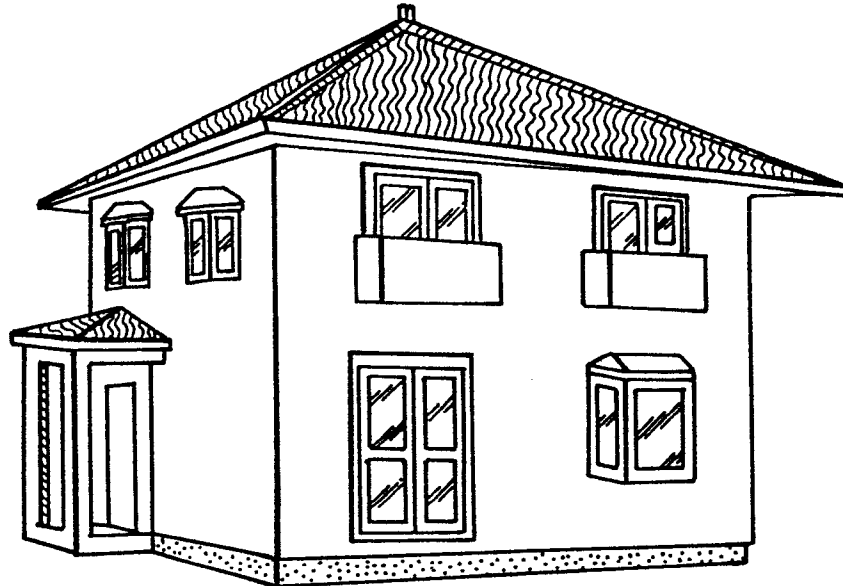


FIG. 7

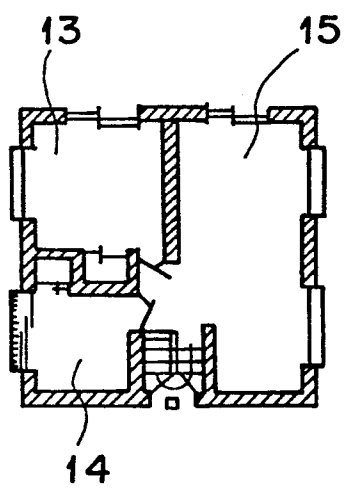


FIG. 8

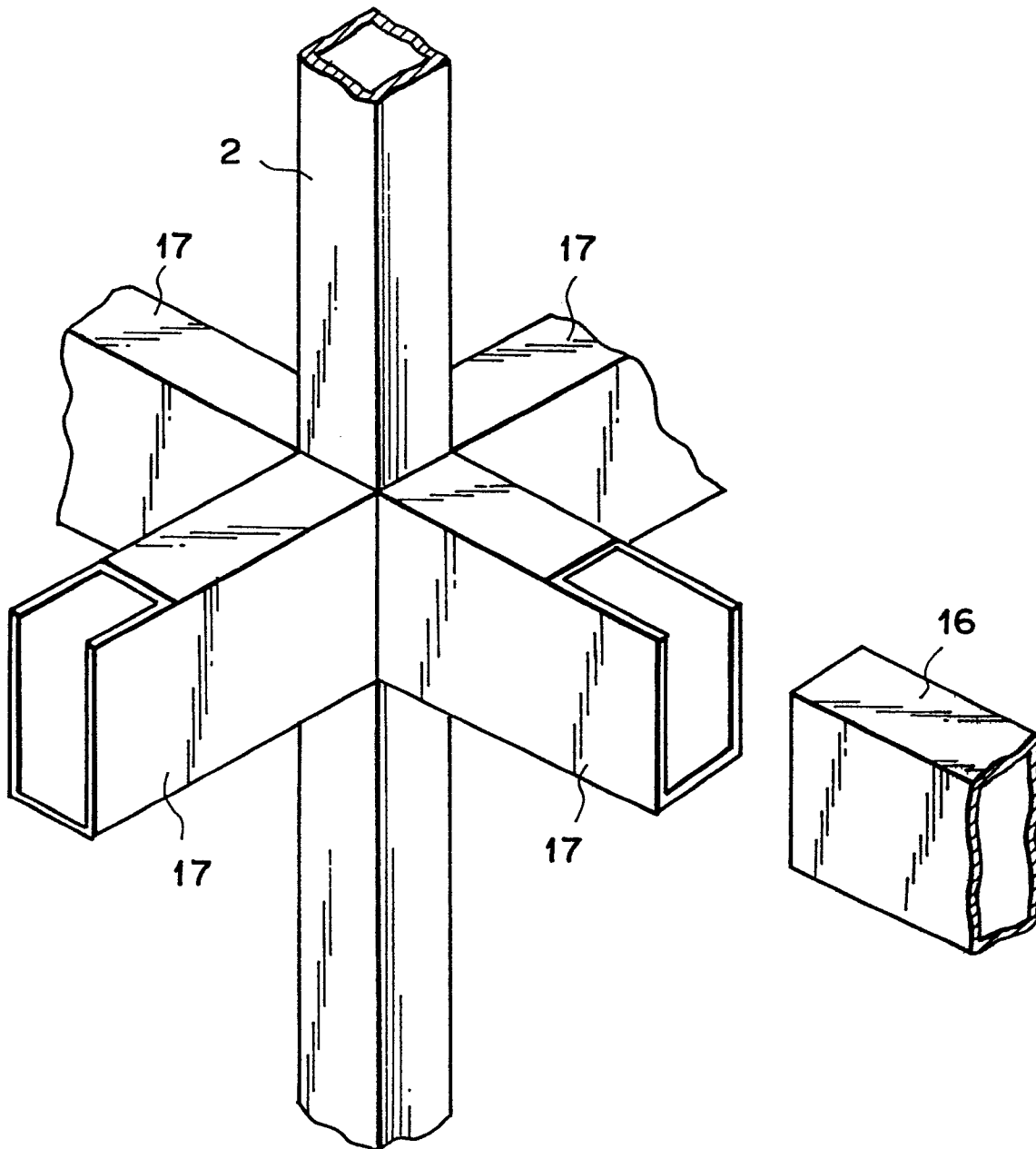


FIG. 9

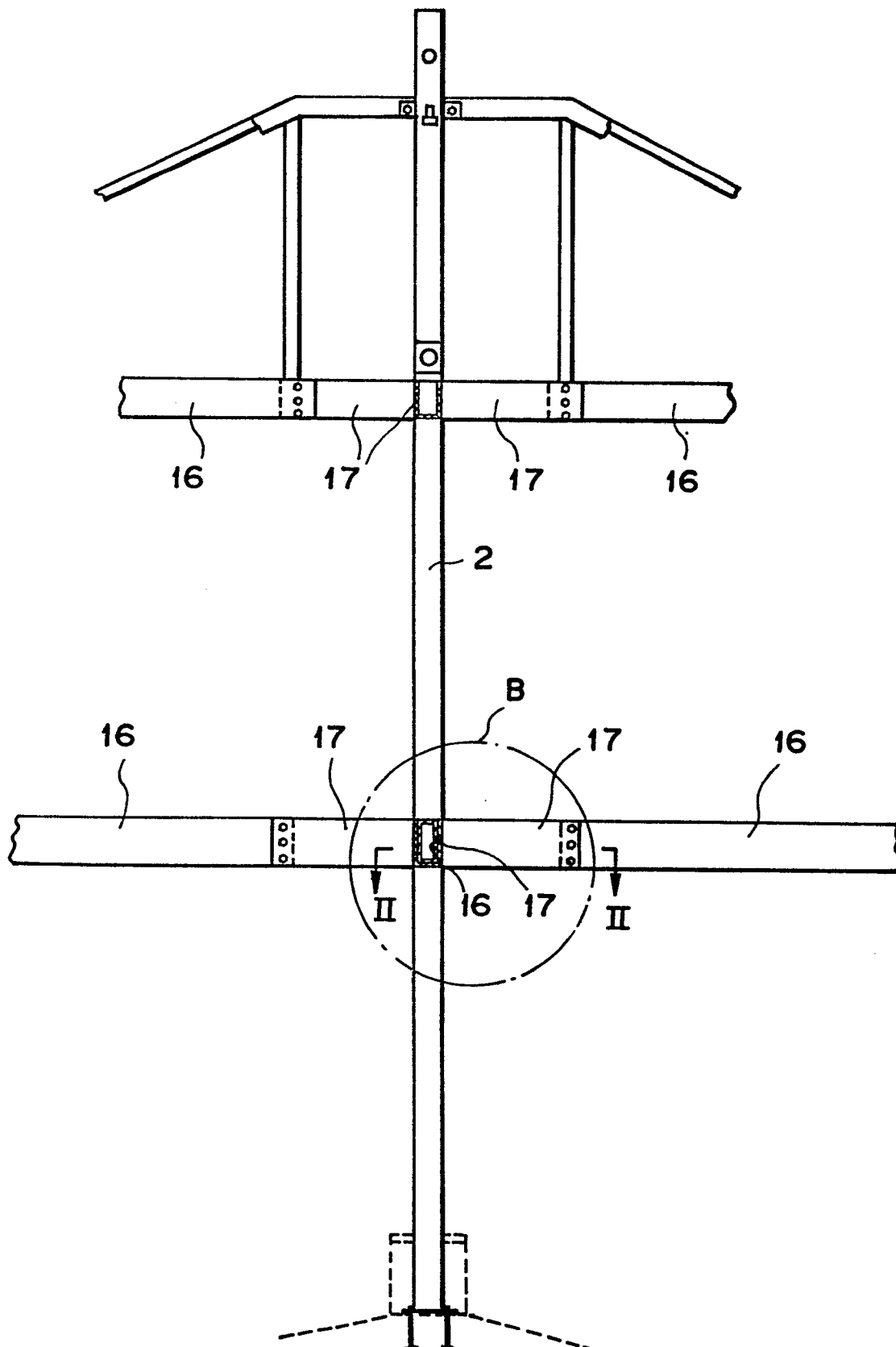


FIG. 10

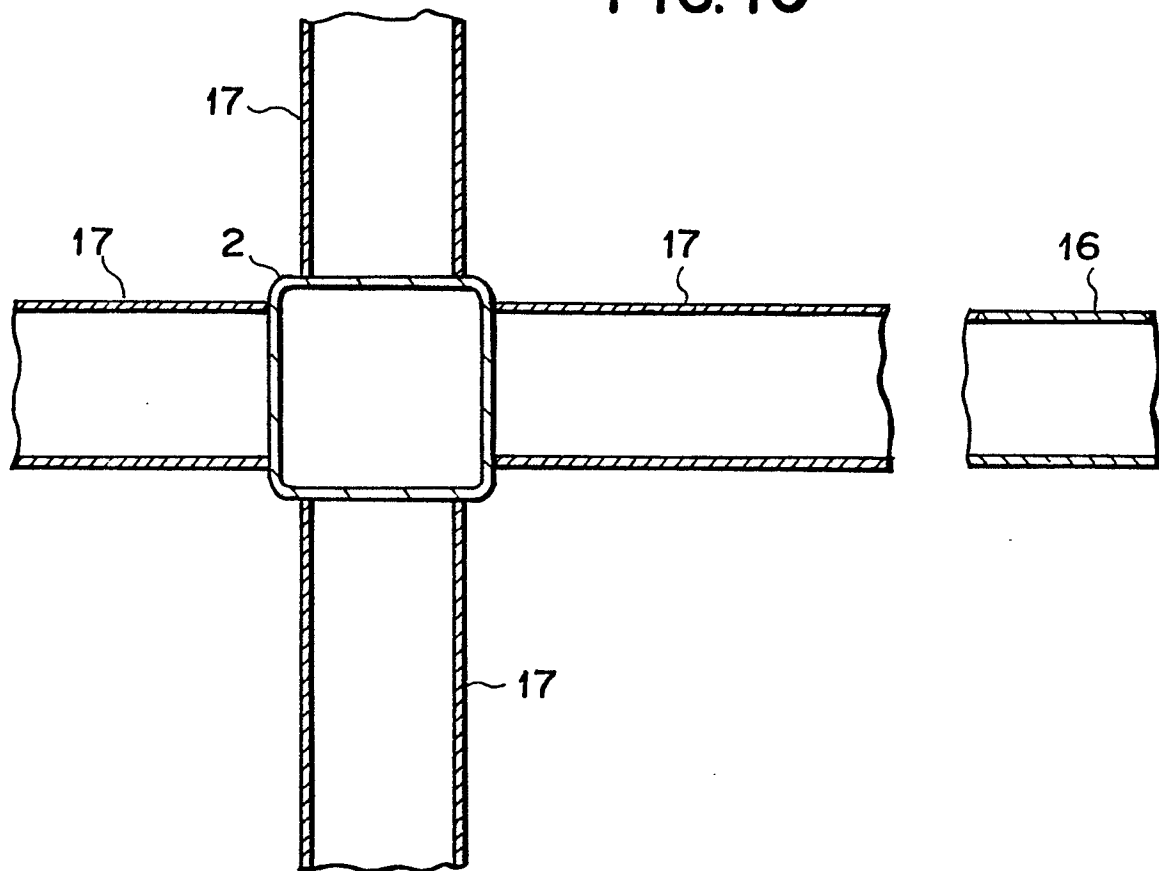


FIG. 11

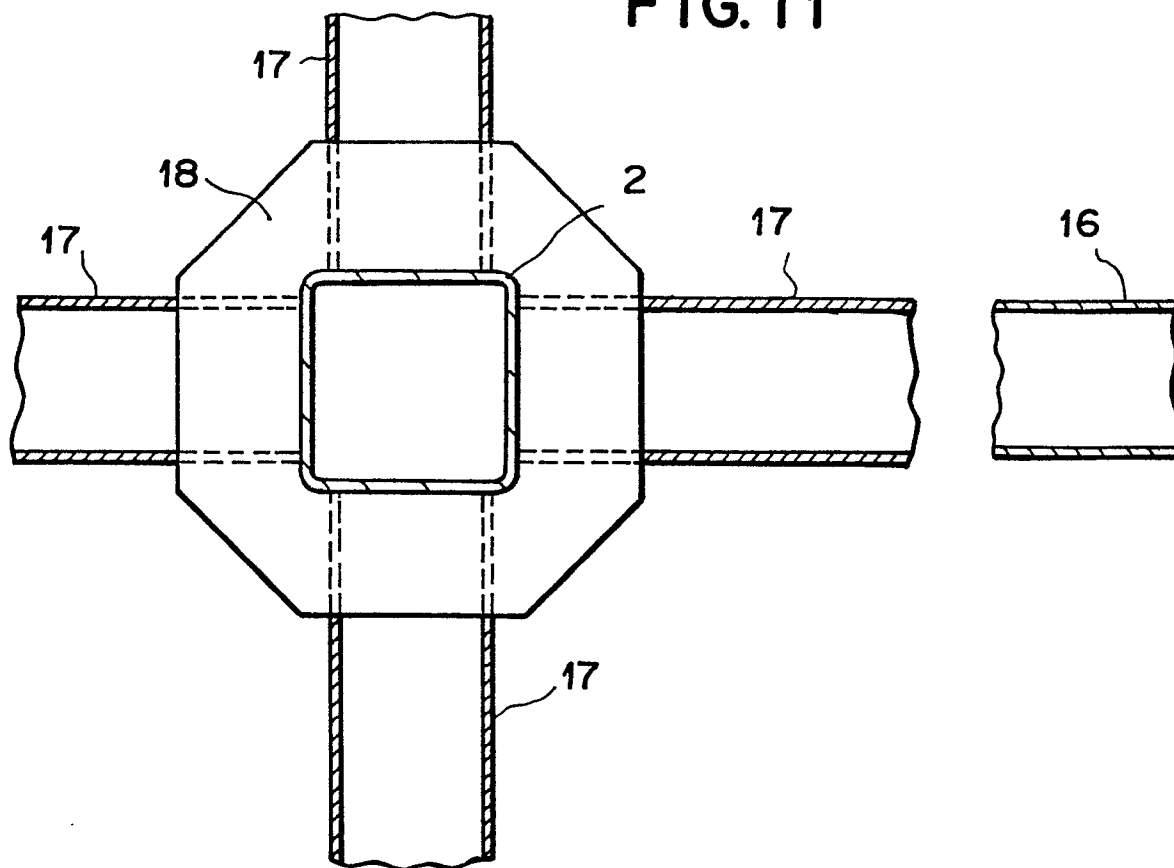
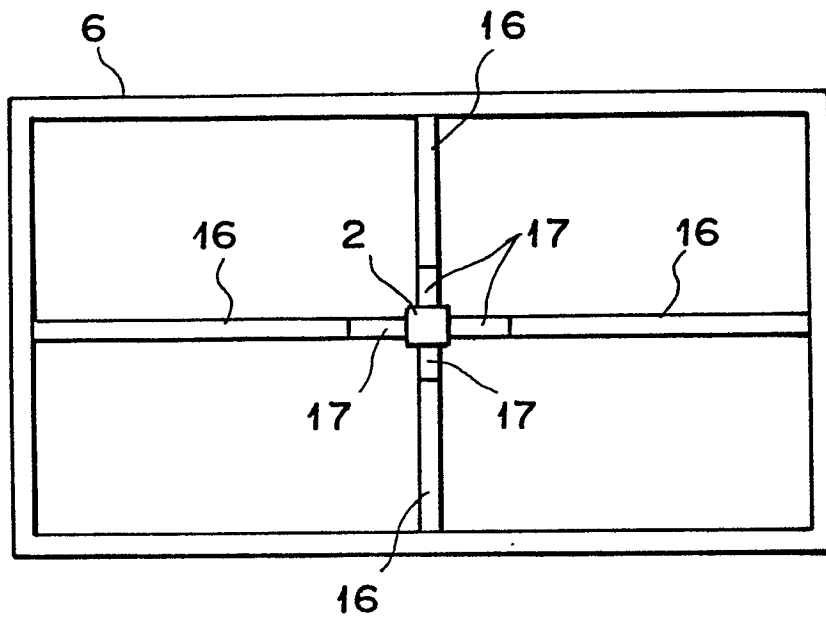


FIG. 12**FIG. 13**