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(54) **Wail assembly comprising a connecting system for connecting prefabricated wall elements**

(57) A wall assembly 1 for use in building prefab buildings and/or houses with a connecting system for connecting prefabricated wall units to one another on a building site, comprising at least two prefabricated wall units 2, 3, and connecting means for coupling the prefabricated wall units 2, 3 to one another at a desired angle on the building site, in which the connecting means comprise a first connecting part connected to the one wall unit 3 and a second connecting part connected to the other wall unit 2, which connecting parts can at least partially be embedded in a settable mass after being coupled to one another. In this case, the first connecting part comprises a box section 10 and the second connecting part a retaining element 15 which extends at least partially freely in the box section 10 after coupling, which retaining element 15, after being fitted in the box section 10, can at least partially be embedded in a settable mass to be introduced into the box section 10.

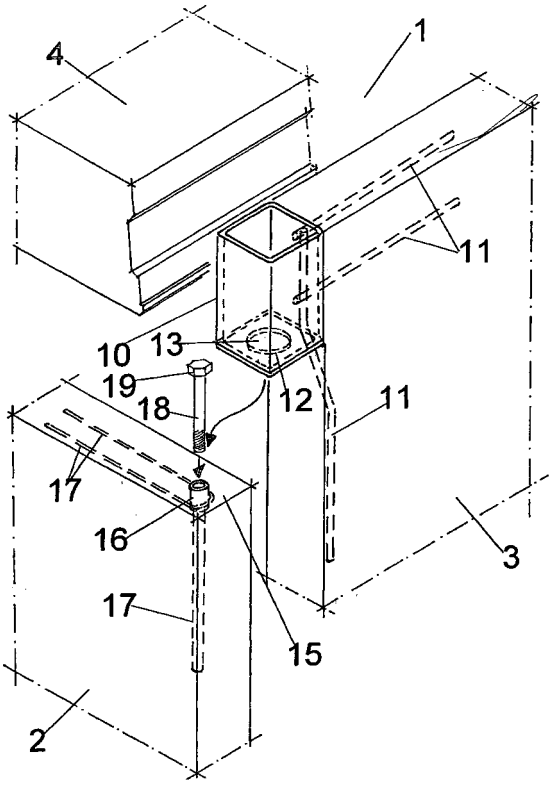

Fig.1

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Description

[0001] The invention relates to a wall assembly for use in building prefab buildings and/or houses with a connecting system for connecting prefabricated wall units thereof to one another. In this case, the stability of the building to be erected is substantially created by the connection between the prefabricated wall units thereof, in combination with a disc action of a floor which rests on the latter.

[0002] A number of variants are known for the connections between prefabricated wall units. These are also referred to as dowel connections. In a variant which is currently being used by the Applicant, the connections in this case comprise steel angle plates embedded during prefabrication with the aid of anchor pins in the wall units. Once the prefabricated wall units have been positioned on the building site, these steel angled plates border one another at right angles. Subsequently, the angled plates are connected to one another by securing a steel connecting plate thereto by welding. This connecting plate extends in a vertical plane in the transverse direction of the building. The connecting plate can be welded to the angled plates within certain limits. This creates adjustment possibilities for the prefabricated wall units during assembly of the building. Floorboards rest on the wall units. Then a temporary formwork is fitted in order to create a mould cavity for the mortar around the connecting plate. This mould cavity around the fixedly welded connecting plate is filled with sand cement mortar. The longitudinal joints between the floorboards are also filled with sand cement mortar. Following fitting, welding, embedding and setting, the dowel connection is finished and can transfer the horizontal and vertical forces onto the wall units.

[0003] This known connection has a drawback that the quality thereof is to a large degree dependent on the experience of the welder during assembly. In addition, realizing the connection takes a relatively long time, in particular if the spot where the connection is to be realized is not readily accessible from the side, or is situated at a great height. Having to use temporary formwork also requires additional material, operations and skills. If the connecting plate is located, for example, in a relatively high position, and, for example, boards have to be attached to the wall units as temporary formwork, fitting and removal thereof will in most cases require the use of ladders or scaffolding.

[0004] It is an object of the present invention to at least partially overcome the abovementioned drawbacks and/or to provide a usable alternative. In particular, it is an object of the invention to provide a weld-free connecting system which is of simple construction and which still offers sufficient adjustment possibilities during installation.

[0005] At least one of the objects is achieved by means of a wall assembly with a connecting system according to claim 1.

[0006] In this case, first and second connecting parts are provided which are connected to a first and second prefabricated wall unit, respectively. The first connecting part comprises a box section. The second connecting part comprises a retaining element which extends at least partially freely in the box section after coupling. The expression at least partially freely is understood to mean that the retaining element can extend into the box section with its free end without being enclosed by the wall sections in a tight-fitting manner. In particular, there is a tolerance between the peripheral walls of the box section and the retaining element of at least 12 mm. The section of the retaining element which extends into the box section after coupling can at least partially be embedded in a settable mass. This settable mass can be introduced into the box section in a simple manner before or after fitting the retaining element in the box section. After the settable mass has set, a strong coupling is achieved between the wall units. The fact that the retaining element is at least partially free in the box section during fitting advantageously provides sufficient adjustment possibilities during installation. Furthermore, it is advantageous that the box section not only forms part of the connecting means, but can also serve as a mould for the settable mass during assembly. Thus, the use of temporary formwork with all the drawbacks this entails is no longer necessary.

[0007] In a suitable embodiment, the box section and retaining element which engage with one another are able to give the connection a certain degree of stability, immediately after the initial fitting, that is to say before the settable mass is introduced or is set. Thus, it is advantageously possible to continue construction without having to wait for the settable mass to set. Once this has set, a very strong connection is achieved between the box section and the retaining element, and thus also between the wall units. In a suitable embodiment, the advantages of a wet and dry connection are thus combined: on the one hand, the speed of the dry initial connection and, on the other hand, the strength of the set and initially wet connection. Since a welded connection or another specialist connection technique is no longer required, the connection can be realized by anyone on the building site in a simple manner.

[0008] In a preferred embodiment, the box section comprises a flange which preferably extends inwards from the peripheral walls of the box section. The flange then delimits a hole through which the retaining element can extend after it has been fitted. Advantageously, the flange, together with the retaining element and the mass which has set around it within the box section, can absorb forces in the axial direction of the box section and transfer them from one wall unit to the other wall unit.

[0009] In a further preferred embodiment, the hole in the flange is at least 30 mm larger than the section of the retaining element which extends through it after fitting. This creates the freedom to adjust the prefabricated wall units with respect to one another during assembly.

[0010] In a particular embodiment, the section of the retaining element which extends into the box section comprises a thickened section, for example a head, collar or flange. This thickened section, together with the rest of the retaining element and the mass which has set around it after fitting inside the box section, can advantageously absorb forces in the axial direction of the box section and transfer them from one wall unit to the other wall unit.

[0011] The retaining element can take various forms. Preferably, the retaining element comprises a pin-shaped section, which has dimensions such that it can extend freely, that is to say with sufficient lateral tolerance, inside the box section after fitting.

[0012] Further preferred embodiments are defined in the subclaims.

[0013] The invention also relates to a method for realizing a connection between prefabricated wall units with the connecting system according to the invention in accordance with claim 26 and 27.

[0014] The invention will be explained in more detail below with reference to the attached drawings, in which:

Fig. 1 shows a diagrammatic perspective view of an embodiment of the wall assembly with the connecting system, with the parts separated;
Fig. 2 shows a view in accordance with Fig. 1 with the parts assembled;
Fig. 3 shows a cross-sectional view of Fig. 2 after the settable mass has been introduced;
Fig. 4 shows a diagrammatic perspective view of a variant embodiment with the parts separated;
Fig. 5 shows a diagrammatic perspective view of a further variant embodiment with the parts separated and a separate cladding unit strip;
Fig. 6 shows a view corresponding to Fig. 5 of a variant having a separate wall unit strip;
Fig. 7 shows a view corresponding to Fig. 5 of a variant having a separate wall unit strip and cladding unit strip;
Fig. 8 shows a view of an embodiment with another element for sealing the space in the box section;
Fig. 9 shows a diagrammatic perspective view of the embodiment from Fig. 8;
Fig. 10 shows a top view of an embodiment with a spacer;
Fig. 11 is a diagrammatic representation of a threaded body with a ring; and
Fig. 12 shows a perspective view of yet another embodiment.

[0015] In Figs. 1-3, the wall assembly is denoted overall by reference numeral 1. The wall assembly 1 comprises a prefabricated concrete wall unit 2, a prefabricated concrete cladding unit 3 and concrete floorboards 4 resting on the wall unit 2. The wall unit 2 and the cladding unit 3 have first and second connecting parts connected thereto for connecting the wall and cladding units 2, 3 to one another at an angle of 90 degrees.

[0016] The first connecting part comprises a box section 10 with a rectangular cross section. The box section 10 is connected to the cladding unit 3 by means of three anchor rods 11 embedded in the material of the prefabricated cladding unit 3. The box section 10 comprises a bottom flange 12 which has a hole 13. The centre axis of the box section 10 extends in the vertical direction and the dimensions of the box section 10 in the transverse direction are such that they substantially correspond to the thicknesses of the wall and cladding units 2, 3. The box section 10 is connected to the cladding unit 3 at an upper corner. Furthermore, the height of the box section 10 is smaller than the thickness of the floorboard 4. The box section 10 is preferably made of metal, in particular thermally galvanized steel, in order to prevent damage.

[0017] The second connecting part comprises a two-part retaining element 15. On the one hand, the retaining element 15 comprises a threaded bush 16 as receiving part which is connected to the wall unit 2 by means of anchor rods 17 which are embedded in the material of the prefabricated wall unit 2. In this case, the threaded bush 16 is flush-mounted in the material of the wall unit 2. In addition, the retaining element 15 comprises a threaded body 18 as insertion part which can be coupled to the receiving part. The threaded body 18 comprises a pin-shaped section which is provided at its free end with a thickened section 19. The threaded body 18 can advantageously be formed by a conventional commercially available threaded bolt. When the threaded body 18 is screwed into the threaded bush 16 (see Figs 2 and 3), the centre axis of the threaded body 18 extends substantially in the vertical direction.

[0018] The prefabricated wall and cladding units are substantially made of concrete, but may also be made from other materials, for example made from building bricks and/or comprise parts made of other materials, such as window frames and door frames. The wall units may be next to one another, so that the invention provides a substantially horizontal connection. The wall and cladding units are in particular at least 200 cm high and 300 cm wide, and may, depending on the wishes of the customer, be prefabricated in the factory, in which case the factory will also ensure that the respective connecting parts are attached to the respective wall and cladding units. In this case, the anchor rods 11 of the box section 10 as well as the threaded bush 16 and the associated anchor rods 17 are embedded into the wall and cladding units 2, 3 at the time of their production. Other connecting techniques for the box section and/or the retaining element to the respective wall and/or cladding unit are also possible. When the prefabricated wall and cladding units 2, 3 arrive on the building site after transportation, the cladding unit 3 with the hole 13 can be positioned above the threaded bush 16 in the wall unit 2 in a simple manner.

[0019] Because the hole 13 has been selected to be larger than the diameter of the threaded bush 16 or threaded body 18, respectively, and because the height

of the box section is at least 2 cm smaller than the thickness of the floorboard 4, there is a possibility in this case to arrange the wall and cladding units 2, 3 both in the horizontal and in the vertical direction with respect to one another. The floorboards 4 are laid on the wall unit 2.

[0020] Before, during or after the adjustment, the threaded body 18 can be screwed through the box section 10 into the threaded bush 16 from above. As can clearly be seen in Fig. 2, the threaded body 18 in this case extends freely into the box section 10.

[0021] As can be seen in Fig. 3, the space in the box section 10, as well as the longitudinal joint between the cladding unit 3 and the floorboard 4, are then filled with settable mass 25, which is formed in this case by a sand cement mortar. In order to prevent the settable mass 25 from flowing away in a downward direction, the underside of the box section 10 is provided with a sealing strip 26 which adjoins the upper side of the wall unit 2. When the settable mass 25 has set, the threaded body 18 is firmly connected to the box section 10. As the box section 10 is continuous in the peripheral direction and provided with the bottom flange 12, forces in the horizontal and vertical direction can be completely absorbed. The box section 10 in this case prevents the settable mass 25 from splitting due to the play of forces.

[0022] Fig. 4 shows a variant in which a box section 40 is connected to a wall unit 41. In this case, a space is left clear at the corner of the wall unit 41 for the box section 40. The box section 40 comprises a top flange 42 provided with a hole. An angle section 46 is connected to a wall unit 45. A pin-shaped retaining element 47 provided with a head is attached to the angle section 46. During assembly, the wall unit 45 can be lowered onto the wall unit 41 in such a manner that the retaining element 47 disappears into the box section 40 via the hole in the top flange 42. The box section 40 may in this case already be filled with a settable mass or may have to be filled subsequently with the settable mass. After setting, this variant also results in a strong connection between the wall units.

[0023] Fig. 5 shows a variant in which a strip 51 forms a side edge of a wall unit. This has been done here because a window opening which is close to the side edge is provided in the wall unit 50. The strip 51 is formed in this case by a tubular steel strip which is connected to the wall unit 50 by means of embedded anchor rods 51. A box section 52 is directly connected to the strip 51. This may be carried out, for example, by means of welding or a bolted connection. For the remainder, the connecting means and the way in which the connection is achieved may be identical to Figs 1-3.

[0024] Fig. 6 shows a variant of Fig. 5 in which, in this case, a wall unit 60 is provided with a strip 61 on a side edge, which strip 61 is connected to the wall unit 60 by means of embedded anchor rods. The strip 61 is again formed by a tubular steel strip. At the upper side of the strip 61, there is a pin-shaped retaining element 62 which is connected, for example by means of welding, to the strip 61. For the remainder, the connecting means and the way in which the connection is achieved may be identical to Figs 1-3.

[0025] Finally, Fig. 7 shows a variant in which both a wall unit 70 and a wall unit 71 are provided at their side edges with strips 72, 73, to which the box section and the retaining element, respectively, are directly connected. For the remainder, the connecting means and the way in which the connection is achieved may be identical to Figs 1-3 in this case as well.

[0026] Figs. 8 and 9 show a variant of the sealing strip 26. A tubular body 80 is placed in the hole 13 and extends through it. The tubular body rests on the upper side 81 of the wall unit 2 and is supported in the horizontal direction and held in position by the hole in the bottom flange 12, more particularly by the edge thereof. The tubular body 80 rests against the bottom flange 12 and thus forms a substantially tight seal. The tubular body may be made of plastic or any other suitable material. In this manner, it is possible to achieve a suitable sealing of the space in the box section in a very simple manner, so that the setting mass cannot flow out of the space. When the wall units have been positioned with respect to one another, the tubular body can be fitted in a simple manner by hand or by means of a suitable instrument. The sealing strip 26 can thus be omitted.

[0027] It is possible to lower the upper side 90 of the box section 10 with respect to the upper side 92 of the wall unit 3. This prevents the surface of the setting mass in the box section from coming into contact with a construction element which is situated above it.

[0028] Fig. 10 shows an embodiment in which the box section 10 is arranged at a distance 82 from the end wall 94 of the wall unit 3. To this end, a spacer 96 is provided. The spacer 96 extends over the height of the box section 10 and is attached on the end side 94 of the wall unit 3 and the side 97 of the box section 10 facing the wall unit 3. The spacer may, for example, be a plate-shaped steel element. The distance 82 creates a space 85 between the wall unit 2 and the wall unit 3 which makes an angular rotation of the wall unit 2 with respect to the wall unit 3 through an angle 84 possible. As a result, it is possible to create non-perpendicular orientations between the two wall units 2, 3 themselves. The space 85 may be filled with mortar when the wall assembly is being finished.

[0029] By selecting the distance 82 to be greater or smaller, the maximum selectable angular rotation 84 and the size of the space 85 may be varied.

[0030] Fig. 11 shows an embodiment in which a ring 86 is arranged near the thickening 19 of the threaded body 18 in order to improve the engagement with the setting mass further.

[0031] Fig. 12 shows an embodiment in which the threaded body 18 is screwed into the bottom flange 12. To this end, the hole 13 in the bottom flange 12 is dimensioned in such a manner that a screw connection can be achieved. The advantage of this embodiment is that, immediately when the threaded body 18 is fitted, a connec-

tion is achieved between the wall units 2 and 3 which is slightly rigid and is able to absorb some forces, so that the wall units 2 and 3 are prefixed with respect to one another. This increases the accuracy with which construction can take place, since less tolerance, or none at all, is possible between the wall units 2, 3. At the same time, the safety is increased, as the risk of a wall unit becoming detached and, for example, falling down, is reduced.

[0032] Many variants are possible in addition to the embodiments illustrated. Thus, the box section and the retaining element can be of different design, or be connected to the wall units at different locations. The box section may, for example, be of cylindrical design or be provided locally with small holes in order to achieve a better bond between the settable mass emerging from the holes and the other wall unit. If desired, a slot may be provided in the peripheral wall of the box section, which slot is slightly larger than the free end of the retaining element, so that the box section can be pushed laterally over the retaining element during assembly. The box section and the retaining element may also be attached to the wall unit in such a manner that the wall units can be coupled to one another at oblique angles, or even in line with one another. Furthermore, the box section and the retaining element may be attached to the wall units at different angles. Thus, their centre axes may, for example, extend in the horizontal direction. In order to be able to introduce the settable mass in a simple manner in this variant as well, an additional filling opening may be provided in the box section. The box section may also be designed as having a dimension in the transverse direction which is smaller than the thickness of the wall units to which it is attached. This has the advantage that a point load on the box section is prevented during transportation and storage, which would otherwise lead to damage of the box section, or bending, or crack formation in the wall unit. The wall units may form both supporting and non-supporting wall units, as well as internal or external walls.

[0033] In a suitable embodiment, the free surface of the settable mass is not directed towards a visible surface, i.e. a surface which is visible to a user after the building has been finished. Thus, no special finish of the free surface of the settable mass is required.

[0034] In a suitable embodiment, there are advantageously no floor elements associated with the connection, i.e. it is possible to construct independently of the type of floor. This increases the freedom of choice regarding the floor construction to be selected. In addition, in a suitable embodiment, there is no need for additional coupling pieces in order to connect the two wall units to one another, as the wall units are connected to one another directly.

[0035] Thus, according to the invention, a very user-friendly connecting system is obtained with which prefabricated wall units can be connected to one another on the building site in a quick, efficient and reliable manner. The wall assembly with connecting system is suitable both for the construction of a complete body, for example a dwelling, and for an extension to an already existing building.

Claims

1. Wall assembly for use in building prefab buildings and/or houses with a connecting system for connecting prefabricated wall units to one another on a building site, comprising:

    - at least two prefabricated wall units;
    - connecting means for coupling the prefabricated wall units to one another at a desired angle on the building site;

    in which the connecting means comprise a first connecting part connected to the one wall unit and a second connecting part connected to the other wall unit, which connecting parts can at least partially be embedded in a settable mass after being coupled to one another,
    characterized in that
    the first connecting part comprises a box section and the second connecting part a retaining element which extends at least partially freely in the box section after coupling, which retaining element, after being fitted in the box section, can at least partially be embedded in a settable mass to be introduced into the box section.

2. Wall assembly according to claim 1, in which the wall units are connected to one another, and in which the retaining element, after being fitted in the box section, is at least partially embedded in a set mass inside the box section.

3. Wall assembly according to claim 1 or 2, in which the box section comprises a flange which delimits a hole through which the retaining element extends after it has been fitted.

4. Wall assembly according to claim 3, in which the hole is larger than the section of the retaining element which extends through it after fitting.

5. Wall assembly according to one of the preceding claims, in which the free end of the retaining element comprises a thickened section.

6. Wall assembly according to one of the preceding claims, in which the free end of the retaining element comprises a pin-shaped section.

7. Wall assembly according to one of the preceding claims, in which the retaining element is made in two

parts and comprises a receiving part attached to the respective wall unit and an insertion part which can be coupled to the receiving part.

8. Wall assembly according to claim 7, in which the receiving part comprises a threaded bush and the insertion part comprises a complementary threaded body.

9. Wall assembly according to claim 8, in which the threaded body is a bolt.

10. Wall assembly according to one of the preceding claims, in which the box section is attached to the respective wall unit by means of one or more anchor rods which are embedded in the material of the respective wall unit during prefabrication of the respective wall unit.

11. Wall assembly according to one of the preceding claims, in which the retaining element is attached to the respective wall unit by means of one or more anchor rods which are embedded in the material of the respective wall unit during prefabrication of the respective wall unit.

12. Wall assembly according to one of the preceding claims, in which the dimensions of the box section in the transverse direction are such that they substantially correspond to the thicknesses of the wall units at the location of the connections to the box section.

13. Wall assembly according to one of the preceding claims, in which the dimension of the box section in the transverse direction is smaller than the thickness of the wall unit to which it is connected at the location of the connection to the box section.

14. Wall assembly according to one of the preceding claims, in which the centre axis of the box section extends substantially in the vertical direction.

15. Wall assembly according to one of the preceding claims, in which the centre axis of the retaining element extends substantially in the vertical direction.

16. Wall assembly according to one of the preceding claims, in which the retaining element is connected to a supporting wall unit, in particular a wall unit which is designed for resting one or more floorboards on after fitting.

17. Wall assembly according to one of the preceding claims, in which the box section is connected to the respective wall unit at an upper corner.

18. Wall assembly according to claim 16 and 17, in which the wall unit to which the box section is connected is designed to have such a height that, after fitting, said wall unit protrudes above the supporting wall unit on the upper side by the thickness of the floorboards, and in which the box section has a height which is smaller than the thickness of the floorboards.

19. Wall assembly according to one of the preceding claims, in which at least one of the wall units is provided on one side edge with a strip to which the box section and/or the retaining element is connected.

20. Wall assembly according to one of the preceding claims, in which the box section is made from metal, in particular thermally galvanized steel.

21. Wall assembly according to one of the preceding claims, in which the settable mass is a sand cement mortar.

22. Wall assembly according to one of the preceding claims, in which at least one of the prefabricated wall units is substantially made of concrete.

23. Wall assembly according to one of the preceding claims, in which the box section is continuous in the peripheral direction.

24. Wall assembly according to one of the preceding claims, in which at least one of the wall units is a non-supporting cladding unit, in particular a cladding unit on which no floorboards rest.

25. Wall assembly according to one of the preceding claims, in which the wall units are at least 200 cm high and 300 cm wide.

26. Wall assembly according to one of the preceding claims, furthermore comprising a substantially tubular body which is at least partially inside the box section and which rests on the wall unit located beneath it, for forming a substantially tight seal to prevent the setting mass from flowing out of the space in the box section.

27. Wall assembly according to one of the preceding claims, in which the box section is at a distance from the wall unit, in such a manner that a space is created which makes non-perpendicular orientation of the first wall unit with respect to the second wall unit possible.

28. Method for connecting to one another prefabricated wall units of a wall assembly for use in building prefab buildings and/or houses having a connecting system according to one of the preceding claims, comprising the following steps:

- positioning the prefabricated wall units with respect to one another, in which the box section and the retaining element engage with one another;
- filling the box section with the settable mass; and
- allowing the settable mass to set.

29. Method according to claim 28, in which the retaining element is made in two parts and comprises a receiving part attached to the respective prefabricated wall unit and an insertion part which can be coupled to the receiving part, furthermore comprising the following steps:

- positioning the prefabricated wall units with respect to one another, the box section being situated above the receiving part; and
- coupling the insertion part with the receiving part through the box section.

30. Wall unit, provided with the box section according to claim 1 and suitable for use in the wall assembly according to claim 1 and/or suitable for use with the method according to claim 28.

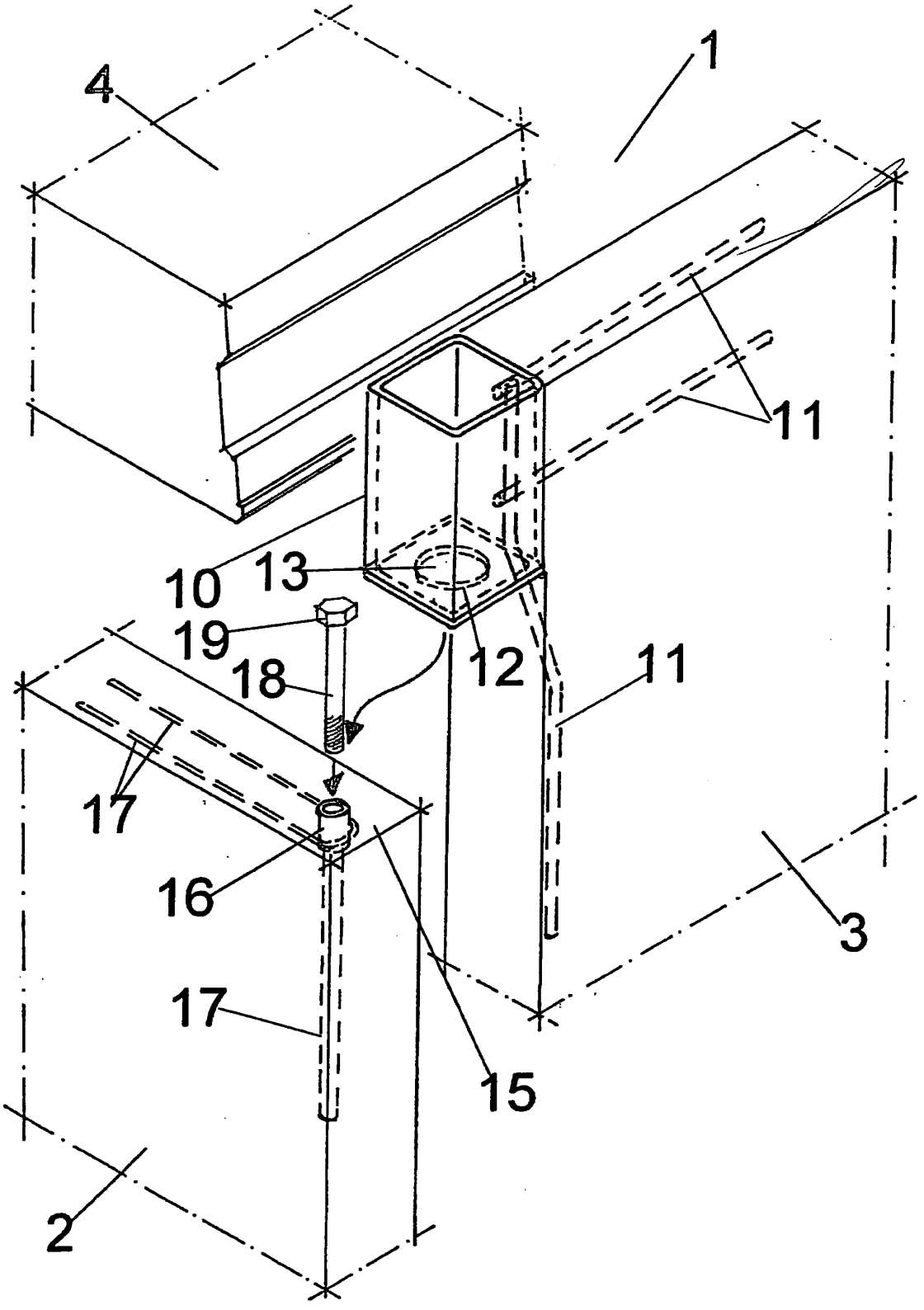

Fig.1

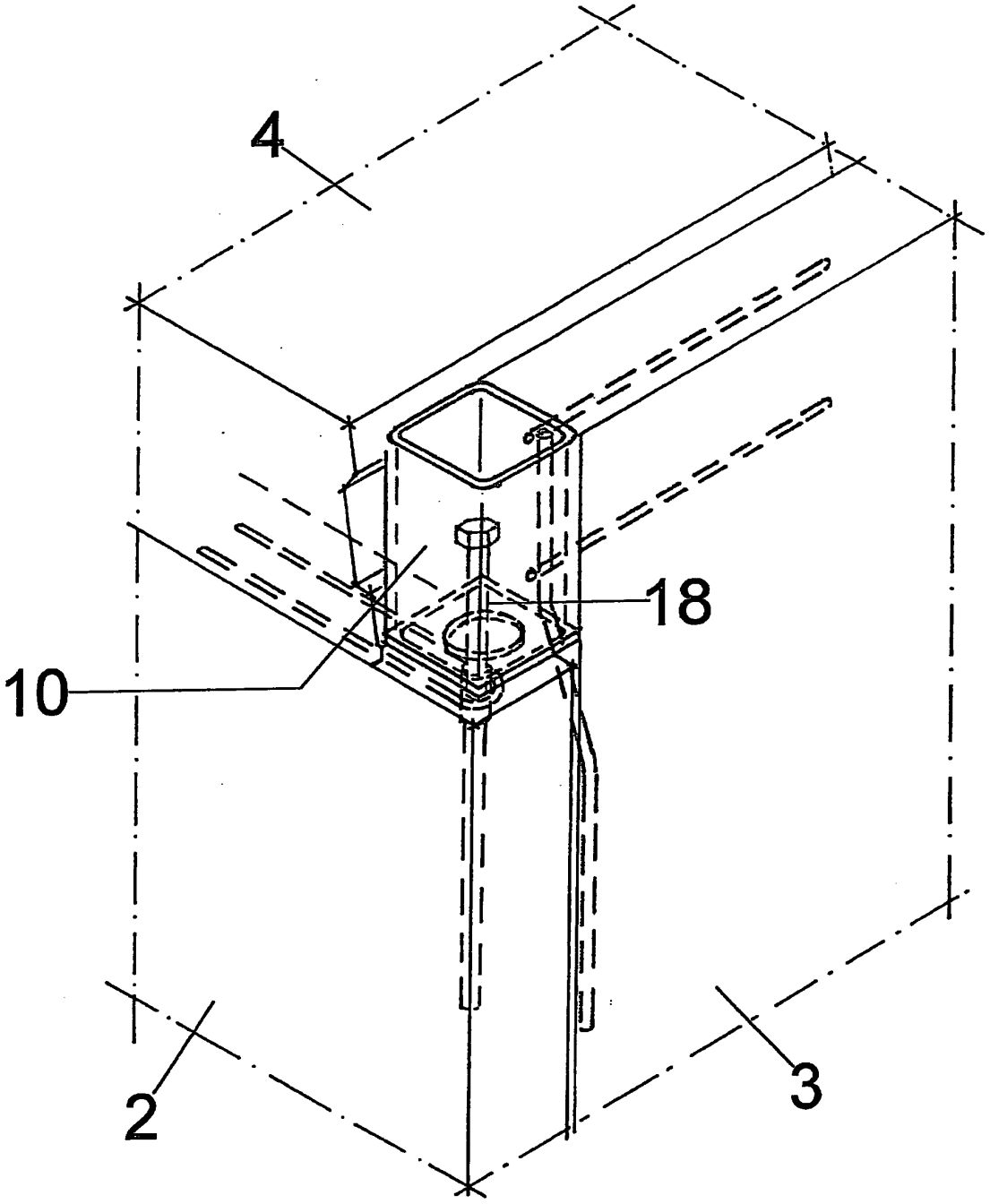

Fig.2

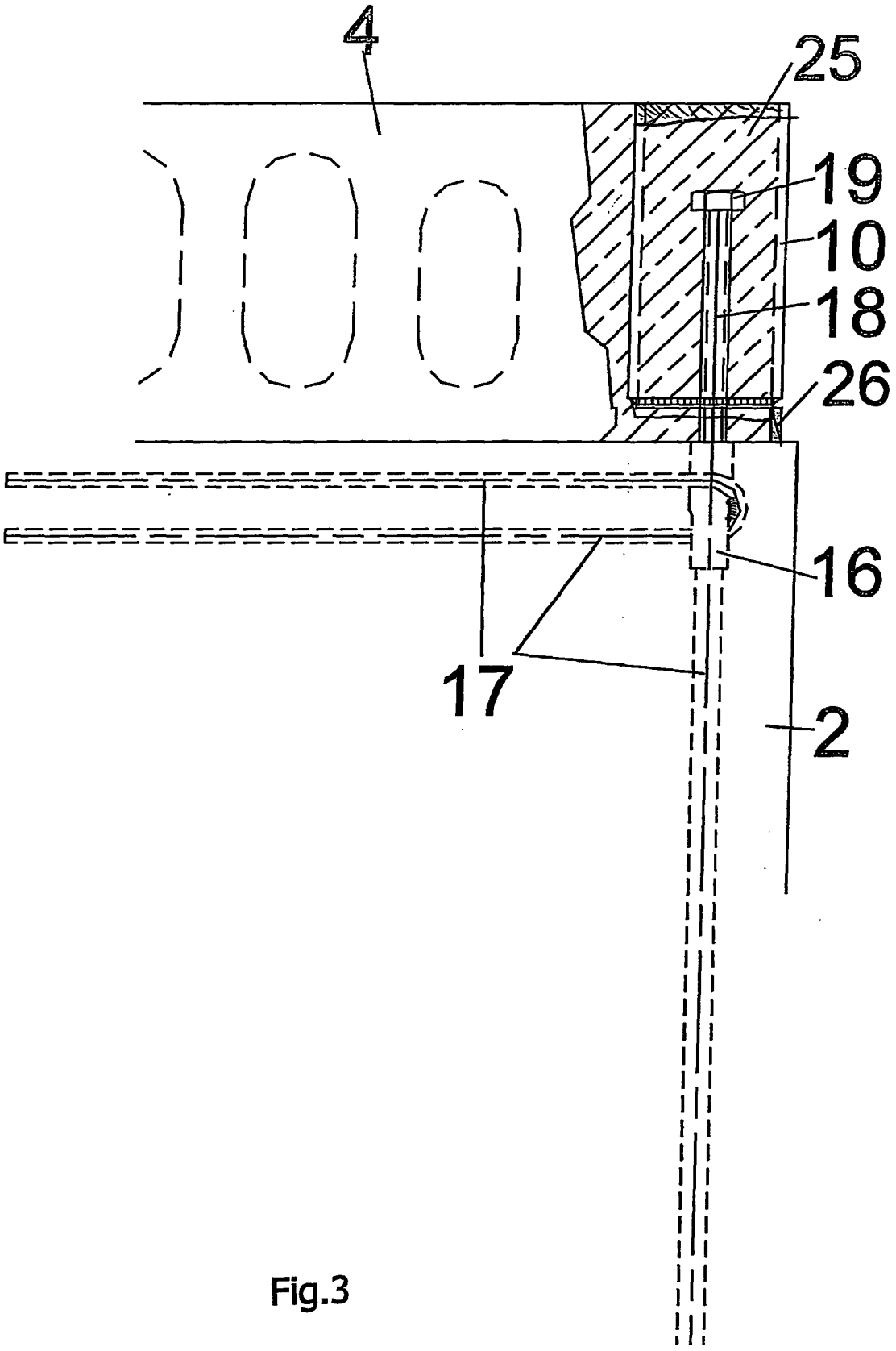

Fig.3

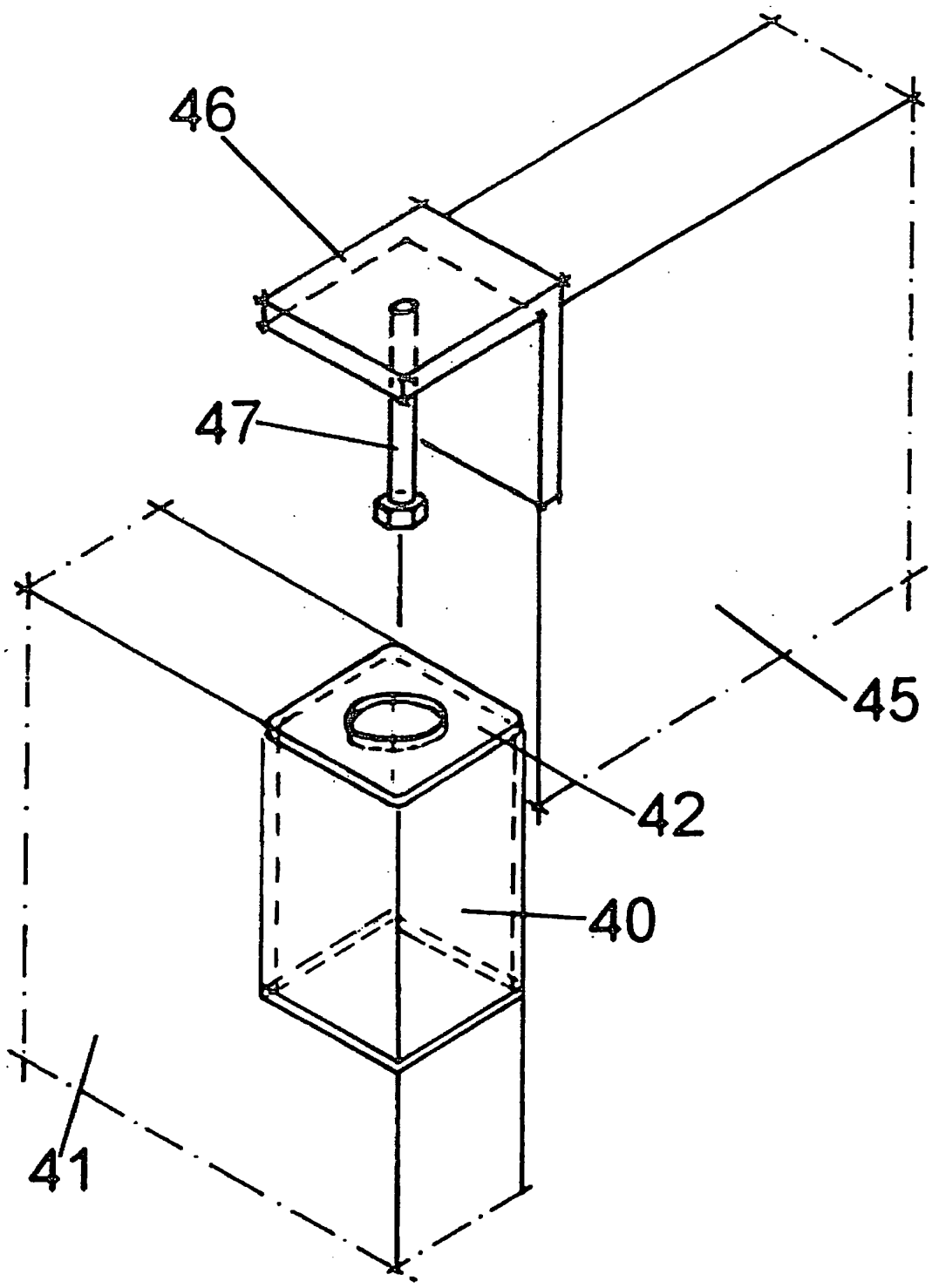

Fig.4

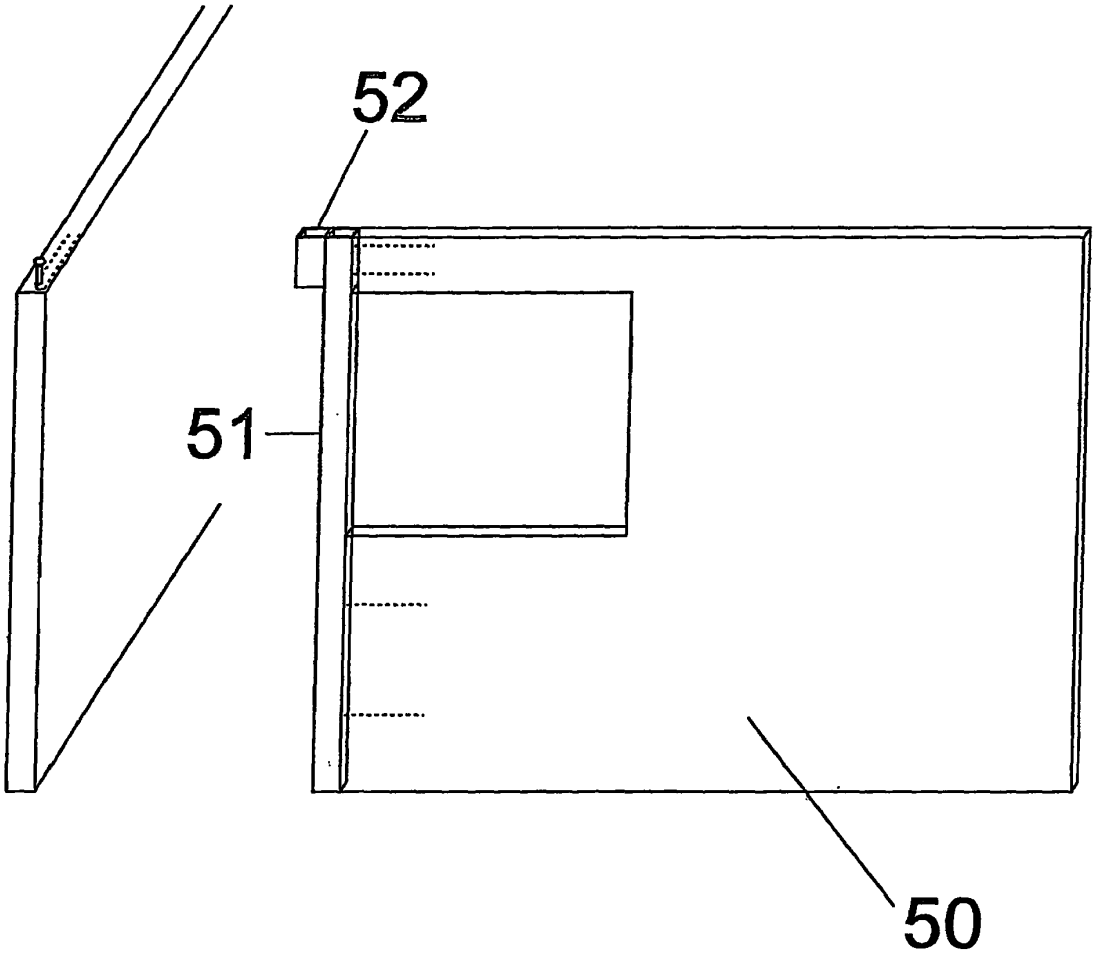

Fig.5

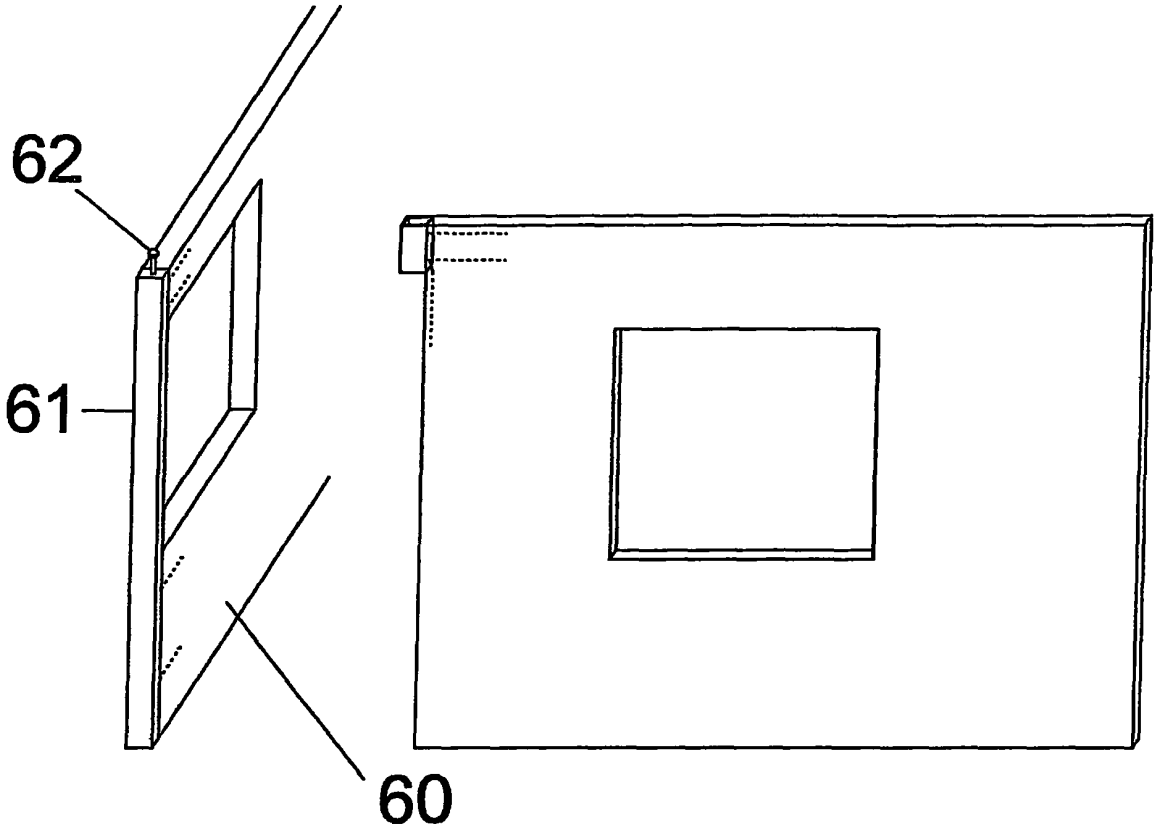

Fig.6

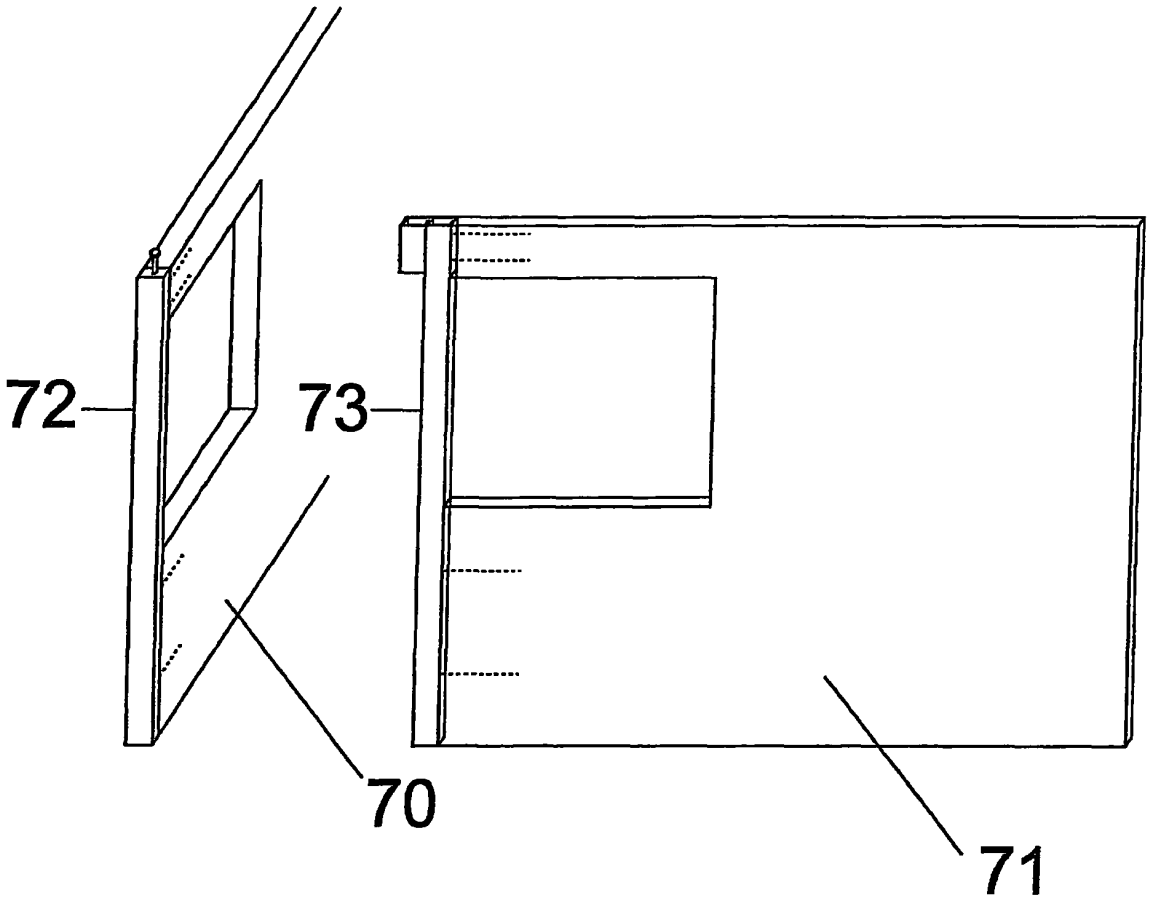

Fig.7

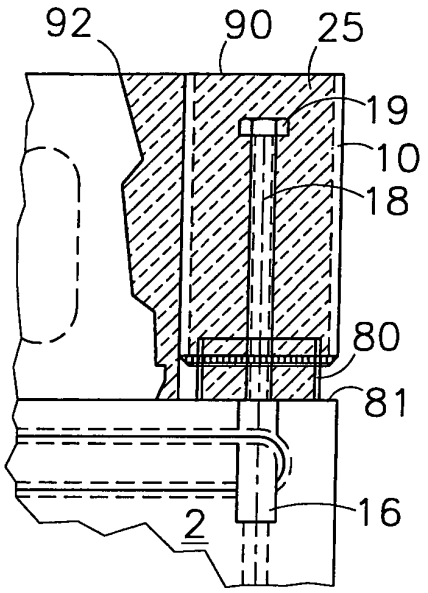

Fig 8

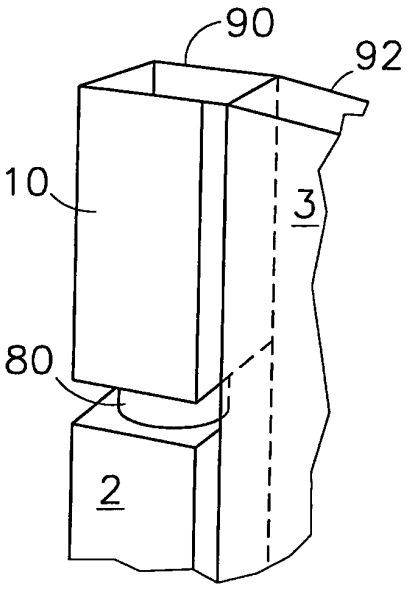

Fig 9

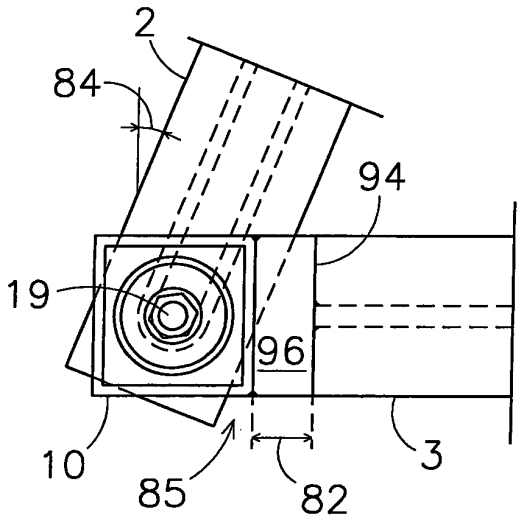

Fig 10

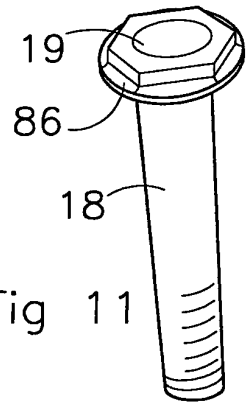

Fig 11

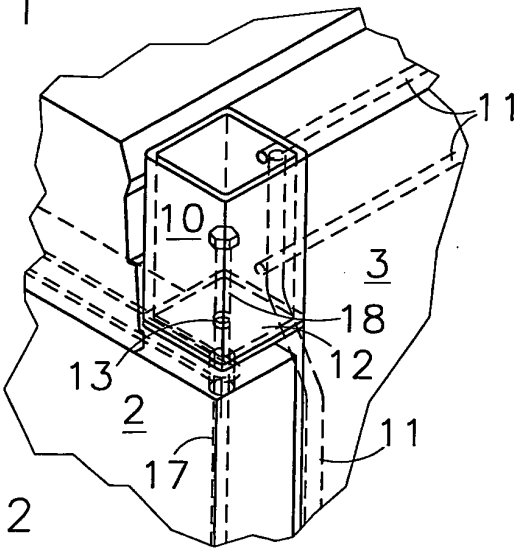

Fig 12