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(54) **Universal supporting construction**

Universale Stützkonstruktion

Construction de support universel

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CH-A- 654 871 **GB-A- 1 287 186**
NL-A- 8 702 969 **NL-A- 8 803 114**

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Description

The invention relates to a universal supporting construction, which comprises a wall-support and a building support co-acting therewith, said wall-support being designed at least at one end with a tubular section and being provided with one part of a pin and sleeve fitting assembly, which part is coupled to the wall support at a distance of its tubular section, while said building support being provided with a hook-shaped support, of which the hooked end is suitable for a close hooking-on in the tubular end section of the wall support, and further provided with the remaining part of said pin and sleeve fitting assembly, which remaining part is coupled to the outer wall of the building support at a distance of the hook-shaped support to obtain a close fitting between the pin and the sleeve parts. Universal supporting constructions of the kind set forth are frequently applied in the building activities of houses and of utility structures in order to support the building construction elements and the scaffold assemblies such as scaffolds and work platforms, liftstructures, suspension bridges and -ladders and other ladder-like types as well as possible.

A universal supporting construction of the above kind is disclosed in CH-A-654 871. However, in the universal supporting construction of said document the axis of the tubular part and the axis of the pin and sleeve fitting assembly are coaxial, so that the building support can pivot with respect to the wall support such as a hinge joint. The problem to be solved by the present invention relates to the prevention of rotational movement of the building construction element with respect to the wall support. According to the invention the prevention of rotational movement in the universal supporting construction of the above kind is obtained by coupling the one part of the fitting assembly to the wall support through a connecting rod. This connecting rod separates the axis of the tubular part from the axis of the pin and sleeve fitting assembly, avoiding thereby that said two axis are coaxial.

Such a universal supporting construction can be applied to a large number of building construction elements without any problem, and can be incorporated in several building construction elements, or can co-act with several building construction elements in order to create complete builders scaffold assemblies, and it can be employed in combination with a shoring construction for a new-erected wall. Several examples of such building construction elements are disclosed in NL-A-87.02969.

The invention will be further elucidated by the accompanying drawings, of which

figs. 1A-B show the elementary composition of the universal supporting construction and further the first application of such a supporting construction in combination with a shoring construction;
fig. 2 shows a first alternative embodiment of the one

of fig. 1A;
fig. 3 shows a second alternative embodiment of the one of fig. 1A;
figs. 4A-B show a first application of a universal supporting construction to a building construction element;
fig. 5 shows an accessory part for a building construction element;
fig. 6 shows an accessory-construction part for the combination of the building construction element depicted in figs. 4A-B and the accessory part depicted in fig. 5;
figs. 7 to 11 and figs. 15 and 16 show further applications of a universal supporting construction for building construction elements;
figs. 13, 14 and 17A-B show particular types of supporting elements;
figs. 12 and 19 show a supporting construction element; and fig. 18 shows a covering-construction element.

In fig. 1A a universal supporting construction is denoted by the reference numeral 1. These supporting construction 1 comprises two construction members co-acting with each other and connected with each other at a detachable way, namely a wall support 2 and a building construction element 3.

In this embodiment the wall support 2 contains a tubular member 4, which is adapted to be attached on a wall 5 or on a shoring section 6 or supporting element placed against a wall or between the floor and the ceiling at the inner wall side 5. For this purpose the tubular member 4 can be provided, for example, with passage openings for passing bolt-connecting means, by which the wall support is fixed whether on the wall 5 or on the shoring section or support element 6.

The wall support 4 is further provided with a pin-shaped receiving member 7, whose bottom part is located at a certain distance from the upper end 9 of the wall support 4 and connected with the wall support through a connecting part 8.

The building construction element 3 can, as will be explained hereinafter, be designed and constructed in many ways on behalf of many applications, but it has to contain anyway an upright supporting element 10 as a part, which must be connected with said wall support 2.

Therefore, the upper part of the supporting element 10 contains a hook-shaped support 11, whose hooked end part 12 has a tubular section in this embodiment, and preferably with such dimensions, that the hooked end part 12 can be hooked-on closely in said tubular end part 9 of the wall support 2. The hook-shaped support 11 can be connected with the supporting element 10 in a permanent or detachable manner.

Furthermore, the supporting element 10 is provided with a tubular sleeve part 14 connected with the outer wall of the supporting element 10 at a certain distance from the hook-shaped support 11 and at the same side

of element 10. The tubular sleeve part 14 is such designed and has such dimensions that a close fitting of the tubular sleeve part 14 around the pin-shaped receiving member 7 can be realised. The positioning of the hook-shaped support 11 and the tubular sleeve part 14 on the supporting element 10 on the one hand, and the positioning of the pin-shaped receiving member 7 with respect to the uppermost end 9 of the wall support 2 on the other hand have to be attuned to each other in such a way that the respective parts of the supporting element 10, namely the hook-shaped support 11 and the tubular sleeve part when hooking-on in the tubular upper end part 9, and around the pin-like receiving member 7, have as large a bearing plane as possible.

It is however not necessary to shape the element 4 with a tubular section; only the upper end 9 of element 4 has to possess a suitable internal shape for a close-fitting co-operation with the elbowed end 12 of the hook-shaped support 11. It is even possible to use a cylindrical section. When designing in such a manner passages must be made in the elbowed end 12 and in the tubular end part 9 at corresponding places to prevent rotational movement of the building construction element 3 with respect to the wall support 2, and pin-shaped elements have to be brought in the passages for locking the both parts.

The pin-shaped receiving member 7 and the sleeve part 14 can also be designed otherwise with respect to the co-acting surfaces.

As to the shape of supporting member 10 it can be said that the shape is defined generally by the choice of material together with the due shape of the building construction element 3.

Fig. 1B shows an embodiment of a shoring member 6 which is used for supporting and shoring new-built wall parts, especially when sand-lime blocks or cellular concrete blocks 85 are used.

Such a shoring structure has a masonry guide 86 which must be placed upright on the concrete floor 77 with the aid of bracing or shoring means 87.

The masonry guide 86 can be fixed by nails on the concrete floor 77 by using a wooden block partly inserted in the masonry guide 86 at its bottom side. It is however advantageous to use an adjustment footing or ground plate 88, which can be fixed on the concrete floor by nails or screws. Too the bracing means 87 can be attached to the concrete floor by means of a ground plate 89. The masonry guide 86 can be further provided with a connection plate welded thereon for a hingable coupling of the bracing means 87 on the masonry guide 86.

When a wall 5 has been erected with sand-lime blocks or cellular concrete blocks 85, the wall 5 has to be supported with the shoring structure described hereinbefore to prevent blowing down of the wall 5. For this purpose, the described masonry guide 86 is erected upright against the wall 5 with the aid of said bracing means 87, and the masonry guide 86 has to be provided with

a passage at a certain height, said passage being directed transversely to the wall. Although the passage can be shaped as a round hole, in practice a slotted passage 91 will be preferred. Moreover, the wall 5 must be provided with a passage opening 92 in a direct line with the passage 91.

With the aid of a connection structure 93, comprising a thread rod member e.g. a rod with the registered trade mark "DIWIDAG" 94 with a beam construction member 95, a tight fitting co-operation between the masonry guide 86 and the wall 5 can be obtained by passing the thread rod member 94 through the passage 91 and the passage opening 92. Therefore, the masonry guide 86 with bracing means 87, beam construction member 95 and connection structure 93 functions as a shoring structure for new walls to be erected.

This shoring structure gets an extremely suitable supplementary function if the beam construction member 95 is built as a wall support 2, and the shoring structure (86, 87) can also perform the function of supporting member structure on behalf of a builder construction member or building platform assembly to be fixed on the outer side of wall 5, said assembly being performed for example as a baluster, building scaffold member, etc., which will be explained hereinafter.

It is also possible to obtain a wider surface for fastening and supporting the wall support on the wall 5 by using an alternative embodiment of this wall support 2. In an embodiment the back side of the support 2 to be placed against the wall 5 it is enlarged by sideways-extending wing plates 15 which comprise passage holes for connecting the wall plate 2 against the wall by bolt- or screw connecting means.

As supporting elements 10 can form part of building construction elements, which are intended for use in various applications, and which have a great diversity of weight load, the distance between the hook-shaped support 11 and the sleeve part can vary considerably.

To realise that the wall support 2 can always be adjusted in the relative distance between the hook-shaped support 11 and the sleeve part 14 for such a diversity in applications and weight load, a very favourable embodiment of a wall support 2 is obtained by connecting the pin-shaped receiving member slidable over the front side of the wall support 2. An uttermost practical and very favourable embodiment of a wall support 2 is obtained by the construction shown in fig.2. In this figure the wall support 2 has a tubular shape (16), of which the two lateral faces (17) and the front face 18 are provided lengthwise with a pair of slotted profilations 96 located behind each other and with a steplike design. At the transition within each pair of co-operating slotted profilations 96 the tubular profile is further provided with a flange edge 19, so that the deepest slotted profilation 97 functions as a guide-rail with the features of a curtain rail. The head of a bolt 20 can be locked in this guide-rail and thus secured behind the two flange edges 19 so that a sliding-bolt connection can be realised.

Moreover, the wall support 2 of this embodiment is further provided at the front face with a tubular distance member 21, whose back face has such a width, that it has a tight fit in the wide slotted opening of the front face 18. In the upper part of the distance member 21 two passages are made in the front and the back face for passing the thread-shaped pin part of a bolt 20 to obtain a sliding-bolt connection. The pin-shaped receiving member 7 is fixed on the front face of the lower end of the distance member 21, for example by a welding connection. After the distance member 21 with the pin-shaped receiving member 7 and the bolt 20 is adjusted in height along the front face 18, the nut 99 is tightened on the bolt 20, so that the wall support 2 being adjustable in height is fixed at the required height.

In the embodiment shown in this figure the slotted tube 16 is not attached directly to the wall behind the tube, but through two hook-shaped sections 22. The both hook-shaped sections 22 are provided with a passage in the extending side or wing parts 13, so that a bolt connection can be realised between each of the lateral faces of tube 16 and an adjoining hook-shaped section 22.

The wing parts 23 of the hook-shaped sections 22 to be positioned against the wall 5, can be attached to it by screw connection structures.

If the supporting element 10 has a tubular shape with a pair of successive slotted openings 96 with a flange edge 19, as explained for the tubular member 16 of the wall support 2 in fig.2, then the sleeve part 14 can also be attached to the supporting element 10 with an adjustment in height by means of a sliding-bolt connection.

Too the hook-shaped support 11 can be connected to the tubular supporting element 10 with a height-adjustment by means of a sliding-bolt connection. It is not necessary to bring the sleeve part 14 in a remote position before the supporting element 10. It is also possible to incorporate this tubular part 14 in an extended portion of the lower part of the supporting element 10 such as shown in fig.3. However, the connecting part 8 has to be made longer in many cases.

Furthermore, it is possible to manufacture parts of this supporting construction, such as the sleeve part 14 and the pin-shaped receiving member 7, as separate elements, and thereafter to connect them to the respective building construction elements.

The supporting constructions explained with the aid of figures 1A-B, 2 and 3 are applicable to more building constructions elements 3. So the supporting element 10 of fig.4A forms the lower part of a baluster 24. The part of baluster 24 situated directly above its lower party, can be provided for example with a clamping element or bow element 25 for taking up a side board 26 to prevent the rolling or falling down of objects from the respective floor. Furthermore, a higher part of the baluster 24 can be provided with clamping elements or bow elements for taking up scaffold planks to protect the workpeople

from an unexpected fall from the floor 77. The baluster 24 can also be provided with hook members 28, 29, 30 and 31 having skipped striplike end parts as shown in fig.4B. The hook members 28 and 29 are suitable for taking up a board plank. As to hook members 30 and 31 the receiving openings 32 and 33 respectively, are turned away from each other, so that a ladderlike unit 34 can be suspended upon these hook members. The free strip end 35 of the lower hook member 30 is longer than that of the upper hook member 31. In order to suspend the ladderlike unit, first the post 36 of the ladderlike unit 34 is hooked in the receiving opening 32 of the lower hook member 30 and thereafter the other post of the ladderlike unit 34 is put over the upper hook member 31. Instead of hook members 30 and 31 clips can be fixed to the baluster 24, so that scaffold tubes, etc. can be locked in these clips.

It is evident that each type of supporting construction 1 as explained hereinbefore, can be applied to erect a baluster 24. To obtain a stronger fixation of hook-shaped support 11 on supporting element 10, it is advisable to connect the hook-shaped support 11 with supporting element 10 at two points by using a bridge unit 99 as shown in fig.4A. For activities on a slanting roof 37 a roof scaffold support 38 can be placed on the baluster 24 as shown in fig.5. This roof scaffold support 38 is composed of a supporting post 39, a frame leg 40 fixed perpendicular to the post 39, a roof support member 41 fixed to the end part of the frame leg 40, and positioned in parallel with the roof 37, and a frame leg support member 42, which forms an intermediate connection between the roof support member 41 and the frame leg 40. As the angles of inclination of roofs can have various values, is it advantageous to interconnect the beams 40, 41 and 42 adjustable and, if necessary, hingable. The connection of the supporting post 39 with the baluster 24 can occur in various ways. For example, a construction for telescoping of one part in the other part can be employed, after which these parts having a correct adjustment can be fixed to each other by a bolt connection. Further, the inner tube 43 of one of these parts can be provided with a (double) slotted structure 44 as shown in fig.6.

Such a slotted structure was already explained with the aid of fig.2. The head of a bolt 20 is locked in the slotted structure 44 with the flange edges 19. A slot 46 is made in the end part of the outer tube 47. When the inner tube 43 is shifted in the outer tube 47 so far as it is desired, and the bolt 20 rests on the bottom edge of the slot 46, a tight fit of the two tube members 43 and 47 can be obtained by turning a nut on the bolt 20.

It is further possible to use the universal supporting construction for the fastening of the roof scaffold support 38 (fig.5). For this application the baluster 24 can be provided with a tubular end part and a lower positioned pin-shaped receiving member 7. In this case the supporting post 39 is provided with a hook-shaped support 11 and a tubular sleeve part 14, which elements (11, 14) are

connected adjustable with the supporting post 39 (by using a slidable bolt connection). In this manner a universal supporting construction forms part of the connection of the roof scaffold support 38 with the baluster 24 and the roof 37.

The supporting element 10 of the universal supporting construction 1 can also form part of a so-called net safety construction as shown in fig.7. The wall plate 2 of this supporting construction is attached to the wall. Preferably, the supporting element 10 (with hook-shaped support 11 and tubular sleeve part 14) is provided with an extension piece at the lower end, while a wall prop 48 is positioned perpendicularly to the lower end of the support member. One end of this wall prop 48 is resting against the wall, while the other end of this prop has a turning point 106, by which the wall prop 48 is coupled rotatably with an arm member 49, being kept in position with the aid of a steel cable drawn between the free end of arm member 49 and the upper end of supporting element 10. If two safety net constructions made in such a manner, are placed at a distance from each other and against the wall 5, a net 141 can be hanged between the two constructions and attached, for example, to the free end of arm member 49 and the upper end of supporting element 10. In this way more safety is obtained for the work people as to falling from a flat or slanting roof.

The supporting element 10 of the universal supporting construction 1 can also form part of a walkway or scaffolding 50 as shown in fig.8A. Even in this case the wall support 2 is attached to the wall 5, and the supporting element 10 forms part of the bearing construction for a scaffolding 50. For this purpose the scaffolding 50 contains said supporting element 10, a girder 51 fixed squared to element 10, and a strut 52 extending in a slanted direction from the lower part of the supporting element 10 to the girder 51. One or more cross connection bars 53 between the strut 52 and the girder 51 are present for strengthening of the construction. At the junction of the lower part of the supporting element 10 and that of the strut 52, it is advisable to provide the construction with a wall prop 48 which functions as support for the strut 52 against wall 5. This wall prop 48 can be connected to the strut 52 not only hingable but also secured in a fixed position. When this wall prop 48 is provided with holes, the wall prop can be attached to the wall 5 with the aid of thread rod members (diwidag rods) and winged nuts in screw engagement with the sleeve. The hook-shaped support 11 can be connected to the girder 51 fixed or detachable. Preferably, the point of junction 54 formed by the girder 51 and the strut 52 can be manufactured in a complex manner for performing other functions, as shown in fig. 8B. This figure shows that to the junction of the parts 51 and 52 is further coupled a first tubular sleeve part 55 positioned upwards and at right angle to the girder 51, a second tubular sleeve part 56 extending along strut 52, and a third tubular sleeve part 57 connected with sleeve part 56 in a

declined direction and positioned in line with sleeve part 56. In the tubular sleeve part 55 a baluster 24 can be inserted to obtain the possibilities as explained with the aid of figures 4A-B and 5.

5 In the tubular sleeve part 56 a narrower tube member 58 (fig.8A) can be inserted, which gives the facility to suspend a safety net construction together with another building construction member having such a tube member 58 (or similar element such as arm member 49).

10 The tubular sleeve part 57 is intended to co-operate with a scaffolding pole for a greater load capacity. This scaffolding pole 59 can be connected with sleeve part 57 in many ways. A favourable embodiment of such a connection is obtained by providing this scaffolding pole at its upper end with a narrower element 60, which means, that this element is inserted tightly in the scaffolding pole 59 and extends partly out of the scaffolding pole 59. Therefore, the element 60 can be put in the sleeve part 57. A slidable clamp connection as explained with the aid of fig.6 can be applied in this case between the scaffolding pole 59 and the element 60 having a smaller cross section. Further the sleeve part 57 and the scaffolding pole 59 can be connected to each other with the aid of a so-called strap connection. Moreover, it is possible to lengthen the scaffolding pole 59 having a narrower element 60 for insertion in the sleeve part 57, at a lower height with a pole 61 having a narrower cross section and being equipped with a ground plate 62 placed on the ground. Even in this case the scaffolding pole 59 and the narrower element 60 can be connected to each other with the aid of a slidable clamp connection as explained hereinbefore by means of fig.6.

30 The girder 51 can be further provided with a sliding sledge 63 cooperating with the upper side of this girder 51 and slidable in horizontal direction. To said sliding sledge 63 a sleeve part 64 is mounted upwards for insertion of a baluster 24. In order to secure the sliding sledge 63 to the girder 51 at the right place, it is preferred to use a tubular beam with a slot structure, so that a slidable bolt connection with the sliding sledge 63 can be realised. The scaffolding 50 can be made as a collapsible structure when the elements 51, 10, 52 and 53 are connected to each other partly hingable and partly detachable.

45 When two scaffolding constructions of such a type are placed at a distance from each other against the wall 5, these constructions can be bridged-over by one or two walkway or scaffold planks.

50 If the girder 51 must have a high load capacity, or when the wall 5 is erected recently, it is advisable to place a masonry guide 86 against the inner side of the wall 5 at the height of the wall support 2 and the wall prop 48. Then the masonry guide 86 can be erected tightly between the floor and the ceiling with the aid of a screw spindle. Thereafter, the wall support 2 connected with the masonry guide 86 by using thread rods (diwidag rods) and winged nuts in screw engagement with

the sleeve, so that the masonry guide 86 can receive the load on the scaffolding 50 as well. As shown in fig. 9A it is not necessary to attach the wall support 2 to a wall 5, because the wall support 2 can also be attached to a supporting plate 65. The upper end of the supporting plate 65 is doubly bent as shown in fig. 9A, so that a hooking facility of a U-shaped hook member (142) of the supporting plate 65 over a rung of a ladder 68 is obtained. Moreover, two hooks 66 can be fastened to the supporting plate 65 at its upper side, so that these hooks can be hooked over a rung 67 of a ladder 68 placed upright as shown in fig. 9B. In this way the supporting plate 65 is borne by a number of rungs 67 of the ladder 68. For safety some clamp elements can be attached to the back side of the supporting plate 65 to co-operate with a lower positioned rung 67 and therefore to provide a better connection of the supporting plate 65 with the ladder 68. Furthermore, a building construction (for example a scaffolding construction 50) together with a supporting element 10 integrated in it or co-operating with it and performed according to the principle of a universal supporting construction can be connected with the wall support 2 of this supporting plate 65.

Moreover, the upper end of the ladder 68 is provided with a gutter head 69. A gutter head 69 comprises a pair of U-shaped section parts 70 positioned in parallel and held at a given distance to each other by means of rod- or bar-shaped members or tubular members (rungs), and connected separately with the respective upper ends of the ladder 68. The other ends of the U-shaped section parts 70 are bridged over by means of a wooden or synthetic beam member, so that the gutter head 69 can damage the roof gutter 72 as little as possible, when placing the beam member in the roof gutter.

Another possible application of a universal supporting construction refers to the use of a so-called front rider as shown in fig. 10. A front rider contains a tubular pole or beam 74, which is erected upright and whose bottom part is shored on the ground by means of a diagonal stay construction 75. The upper part of the beam 74 is attached to a floor 77 with the aid of a clamping connection 76. Furthermore, it is advantageous to secure the front rider 73 half-way to the wall or to a floor. The front rider 73 contains further a tube member 78, which surrounds closely a part of beam 74. Moreover, the lower part of the front rider 73 is provided with a hand winch 79, of which the winding rope 80 runs upwards within the beam 74, and goes via a guide wheel placed at the upper part of the beam 74 outside the beam 74 and further along its front side to the tube member 78 and hooked on it. In this way a height-adjustment of the tube member 78 is obtained. To the front side of the tube member 78 the wall support 2 is attached, so that a building construction element can be connected to this wall support by means of a supporting element 10 incorporated in this wall support. When two front riders 73 are positioned at a distance from each other and against the wall 5, and a scaffolding construction as shown in

fig. 8A is hooked on each of the front riders, a scaffolding 50 being adjustable in height with the aid of the winch action 79 can be obtained when the scaffold constructions are bridged over by scaffold planks.

In order to prevent, in case of breaking of the rope, that a work scaffolding falls down over a certain distance, a fall safety device must be available on each front rider 73 equipped with a scaffolding construction. When a passage is made in the tube member 78, and passages are made in the tubular beam 74 on positions corresponding with the passage of tube member 78 at various heights, and after the scaffolding 50 has been hoisted up so far that a certain passage in the tube member 78 and a passage in the beam 74 are in line with each other, a pinshaped lock element can be put through these passages. In this way this height-adjustable scaffolding is secured against accidents in case of breaking of a rope.

An alternative embodiment of this front rider 73 as shown in fig. 11 is obtained by positioning the front rider at such a distance from the wall 5, that there is sufficient space between this wall and the front rider for connecting a building construction element such as a scaffolding 50 with the tube member 78.

At its bottom part and if possible at higher levels the front rider 73 is attached to the wall 5 or floor 77 by means of a distance member, with which a protection by shoring is created.

The front rider 73 is coupled at its upper side to the roof 37 at the place of a roof girder or -joist 83 by means of a distance member 82.

Because of reasons of safety in the building it is desired to fit an effectively working net safety construction around this floor.

For this purpose, wall supports 2 are first attached to the outside of the outer walls at the outer edges of this floor. Thereafter building structure elements equipped with at least one supporting element 10 (and eventually a baluster element 24) can be connected with the wall supports 2 for obtaining universal supporting constructions. When a building structure element is only manufactured as a supporting element 10, the building structure element has to shaped as a tubular section, so that a baluster 24 having a slightly smaller tubular section can be inserted in the tubular section of the supporting element 10. When the supporting element 10 and the building structure element have a cross section of the same dimensions, then the baluster 24 can be joined to the supporting element 10 by using an intermediate member with a smaller cross section.

To a baluster 24 can also be connected a tubular section part 84, extending outwards in a slanting upward direction, and forming part of a safety net construction (141). The side boards 26 between the balusters 24 are positioned as low as possible, and the scaffold boards or fall protection ladders are attached at higher levels in order to place slogans on it.

The supporting element 10 can also be integrated

in the building construction element. Then such a building construction element can be formed as a baluster 24, a combined structure of a baluster 24 equipped with a net safety construction (141) or a scaffolding structure element 50 or a front rider 73 as shown in the preceding figures. It can occur that the outer wall is lacking at one or more places around the floor 77 as a result of a projected window-frame or anything like it. At such a place it is not possible to fix a supporting construction 1, because such a support construction for a wall support 2 requires a securing plane which is larger than the thickness of the floor 77.

However, a solution to attach a baluster 24 at such a place, can be obtained by using a baluster supporting element co-acting with a glue plate 100. A glue plate 100 known in the building, is an oblong plate-shaped element, which has preferably a circular opening 102 of a few centimetres in diameter in one part, and some nail holes 103 in the other part. Such a glue plate 100 is shown in fig. 12. The baluster supporting element 101 is a tubular section member 104 which contains at the bottom end a horizontal distance holder 105 equipped with a wall prop 48. Further the baluster supporting element 101 contains a hook-shaped member 107, which has, a little above the distance holder 105, a fixed connection with the tubular section member 104 or a sliding bolt connection performed in the tubular section 104 with the aid of a guide rail.

The hook-shaped member 107 has such dimensions that it can be tightly hooked in the opening 102.

In order to place the baluster supporting element 107 the hook-shaped member 107 is hooked in the opening 102, after which the baluster supporting element 101 is kept upright against the outer edge of the floor 77 and the glue plate 100 is laid down on the floor 77. In this position the glue plate 100 is fixedly attached to the floor 77, either directly by concrete nails through the nailholes of the glue plate, or by first boring holes in the floor at the place of the nail holes and then filling up these holes by nailable or screwable material. Thereafter, the glue plate 100 is secured to the floor 77 by nails, eventually by screws. The baluster supporting element 101 is then positioned in the right way.

When such a baluster supporting element 101 has a short length, it can be lengthened with a baluster 24 or a combination of a baluster 24 and a supporting arm 58 for a safety net construction (141). In this case the supporting arm 58 as a short tube member is welded in a sloping upward direction to the baluster 24. In this way balusters 24 in combination with supporting arms for a safety net construction or not can be positioned around the floor 77.

Moreover, the wall support 2 can be used for attaching a building construction element designed as end-closure safety means for walkways. Like it is shown in fig. 13, the building construction element designed as end-closure safety means 143 contains a horizontal tubular shaped supporting arm 144 whose end part is pro-

vided with a hook-shaped support 11 fixed perpendicularly thereto and designed with such dimensions that it has a tight fit in the upper end 9 of a wall support 2.

Furthermore, the supporting arm 144 is provided at the bottom side with a bow element 145 so that the end-closure safety means has a suitable effect also for lower levels on the walkway 50.

It is also possible that an outer wall is lacking on a place at which a baluster 24 has to be fixed to the outer edge of a floor 77. However, such a floor can be constructed with the aid of channel plates with oval channel openings 146. In such a situation an alternative embodiment of a baluster supporting element 101 can be applied as shown in fig. 14. Such a supporting element 101 contains a disk-like element 147, to which at one side a tube member 148 is welded perpendicularly to the disk-like element 147. In the upper side of this tube member a slotted hole 149 is made. On the other side of the disk-like element 147 a tube member 150 for a baluster 124 is attached upwards against the disk-like element 147, and if required, a tube member 151 extending in a sloping upward direction and fitted for an arm member for a safety net construction (141). Then the tube member 148 is inserted in a channel hole at the required place for the supporting means, after which a hole is bored in the floor towards the slotted hole 149. The tube member part 150 for the baluster support element 101 to be placed thereon is secured to the floor by a locking pin 152 put through the hole of the floor into the slotted hole 149 of the tube member 148.

The disk-like element 147 is further provided with screw holes 153 so that the element 147 can be fixed against the floor 77 by screws.

In order to support a universal supporting construction efficiently in case of a high load capacity, a building construction as shown in fig. 15 can be used. This figure shows that for a baluster supporting element 101 the supporting element 10 has a tube member 154, which is at least partly inserted in the lower part, and has a passage 155 for the insertion and securing of a scaffolding pole 59 supported on the ground. The supporting element 10 can be connected with the scaffolding pole 59 by a locking-pin, or is resting on a flange ring or plate fixed to the scaffolding pole at a given height. Such an inner tube 154 equipped with passage 155 can also be incorporated in the supporting element 10 of a building construction, such as a scaffolding 50. The supporting element 10 is then supported on the ground with the aid of a scaffolding pole. A scaffolding, on which an extremely large load will rest, can be better constructed for reasons of safety by using a rather extended supporting element 10 and a supporting arm 52 extended likewise. In order to obtain the construction part required for it against the wall 5, it is advantageous to place two wall supports 10 above each other and to connect these supports with each other, so that a wall support of the double length is obtained. The coupling of the two wall supports to each other can occur at different ways. For example,

an outer tube member can be used for shifting partly over the bottom part of the upper wall support and partly over the top part of the lower wall support, after which these elements can be connected with each other. At a similar way it is possible to use an inner tube for it. Furthermore, it is possible, when using supporting elements 10 of the type as shown in fig. 15, to let down the inner tube part 154 extending beneath the upper supporting element 10, into the upper end of the lower supporting element 10, and then to fix the two elements to each other by locking pins, or with the aid of a scaffolding pole 59 supported on the ground, said pole is running through the lower supporting element in the upper supporting element 10. Then the building construction element designed as scaffolding has preferably a hook-shaped support 11 and two tube member parts positioned at a certain distance from each other. The hook-shaped support 11 is acting together with the upper end of the upper wall support 2A, while the two tube member parts are co-acting with the pin-shaped receiving members 7A-B of the two wall supports 2A and 2B respectively. It is also possible as shown in fig. 16, to insert an intermediate support or distance tube member 155 between the two wall supports 2A and 2B to be placed above each other. In this case the distance tube member 155 can be either inserted partly into the two wall supports, or provided at the bottom end with an inner tube member 154 partly inserted in the lower part of the tube member 155 and partly extended downwards at a similar way as the wall supports 2A and 2B are designed. In such a way three supports 2A, 155 and 2B can be placed above each other. When a wall support 2 has to be secured to the edge of a floor 77, but exactly for and against a support column 156, problems arise as to the fastening of the wall support 2 to the support column, which can be solved as shown in fig. 17A-B.

In this case a pipe element 157 is welded horizontally to the front side of the wall support 2 just beneath its upper end, so that for example a diwidag rod 94 can be put through the pipe element. Moreover, two connecting members 158 are necessary for such a fastening, said members being designed as a short pipe-like member 159 with a hook-shaped member 160 fixed traverse on it as shown in fig. 17B. The pipe-like members 159 of the connecting members 158 are shifted over the two ends of the diwidag rod 94, after which winged nuts due to the diwidag rod, are turned on over the ends of the diwidag rod 94. Each of the hook-shaped members 160 of the two connecting members 158 is hooked on in a circular opening (102) of a glue plate 100, after which the glue plate is attached to the top side of the floor 77. If the pipe-like member 159 has an internal screw thread due to the diwidag rod 94, the pipe-like parts 159 of the connecting members 158 can be turned on over the diwidag rods, after which the hook-shaped members 160 of such a connecting member 158 can be attached to the top side of the floor 77 by using glue plates 100.

Instead of connecting members 158 to be secured with glue plates 100, it is also possible to use a coupling member 137 of two pipe-like members 138 and 139 welded to each other in a crossed position. Pipe-like member 138 is shifted over the diwidag rod 94A, running through the pipe-like member 157 at the front side of the wall support 2. A second diwidag rod 94B is put through the second pipe-like member 139 and closed by a winged nut at one end. The other end of the diwidag rod 94B is put in a pipe-like member welded to a ground plate attached on the floor, and then fixed in this position.

By using the means mentioned hereinbefore it is possible to place efficiently acting safety net constructions around the whole working floor and also around various building construction unities such as scaffoldings.

When scaffold boards on a scaffolding 50 have to be placed in line and level with each other, it is advisable to provide them at the ends with hook-on construction elements. Such a hook-on construction element can contain for example a strip-like end extending over the whole width of the scaffold board and is bent squarely inwards, that is to say, U-shaped. When the one hook-on construction element is at the upper side of the scaffold board and is bent downwardly, whilst the other hook-on construction element is at the bottom side of the respective scaffold board and is bent upwardly, these scaffold boards can be hooked in each other.

Instead of a bent strip-like end one of the two scaffold boards can also contain a rod or bar like element at one end, on which the hook-on construction element of the other scaffold board can be hooked.

When laying roof gutters and mounting lighting equipments in, for example, assembly halls, it is also advisable to use safety-net constructions. A possible realisation of it is obtained by providing the upper ends of four standards, e.g. support poles in the assembly hall with a pulley. To each of the four angular points of the rectangular net a rope is fixed, which is guided over the respective pulley, and to which a (counter-)weight is mounted.

When a person falls in the net, the net with the person goes downwards with a moderate velocity, while the counter weights are lifted upwards. In this way the fall of a person is slowed down sufficiently.

It happens frequently, that people falls down in a stair opening of a house under construction. To prevent this a safeguard construction has to be mounted over such a stair opening as shown in fig. 18. A possible safeguard construction can consist for example of a pair of tube members 121 being in parallel and kept at a certain distance from each other by the aid of cross members 122 fixed between the tube members 121. To the upper faces of the tube members, plates are attached to get a fixed plate covering 123 for a part of the plane between the tube members, while the rest of this plane is covered by an as turnable trap-door constructed metal sheet 124

which is connected hingable to the mentioned fixed plate covering 123. In order to prevent a displacement of the stair-opening safeguard construction during building activities, two hook-shaped elements 125 has to be attached to the bottom face of each tube member 121 in such a way that they extend in the stair opening. Preferably the two hook-shaped elements positioned under the fixed plate covering, can be attached adjustable to the respective tube member 121. It can be realised by using tube members with a guide rail facility, so that a hook-shaped element 125 can be secured at the right place by means of a slidable bolt connection..

Another connection of the wall support 2 to a wall 5 is obtained by making a passage 161 in the front and rear side of the wall support 2 at the same level. Through the two passages 161 in the wall support 2 a thread bar 94 equipped with a nut at the front side of the wall support 2 is inserted. Then at the rear side of the wall support 2 the thread bar 94 is passed through a passage made in the wall, after which another nut is turned on the thread bar.

When a wall support 2 has to be fastened against the edge of a floor 77, the following manner of fastening can be used, which is shown in fig.18.

To get means for fastening the wall support 2 to the floor 77 a base- or ground plate 162 is used, on which a guide member 163 for a thread rod is fixed parallel with the plate 162. The guide member for a thread rod 163 is formed by a pipe-like element, in which screw thread is made for the insertion of a thread bar 94. The base- or ground plate 162 is attached to the floor 77 at the same way as the glue plate 100 (see fig.12) is fixed to the floor. Then one end of the thread bar 94 is screwed into the guide member 163, after which the wall support 2 is shifted over the free end of guider member 163 and fastened by means of a nut.

Claims

1. Universal supporting construction, which comprises a wall-support (2) and a building support (3) co-acting therewith, said wall-support (2) being designed at least at one end with a tubular section (4) and being provided with one part of a pin and sleeve fitting assembly (7, 14), which part is coupled to the wall support (2) at a distance of its tubular section (4), while said building support (3) being provided with a hook-shaped support (11), of which the hooked end is suitable for a close hooking-on in the tubular end section (9) of the wall support (2), and further provided with the remaining part of said pin and sleeve fitting assembly (7, 14), which remaining part is coupled to the outer wall of the building support at a distance of the hook-shaped support (11) to obtain a close fitting between the pin (7) and the sleeve (14) parts, characterised in that the one part of the fitting assembly (7,14) is coupled to the wall

support (2) through a connecting rod (2).

2. Universal supporting construction as claimed in claim 1 characterised in that the sleeve (14) is positioned in line with the hook-shaped support (11) against the outer wall of the building support (3).
3. Universal supporting construction as claimed in claim 1 characterised in that the pin member (7) is connected with the supporting element by using a slidable bolt construction.
4. Universal supporting construction as claimed in claim 3 characterised in that the pin member (7) is connected with the supporting element with the aid of a distance member (8).
5. Universal supporting construction as claimed in claim 1 characterised in that the wall support (2) is provided with a tubular member (157) for passing a thread rod member (94), which member is connected with two glue plates (100) fitted to the working floor, with the aid of a coupling member (94, 158).
6. Universal supporting construction as claimed in claim 1 characterised in that the wall support (2) at one end is provided with a distance member fitted squarely to the tubular member, and with a hook-shaped member fitted to the outer side of the tubular member, and faced to the wall support.
7. Universal supporting construction as claimed in claim 1 characterised in that the wall support (2) comprises bolt connection means to cooperate with a wall shoring section.
8. Universal supporting construction as claimed in claim 1 characterised in that the hooked end of the hooked-shaped support (11) and the tubular end section (9) of the wall support (2) have a rectangular cross-section.
9. Building construction element characterised in that a universal supporting construction as claimed in claim 1 or 2 is integrated in said building construction element and is provided with a wall support (2) and a building support (3) co-acting therewith, said wall support (2) being designed at least at one end with a tubular section (9) and being provided with one part of a pin and sleeve fitting assembly (7, 14), which part is coupled to the wall support (2) at a distance of its tubular end section (9) through a connecting rod (8), while said building support (3) forming part of the building construction element and being provided with a hook-shaped support (11), of which the hooked end (12) is suitable for a close hooking-on in said tubular end section (9) of the wall support (2), and further provided with the

remaining part of said pin and sleeve fitting assembly (7, 14), which remaining part is coupled to the outer wall of the building support (3) at a distance of the hook-shaped support (11) to obtain a close fitting between the pin and the sleeve parts (7, 14).

- 5
10. Building construction element as claimed in claim 9 characterised in that the building construction element is constructed as a baluster (24).
11. Building construction element as claimed in claim 9 characterised in that the building construction element is constructed as a walkway construction element (50).
12. Building supporting construction as claimed in claim 9 characterised in that the building construction element is constructed as a fall safe guard construction, whereby the building construction element contains a swing arm (49) connected hingable to the supporting element (10) and whereby a fall safety net is hanged on the supporting element (10) and the swing arm (49).
13. Supporting plate (65) provided with hook-on members (142) for the fastening of the supporting plate (65) on a rung (67) of a ladder, said supporting plate (65) being provided with a universal supporting construction as claimed in claim 1.
14. Front rider (73), of which a girder (74) is surrounded over a given length by a tacklable tubular member (78) characterised in that said tubular member (78) is provided with a universal supporting construction as claimed in claim 1.

Patentansprüche

1. Universale Stützkonstruktion, welche eine Wand-Haltestütze (2) und ein damit zusammenarbeitendes Bau-Abstützelement (3) aufweist,
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- wobei die Wand-Haltestütze (2) zumindest an einem Endstück (4) rohrförmig ist dargestellt und mit einem Teil einer stift- und rohrförmigen Aufnahmevorrichtung (7, 14) versehen ist, welcher Teil auf einem Distanz des rohrförmigen Endstückes angebracht ist, und
 - wobei das Bau-Abstützelement (3) mit einer Hakenstütze (11) versehen ist, von der das hakenförmige Endstück (12) zu einem formschlüssigen Einhaken in genanntes rohrförmiges Endstück (9) der Wand-Haltestütze geeignet ist und weiter mit dem übrigen Teil der stift- und rohrförmigen Aufnahmevorrichtung (7, 14) versehen ist, welcher Teil auf einem gewissen Distanz von der Hakenstütze an die Aussensei-
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- 55

te des Bau-Abstützelementes angebracht ist zwecks einer formschlüssigen Aufnahme des stiftförmigen Teiles (7) in das rohrförmige Teil (14)

dadurch gekennzeichnet dass der eine Teil der Aufnahmevorrichtung (7, 14) an der Wand-Haltestütze über einer Verbindungsstange (2) gekuppelt ist.

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2. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass der rohrförmige Teil (14) in Linie mit der Hakenstütze (11) an der Aussenseite des Bau-Abstützelementes (3) angebracht ist.

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3. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass das stiftförmige Element (7) unter Verwendung einer Schlitzbolz-Konstruktion mit dem Abstützelement (3) verbunden ist.

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4. Universale Stützkonstruktion nach Anspruch 3 dadurch gekennzeichnet dass das stiftförmige Element unter Benutzung eines Distanzhalters (8) mit dem Abstützelement (3) verbunden ist.

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5. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass die Wand-Haltestütze (2) ein Rohrteil (157) aufweist zwecks einer Durchführung eines Gewindestangeorgans (94), welches Organ an den zwei Endstücken unter Verwendung eines Kopplungsorgans (94, 158) an zwei Leimplatten (100) verbunden ist, welche Leimplatten an dem Bauflur gekoppelt sind.

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6. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass die Wand-Haltestütze (2) an einem Endstück mit einem Distanzhalter versehen ist, der formschlüssig an dem rohrförmigen Element gekuppelt ist, und weiter mit einer Hakenstütze (11) versehen ist, die an die Aussenseite des rohrförmigen Elements befestigt ist, und zu der Haltestütze (2) gekehrt ist.

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7. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass die Wand-Haltestütze (2) Bolzverbindungsmiteln aufweist zwecks einer Zusammenarbeit mit einer Wandstrebesektion.

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8. Universale Stützkonstruktion nach Anspruch 1 dadurch gekennzeichnet dass der hakenförmige Endstück (12) der Hakenstütze (11) und der rohrförmige Endstück (9) der Wand-Haltestütze (9) einen rechteckigen Querschnitt aufweisen.

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9. Bau-Konstruktionselement dadurch gekennzeichnet dass eine universale Stützkonstruktion nach Anspruch 1 oder 2 in genanntem Bau-Konstruktionselement integriert ist und mit einer Wand-Haltestütze

(2) und einem damit zusammenarbeitenden Bau-Abstützelement (3) versehen ist,

- wobei die Wand-Haltestütze (2) zumindest an einem Endstück (4) rohrförmig ist dargestellt und mit einem Teil einer stift- und rohrförmigen Aufnahmevorrichtung (7, 14) versehen ist, welcher Teil unter Verwendung eines Brückteils auf einem Distanz des rohrförmigen Endstückes an die Wand-Haltestütze angebracht ist, und
- wobei das Bau-Abstützelement (3) ein Teil des Bau-Konstruktionselementes ist und mit einer Hakenstütze (11) versehen ist, von der das hakenförmiges Endstück (12) zu einem formschlüssigen Einhaken in genanntes rohrförmiges Endstück (9) der Wand-Haltestütze geeignet ist und weiter mit dem übrigen Teil der stift- und rohrförmigen Aufnahmevorrichtung (7, 14) versehen ist, welcher Teil auf einem gewissen Distanz von der Hakenstütze (11) an die Aussenseite des Bau-Abstützelementes angebracht ist zwecks einer formschlüssigen Aufnahme des stiftförmigen Teiles (7) in das rohrförmige Teil (14).

10. Bau-Konstruktionselement nach Anspruch 9 dadurch gekennzeichnet dass das Bau-Konstruktionselement als ein Baluster (24) ist dargestellt.

11. Bau-Konstruktionselement nach Anspruch 9 dadurch gekennzeichnet dass das Bau-Konstruktionselement als ein Laufgerüst-Konstruktionselement (50) ist dargestellt.

12. Bau-Abstützkonstruktion nach Anspruch 9 dadurch gekennzeichnet dass das Bau-Konstruktionselement als eine Schütznetz-Konstruktion ist dargestellt, wobei das Bau-Konstruktionselement einen an dem Abstützelement gelenkbar eingehangen Dreharm (49) enthält, und wobei das Schütznetz an das Abstützelement (10) und den Dreharm ist angeheftet.

13. Stützplatte (65) versehen mit Anheftorganen (142) zur Befestigung der Stützplatte (65) an einer Sprosse (67) einer Leiter, welche Stützplatte (65) mit einer universaler Stützkonstruktion nach Anspruch 1 versehen ist.

14. Fassaderitter (73), wobei eine Stütze über einem gewissen Länge mit einem takelbar ausgeführten rohrförmigen Profilteil (78) umgeben ist dadurch gekennzeichnet dass genannter Profilteil (78) mit einer universalen Abstützkonstruktion nach Anspruch 1 versehen ist.

Revendications

1. Construction de support universel, qui comprend un support mural (2) et un élément-support de construction (3) travaillant en conjugaison, où le support mural (2) comporte au moins à l'une de ses extrémités (4) une section tubulaire et est pourvu d'une partie d'un dispositif d'assemblage à goujon et manchon (7, 14), laquelle se fixe au support mural (2) à distance de la section tubulaire (4), et où l'élément-support de construction (3) est équipé, d'une part, d'un support en équerre (11) dont la partie coudée (12) peut s'adapter exactement dans l'extrémité tubulaire (9) du support mural (2), et, d'autre part, de l'autre partie du dispositif d'assemblage à goujon et manchon (7, 14), laquelle s'accouple à la paroi extérieure de l'élément-support de construction (3) à distance du support en équerre (11) de telle sorte que le goujon (7) s'adapte exactement dans le manchon (14), avec pour caractéristique que l'une des parties du dispositif d'assemblage (7, 14) est accouplé au support mural (2) par l'intermédiaire d'une tige de liaison.
2. Construction de support universel selon la revendication 1 caractérisée en ce que le manchon (14) se positionne contre la paroi extérieure de l'élément-support de construction (3) dans l'alignement du support en équerre (11).
3. Construction de support universel selon la revendication 1 caractérisée en ce que le goujon (7) est fixé à l'élément-support au moyen d'un système de barre coulissante.
4. Construction de support universel selon la revendication 1 caractérisée en ce que le goujon (7) est fixé à l'élément-support au moyen d'une entretoise (8).
5. Construction de support universel selon la revendication 1 caractérisée en ce que le support mural (2) est pourvu d'un élément tubulaire (157) destiné au passage d'une tige filetée (94), laquelle est reliée, à ses deux extrémités, par l'intermédiaire d'éléments de liaison, à deux plaques adhésives (100) fixées au plancher de travail.
6. Construction de support universel selon la revendication 1 caractérisée en ce que le support mural (2) est pourvu à l'une de ses extrémités d'une entretoise qui s'adapte exactement dans l'élément tubulaire, et à l'autre d'un support en équerre (11) qui est fixé à l'extérieur d'élément tubulaire et fait face au support mural (2).
7. Construction de support universel selon la revendication 1 caractérisée en ce que le support mural (2) comporte des dispositifs de fixation boulonnés pour

l'association à un étai mural.

- 8.** Construction de support universel selon la revendication 1 caractérisée en ce que la partie coudée du support en équerre (11) et l'extrémité tubulaire (9) du support mural (2) sont de section rectangulaire. 5
- 9.** Élément de construction caractérisé en ce qu'une construction de support universel selon la revendication 1 ou 2 est intégrée audit élément de construction et est pourvue d'un support mural (2) et d'un élément-support de construction (3) travaillant en conjugaison, 10
- où le support mural (2) comporte au moins à l'une de ses extrémités (4) une section tubulaire (9) et est pourvu d'une partie d'un dispositif d'assemblage à goujon et manchon (7, 14), laquelle se fixe au support mural (2) à distance de la section tubulaire (4), et 15 20
 - où l'élément-support de construction (3) fait partie de l'élément de construction et est équipé, d'une part, d'un support en équerre (11) dont la partie coudée (12) peut s'adapter exactement dans l'extrémité tubulaire (9) du support mural (2), et, d'autre part, de l'autre partie du dispositif d'assemblage à goujon et manchon (7, 14), laquelle s'accouple à la paroi extérieure de l'élément-support de construction (3) à distance du support en équerre (11) de telle sorte que le goujon (7) s'adapte exactement dans le manchon (14). 25 30
- 10.** Élément de construction selon la revendication 9 caractérisé en ce que l'élément de construction est construit comme un ballustre (24). 35
- 11.** Élément de construction selon la revendication 9 caractérisé en ce que ledit élément est construit comme un élément construction de passerelle (50). 40
- 12.** Système de support de construction selon la revendication (9) caractérisé en ce que ledit système est construit comme une rambarde de sécurité, où le système de support de construction comporte un bras pivotant (49) qui s'articule sur le support (10) et où un filet de sécurité est accroché au support (10) et au bras pivotant (49). 45
- 13.** Plaque d'appui (65) pourvue d'éléments d'accrochage (142) pour la fixation de ladite plaque d'appui (65) à un barreau (67) d'échelle, laquelle plaque d'appui est équipée d'une construction de support universel selon la revendication 1. 50 55
- 14.** Cavalier de façade (73), dont une poutre (74) est entourée sur une certaine longueur d'une section en profilé tubulaire pour accrochage (78) caracté-

sé en ce que ledit élément tubulaire (78) est pourvue d'une construction de support universel selon la revendication 1.

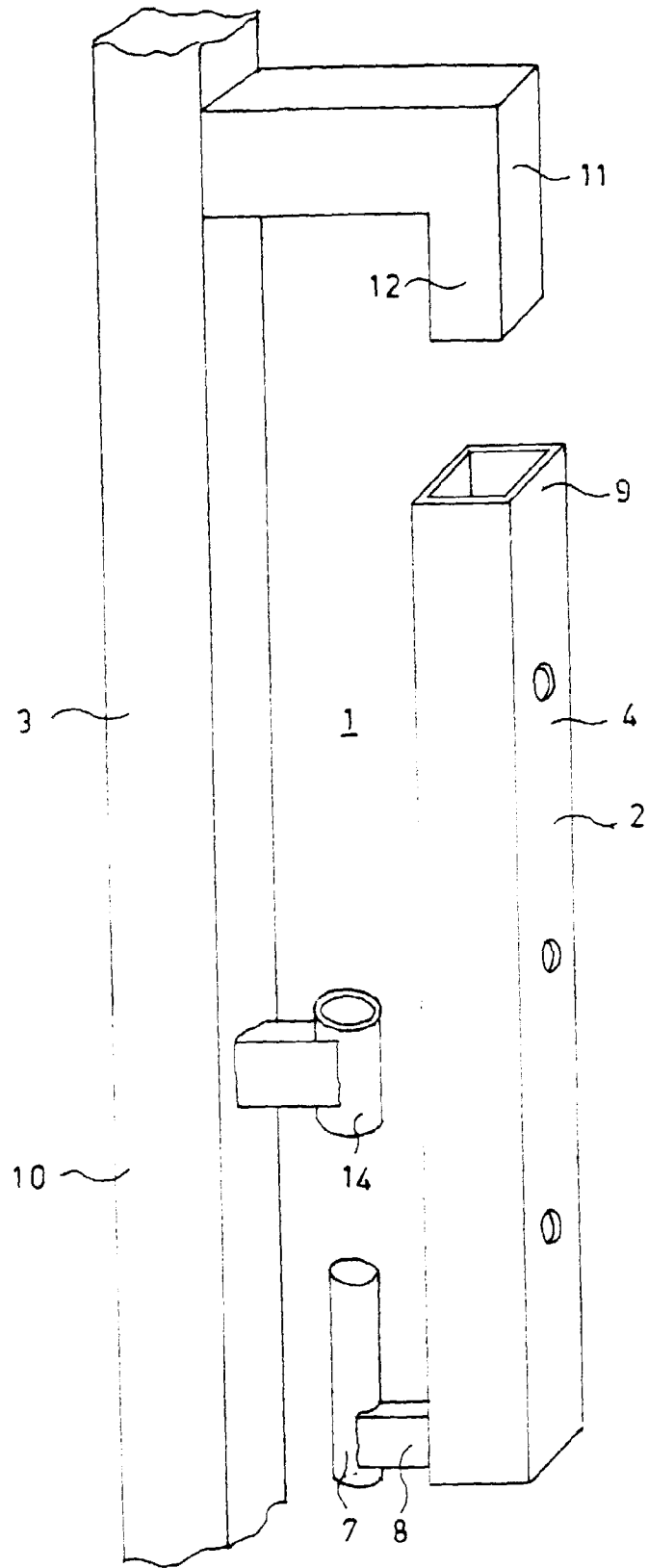


Fig. 1A

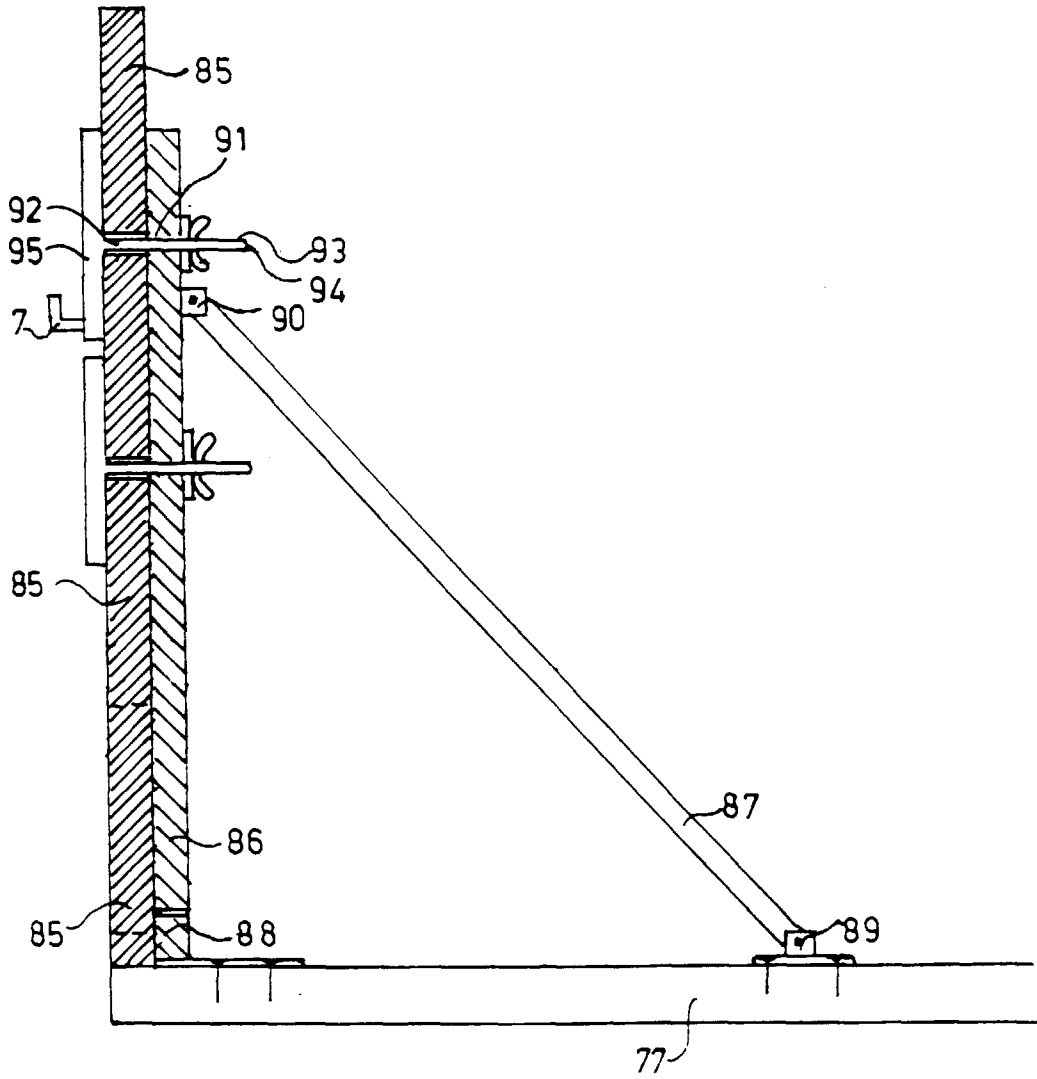


Fig. 1B

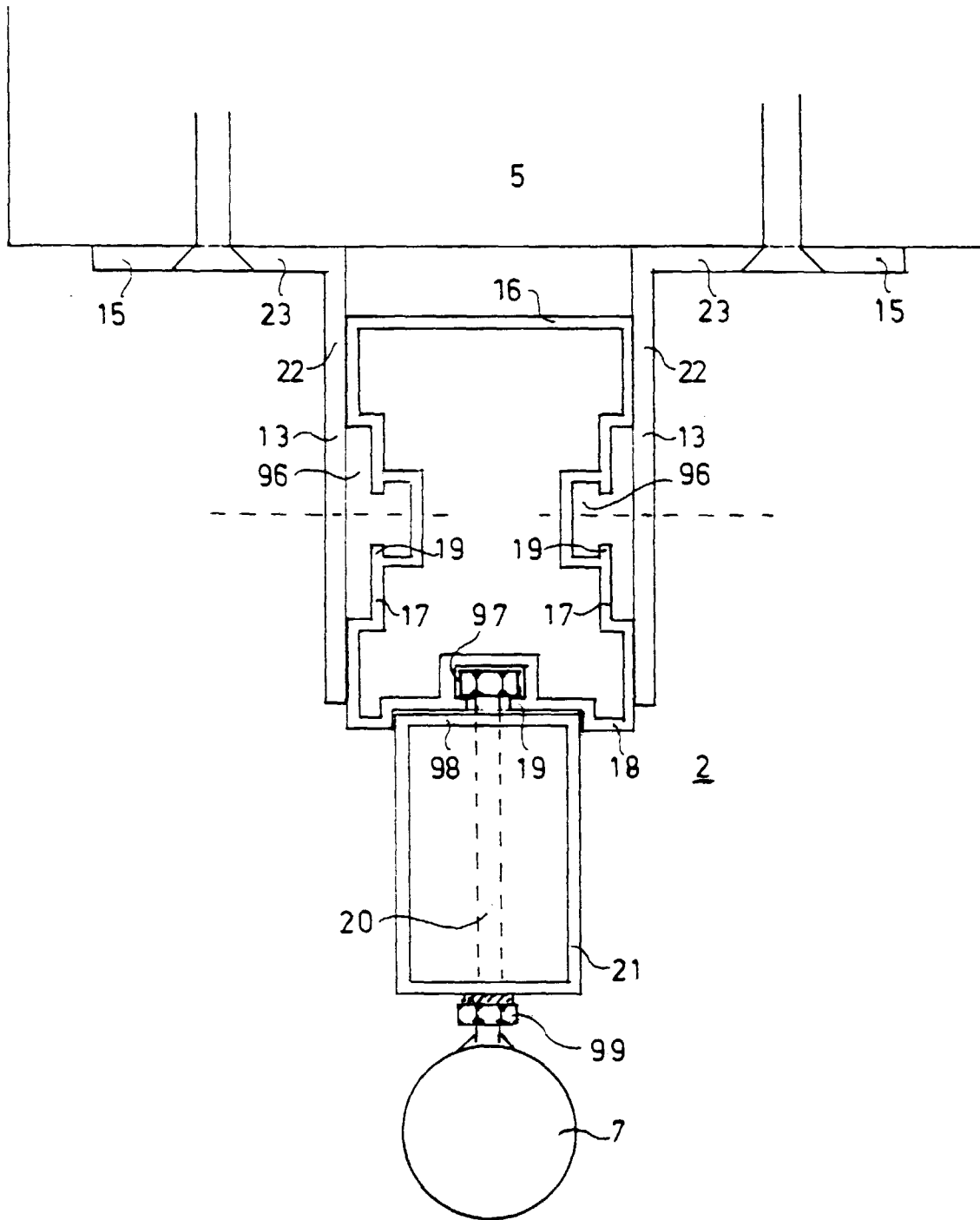


Fig. 2

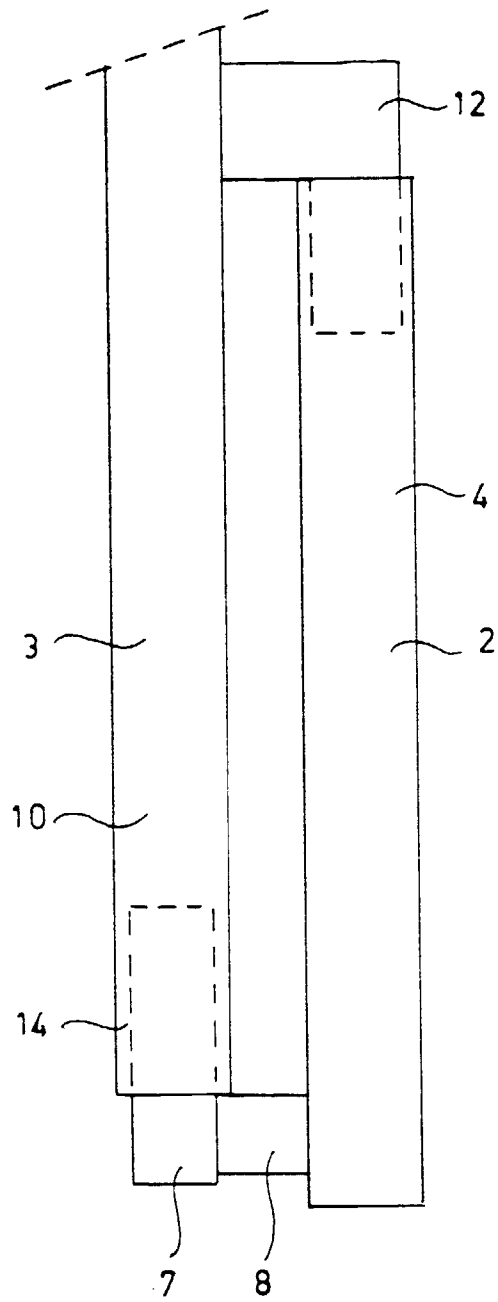


Fig. 3

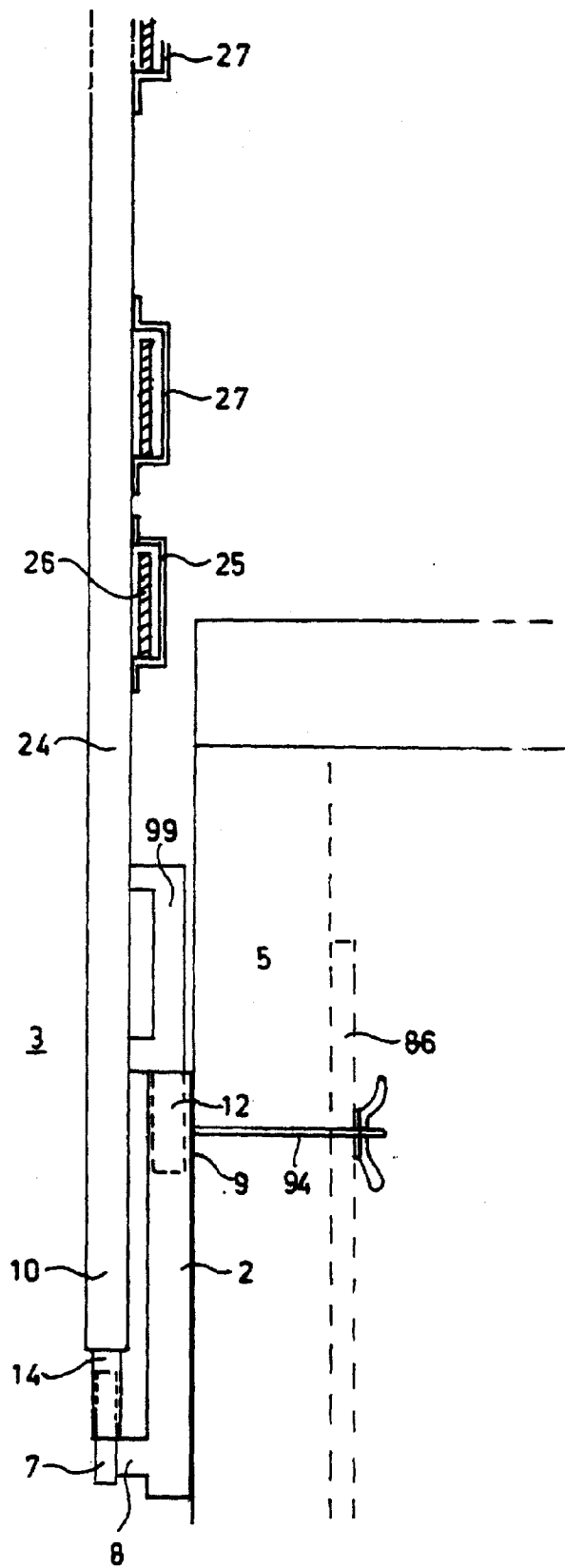


Fig. 4A

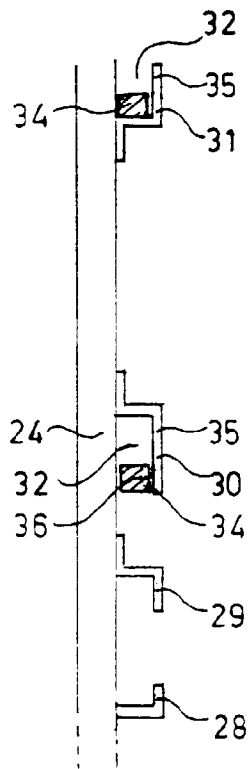


Fig. 4B

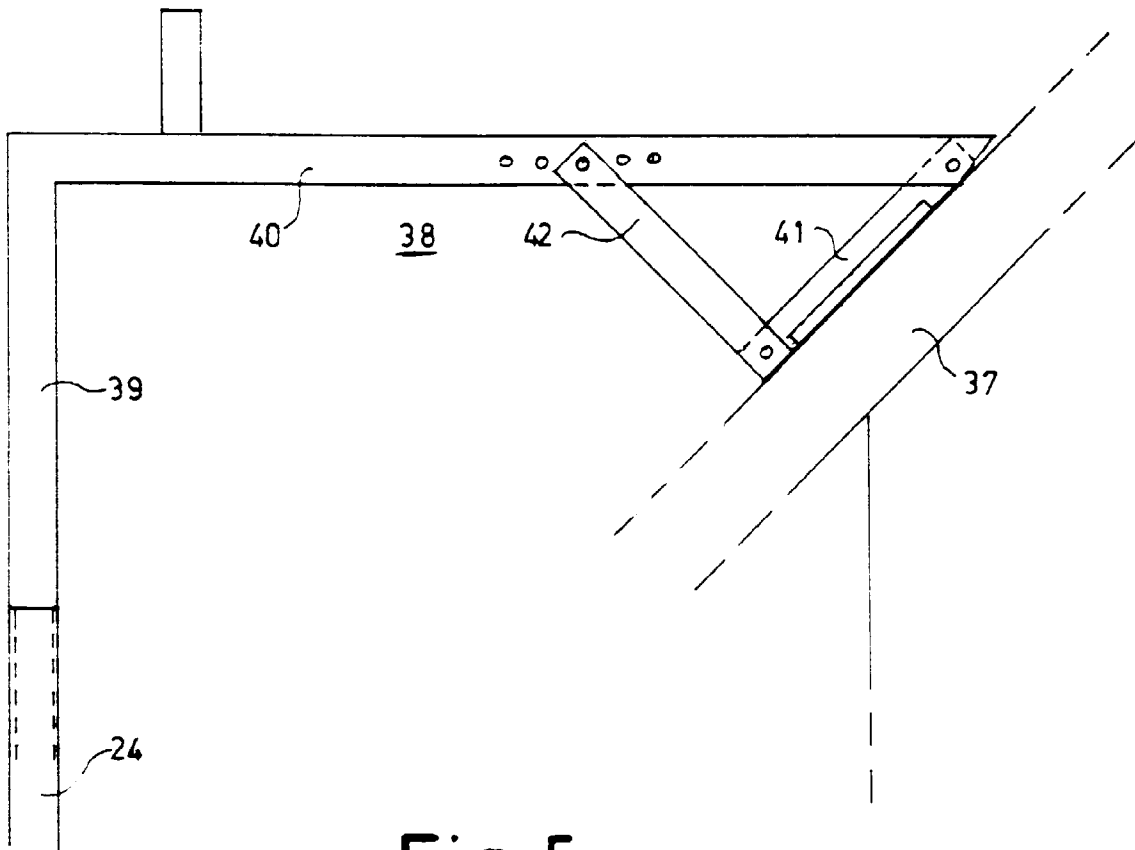


Fig. 5

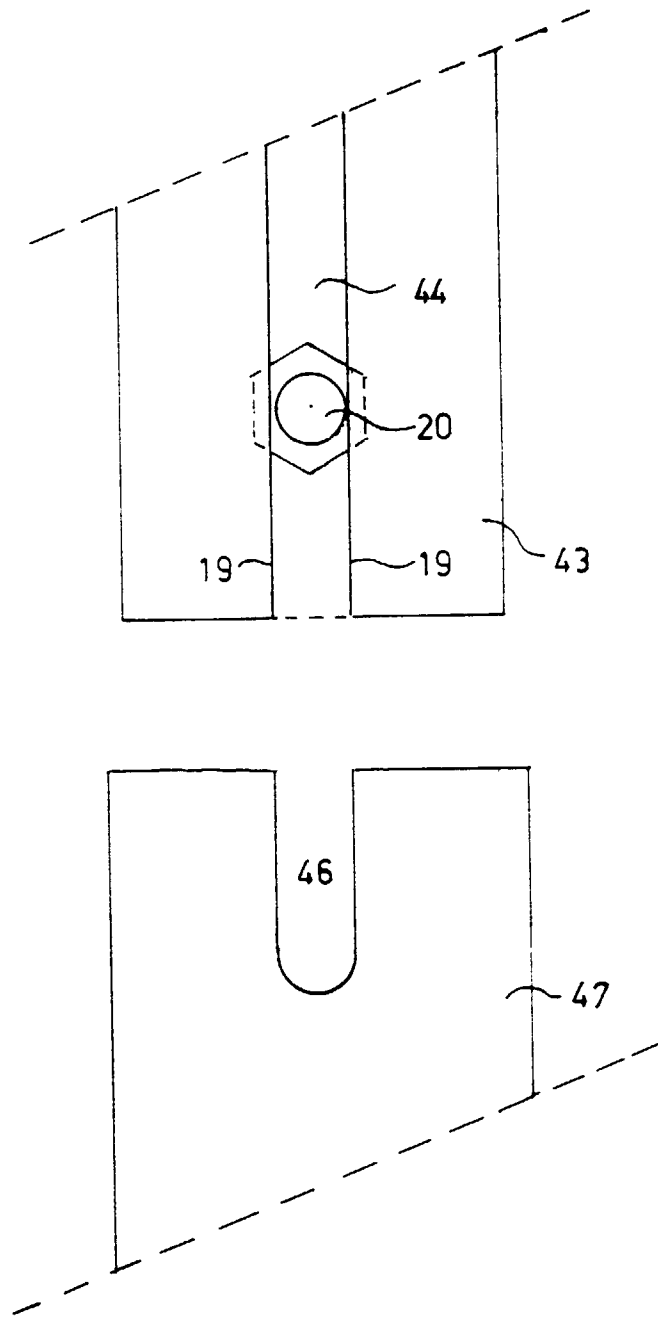


Fig. 6

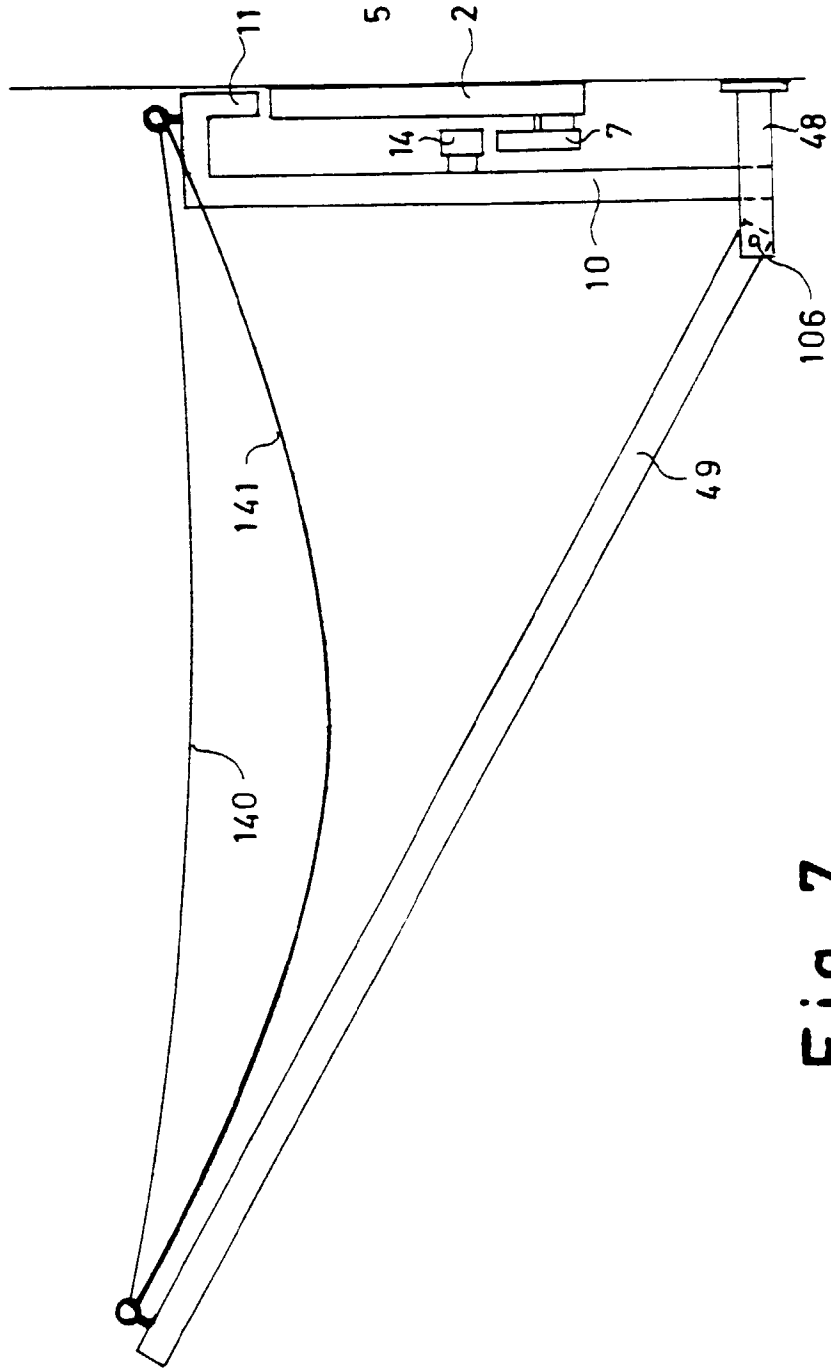


Fig. 7

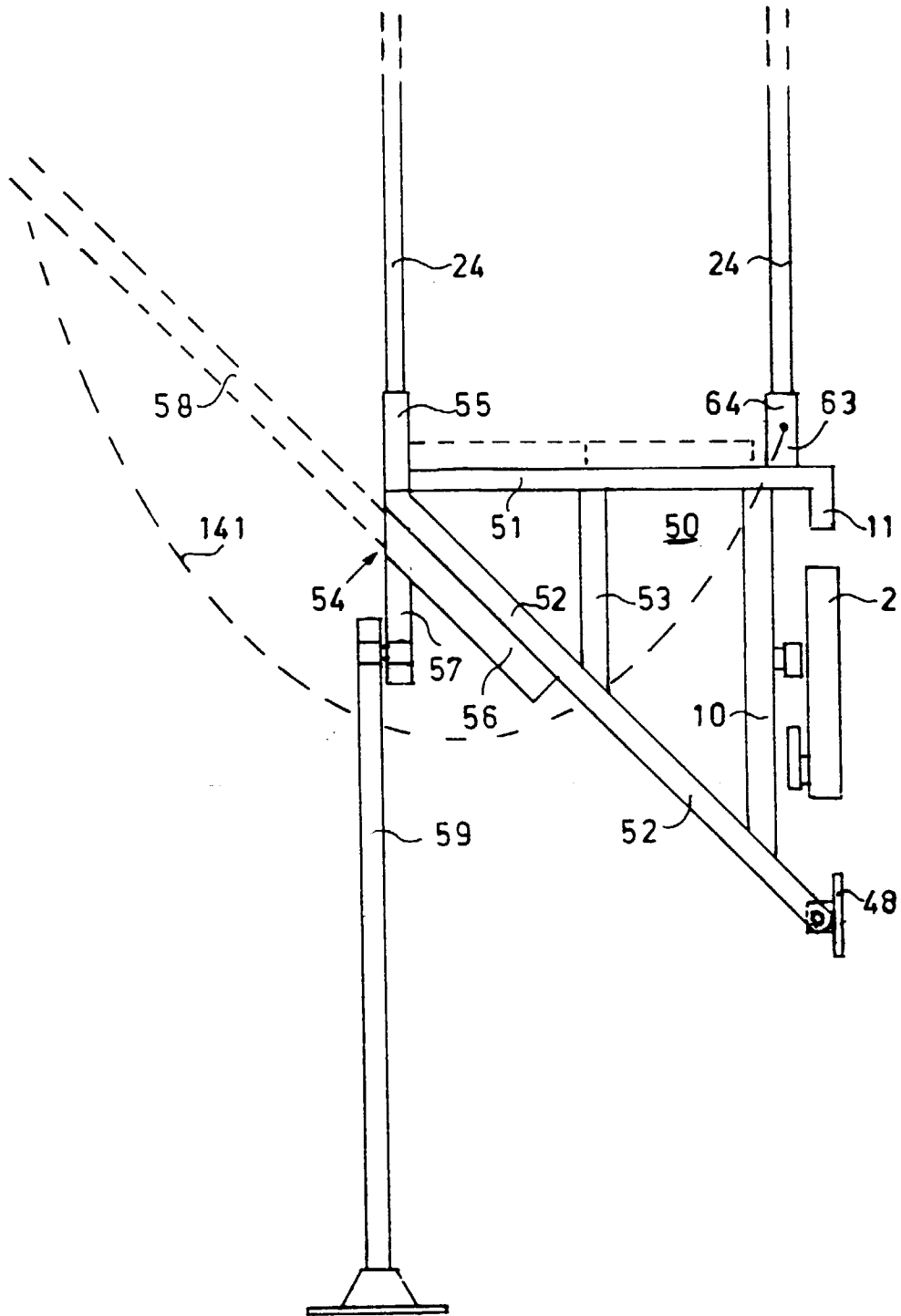


Fig. 8A

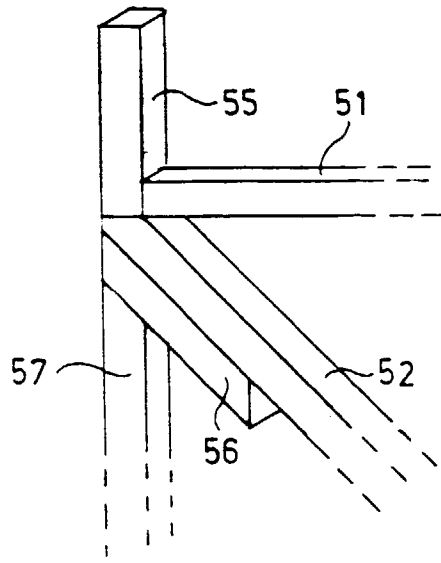


Fig. 8B

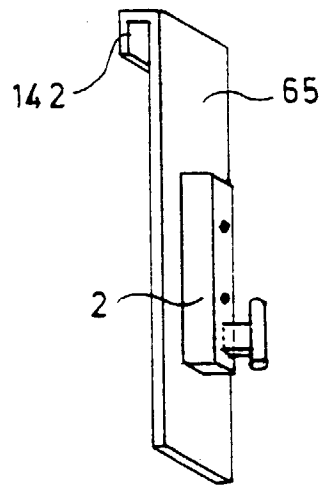


Fig. 9A

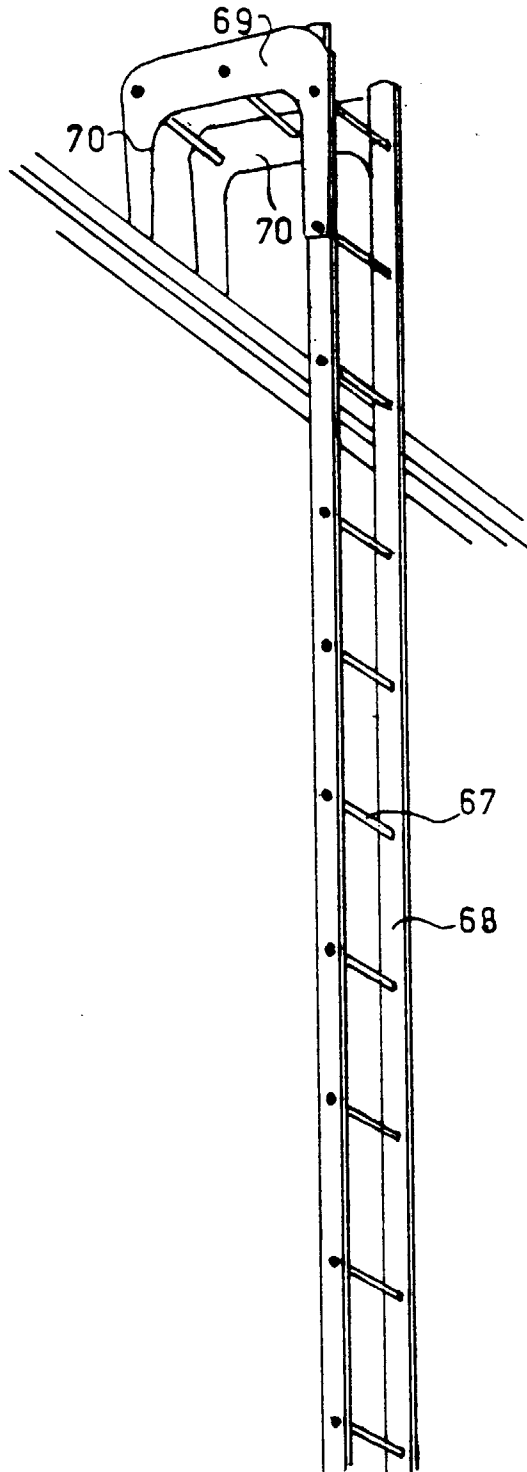


Fig. 9B

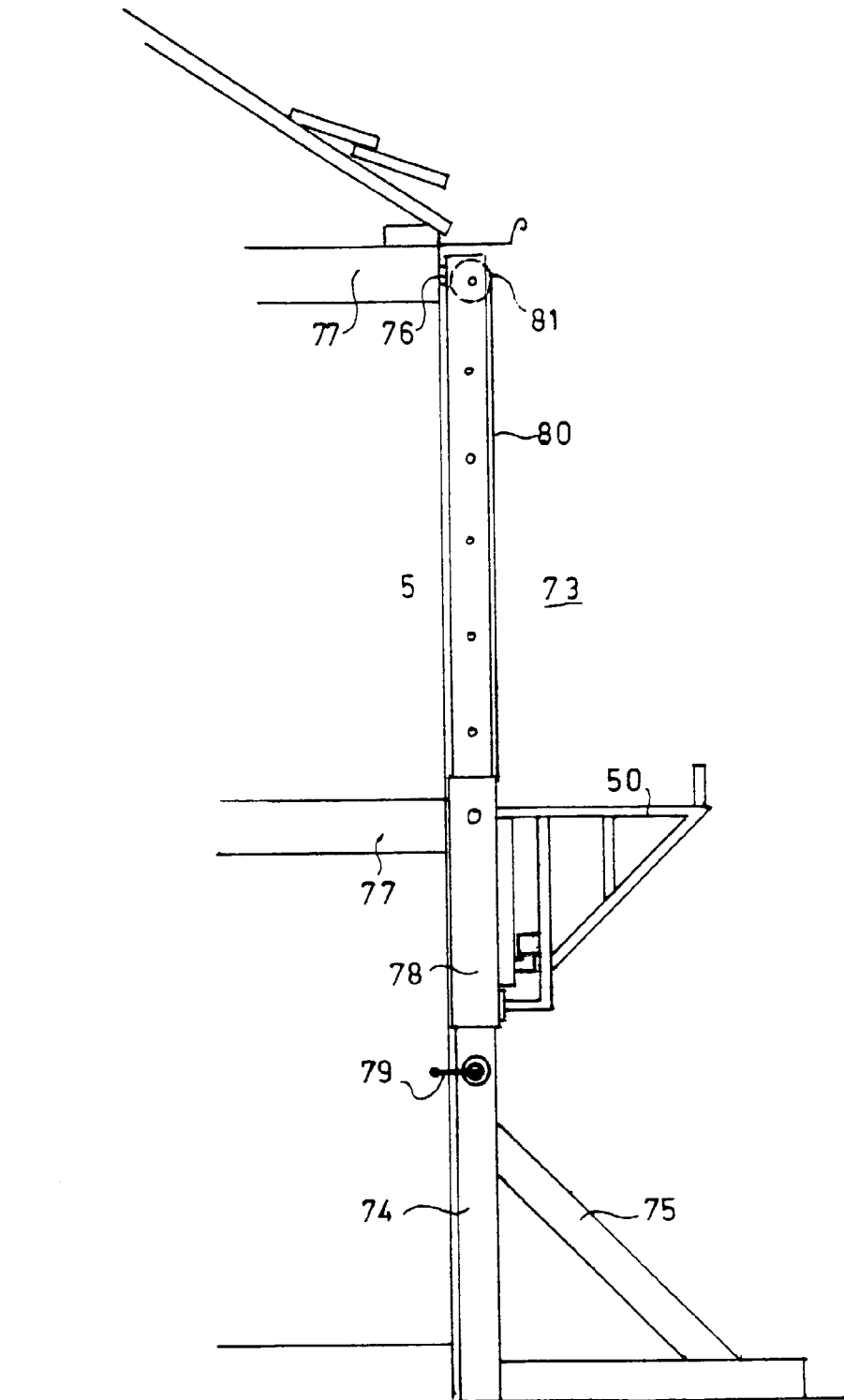


Fig. 10

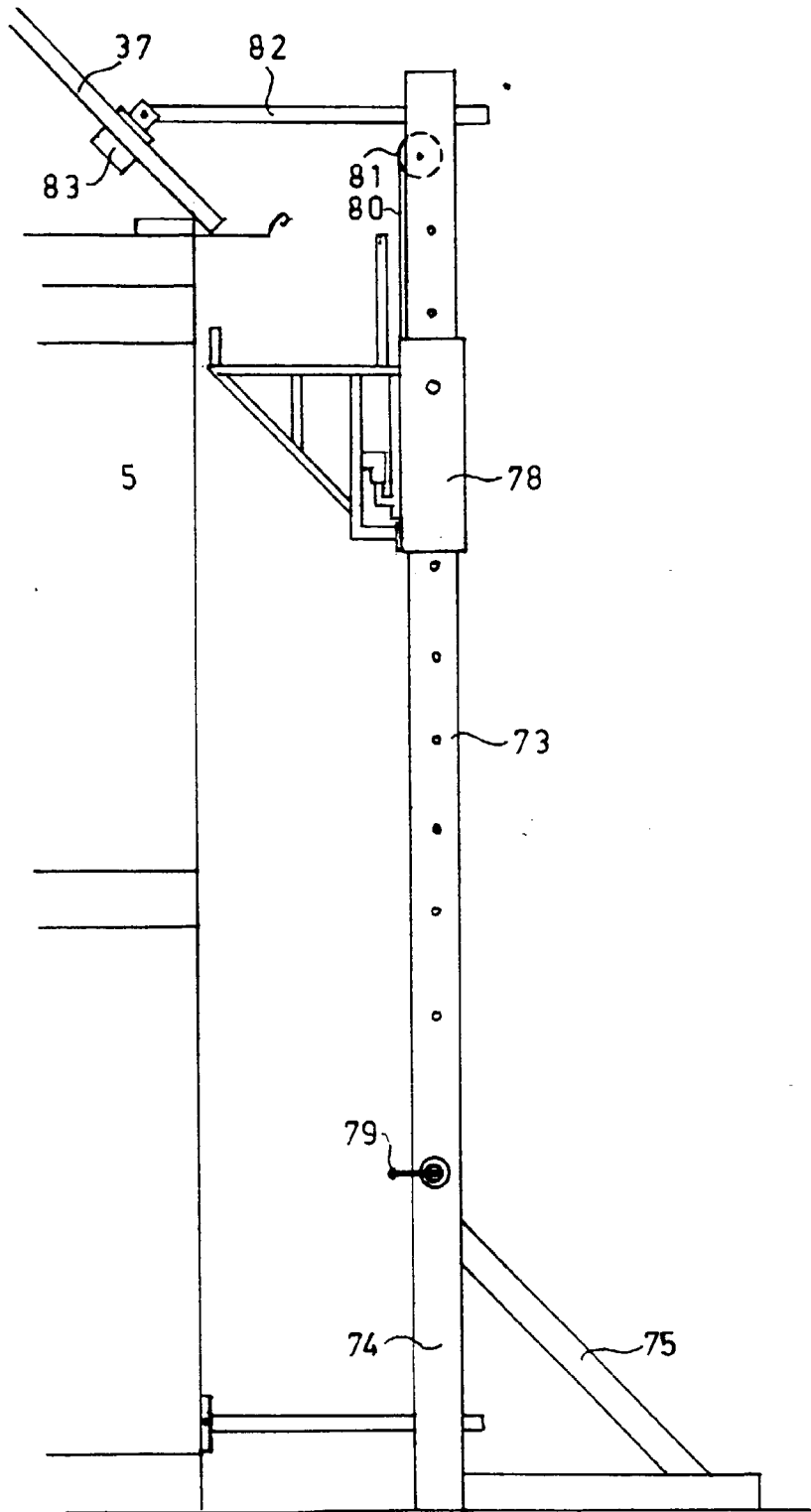


Fig. 11

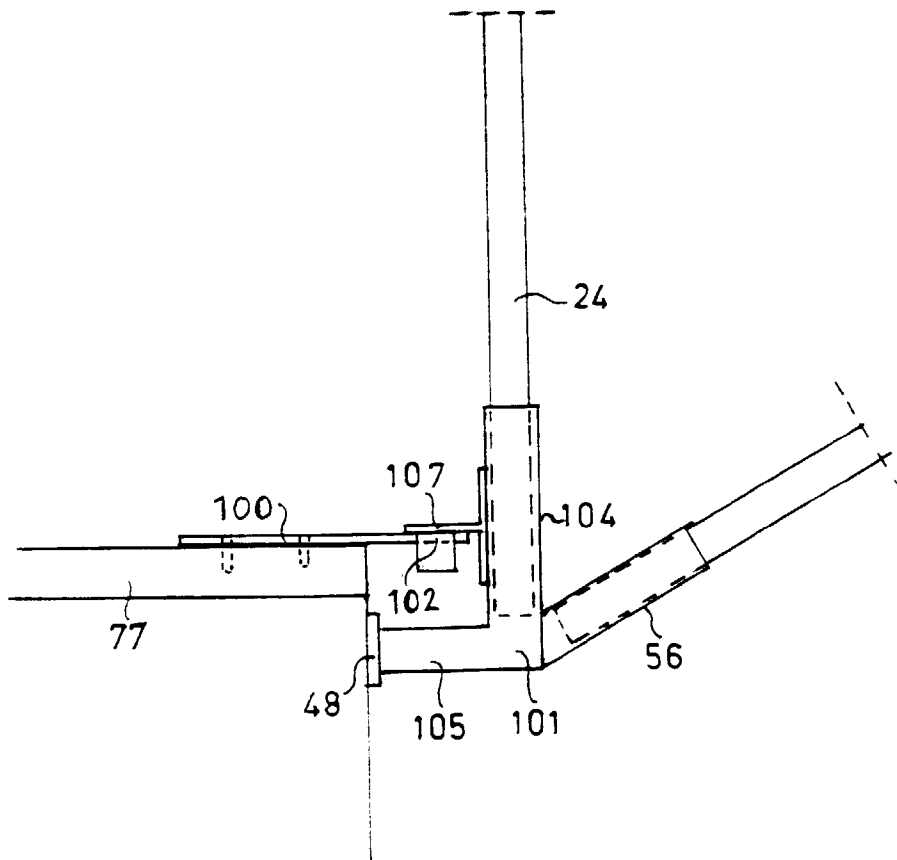
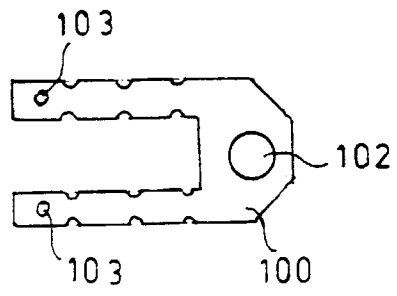


Fig. 12

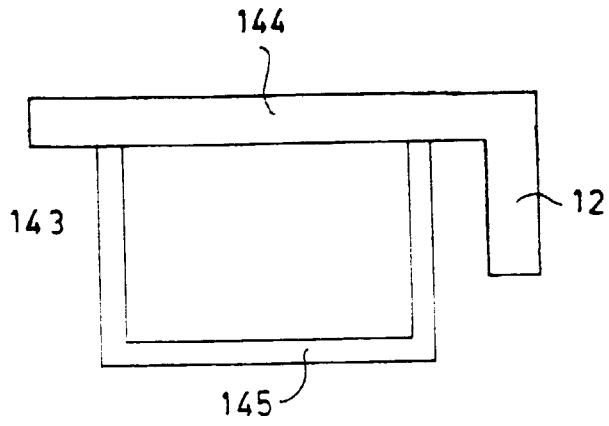


Fig. 13

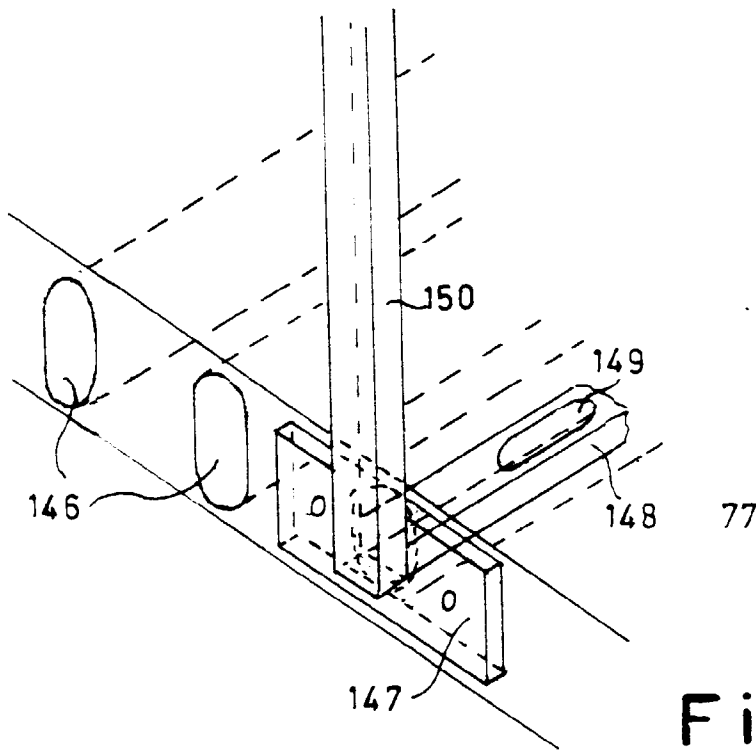


Fig. 14

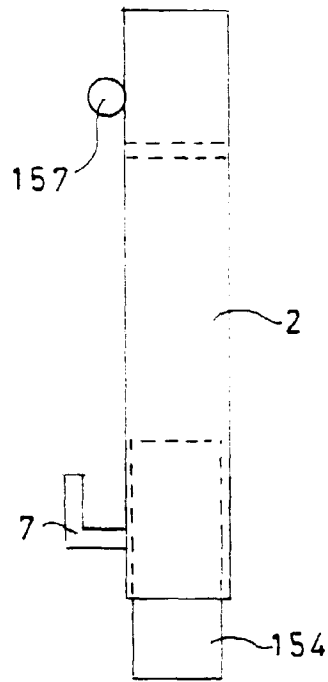


Fig.15

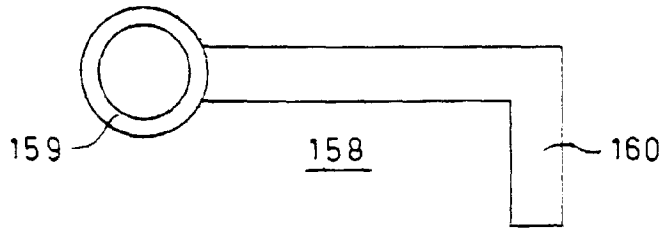


Fig.17B

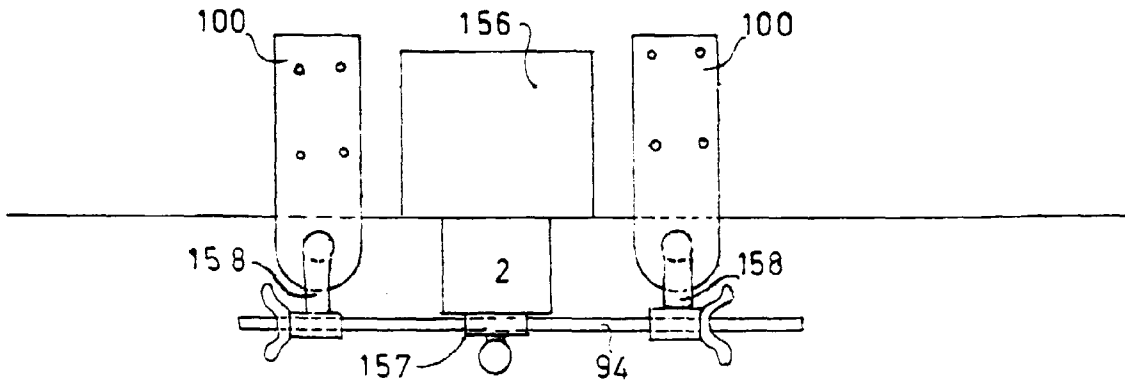


Fig.17A

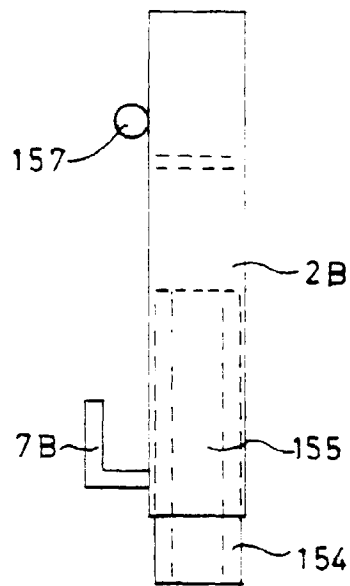
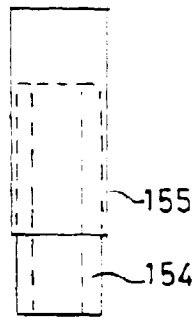
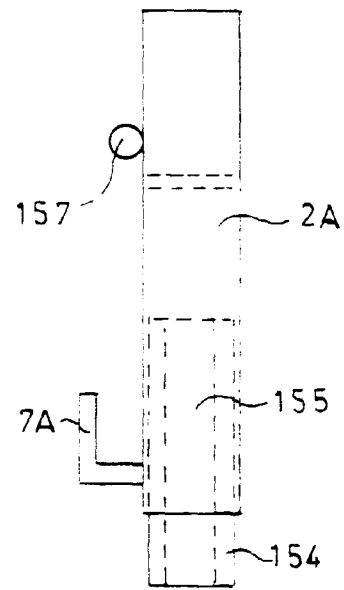


Fig.16

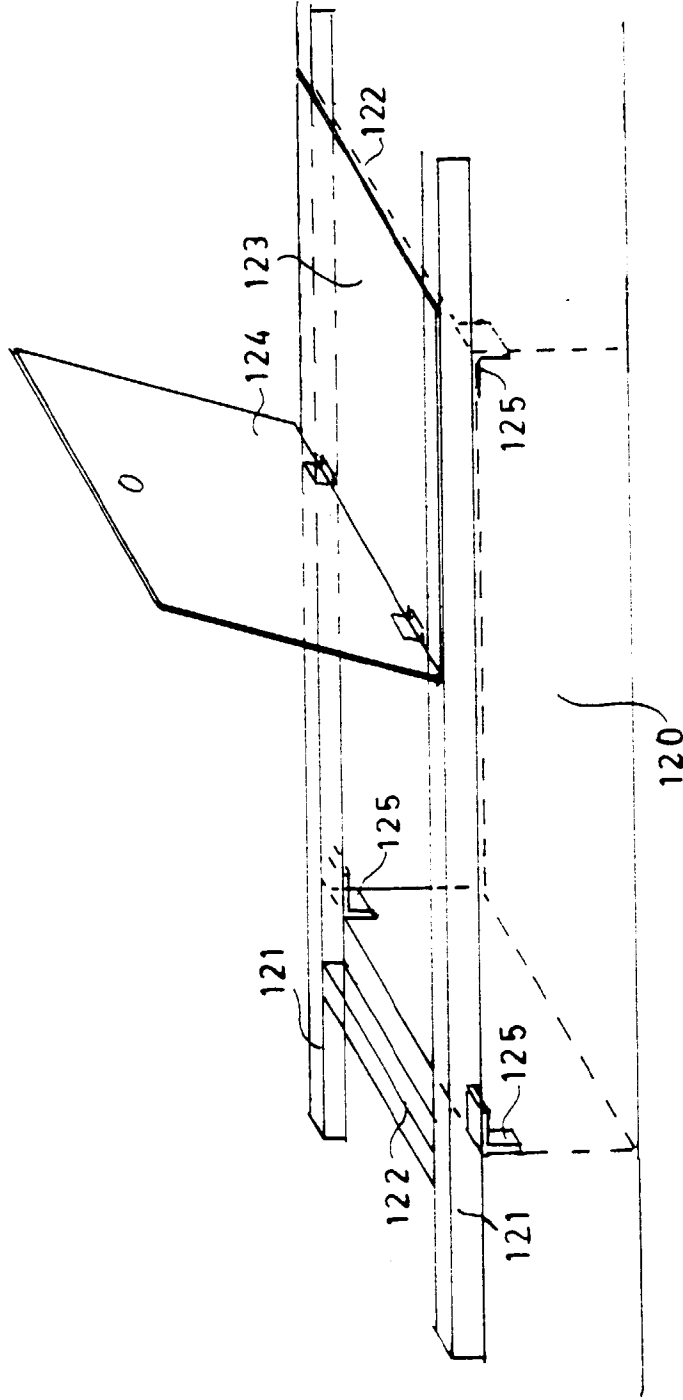


Fig. 18

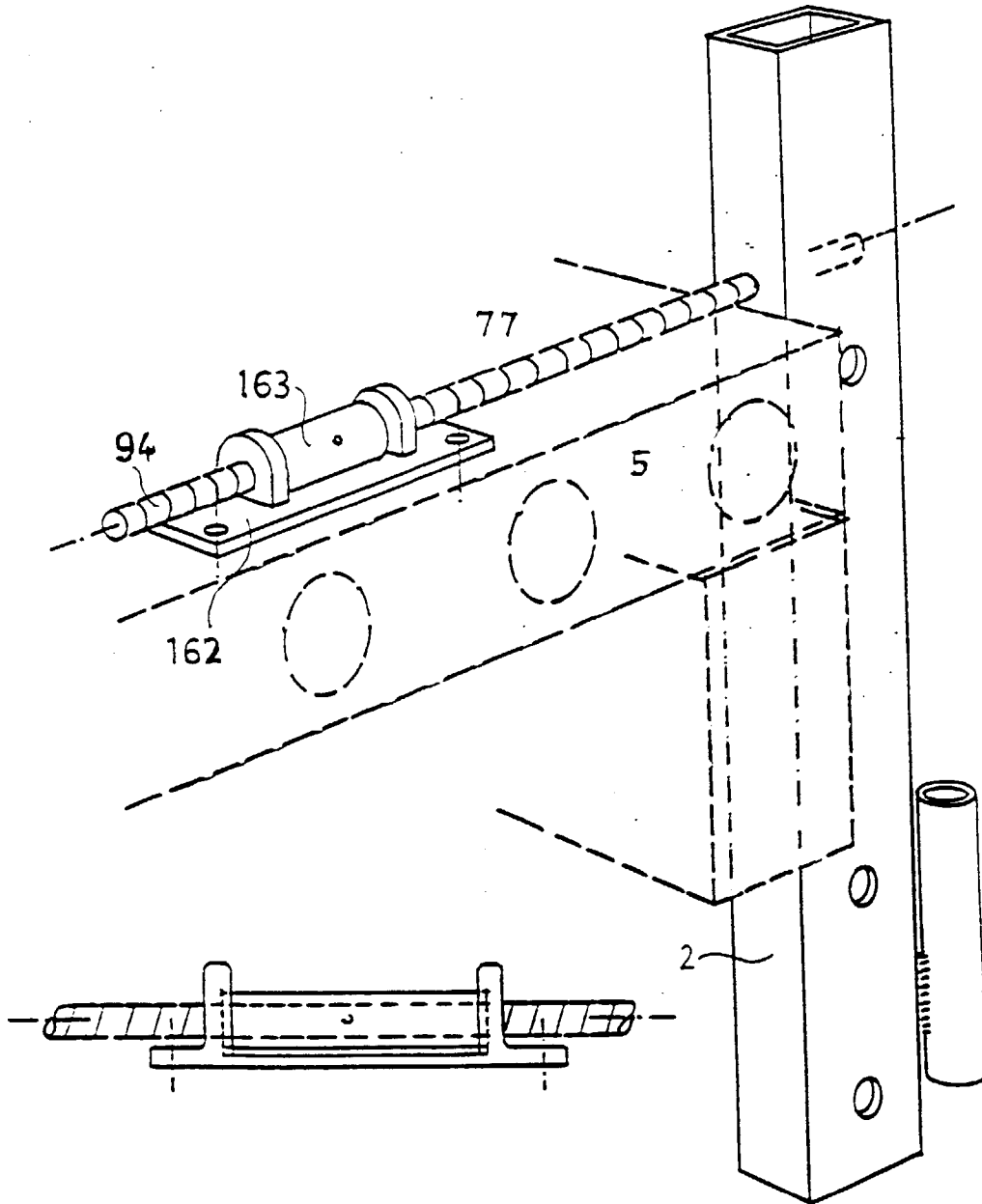


Fig.19