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(54) **Apparatus for providing support in building construction**

(57) Apparatus for providing support in building construction, the apparatus comprising a structural element, a support and means for connecting the support to the structural element.

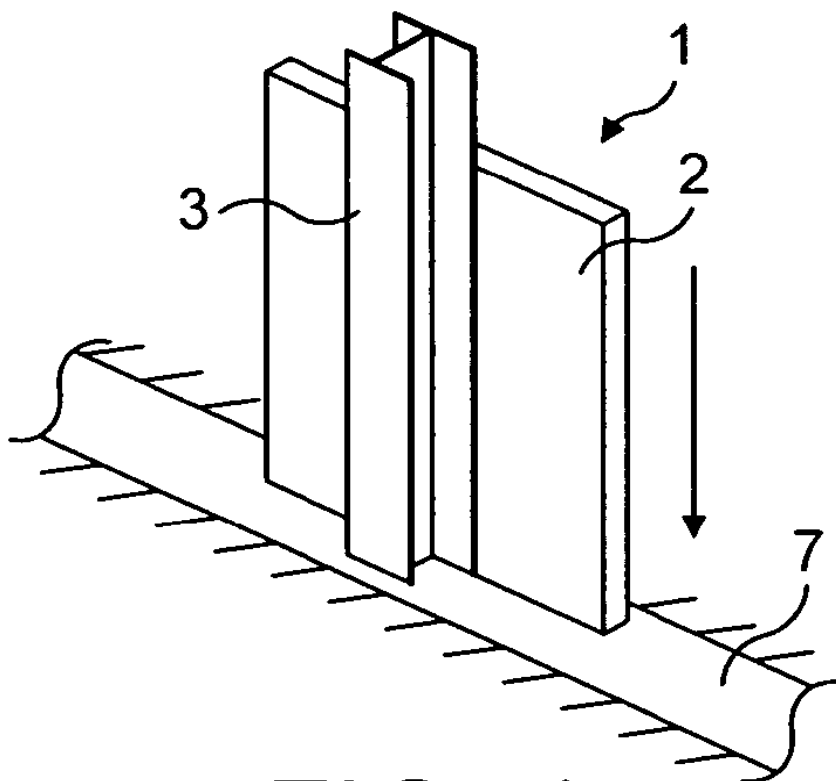


FIG. 1

Description

[0001] The invention relates to an apparatus for providing support in building construction, particularly in construction involving excavation below ground level.

[0002] It is normal practice to install either a temporary or permanent earthworks support system when excavating below ground level. This may be in the form of a wall of, for example, trench or sheet pile, kingpost, contiguous secant bored piled or diaphragm construction. Excavation then takes place whilst progressively installing, as necessary, support to the wall either as internal props (frames) or external ground anchors.

[0003] One of the main problems associated with this type of work is wall movement caused by ground movement occasioned by the excavation process before support can be applied to the earthwork support system. Propping at ground level does assist, but as soon as the excavation reaches an appreciable level, the wall deflects inwards under the ground (and if, relevant, water) pressures acting on the active (retained) side of the wall. This is not necessarily a problem for essentially shallow excavations of one basement depth, but manifests itself for deeper basements or if the ground conditions are weak.

[0004] It is an object of this invention to seek to mitigate these disadvantages.

[0005] Accordingly, the present invention provides apparatus for providing support in building construction, the apparatus comprising a structural element, a support and means for connecting the support to the structural element.

[0006] Using the apparatus of the invention, it is possible to provide support prior to excavation. A trench is excavated which is just large enough to accommodate the apparatus. A restraint is then installed, and the support is connected to the restraint. Excavation can then take place as the structural element will now be supported.

[0007] The apparatus may be pre-engineered, and then transported to the excavation site.

[0008] The support may be permanently connected to the structural element. Alternatively, the support may be detachably connected to the structural element. It will then be possible to connect the support to the structural element on site before insertion of the apparatus in the trench, thereby facilitating transport of the apparatus. It will also be possible to remove the support after excavation, and replace it with a permanent support such as a floor which may be cast to the structural element.

[0009] The support may be pivotally connected to the structural element. This also facilitates transport of the apparatus, especially where the support is not detachably connected to the structural element.

[0010] The apparatus may comprise a plurality of means for connecting the support to the structural element, the means being positioned such that the support can be connected at different levels on the structural el-

ement. It will then be possible to select the position of the support according to requirements. Where the support is detachable, this may be done on site.

[0011] The apparatus may comprise means for connecting the support to a first restraint. This will facilitate connection of the support to the restraint, and will provide a more secure connection than simply casting the support to the restraint. The first restraint may comprise a floor slab or beam or an opposing wall panel or any suitable structural restraint.

[0012] The apparatus may comprise means for connecting the support to a second restraint to reduce the forces on the first restraint. The second restraint may comprise a pile.

[0013] The support may comprise a secondary support, and means for connecting the secondary support to the structural element or to a restraint. This will provide additional support.

[0014] The support may comprise any suitable structural member. For example, the support may comprise a truss or frame. The truss or frame may be rigid or may be of hinged construction so allowing it to be opened up after insertion of the apparatus in the trench, thereby facilitating transport.

[0015] The structural element may comprise means for connecting the structural element to a restraint. These means may be in the form of locating joints.

[0016] The structural element may be any element used in construction. For example, the structural element may be a wall panel or a kingpost.

[0017] The structural element may comprise means for connecting the element to another structural element. These means could be in the form of joints, dowels or prestressed tendons in suitably located ducts. A support may not be required on each element as adjacent elements may provide sufficient support. For example, a support may be provided on alternate elements. The structural elements may be of different width and/or thickness, and at least one of the elements may comprise a recess for receiving a prop.

[0018] The invention further provides a method of providing support in building construction, the method comprising the steps of excavating a trench, inserting an apparatus according to the invention into the trench, connecting the support to a restraint, and carrying out excavation.

[0019] The support may be positioned on either side of the structural element. For example, the support may be positioned on the same side of the structural element as the excavation.

[0020] For a better understanding of the invention, a number of embodiments of an apparatus and method according to the invention will now be described by way of example, with reference to the accompanying drawing of which:

Figure 1 shows a perspective view of a first embodiment of an apparatus according to the invention be-

fore insertion in a trench;

Figure 2 shows a perspective view of the apparatus of Figure 1 after insertion in the trench and movement of the support;

Figure 3 shows an elevation view of the apparatus shown in Figure 2 after installation of a restraint;

Figure 4 shows an elevation view of the apparatus shown in Figure 3 after bulk excavation;

Figure 5 shows an elevation view of the apparatus shown in Figure 4 after installation of a permanent internal support;

Figure 6 shows the apparatus shown in Figure 5 with the support removed;

Figure 7 shows an elevation view of a second embodiment of an apparatus according to the invention after insertion in a trench;

Figure 8 shows an elevation view of the apparatus shown in Figure 7 after movement of the support;

Figure 9 shows an elevation view of the apparatus shown in Figure 8 after installation of a floor slab;

Figure 10 shows an elevation view of the apparatus shown in Figure 9 after bulk excavation;

Figure 11 shows an elevation view of the apparatus shown in Figure 10 with the support removed; and

Figure 12 shows an elevation view of an alternative structural element for use with the apparatus according to the invention.

[0021] The drawings show an apparatus 1 for providing support in building construction, the apparatus 1 comprising a structural element (wall panel) 2, a support 3 and means 4 for connecting the support to the structural element.

[0022] In the embodiment shown in Figures 1 to 6, the wall panel 2 is made of precast reinforced concrete, but may be made of any suitable material. The wall panel 2 may have an integral beam or thickening at the lower propping levels to assist load spreading and wall panel strength. The wall panel 2 may also have locating joints at its edges to assist connection between the panel and a floor slab. The edges and/or joints may have preformed grout ducts to allow post-grouting of joints.

[0023] The support 3 is made of metal, but may be made of any suitable material. The support 3 is attached to the wall panel 2 at a predetermined level, and comprises a strut, which is detachably connected to the wall panel 2 at one end by a hinge 4 so that the support 3

can be pivoted with respect to the wall panel 2. The support 3 includes a bracket 5 at its other end for connecting the support 3 to a first restraint which comprises a floor slab 6. Any suitable means may be used for connecting the support 3 to the wall panel 2 and floor slab 6. These means may be used for other purposes after removal of the support, for example, for the attachment of barriers or fenders.

[0024] Figure 1 - shows the apparatus 1 before insertion into an elongate trench 7, which has been excavated to a length and depth which is sufficient to accommodate the wall panel 2, and then filled with fresh slurry. Open trench excavation or any other suitable method may also be used. Guide walls may be used to improve accuracy of line and/or level. The support 3 may also have means for assisting location of the wall panel 2 in the trench 7 such as skid panels attached to the inner (excavation) sides of the support 3.

[0025] Figure 2 shows the apparatus 1 after insertion into the elongate trench 7. A second elongate trench 8 has been excavated at right angles to the elongate trench 7 such that the combined trenches 7, 8 form a "T". The second trench 8 may be excavated at the same time as the first trench 7, or, alternatively, may be excavated after insertion of the apparatus 1 in the first trench 7. Once the second trench 8 has been excavated, the support 3 is pivoted away from the wall panel 2 to a predetermined angle. Any suitable angle may be selected in both elevation and plan. This may be done either before or after the slurry has set.

[0026] Figure 3 shows the apparatus 1 after installation of the floor slab 6. The support 3 has been connected to the floor slab 6 by means of the bracket 5.

[0027] Figure 4 shows the apparatus 1 after bulk excavation has taken place to below the level of the support 3.

[0028] Figure 5 shows the apparatus 1 after installation of a permanent internal support 9, which comprises a cast slab.

[0029] Figure 6 shows the apparatus 1 after removal of the temporary support 3.

[0030] The embodiment shown in Figures 7 to 11 is the same as the embodiment shown in Figures 1 to 6 except that it includes a second restraint, which comprises a pile 10. The pile 10 is made of steel, but may be made of any suitable material.

[0031] Figure 7 corresponds to Figure 1, except that the pile 10 has been inserted into a bore 11, which is positioned such that when the support 3 is pivoted away from the wall panel 2 to its predetermined angle, the free end of the support 3 will meet the upper end of the pile 10.

[0032] Figure 8 corresponds to Figure 2, except that the free end of the support 3 has been connected to the upper end of the pile 10. Any suitable means may be used for connecting the support 3 to the pile 10.

[0033] Figure 9 corresponds to Figure 3, except that the floor slab 6 has been connected to the pile 10 as

well as to the support 3. Any suitable means may be used for connecting the pile 10 to the floor slab 6.

[0034] Figure 10 corresponds to Figure 4, and Figure 11 corresponds to Figure 6.

[0035] From these Figures, it can be seen that the pile 10 provides tensile resistance to the out of balance vertical forces induced by the support 3 at the point where it connects with the floor slab 6. The pile 10 can be left in position after bulk excavation so that it provides permanent vertical support to the floor slab 6 and the rest of the structure, or it can be removed.

[0036] Figure 12 shows a structural element 12 which may be used instead of the wall panel 2. The structural element 12 includes a central pier 13 and two intermediate panels 14 on either side of the pier 13.

[0037] The pier 13 is wider and thicker than the panels 14, and is designed to carry the combined forces applied to the pier 13 and panel 14.

[0038] The pier 13 includes a cut-out 15 at its lower end for receiving a prop 16. The prop 16 holds the pier 13 in place prior to excavation. The panels 14 may also be held in place by props.

[0039] The pier 13 also includes a cut-out 17 on either side for receiving a corresponding projection 18 on each of the panels 14 in a sliding joint.

[0040] The pier 13 assists with initial locational accuracy in the trench.

Claims

1. Apparatus for providing support in building construction, the apparatus comprising a structural element, a support and means for connecting the support to the structural element.
2. Apparatus according to claim 1, wherein the support is detachably connected to the structural element.
3. Apparatus according to claim 1 or claim 2, wherein the support is pivotally connected to the structural element.
4. Apparatus according to any preceding claim, wherein the apparatus comprises a plurality of means for connecting the support to the structural element, the means being positioned such that the support can be connected at different levels on the structural element.
5. Apparatus according to any preceding claim, wherein the apparatus comprises means for connecting the support to a first restraint.
6. Apparatus according to claim 5, wherein the first restraint comprises a floor slab.
7. Apparatus according to claim 5 or claim 6, wherein the apparatus comprises means for connecting the support to a second restraint.
8. Apparatus according to claim 7, wherein the second restraint comprises a pile.
9. Apparatus according to any preceding claim, wherein the support comprises a secondary support.
10. Apparatus according to claim 9, wherein the apparatus comprises means for connecting the secondary support to the structural element.
11. Apparatus according to claim 10, wherein the apparatus comprises means for connecting the secondary support to a restraint.
12. Apparatus according to any of claims 9 to 11, wherein the support comprises a truss or frame.
13. Apparatus according to any preceding claim, wherein the structural element is a kingpost.
14. Apparatus according to any of claims 1 to 12, wherein the structural element is a wall panel.
15. Apparatus according to any preceding claim, wherein the structural element comprises means for connecting the element to another structural element.
16. Apparatus according to claim 15, wherein the structural elements are of different width and/or thickness.
17. Apparatus according to claim 15 or claim 16, wherein at least one of the structural elements comprises a recess for receiving a prop.
18. Apparatus according to any preceding claim, wherein the structural element comprises means for connecting the element to a restraint.
19. A structural element as described in any of claims 1 to 18 comprising means for connecting a support thereto.
20. A support as described in any of claims 1 to 18 comprising means for connecting a structural element thereto.
21. A method of providing support in building construction, the method comprising the steps of excavating a trench, inserting an apparatus according to any preceding claim into the trench, connecting the support to a first restraint, and carrying out bulk excavation.

vation.

- 22.** A method according to claim 20, wherein the support is positioned on the opposite side of the structural element as the bulk excavation.

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- 23.** A method according to claim 20, wherein the support is positioned on the same side of the structural element to the bulk excavation.

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- 24.** A method according to claim 23, wherein the apparatus comprises first and second restraints, both of which are positioned on the same side as the support.

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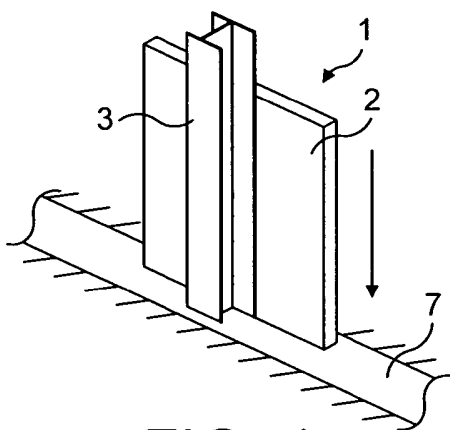


FIG. 1

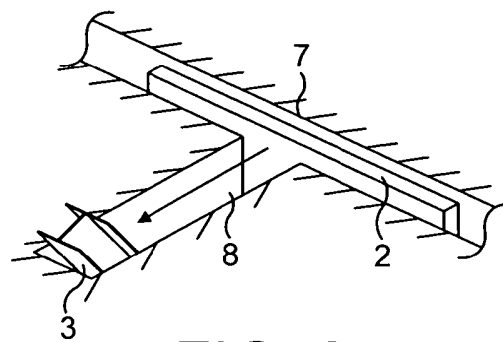


FIG. 2

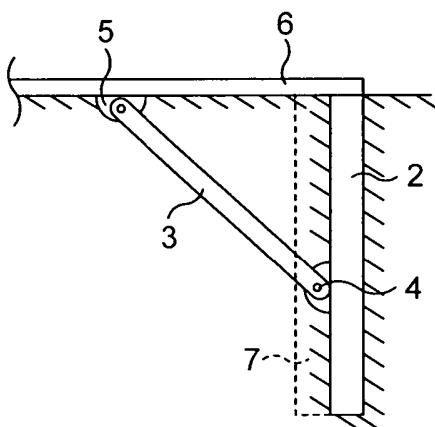


FIG. 3

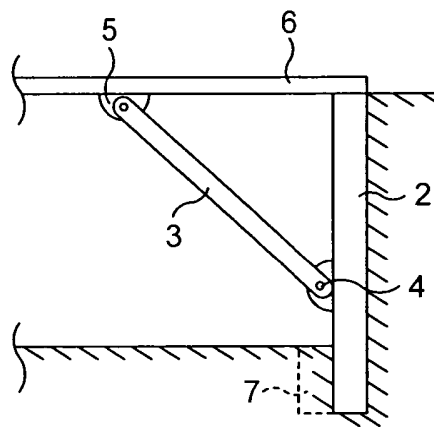


FIG. 4

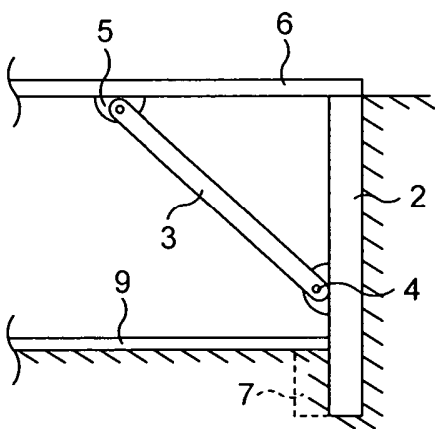


FIG. 5

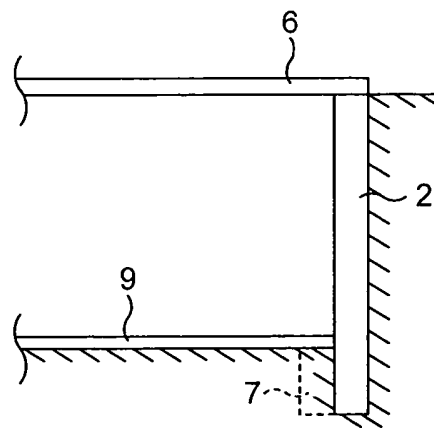


FIG. 6

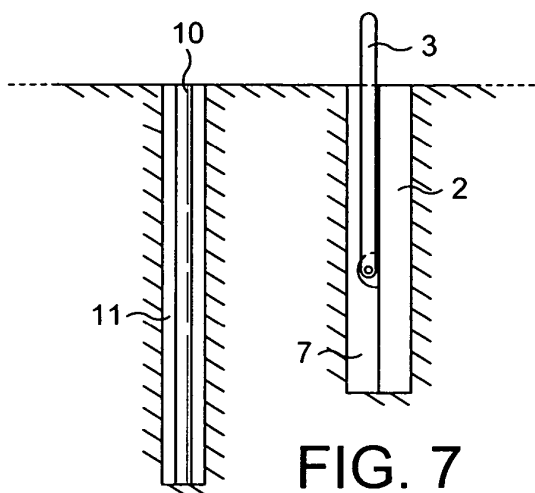


FIG. 7

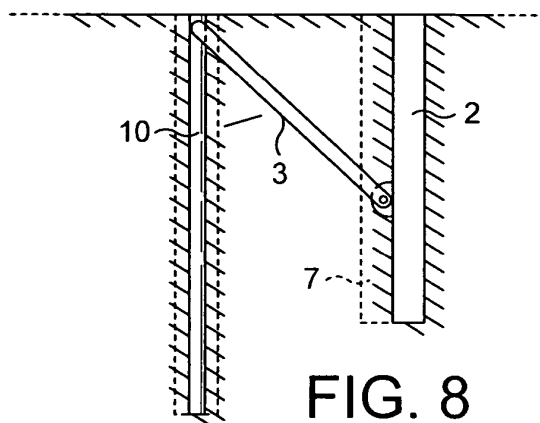


FIG. 8

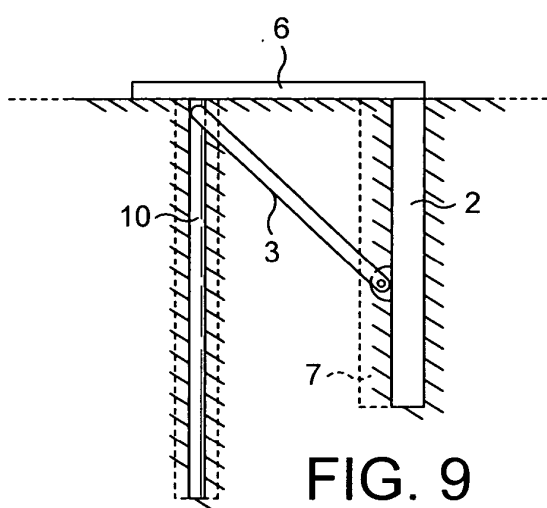


FIG. 9

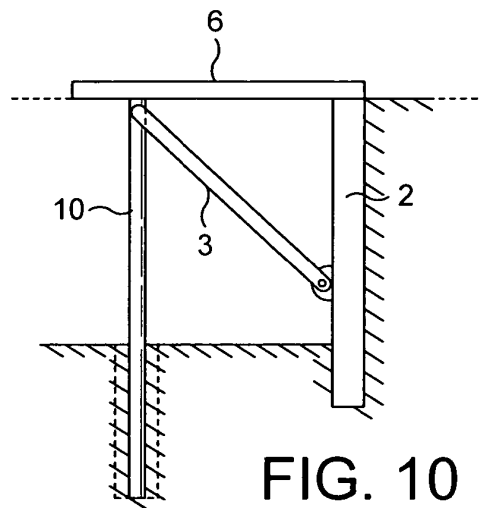


FIG. 10

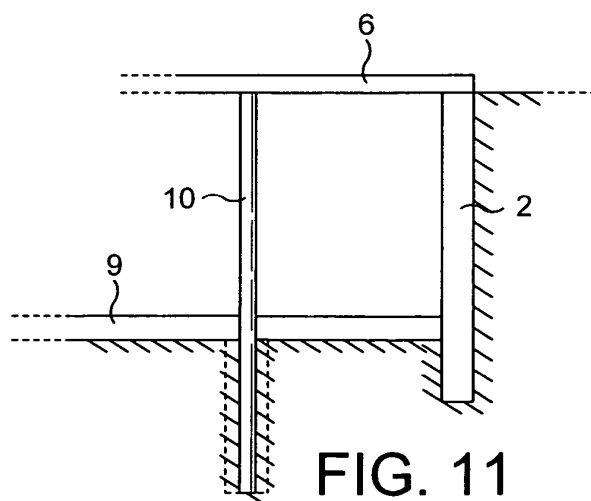


FIG. 11

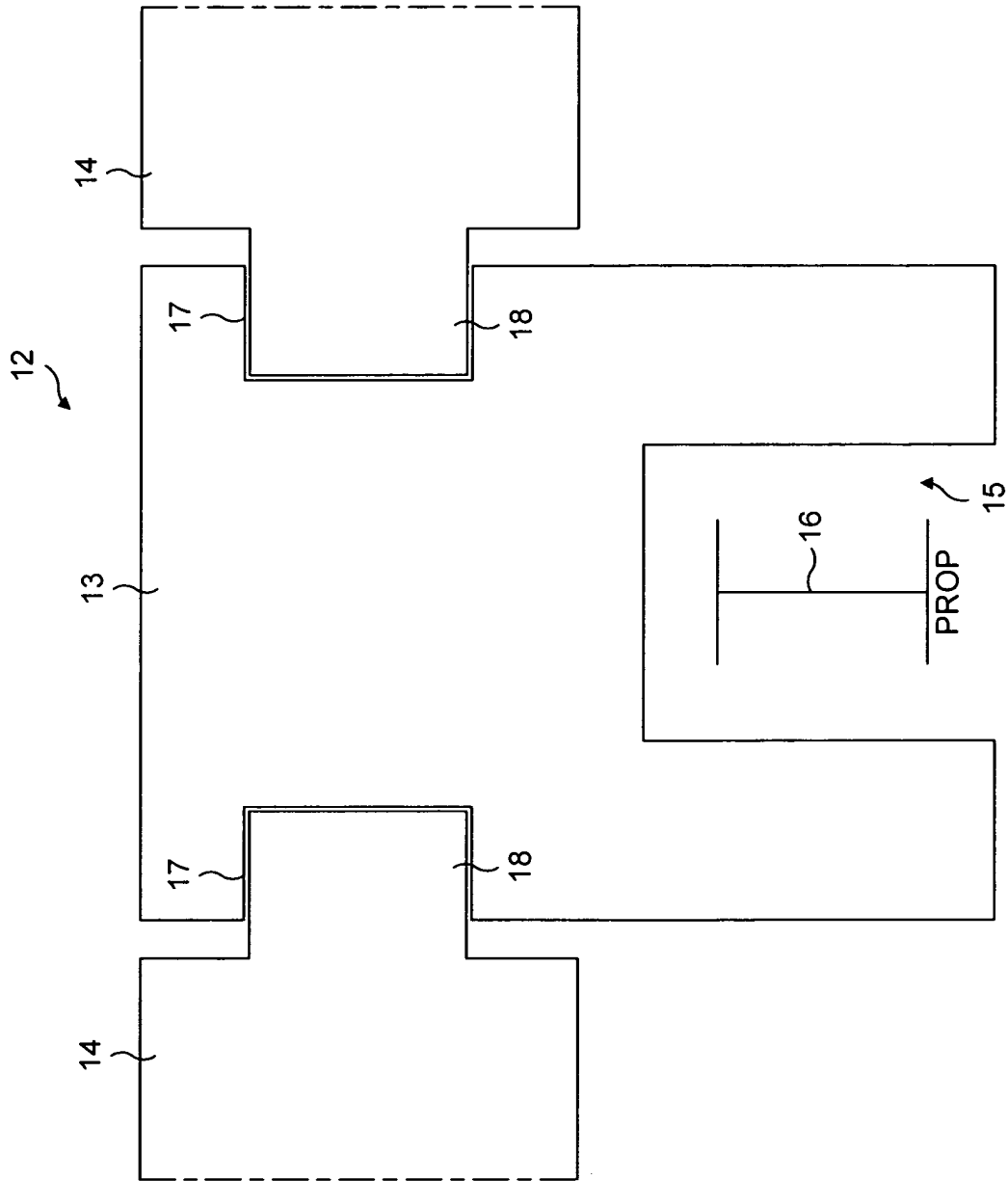


FIG. 12



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EUROPEAN SEARCH REPORT

Application Number
EP 04 25 6526

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 January 2005	Examiner Nilsson, L
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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