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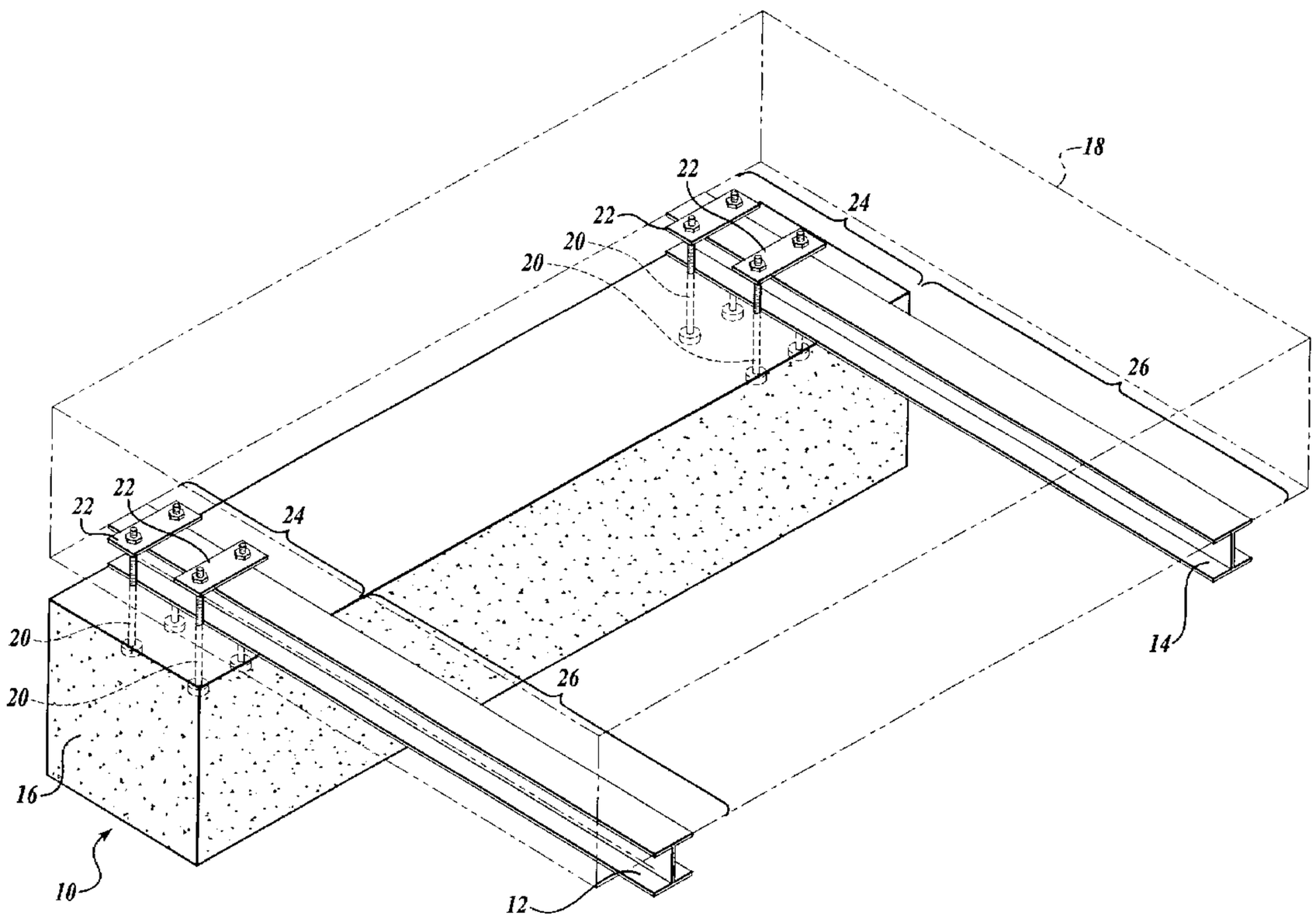
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(54) Titre : SUPPORT PORTEUR EN PORTE-A-FAUX
(54) Title: CANTILEVERED STRUCTURAL SUPPORT



(57) Abrégé/Abstract:
A cantilevered structural support (10) comprises a counterbalance (16) and an elongate support member (12, 14) that is secured to the counterbalance (16). A cantilevered portion (26) of the support member extends outward from the counterbalance (16). When one or more cantilevered structural supports (10) are used to support a freestanding structure (18), the cantilevered portions of the support members (12, 14) are configured to support 40% or more of the footprint area of the structure.

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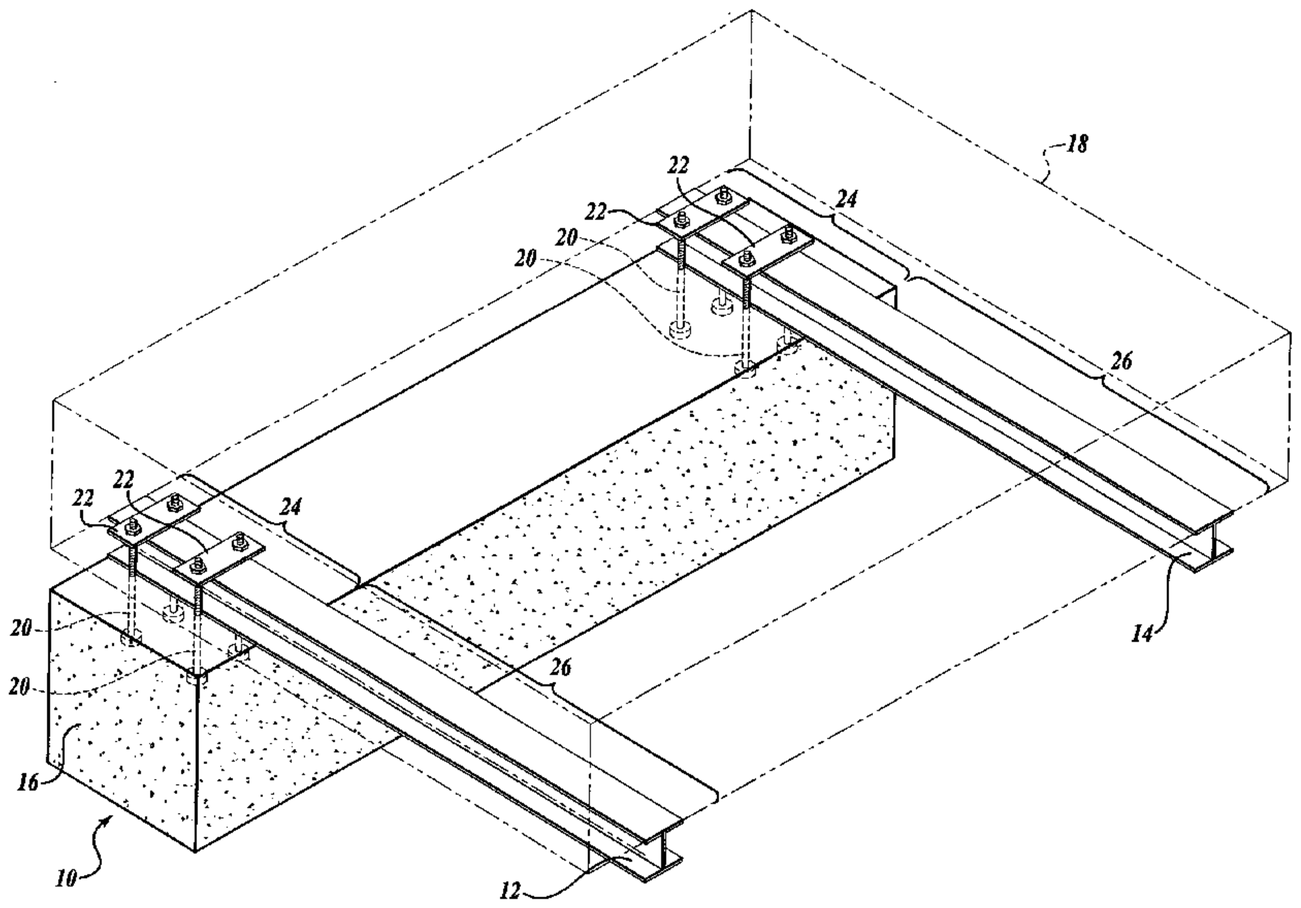
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(54) Title: CANTILEVERED STRUCTURAL SUPPORT



(57) Abstract: A cantilevered structural support (10) comprises a counterbalance (16) and an elongate support member (12, 14) that is secured to the counterbalance (16). A cantilevered portion (26) of the support member extends outward from the counterbalance (16). When one or more cantilevered structural supports (10) are used to support a freestanding structure (18), the cantilevered portions of the support members (12, 14) are configured to support 40% or more of the footprint area of the structure.

WO 02/055799 A1

CANTILEVERED STRUCTURAL SUPPORT

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of the filing date of U.S. Provisional Application No. 60/260,694, filed January 9, 2001.

FIELD OF THE INVENTION

The present invention relates generally to foundational supports for supporting a structure.

BACKGROUND OF THE INVENTION

A structure, such as a house, cabin, shed, and the like, is typically built on a foundation that is set in the ground. Building foundations generally require excavating the site and pouring concrete into forms that are laid out in a design that provides support to the building.

Constructing a foundation on level land is a fairly straightforward task. However, when building on critical slopes, issues arise with exposure of the soil to elements such as wind, rain, or snow that cause erosion or slide problems. Conventional foundations on critical slope properties usually require extensive soil stabilization techniques. These techniques include cast-in-place piles, auger-cast piles, pin piles, and the like, that are set in the ground during the construction of the foundation. These soil stabilization techniques may considerably increase the construction cost, potentially making the costs prohibitive.

In other circumstances, it may be desired to build a structure, such as a dock or boathouse, near the shore of a lake or the bank of a river. The lake shore or river bank may or may not be a critical slope. However, due to environmental concerns, penetration of the water or land near the water to construct the foundation for the structure may not be desirable or even possible under government building permits.

The present invention provides a structural support that solves the foregoing problems and other shortcomings in the prior art.

SUMMARY OF THE INVENTION

The present invention is directed to a cantilevered structural support for structures such as houses, cabins, boat houses, docks, piers, and the like, to be built on critical slope properties and/or over or near sensitive land or water. The structural support of the

present invention is cantilevered in manner that permits a significant percentage (*e.g.*, 40% or more) of the structure to be supported outward from the critical slope or over the sensitive land or water. The present invention provides a less expensive alternative to conventional building foundations that require extensive soil stabilization techniques. It is also useful for construction or replacement of docks or piers where penetration of the water is not desirable. Other suitable applications for the present invention include, for example, supporting a structure over water such as a cabin or boat house.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 illustrates a pair of cantilevered structural supports constructed in accordance with the present invention and shown in an environment supporting a freestanding structure;

FIGURE 2 is a perspective view of a cantilevered structural support constructed in accordance with the present invention wherein a support member is attached to a counterbalance by way of securing plates and anchor bolts that extend into the counterbalance;

FIGURE 3 is a front elevation view of the cantilevered structural support shown in FIGURE 2;

FIGURE 4 is a side elevation view of the cantilevered structural support shown in FIGURE 2;

FIGURE 5 is top plan view of the cantilevered structural support shown in FIGURE 2;

FIGURE 6 is a front elevation view of another cantilevered structural support constructed in accordance with the present invention wherein a support member is attached to a counterbalance by way of a plate and welded head studs (Nelson studs) embedded in the counterbalance;

FIGURE 7 is a side elevation view of the cantilevered structural support shown in FIGURE 6; and

FIGURE 8 is a top plan view of the cantilevered structural support shown in FIGURE 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A cantilevered structural support constructed according to the present invention includes a counterbalance and an elongate support member attached thereto for supporting the load of a freestanding structure. FIGURE 1 illustrates one embodiment of a cantilevered structural support 10 of the present invention. In FIGURE 1, a pair of cantilevered support members 12 and 14 are attached to a counterbalance 16 to support a freestanding structure 18, such as a house, dock, or other type of structure. As described in more detail below, the support members 12, 14 shown in FIGURE 1 are attached to the counterbalance 16 by way of anchor bolts 20 that extend into the counterbalance 16. Steel plates 22 are connected to the anchor bolts 20 and extend over the top of the support members 12, 14 to secure the support members 12, 14 to the counterbalance 16.

While a preferred embodiment of the invention described herein includes a concrete block as a counterbalance and a steel I-beam attached thereto as a support member, persons of ordinary skill in the art will appreciate that other types of material may be used for the counterbalance and/or support member. Furthermore, while FIGURE 1 illustrates the use of a single counterbalance with two support members, those of ordinary skill in the art will appreciate that other embodiments of the invention may use any number of support members or counterbalances. For example, a separate counterbalance may be provided for each of the support members 12, 14.

Each of the support members 12, 14 has a secured portion 24 that is attached to the counterbalance 16 and a cantilevered portion 26 that extends outward from the counterbalance. The length of the cantilevered portion 26 may vary in accordance with the dimension of the structure 18 that the cantilevered structural support 10 is designed to hold, the magnitude of the load of the structure 18, and the size and material of which the support members 12, 14 and counterbalance 16 are constructed. The present invention departs from the prior art in that the cantilevered structural support 10 is designed to support a freestanding structure 18 in which a significant portion of the structure 18 is supported by the cantilevered portion 26. In particular, the perimeter of the structure 18 defines a footprint having an area that is supported by the support members 12, 14. The cantilevered portion 26 of the support members 12, 14 is designed to support 40% or more of the footprint area of the structure 18.

FIGURE 2 illustrates a cantilevered structural support 30 having a support member 32 attached to a counterbalance 34 in a manner as shown in FIGURE 1. In a preferred embodiment, the counterbalance 34 is a concrete block poured in place, and either stands alone or is supported by piles, *e.g.*, cast-in-place piles, set in the ground. The shape, volume, and weight of the counterbalance 34 is adjusted in accordance with the load that the cantilevered structural support 30 is designed to support and the nature of the ground (soil type, slope, etc) in which the structural support 30 is set.

The counterbalance 34 may alternatively be formed of other material and by other methods, such as a precast concrete block of sufficient weight to counterbalance the load carried by the support member 32. The precast concrete block is lifted and set in place at the construction site. If the attachment of the support member 32 to the counterbalance 34 requires bolts or rods that are embedded in the counterbalance, as shown in FIGURE 2, the bolts or rods are preferably embedded in the counterbalance 34 when the counterbalance is formed.

Further exemplary embodiments of the counterbalance 34 may include a slab formed of material, such as steel, or a combination of material, such as concrete and steel, having sufficient weight to counterbalance the load carried by the support member 32. The counterbalance 34 may also comprise a natural rock formation of sufficient weight and structural integrity to hold a support member 32 and counterbalance the load that the cantilevered structural support 30 is designed to carry.

In a preferred embodiment of the invention, the support member 32 is a steel I-beam of the form shown in FIGURE 2. Other support members suitable for use with the present invention include, for example, wood beams, laminated wood beams, precast/prestressed or post-tensioned concrete beams, composite steel and concrete beams, fiberglass beams, steel or combination wood/steel trusses, or any combination of the above.

In FIGURE 2, the support member 32 is attached to the counterbalance 34 by way of anchor bolts 36 that are secured to one or more overhead plates 38. FIGURES 3-5 provide additional views of the cantilevered structural support 30 shown in FIGURE 2. In embodiments where the counterbalance 34 is formed of poured concrete, the anchor bolts 36 are preferably embedded in the concrete when it is poured. The anchor bolts 36 extend upwards from the counterbalance 34, with one or more anchor bolts preferably located on each side of the support member 32. To attach the support member 32 to the

counterbalance 34, the support member 32 is placed on the counterbalance 34 between the anchor bolts 36. Plates 38, preferably formed of steel with precut holes, are placed over the top of the support member 32, with the anchor bolts 36 extending through the holes in the plates. The anchor bolts are preferably threaded, with nuts having corresponding threads and washers being used to secure the plates 38 to the anchor bolts 36, thus securing the support member 32 to the counterbalance 34. In other embodiments of the invention, the anchor bolts 36 may be welded or otherwise securably attached to the steel plates 38 and/or the support member 32 to secure the support member 32 to the counterbalance 34.

To resist lateral stresses on the support member 32, the plates 38 are preferably welded or otherwise bonded to the support member 32. For example, where a steel plate and steel I-beam are used, continuous welding or tack welding may be used. The diameter and length of the anchor bolts 36, and the thickness of the plates 38, depend on the load that the cantilevered structural support 30 is designed to hold.

FIGURE 3 provides a front elevation view of the cantilevered structural support 10 shown in FIGURE 2, while FIGURE 4 provides a side elevation view. FIGURE 5 is a top plan view of the cantilevered structural support shown 10 in FIGURE 2. FIGURES 3-5 further illustrate the anchor bolts and plates used to secure the support member 32 to the counterbalance 34 in this embodiment of the invention.

Another exemplary embodiment of the invention is shown in FIGURES 6-8 in which a cantilevered structural support 50 has a support member 52 and a counterbalance 54. The support member 52 is attached to the counterbalance 54 by way of welded head studs (Nelson studs) 56 and a plate 58 embedded in the counterbalance 54. The embedded plate 58 and head studs 56 are preferably set in the counterbalance 54 when the counterbalance is formed. The support member 52 is attached to the embedded plate 58 by way of a secure bonding, such as a continuous weld, along the edges 60 of the support member 52 that contact the plate 58. FIGURE 6 is a front elevation view of this embodiment of the invention, while FIGURES 7 and 8 provide a side elevation view and top plan view of the same.

In other embodiments of the invention, the support member may be attached to the counterbalance by way of bolts, epoxy, or expansion anchors. In applications where the support member and counterbalance are both formed of concrete, the support member

may be attached to the counterbalance by way of reinforcing steel dowels, inserts, rebar with mechanical couplers, epoxy grouting of rebar into the concrete, or tiebacks.

Depending on the conditions of the soil where the counterbalance is set, the counterbalance may sit in the earth without further anchor. Other soil conditions may require further anchoring of the counterbalance to the earth. In these circumstances, known piling methods may be used, such as steel pilings, precast concrete pilings, auger-cast pilings, cast-in-place pilings, drilled pier, tiebacks, pin piles, and helical pier pilings. Dywidags may also be used to anchor the counterbalance in place.

The present invention is not limited by the shape or type of structure that the cantilevered structural support is designed to hold. FIGURE 1 illustrates in dotted line a freestanding structure 18 having a rectangular shape resting on top of the support members 12, 14. In other applications of the invention, the support members 12, 14 may be integrated into the structure being supported. The structure 18 may be occupied by persons or objects, or it may be a structure, such as a dock, that is designed with a surface on which people can walk. In a dock application, the cantilevered portions 26 of the support members 12, 14, and the structure 18 (*i.e.*, dock) extend outward over the surface of the water. Further attachments may be connected to the dock for securing boats that are in the water. The structure 18 may further be configured as a boathouse that permits a boat to park between the support members 12 and 14.

While preferred embodiments of the invention have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention. The scope of the invention, therefore, should be determined from the following claims and equivalents thereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A cantilevered structural support comprising a counterbalance and an elongate support member, the elongate support member having a secured portion that is attached to the counterbalance and a cantilevered portion extending outward from the counterbalance to support a freestanding structure having a footprint area, wherein when one or more cantilevered structural supports are used to support the structure, the cantilevered portions of the support members are configured to support 40% or more of the footprint area of the structure.

2. The cantilevered structural support of Claim 1, further comprising one or more anchor bolts and one or more plates attached thereto, the anchor bolts extending into the counterbalance and the plates extending across the support member to attach the support member to the counterbalance.

3. The cantilevered structural support of Claim 1, further comprising a plate secured to the counterbalance, wherein the elongate support member is secured to the plate to attach the support member to the counterbalance.

4. The cantilevered structural support of Claim 3, wherein a weld is used to secure the support member to the plate.

5. The cantilevered structural support of Claim 3, wherein the plate is embedded in the counterbalance.

6. The cantilevered structural support of Claim 3, wherein head studs embedded in the counterbalance are attached to the plate to secure the plate to the counterbalance.

7. The cantilevered structural support of Claim 1, wherein the counterbalance is formed of concrete.

8. The cantilevered structural support of Claim 1, wherein the elongate support member is a beam.

9. The cantilevered structural support of Claim 8, wherein the beam is an I-beam formed of steel.

10. The cantilevered structural support of Claim 8, wherein the beam is formed of concrete.

11. The cantilevered structural support of Claim 8, wherein the beam is formed of wood.

12. A method of constructing a cantilevered structural support, comprising providing a counterbalance and attaching an elongate support member to the counterbalance, the elongate support member having a secured portion that is attached to the counterbalance and a cantilevered portion extending outward from the counterbalance to support a freestanding structure having a footprint area, wherein when one or more of the cantilevered structural supports are used to support the structure, the cantilevered portions of the support members are configured to support 40% or more of the footprint area of the structure.

13. The method of Claim 12, further comprising:

(a) securing one or more anchor bolts in the counterbalance at locations proximal to the support member;

(b) placing one or more plates across the support member; and

(c) attaching the plates to the anchor bolts, whereby the support member is attached to the counterbalance.

14. The method of Claim 12, further comprising securing a plate to the counterbalance and securing the support member to the plate, whereby the support member is attached to the counterbalance.

15. The method of Claim 14, further comprising welding the support member to the plate.

16. The method of Claim 14, further comprising embedding the plate in the counterbalance.

17. The method of Claim 14, further comprising:

(a) embedding head studs in the counterbalance; and

(b) attaching the head studs to the plate to secure the plate to the counterbalance.

18. A method of supporting a freestanding structure, comprising forming one or more cantilevered structural supports having a counterbalance and an elongate support member attached thereto, the elongate support member having a secured portion that is attached to the counterbalance and a cantilevered portion extending outward from the counterbalance, and constructing the structure on the one or more cantilevered structural supports wherein the cantilevered portions of the support members support 40% or more of the footprint area of the structure.

19. The method of Claim 18, further comprising:

(a) securing one or more anchor bolts in the counterbalance of each cantilevered structural support at locations proximal to the respective support member;

(b) placing one or more plates across the respective support member; and

(c) attaching the plates to the anchor bolts, whereby the respective support member is attached to the counterbalance.

20. The method of Claim 18, further comprising securing a plate to the counterbalance of each cantilevered structural support and securing each respective support member to the plate, whereby the respective support member is attached to the counterbalance.

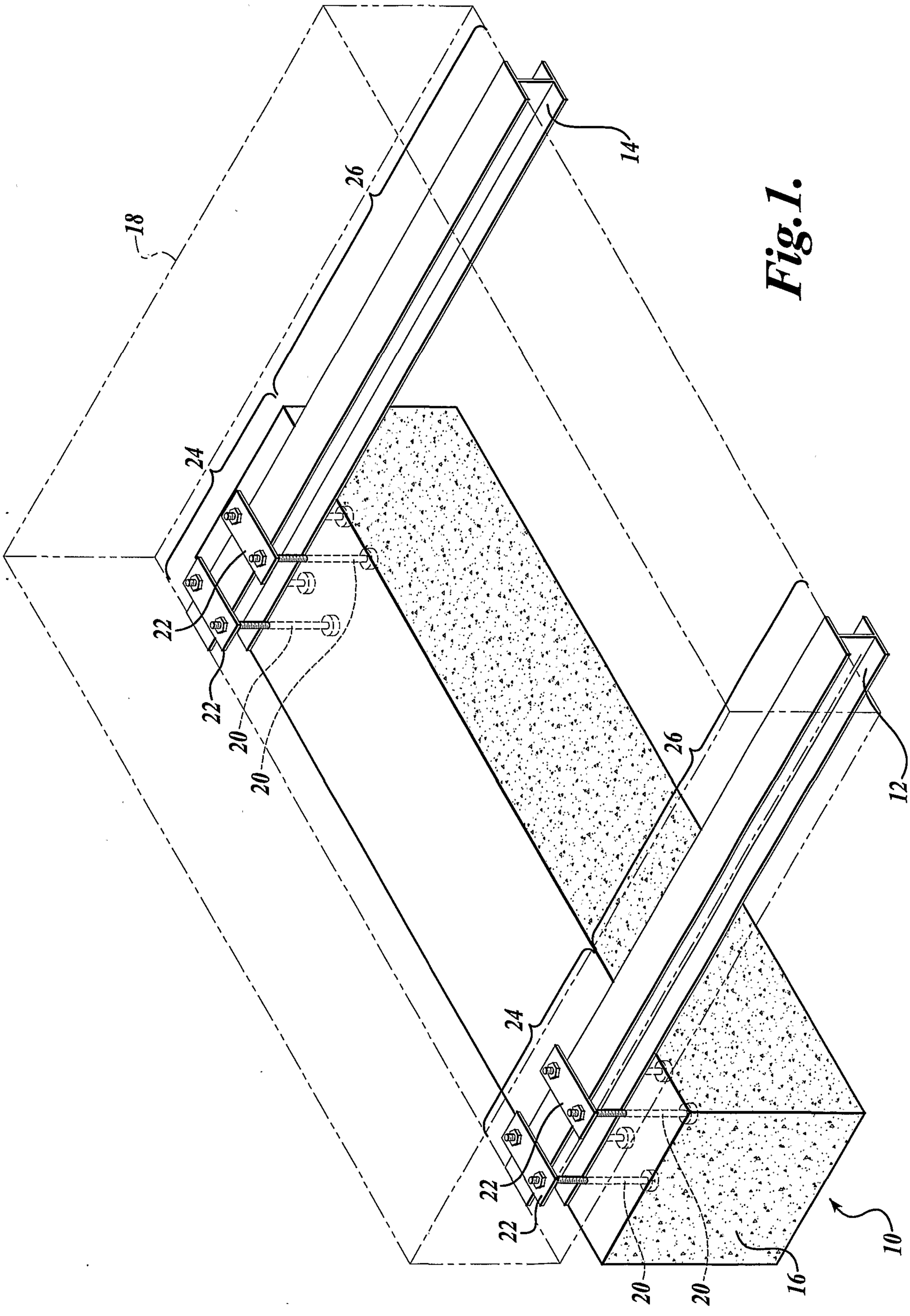
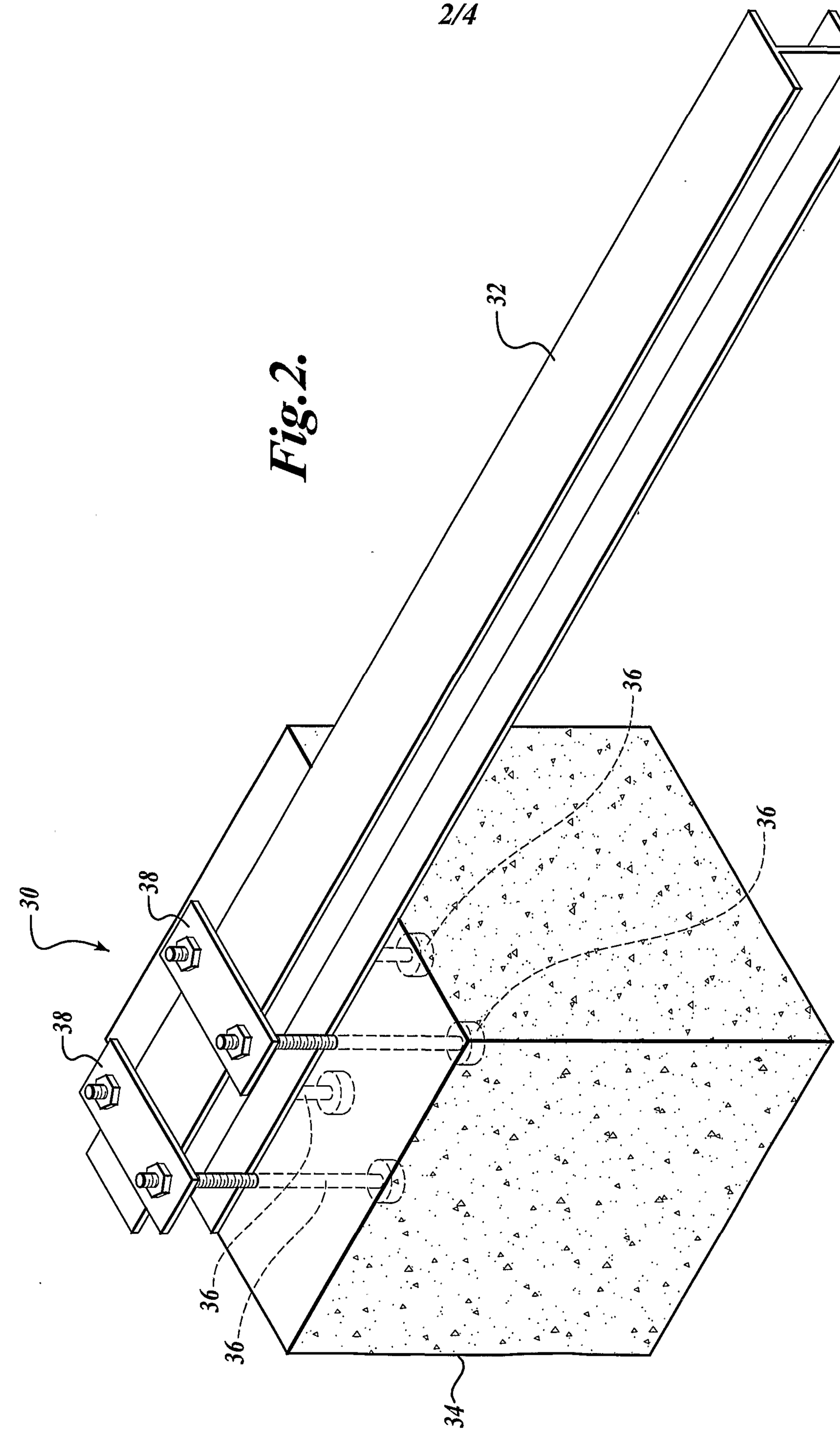


Fig. 1.

Fig.2.



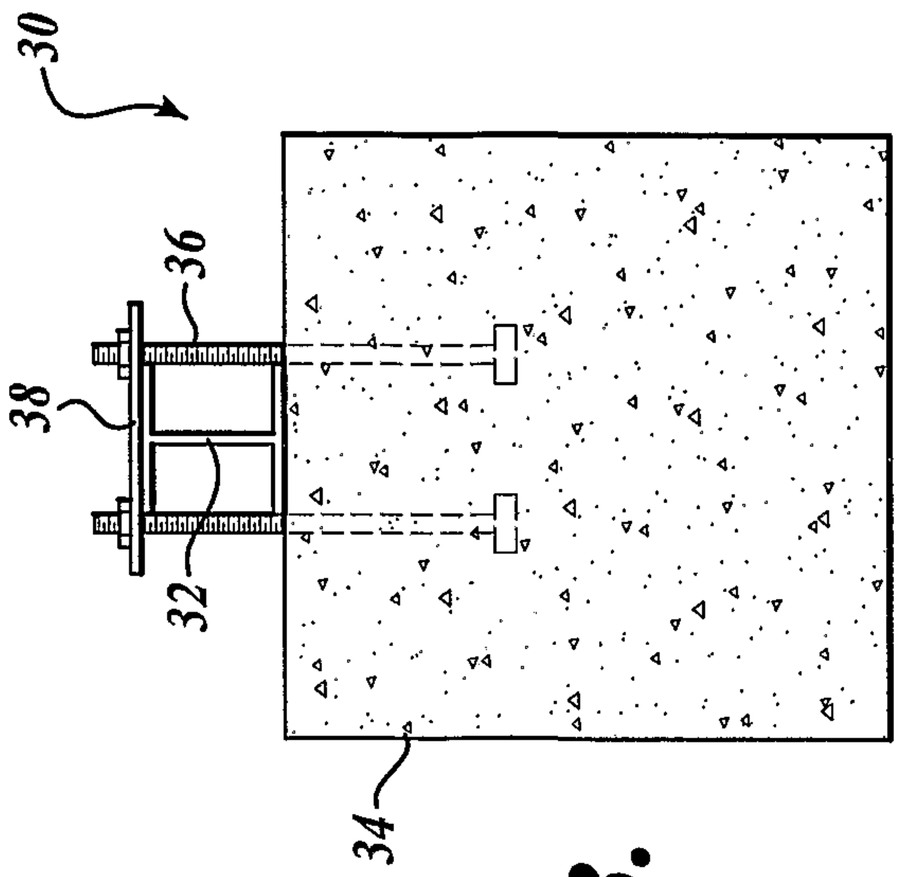


Fig.3.

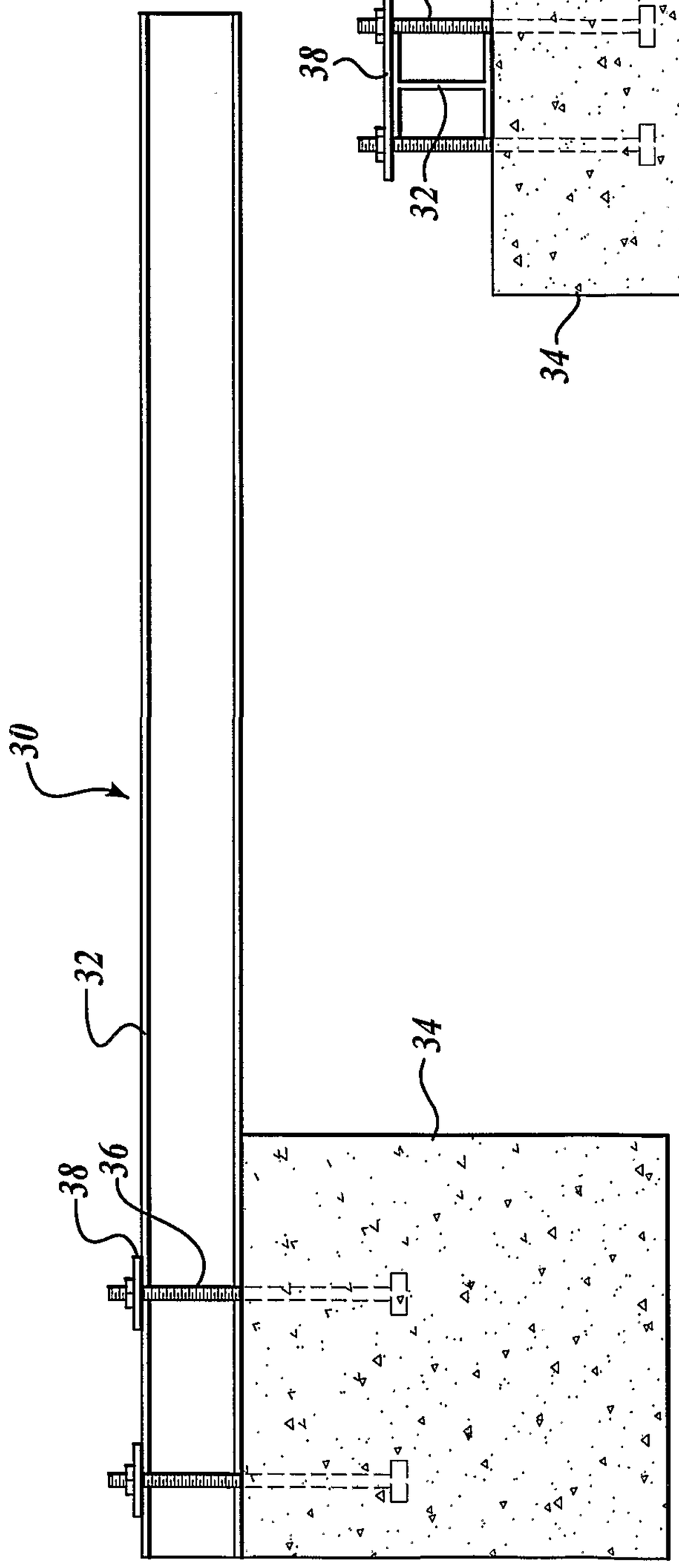


Fig.4.

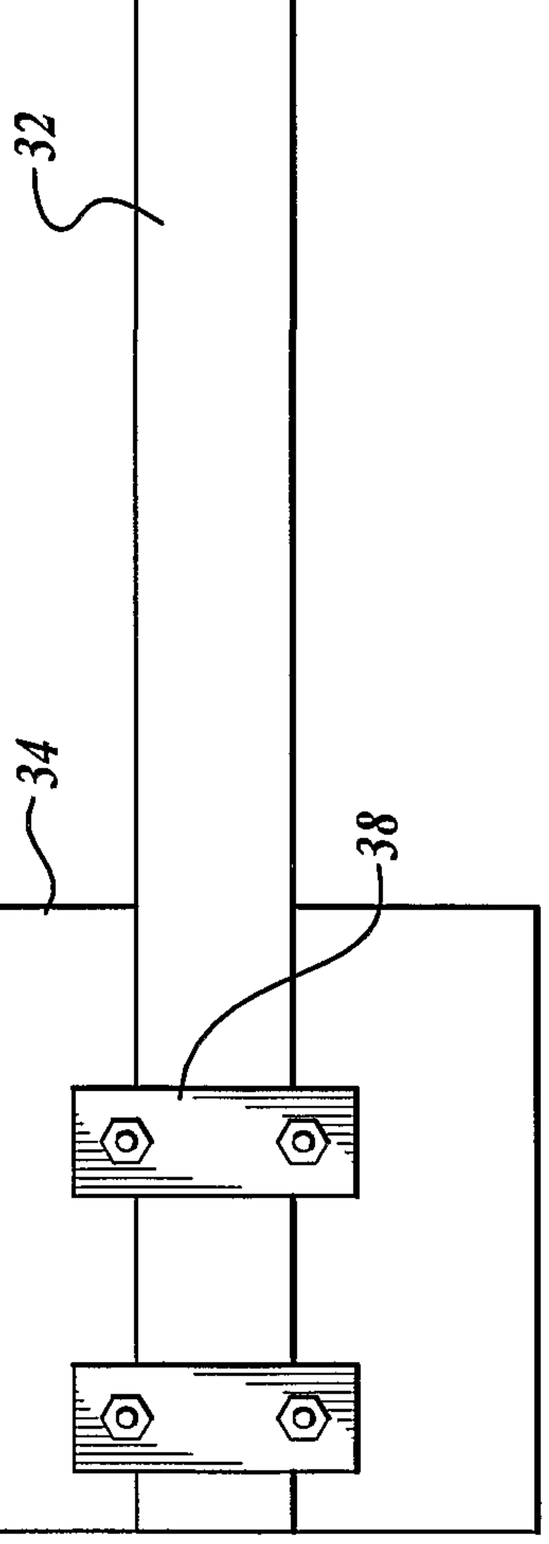


Fig.5.

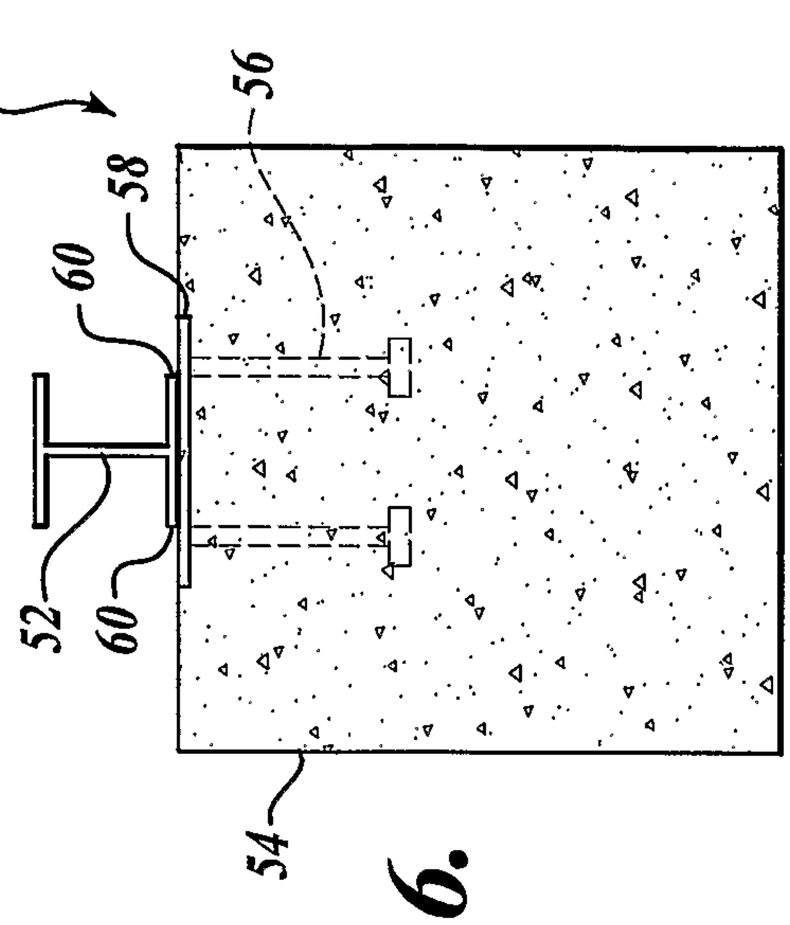
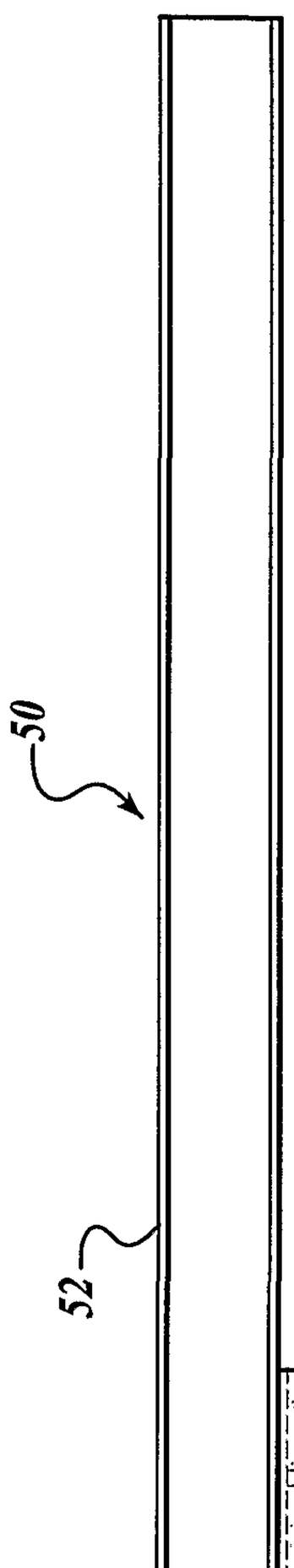


Fig. 6.



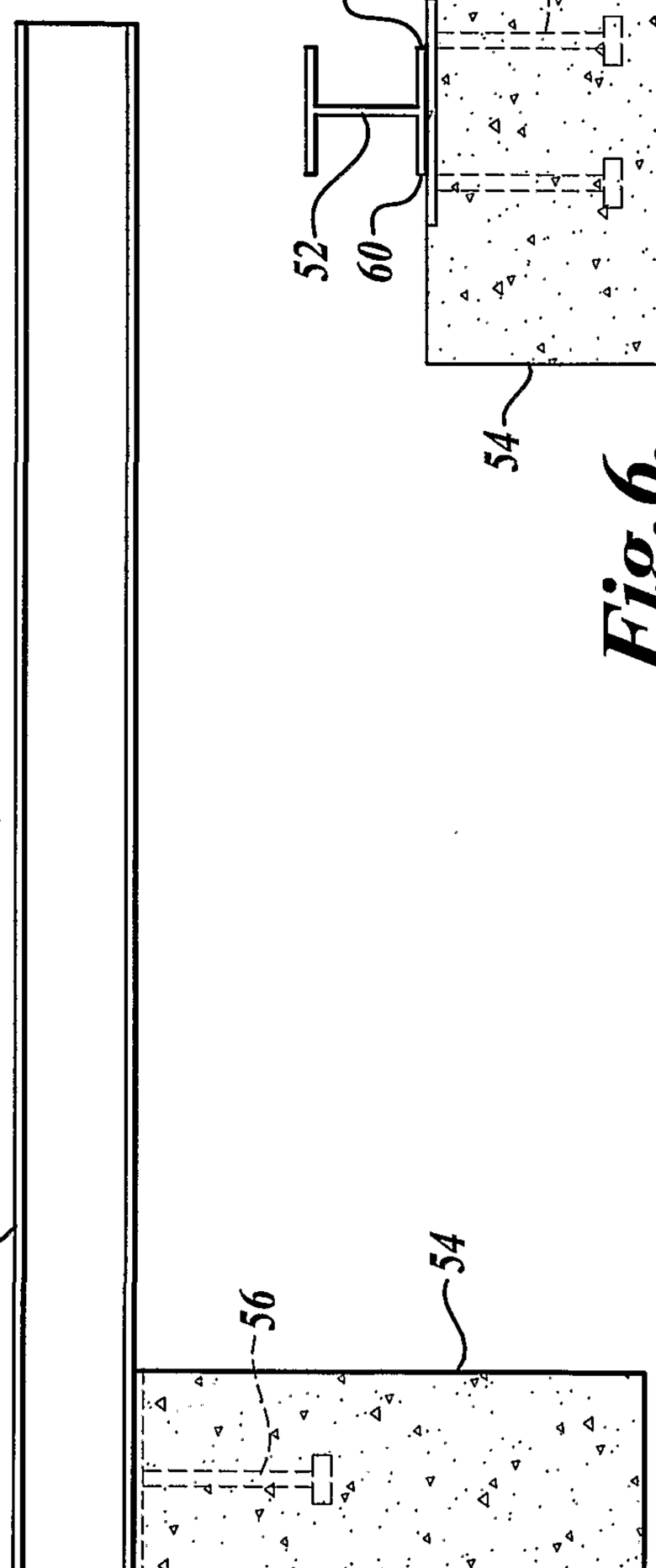


Fig. 7.

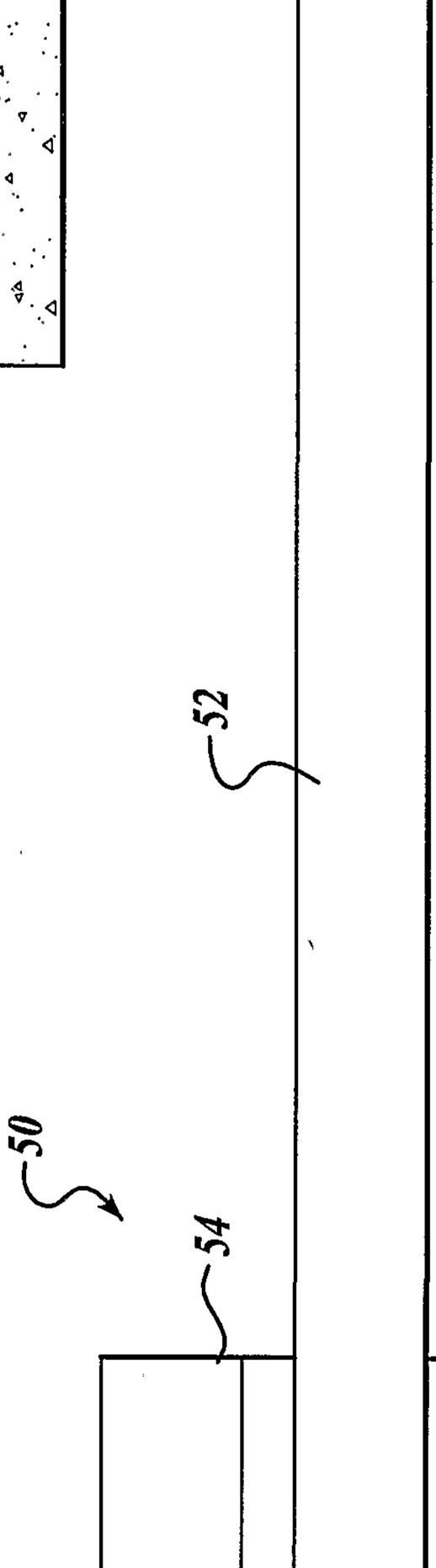
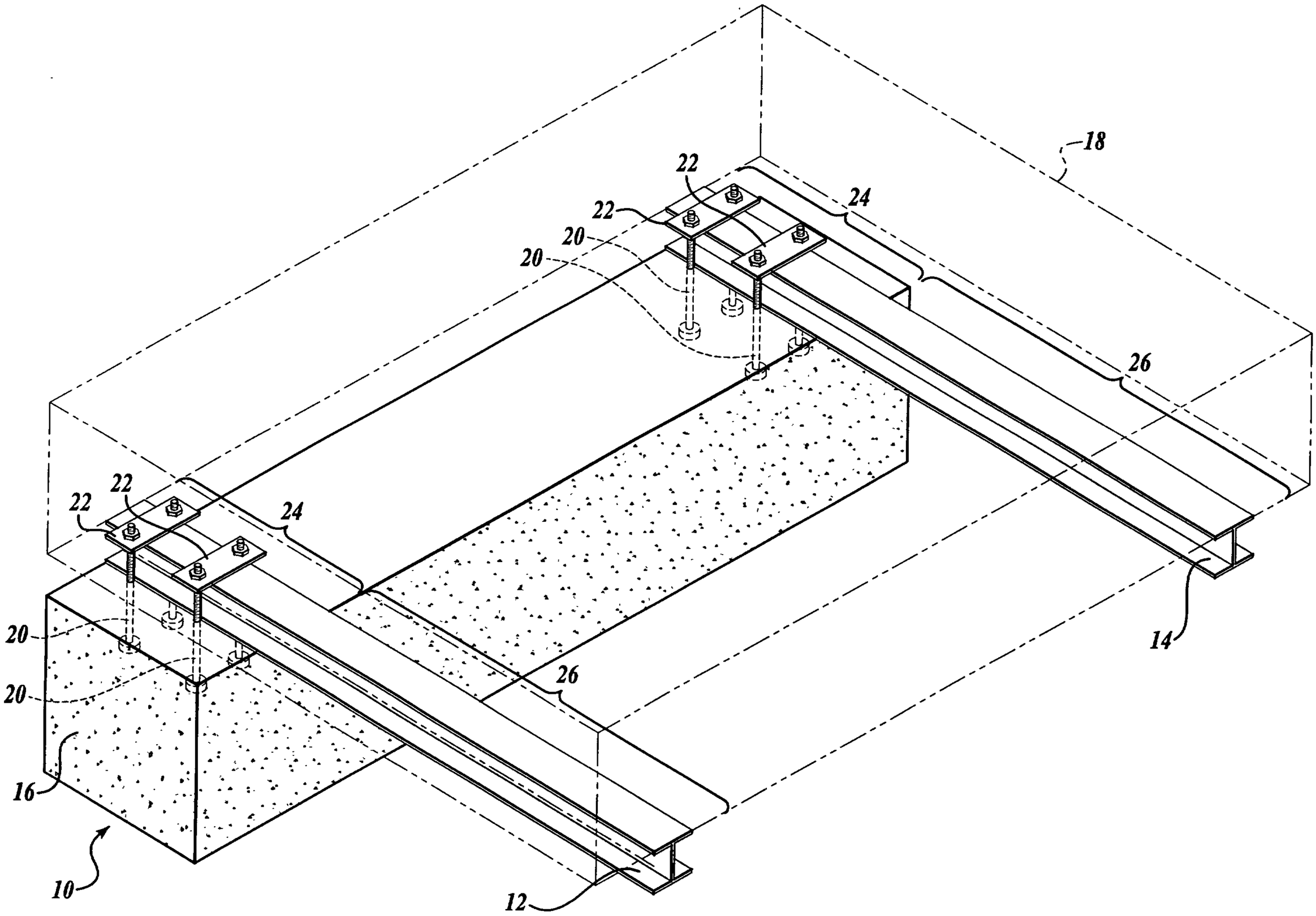


Fig. 8.


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