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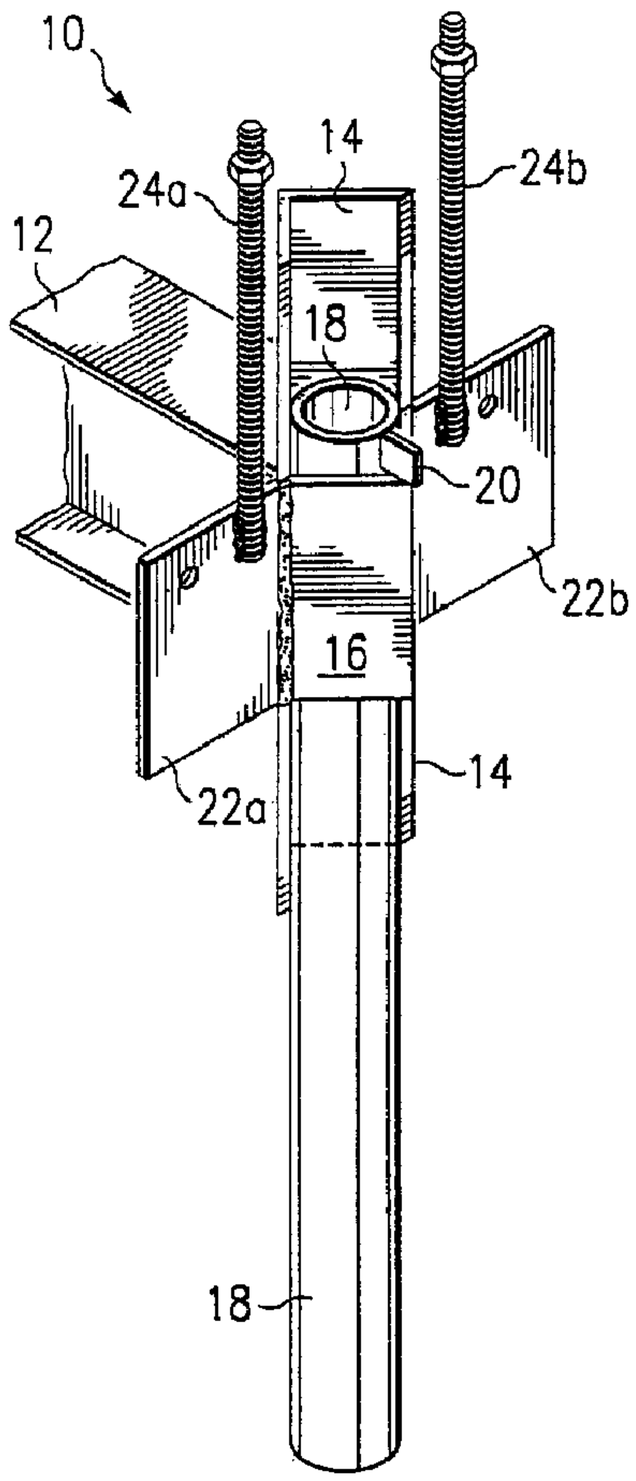
(54) Title: BUILDING FOUNDATION INSTALLATION SYSTEM



(57) Abrégé/Abstract:
A building foundation installation is provided. The building foundation installation includes a first piling having a helix formed at one end thereof for penetrating the ground, a first connecting member secured in the other end portion of the piling; a second piling for

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(57) Abrégé(suite)/Abstract(continued):
supporting a load, a second connecting member secured one end portion in the second piling, and a third connecting member connecting the first and second connecting sections and therefore the pilings in an abutting, end-to-end relationship.

Abstract

A building foundation installation is provided. The building foundation installation includes a first piling having a helix formed at one end thereof for penetrating the ground, a first connecting member secured in the other end portion of the piling; a second piling for supporting a load, a second connecting member secured one end portion in the second piling, and a third connecting member connecting the first and second connecting sections and therefore the pilings in an abutting, end-to-end relationship.

Building Foundation Installation System

This invention relates to a system and method for raising and supporting a building and to a system and method for connecting elongated sections, such as pilings, conduits, and the like, in an end-to-end, abutting, relationship for form pilings for the raising and support system.

Brief Description of the Drawings

Figs. 1-3 are isometric views depicting the raising and supporting system of the present invention in various stages of operation; and

Figs. 4 and 5 are front elevational views of the system of Figs. 1-3 showing additional stages of operation.

Fig. 6 is an exploded, isometric view of the connecting system according to an embodiment of the present invention shown with two elongated piling sections to be connected.

Fig. 7 is a partial, longitudinal sectional view of the system and sections of Fig. 6 shown in an assembled condition.

Fig. 8 is a cross-sectional view taken along the line 8-8 of Fig. 7.

Fig. 9 is a partial elevational view of a building foundation installation utilizing the system of Figs. 6-8.

Fig. 10 is an exploded, isometric view of the connecting system according to an embodiment of the present invention shown with two elongated piling sections to be connected.

Detailed Description

Referring specifically to FIG. 1 of the drawings, the reference numeral 10 refers, in general, to the lifting assembly of the present invention which includes a lifting arm 12, in the form of an I-beam, which extends under the foundation or slab to be lifted. A relatively long channel iron 14 is welded to one end of the lifting arm 12 and extends perpendicular thereto. A relatively short channel iron 16 is welded to the channel iron 14 along their respective corresponding longitudinal edges to define an opening for receiving a support sleeve 18. A lip 20 is welded to the upper end portion of the sleeve 18 which engages the channel iron 16 to maintain the sleeve in the position shown with the upper end portion extending slightly above the channel irons 14 and 16, for reasons to be explained.

A pair of mounting plates 22a and 22b are welded to the respective corresponding welded edges of the channel irons 14 and 16 and each has an opening extending there through. A pair of threaded rods 24a and 24b are welded to the plates 22a and 22b, respectively and extend upwardly therefrom for reasons to be described.

FIG. 2 depicts the apparatus of FIG. 1 with a hydraulic drive assembly mounted thereon. The reference numeral 26 refers, in general, to a driving, or clamping, assembly, which includes a gripping sleeve 28. Although not clear from the drawings, it is understood that the sleeve 28 is in the form of a conventional "slip bowl" for grabbing or clamping over a pipe and, as such, includes three inner arcuate inserts (not shown) which are tapered in a vertical direction so that they will grab, or clamp, a pipe segment of a predetermined diameter during downward movement, and slide over the pipe segment during upward movement, in a conventional *manner. A* pair of mounting plates 30a and 30b are connected to, and extend from, diametrically opposite portions of the sleeve 28 and each has an opening extending there through. This clamping assembly 26 is disclosed in more detail in applicant's U.S. Patent No. 4,765,777, the disclosure of which is hereby incorporated by reference.

A pair of hydraulic ram units 32a and 32b are adapted for installation between

the respective plates 22a and 30a, and the plates 22b and 30b. The ram units 32a and 32b include a pair of arms 34a and 34b, respectively, which are connected to pistons (not shown) which reciprocate in the ram units in response to actuation of the units, in a conventional manner. This reciprocal movement of the pistons causes corresponding movement of the arms 34a and 34b between the extended position shown in FIG. 2 and a retracted position.

The ram units 32a and 32b include a pair of clevises 36a and 36b respectively, which are connected to the respective ends of the arms 34a and 34b. The clevises 36a and 36b extend over the plates 30a and 30b, respectively and are connected to the latter plates by a pair of bolts. In a similar manner, a pair of clevises 38a and 38b are connected to the lower ends of the ram units 32a and 32b, respectively, extend over the plates 22a and 22b, and are connected to the latter plates by a pair of bolts.

The sleeve 28 of the clamping assembly 26 extends around a piling, or pipe assembly, shown in general by the reference numeral 40 which comprises a plurality of pipe segments connected together in a conventional manner. Due to the tapered configuration of the above-described arcuate inserts, the clamping assembly 26 can be manually lifted upwardly on the piling assembly 40 without encountering substantial resistance. When the hydraulic ram units 32a and 32b are then retracted, the clamping assembly 26 moves downwardly over the piling assembly 40 and the inserts grab, or clamp, the outer surface of the pipe assembly and force it downwardly, as will be described in further detail later.

To install the lifting assembly 10, the area around the foundation to be lifted is initially excavated and the lifting assembly is placed in the excavated area with the lifting arm 12 extending underneath the house (not shown) and against the lower surface of the foundation. The sleeve 18 is inserted through the opening defined by the channel irons 14 and 16 and driven into the ground until the lip 20 engages the upper end of the channel iron 16. The sleeve can be driven manually or by use of the hydraulic ram units 32a and 32b in the manner described herein.

A section of the piling assembly 40 is then placed in the sleeve A and the clamping assembly 26 is placed over the upper portion of the piling assembly. The hydraulic ram units 32a and 32b, in their extended positions shown in FIG. 2, are then installed between the respective plates 22a and 30a and the plates 22b and 30b, respectively.

The ram units 32a and 32b are then actuated simultaneously to cause a retracting motion of their corresponding pistons, and therefore the arms **34a and 34b,** to force the clamping assembly 26 downwardly. As a result, the sleeve 28 grabs the piling assembly 40 and forces it downwardly into the ground for a predetermined distance. The ram units 32a and 32b are then simultaneously actuated back to their expanded condition, moving the clamping assembly 26 upwardly to an upper portion of the piling assembly 40, and the sequence is repeated. During this sequential driving of the piling assembly 40 into the ground, additional pipe segments may be added to the assembly 40 as needed.

It is understood that a shim (not shown) can be inserted between the side wall of the foundation and the upper end portion of the channel iron 14 as needed to stabilize and align the system during the above operation.

The above procedure is repeated until the lower end portion of the piling assembly 40 encounters resistance in the ground, 'which is usually in the form of bedrock or the like, in which case the aforementioned driving movement is terminated. After resistance is encountered the procedure depicted in FIGS. 3 and 4 is initiated. More particularly, the upper segment of the piling assembly 40 is cut off so that a few inches extend above the upper end of the sleeve 18. A drive plate 42 having two sleeves 44a and 44b at its ends is positioned over the upper piling segment with its lower edge engaging the segment and with the sleeves 44a and 44b extending over the rods 24a and 24b, respectively. A drive pipe segment 46 is then placed over the plate 42, with notches in the former extending over the upper edge of the latter.

As shown in FIG. 4 the clamping assembly 26 and the hydraulic ram units 32a

and 32b are installed in the manner described in connection with FIG. 2 with the sleeve 28 extending over the pipe segment 46. The arms 34a and 34b are expanded to the extent needed for the sleeve 28 to grasp the upper end portion of the pipe segment 46.

The ram units 32a are then retracted to exert a vertical force against the piling assembly 40 and therefore the plate 42 and the pipe segment 46. Since the piling assembly 40 can no longer be driven downwardly, the foundation will be lifted the desired amount causing the lifting arm 12, the channel iron 14 and 16, the plates 22a and 22b, and the rods 24a and 24b to move upwardly relative to the piling assembly 40, the plate 42, and the pipe segment 46 to the position shown in FIG. 5. Thus the plate 42 is spaced from its original position on the rods 24a and 24b a distance corresponding to the distance of the lift of the foundation.

A pair of nuts 48a and 48b are then advanced downwardly over the rods 24a and 24b, respectively until they engage the plate 42 to secure the assembly in the position of FIG. 5. The hydraulic ram units 32a and 32b along with the clamping assembly 26 and the pipe segment 46 are then removed, and the area around the assembly is filed with dirt.

Although only one lifting assembly 10 is shown in the drawing it is understood that, in actual practice, several will be used at once at different locations along the foundation depending on the extent of the damage, in which case, after all of the piling assemblies 40 have been driven into the ground until they encounter resistance, all of the ram units 32a and 32b associated with the piling assemblies are simultaneously actuated again in the manner described in connection with FIGS. 4 and 5 to raise the foundation, and therefore the house, a predetermined distance.

With reference to Figs. 6-8, the connecting system according to an embodiment of the present invention is shown, in general, by the reference numeral 60 and is adapted for connecting the corresponding ends of two piling sections 62 and 64 of the piling 40.

As shown in Fig. 7, the system 60 comprises two hexagonal fasteners 70 and 72

which are sized to extend in the end portions 62a and 64a of the sections 62 and 64, respectively. As shown in Fig. 8, the outer surface of each fastener 70 and 72 is hexagonal in shape, thus forming six planer surfaces and six angles, with the apexes of the angles between adjacent surfaces extending relative to the corresponding inner surfaces of the sections 62 and 64, respectively, with minimal clearance, as shown in Fig. 8 in connection with the fastener 72 and the section 64.

The fasteners 70 and 72 can be secured in the sections 62 and 64, respectively, by welding the outer planer surfaces of the fasteners to the corresponding inner surfaces of the sections. Due to the hexagonal outer surfaces of the fasteners 70 and 72, a plurality of weldments 74 are thus formed between the latter surfaces and the corresponding inner surfaces of the sections and between the above-mentioned apexes. The respective outer faces of the fasteners 70 and 72 extend flush with the corresponding ends of the sections 62 and 64 respectively, as shown in Fig. 8.

Each fastener 70 and 72 has an internally threaded bore, and an externally threaded rod 80 is provided which is sized to threadedly engage the bores of the fasteners as shown in Fig. 7. The length of rod 80 is at least equal to, or greater than, the combined widths of the fasteners 70 and 72. In the embodiment shown, in the assembled position of Fig. 7, the length of the rod 80 is greater than the combined widths of the fasteners 70 and 72, so that the end portions 80a and 80b of the rod 80 extend outwardly from the corresponding inner faces of the fasteners 70 and 72, respectively.

To assemble the sections 62 and 64 in an end-to-end abutting relationship as shown in Fig. 7, the fasteners 70 and 72 are secured in their respective end portions 62a and 64a, of the sections, as described above. Then, one end portion of the rod 80 is threadedly engaged with the outer face of the fastener 70 in the section 62, and the rod 80 is rotated relative to the fastener 70, or visa versa, so that the rod is advanced to an axial position relative to the fastener until the end portion 80a of the rod extends completely within the bore of the fastener, or until the end portion 80a extends

outwardly from the inner face of the fastener as shown.

The other section 64, with the fastener 72 secured therein, is then moved to a position where the other end portion 80b of the rod 80 threadedly engages the outer face of the fastener 72. Then the rod 80 is rotated relative to the fastener 72, or visa versa, so that the rod is advanced to an axial position relative to the fastener 72 until the corresponding end of the elongated 64 abuts the corresponding end of the elongated 62. In this position, the end portion 80b of the rod 80 extends completely within the bore of the fastener 72, or extends outwardly from the inner face of the fastener as shown. Of course, the sections 62 and 64 can also be assembled by initially engaging the rod 80 with the fastener 72 in the section 64 and then engaging the rod with the fastener 70 in the section 62 in the manner described above.

It is understood that the connection system 60 can be used to connect pilings in other types of building raising and support systems. For example, in the arrangement of Fig. 9, the sections 62 and 64 are connected together by the system 60 in the manner described above, and at least one transversely-extending, load-bearing section, in the form of as a metallic helix section 88, is secured, in any conventional manner, the elongated section 14 near its other end portion 14b. The sections 62 and 64 and helix section 88 form an elongated earth screw anchor assembly that can penetrate the ground G in a conventional manner and can be utilized in conjunction with other equipment to support and stabilize a building structure which has or may experienced settlement or movement.

According to the embodiment of Fig. 10, a connecting system according to an alternate embodiment is shown, in general, by the reference numeral 82 and includes two piling sections 84 and 86 which have internally threaded end portions 84a and 86a, respectively. Two fasteners 88 and 90 are provided each of which has an externally threaded outer surface sized to threadedly engage the internally threaded end portions 84a and 86a of the end sections 84 and 86, respectively. Each fastener 88 and 90 also has an internally threaded bore, and an externally threaded rod 92 is provided which is sized to threadedly engage the latter bore of each of the fasteners.

To assemble the system 82 the fasteners 88 and 90 are threadedly engaged in the corresponding end portions of the sections 84 and 86. Then the respective end portions of the rod 92 are threadedly engaged in the fasteners 88 and 90 so that the each end portion of the rod extends into the sections 84 and 86 for an axial length sufficient to permit the corresponding ends of the sections 84 and 86, in the assembled condition of the system 82, to abut. Otherwise, the embodiment of Fig.10 is identical to that of Fig 6.

Still other examples of systems to raise and support buildings are disclosed in U.S. Patent No. 5,951,206, U.S. Patent No. 5,722,798, and U.S. Patent No. 4,695,203, all assigned to the assignee of the present invention.

In this context, it is understood that in most installations of this type, multiple screw anchors, identical to the screw anchor described above, could also be used.

It is understood that variations may be made in the foregoing without departing from the scope of the invention, and examples of the variations are as follows:

. The sections 62 and 64 of the piling 40 do not have to have a circular cross sections but can take other shapes such as rectangular, square, etc, in which case the outer surfaces of the fasteners 70 and 72 would be shaped accordingly.

. The fasteners 70 and 72 are not limited to those having a hexagonal outer surface and the fasteners can be fastened into the interior of the sections 62 and 64 by other techniques, such as by as threaded connection or by adhesives, pins, clips, etc.

. The outer surfaces of the fasteners 70 and 72 do not have to extend flush with the corresponding ends of the sections 62 and 64 respectively but rather can extend in the sections a predetermined distance.

. The rod 80 can be directly welded into the interior of the section 62 and the fastener 72 attached to the section 64 as described above; after which the section 64/fastener 72 would be rotated relative to the rod 80, and therefore the section 72, until the corresponding end of the elongated 64 abuts.the corresponding end of the elongated 72.

. The length of the rod 80 can be varied so that, in the assembled condition of the sections 62 and 64, the ends of the rod at least extend flush with the corresponding inner faces of the fasteners 70 and 72, respectively, or outwardly from the latter faces a predetermined distance, including the distance shown in Fig. 7.

. The sections 62 and 64 are not limited to pilings sections, but could be in the form of any other type of tubular members such as pipes, conduits, etc. for transporting fluid, etc.

. The raising and supporting system 10 of the present invention can also be used in an identical manner to raise a concrete slab extending underneath the entire area of a building or a house. In the case of a concrete slab, the system 10 would be mounted on an outer wall of the slab.

. The clamping assembly 26 can be replaced with a block, or driving section

that engages the upper end of the piling 40 and, when forced downwardly by the ram units 32a and 32b, drives the assembly into the ground.

An external drive system can be provided to drive the sleeve 25 and then the piling 40 into the ground until a predetermined resistance is encountered, after which the ram units 32a and 32b can be installed and activated to raise the foundation or slab in the manner described above.

Since other modifications, changes, and substitutions are intended in the foregoing disclosure, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.

What is claimed is:

1. A building foundation installation comprising:

a first piling having a helix formed at one end thereof for penetrating the ground, and another end opposite the one end being a tubular portion;

a first connecting member in engagement and internally within the tubular other end of the first piling;

a second piling for supporting a load and having a tubular end portion;

a second connecting member in engagement and internally within the tubular end portion of the second piling; and

a third connecting member mounted internally within the first and second connecting members, and connecting the first and second connecting members and therefore the pilings, in an abutting, end-to-end relationship.

2. The system of claim 1 wherein each of the first and second connecting members has an internally threaded bore and wherein the third connecting member is an externally threaded rod adapted to threadedly engage the bores of the first and second connecting members to secure the pilings in the abutting, end-to-end relationship.

3. The system of claim 1 wherein the first and second connecting members are connected by weldments within their respective pilings.

4. The system of claim 3 wherein the outer surface of each of the first and second connecting members has a plurality of planar surfaces with an angle

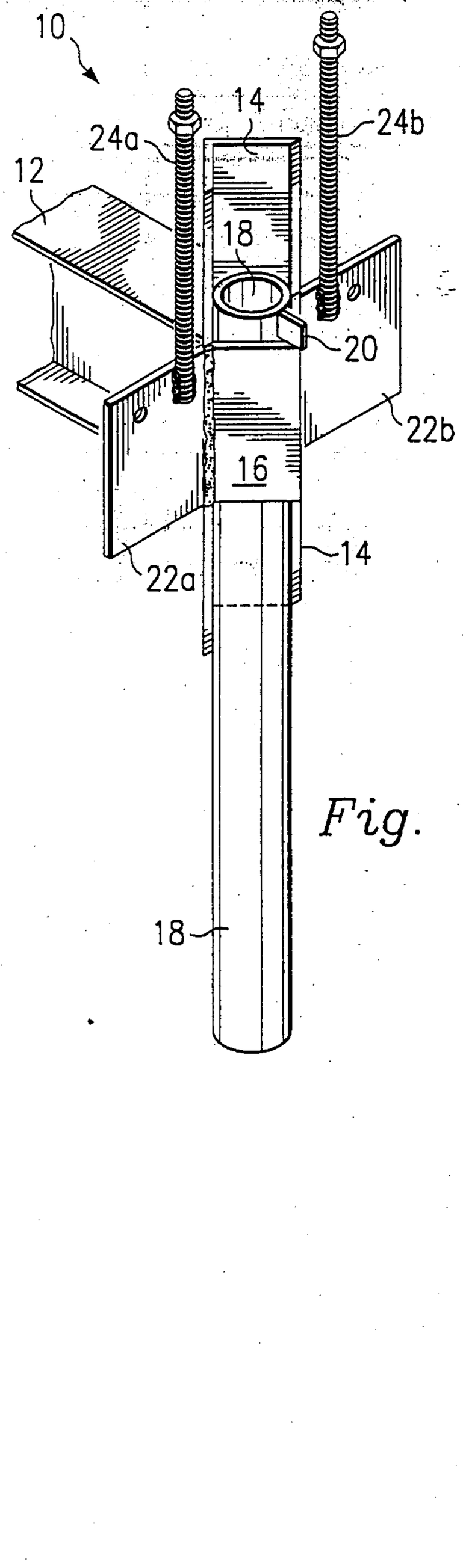
extending between adjacent planar surfaces, the apexes of the angles extending in their corresponding tubular ends with minimal clearance.

5. The system of claim 4 wherein the weldments extend between the planar surfaces of the connecting members and the corresponding inner surfaces of the corresponding tubular ends and between adjacent apexes.

6. The system of claim 1 wherein an external surface of each of the first and second connecting members extends substantially flush with the corresponding abutting tubular ends.

7. The system of claim 1 wherein the respective tubular ends of the first and second pilings are internally threaded, the respective first and second connecting members are externally threaded and in threaded engagement with the corresponding tubular ends of the first and second pilings.

8. The system of claim 7 wherein an external surface of each of the first and second connecting members extends substantially flush with the corresponding abutting tubular ends.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24b
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22b
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22a
18

Fig. 1

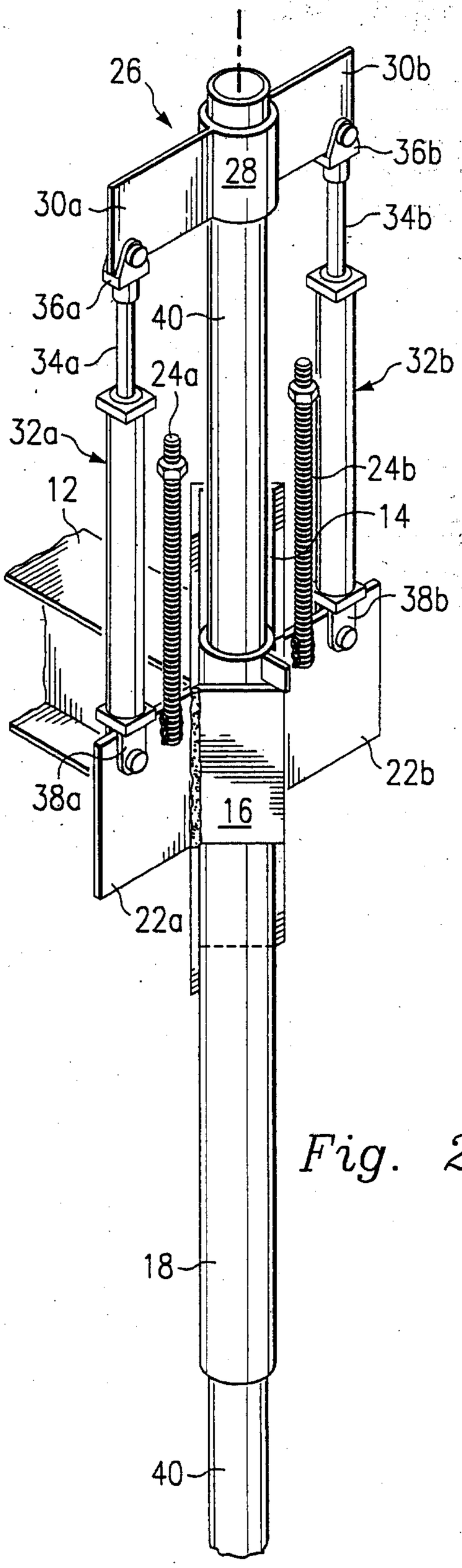
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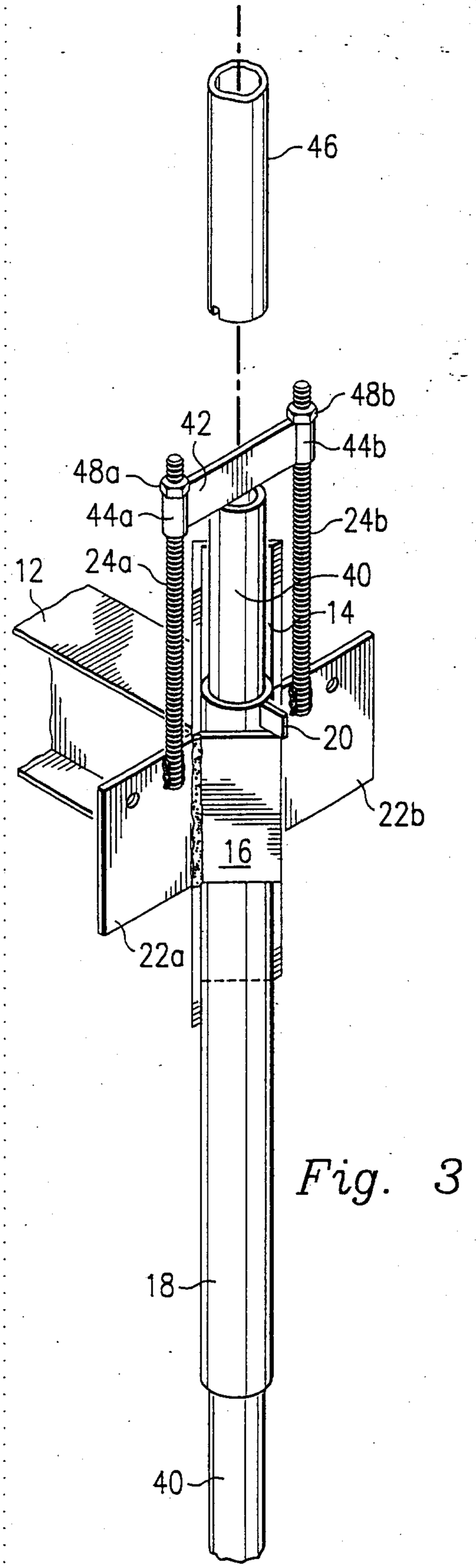
Fig. 2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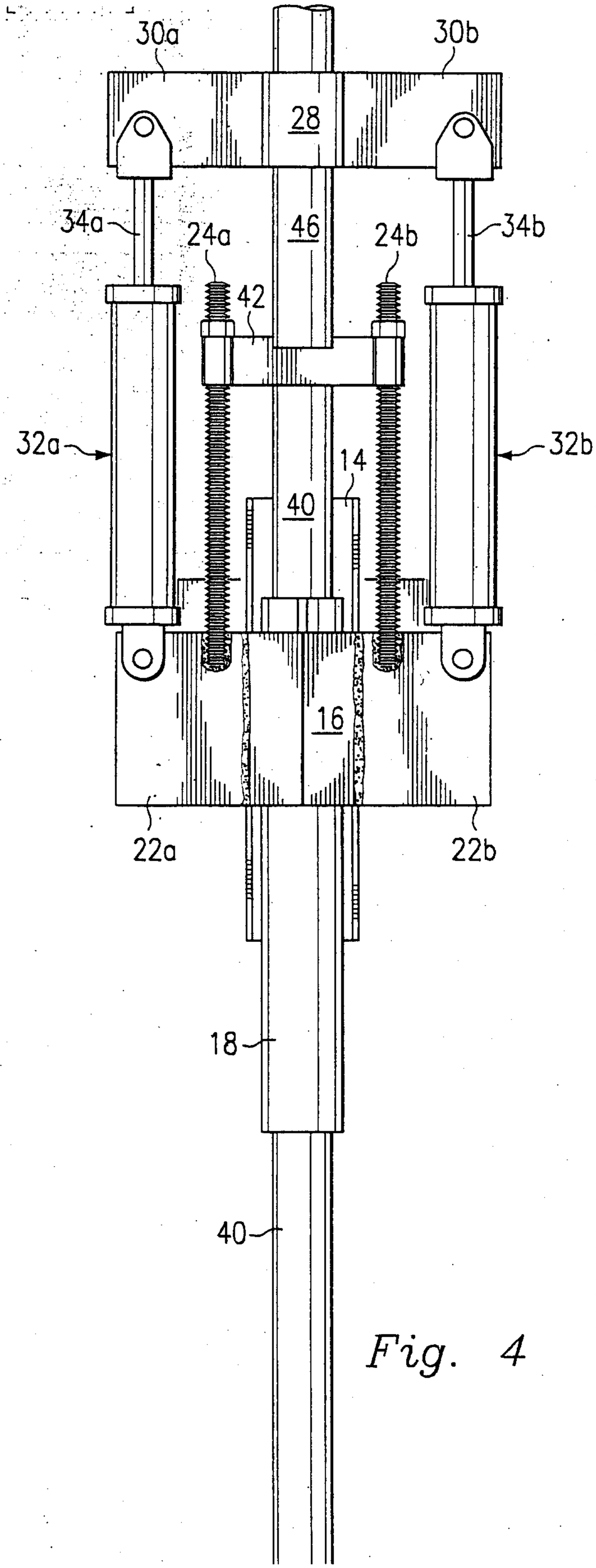
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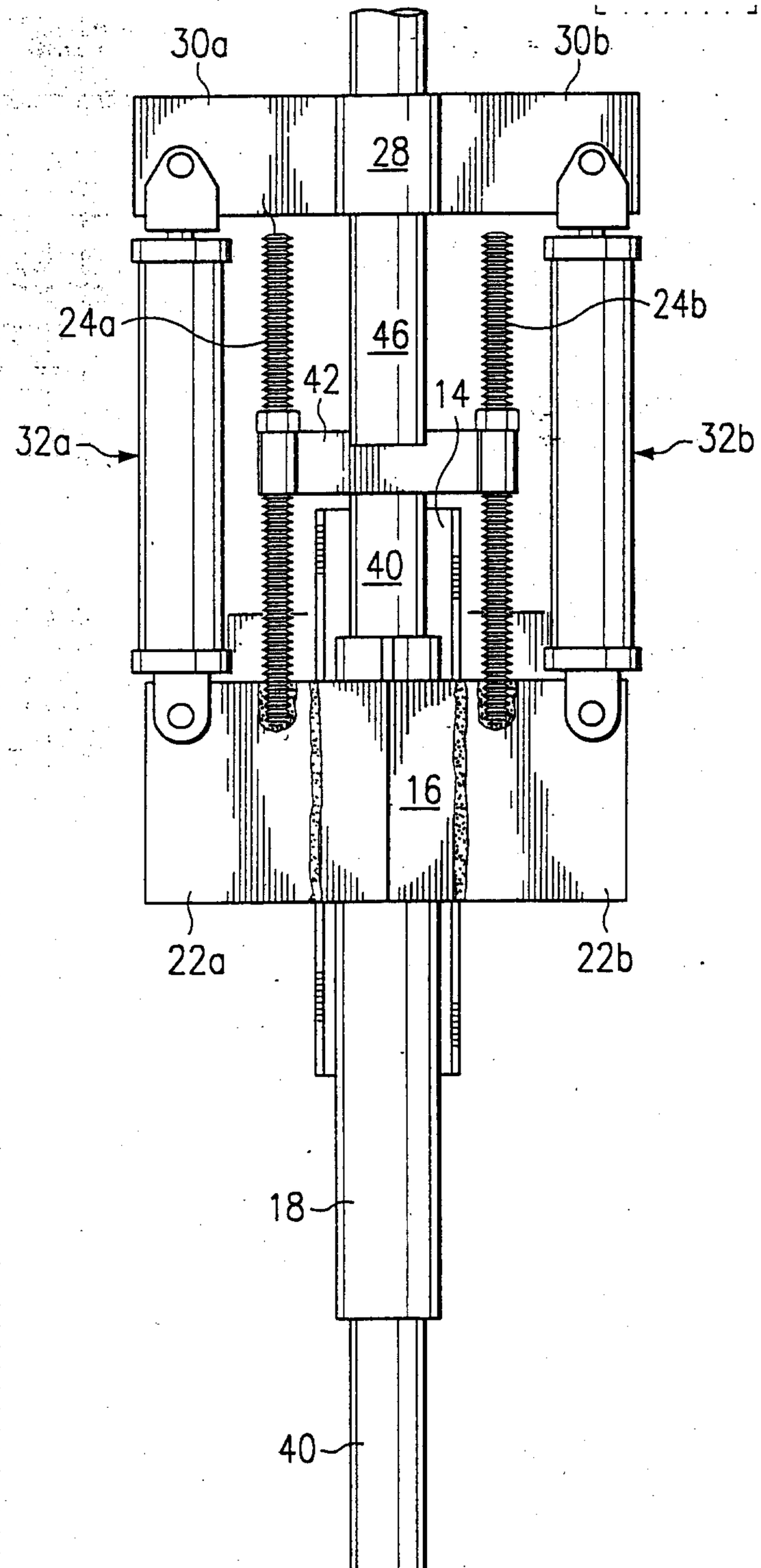
Fig. 4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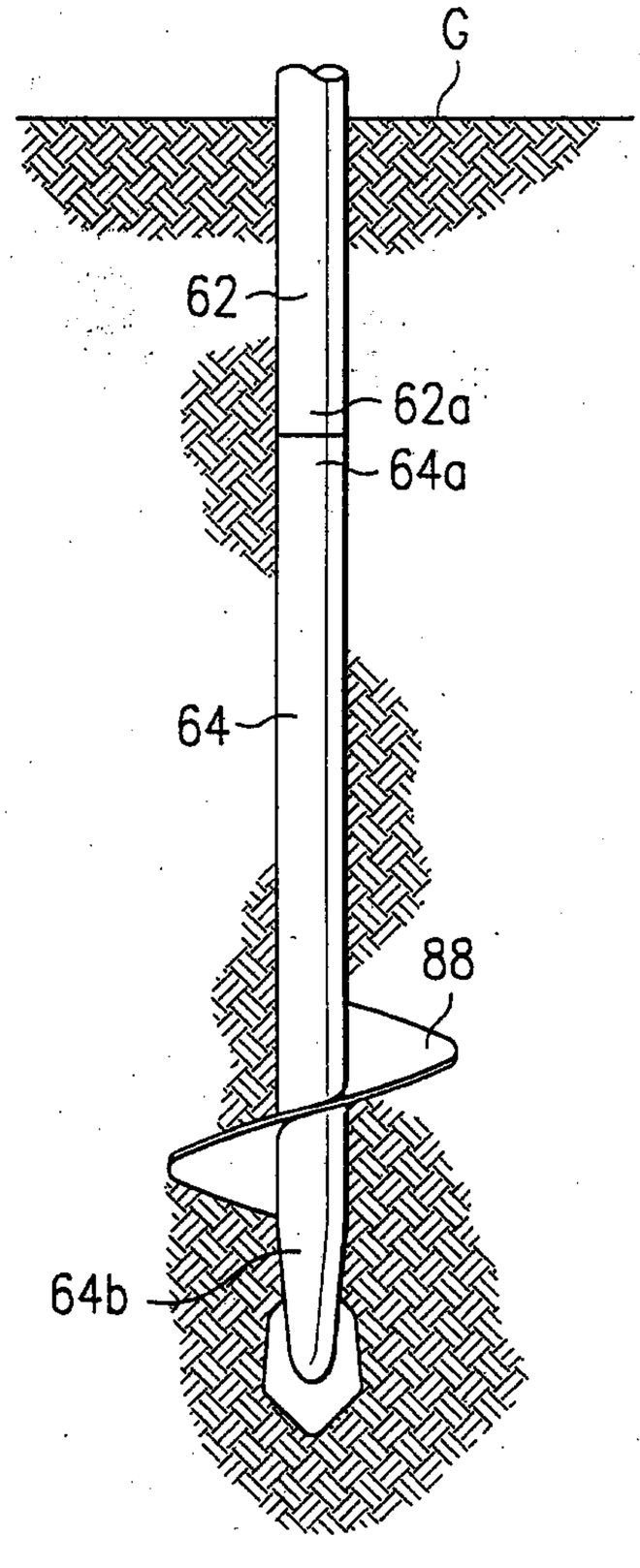
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64b

Fig. 9

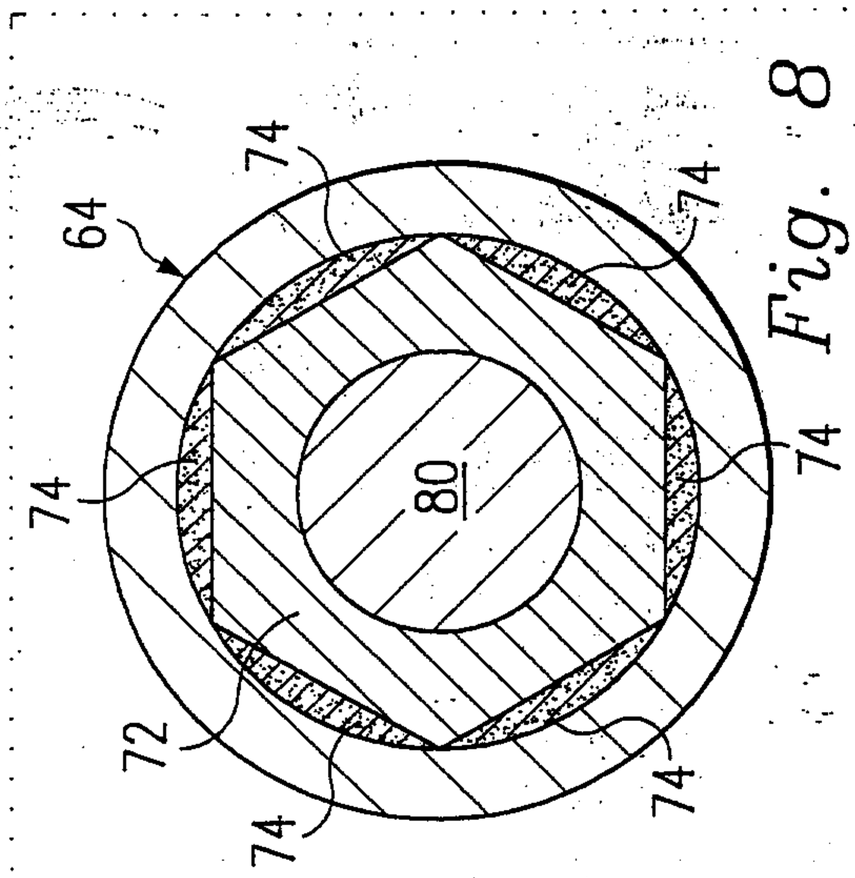


Fig. 8

Fig. 8

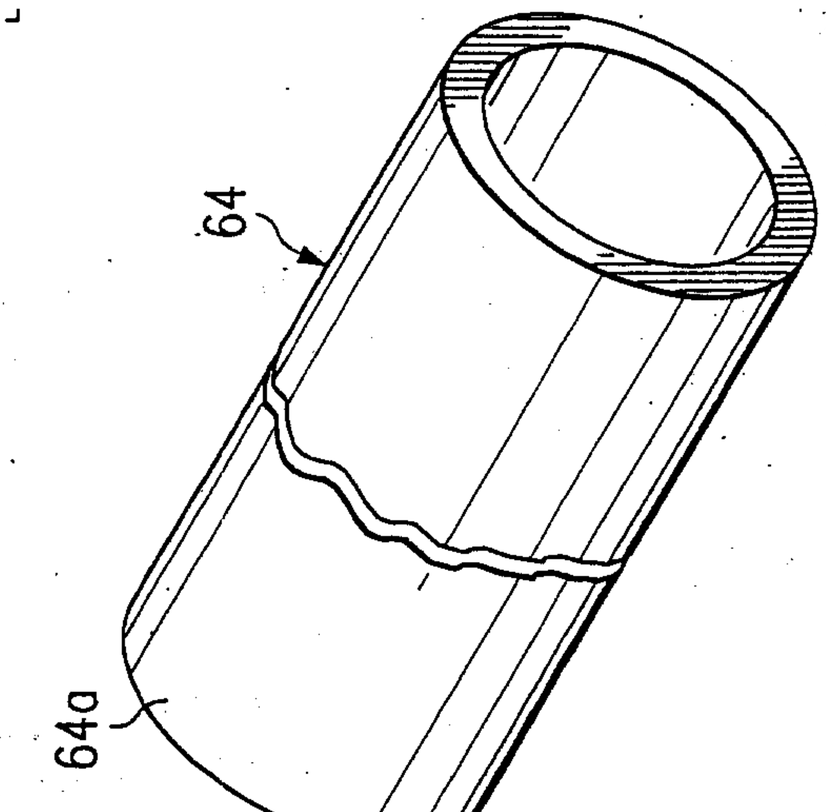


Fig. 8

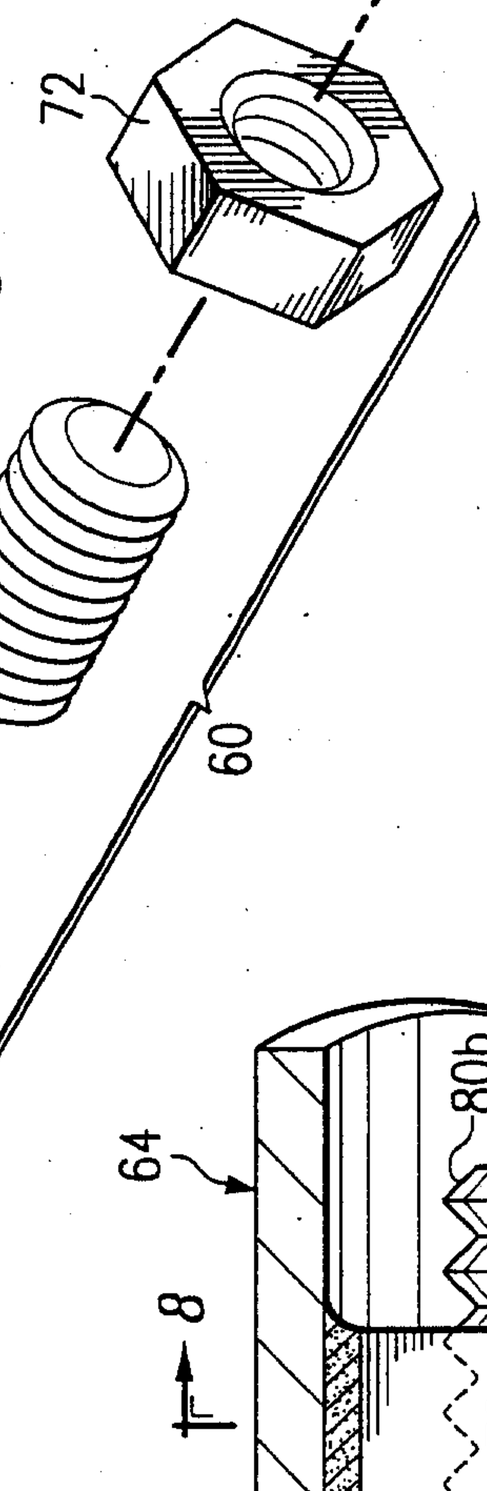
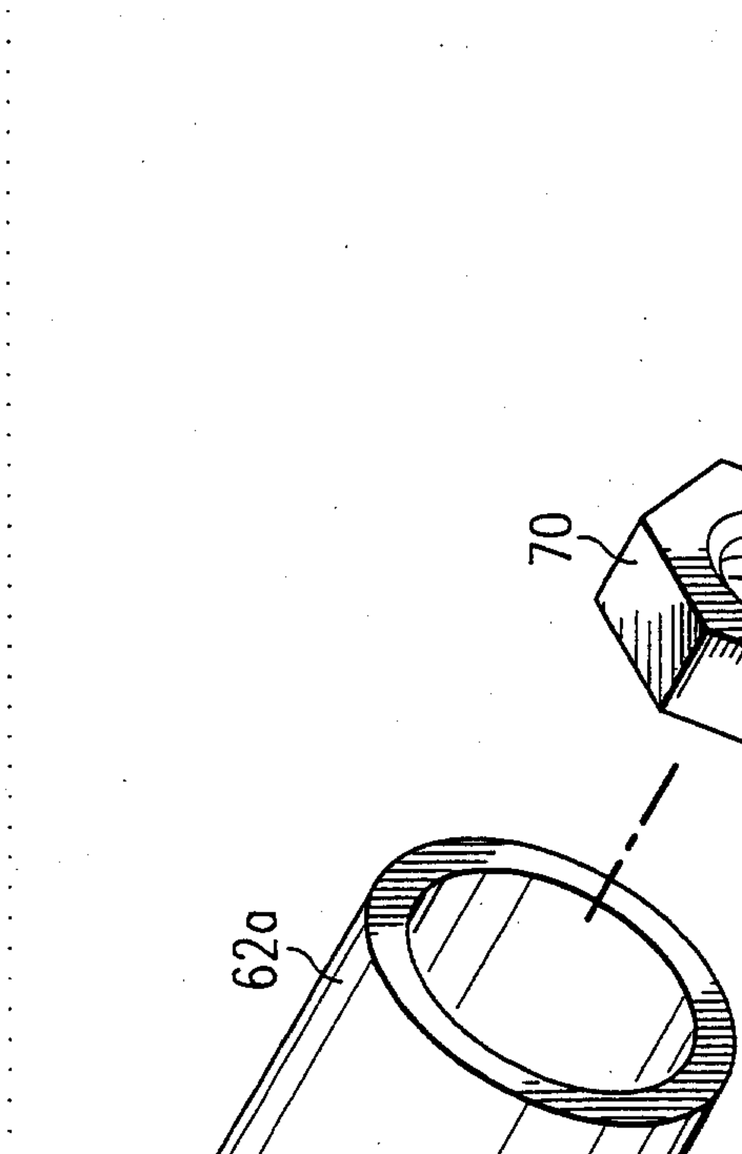


Fig. 6



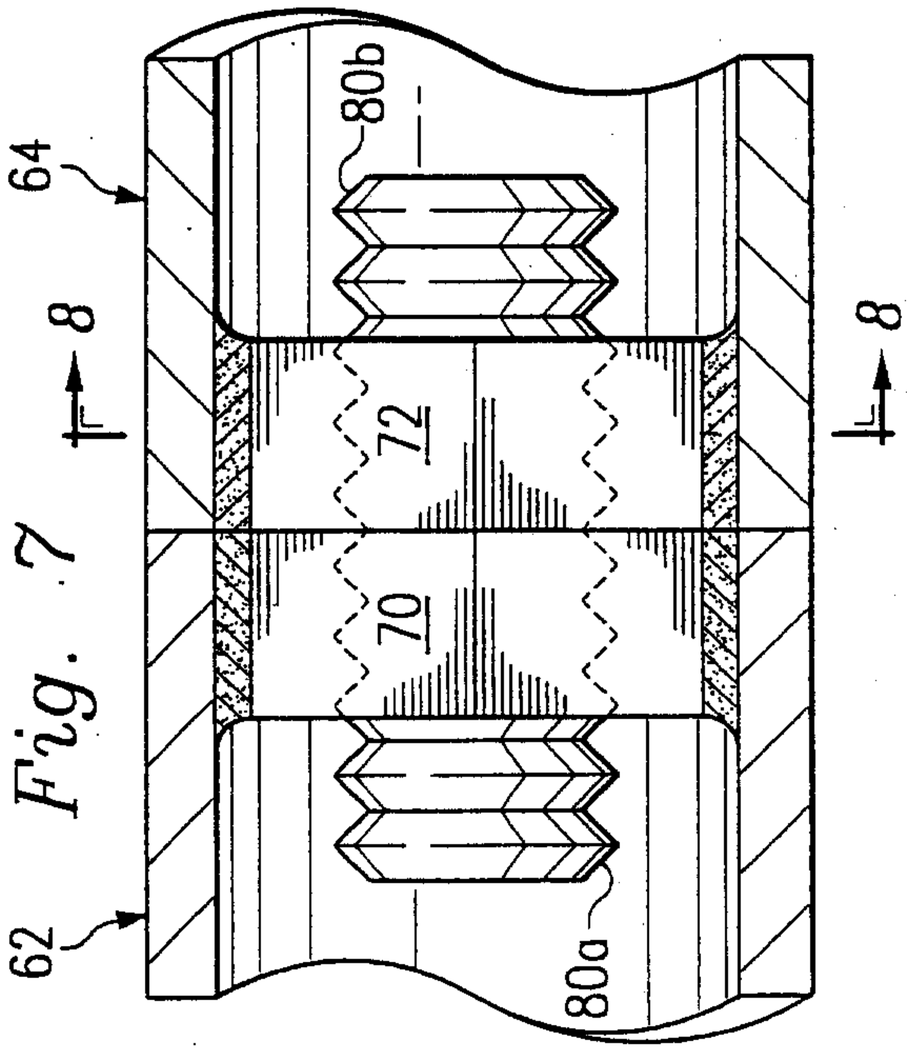


Fig. 7

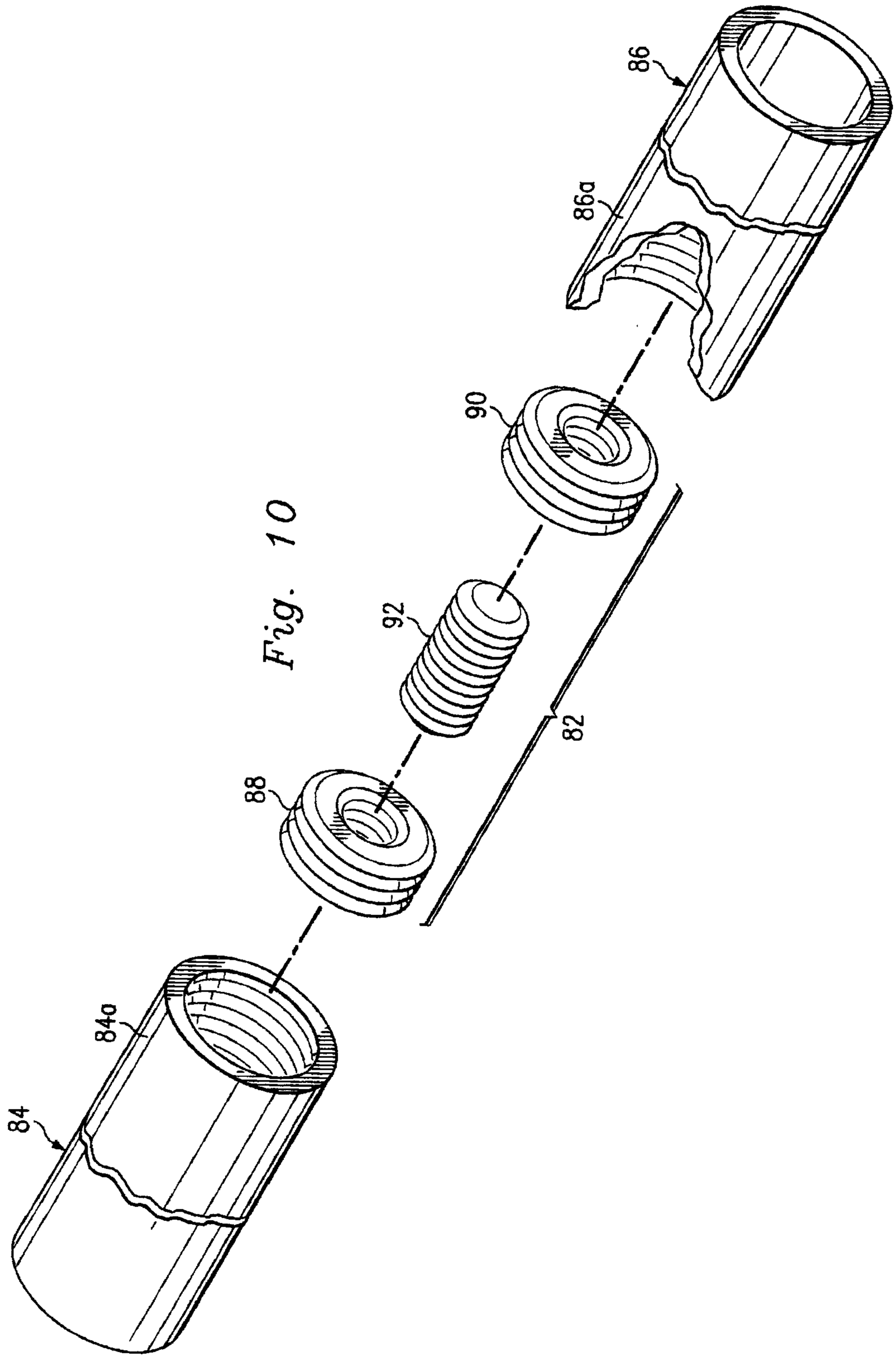
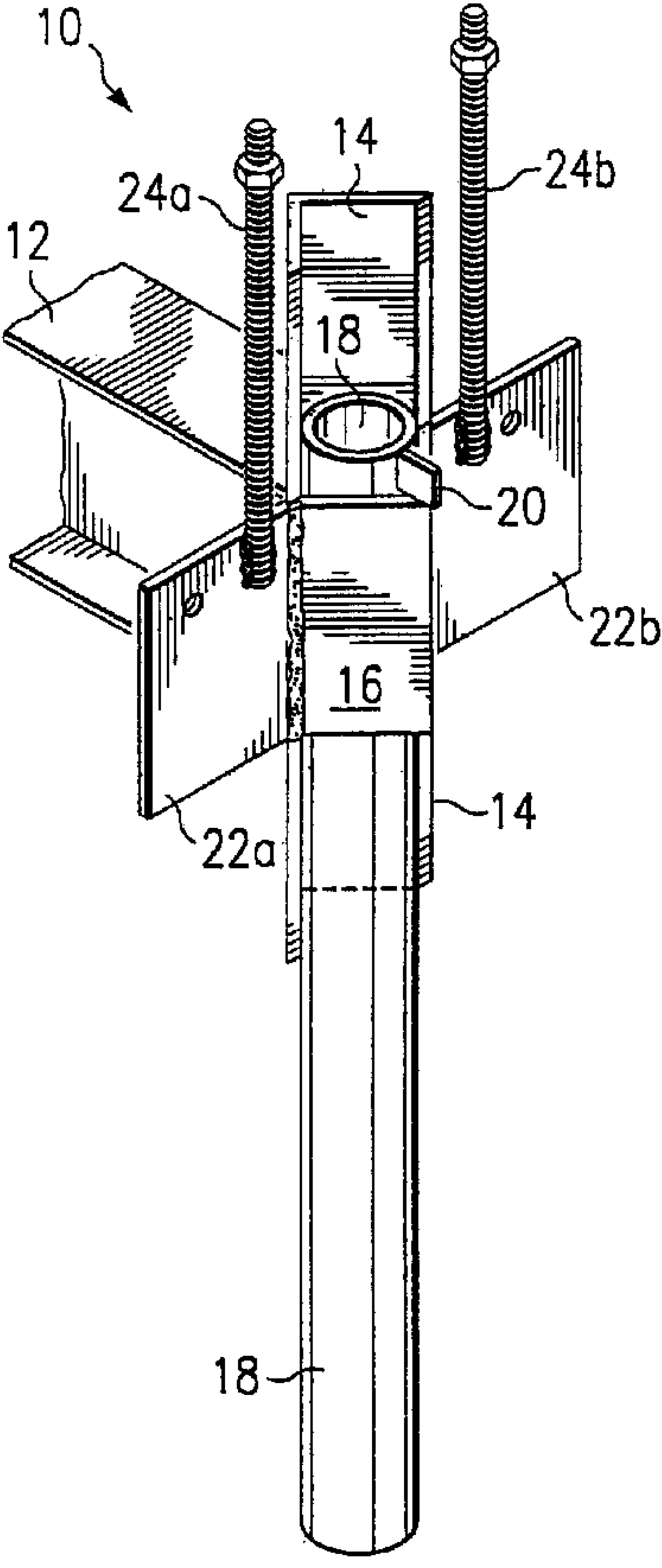


Fig. 10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