(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 664 732 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.11.2013 Bulletin 2013/47

(51) Int Cl.:
E04G 21/18 *(2006.01)* ***E04F 11/18*** *(2006.01)*

(21) Application number: **13167509.2**

(22) Date of filing: **13.05.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **16.05.2012 US 201261648001 P**

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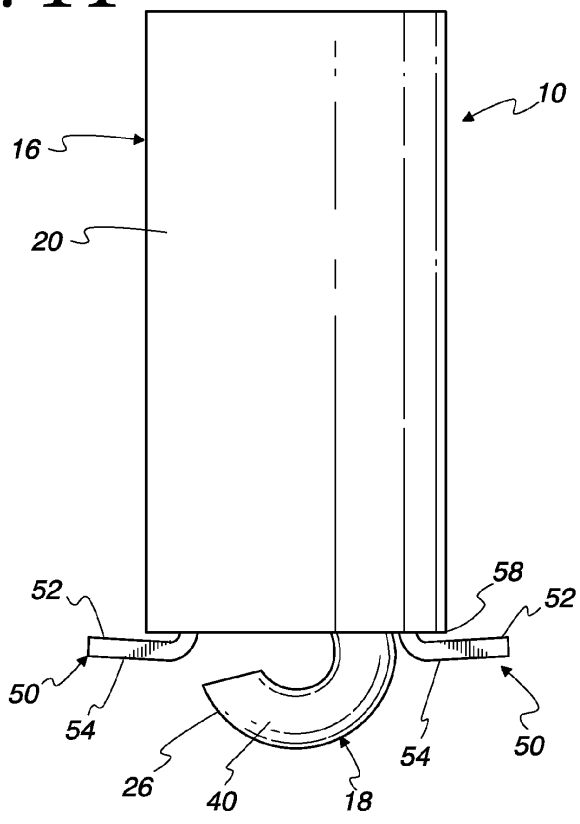
(54) Socket for attachment to rebar and casting into a concrete structure

(57) A fixture (10) is provided for casting into a concrete structure (12) including reinforcement bars (14). The fixture (10) includes a socket (16), and a clamp (18). The clamp (18) is configured to sandwich a reinforcement bar (14) against the fixture (10) to position the socket (16) relative to the reinforcement bar (14) prior to casting the fixture (10) and the reinforcement bar (14) into a concrete structure (12).

Fig. 14



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Description

BACKGROUND

[0001] It is known to cast various construction fixtures into a concrete structure, including to cast in a socket in the form of a cylindrical metal tube that can receive and support a mating cylindrical structure after the socket is cast into the concrete structure. In one known form, provided by Honeywell Safety Products, Combisafe International, a cylindrical steel socket is cast into a concrete structure, such as a precast structural component and is used to support an edge protection system via posts that are received into the socket to extend therefrom while supporting a mesh barrier or other containment structure. Such edge protection systems, including the cylindrical steel socket, are designed to comply with certain industry standards, such as, for example, European Standard for edge protection EN 13374. While such fixtures work well for their intended purpose, there is always room for improvement.

SUMMARY

[0002] In accordance with one feature of this invention, a fixture is provided for casting into a concrete structure including reinforcement bars (rebar). The fixture includes a socket, and a clamp configured to sandwich a rebar against the fixture to position the socket relative to the rebar prior to casting the fixture and the rebar into a concrete structure.

[0003] As one feature, the socket has a cylindrical interior surface. As a further feature, the socket has a cylindrical exterior surface. As yet a further feature, the socket is provided in the form of a cylindrical-shaped metal tube.

[0004] In one feature, the clamp includes a hook shaped to engage around a rebar. In a further feature, the hook is mounted to the fixture to translate relative to the socket. As yet a further feature, the hook includes a threaded shank or shaft. In a further feature, the fixture includes a clamp mount bracket fixed to the socket, the clamp mount bracket including an opening for receiving the threaded shank of the hook. In one feature, the opening is a threaded opening configured to threadably engage the threaded shank of the hook. In an alternate feature, the shank of the hook is slidably received in the opening of the clamp mount bracket and the fixture includes a threaded nut threadably engaged with the threaded shank of the hook and abutted against the clamp mount bracket.

[0005] According to one feature, the fixture further includes at least one surface extending from the socket for engagement against a rebar. In one feature, the fixture includes an annular flange defining the at least one surface, the flange fixed to an end of the socket adjacent the clamp. In an alternate feature, the fixture includes at least one catch plate defining the at least one surface, the at least one catch plate fixed to an end of the socket adjacent the clamp. In one feature, the catch plate includes a pair of feet extending from the socket on opposite sides of the hook. In one feature, the catch plate and the clamp mount bracket are formed from a single piece of material.

[0006] Other features and advantages will become apparent from a review of the entire specification, including the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Fig. 1 is a partially broken, isometric view from above of a fixture according to this disclosure as cast in a concrete structure including rebar, with portions of the concrete removed to expose part of the fixture and a portion of the rebar for purposes of illustration;

[0008] Fig. 2 is an enlarged isometric view taken from a different angle of the fixture and concrete structure of Fig. 1;

[0009] Fig. 3 is a longitudinal cross-sectional view showing the fixture of Figs. 1 and 2 with a clamp of the fixture in an open condition;

[0010] Fig. 4 is a view similar to Fig. 3 but showing the clamp in a closed or clamped condition;

[0011] Fig. 5 is a side elevation view of an alternate embodiment of a clamp component of the fixture of Figs. 1-4;

[0012] Fig. 6 is an isometric view from below of another embodiment of the fixture according to this disclosure as cast in a concrete structure including rebar, with portions of the concrete removed to expose the rebar and the fixture;

[0013] Fig. 7 is a view similar to Fig. 6 but showing the rebar and the fixture prior to casting in concrete;

[0014] Fig. 8 is a front elevational view of the fixture of Figs. 6 and 7;

[0015] Fig. 9 is an isometric view of the fixture of Figs. 6-8;

[0016] Fig. 10 is an isometric, longitudinal cross-sectional view of the fixture of Figs. 6-9;

[0017] Fig. 11 is a transparent, three-dimensional rendering of the fixture of Figs. 6-10;

[0018] Fig. 12 is a front elevational view of a catch plate component of the fixture of Figs. 6-11;

[0019] Fig. 13 is an isometric view from above of the catch plate of Fig. 12;

[0020] Fig. 14 is a front elevational view of another embodiment of the fixture according to this disclosure;

[0021] Fig. 15 is an isometric view from below of the fixture of Fig. 14;

[0022] Fig. 16 is a transparent, three-dimensional rendering of the fixture of Figs. 14-15;

[0023] Fig. 17 is a front elevational view of a catch plate of the fixture of Figs. 14-16;

[0024] Fig. 18 is an isometric view from above of the catch plate of Figs. 17;

[0025] Fig. 19 is an isometric view from below of an-

other embodiment or fixture according to this disclosure;

[0026] Fig. 20 is a transparent, three-dimensional rendering of the fixture of Fig. 19;

[0027] Fig. 21 is an isometric view from above of a catch plate of the fixture of Figs. 19 and 20;

[0028] Fig. 22 is a side elevational view of another embodiment or fixture according to this disclosure;

[0029] Fig. 23 is a cross-sectional view of the fixture of Fig. 22;

[0030] Fig. 24 is a plan view from above of the fixture of Figs. 22 and 23;

[0031] Fig. 25 is an isometric view from below of another embodiment or fixture according to the disclosure, with the fixture installed on a grid of rebar;

[0032] Fig. 26 is a front elevation view of the fixture of Fig. 25;

[0033] Fig. 27 is a cross-sectional view of the fixture of Figs. 25 and 26;

[0034] Fig. 28 is a top plan view of the fixture of Figs. 25-27;

[0035] Fig. 29 is an isometric view from below of another embodiment or fixture according to this disclosure, with the fixture installed on a grid of rebar;

[0036] Fig. 30 is an isometric from above of the fixture of Fig. 29;

[0037] Fig. 31 is a transparent three-dimensional rendering of the fixture of Figs. 29 and 30;

[0038] Fig. 32 is a plan view from above of the fixture of Figs. 29-31; and

[0039] Fig. 33 is a view from below of the fixture of Figs. 29-32.

DETAILED DESCRIPTION

[0040] With reference to Figs. 1 and 2, a construction component or fixture 10 is shown as cast into a reinforced concrete structure 12 including a grid of rebar 14, with a portion of the concrete being removed to expose a forward half of the fixture 10 and portions of the rebar 14 and with the remainder of the fixture 10 and the rebar 14 within the concrete of the structure 12 being shown in phantom. The fixture 10 includes a socket 16 and a clamp 18 configured to sandwich a rebar 14 against the fixture 10 to position the socket 16 relative to the rebar 14 prior to casting the fixture 10 and the rebar 14 into the concrete structure 12. The socket 16 is configured to receive another construction component or fixture, such as, for example, a post (not shown) that can in turn support a mesh barrier or other containment structure for an edge protection system. In this regard, prior to casting, an array of the fixtures 10 can be connected to the rebar 14 to provide support for a series of posts in the concrete structure 12, such as a linear array of fixtures 10 to support a linear array of posts with a mesh barrier extending from post to post. Further in this regard, the illustrated socket 16 is provided in the form of a cylindrical-shaped metal tube 20 centered on a longitudinal axis 21 and having a cylindrical interior surface 22 and a cylindrical exterior surface 24, with the interior surface 22 sized to receive the cylindrical exterior surface of a cylindrical post or the cylindrical outer surface of a plastic sleeve which in turn has a cylindrical interior surface to receive a cylindrical post.

[0041] As best seen in Figs. 3 and 4, the clamp 18 includes a hook 26 shaped to engage around the rebar 14, with the hook 26 being mounted to the fixture 10 to translate along the axis 21 relative to the socket 16, as illustrated by arrows A in Figs. 3 and 4. In this regard, in the illustrated embodiment, the fixture 10 includes a clamp mount bracket 28 fixed to the socket 16 by any suitable means, such as, for example, via welding or other suitable bonding to the interior surface 22 of the socket 16 as shown at 29 in Figs. 3 and 4. The mount bracket 28 includes an opening 30 for receiving a shank or shaft 32 of the hook 26 to guide the hook 26 for translation along the axis 21. In the embodiment shown in Figs. 3 and 4, the shank 32 has external threads (shown diagrammatically at 34) that mate with internal threads (shown diagrammatically at 36) in the opening 30 so that relative rotation between the hook 26 and the socket 16 will cause the hook 26 to translate along the axis 21 relative to the socket 16. In the embodiment of Figs. 3 and 4, the hook 26 is a two piece fabrication, with a U-shaped, rebar receiving portion 40 having a threaded bolt 42 extending through an upper leg 43 of the portion 40 to define the threaded shank 32, and the U-shaped portion 40 and the bolt 42 being bonded by any suitable means, such as, for example, by welding or brazing. Fig. 5 illustrates an alternate embodiment of the hook 26 wherein the shank 32 is provided in the form of a threaded stud 44 extending upwardly from the U-shaped portion 40, with the threaded stud and the U-shaped portion either being machined from a single piece of material or joined together by any suitable means of bonding, such as, for example, via welding. As best seen in Fig. 5, the U-shaped portion 40 can be provided with a lower leg 46 having a slightly V-shaped configuration to somewhat conform to the rebar 14. In operation, the fixture 10 is installed onto a rebar 14 with the clamp 18 in an open condition spaced from the rebar 14, as shown in Fig. 3, and then the socket 16 is rotated (as shown by arrow B) relative to the hook 26 and the rebar 14 to tighten the clamp 18 by translating the hook 26 along the axis 21 via the mating action of the threads 34,36 to create clamping forces against the rebar 14, as shown by arrows C in Fig. 4.

[0042] Figs. 6-33 show several alternate embodiments for the fixture 10, with like reference numbers indicating like components in the drawings.

[0043] Figs. 6-13 illustrate an alternate embodiment of the fixture 10 that differs in a number of ways from the embodiment shown in Figs. 1-5. Specifically, the fixture 10 of Figs. 6-13 includes a pair of catch plates 50 defining surfaces 52 and/or 54 extending from the socket 16 for engagement with the rebar 14. In this regard, the catch plates 50 are provided in the form of a pair of feet 56

extending forward laterally from an end 58 of the socket 16 adjacent the hook 26, with each of the feet 56 having a pair of flanges 60 that serve to strengthen the feet 56. Additionally, the hook 26 is formed from a single piece of material 57 having a generally circular cross section, with the single piece of material defining both the U-shaped portion 40 and the shank 32, with the U-shaped portion 40 being semicircular in shape for engagement with the rebar 14. As best seen in Figs. 10-13, the catch plates 50 are a unitary, single piece construction that includes the clamp mount bracket 28 and can be formed using any suitable method, such as via stamping, forging, or machining from a single piece of material. Rather than the opening 30 being threaded as in the embodiment of Figs. 1-5, the opening 30 in the embodiment of Figs. 6-13 is unthreaded so that the threaded shank 32 is slidably received therein for translation along the axis 21, and the fixture 10 further includes a threaded nut 62 having internal threads 36 that mate with the external threads 34 of the shank 32. In operation, the clamp 18 is installed in the open condition and the nut 62 is rotated relative to the socket 16 and the hook 26 to translate the hook 26 to the closed condition in engagement with the rebar 14 via the action of the mating threads 34,36.

[0044] Figs. 14-18 illustrate another embodiment of the fixture 10 that is very similar to the embodiment shown in Figs. 6-13 except that the feet 56 are provided with a single flange 60 rather than a pair of flanges 60.

[0045] Figs. 19-21 illustrate another embodiment that differs from the embodiments of Figs. 6-18 in that the feet 56 have a primarily vertically extending cross section, rather than a primarily horizontally extending cross section as in the embodiments of Figs. 6-18.

[0046] Figs. 22-24 illustrate another embodiment of the fixture 10 that is very similar to the embodiments shown in Figs. 6-21 except that, in the embodiment of Figs. 22-24, the catch plates 50 do not include feet 56 that extend in a laterally forward direction from the socket 16.

[0047] Figs. 25-28 illustrate another alternate embodiment of the fixture 10 that differs from the embodiments of Figs. 6-24 in that the embodiment of Figs. 25-28 includes an annular flange 64 fixed to the end 58 of the socket 16 to define the surface 54 for engaging the rebar 14, rather than including the catch plates 50. Additionally, the mount bracket 28 is a separate component from the annular flange 64.

[0048] Figs. 29-33 illustrate yet another embodiment of the fixture 10 that differs from the embodiment of Figs. 25-28 in that a pair of catch plates 68 are fixed to the sides of the socket 16 to extend in a laterally forward direction therefrom to define the surfaces 52,54, rather than having an annular flange 64 as in the embodiment of Figs. 25-28. As with the feet 56 of the embodiment of Figs. 19-21, the catch plates 68 have a primarily vertical cross-section, but differ in that they provide a pair of curved surfaces 52,54 for engagement with the rebar 14 rather than flat surfaces 52.

[0049] It should be appreciated that by providing a fixture 10 that includes the clamp 18, the fixture 10 can be attached directly to the rebar 14 and thereby benefit from the strength of the steel rebar in addition to the strength of the surrounding concrete in the concrete structure 12. Further, it should be appreciated that by minimizing the parts extending from the socket 16, the fixture 10 can be packaged with relative ease and with a significant density of the fixtures 10 in each packing container, thereby optimizing the transportation of the fixtures 10 before assembly into a concrete structure 12. It should be further appreciated that by providing the clamp 18 to directly attach the fixture 10 to the rebar 14, the fixture 10 doesn't require any additional tying of the fixture 10 to the rebar, thereby reducing labor costs and materials in comparison to conventional fixtures 10. Furthermore, it should be appreciated that by providing the surfaces 52 and/or 54 extending from the socket 16, the fixture 10 can be mounted to the rebar 14 to extend normal from the rebar 14 without any additional effort other than tightening of the clamp 26. It should also be appreciated that because the fixture 10 attaches directly to the rebar 14, the fixture 10 is self-regulating with respect to the concrete cover provided for the fixture 10 in the finished concrete structure 12, without requiring additional spacers as in conventional fixtures.

[0050] It should be appreciated that while several specific embodiments for the fixture 10 have been shown herein, there are many possible modifications that are contemplated within the scope of the disclosure. For example, while the sockets 16 have been shown as cylindrical in shape, it should be understood that other potential shapes for the socket 16 are contemplated. Similarly, while two specific shapes have been shown for the U-shaped portion 40, other shapes may be desirable depending upon a particular application and are contemplated within the scope of this disclosure. As yet a further example, while threaded engagements have been disclosed herein as a means for actuating the clamp 18 between the open and closed position, it should be understood that other suitable means may be desirable depending upon the requirements of each particular application and are contemplated within the scope of this disclosure. Accordingly, the scope of this disclosure should not be limited to any of the specific embodiments described herein unless specifically recited in an appended claim.

Claims

1. A fixture (10) for casting into a concrete structure (12) including reinforcement bars (14), the fixture (10) comprising:

   a socket (16); and
   a clamp (18) configured to sandwich a reinforcement bar (14) against the fixture (10) to position the socket (16) relative to the reinforcement bar

(14) prior to casting the fixture (10) and the reinforcement bar (14) into a concrete structure (12).

2. The fixture (10) of claim 1 wherein the socket (16) comprises at least one of a cylindrical interior surface (22) and a cylindrical exterior surface (24).

3. The fixture (10) of any one of claims 1 or 2 wherein the socket (16) is provided in the form of a cylindrical-shaped metal tube (20).

4. The fixture (10) of any one of claims 1, 2 or 3 wherein the clamp (18) comprises a hook (26) shaped to engage around a reinforcement bar (14).

5. The fixture (10) of claim 4 wherein the clamp (18) further comprises:

a threaded shank (32) extending from the hook (26); and
the clamp (18) further comprises a threaded feature (36) engaged with the threaded shank (32) to translate the hook (26) relative to the remainder of the fixture (10).

6. The fixture (10) of claim 5 wherein the threaded shank (32) and the hook (26) are formed from a single piece of material (57).

7. The fixture (10) of claim 5 wherein the threaded shank (32) and the hook (26) are an assembly, with the hook (26) being one piece of the assembly and the threaded shank (32) being another piece of the assembly.

8. The fixture (10) of claim 5 wherein the fixture (10) further comprises a clamp mount bracket (28) fixed to the socket (16), the clamp mount bracket (28) including an opening (30) for receiving the threaded shank (32).

9. The fixture (10) of claim 8 wherein the threaded feature (36) is provided in the form of the opening (30) being a threaded opening (30) configured to threadably engage the threaded shank (32).

10. The fixture (10) of claim 8 wherein the shank (32) is slidably received in the opening (30) of the clamp mount bracket (28) and the fixture (10) further comprises a threaded member (62) defining the threaded feature (36) threadably engaged with the threaded shank (32) and abutted against the clamp mount bracket (28).

11. The fixture (10) of any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 further comprising at least one surface (52,54) extending from the socket (16) for engagement against a reinforcement bar (14).

12. The fixture (10) of claim 11 further comprising at least one catch plate (50) defining the at least one surface (52,54), the at least one catch plate (50) fixed to an end (58) of the socket (16) adjacent the clamp (18).

13. The fixture (10) of claim 12 wherein the catch plate (50) includes a pair of feet (56) extending from the socket (16) on opposite sides of the clamp (18).

14. The fixture (10) of claim 13 wherein at least one of the pair of feet (56) includes at least one stiffening flange (60) extending along the at least one of the pair of feet (56).

15. The fixture (10) of any one of claims 12, 13 or 14 wherein the catch plate (50) and the clamp mount bracket (28) are formed from a single piece of material (57).

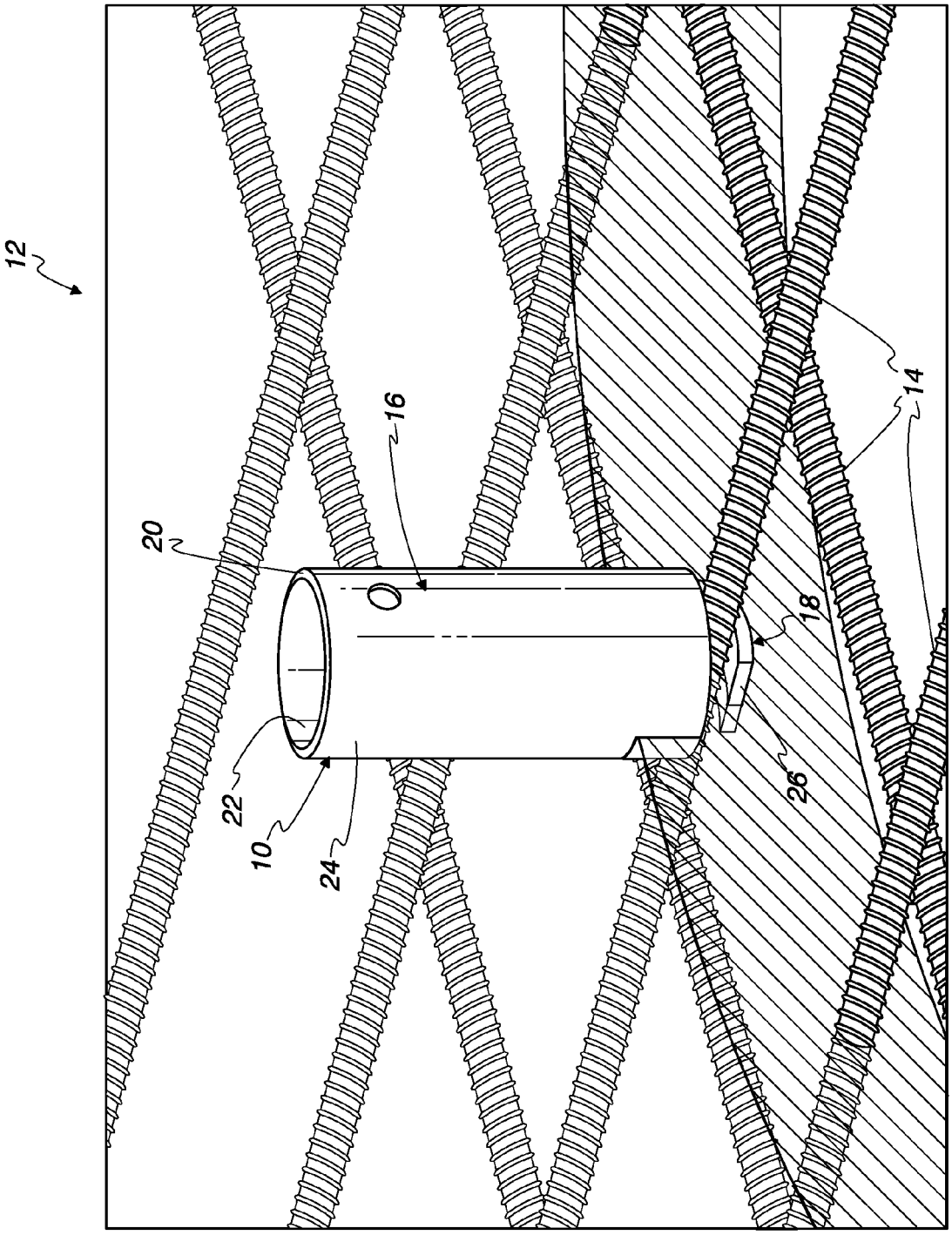

Fig. 1

Fig. 2

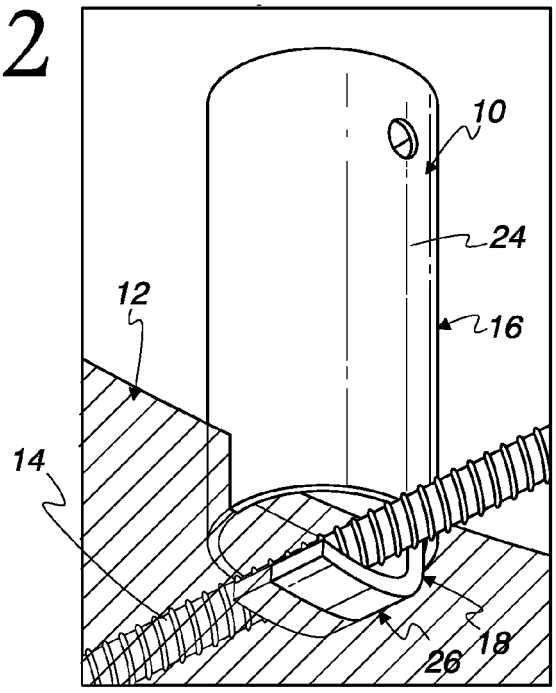
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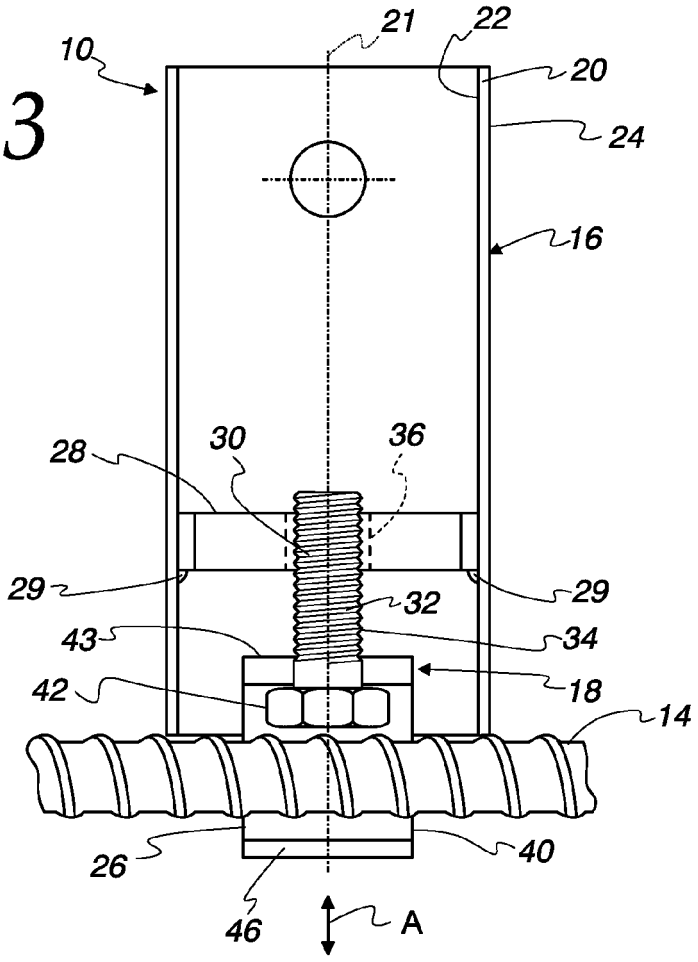
Fig. 3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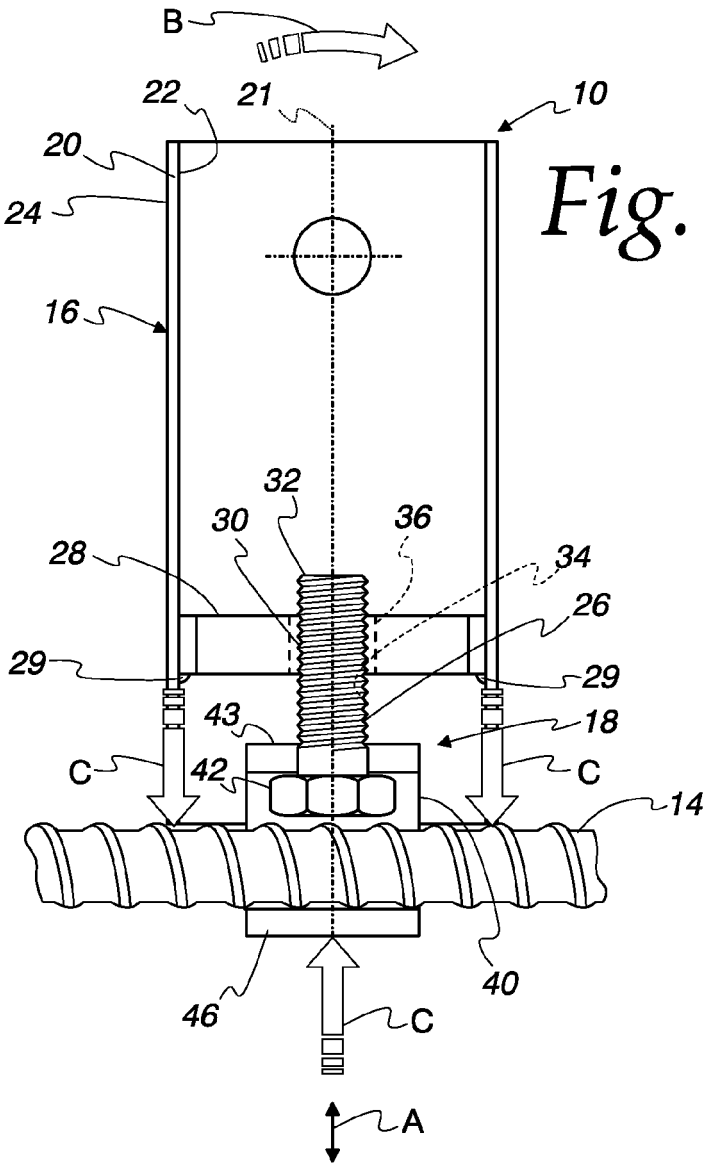
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Fig. 4

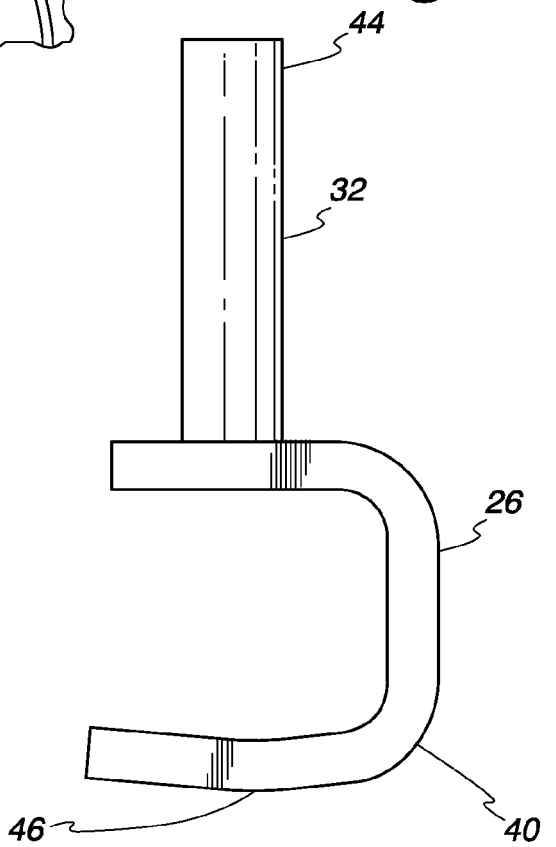
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Fig. 5

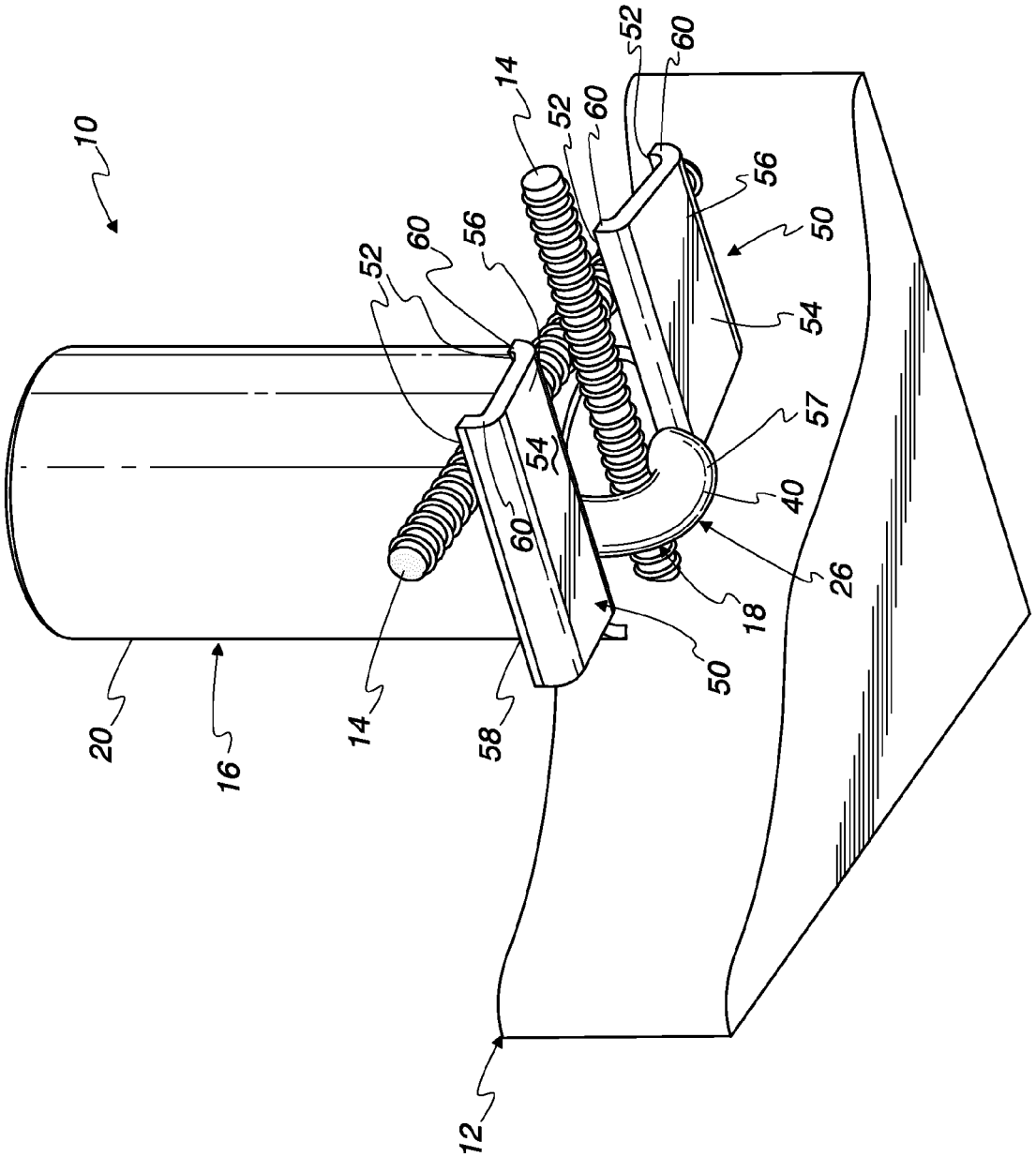

Fig. 6

Fig. 8

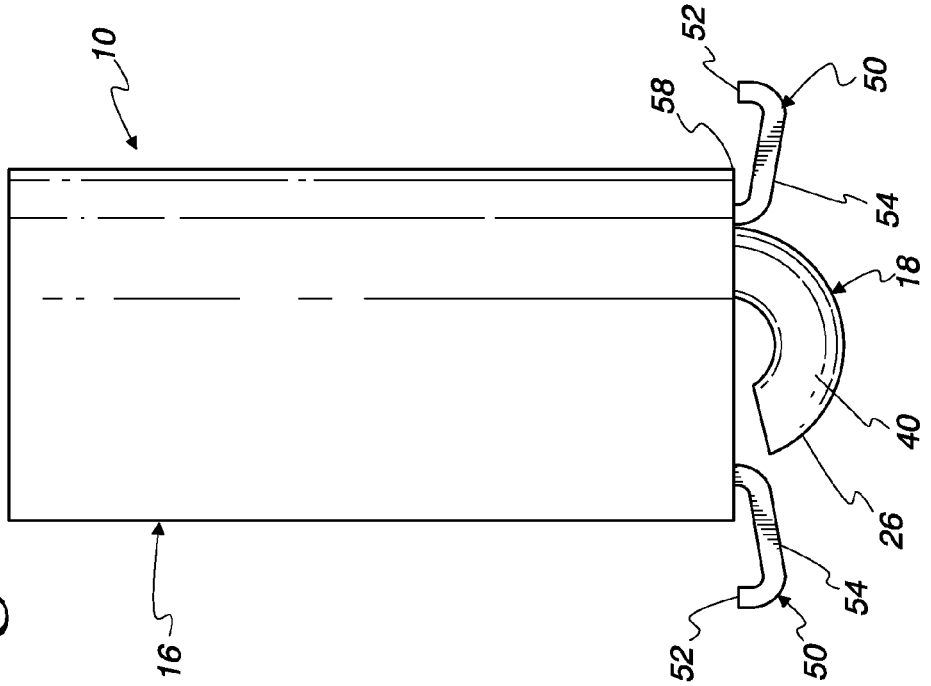
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Fig. 7

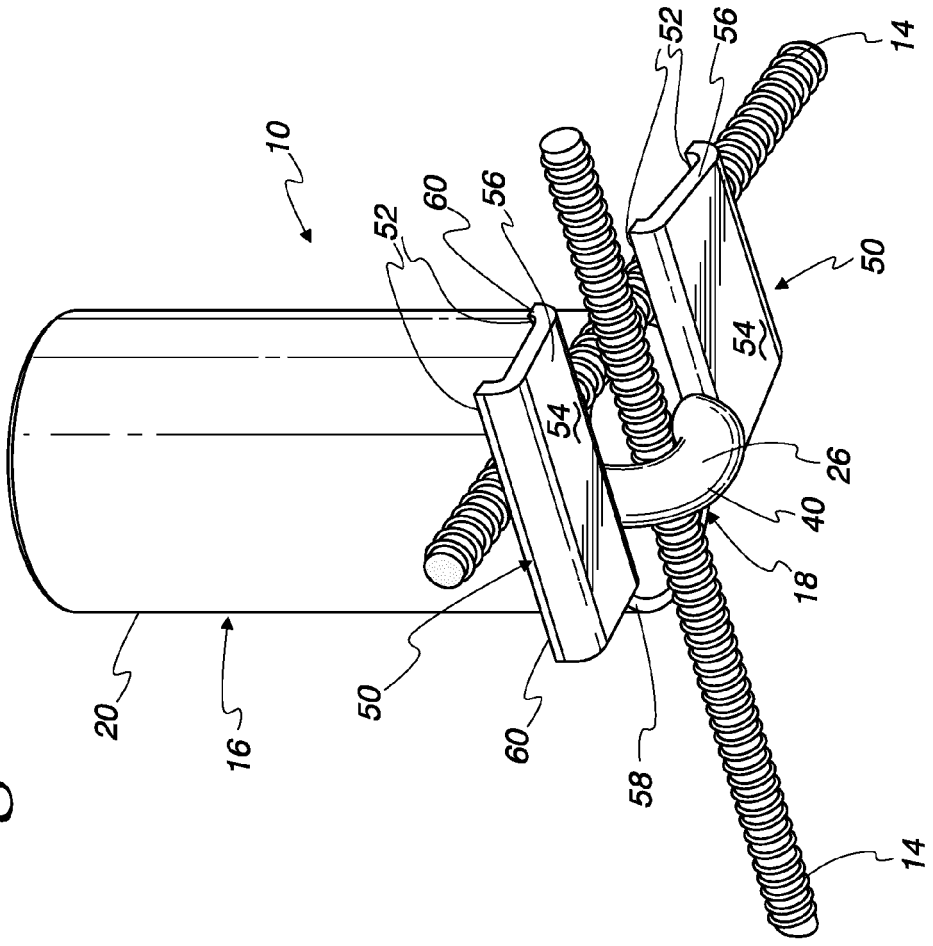
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Fig. 10

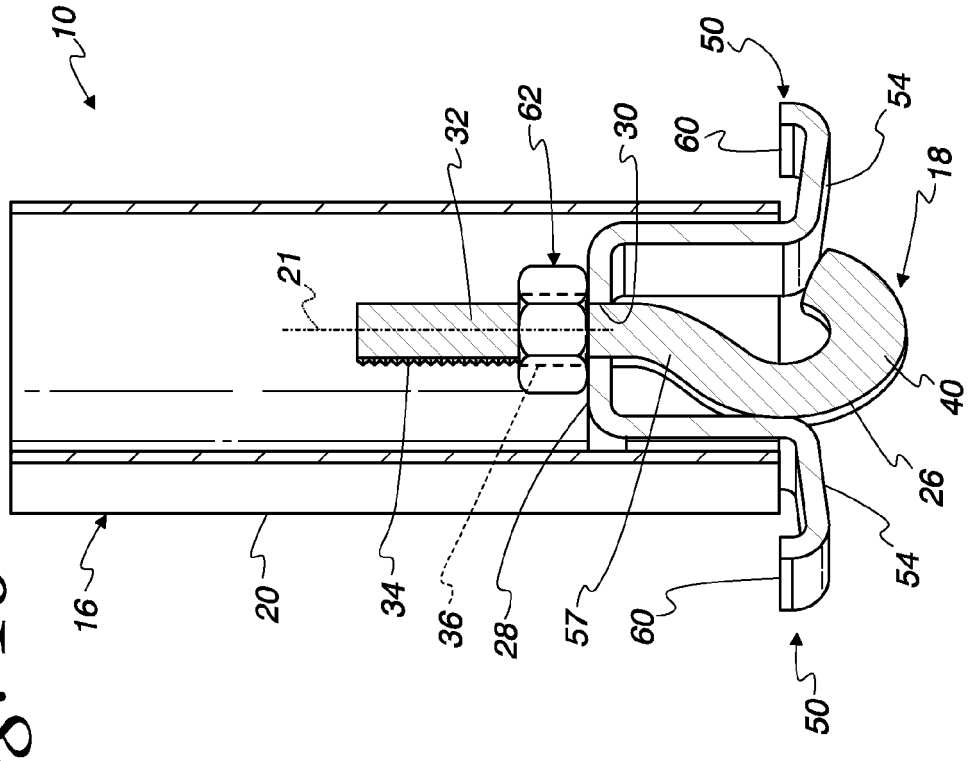
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Fig. 9

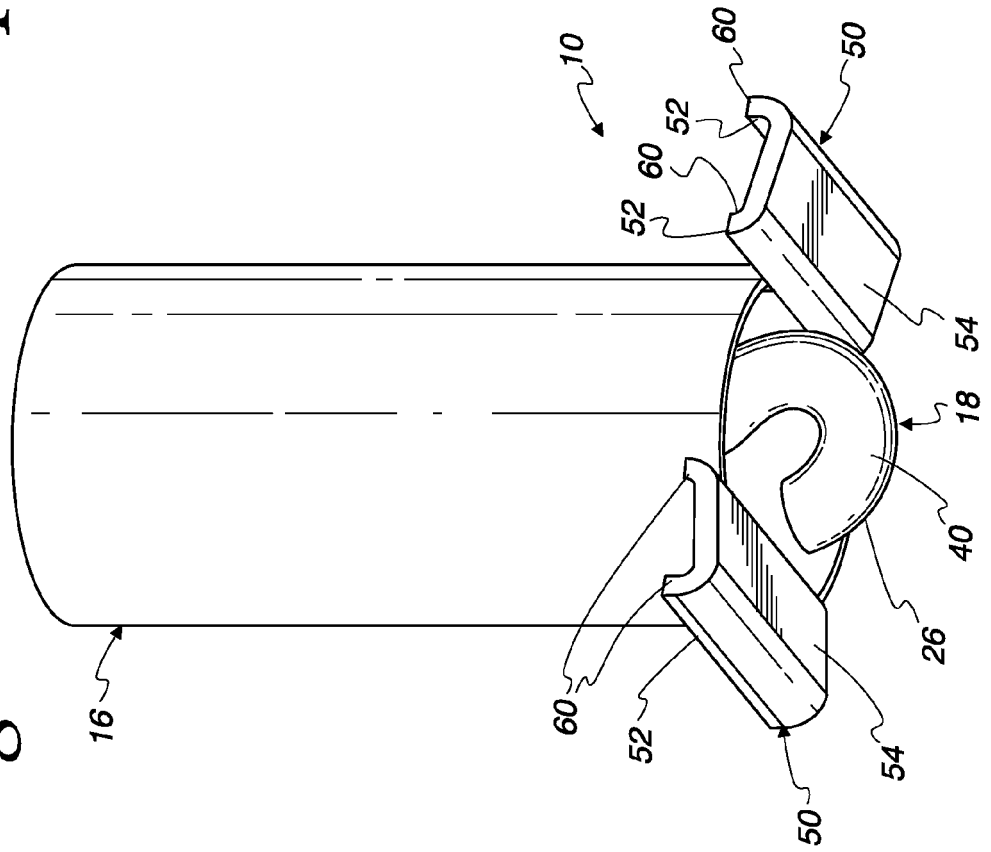
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Fig. 12

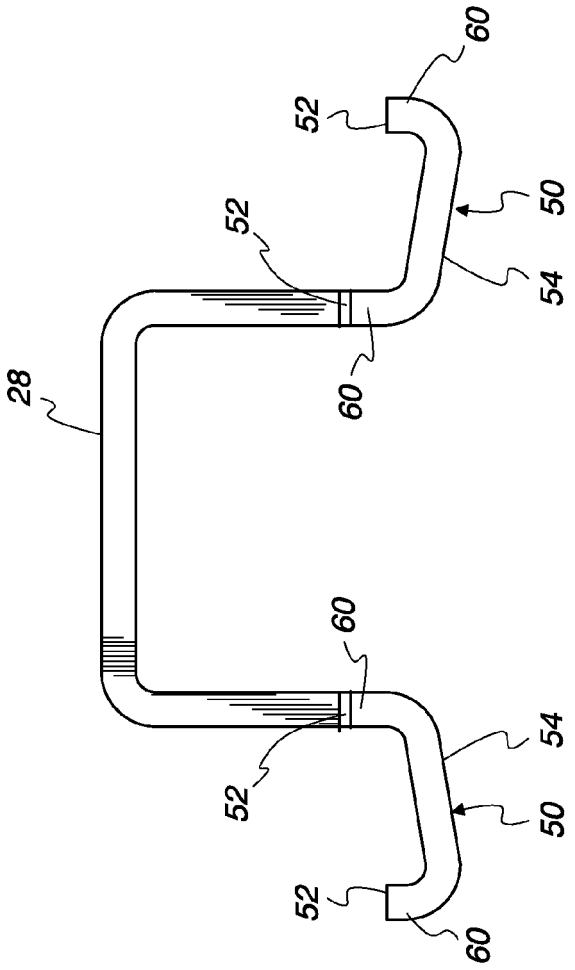
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Fig. 11

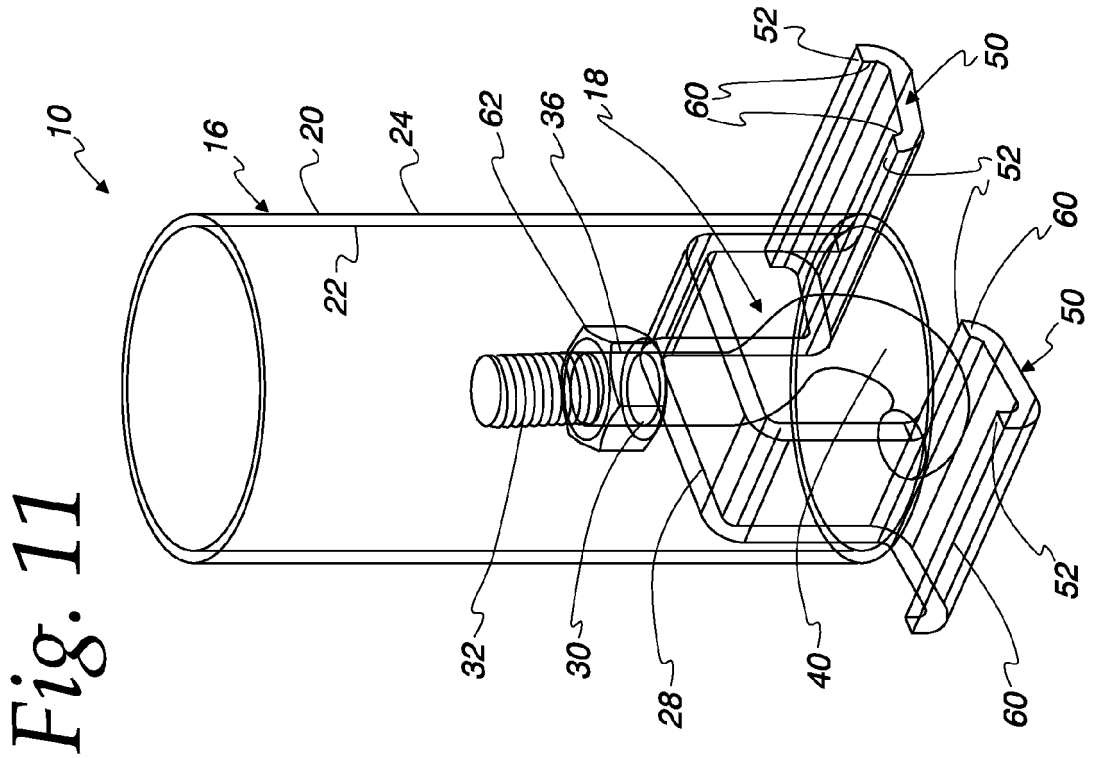
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Fig. 14

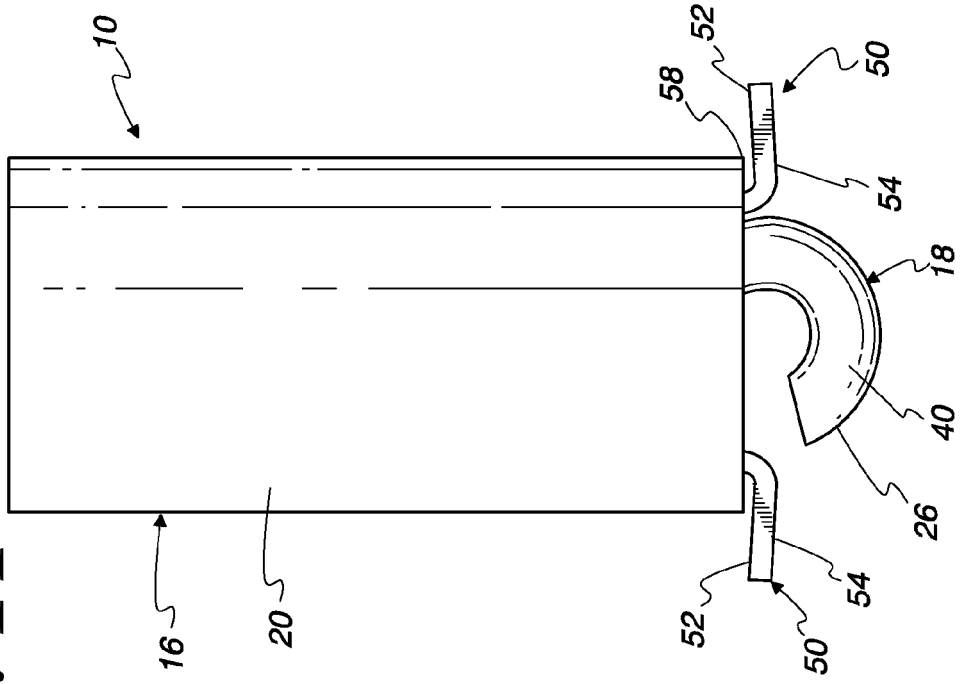

Fig. 13

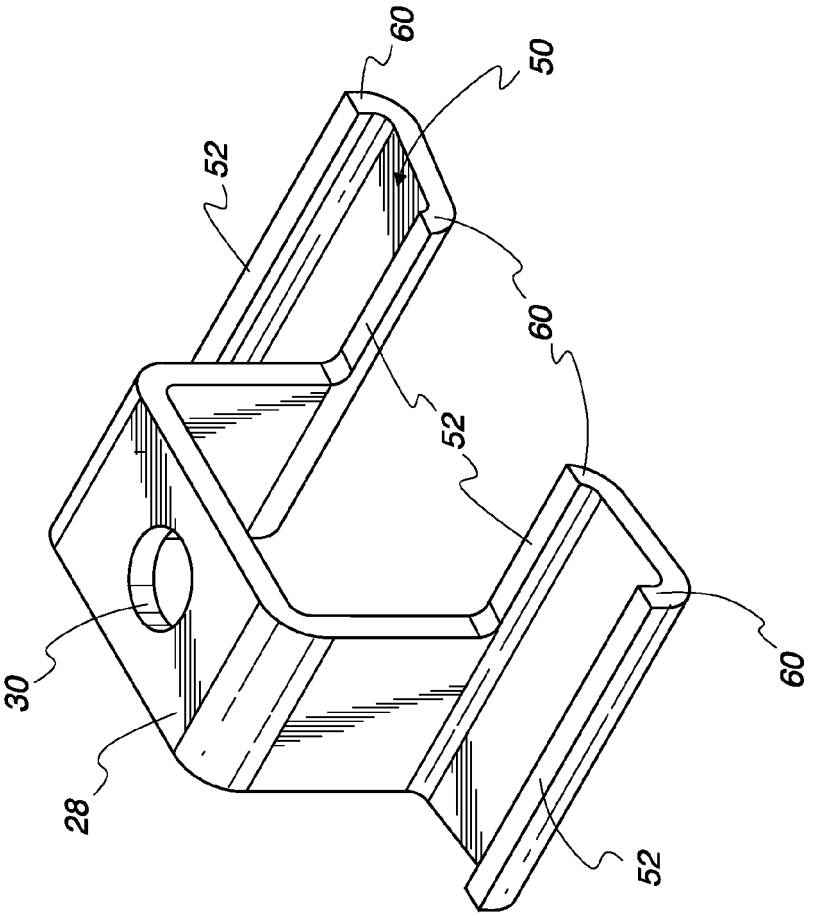

Fig. 16

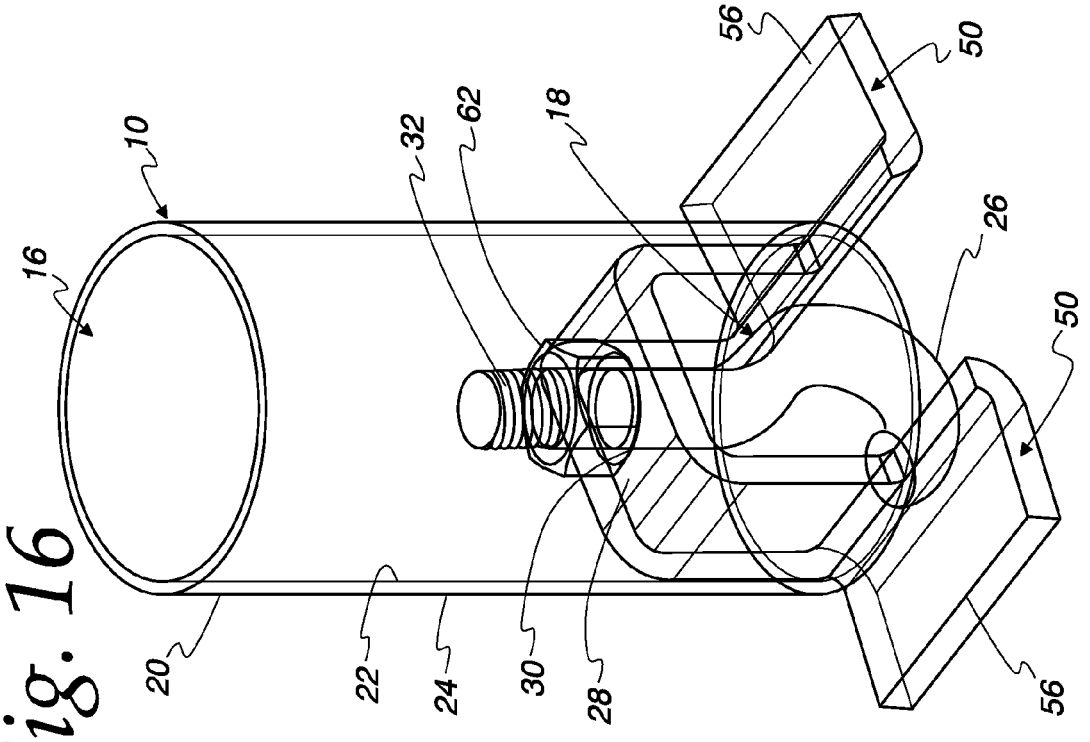
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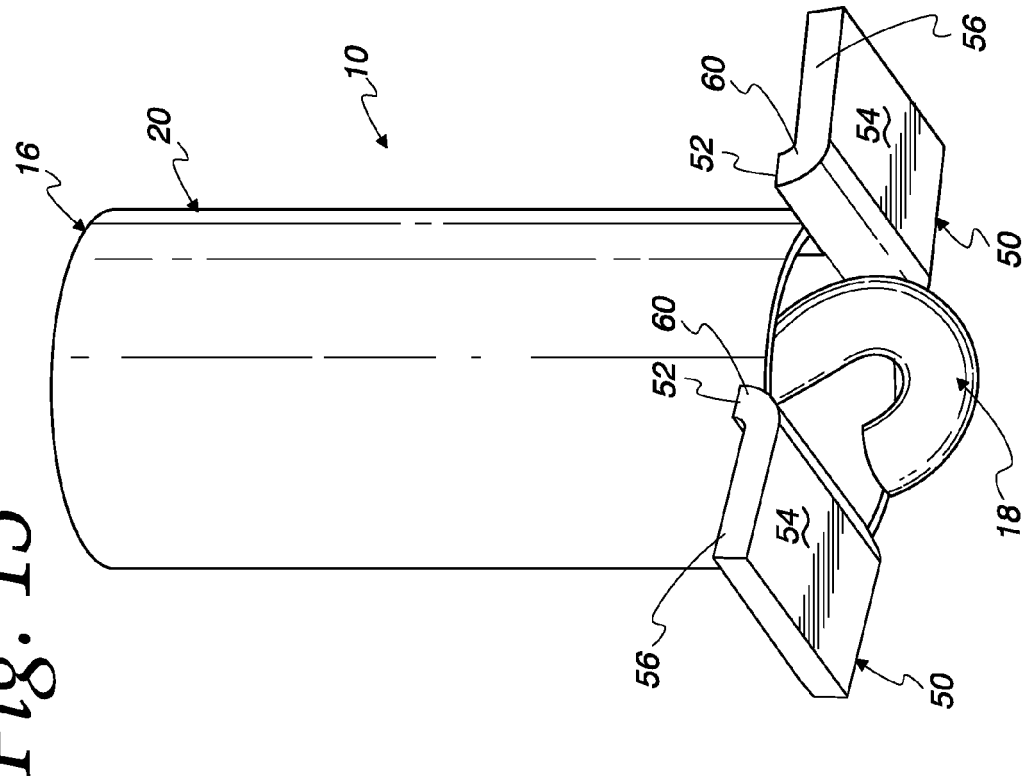
Fig. 15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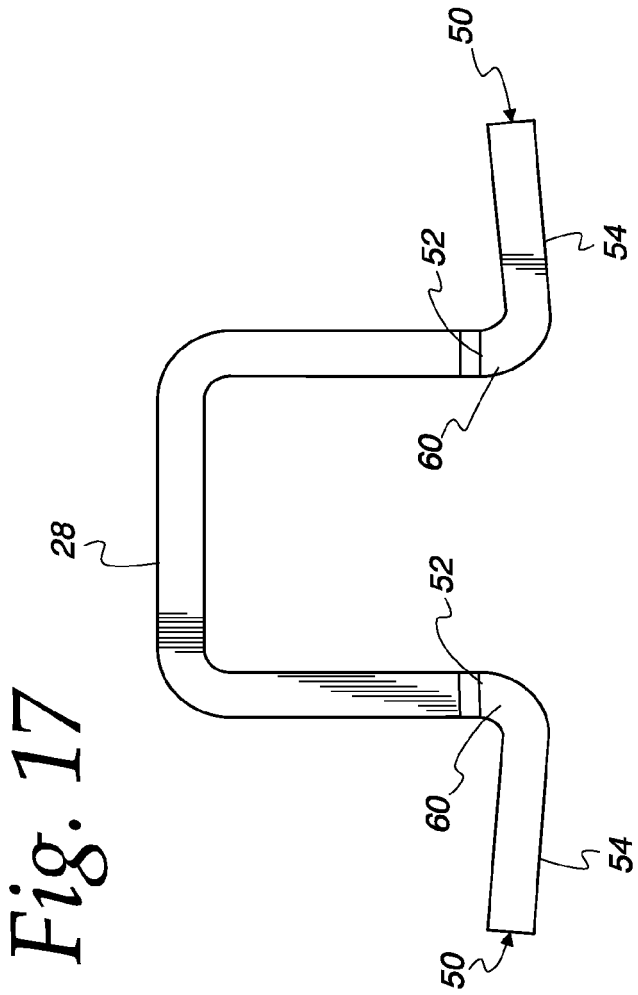

Fig. 17

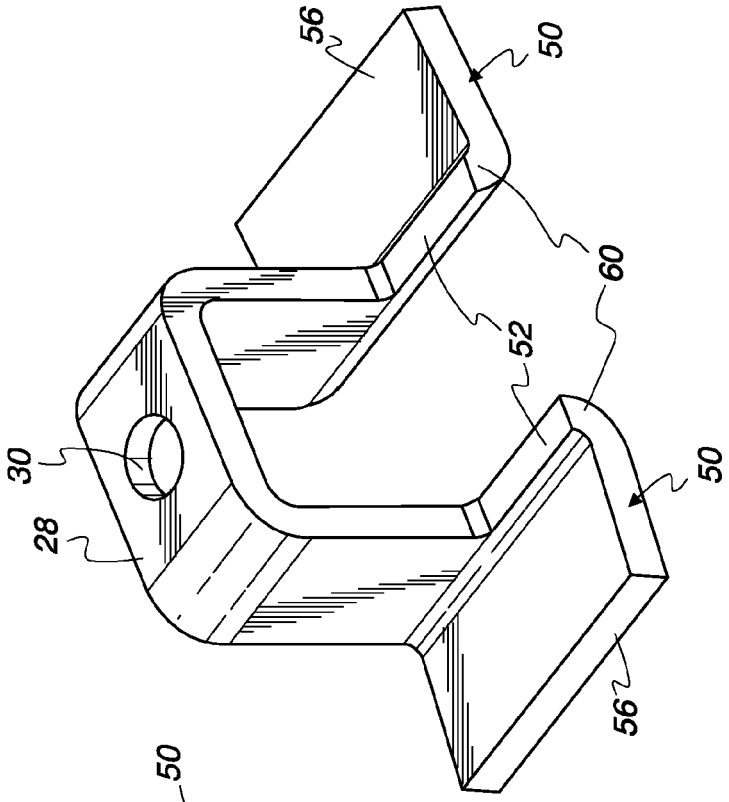

Fig. 18

Fig. 20

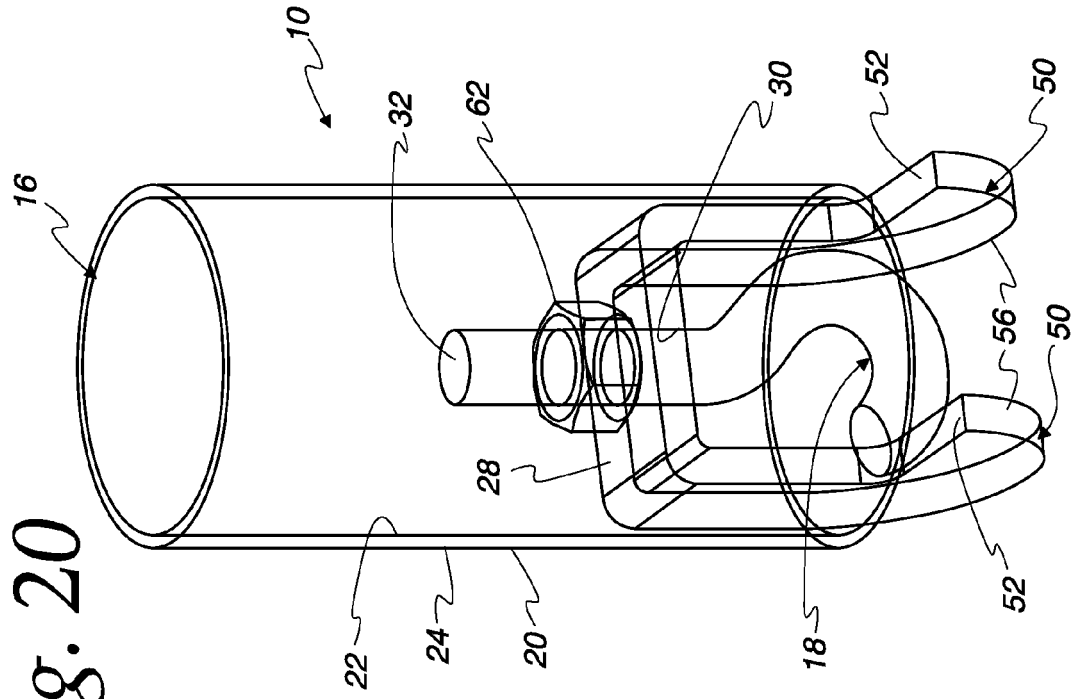
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Fig. 19

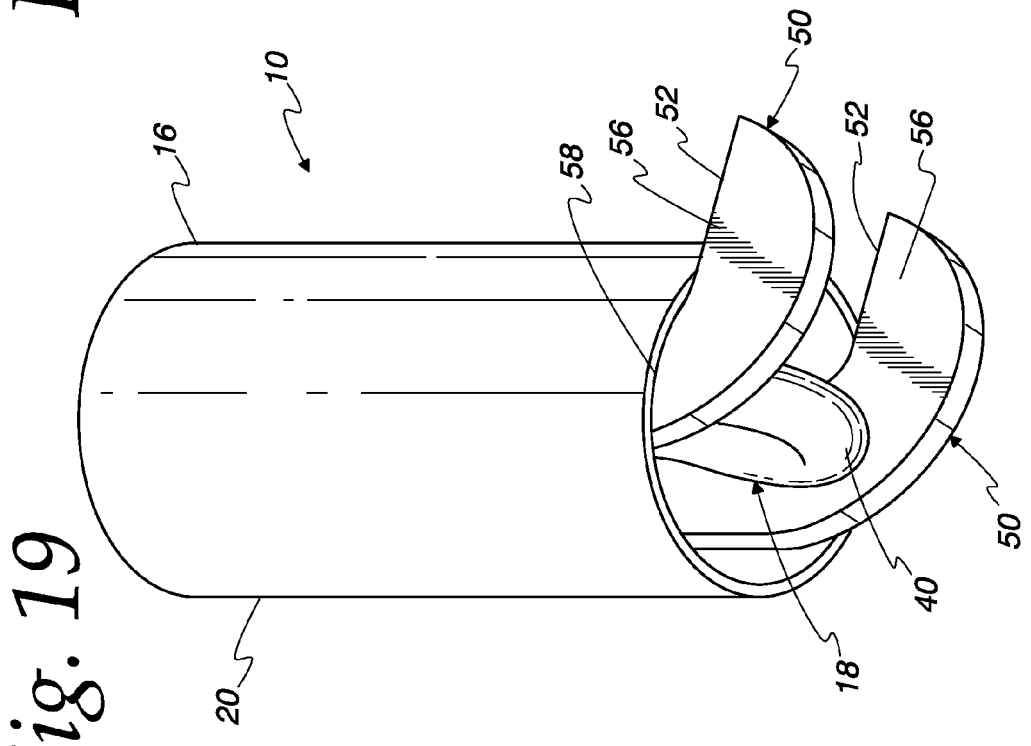
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Fig. 22

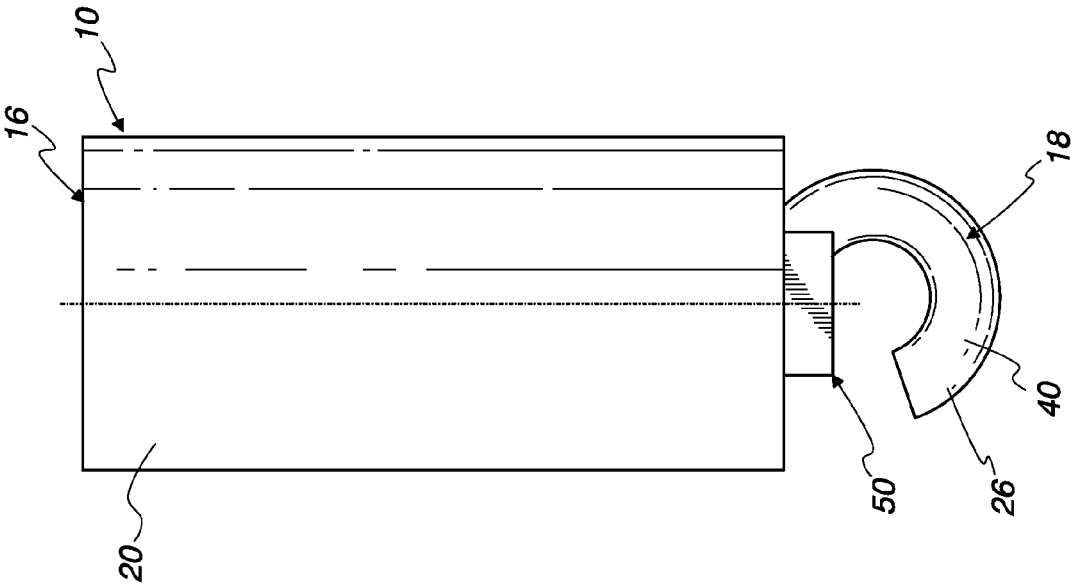
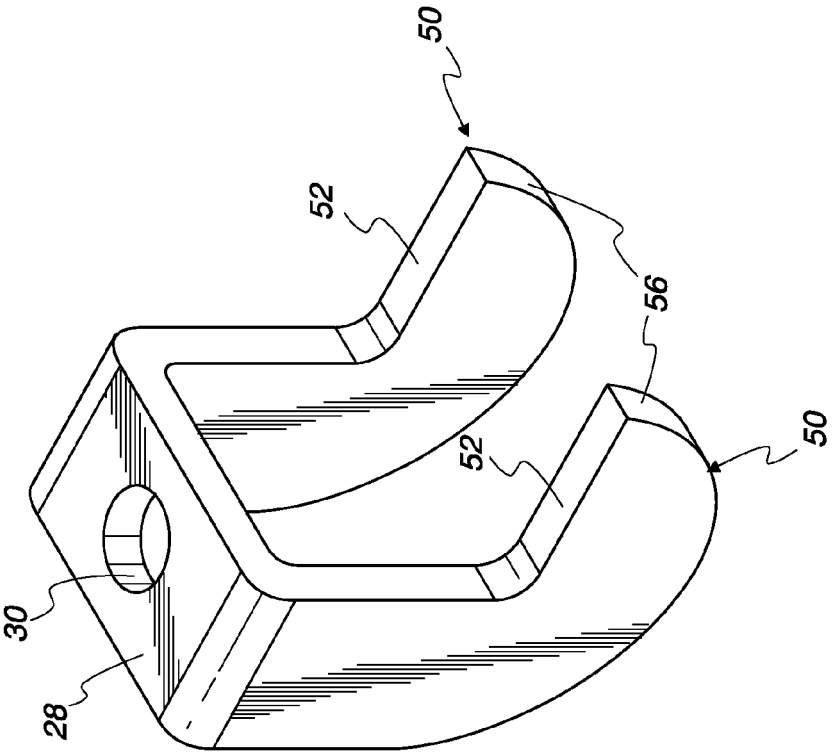


Fig. 21



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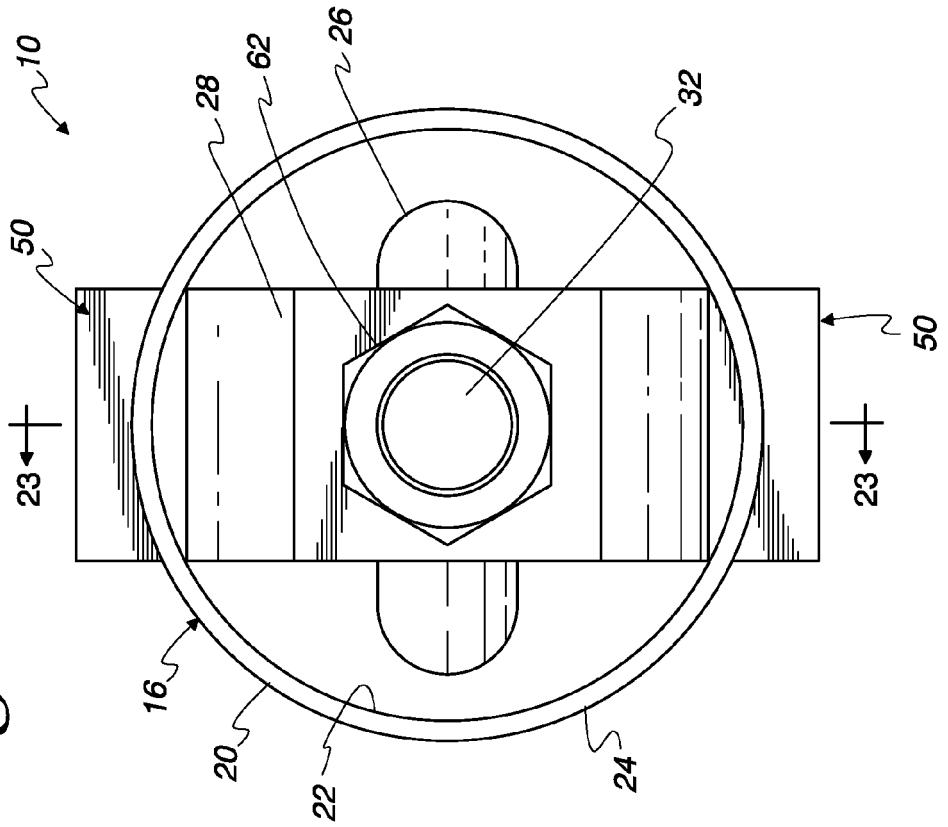
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Fig. 23

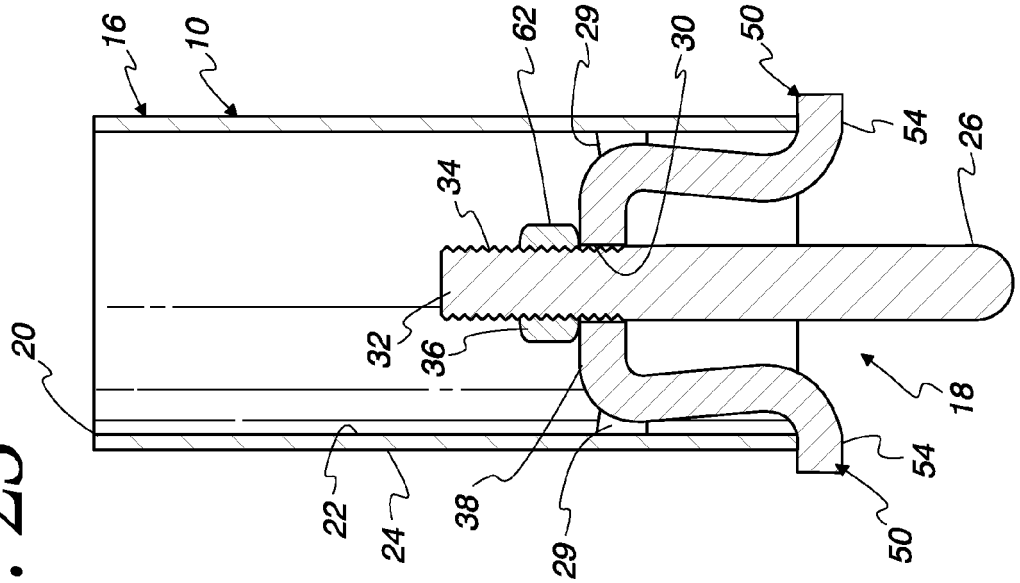
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Fig. 25

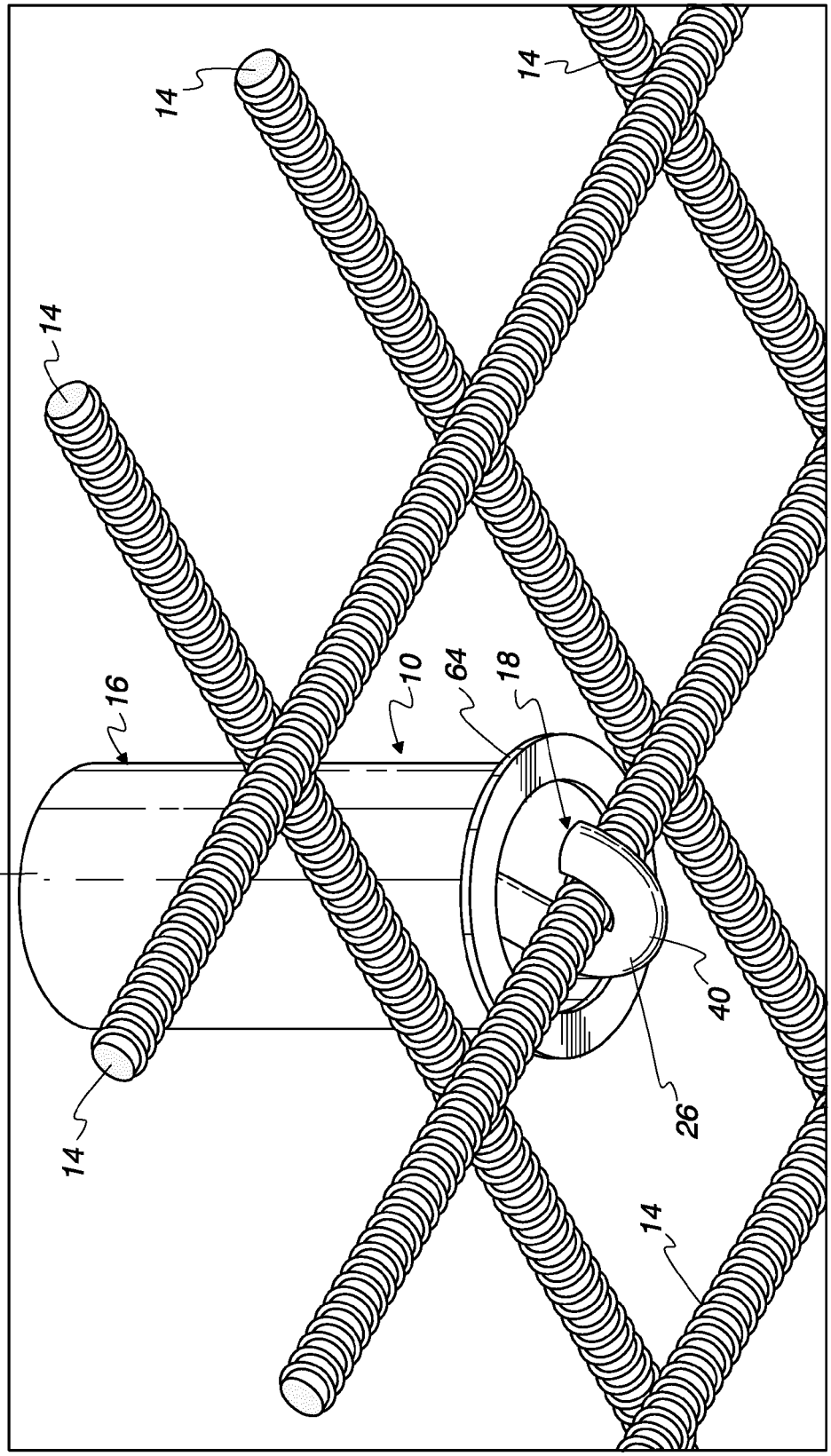


Fig. 27

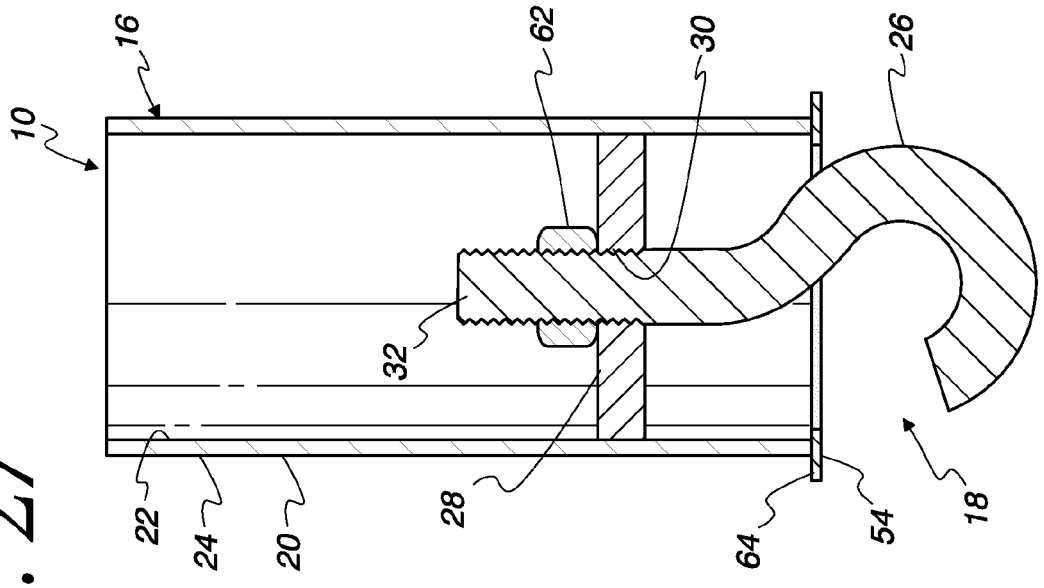


Fig. 26

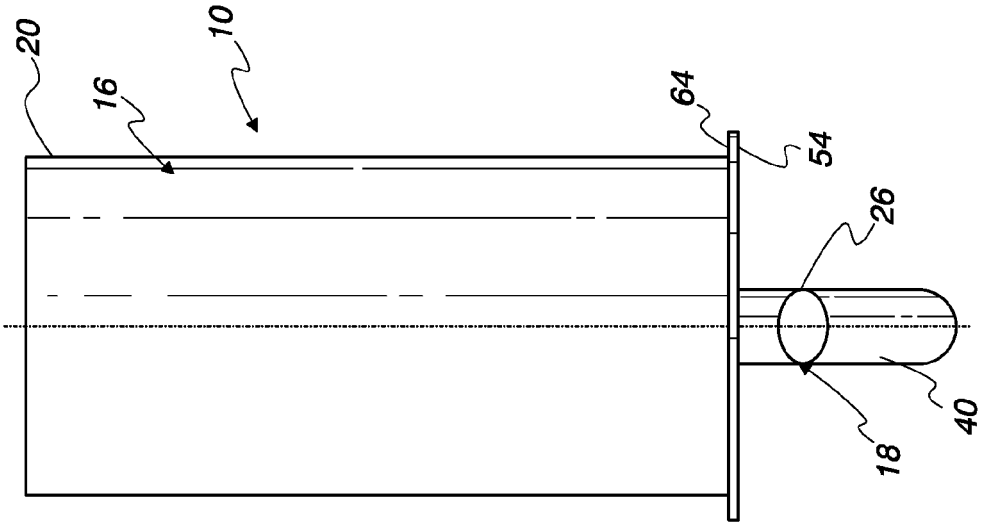


Fig. 29

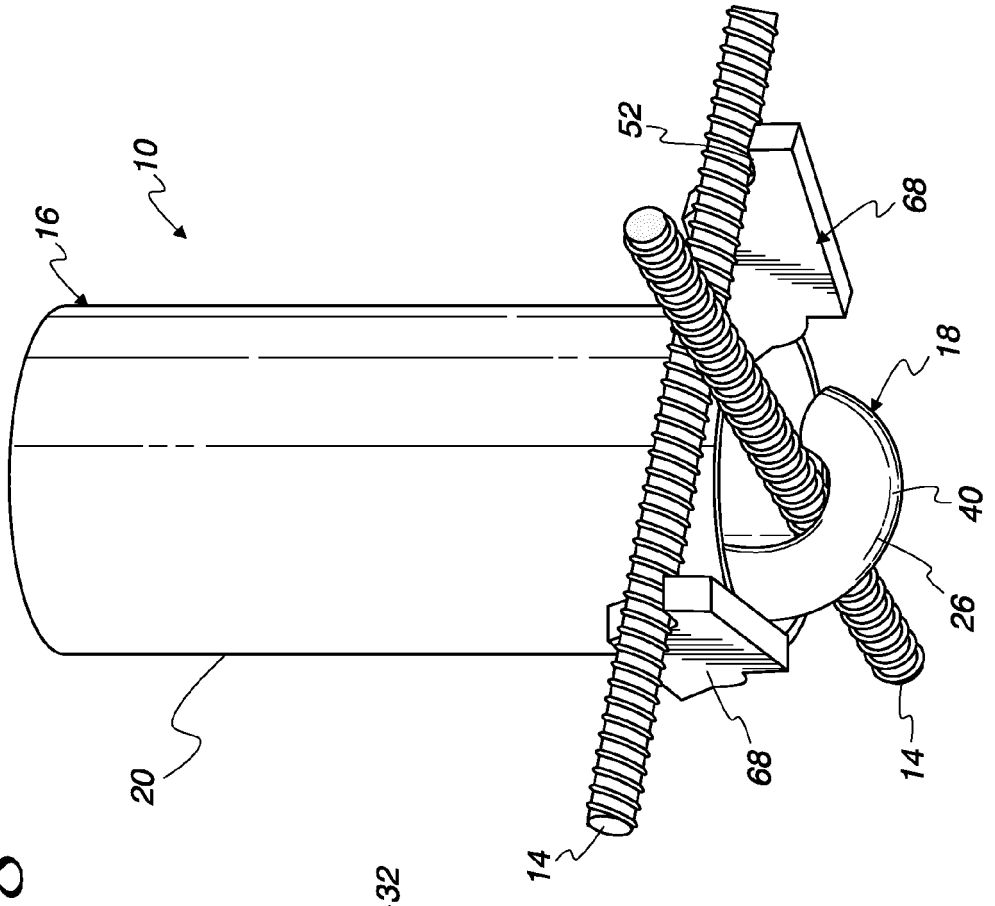
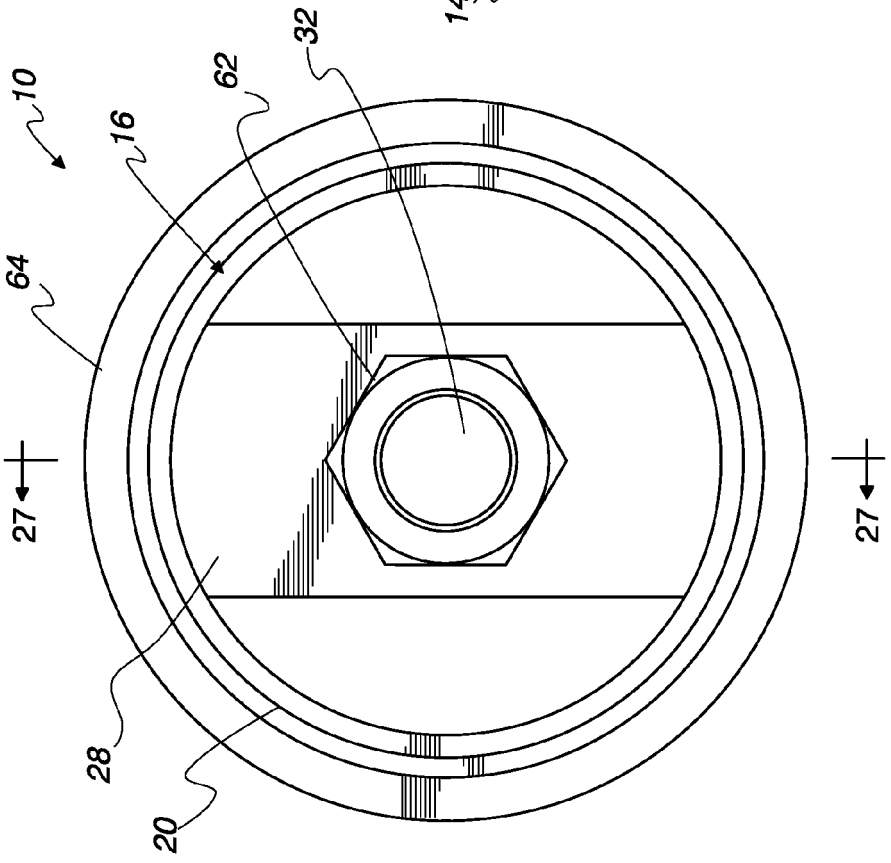


Fig. 28



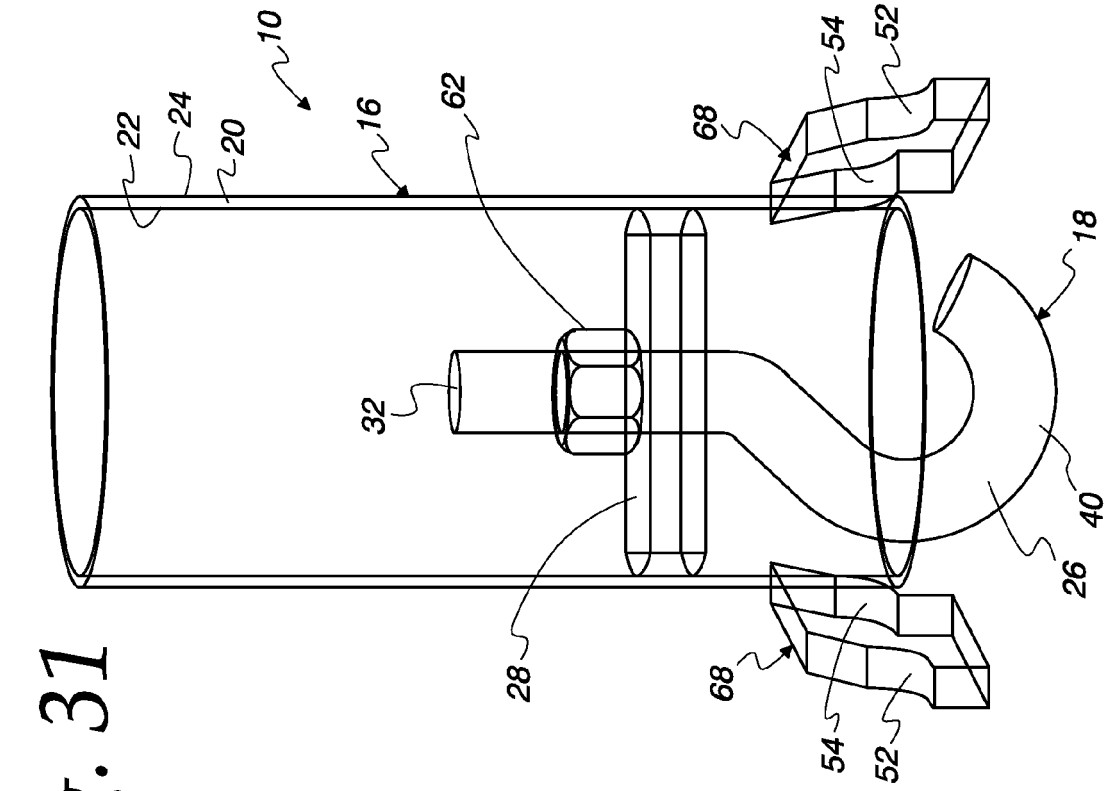

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Fig. 31

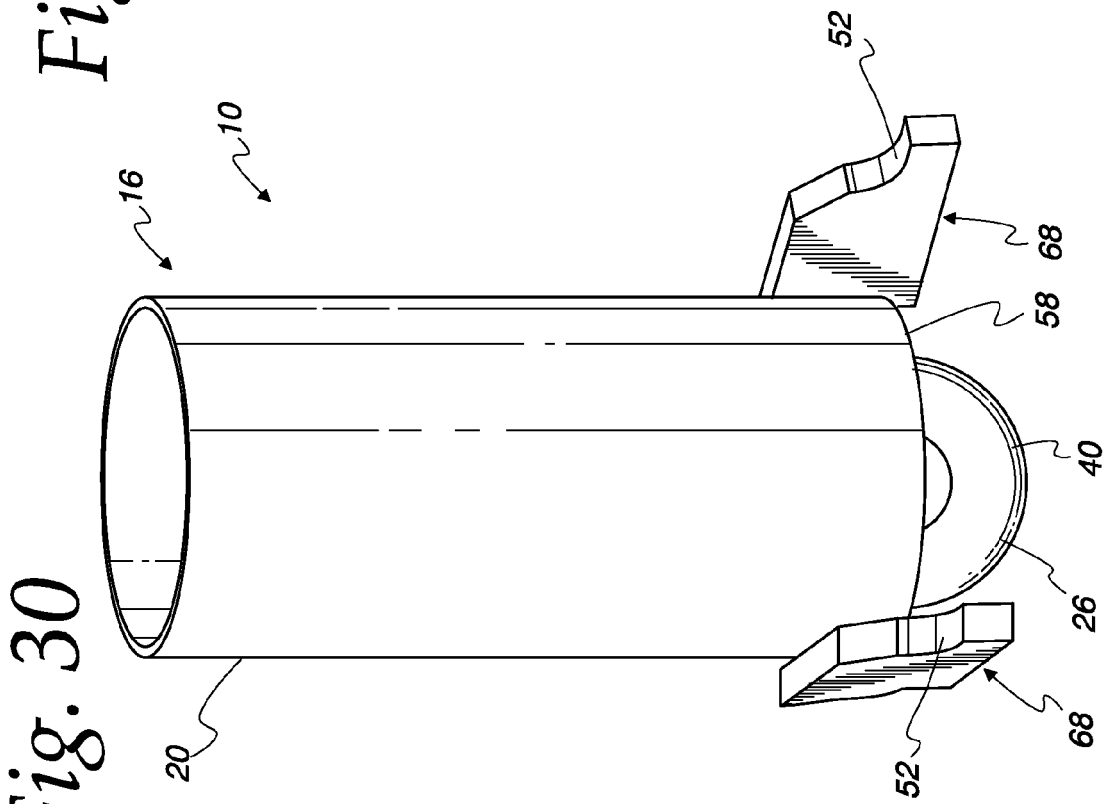
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Fig. 30

Fig. 33

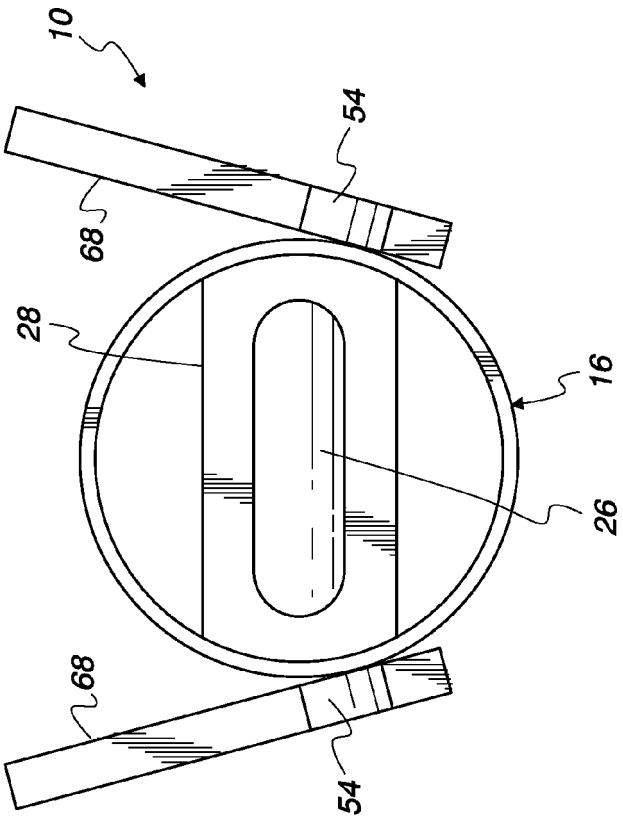

Fig. 32