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(54) SYSTEM FOR FOR POST-TENSIONED CONCRETE MEMBER

SYSTEM FÜR NACHGESPANNTES BETONELEMENT

SYSTEME POUR ÉLÉMENT DE BÉTON PRÉCONTRAINT

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(56) References cited:
NL-A- 7 004 097
US-A- 4 616 458
US-A- 4 773 198
US-A- 5 024 032
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Description

Technical Field/Field of the Disclosure

[0001] The present disclosure relates generally to post-tensioned, pre-stressed concrete construction. The present disclosure relates specifically to anchors and systems for use therein.

Background of the Disclosure

[0002] Many structures are built using concrete, including, for instance, buildings, parking structures, apartments, condominiums, hotels, mixed-use structures, casinos, hospitals, medical buildings, government buildings, research/academic institutions, industrial buildings, malls, roads, bridges, pavement, tanks, reservoirs, silos, sports courts, and other structures.

[0003] Prestressed concrete is structural concrete in which internal stresses are introduced to reduce potential tensile stresses in the concrete resulting from applied loads; prestressing may be accomplished by post-tensioned prestressing or pre-tensioned prestressing. In post-tensioned prestressing, a tension member is tensioned after the concrete has attained a desired strength by use of a post-tensioning tendon. The post-tensioning tendon may include for example and without limitation, anchor assemblies, the tension member, and sheathes. Traditionally, a tension member is constructed of a material that can be elongated and may be a single or a multi-strand cable. Typically, the tension member may be formed from a metal or composite material, such as reinforced steel. The post-tensioning tendon conventionally includes an anchor assembly at each end. The post-tensioning tendon is fixedly coupled to a fixed anchor assembly positioned at one end of the post-tensioning tendon, the "fixed-end", and stressed at the stressed anchor assembly positioned at the opposite end of the post-tensioning tendon, the "stressing-end" of the post-tensioning tendon.

[0004] Post-tension members are conventionally formed from a strand and a sheath. The strand is conventionally formed as a single or multi-strand metal cable. The strand is conventionally encapsulated within a polymeric sheath extruded thereabout to, for example, prevent or retard corrosion of the metal strand by protecting the metal strand from exposure to corrosive or reactive fluids. Likewise, the sheath may prevent or retard concrete from bonding to the strand and preventing or restricting movement of the sheath during post-tensioning. The sheath may be filled with grease to further limit the exposure of the metal strand and allow for increased mobility. Once installed in the concrete member, and before the strand is tensioned and sealed, the end of the tension member extending from the concrete member may provide an entry point for fluids such as water resulting from ambient humidity or precipitation.

[0005] US4773198 A discloses tendon anchors that include forward and rear connection means for fluid-resistant connection to adjacent members.

[0006] US4616458 A discloses a protective apparatus for tendons in tendon tensioning assemblies.

[0007] NL7004097 A discloses an anchor body for adjusting tensioning elements.

[0008] US5024032 A discloses a post tensioning anchor assembly comprising a tapered tubular member, cable cap and anchoring plate assembly.

[0009] US5347777A discloses a post tensioning anchor plate assembly comprising an anchor plate and coupling elements therefor.

Summary

[0010] The present invention is as defined in the claims. In particular, the present invention is defined in claim 1 and relates to:

A system for post tensioning a concrete member (40) comprising:

an anchor body (14, 18);
a pocket former (100) removably coupled to the anchor body (14, 18) and configured to form in the concrete member (40) a pocket cavity (101') around the anchor body (14, 18);
a strand (27), the strand (27) inserted through the anchor body (14, 18), the strand (27) having a strand end (170) and an outer diameter (160);
a pocket cap (103), the pocket cap (103) configured to be positioned around the strand (27) and
to engage the pocket cavity (101') using friction or press fit, the pocket cap (103) having a cylindrical interior wall (113), the pocket cap (103) adapted to restrict fluid access to the point where the strand (27) extends from the anchor body (14, 18)
wherein the outer surface (140) of the pocket former (100) comprises an annular keyway former (102) extending radially outwardly from the outward tapered surface (140) of a pocket former body (101)
wherein the keyway former (102) forms in the concrete member (40) a keyway (102') when the keyway former (102) is removed from the concrete member (40);
wherein the shape of the keyway (102') corresponds with the outside shape of keyway former (102); and,
wherein the pocket cap has one or more extensions (107) that couple the pocket cap (103) to a keyway surface (102").

[0011] The present invention provides for a system for post tensioning a concrete member. The system includes an anchor body, and a strand, the strand inserted through the anchor body. The strand has a strand end and an outer diameter. The system also includes a pocket cap, the pocket cap positioned around the strand. The pocket cap has a cylindrical interior wall, the cylindrical interior wall having a pocket cap diameter corresponding to the

outer diameter of the strand.

[0012] The present disclosure also provides for a method of forming a post-tensioned concrete member, however the method does not form part of the present invention. The method includes positioning a post-tensioning tendon within a concrete form, the post-tensioning tendon including a tension member, fixed anchor, and a stressing end anchor. The tension member includes a strand. The method also includes positioning a pocket former between the stressing end anchor and the concrete form. The pocket former is coupled to the stressing end anchor, where the stressing end anchor has a stressing end anchor body. The method additionally includes pouring concrete into the concrete form thereby forming a concrete member and encasing the post-tensioning tendon and pocket former in the concrete member. The method includes forming a cavity in the concrete by removing the pocket former, the cavity corresponding to the outer shape of the pocket former. The cavity has a cavity surface. The method also includes coupling a pocket cap to the cavity surface.

Brief Description of the Drawings

[0013] The present disclosure is best understood from the following detailed description when read with the accompanying figures. It is emphasized that, in accordance with the standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of the various features may be arbitrarily increased or reduced for clarity of discussion.

FIGS. 1A, 1B depict a partial cross section of a concrete post-tensioning tendon within a concrete form consistent with at least one embodiment of the present disclosure.

FIGS. 2A, 2B, 2C depict an anchor and pocket cap consistent with at least one embodiment of the present invention.

FIG. 3 depicts an anchor and pocket cap not forming part of the present invention.

Detailed Description

[0014] It is to be understood that the following disclosure provides many different embodiments, or examples, for implementing different features of various embodiments. Specific examples of components and arrangements are described below to simplify the present disclosure. These are, of course, merely examples and are not intended to be limiting. In addition, the present disclosure may repeat reference numerals and/or letters in the various examples. This repetition is for the purpose of simplicity and clarity and does not in itself dictate a relationship between the various embodiments and/or configurations discussed.

[0015] When stressing concrete member 40, anchoring systems may be provided to hold the tension member before and after stressing. In some aspects of the present disclosure, as depicted in FIGS. 1A, 1B, post-tensioning tendon 11 may be positioned within concrete form 21. Concrete form 21 is a form into which concrete may be poured to form concrete member 40. Post-tensioning tendon 11 may include for example and without limitation fixed end anchor 13, tension member 15, and stressing end anchor 17. As depicted in FIG. 1A, in some aspects of the present disclosure, fixed end anchor 13 may include fixed end anchor body 14. Fixed-end anchor body 14 is positioned within concrete form 21 such that fixed-end anchor body 14 will be encased in concrete 23 after concrete is poured into concrete form 21. In some aspects of the present disclosure, fixed end cap 19 may be positioned at distal end 41 of fixed end anchor body 14. Fixed end cap 19 may, in certain aspects of the present disclosure, protect tension member 15 from corrosion after concrete 23 is poured by preventing or retarding corrosive or reactive fluids or concrete from contacting tension member 15.

[0016] In some aspects of the present disclosure, tension member 15 may include strand 27 and sheath 29. Strand 27 may be a single or multi-strand metal cable. Sheath 29 may be tubular or generally tubular and may be positioned about strand 27. In some aspects of the present disclosure, space between strand 27 and sheath 29 may be filled or partially filled with a filler such as grease. When installing tension member 15, in some aspects of the present disclosure, a length of sheath 29 may be removed from first end 43 of tension member 15, exposing strand 27. Strand 27 may be inserted through fixed end anchor body 14 and secured thereto, for example and without limitation, by one or more wedges. After strand 27 is secured, fixed end anchor body 14 may be installed in concrete form 21. Tension member 15 may be positioned within concrete form 21 and tension member 15 may be cut to correspond with the length of concrete form 21. In some aspects of the present disclosure, a length of sheath 29 may be removed from second end 44 of tension member 15, exposing strand 27. Strand 27 may be inserted through stressing end anchor body 18. After insertion of strand 27 through stressing end anchor body 18, stressing end anchor 17 may be positioned within concrete form 21. End wall 22 may include strand aperture 45 through which strand 27 may extend.

[0017] Pocket former 100 may be positioned between stressing end anchor body 18 and end wall 22 of concrete form 21. Pocket former 100 does prevent or restrict concrete 23 from filling the space between stressing end anchor body 18 and end wall 22, thus forming a cavity or pocket in edge 42 of concrete member 40 formed by concrete 23 within concrete form 21. Pocket former 100 may thus allow access to tension member 15 from outside concrete member 40 once concrete member 40 is sufficiently hardened and end wall 22 is removed. As used herein, "stressing end anchor assembly" refers to the combination of stressing end anchor 17, pocket former 100, and, as described hereinbelow, pocket cap

103.

[0018] As depicted in FIGS. 2A, 2B, pocket former 100 does include pocket former body 101. In some aspects of the present disclosure, pocket former body 101 may include a coupler for coupling pocket former 100 to stressing end anchor 17. In some aspects of the present disclosure, pocket former body 101 may be hollow. In some aspects of the present disclosure, pocket former body 101 may be a cylindrical or generally cylindrical member. Pocket former body 101 may be any shape suitable for providing a pocket in concrete 23 to allow access to the end of tension member 15 including, but not limited to, cylindrical, frustoconical, prismatoidal, ellipsoidal, or any combination thereof. Additionally, the cross-sectional shape of pocket former body 101 may be any shape including, but not limited to, square, round, oblong, ovate, ellipsoidal, triangular, polyhedral, or any combination thereof. As depicted in FIG. 2A, pocket former body 101 is frustoconical or otherwise tapered from pocket former outer edge 120 to pocket former inner edge 130. In some aspects of the present disclosure, by tapering pocket former body 101 from pocket former outer edge 120 to pocket former inner edge 130, removal of pocket former body 101 from concrete 23 may be accomplished more easily than a non-tapered pocket former body. As depicted in FIG. 2A, when pocket former body 101 is removed from concrete 23 (once concrete 23 has reached a sufficient strength), cavity 101' is formed in concrete 23. The shape of cavity 101' does correspond with the outside shape of pocket former body 101.

[0019] The pocket former 100 does include keyway former 102. Keyway former 102 is annular or generally annular and positioned on outer tapered surface 140 of pocket former body 101. As depicted in FIG. 2A, the keyway former 102 does extend radially outwardly from outer tapered surface 140 of pocket former body 101. As depicted in FIG. 2B, when keyway former 102 is removed from concrete 23, keyway 102' is formed in concrete 23. Keyway 102' is a cavity within concrete 23. The shape of keyway 102' does, correspond with the outside shape of keyway former 102

[0020] The pocket cap 103 may be positioned around strand 27. Pocket cap 103 may cover cavity 101' and prevent or restrict fluid intrusion thereinto. Pocket cap 103 may be positioned between cavity 101' and strand 27. In some aspects of the present disclosure, pocket cap 103 may be annular or generally annular. Pocket cap 103 will couple to keyway surface 102" by one or more extensions adapted to fit into keyway 102'. The pocket cap 103 does include one or more extensions 107 that couple pocket cap 103 to keyway surface 102" as depicted in FIG. 2C. As depicted in FIG. 3, cavity 101' may include cylindrical section 105 and frustoconical section 106. In such an aspect not forming part of the present invention, pocket cap 103 may fit within cylindrical section 105 by, for example and without limitation, a friction or press fit. In another aspect of the present disclosure, cylindrical section 105 may instead be tapered inwardly or outwardly. Surface 23' of concrete 23 in cavity 101' may, for example, be rough enough to retain pocket cap 103 therewithin without locking members.

[0021] In some aspects of the present disclosure, as depicted in FIGS. 2B, 2C, pocket cap 103 may be filled with a filler such as grease 111. Grease 111 may, for example and without limitation, prevent or restrict corrosive or reactive fluids from contacting strand 27. Grease 111 may be positioned within pocket cap 103 before pocket cap 103 is installed to cavity 101'.

[0022] In some aspects of the present disclosure, strand end 170 of strand 27 may pass through pocket cap 103. The pocket cap 103 has a cylindrical or generally cylindrical interior wall 113 having a pocket cap diameter 150 generally corresponding to strand outer diameter 160. In some aspects of the present disclosure, grease 111 may be positioned along cylindrical interior wall 113. In some aspects of the present disclosure, cylindrical interior wall 113 may terminate in end flange 115. End flange 115 may retain grease 111 within pocket cap 103. In some aspects of the present disclosure, one or more seals 117 may be positioned between cylindrical interior wall 113 and strand 27 to retain grease 111 within pocket cap 103.

[0023] In some aspects of the present disclosure, as depicted in FIG. 3, pocket cap 103 may enclose strand end 170 of strand 27. Pocket cap 103 may include cap end wall 119 positioned to retain grease 111 within pocket cap 103.

[0024] In some aspects of the present disclosure, gasket 109 as depicted in FIG. 3 may seal between stressing end anchor body 18 and pocket cap 103. Gasket 109 may be compressed between stressing end anchor body 18 and pocket cap 103. Gasket 109 may be formed from an elastic material such as rubber.

[0025] Post-tensioning tendon 11 may be positioned within concrete form 21 as depicted in FIG. 1A. Pocket former 100 of stressing end anchor 17 may be positioned such that pocket former 100 is in contact with end wall 22. Concrete 23, as depicted in FIG. 1B may be poured into concrete form 21 and allowed to set. End wall 22 of concrete form 21 may be removed. Pocket former 100 and, keyway former 102 are removed from cavity 101' as depicted in FIG. 2A. A pocket cap 103 is placed within cavity 101. Pocket cap 103 may remain coupled to keyway surface 102" until access to strand 27 is desired, such as, for example, when strand 27 is to be post-tensioned; pocket cap 103 may be decoupled and removed to access strand 27. In some aspects of the present disclosure, pocket cap 103 may be removed from cavity 101', as depicted in FIG. 2B, by mechanical action.

[0026] Pocket cap 103 may be formed by, for example and without limitation, injection molding, milling, turning, or casting. Pocket cap 103 may be formed as a single unit or may include multiple components.

[0027] The foregoing outlines features of several embodiments so that a person of ordinary skill in the art may better understand the aspects of the present disclosure.

Such features may be replaced by any one of numerous equivalent alternatives, only some of which are disclosed herein. One of ordinary skill in the art should appreciate that they may readily use the present disclosure as a basis for designing or modifying other processes and structures for carrying out the same purposes and/or achieving the same advantages within the scope defined by the appended claims.

Claims

1. A system for post tensioning a concrete member (40) comprising:

   an anchor body (14, 18);
   a pocket former (100) removably coupled to the anchor body (14, 18) and configured to form in the concrete member (40) a pocket cavity (101') around the anchor body (14, 18) the pocket former (100) comprising a pocket former body (101);
   a strand (27), the strand (27) inserted through the anchor body (14, 18), the strand (27) having a strand end (170) and an outer diameter (160);
   a pocket cap (103), the pocket cap (103) configured to be positioned around the strand (27) and to engage the pocket cavity (101') using friction or press fit, the pocket cap (103) having a cylindrical interior wall (113), the pocket cap (103) adapted to restrict fluid access to the point where the strand (27) extends from the anchor body (14, 18);
   wherein the outer surface (140) of the pocket former (100) comprises an annular keyway former (102) extending radially outwardly from the outward tapered surface (140) of the pocket former body (101);
   wherein the keyway former (102) forms in the concrete member (40) a keyway (102') when the keyway former (102) is removed from the concrete member (40);
   wherein the shape of the keyway (102') corresponds with the outside shape of keyway former (102); and
   wherein the pocket cap has one or more extensions (107) that couple the pocket cap (103) to a keyway surface (102").

2. The system of claim 1 wherein the pocket former (100) is configured to form a pocket cavity (101') having a cylindrical section and a frustoconical section, and wherein the pocket cap (103) engages the cylindrical section of the pocket cavity (101') using friction or press fit.

3. The system of claim 1 wherein the strand (27) passes through the pocket cap (103).

4. The system of claim 1 or 3 wherein the pocket cap (103) has a cylindrical or generally cylindrical interior wall (113) and the cylindrical interior wall (113) terminates in an end flange (115).

5. The system of claim 1, wherein the pocket cap (103) includes a cap end wall (119) and encloses the strand end (170).

6. The system of any one of claims 1 to 5, further comprising one or more seals (117) positioned between the cylindrical interior wall (113) and the strand (27).

7. The system of any one of claims 1 to 6 wherein the pocket cap (103) contains grease between the pocket cap (103) and the strand (27).

Patentansprüche

1. System zum Nachspannen eines Betonelements (40), umfassend:

   einen Ankerkörper (14, 18);
   einen Aussparungsformer (100), der abnehmbar mit dem Ankerkörper (14, 18) verbunden und dafür konfiguriert ist, in dem Betonelement (40) einen Aussparungshohlraum (101') um den Ankerkörper (14, 18) zu formen, wobei der Aussparungsformer (100) einen Aussparungsformerkörper (101) umfasst;
   eine Litze (27), wobei die Litze (27) durch den Ankerkörper (14, 18) eingeführt wird, wobei die Litze (27) ein Litzenende (170) und einen Außendurchmesser (160) aufweist;
   eine Aussparungsabdeckung (103), wobei die Aussparungsabdeckung (103) dafür konfiguriert ist, um die Litze (27) positioniert zu sein und den Aussparungshohlraum (101') mittels Reib- oder Presspassung in Eingriff zu nehmen, wobei die Aussparungsabdeckung (103) eine zylindrische Innenwand (113) aufweist, wobei die Aussparungsabdeckung (103) dafür ausgelegt ist, Fluidzugang zu dem Punkt, wo sich die Litze (27) von dem Ankerkörper (14, 18) erstreckt, einzuschränken;
   wobei die Außenfläche (140) des Aussparungsformers (100) einen ringförmigen Keilnutformer (102) umfasst, der sich radial nach außen von der äußeren Kegelfläche (140) des Aussparungsformerkörpers (101) erstreckt;
   wobei der Keilnutformer (102) eine Keilnut (102') in dem Betonelement (40) formt, wenn der Keilnutformer (102) aus dem Betonelement (40) entfernt wird;
   wobei die Form der Keilnut (102') der Außenform des Keilnutformers (102) entspricht; und
   wobei die Aussparungsabdeckung eine oder

mehrere Verlängerungen (107) aufweist, die die Aussparungsabdeckung (103) mit einer Keilnutoberfläche (102") verbinden.

2. System nach Anspruch 1, wobei der Aussparungsformer (100) dafür konfiguriert ist, einen Aussparungshohlraum (101') zu formen, der einen zylindrischen Abschnitt und einen kegelstumpfförmigen Abschnitt aufweist, und wobei die Aussparungsabdeckung (103) den zylindrischen Abschnitt des Aussparungshohlraums (101') mittels Reib- oder Presspassung in Eingriff nimmt.

3. System nach Anspruch 1, wobei die Litze (27) durch die Aussparungsabdeckung (103) verläuft.

4. System nach Anspruch 1 oder 3, wobei die Aussparungsabdeckung (103) eine zylindrische oder generell zylindrische Innenwand (113) aufweist und die zylindrische Innenwand (113) in einem Endflansch (115) endet.

5. System nach Anspruch 1, wobei die Aussparungsabdeckung (103) eine abdeckungsseitige Wand (119) beinhaltet und das Litzenende (170) umschließt.

6. System nach einem der Ansprüche 1 bis 5, ferner umfassend eine oder mehrere Dichtungen (117), die zwischen der zylindrischen Innenwand (113) und der Litze (27) positioniert sind.

7. System nach einem der Ansprüche 1 bis 6, wobei die Aussparungsabdeckung (103) Fett zwischen der Aussparungsabdeckung (103) und der Litze (27) enthält.

Revendications

1. Système de post-tension d'un élément en béton (40), comprenant :

un corps d'ancrage (14, 18) ;
un dispositif de coffrage de poche (100) accouplé amovible au corps d'ancrage (14, 18) et configuré pour former dans l'élément en béton (40) une cavité de poche (101') autour du corps d'ancrage (14, 18), le dispositif de coffrage de poche (100) comprenant un corps de dispositif de coffrage de poche (101) ;
un brin (27), le brin (27) étant inséré à travers le corps d'ancrage (14, 18), le brin (27) ayant une extrémité de brin (170) et un diamètre externe (160) ;
un couvercle de poche (103), le couvercle de poche (103) étant configuré pour être positionné autour du brin (27) et pour s'engager dans la cavité de poche (101') par ajustement serré ou pressé, le bouchon de poche (103) ayant une paroi intérieure cylindrique (113), le bouchon de poche (103) étant conçu pour restreindre un l'accès d'un fluide vers le point où le brin (27) s'étend depuis le corps d'ancrage (14, 18) ;
la surface externe (140) du dispositif de coffrage de poche (100) comprenant un dispositif de coffrage de rainure annulaire (102) s'étendant radialement vers l'extérieur depuis la surface conique extérieure (140) du corps de dispositif de coffrage de poche (101) ;
le dispositif de coffrage de rainure (102) formant dans l'élément en béton (40) une rainure (102') quand le dispositif de coffrage de rainure (102) est retiré de l'élément en béton (40) ; la forme de la rainure (102') correspondant à la forme extérieure du dispositif de coffrage de rainure (102) ; et
le bouchon de poche ayant une ou plusieurs extensions (107) qui accouplent le bouchon de poche (103) à une surface de rainure (102").

2. Système selon la revendication 1, dans lequel le dispositif de coffrage de poche (100) est configuré pour former une cavité de poche (101') ayant une section cylindrique et une section tronconique, et dans lequel le bouchon de poche (103) s'engage dans la section cylindrique de la cavité de poche (101') par ajustement serré ou pressé.

3. Système selon la revendication 1, dans lequel le brin (27) traverse le bouchon de poche (103).

4. Système selon la revendication 1 ou 3, dans lequel le bouchon de poche (103) a une paroi intérieure cylindrique ou généralement cylindrique (113) et la paroi intérieure cylindrique (113) se termine en un rebord d'extrémité (115).

5. Système selon la revendication 1, dans lequel le bouchon de poche (103) inclut une paroi d'extrémité de bouchon (119) et enferme l'extrémité de brin (170).

6. Système selon l'une quelconque des revendications 1 à 5, comprenant en outre un ou plusieurs joints (117) positionnés entre la paroi intérieure cylindrique (113) et le brin (27).

7. Système selon l'une quelconque des revendications 1 à 6, dans lequel le bouchon de poche (103) contient de la graisse entre le bouchon de poche (103) et le brin (27).

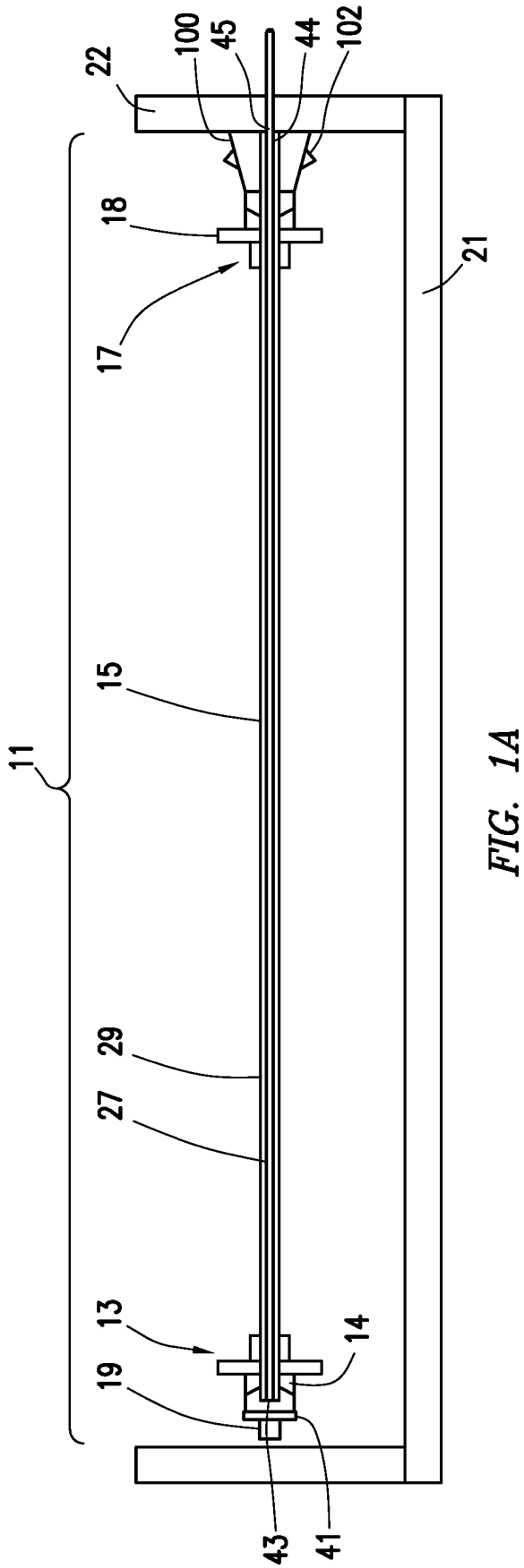
22
100
45
44
102
18
17
21
11
15
29
27
13
14
19
43
41

FIG. 1A

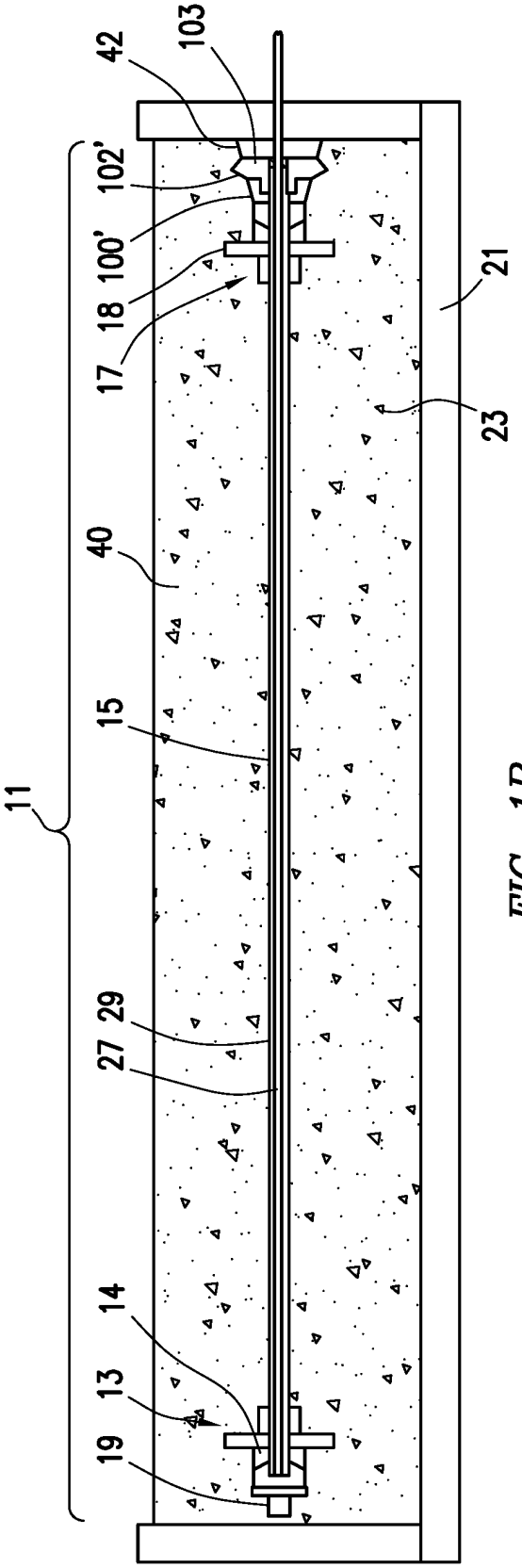
42
103
102'
100'
18
17
21
23
40
11
15
29
27
14
13
19

FIG. 1B

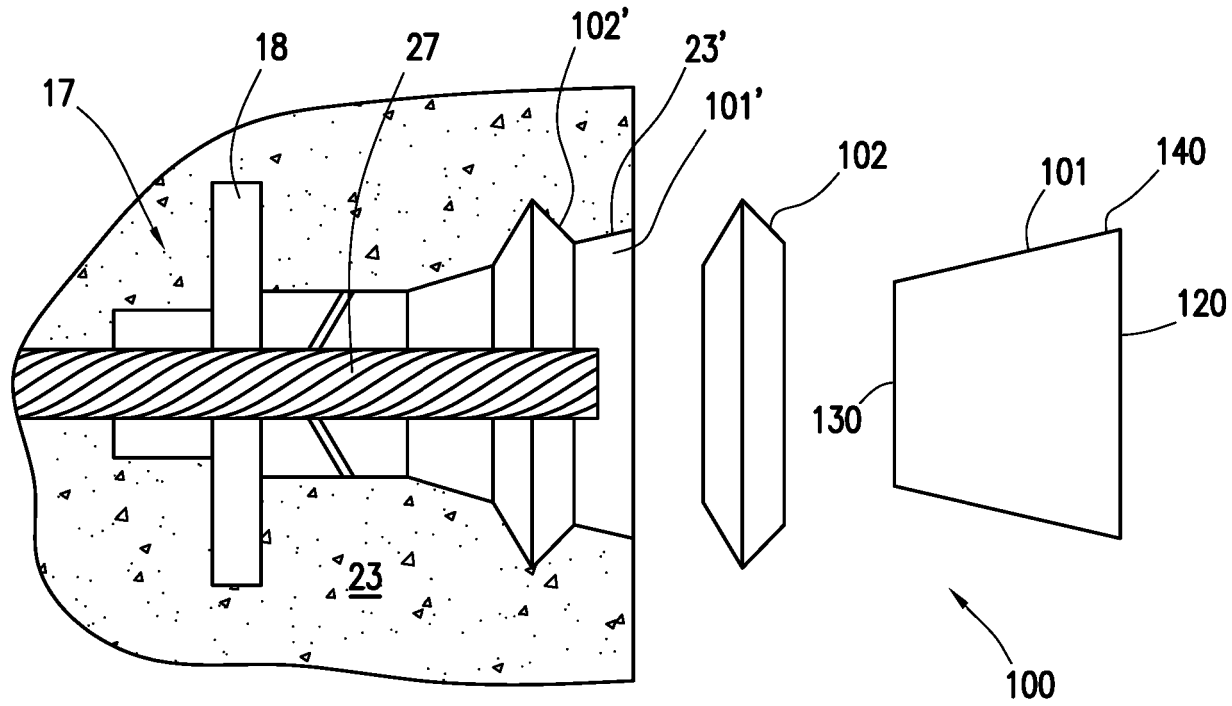
17
18
27
102'
23'
101'
102
101
140
120
130
23
100

FIG. 2A

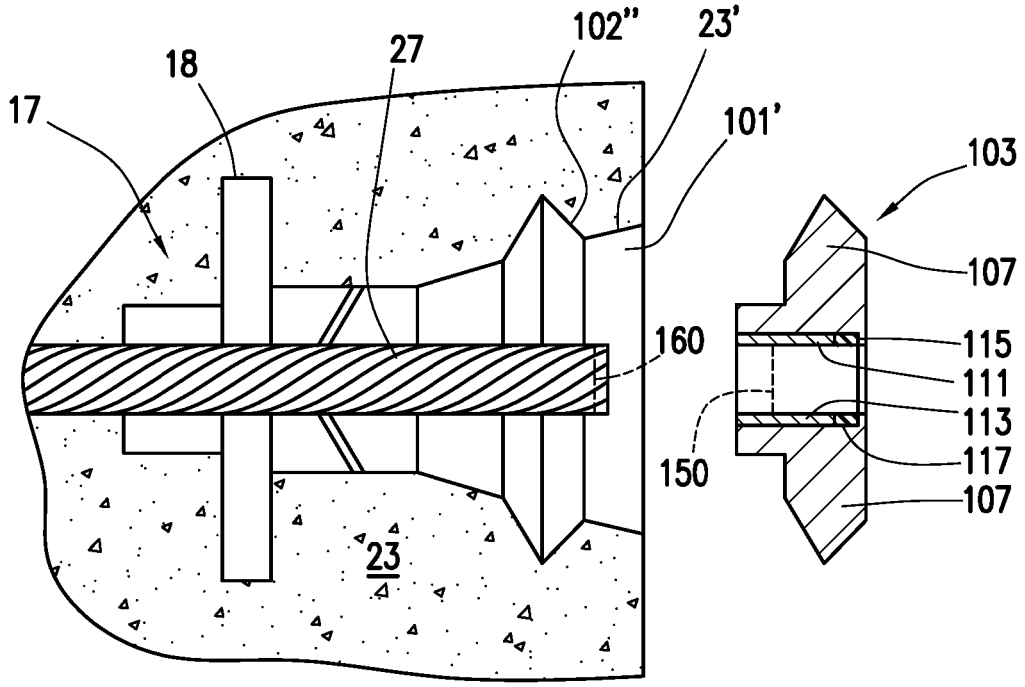
17
18
27
102"
23'
101'
103
107
160
115
111
113
117
150
107
23

FIG. 2B

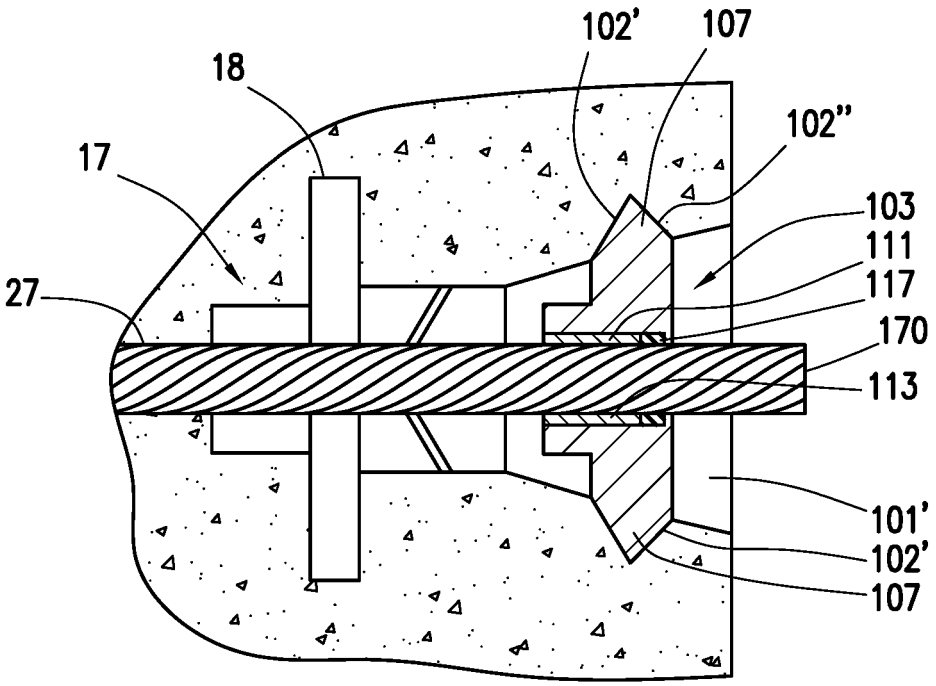
102'
107
18
102"
17
103
111
27
117
170
113
101'
102'
107

FIG. 2C

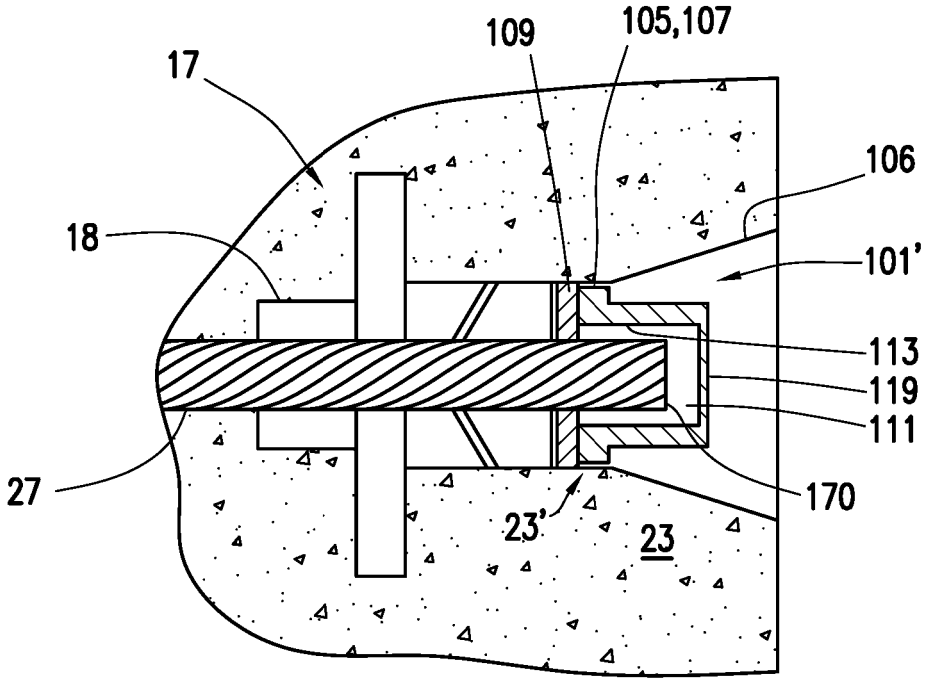
109
105,107
17
106
18
101'
113
119
111
27
170
23'
23

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4773198 A **[0005]**
- US 4616458 A **[0006]**
- NL 7004097 A **[0007]**
- US 5024032 A **[0008]**
- US 5347777 A **[0009]**