



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.09.2018 Bulletin 2018/38

(51) Int Cl.:
E04C 5/12 (2006.01)

(21) Application number: **18166866.6**

(22) Date of filing: **03.08.2016**

(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

(30) Priority: **04.08.2015 US 201562200945 P**
02.08.2016 US 201615226334
02.08.2016 PCT/US2016/045147

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
16182614.4 / 3 128 096

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Remarks:

This application was filed on 11-04-2018 as a divisional application to the application mentioned under INID code 62.

(54) **SYSTEM FOR POST-TENSIONED CONCRETE MEMBER**

(57) A system for post tensioning a concrete member is disclosed. The system may include an anchor body, and a strand, the strand inserted through the anchor body. The strand may have a strand end and an outer diameter. The system may also include a pocket cap, the pocket cap positioned around the strand. The pocket cap may have a cylindrical interior wall, the cylindrical interior wall having a pocket cap diameter corresponding to the outer diameter of the strand.

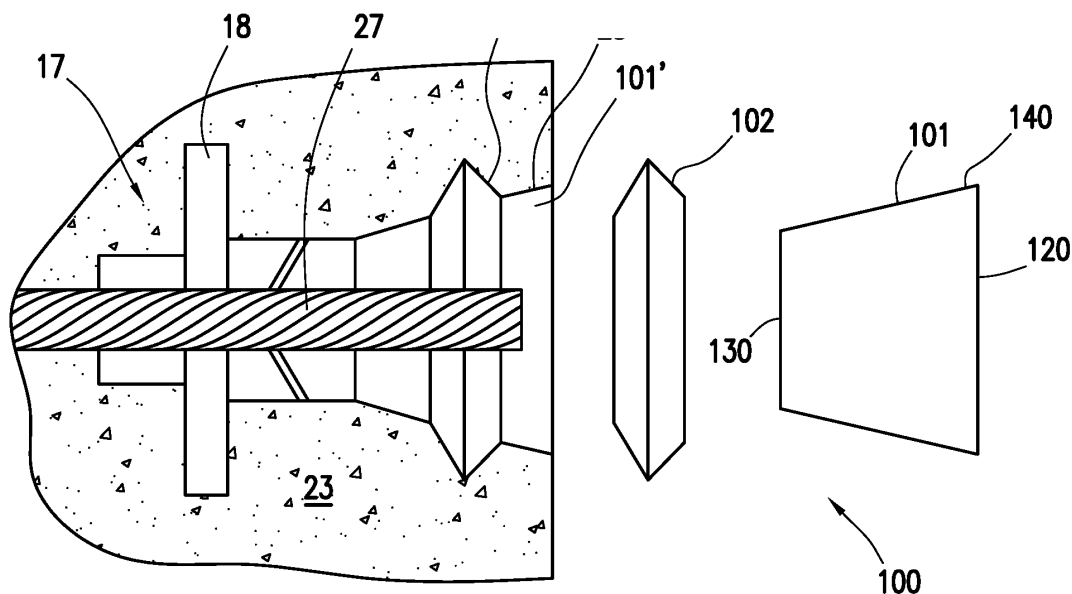


FIG. 2A

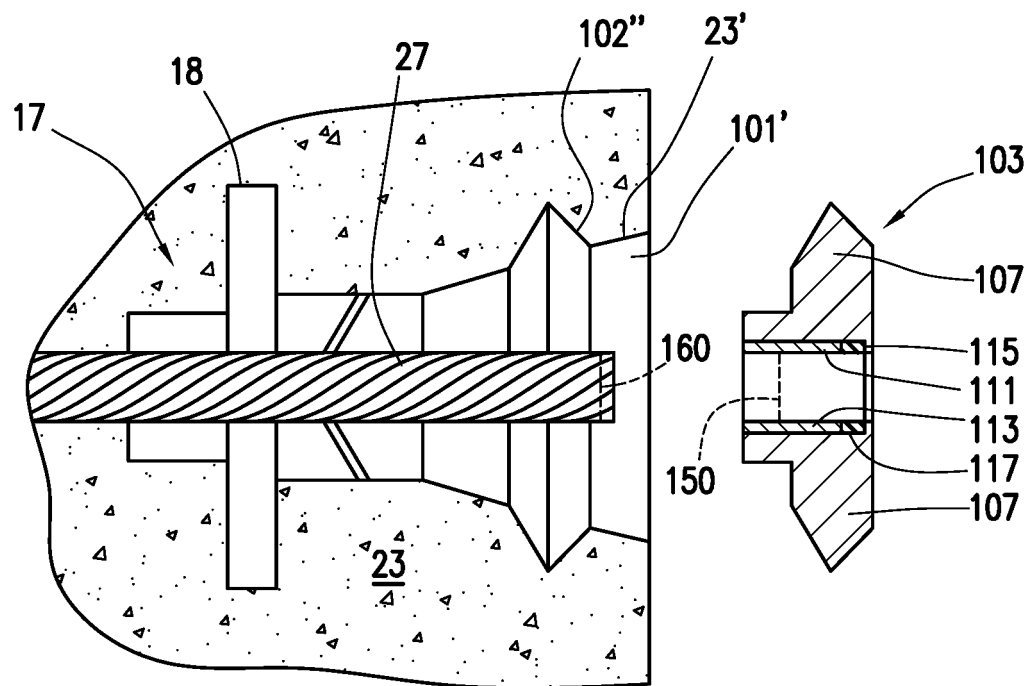


FIG. 2B

Description

Cross-Reference to Related Applications

[0001] This application is a nonprovisional application that claims priority from U.S. provisional application number 62/200,945, filed August 4, 2015; U.S. nonprovisional application number 15/226,334, filed 2 August 2016; and, PCT application number PCT/US2016/45147, filed 2 August 2016, each of which is hereby incorporated by reference in its entirety.

Technical Field/Field of the Disclosure

[0002] The present disclosure relates generally to post-tensioned, pre-stressed concrete construction. The present disclosure relates specifically to anchors for use therein.

Background of the Disclosure

[0003] 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.

[0004] 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.

[0005] 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 con-

crete 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.

Summary

[0006] The present disclosure 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.

[0007] The present disclosure also provides for a method of forming a post-tensioned concrete member. 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

[0008] 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 disclosure.

FIG. 3 depicts an anchor and pocket cap consistent with at least one embodiment of the present disclosure.

Detailed Description

[0009] 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.

[0010] When stressing concrete member 40, anchoring systems may be provided to hold the tension member before and after stressing. In some embodiments, 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 embodiments, fixed end anchor 13 may include fixed end anchor body 14. Fixed-end anchor body 14 may be 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 embodiments, fixed end cap 19 may be positioned at distal end 41 of fixed end anchor body 14. Fixed end cap 19 may, in certain embodiments, 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.

[0011] In some embodiments, 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 embodiments, 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 embodiments, 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 embodiments, 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.

[0012] Pocket former 100 may be positioned between stressing end anchor body 18 and end wall 22 of concrete form 21. Pocket former 100 may be adapted to, for example and without limitation, 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.

[0013] In some embodiments, as depicted in FIGS. 2A, 2B, pocket former 100 may include pocket former body 101. In some embodiments, pocket former body 101 may include a coupler for coupling pocket former 100 to stressing end anchor 17. In some embodiments, pocket former body 101 may be hollow. In some embodiments, 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, prismatic, 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 may be frustoconical or otherwise tapered from pocket former outer edge 120 to pocket former inner edge 130. In some embodiments, 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' may correspond with the outside shape of pocket former body 101.

[0014] In some embodiments, pocket former 100 may include keyway former 102. Keyway former 102 may be annular or generally annular and may be positioned on outer tapered surface 140 of pocket former body 101. As depicted in FIG. 2A, at least a part of keyway former 102 may 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' may be formed in concrete 23. Keyway 102' is a cavity within concrete 23. The shape of keyway 102' may correspond with the outside shape of keyway former 102.

[0015] In some embodiments, pocket cap 103 may be positioned around strand 27. Pocket cap 103 may cover cavity 101' and prevent or restrict fluid intrusion therein. Pocket cap 103 may be positioned between cavity 101' and strand 27. In some embodiments, pocket cap 103 may be annular or generally annular. Pocket cap 103 may couple to keyway surface 102" using any coupling assembly known in the art, including, for example and without limitation, one or more extensions adapted to fit into keyway 102' or a threaded connection. In some embodiments, pocket cap 103 may include one or more extensions 107 that couple pocket cap 103 to keyway surface 102" as depicted in FIG. 2C. In some embodiments, as depicted in FIG. 3, cavity 101' may include cylindrical section 105 and frustoconical section 106. In such an embodiment, pocket cap 103 may fit within cylindrical section 105 by, for example and without limitation, a friction or press fit. In another embodiment, 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.

[0016] In some embodiments, 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'.

[0017] In some embodiments, strand end 170 of strand 27 may pass through pocket cap 103. In some such embodiments, pocket cap 103 may have a cylindrical or generally cylindrical interior wall 113 having a pocket cap diameter 150 generally corresponding to strand outer diameter 160. In some embodiments, grease 111 may be positioned along cylindrical interior wall 113. In some embodiments, cylindrical interior wall 113 may terminate in end flange 115. End flange 115 may retain grease 111 within pocket cap 103. In some embodiments, one or more seals 117 may be positioned between cylindrical interior wall 113 and strand 27 to retain grease 111 within pocket cap 103.

[0018] In some embodiments, 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.

[0019] In some embodiments, 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.

[0020] 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, if included, keyway former 102 are removed from cavity 101' as depicted in FIG. 2A. In some embodiments, pocket cap 103 may be 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 embodiments, pocket cap 103 may be removed from cavity 101', as depicted in FIG. 2B, by mechanical action.

[0021] 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.

[0022] 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 of the embodiments introduced herein. One of ordinary skill in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the present disclosure and that they may make various changes, substitutions, and alterations herein without departing from the spirit and scope of the present disclosure. Unless explicitly stated otherwise, nothing herein is intended to be a definition of any word or term as generally used by a person of ordinary skill in the art, and nothing herein is a disavowal of any scope of any word or term as generally used by a person of ordinary skill in the art.

[0023] The present invention will now be described with reference to the following clauses:

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

an anchor body;

a strand, the strand inserted through the anchor body, the strand having a strand end and an outer diameter;

a pocket cap, the pocket cap positioned around the strand, the pocket cap having a cylindrical interior wall.

2. The system of clause 1, wherein the strand passes through the pocket cap.

3. The system of clause 2, wherein cylindrical interior wall terminates in an end flange.

4. The system of clause 3 further comprising one or more seals positioned between the cylindrical interior wall and the strand.

5. The system of clause 2, wherein the pocket cap comprises extensions.

6. The system of any one of clause 1 to 5, wherein the pocket cap contains grease.

7. The system of any one of clause 1 to 5, wherein the pocket cap encloses the strand end.

8. The system of clause 7, wherein the pocket cap comprises a cap end wall, the cap end wall containing grease.

9. The system of clause 8 further comprising a gasket, the gasket compressed between the anchor body and the pocket cap.

10. A method of forming a post-tensioned concrete member comprising:

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 including a strand;

positioning a pocket former between the stressing end anchor and the concrete form, the pocket former coupled to the stressing end anchor, the stressing end anchor having a stressing end anchor body;

pouring concrete into the concrete form thereby forming a concrete member;

encasing the post-tensioning tendon and pocket former in the concrete member;

forming a cavity in the concrete by removing the pocket former, the cavity corresponding to the outer shape of the pocket former, the cavity having a cavity surface; and

coupling a pocket cap to the cavity surface.

11. The method of clause 10, wherein the pocket former further comprises a keyway former, and the method further includes:

removing the keyway former from the concrete member leaving a keyway in the cavity corre-

sponding to the outer shape of the keyway former, the keyway having a keyway surface; and

coupling an extension of the pocket cap to the keyway surface.

12. The method of clause 11, wherein the pocket former has an outer tapered surface and wherein the keyway former extends radially outward from the outer tapered surface of the pocket former.

13. The method of clause 11 or clause 12 further comprising positioning the pocket cap around the strand.

14. The method of any one of clauses 11 to 13, wherein the cavity has a cylindrical section and a frustoconical section and the pocket cap is positioned within the cylindrical section using friction or press fit.

15. The method of clause 14, wherein the pocket cap does not include a locking member.

16. The method of any one of clauses 11 to 15 further comprising filling the pocket cap with grease prior to coupling a pocket cap to the cavity surface.

17. The method of any one of clauses 11 to 16 further comprising prior to the step of coupling the pocket cap to the cavity surface: forming the pocket cap by injection molding, milling, turning, or casting.

18. The method of any one of clauses 11 to 17 after the step of coupling the pocket cap to the cavity surface: decoupling the pocket cap from the cavity surface.

19. The method of any one of clauses 11 to 18, wherein pocket cap comprises a cylindrical interior wall and the method further comprises positioning one or more seals between the cylindrical interior wall and the strand.

20. The method of any one of clauses 11 to 19 further comprising compressing a gasket between the stressing end anchor body and the pocket cap.

Further clauses

[0024] Aspects of embodiments of the invention are summarised in the following numbered clauses:

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

- an anchor body;
- a strand, the strand inserted through the anchor body, the strand having a strand end and an outer diameter;
- a pocket cap, the pocket cap positioned around the strand, the pocket cap having a cylindrical interior wall.
2. The system of clause 1, wherein the strand passes through the pocket cap.
3. The system of clause 2, wherein cylindrical interior wall terminates in an end flange; optionally, further comprising one or more seals positioned between the cylindrical interior wall and the strand.
4. The system of clause 2, wherein the pocket cap comprises extensions.
5. The system of any one of clauses 1 to 4, wherein:
- the pocket cap contains grease; and/or,
- the pocket cap encloses the strand end.
6. The system of clause 5, wherein the pocket cap comprises a cap end wall, the cap end wall containing grease; optionally, further comprising a gasket, the gasket compressed between the anchor body and the pocket cap.
7. A method of forming a post-tensioned concrete member comprising:
- 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 including a strand;
- positioning a pocket former between the stressing end anchor and the concrete form, the pocket former coupled to the stressing end anchor, the stressing end anchor having a stressing end anchor body;
- pouring concrete into the concrete form thereby forming a concrete member;
- encasing the post-tensioning tendon and pocket former in the concrete member;
- forming a cavity in the concrete by removing the pocket former, the cavity corresponding to the outer shape of the pocket former, the cavity having a cavity surface; and
- coupling a pocket cap to the cavity surface.
8. The method of clause 7, wherein the pocket former further comprises a keyway former, and the method further includes:
- removing the keyway former from the concrete member leaving a keyway in the cavity corresponding to the outer shape of the keyway former, the keyway having a keyway surface; and
- coupling an extension of the pocket cap to the keyway surface.
9. The method of clause 8, wherein the pocket former has an outer tapered surface and wherein the keyway former extends radially outward from the outer tapered surface of the pocket former.
10. The method of clause 8 or claim 9 further comprising positioning the pocket cap around the strand.
11. The method of any one of clauses 8 to 10, wherein the cavity has a cylindrical section and a frustoconical section and the pocket cap is positioned within the cylindrical section using friction or press fit; optionally, wherein the pocket cap does not include a locking member.
12. The method of any one of clause 8 to 11 further comprising:
- filling the pocket cap with grease prior to coupling a pocket cap to the cavity surface; and/or,
- prior to the step of coupling the pocket cap to the cavity surface:
- forming the pocket cap by injection molding, milling, turning, or casting.
13. The method of any one of clauses 8 to 12 after the step of coupling the pocket cap to the cavity surface:
- decoupling the pocket cap from the cavity surface.
14. The method of any one of clauses 8 to 13, wherein pocket cap comprises a cylindrical interior wall and the method further comprises positioning one or more seals between the cylindrical interior wall and the strand.
15. The method of any one of clauses 8 to 14 further comprising compressing a gasket between the stressing end anchor body and the pocket cap.

Claims

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

an anchor body (14, 18);

a pocket former removably coupled to the anchor body and configured to form in the concrete a pocket cavity around the anchor body;

a strand (27), the strand inserted through the anchor body, the strand having a strand end (170) and an outer diameter (160);

a pocket cap (103), the pocket cap configured to be positioned around the strand and to engage the pocket cavity using friction or press fit, the pocket cap having a cylindrical interior wall (113), the pocket cap adapted to restrict fluid access to the point where the strand extends from the anchor body.
2. The system of claim 1 wherein the pocket former is configured to form a pocket cavity having a cylindrical section and a frustoconical section, and wherein the pocket cap engages the cylindrical section of the pocket cavity.
3. The system of claim 1 wherein the strand passes through the pocket cap.
4. The system of 3 wherein the cylindrical interior wall terminates in an end flange (115).
5. The system of claim 1 wherein the pocket cap includes a cap end wall (119) and encloses the strand end.
6. The system of any one of claims 1 to 5, further comprising one or more seals (117) positioned between the cylindrical interior wall and the strand.
7. The system of any one of claims 1 to 6 wherein the pocket cap comprises extensions (107).
8. The system of any one of claims 1 to 7 wherein the pocket cap contains grease between the pocket cap and the strand.

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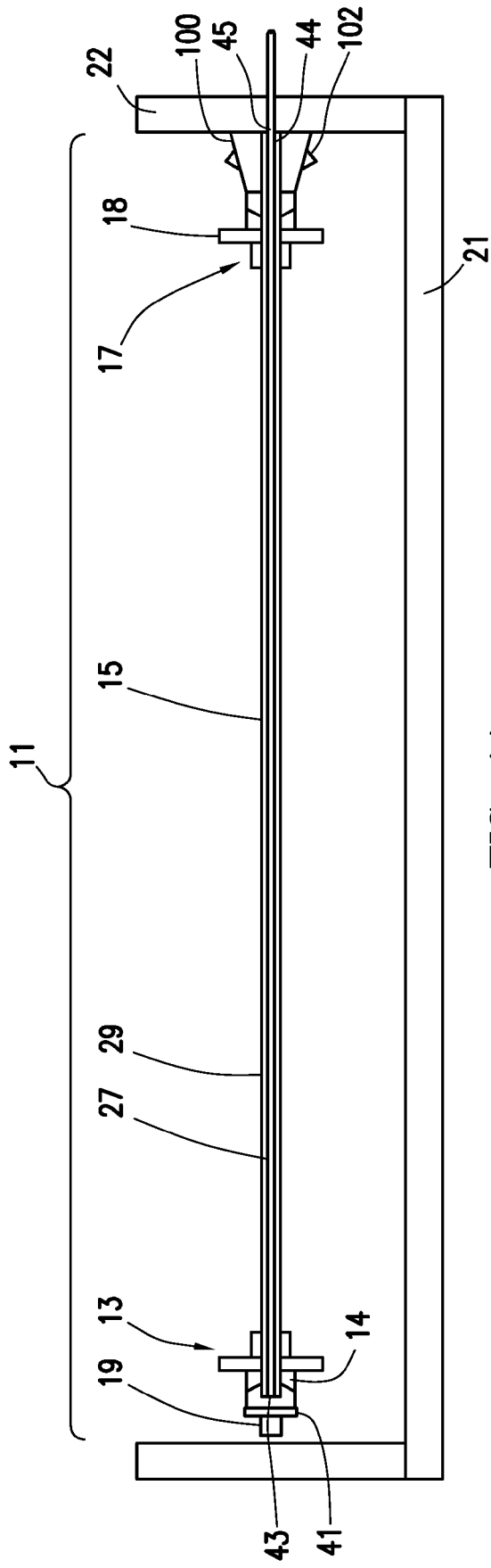


FIG. 1A

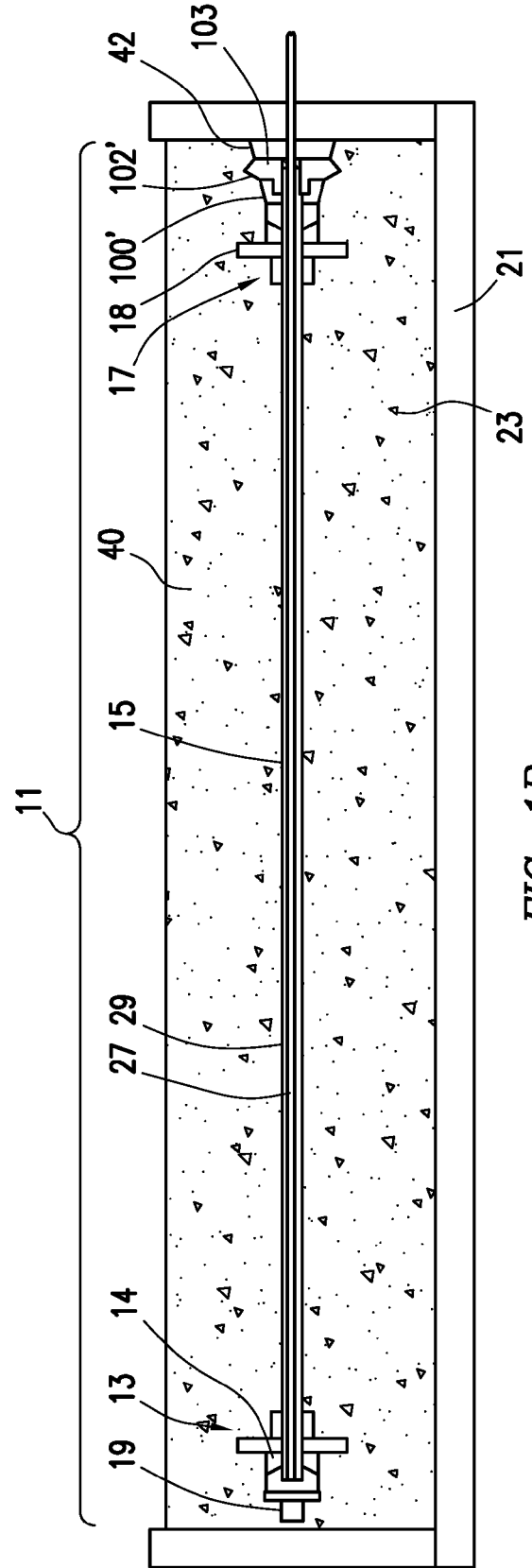


FIG. 1B

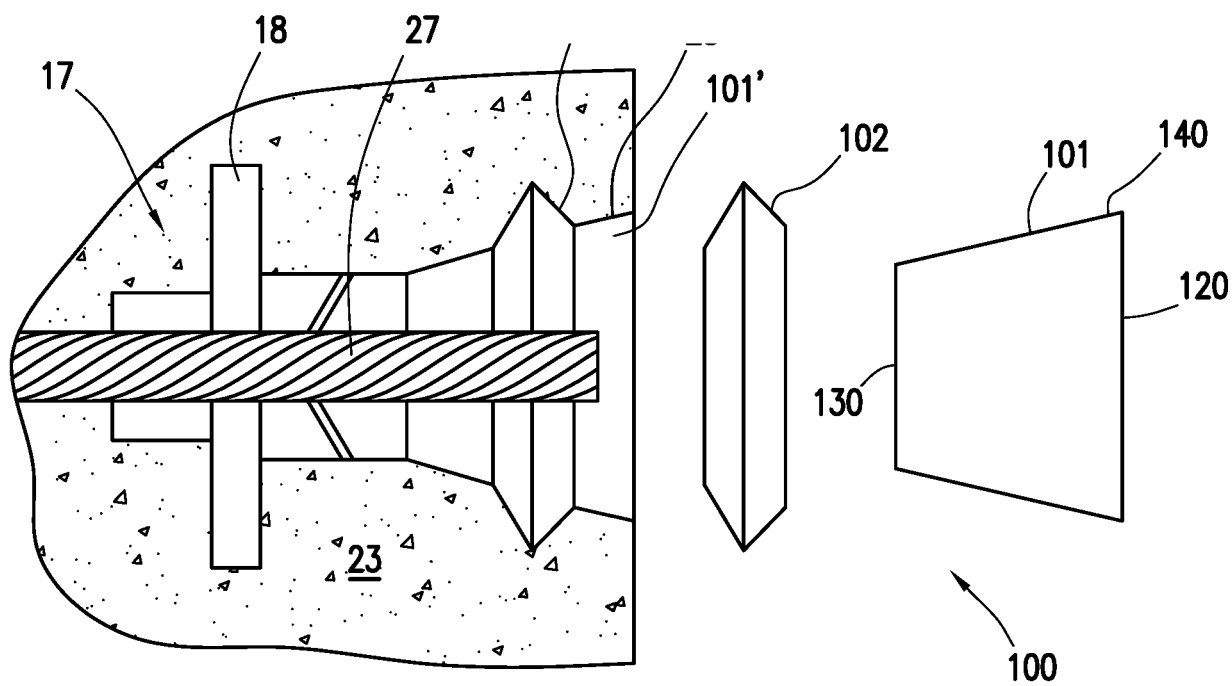


FIG. 2A

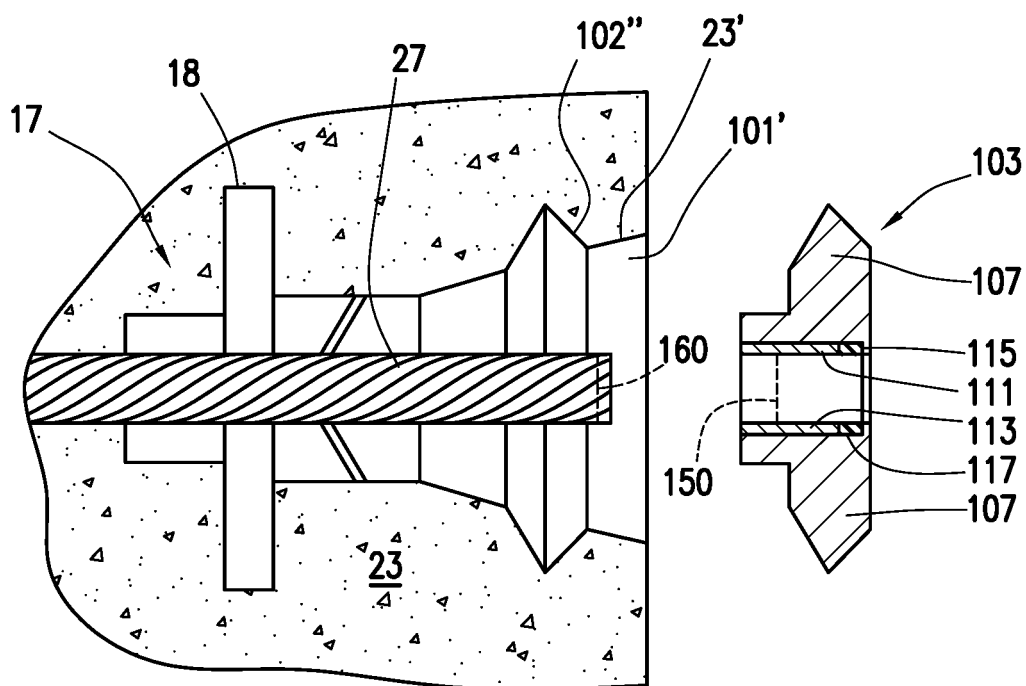


FIG. 2B

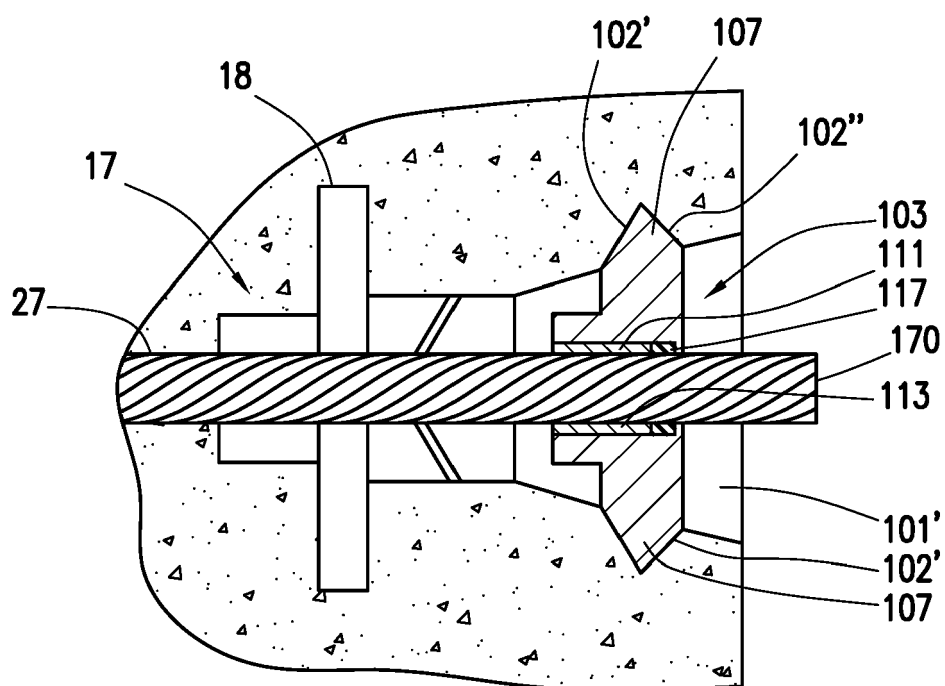


FIG. 2C

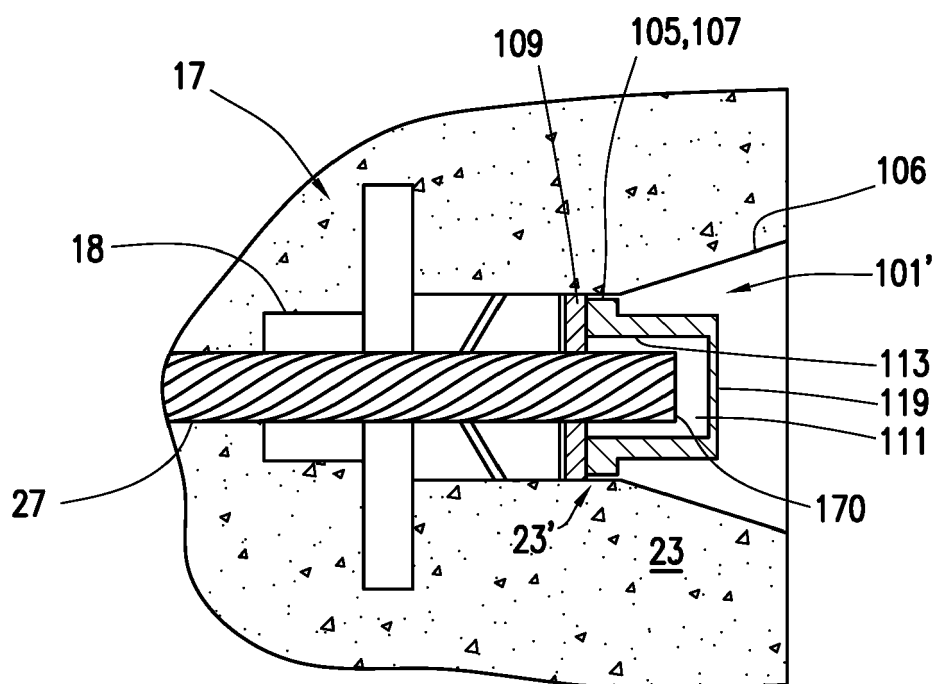


FIG. 3



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 16 6866

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 July 2018	Examiner Garmendia Irizar, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 16 6866

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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REFERENCES CITED IN THE DESCRIPTION

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