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(54) **ANCHOR**

(57) An anchor includes an anchor body and an insert at least partially within the anchor body. The anchor also includes a coupler body, the coupler body mechanically

coupled to the insert, and a coupler nut, the coupler nut coupled to the coupler body.

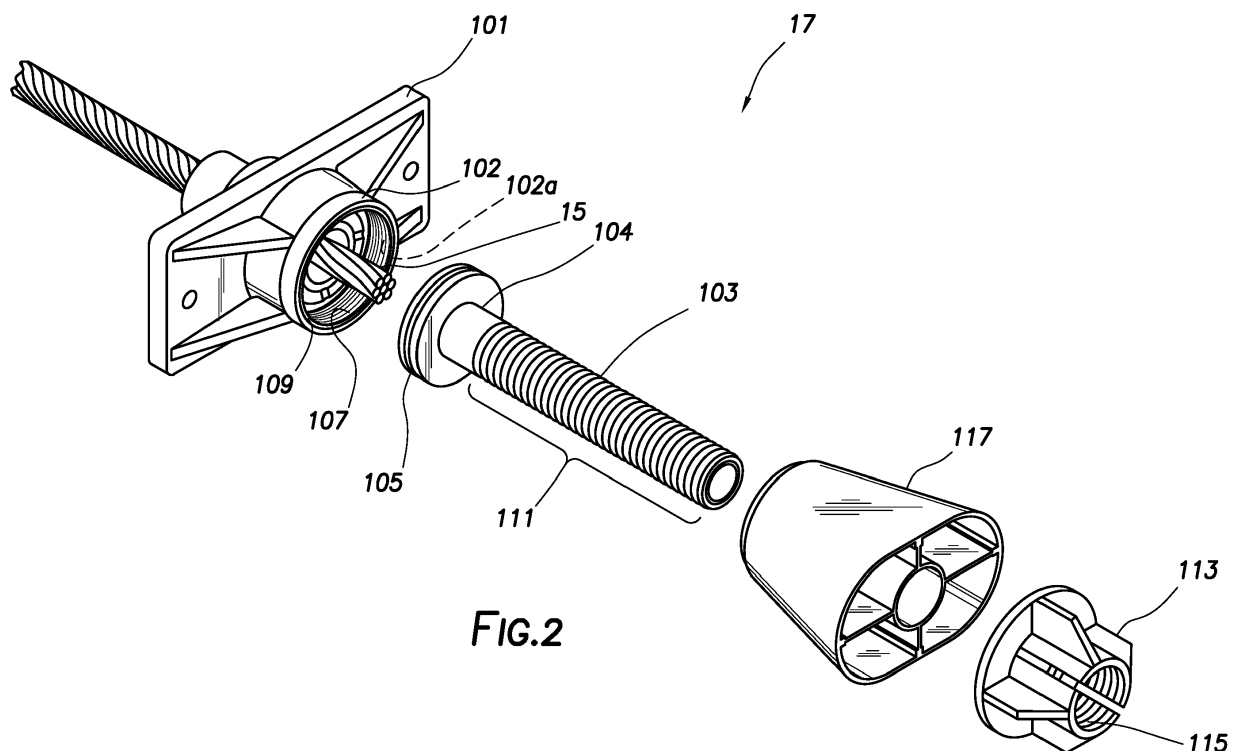


FIG.2

Description

Cross-Reference to Related Applications

[0001] This application is a nonprovisional application which claims priority from U.S. provisional application number 62/313,428, filed March 25, 2016, and U.S. non-provisional application number 15/382,284, filed 16 December 2016.

Technical Field/Field of the Disclosure

[0002] The present disclosure relates generally to post-tension anchors. More particularly, the present disclosure relates to an anchor used in post-tensioning concrete.

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, bridges, pavement, tanks, reservoirs, silos, foundations, sports courts, and other structures.

[0004] Prestressed concrete is structural concrete in which internal stresses are introduced to the concrete member 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 specified strength by use of a post-tensioning tendon. The post-tensioning tendon may include for example and without limitation, anchors, the tension member, and sheathes or ducts. One having ordinary skill in the art with the benefit of this disclosure will understand that a tension member could be any suitable material exhibiting tensile strength which can be elongated including, for example and without limitation, reinforcing steel, single or multi-strand cable. One having ordinary skill in the art with the benefit of this disclosure will likewise understand that the tension member may be formed from a metal or composite without deviating from the scope of this disclosure. The post-tensioning tendon includes an anchor at each end. The tension member is fixedly coupled to a fixed anchor positioned at one end of the tension member, the so-called "fixed-end" of the tension member, and is adapted to be stressed at the stressing anchor, the "stressing-end" of the tension member.

[0005] The concrete may be poured into a concrete form. The concrete form may be a form or mold into which concrete is poured or otherwise introduced to give shape to the concrete as it sets or hardens thus forming a concrete member.

[0006] Each anchor is typically nailed to the concrete form to attach the anchor to the concrete form in which

the concrete member is to be formed.

[0007] To allow access to the stressing-end of the post-tensioning tendon once the concrete is poured, a pocket former may be utilized to prevent concrete from filling the area between the stressing anchor and the concrete form used to form the concrete member. Once the concrete has sufficiently hardened and the concrete form is removed, the pocket former is removed from the concrete member. Traditionally, pocket formers are tapered to, for example, allow for easier removal from the concrete member. Typically, once the post-tensioning tendon is stressed, thereby forming a post-tensioned concrete member, and the pocket former removed, the pocket formed by the pocket former is filled with a material such as a cementitious chloride-free grout or concrete to, for example, provide fire protection and corrosion protection.

Summary

[0008] The present disclosure provides for an anchor for a post-tensioning tendon. The anchor includes an anchor body and an insert at least partially within the anchor body. The anchor also includes a coupler body, the coupler body mechanically coupled to the insert, and a coupler nut, the coupler nut coupled to the coupler body.

[0009] 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, a fixed anchor, and a stressing anchor. The fixed anchor is positioned at a first position within the concrete form, and the stressing anchor is positioned at a second position within the concrete form. The tension member extends between the fixed anchor and the stressing anchor, where one or both of the fixed anchor and stressing anchor include an anchor body, an insert at least partially within the anchor body, a coupler body, and a coupler nut. The method also includes mechanically coupling the coupler body to the insert and positioning the coupler body through an end of the concrete form. The method also includes threadedly coupling the coupler nut to the coupler body and placing concrete into the concrete form. In addition, the method includes tensioning the tension member.

Brief Description of the Drawings

[0010] 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-1F depict partial cross section views of an anchor in a concrete pouring operation consistent with at least one embodiment of the present disclosure.

sure.

FIG. 2 depicts an exploded view of an anchor consistent with at least one embodiment of the present disclosure.

Detailed Description

[0011] 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.

[0012] When forming a concrete member to be post-tensioned, anchors may be provided to hold the post-tensioning tendon both before and after stressing. In some embodiments, as depicted in FIGS. 1A-B, post-tensioning tendon 11 may be positioned within concrete form 21. Post-tensioning tendon 11 may include for example and without limitation fixed anchor 13, tension member 15, and stressing anchor 17. Tension member 15 may extend between fixed anchor 13 positioned at a first position within concrete form 21 and stressing anchor 17 positioned at another position within concrete form 21. In some embodiments, post-tensioning tendon 11 may also include a sheath (not shown) positioned about tension member 15 and one or more seals (not shown) between the sheath and each anchor. The sheath and seals may, for example, protect tension member 15 from corrosion after concrete 23 (shown in FIG. 1B) is poured. Additionally, the sheath and seals may, for example, reduce or prevent concrete from ingressing into tension member 15 and preventing or retarding its tensioning as discussed below. In some embodiments, a seal for fixed anchor 13 may be omitted. As depicted in FIG. 1A, in some embodiments, fixed anchor 13 may be positioned within concrete form 21 such that fixed anchor 13 will be encased in concrete 23. In some embodiments, fixed end cap 19 may be positioned at the end of fixed anchor 13 to protect tension member 15 from corrosion after concrete 23 is poured.

[0013] As depicted in FIGS. 1A, 1B, fixed anchor 13 and stressed anchor 17 each include anchor body 101. Anchor body 101 may be in any configuration positionable within concrete form 21 coupleable to tension member 15 as described herein that retains its position within concrete 23 once concrete 23 sets. In some embodiments, as shown with respect to stressed anchor 17, anchor body 101 may include anchor plate 101a positioned to retain stressed anchor 17 in position under tension when positioned in concrete 23. In some embodiments,

anchor body 101 may further include coupler extension 102. Coupler extension 102 may be generally tubular and may extend from anchor plate 101a.

[0014] In certain embodiments, such as those shown in FIGS. 1A-F and 2, stressed anchor 17 may include coupler body 103. Coupler body 103 may be generally tubular and may mechanically couple to anchor body 101. Coupler body 103 may mechanically couple to anchor body 101 by, for instance and without limitation, a bayonet ramp, threaded connection, or discontinuous threaded connection. In some embodiments, as depicted in FIG. 2, coupler body 103 may include anchor coupling flange 104 having coupling features 105 for mechanically coupling coupler body 103 to anchor body 101. Anchor body 101 may include corresponding coupling features 107 formed on interior surface 102a of coupler extension 102 which correspond with coupling features 105 of coupler body 103 for coupling anchor body 101 to coupler body 103. In some embodiments, coupling features 105 and corresponding coupling features 107 may be a threaded connection, including, for example and without limitation, straight threads, tapered threads, continuous threads, discontinuous threads, threads of varying density, threads of varying angles, and threads of varying pitch. In some embodiments, for example and without limitation, coupling features 105 and corresponding coupling features 107 may have tapered ends or straight ends, or may constitute male and female ends. In some embodiments, coupling features 105 and corresponding coupling features 107 may be corresponding bayonet ramps which engage to mechanically couple coupler body 103 to anchor body 101. In some embodiments, coupling features 105 and corresponding coupling features 107 may include one or more tongues and corresponding grooves positioned to press-fit coupler body 103 to anchor body 101. In other embodiments, coupler body 103 may couple to anchor body 101 by, for example and without limitation, press fitting, mechanical welding, chemical welding, friction welding, thermal coupling or welding, electrical welding, optical welding, or beam-energy welding.

[0015] In some embodiments, corresponding coupling features 107 may be formed on an interior surface of insert 109. Insert 109 may be positioned within coupler extension 102 of anchor body 101. In some embodiments, insert 109 may be annular. In some embodiments, insert 109 may be a tube positioned on an interior surface 102a of coupler extension 102. In some embodiments, insert 109 may substantially cover interior surface 102a of coupler extension 102. Insert 109 may be mechanically coupled to coupler extension 102 by, for example and without limitation, mechanical coupling such as, but not limited to, press fitting, mechanical welding, chemical welding, friction welding, thermal coupling or welding, electrical welding, optical welding, or beam-energy welding. In some embodiments, insert 109 may be formed from a flame resistant or heat resistant material. In some such embodiments, insert 109 may be formed from, for

example and without limitation a metal such as steel, aluminum, or zinc. In some such embodiments, by forming insert 109 from a flame resistant or heat resistant material, cutting operations, such as by torch or other similar methods, of tension member 15 may be undertaken without damaging anchor body 101 as insert 109 may deflect or absorb heat or otherwise prevent heat from a cutting operation away from anchor body 101.

[0016] In some embodiments, coupler body 103 may include threads 111 for mechanically coupling coupler body 103 to concrete form 21. Threads 111 may be formed on an exterior surface of coupler body 103. Coupler nut 113 may include threads 115 that correspond with threads 111 of coupler body 103 for threadedly coupling coupler nut 113 to coupler body 103. In some embodiments, threads 111 and 115 may be any type of threaded connection, including, for example and without limitation, straight threads, tapered threads, continuous threads, discontinuous threads, threads of varying density, threads of varying angles, and threads of varying pitch. In some embodiments, for example and without limitation, threads 111 and 115 may have tapered ends or straight ends, or may constitute male and female ends. In some embodiments, as depicted in FIG. 1A, coupler body 103 may be coupled to anchor body 101 such that when stressing anchor 117 is positioned in concrete form 21, coupler body 103 extends through a hole formed in end 22 of concrete form 21. Coupler nut 113 may be threaded onto coupler body 103 and tightened.

[0017] In some embodiments, as depicted in FIG. 2, stressing anchor 17 may include pocket former 117. Pocket former 117 may be positioned about coupler body 103 and may slide thereon. Pocket former 117 may be positioned between the end of anchor body 101 and end 22. Pocket former 117 may, for example and without limitation, prevent concrete 23 from filling the space between anchor body 101 and the edge of the resultant concrete member formed by concrete 23 within concrete form 21. Pocket former 117 may thus allow access to tension member 15 from without the concrete member once it is sufficiently hardened and concrete form 21 is removed. Pocket former 117 may be positioned on coupler body 103 before stressing anchor 17 is positioned in concrete form 21 such that it extends from anchor body 101 to end 22 of concrete form 21 as depicted in FIG. 1A.

[0018] Tension member 15 may be threaded through stressing anchor 17, passing through anchor body 101 and coupler body 103 such that tension member 15 extends from concrete form 21 as depicted in FIG. 1A. Tension member 15 may be threaded through stressing anchor 17 before or after stressing anchor 17 is coupled to end 22 of concrete form 21.

[0019] Once stressing anchor 17 is positioned in concrete form 21, concrete 23 may be placed into concrete form 21 as depicted in FIG. 1B. As depicted in FIG. 1C, when concrete 23 is poured, stressing anchor 17 remains coupled to end 22. Concrete 23 substantially surrounds the remainder of stressing anchor 17. Coupler nut 113

may be removed from coupler body 103 as depicted in FIG. 1D. Anchor body 101 may be held in place by concrete 23. End 22 may be removed from concrete 23 as depicted in FIG. 1E. Coupler body 103 may then be removed from anchor body 101 by, for example and without limitation, unthreading it from insert 109. Tension member 15 may then be tensioned as understood in the art.

[0020] Although depicted and described with stressing anchor 17, the embodiments described herein are equally applicable to fixed anchor 13.

[0021] 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.

[0022] The present invention is now described with reference to the following clauses:

1. An anchor for a post-tensioning tendon comprising:

an anchor body;

an insert at least partially within the anchor body;

a coupler body, the coupler body mechanically coupled to the insert; and

a coupler nut, the coupler nut coupled to the coupler body.

2. The anchor of clause 1, wherein the coupler body further comprises an anchor coupling flange having coupling features formed thereon and the insert further comprises corresponding coupling features formed thereon for mechanically coupling the coupler body to the insert.

3. The anchor of clause 2, wherein the coupling features and corresponding coupling features comprise one or more of a threaded connection or bayonet ramps.

4. The anchor of any one of clauses 1 to 3, wherein the coupler body further comprises an anchor coupling flange having bayonet ramps formed thereon, and the insert further comprises corresponding bay-

onet ramps formed thereon for mechanically coupling the coupler body to the insert.

5. The anchor of any one of clauses 1 to 4, wherein the coupler body further comprises threads formed on an exterior surface thereof for coupling the coupler body to the coupler nut. 5

6. The anchor of any one of clauses 1 to 5, further comprising a pocket former, the pocket former positioned about the coupler body. 10

7. The anchor of any one of clauses 1 to 6, wherein the coupler body is threadedly coupled to the anchor body. 15

8. The anchor of any one of clauses 1 to 7, wherein the insert is mechanically coupled to the anchor body by press fitting, mechanical welding, chemical welding, friction welding, thermal coupling or welding, electrical welding, optical welding, or beam-energy welding. 20

9. The anchor of any one of clauses 1 to 8, wherein the insert is formed from a flame resistant material. 25

10. The anchor of any one of clauses 1 to 9, wherein the insert is formed from metal.

11. The anchor of any one of clauses 1 to 10, wherein the insert is formed from at least one of steel, aluminum, or zinc. 30

12. A method of forming a post-tensioned concrete member comprising: 35

positioning a post-tensioning tendon within a concrete form, the post-tensioning tendon including a tension member, a fixed anchor, and a stressing anchor, the fixed anchor positioned at a first position within the concrete form, the stressing anchor positioned at a second position within the concrete form, the tension member extending between the fixed anchor and the stressing anchor, one or both of the fixed anchor and stressing anchor including: 40

an anchor body, the anchor body including an insert;

a coupler body; and 50

a coupler nut;

mechanically coupling the coupler body to the insert; 55

positioning the coupler body through an end of

the concrete form;

threadedly coupling the coupler nut to the coupler body;

placing concrete into the concrete form; and

tensioning the tension member.

13. The method of clause 12, further comprising:

removing the coupler nut;

removing the end of the concrete form; and

removing the coupler body from the anchor body.

14. The method of any one of clauses 12 or 13, wherein the coupler body further comprises an anchor coupling flange having coupling features formed thereon and the insert further comprises corresponding coupling features, and wherein mechanically coupling the coupler body to the insert comprises coupling the coupler body to the insert.

15. The method of clause 14, wherein the coupling features and corresponding coupling features comprise one or more of a threaded connection or bayonet ramps.

16. The method of any one of clauses 12 to 15, wherein the coupler body further comprises an anchor coupling flange having bayonet ramps formed thereon and the insert further comprises corresponding bayonet ramps, and wherein mechanically coupling the coupler body to the insert comprises engaging the bayonet ramps of the coupler body with the bayonet ramps of the insert.

17. The method of any one of clauses 12 to 16, wherein the insert is formed from a flame resistant material.

18. The method of any one of clauses 12 to 17, wherein the coupler body further comprises threads formed on an exterior surface thereof for coupling the coupler body to the coupler nut.

19. The method of clause 18, wherein the threads formed on the exterior surface of the coupler body are one or more of straight threads, tapered threads, continuous threads, discontinuous threads, threads of varying density, threads of varying angles, and threads of varying pitch.

20. The method of any one of clauses 12 to 19, wherein the insert is formed from metal.

21. The method of any one of clauses 12 to 20, wherein the insert is formed from at least one of steel, aluminum, or zinc.

22. The method of any one of clauses 12 to 21, further comprising:

positioning a pocket former about the coupler body before the coupler body is positioned through the end of the concrete form.

Claims

1. An anchor for a post-tensioning tendon comprising: 15

an anchor body;
an insert at least partially within the anchor body;
a coupler body, the coupler body mechanically coupled to the insert; and
a coupler nut, the coupler nut coupled to the coupler body. 20

2. The anchor of claim 1, wherein the coupler body further comprises an anchor coupling flange having coupling features formed thereon and the insert further comprises corresponding coupling features formed thereon for mechanically coupling the coupler body to the insert; optionally, wherein the coupling features and corresponding coupling features 25
comprise one or more of a threaded connection or bayonet ramps. 30

3. The anchor of any one of claims 1 or 2, wherein the coupler body further comprises: 35

an anchor coupling flange having bayonet ramps formed thereon, and the insert further comprises corresponding bayonet ramps formed thereon for mechanically coupling the coupler body to the insert; and/or, threads formed on an exterior surface thereof for coupling the coupler body to the coupler nut. 40

4. The anchor of any one of claims 1 to 3, further comprising a pocket former, the pocket former positioned about the coupler body. 45

5. The anchor of any one of claims 1 to 4, wherein the coupler body is threadedly coupled to the anchor body. 50

6. The anchor of any one of claims 1 to 5, wherein the insert is mechanically coupled to the anchor body by press fitting, mechanical welding, chemical welding, friction welding, thermal coupling or welding, electrical welding, optical welding, or beam-energy welding. 55

7. The anchor of any one of claims 1 to 6, wherein the insert is formed:

from a flame resistant material; and/or,
from metal; and/or,

from at least one of steel, aluminum, or zinc.

8. 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, a fixed anchor, and a stressing anchor, the fixed anchor positioned at a first position within the concrete form, the stressing anchor positioned at a second position within the concrete form, the tension member extending between the fixed anchor and the stressing anchor, one or both of the fixed anchor and stressing anchor including:

an anchor body, the anchor body including an insert;
a coupler body; and
a coupler nut;

mechanically coupling the coupler body to the insert;
positioning the coupler body through an end of the concrete form;
threadedly coupling the coupler nut to the coupler body;
placing concrete into the concrete form; and
tensioning the tension member.

9. The method of claim 8, further comprising:

removing the coupler nut;
removing the end of the concrete form; and
removing the coupler body from the anchor body.

10. The method of any one of claims 8 or 9, wherein the coupler body further comprises an anchor coupling flange having coupling features formed thereon and the insert further comprises corresponding coupling features, and wherein mechanically coupling the coupler body to the insert comprises coupling the coupler body to the insert; optionally, wherein the coupling features and corresponding coupling features comprise one or more of a threaded connection or bayonet ramps.

11. The method of any one of claims 8 to 10, wherein the coupler body further comprises an anchor coupling flange having bayonet ramps formed thereon and the insert further comprises corresponding bay-

onet ramps, and wherein mechanically coupling the coupler body to the insert comprises engaging the bayonet ramps of the coupler body with the bayonet ramps of the insert.

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12. The method of any one of claims 8 to 11, wherein the insert is formed from a flame resistant material.

13. The method of any one of claims 8 to 12, wherein the coupler body further comprises threads formed on an exterior surface thereof for coupling the coupler body to the coupler nut; optionally, wherein the threads formed on the exterior surface of the coupler body are one or more of straight threads, tapered threads, continuous threads, discontinuous threads, threads of varying density, threads of varying angles, and threads of varying pitch.

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14. The method of any one of claims 8 to 13, wherein the insert is formed from metal; optionally, at least one of steel, aluminum, or zinc.

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15. The method of any one of claims 8 to 14, further comprising:

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positioning a pocket former about the coupler body before the coupler body is positioned through the end of the concrete form.

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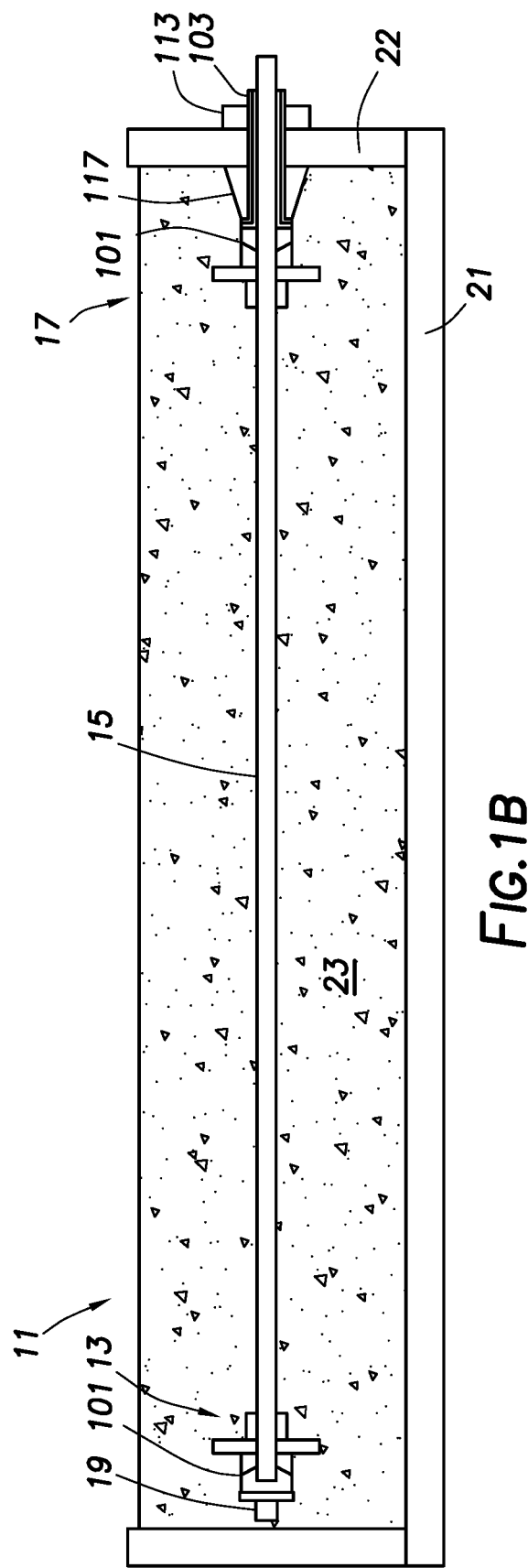
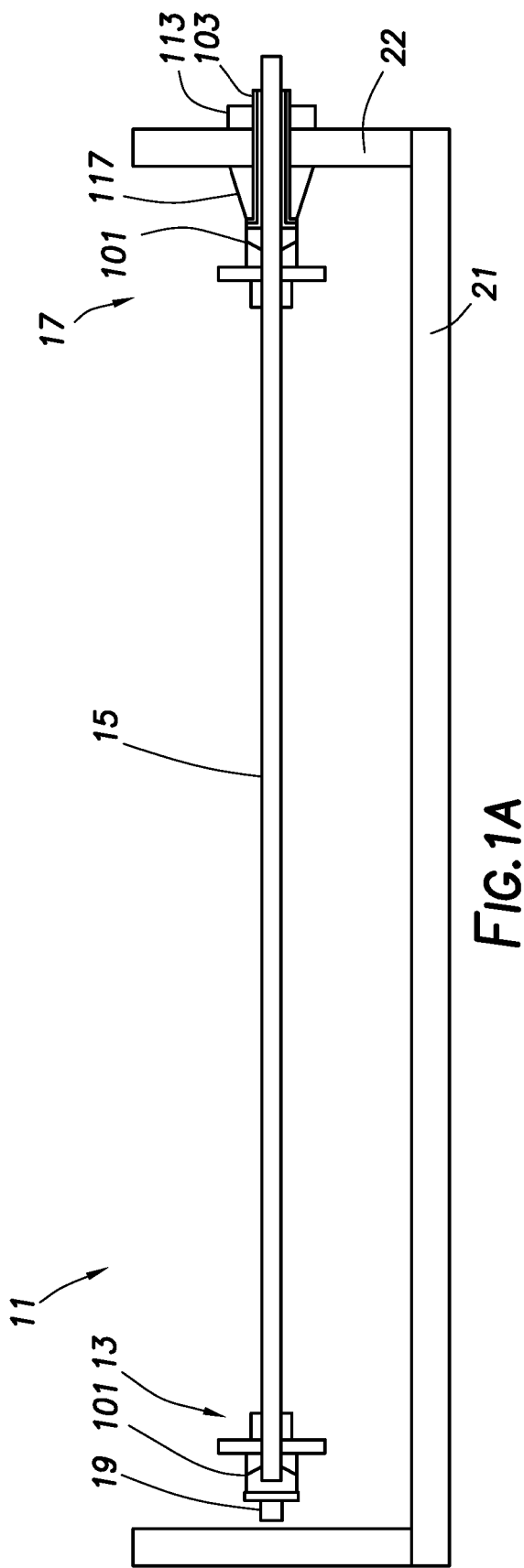
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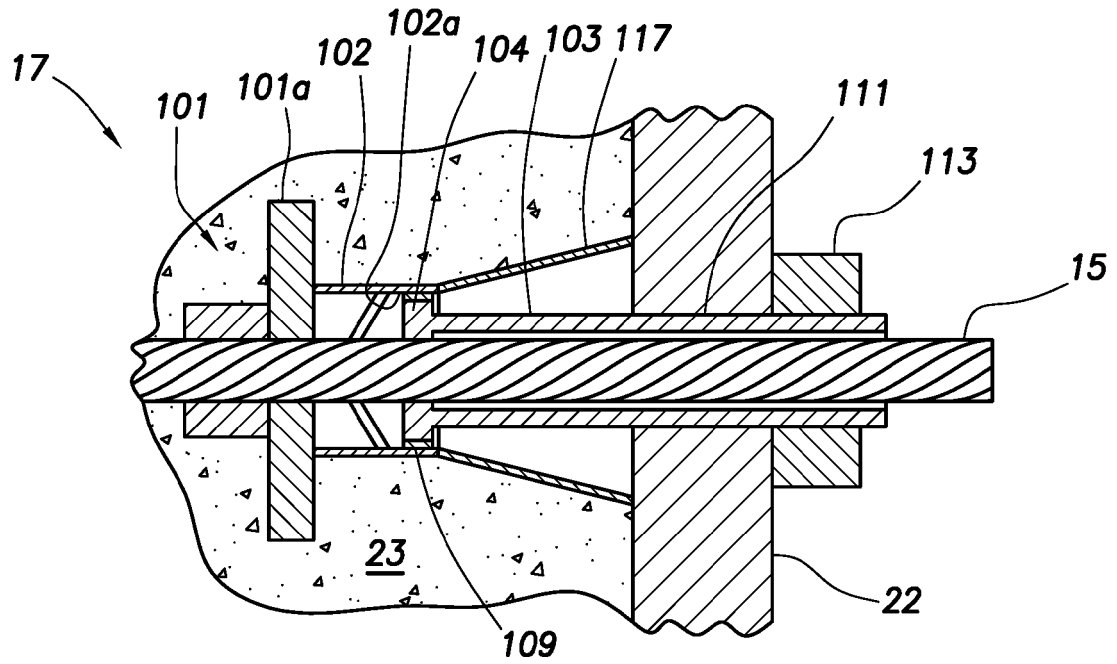


FIG. 1C

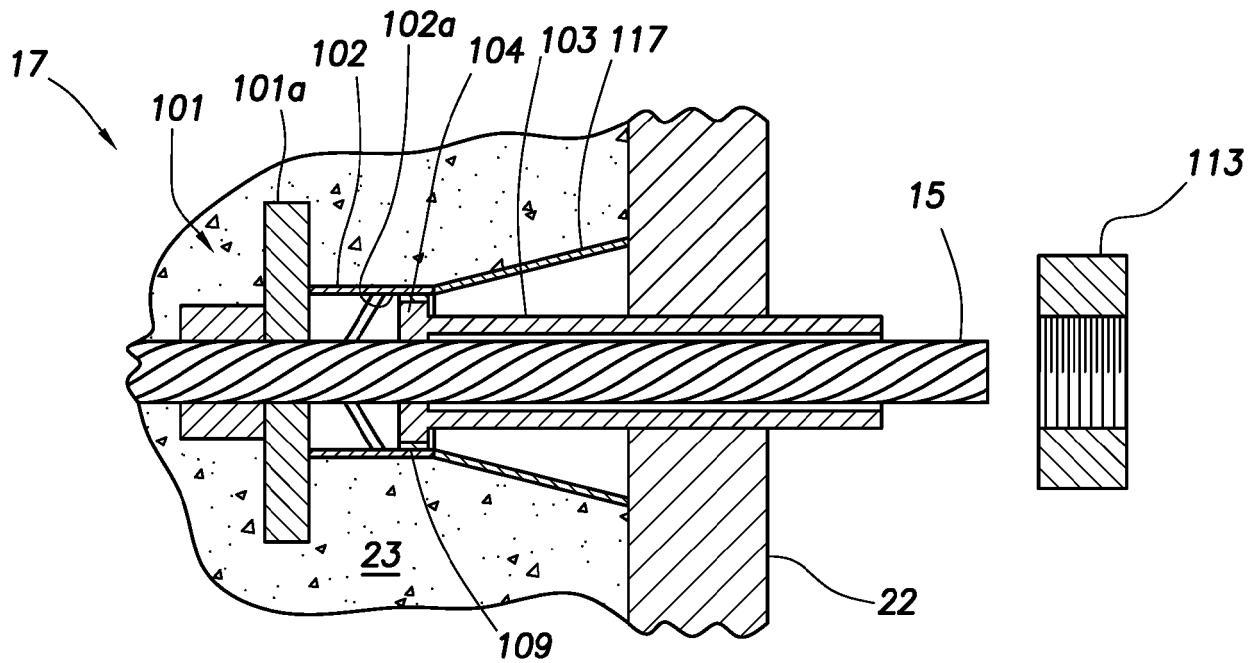


FIG. 1D

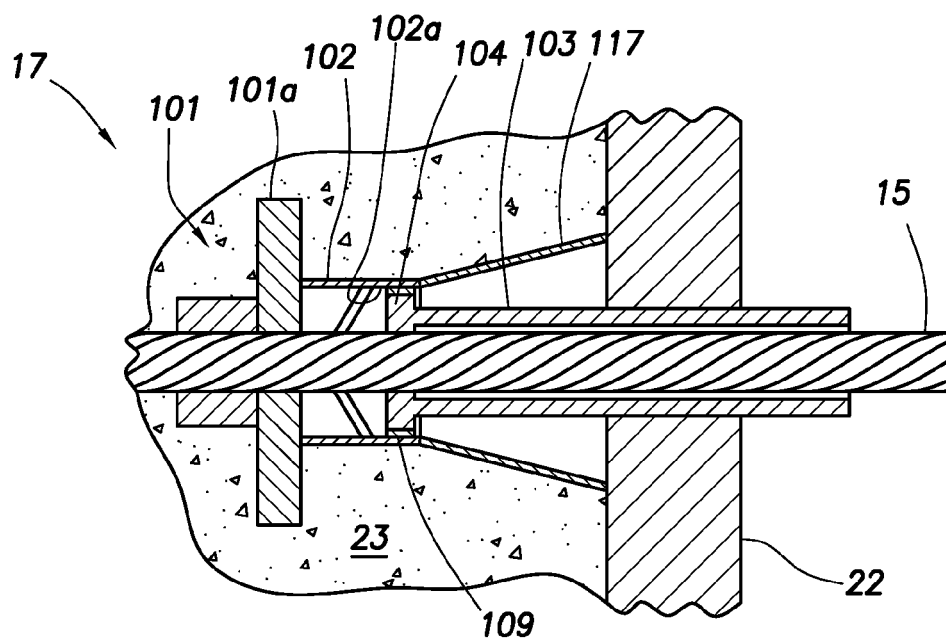
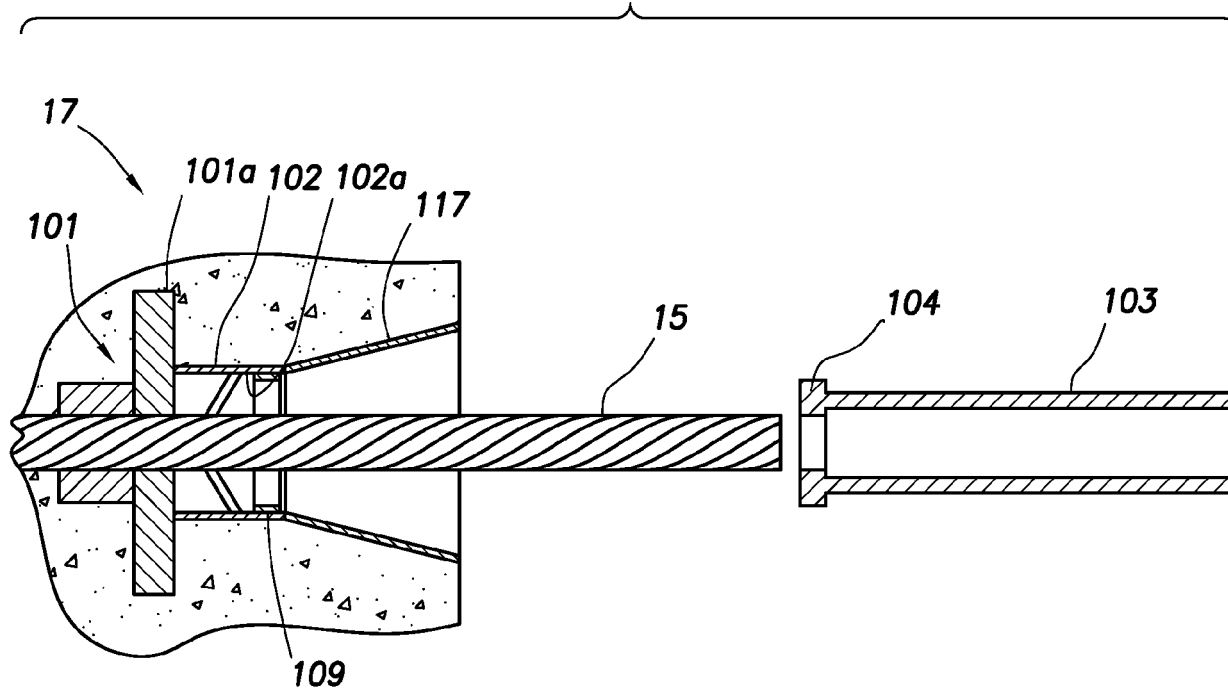


FIG. 1E

FIG. 1F



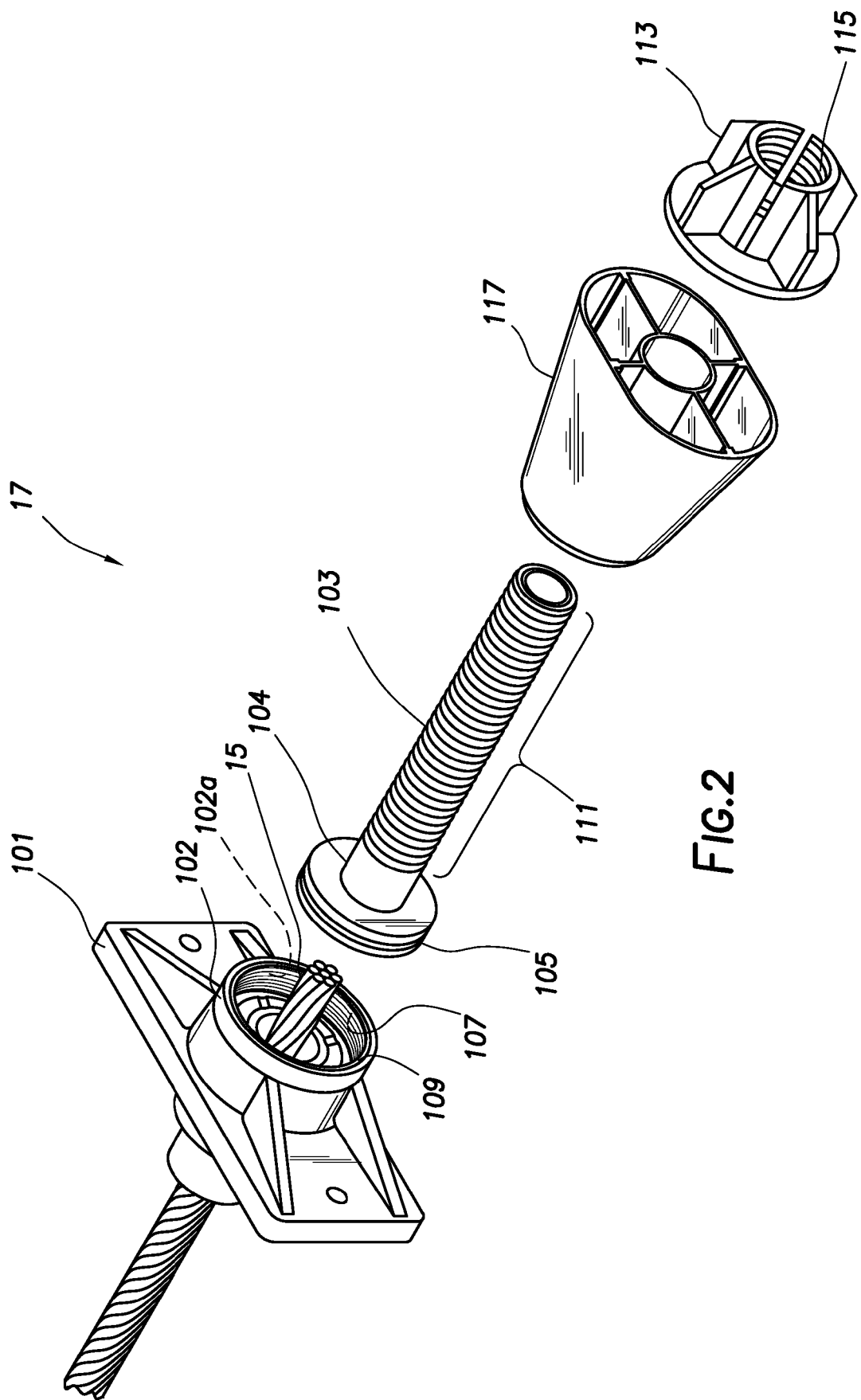


FIG.2



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 20 5459

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 174 685 B2 (HAYES) 13 February 2007 (2007-02-13)	1-7	INV. E04C5/12
A	* column 3, line 38 - column 4, line 58; figures 4-6 *	8-15	
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			TECHNICAL FIELDS SEARCHED (IPC)
			E04C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		24 May 2017	Righetti, Roberto
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 20 5459

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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