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(54) **Spacing tension member for providing formwork for watertight concrete walls**

Abstandsspannungselement zur Bereitstellung von Schalungen für wasserdichte Betonwände

Élément de tension d'espacement pour fournir un coffrage pour les murs en béton étanches

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Description

[0001] The present invention relates to a spacing tension member for providing formwork for providing watertight concrete walls.

[0002] Nowadays, concrete basins built on site, particularly for use as a digester for biogas co-generation plants, purification plants, and the like, must be able to ensure a long-lasting watertight and gastight seal.

[0003] To this end, the most widespread technique is that of providing monolithic basins, usually circular, which are cast on site using special formworks on which through bars are not used to join the outer and inner walls of the formwork and keep them spaced apart to oppose the pressure of the concrete casting, and instead formworks are adopted with inner and outer walls that are completely independent.

[0004] In fact, using through bars would result in a corresponding number of through holes in the completed concrete structure, and these holes would have to be filled in using sealing systems the tightness of which over time can be estimated but not with any certainty.

[0005] Systems that use formworks with independent walls are excellent, but they have some limitations, in terms of lengthy assembly times, and having fittings made specifically for such use, and being extremely cumbersome in terms of storage.

[0006] Furthermore, such special formwork being made for building monolithic basins, the panels and the other components that go to make it up can be used substantially only for similar applications.

[0007] Also common is the construction of basins for simple collection, with sealing requirements that are not as exacting and for which ordinary formworks with through bars are used, subsequently filling in the holes with various sealing systems; but the application of these systems in particular to biogas fermenters, with the mandatory filling-in of a direct passage in the casting, presents evident difficulties and restrictions, such as the use of special resins for filling-in, the use of caps, spacers and sleeves that are specially made, tested and certified, and the possibility of ensuring the tightness of the sealing over time.

[0008] Furthermore, the sealing work is generally lengthy and complex owing to the insertion of the aforementioned sleeves and caps, the application of resins, the subsequent finishing of the surfaces, and all the other operations to complete and verify the sealing. US 2 292 548 A discloses a form tie used for holding together forms used in concrete work, consisting of two or more parallel rods 1, maintained in spaced apart relationship by means of helices 2 and 3, each located at one end of the rods and secured between the same by being welded, and each consisting of a spirally formed length of rod constituting a thread for the reception of the threaded end 4 of a lag screw 5 extending through a longitudinally extending brace 6 between the vertical supports 7 and through holes in the form boards 8. The ends of the form tie are

spaced inwardly from the inside faces 9 and 10 of the form boards 8 between which the concrete mass is poured, and conical spacing members 11 are located between the ends of the tie and such inside faces 9 and 10 of the form boards 8 to properly position the tie, each cone 11 having a tapered bore 12 and a square opening 13 at the large end thereof into which an end of a tool is fitted after the lag screw has been removed to enable the cone to be rotated in the hardened wall to loosen it and remove it from the wall. The smaller end of the cone 11 abuts against the end of the helix 3 that is provided with a flat surface bearing surface 15

[0009] US 2 292 548 A discloses the features of the preamble of claim 1.

[0010] US 1 665 649 A discloses a spreader tie 15 for a concrete wall form 10, comprising a brace member 16 of twisted flat material 17 between ear ends 18 bent at right angles through which the inner ends of a pair of rods 19 extend, the rods extending through beams 13 and boards 14 of the wall form 10, and through horizontal cross beams 20 supported by the rods, the ends 21, 22 of which are screw threaded into corrugated cone members abutting against the inner faces of the form sections and the ears 18. Square nuts 24 also co-act with the screw threads 21 and are prevented from rotation by the flat face of the brace member 16.

[0011] The aim of the present invention is to provide a spacing tension member for providing formwork for watertight concrete walls, which is capable of overcoming the limitations and drawbacks of the above-mentioned known art.

[0012] Within this aim, an important object of the invention is to provide a spacing tension member that enables the construction of concrete basins, circular and otherwise, by using formworks of the conventional type, which are thus cheaper and faster to use than special formworks, and in such conventional formworks the pressure of the casting is opposed by such spacing tension members according to the invention.

[0013] Another object of the invention is to provide a spacing tension member that makes it possible to provide walls that are capable of ensuring a seal that is tight, reliable and constant over time, as required for the above-mentioned applications in plants for the containment of aggressive fluids that could invalidate the functionality of systems for sealing through holes.

[0014] Thus an object of the invention is to provide a spacing tension member that makes it possible to provide a concrete wall with no through holes that allow leaks of liquids or gases.

[0015] Another object of the invention is to provide a spacing tension member that can be installed and handled with ease.

[0016] Another object of the invention is to provide a spacing tension member that can be made using conventional systems and technologies.

[0017] In accordance with the invention, there is provided a spacing tension member for providing formwork

for watertight concrete walls, as defined in for watertight concrete walls,

[0018] Further characteristics and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of the spacing tension member according to the invention, which is illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a side view of a detail of a formwork in which there is mounted a spacing tension member according to the invention when mounted;

Figure 2 is a side view of the spacing tension member according to the invention, assembled;

Figure 3 is a partially exploded perspective view of the spacing tension member according to the invention;

Figure 4 shows the same view as Figure 3 with the components assembled;

Figures 5 and 6 schematically show the final steps of using the spacing tension member according to the invention.

[0019] With reference to the figures, a spacing tension member for providing formwork 11 for watertight concrete walls 12 is generally designated with the reference numeral 10.

[0020] Such spacing tension member 10 comprises two opposite traction bars 13 and 14, operating in a substantially coaxial configuration, as in Figure 1, each one passing through a corresponding panel 15 and 16 of a formwork wall.

[0021] Each traction bar 13 and 14 protrudes outside the corresponding panel 15 or 16, for screwing to a tightening plate 17 and 18.

[0022] Likewise, in the space 19 between the two facing panels, internal 15 and external 16, each traction bar 13 and 14 is adapted to be screwed to a spacer body 20 that is adapted to be embedded and concealed in the concrete casting 21.

[0023] Such spacer body 20, in the embodiment of the invention described herein which is understood to be non-limiting, comprises two opposite bushes 22 and 23 which are internally threaded for screwing to the ends 24 and 25, inside the space 19 between the panels 15 and 16, of the traction bars 13 and 14.

[0024] The two bushes 22 and 23 are mutually rigidly coupled by two lateral spacers 26 and 36, which are arranged outside the space 30 between the two facing bushes 22 and 23.

[0025] In the present embodiment, such two lateral spacers 26 and 36 are each constituted by a portion of a metallic bar, such as a building yard steel rod, and are welded to the two bushes 22 and 23 in diametrically opposite positions.

[0026] Such spacers can also be different in number, for example one or more than two, and can also be constituted by a metallic plate or by other similar and equiv-

alent components.

[0027] The free portion, 27 and 28 respectively, of each traction bar 13 and 14 between the panel 15 and 16 and the corresponding facing screw coupling bush 22 and 23, when it is mounted, is protected from the concrete casting 21 by means of an annular plug 31 and 32 which can be removed when the casting has hardened.

[0028] Each annular plug 31 and 32 is frustum-shaped to facilitate its extraction.

[0029] The bushes 22 and 23 are each constituted by a hexagonal nut.

[0030] The threaded hole 34 and 35 of each hexagonal nut is blind, for closure by way of a plug 39 and 40, or by welding, or by other means.

[0031] The spacer body 20 taken as a whole defines a hollow-structure interconnection between the two traction bars 13 and 14, which thanks to the lateral spacers 26 and 36 allows the concrete casting to penetrate between the bushes 22 and 23 and thus between the ends of the traction bars 13 and 14, which through the spacers transmit the tractive force to which they are subjected in the manner of a single bar.

[0032] Such spacer body 20, by remaining embedded in the concrete casting, ensures that the holes 42 and 43, which remained free for the removal of the traction bars 13 and 14 and of the respective caps 31 and 32, are not mutually in communication, thus closing off all routes to a possible penetration of liquids and/or gases.

[0033] In other words, once the casting has hardened there are no longer empty spaces or badly sealed fissures that can permit infiltration or leaks of liquid and gas.

[0034] Once the casting is complete and the formwork removed, the threaded traction bars 13 and 14 and the caps 31 and 32 are retrieved, and the holes 42 and 43 are closed in a simple manner and without resorting to particular sealing systems, since the actual hydraulic seal is already provided by the casting itself.

[0035] The assembly of a formwork for the projects mentioned above is virtually identical to mounting the paneling for a conventional casting with the sole difference that the spacing tension members need to be pre-assembled according to the invention to be used.

[0036] Thus there is a first operation of screwing the traction bars 13 and 14 to the spacer body 20, with insertion of the protective caps 31 and 32.

[0037] Then, the formwork is closed and the casting is carried out.

[0038] Once curing of the concrete is complete the formwork is opened, and the traction bars 13 and 14, the panels and finally the protective caps 31 and 32 are all removed.

[0039] Finally the dead holes 42 and 43 left by the annular protective caps 31 and 32 are closed.

[0040] In this manner a hermetically tight wall is obtained, even if not monolithic, by way of a system that does not necessitate further operations of sealing, preparation and/or cleaning etc., but simply by casting the concrete as per normal site practice.

[0041] Naturally the system can be applied, by selection of the suitable spacer, to all widths of walls.

[0042] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0043] In practice the materials employed, provided they are compatible with the specific use, and the contingent dimensions and shapes, may be any according to requirements and to the state of the art.

[0044] Where technical features mentioned in any claim are followed by reference signs, such reference signs have been inserted for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A spacing tension member (10) for providing formwork (11) for watertight concrete walls (12), the formwork (11) comprising two facing panels (15, 16), the spacing tension member, when assembled to the formwork (11), comprising two opposite traction bars (13, 14), each one passing through the corresponding panel (15, 16) of the formwork (11), to each one of said traction bars being coupled by screwing, externally to the panels (15, 16), a tightening plate (17, 18) and, in the space (19) between the two facing panels (15, 16), a spacer body (20) that is adapted to remain embedded and concealed within the concrete casting (21) of the watertight concrete walls (12), said spacer body (20) comprising two opposite bushes (22, 23) for screwing to the ends (24, 25), inside said space (19), of said traction bars (13, 14), said two bushes (22, 23) being mutually rigidly coupled by at least one lateral spacer (26), which is arranged outside the space (30) between the two facing bushes (22, 23), the free portion (27, 28) of each traction bar (13, 14) between the panel (15, 16) and the corresponding facing screw coupling bush (22, 23) being protected from the concrete casting (21) by means of an annular plug (31, 32), which can be removed when the casting has hardened, **characterized in that** said bushes (22, 23) being each constituted by a hexagonal nut with a threaded hole (34, 35) that is closed on the side facing the space (30) between the two facing bushes (22, 23) by means of a plug (39, 40) or by welding or by other means.
2. The spacing tension member according to claim 1, **characterized in that** said two bushes (22, 23) are mutually rigidly coupled by two lateral spacers (26, 36), each constituted by a portion of a metallic bar, such as a building yard steel rod, which are welded to the two bushes (22, 23) in diametrically opposite positions.

3. The spacing tension member according to claim 1, **characterized in that** said two bushes (22, 23) are mutually rigidly coupled by only one or more than two spacers, such as for example metallic rods or metallic plates or other similar and equivalent components.

Patentansprüche

1. Ein Abstandsspannungselement (10) zur Bereitstellung von Schalungen (11) für wasserdichte Betonwände (12), wobei die Schalungen (11) zwei gegenüberliegende Platten (15, 16) umfassen und das Abstandsspannungselement, wenn es an den Schalungen (11) montiert ist, zwei gegenüberliegende Zugstangen (13, 14) umfasst, die jeweils durch die entsprechende Platte (15, 16) der Schalungen (11) verlaufen, wobei mit jeder der Zugstangen durch Verschraubung, außerhalb der Platten (15, 16), eine Befestigungsplatte (17, 18) und, in dem Raum (19) zwischen den zwei gegenüberliegenden Platten (15, 16), ein Abstandskörper (20) gekoppelt ist, der ausgebildet ist, um in den Betonguss (21) der wasserdichten Betonwände (12) eingebettet und darin verborgen zu bleiben, wobei der Abstandskörper (20) zwei gegenüberliegende Buchsen (22, 23) zum Aufschrauben auf die Enden (24, 25), innerhalb des Raums (19), der Zugstangen (13, 14) umfasst, wobei die zwei Buchsen (22, 23) durch mindestens ein seitliches Abstandselement (26) starr miteinander gekoppelt sind, welches außerhalb des Raums (30) zwischen den beiden gegenüberliegenden Buchsen (22, 23) angeordnet ist; wobei der freie Abschnitt (27, 28) jeder Zugstange (13, 14) zwischen der Platte (15, 16) und der entsprechenden gegenüberliegenden Schraubenkupplungsbuchse (22, 23) vor dem Betonguss (21) durch einen ringförmigen Stopfen (31, 32) geschützt ist, welcher entfernt werden kann, wenn der Guss erhärtet ist, **dadurch gekennzeichnet, dass** die Buchsen (22, 23) jeweils aus einer Sechskantmutter mit einer Gewindebohrung (34, 35) bestehen, die auf der dem Raum (30) zwischen den zwei gegenüberliegenden Buchsen (22, 23) zugewandten Seite durch einen Stöpsel (39, 40) oder durch Schweißen oder andere Mittel verschlossen ist.
2. Das Abstandsspannungselement gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die beiden Buchsen (22, 23) miteinander durch zwei seitliche Abstandselemente (26, 36) starr gekoppelt sind, die jeweils aus einem Abschnitt einer Metallstange, wie zum Beispiel einer Baustellen-Stahlstange, bestehen und in diametral entgegengesetzten Positionen mit den zwei Buchsen (22, 23) verschweißt sind.

3. Das Abstandsspannungselement gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die zwei Buchsen (22, 23) durch nur ein oder mehr als zwei Abstandselemente starr miteinander gekoppelt sind, wie zum Beispiel Metallstangen oder Metallplatten oder andere ähnliche und gleichwertige Komponenten.

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douilles (22, 23) sont couplées de manière mutuellement rigide par un seul ou plus de deux dispositifs d'espacement, tels que par exemple des tiges métalliques ou des plaques métalliques ou d'autres composants similaires et équivalents.

Revendications

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1. Élément de tension d'espacement (10) pour fournir un coffrage (11) pour les murs en béton étanches (12), le coffrage (11) comprenant deux panneaux en vis-à-vis (15, 16), l'élément de tension d'espacement, lorsqu'il est assemblé au coffrage (11), comprenant deux barres de traction opposées (13, 14), chacune passant par le panneau (15, 16) correspondant du coffrage (11), à chacune desdites barres de traction, étant couplée par vissage, à l'extérieur des panneaux (15, 16), une plaque d'étanchéité (17, 18) et dans l'espace (19) entre les deux panneaux en vis-à-vis (15, 16), un corps de dispositif d'espacement (20) qui est adapté pour rester encastré et dissimulé à l'intérieur de la coulée de béton (21) des parois en béton étanches (12),
 ledit corps de dispositif d'espacement (20) comprenant deux douilles opposées (22, 23) pour se visser aux extrémités (24, 25), à l'intérieur dudit espace (19), desdites barres de traction (13, 14), lesdites deux douilles (22, 23) étant couplées de manière mutuellement rigide par le au moins un dispositif d'espacement latéral (26), qui est agencé à l'extérieur de l'espace (30) entre les deux douilles en vis-à-vis (22, 23), la partie libre (27, 28) de chaque barre de traction (13, 14) entre le panneau (15, 16) et la douille de couplage de vis en vis-à-vis (22, 23) correspondante étant protégée de la coulée de béton (21) au moyen d'un bouchon annulaire (31, 32), qui peut être retiré lorsque la coulée a durci, **caractérisé en ce que** lesdites douilles (22, 23) sont chacune constituées par un écrou hexagonal avec un trou fileté (34, 35) qui est fermé sur le côté faisant face à l'espace (30) entre les deux douilles en vis-à-vis (22, 23) au moyen d'un bouchon (39, 40) ou par soudage ou par d'autres moyens.
2. Élément de tension d'espacement selon la revendication 1, **caractérisé en ce que** lesdites deux douilles (22, 23) sont couplées de manière mutuellement rigide par deux dispositifs d'espacement latéraux (26, 36), chacun constitué par une partie d'une barre métallique, telle qu'une barre en acier de chantier, qui sont soudés aux deux douilles (22, 23) dans des positions diamétralement opposées.
3. Élément de tension d'espacement selon la revendication 1, **caractérisé en ce que** lesdites deux

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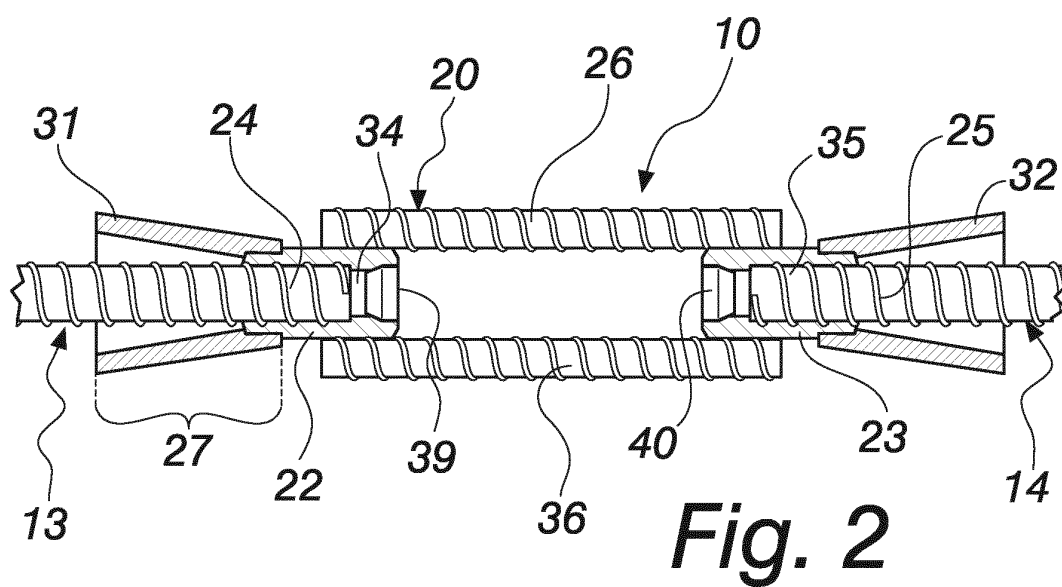
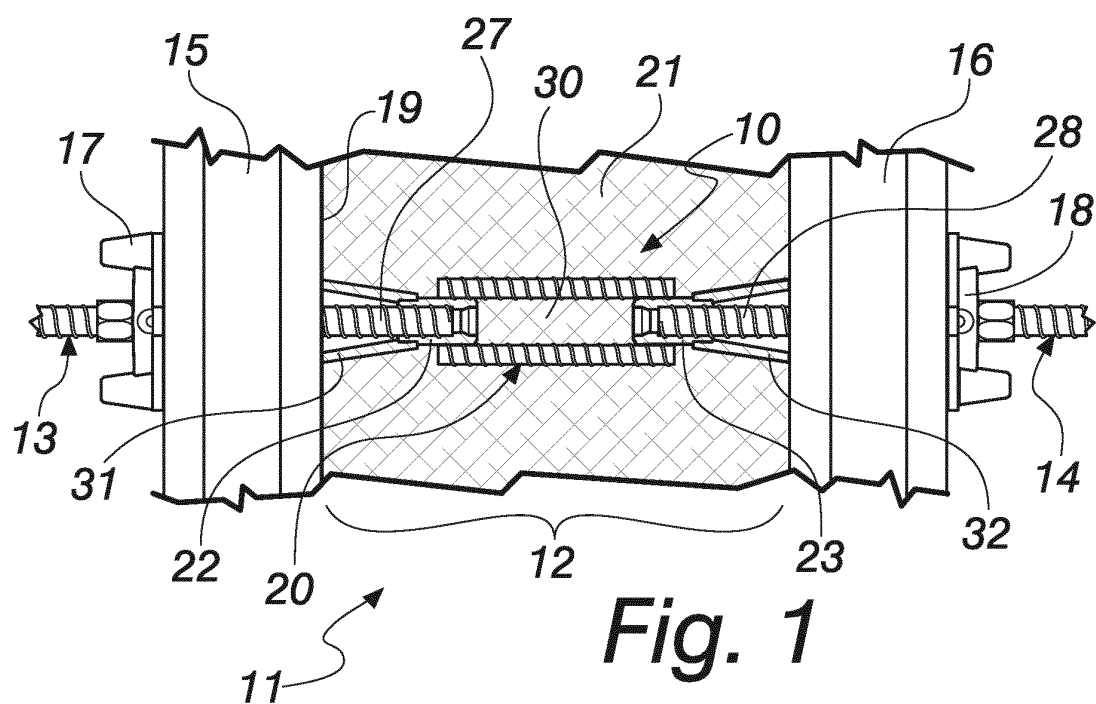
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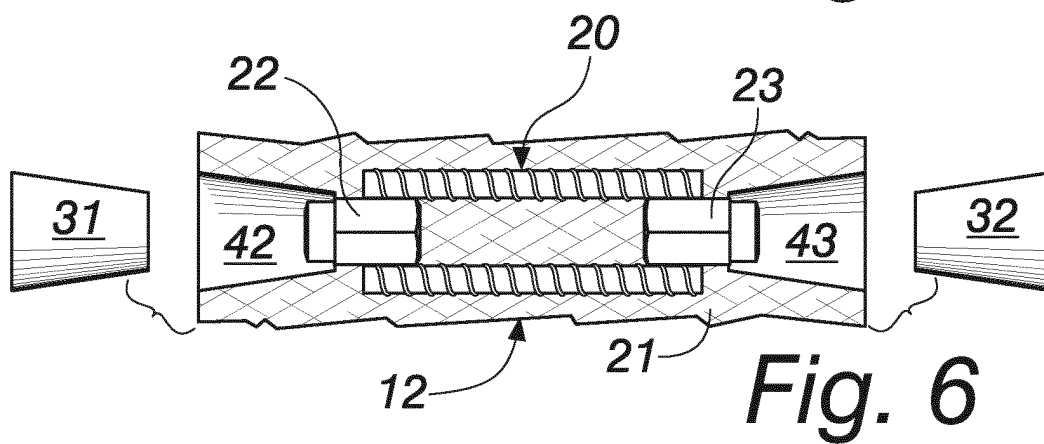
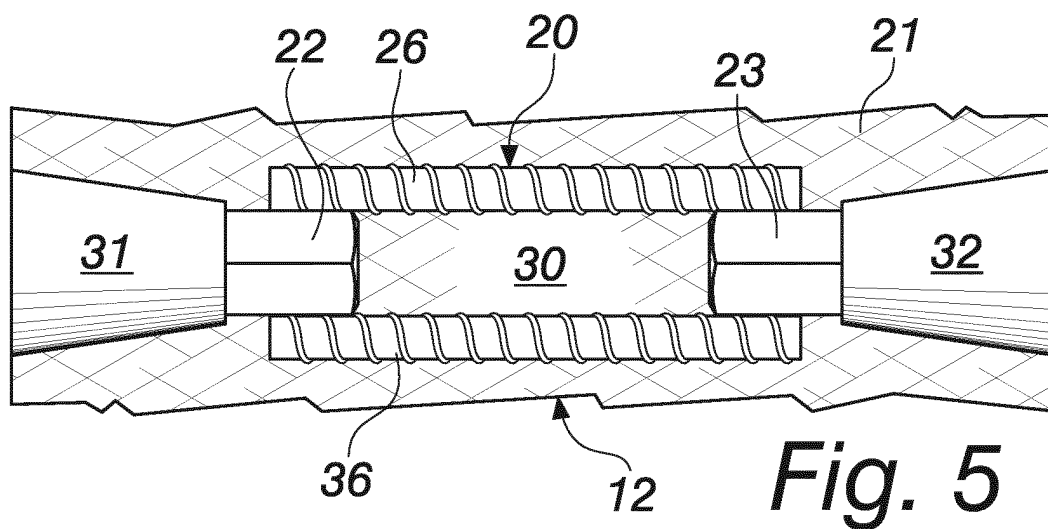
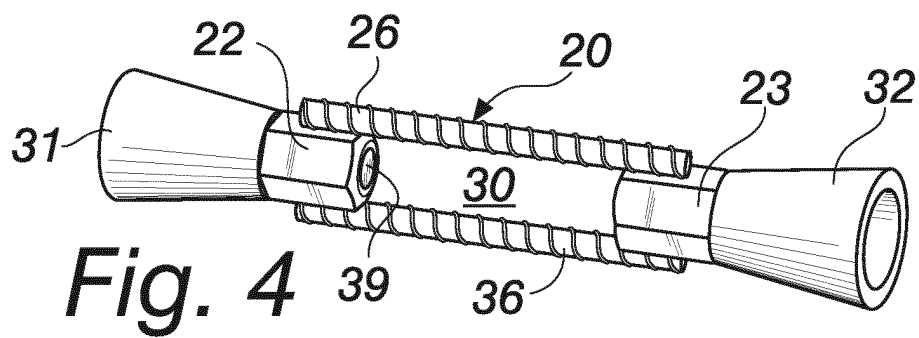
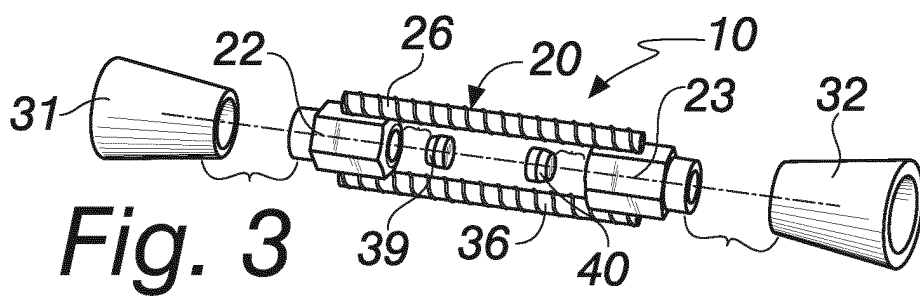
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REFERENCES CITED IN THE DESCRIPTION

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