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

(11) **EP 4 046 705 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.08.2022 Bulletin 2022/34

(21) Application number: **22157543.4**

(22) Date of filing: **18.02.2022**

(51) International Patent Classification (IPC):
B01F 27/091 *(2022.01)* ***B01F 27/13*** *(2022.01)*
B01F 27/2121 *(2022.01)* ***B01F 27/2123*** *(2022.01)*
B01F 27/213 *(2022.01)* ***B01F 27/60*** *(2022.01)*
B01F 27/70 *(2022.01)* ***B01F 27/90*** *(2022.01)*
B28C 5/14 *(2006.01)* ***B28C 5/16*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B01F 27/091; B01F 27/13; B01F 27/2121; B01F 27/2123; B01F 27/213; B01F 27/61; B01F 27/70; B01F 27/90; B28C 5/1292

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

(30) Priority: **18.02.2021 IT 202100003770**

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(54) **MIXING MACHINE FOR THE PREPARATION OF MORTARS AND PLASTERS FOR THE CONSTRUCTION INDUSTRY**

(57) The present invention relates to a mixing machine (10) for the preparation of mortars and plasters for the construction industry, comprising:
- a loading tank (11);
- a tubular mixing chamber (15), comprising in turn an inlet opening (16) connected to the loading tank (11), an inner surface (22), and an unloading mouth (17);
- a feed screw (18), rotating about a feed axis (X1), configured to determine the movement of a material to be mixed from the bottom (14) of the loading tank (11) towards the tubular mixing chamber (15);
- a mixing tool (19), placed to operate inside the tubular mixing chamber (15) and operationally connected to the feed screw (18) so as to rotate with it;
- pumping means (20) for introducing a mixing liquid into said tubular mixing chamber (15);
- drive means (21) for driving the feed screw (18) and the mixing tool (19).

The mixing tool (19) comprises a rotating longitudinal body (25) placed to rotate about a longitudinal axis (X2) thereof, from which rotating longitudinal body (25) at least one flexible scraping element (26) develops, configured to be in contact with the inner surface (22) of the tubular mixing chamber (15) at least when said rotating longitudinal body (25) rotates about said longitudinal axis (X2) thereof.

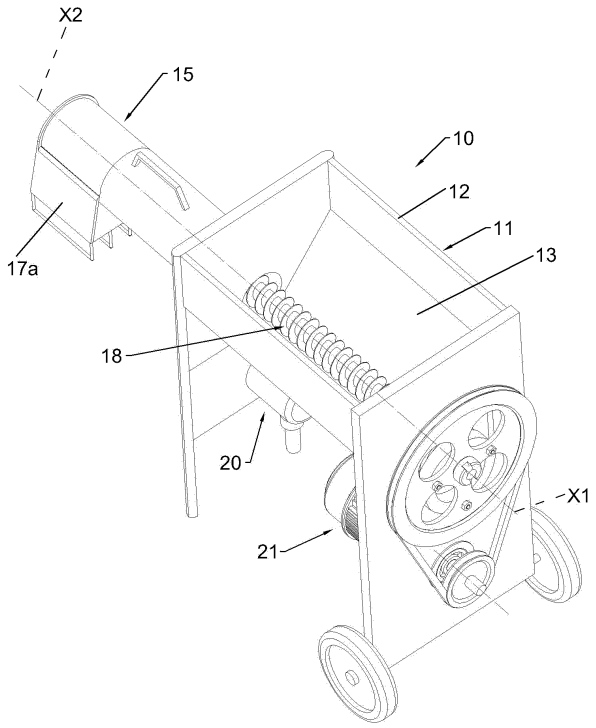

Fig. 1

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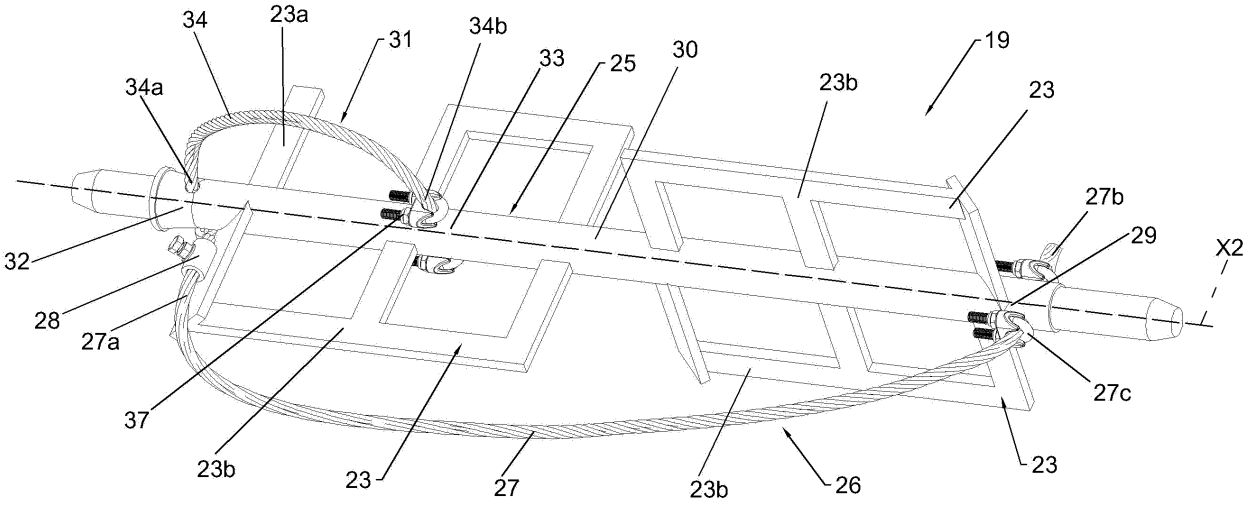

34
23a
31
34b
33
25
30
19
34a
23b
23
27b
29
X2
32
28
27a
37
23b
23
27
23b
26
23
27c

Fig. 2

Description

[0001] The invention relates to a mixing machine for the preparation of mortars and plasters for the construction industry.

[0002] Various types of mixing machines are now known and widespread in the construction industry field, such as plastering machines, with a vertical or inclined axis, for the application of coating glues, and continuous mixers for dry mortar in bags, in which mixing takes place in a substantially horizontal direction.

[0003] These mixing machines are configured to process sandy materials, aggregates in general, and other pre-mixed materials typical of the field, in order to mix them with water to form a fluid output material, which is made available to operators on site.

[0004] In general, such mixing machines include:

- a loading tank, in turn comprising a loading mouth, one or more inclined walls and a bottom towards which the one or more inclined walls converge;
- a tubular mixing chamber, which in turn comprises an inlet opening connected to the loading tank, and an unloading mouth, on the opposite side of the same tubular chamber with respect to the inlet opening;
- a feed screw, rotating about a feed axis, configured to determine the movement of the material to be mixed from the bottom of the loading tank towards the tubular mixing chamber;
- a mixing tool, placed to operate inside the tubular mixing chamber and operationally connected to the feed screw so as to rotate with it;
- pumping means for introducing a mixing liquid, normally water, into the tubular mixing chamber;
- drive means for driving the feed screw and the mixing tool.

[0005] By means of such mixing machines, a mixture is made which constitutes a plaster or mortar.

[0006] Typically, the mixing tool comprises a rotation shaft from which paddles develop radially; such paddles extend radially up to a predetermined distance from the inner surface of the tubular mixing chamber, e.g. about 1 cm, in order to prevent the paddles themselves from bending against a layer of material that may form on such inner surface.

[0007] Such paddles may consist, for example, of cantilevered radial bars, or of arched paddles comprising two or more radial bars and a longitudinal bar attached to the ends of the radial bars, whereby 'longitudinal' means that this bar develops in a direction parallel to the development direction of the rotating shaft.

[0008] The feed screw and the mixing tool are generally coaxial.

[0009] For mixing machines known as 'continuous mixers', with a horizontal axis, the feed screw and the mixing tool are coaxially connected by an intermediate joint, which also has an auxiliary feed propeller.

[0010] For mixing machines known as 'plastering machines', with a vertical axis or inclined axis, the feed screw and the mixing tool are joined together, so they either define a single piece, or the two pieces are welded together.

[0011] These known mixing machines, although widespread and appreciated today, have some limitations and some aspects of perfectibility.

[0012] A first limitation of the known mixing machines is linked to the fact that the mixture obtained using sandy materials, i.e. inert materials, mixed with water in the tubular mixing chamber, centrifuged by the movement of the mixing tool, adheres to the inner surface of the same mixing chamber in a mild way and is easily removable; on the other hand, when sticky materials are used, such as tile glues or coating glues, the resulting mixture adheres strongly to the inner surface of the tubular mixing chamber and tends to form a coating up to one centimetre thick, which is very difficult to remove due to the sticky material it is made of.

[0013] This coating of sticky material is very harmful to the integrity of the mixing machine, since if it develops over one centimetre in thickness, it can cause the paddles of the mixing tool to stop, resulting in the blocking of the latter and the feed screw which is connected to the mixing tool itself.

[0014] Furthermore, even if it does not become so thick as to be harmful to the integrity of the machine, this coating of sticky material nevertheless causes a reduction in the transit section inside the tubular mixing chamber, and at the same time subtracts material from the mixture formed in the mixing chamber, since this material instead of mixing with the water remains stuck in the coating; in this way, the mixture coming out of the mixing machine does not have the desired composition and density.

[0015] Another disadvantage of the formation of a coating of material inside the mixing chamber is that pieces of this coating come detached from the inner surface of the tubular mixing chamber in an uncontrolled and unpredictable manner, randomly and undesirably changing the predetermined density of the mixture being prepared.

[0016] Generally, cleaning the tubular mixing chamber requires stopping the mixing machine, opening the tubular mixing chamber, removing the mixing tool and cleaning to remove the coating of sticky material.

[0017] The removal of this coating of sticky material is very difficult, as it requires a jet of water and the simultaneous mechanical action of a specific scraping tool in order to be performed.

[0018] Particularly on construction sites set up inside private homes, the use of the large amount of water needed for effective cleaning can cause a lot of inconvenience.

[0019] Another drawback of continuous mixers of the known type is linked to the fact that, when the water is introduced into the tubular mixing chamber, it initially tends to go towards the area upstream of the mixing tool, instead of downstream, and towards the unloading mouth, and then reverses its motion at the intermediate

joint with the auxiliary propeller; in the tubular compartment in which the intermediate joint is housed, the material entering from the loading tank and the water tend to partially mix and adhere to the inner surface of the tubular compartment, resulting in the formation of a layer of material with problems similar to those described above for the coating formed in the tubular mixing chamber.

[0020] Another limitation of known continuous mixers is linked to the fact that the sandy or granular materials, or other materials, which are introduced into the loading tank, often also contain more or less extensive pieces of fibre, for example hemp filaments, or metal fragments, which tend to group together and form agglomerates that tend to block the unloading mouth. The problem lies in the fact that, when the unloading mouth is partially blocked, the mixing uniformity is compromised, as the mixture of water and sandy or powdery material, which is being processed in the tubular mixing chamber, no longer advances smoothly.

[0021] All mixers of the known type described above have the disadvantage that the flow rate of mixed material flowing out the mixer is difficult to keep constant. The object of the present invention is to develop a mixing machine for the preparation of mortars and plasters for the construction industry, capable of obviating the aforementioned drawbacks and limitations of the known technique.

[0022] In particular, an object of the invention is to develop a mixing machine whose tubular mixing chamber is easy to clean.

[0023] A further object of the invention is to develop a mixing machine which makes it possible to obtain a more constant, i.e. less variable, output flow rate of mortar or plaster than similar machines of a known type.

[0024] A further object of the invention is to develop a mixing machine which makes it possible to obtain at the outlet a mortar or plaster with a more stable, i.e. less variable, density than similar machines of a known type.

[0025] A further object of the invention is to develop a mixing machine that is structurally simple and easy and cheap to maintain.

[0026] Again, an object of the invention is to develop a simple and safe-to-operate mixing machine.

[0027] Again, an object of the invention is to develop a mixing machine that can be set up in a number of different configurations according to needs and technical requirements.

[0028] The above-mentioned object and purposes are achieved by a mixing machine for the preparation of mortars and plasters for the construction industry, according to claim 1.

[0029] Further characteristics of the mixing machine according to claim 1 are described in the dependent claims.

[0030] The task and the aforesaid objects, together with the advantages that will be mentioned hereinafter, are indicated by the description of three embodiments of the invention, which are given by way of non-limiting example with reference to the attached drawings, where:

- figure 1 represents a perspective view of a mixing machine according to the invention in a first embodiment thereof;
- figure 2 represents a perspective view of a detail of the machine according to the invention in the first embodiment thereof;
- figure 3 represents a cross-sectional side view of the mixing machine in the first embodiment thereof, in a first operating step;
- figure 4 represents the same view as figure 3 with the machine in a second operating step;
- figure 5 represents the same view as figures 3 and 4 with the machine in a third operating step;
- figure 6 represents a schematic perspective view of the detail of figure 2 in a variant embodiment thereof;
- figure 7 represents a perspective view of a mixing machine according to the invention in a second embodiment thereof;
- figure 8 represents a perspective view of a detail of the machine of figure 7 according to the invention;
- figure 9 represents an exemplary perspective view of the detail of figure 8 inside a machine as in figure 7;
- figure 10 represents a partially cross-sectional schematic side view of a mixing machine according to the invention in a third embodiment thereof;
- figure 11 represents a perspective view of a detail of the machine of figure 10;
- figure 12 represents a perspective view of a variant embodiment of the details of figures 8 and 11;
- figure 13 represents a perspective view of another variant embodiment of the details of figures 8 and 11.

[0031] With reference to the above figures, a mixing machine for the preparation of mortars and plasters for the construction industry is indicated as a whole of a first embodiment thereof with the numeral **10.**

[0032] A mixing machine **10** as shown in figures 1 to 5 is known in technical jargon as a 'continuous mixer', particularly suitable for dry bagged mortars.

[0033] Such a mixing machine **10** for preparing mortar comprises:

- a loading tank **11,** in turn comprising a loading mouth **12,** one or more inclined walls **13,** and a bottom **14** towards which the one or more inclined walls **13** converge;
- a tubular mixing chamber **15,** in turn comprising an inlet opening **16,** clearly visible in figures 3 to 5, connected to the loading tank **11,** an inner surface **22,** and an unloading mouth **17** positioned on the opposite side of the tubular mixing chamber **15** with respect to the inlet opening **16;**
- a feed screw **18,** rotating about a feed axis **X1,** configured to determine the movement of a material to be mixed from the bottom **14** of the loading tank **11**

towards the tubular mixing chamber **15;**

- a mixing tool **19,** well represented in figure 2, placed to operate inside the tubular mixing chamber **15** and operationally connected to the feed screw **18** so as to rotate with it;
- pumping means **20** for introducing a mixing liquid, normally water, into the tubular mixing chamber **15;**
- drive means **21** for driving the feed screw **18** and the mixing tool **19.**

[0034] The pumping means **20** and the drive means **21** are to be understood as being known per se.

[0035] The pumping means **20** may, for example, comprise a pump driven by the same drive means **21,** or with an autonomous and independent drive; the pumping means **20** may also be other, technically equivalent, means.

[0036] The drive means **21** may for example comprise an electric motor configured to transmit rotation to the feed screw **18** via a belt system, or by other technically equivalent means known per se.

[0037] The peculiarity of the invention resides in the fact that the mixing tool **19** comprises a rotating longitudinal body **25** placed to rotate about a longitudinal axis **X2** thereof, at least one flexible scraping element **26** developing from said rotating longitudinal body **25,** configured to be arranged in contact with the inner surface **22** of the tubular mixing chamber **15** at least when the rotating longitudinal body **25** rotates about its longitudinal axis **X2.**

[0038] This flexible scraping element **26** develops in the direction of the longitudinal axis **X2** between two connection points **28** and **29** with the rotating longitudinal body **25.**

[0039] The mixing machine **10,** belonging to the 'continuous mixer' type, has the tubular mixing chamber **15** positioned with a horizontal axis; consequently, the longitudinal axis of the rotating longitudinal body **25** is also substantially horizontal.

[0040] In this first embodiment of the invention, which is of course intended to be illustrative and not limiting of the invention itself, the rotating longitudinal body **25** comprises a rotation shaft **30.**

[0041] Such rotation shaft **30** is of such a length that it longitudinally crosses the tubular mixing chamber **15** from the inlet opening **16** to the unloading mouth **17.**

[0042] The unloading mouth **17** is open downwards.

[0043] Below the unloading mouth **17** there may be a collar **17a** for directing the outlet jet and possibly a jet breaker grille **17b.**

[0044] The rotating longitudinal body **25** comprises mixing paddles **23,** radially developing from the rotation shaft **30;** said mixing paddles **23** extend radially up to a predetermined distance from the inner surface **22** of the tubular mixing chamber **15,** for example about 1 cm, in order to prevent the same paddles **23** from crashing against a layer, or coating, of material that may form on said inner surface **22.**

[0045] The mixing paddles **23** are to be understood to be of a known type in themselves, and are to be understood to be of various shapes and sizes according to needs and technical requirements.

[0046] For example, in such a first embodiment of the invention, such mixing paddles **23** comprise:

- one or more radial cantilever bars **23a;** for example, there is a radial cantilever bar **23a,** positioned on the section of the rotation shaft **30** which is located at the unloading mouth **17;**
- a plurality of arced paddles **23b,** comprising two or more radial bars and a longitudinal bar attached to the ends of the radial bars, wherein 'longitudinal' means that this bar develops in a direction parallel to the development direction of the rotation shaft.

[0047] Advantageously, the flexible scraping element **26** comprises a cable made of metallic material **27,** hereinafter also referred to as 'metal cable' for brevity; in particular, the flexible scraping element **26** comprises a metal cable **27.**

[0048] The use of a metal cable **27** makes it possible to have a flexible scraping element **26** that is self-supporting when not in use, i.e. it does not bend downwards by gravity, and at the same time, thanks to its mass, when it is drawn in rotation it is pushed against the inner surface **22** of the tubular mixing chamber **15** by the centrifugal force.

[0049] The flexibility of the metal cable **27** allows easy removal of the mixing tool **19** from the tubular mixing chamber **15,** for example for cleaning operations, or for replacement or maintenance of the mixing tool **19** itself.

[0050] In the example embodiment described herein, again by way of non-limiting example of the invention, the two connection points **28** and **29** to the rotation shaft **30** are positioned one in proximity to the inlet opening **16** and one in proximity to the unloading mouth **17,** respectively.

[0051] The metal cable **27** is constrained to at least one of the two connection points in such a way that it does not translate in a radial direction in relation to said longitudinal axis **X2.**

[0052] For example, the metal cable **27** is constrained to the rotation shaft **30** at both connection points **28** and **29** in such a way that it does not translate in the radial direction with respect to the longitudinal axis **X2,** unless there is clearance; this clearance is understood to be comprised between 1 mm and 10 mm.

[0053] At a first connection point **28,** a first end **27a** of the metal cable **27** is inserted and fixed into a locking collar which is in turn fixed to a mixing paddle **23;** in this way, the first end **27a** is not able to move in a radial direction with respect to the longitudinal axis **X2.**

[0054] A second end **27b** of the metal cable **27** is placed to cross the rotation shaft **30** in a corresponding through-hole diametrically defined on the same rotation shaft **30** at a second connection point **29.**

[0055] This second end **27b** is fixed to the rotation shaft **30** by means of two clamps **27c,** opposite with respect to the diameter of the rotation shaft **30,** which prevent the second end **27b** from moving radially, except for physiological millimetre level clearance.

[0056] In an alternative embodiment, one or both of the ends **27a** and **27b** are constrained to the rotation shaft **30** by means which allow free translation in a radial direction; this free translation is intended to be able to take place over a length of, for example, between 2 cm and 10 cm, where the translation limits are imposed by corresponding mechanical limit switches.

[0057] Figure 3 clearly shows how the flexible scraping element **26** is arranged in contact with the inner surface **22** and is able, by rotating about the longitudinal axis **X2,** to remove the coating, or layer, of material from it, which would otherwise adhere to the inner surface **22** creating the undesired blocking of the space between the mixing paddles **23** and the same inner surface **22.**

[0058] The mixing machine **10** may also comprise a mixing tool **19** in turn comprising an auxiliary flexible scraping element **31,** as well exemplified in figures 2 to 5. This auxiliary flexible scraping element **31** also develops in the direction of the longitudinal axis **X2** between two connection points **32** and **33** with the rotating longitudinal body **25,** i.e., in particular, with the rotation shaft **30.**

[0059] The auxiliary flexible scraping element **31** is positioned at the unloading mouth **17** and is of a size such that it passes through at least part of said unloading mouth **17** during rotation, as shown in the schematic section of figure 5.

[0060] Similarly to what is written above for the flexible scraping element **26,** the auxiliary flexible scraping element **31** comprises an auxiliary metal cable **34,** hereinafter referred to as 'auxiliary metal cable **34';** in particular, the auxiliary flexible scraping element **31** consists of an auxiliary metal cable **34.**

[0061] Said auxiliary metal cable **34** is constrained with the rotation shaft **30** by a first end **34a** thereof to at least one of the two connection points, for example to a first connection point **32,** so as to translate in a radial direction with respect to said longitudinal axis **X2.**

[0062] For example, the first end **34a** of the auxiliary metal cable **34** is positioned to pass through a diametrical through-hole defined on the rotation shaft **30.**

[0063] The first end **34a** has an anti-extraction head **34c,** which is larger than the cross-section of the through-hole on the rotation shaft **30.**

[0064] Thanks to this technical device, when the auxiliary metal cable **34** is in contact with the inner surface **22,** the first end **34a** moves radially away from the rotation shaft **30,** as schematically shown in figure 4, whereas when the auxiliary metal cable **34** is at the unloading mouth **17,** the first end **34a** moves radially towards the rotation shaft **30** and the auxiliary cable **34** extends until it reaches the flow-breaker grille **17b,** cooperating in the cleaning of the same flow-breaker grille **17b;** the first end **34a** is prevented from exiting the through hole in which it is inserted by the presence of the anti-extraction head **34c,** clearly visible in figure 4.

[0065] A second end **34b** of the auxiliary metal cable **34** is fixed to the rotation shaft **30** by means of two clamps **37,** opposite with respect to the diameter of the rotation shaft **30,** which prevent the second end **34b** from moving radially, except for physiological millimetre level clearance.

[0066] The auxiliary metal cable **34** is therefore of such a length that, in the maximum radial extension arrangement between the two connection points **32** and **33,** it touches the flow-breaker grille **17b.**

[0067] The flexible scraping element **26** and the auxiliary flexible scraping element **31** are advantageously and suitably angularly offset from the longitudinal axis **X2,** of rotation; for example, the flexible scraping element **26** and the auxiliary flexible scraping element **31** are offset by 90°.

[0068] Furthermore, appropriately, the flexible scraping element **26** and the auxiliary flexible scraping element **31** are mounted on the rotation shaft **30** in such a way that they are not pinched between the mixing paddles **23** and the inner surface **22** of the tubular mixing chamber **15.**

[0069] Then, the flexible scraping element **26** and the auxiliary flexible scraping element **31** are mounted on the rotation shaft so as to follow the mixing paddles **23** with respect to the direction of rotation of the mixing tool **19.**

[0070] The feed screw **18** and the mixing tool **19** are generally coaxial.

[0071] The feed screw **18** and the mixing tool **19** are coaxially connected by an intermediate joint **38,** clearly visible in figures 3, 4 and 5, provided with an auxiliary feed propeller **38b,** the latter being shown in figure 5.

[0072] Said intermediate joint **38** has a scraping relief **38a,** visible in figure 3, configured to rub against the inner surface in the tubular compartment **39** in which the intermediate joint **38** is housed.

[0073] In this embodiment, the scraping relief **38a** comprises a piece of metal cable fixed to protrude from the auxiliary propeller **38b** of the intermediate joint **38.**

[0074] Thanks to such scraping relief **38a,** the material adhering to the inner surface of the tubular compartment **39** is immediately removed, thereby preventing the formation of a coating or layer of material with drawbacks entirely similar to those described above for the coating, or layer, formed in the tubular mixing chamber.

[0075] A variant embodiment of a mixing tool **519** is schematically shown in figure 6.

[0076] In such a variant, the mixing tool **519** comprises a rotating longitudinal body **525** placed to rotate about a longitudinal axis **X2** thereof, two flexible scraping elements **526a** and **526b** developing from such rotating longitudinal body **525,** configured to arrange themselves in contact with the inner surface **22** of the tubular mixing chamber **15** at least when the rotating longitudinal body

525 rotates about its longitudinal axis **X2.**

[0077] Such flexible scraping elements **526a** and **526b** develop in the direction of the longitudinal axis **X2** between two connection points **528** and **529** and **532** and **533** respectively, with the rotating longitudinal body **525.**

[0078] The rotating longitudinal body **525** comprises a rotation shaft **530.**

[0079] The flexible scraping elements **526a** and **526b** both consist of a respective metal cable **570** and **571.**

[0080] Each metal cable **570** and **571** develops in an 'S'-shaped line from one end of a rotation shaft **530** to the other, diametrically crossing the same rotation shaft **530** in a central area thereof.

[0081] The two metal cables **570** and **571** are advantageously and appropriately offset at an angle with respect to the longitudinal axis **X2,** of rotation; for example, the two metal cables **570** and **571** are offset by 90°.

[0082] The ends of the cables are constrained to the rotation shaft **530** in the same way as described above for the cables **27** and **34** made of metallic material.

[0083] In this peculiar configuration, the mixing tool **519** has no mixing paddles, but the same flexible scraping elements **526a** and **526b** also have the mixing function.

[0084] Figures 7 to 9 show a second embodiment of a mixing machine according to the invention, referred to therein as number **110.**

[0085] The mixing machine **110** in this second embodiment is known in technical jargon as a 'plastering machine', of the vertical axis type, particularly for glues for installing external coatings, and therefore in general for very sticky materials.

[0086] Such a mixing machine **110** comprises:

- a loading tank **111,** in turn comprising a loading mouth **112,** one or more inclined walls **113,** and a bottom **114** towards which the one or more inclined walls **113** converge;
- a tubular mixing chamber **115,** in turn comprising an inlet opening **116** connected to the loading tank **111,** an inner surface **122,** and an unloading mouth **117** positioned on the opposite side of said tubular mixing chamber **115** with respect to the inlet opening **116;**
- a feed screw **118,** rotating about a feed axis **X1,** configured to determine the movement of a material to be mixed from the bottom **114** of the loading tank **111** towards the tubular mixing chamber **115;**
- a mixing tool **119,** placed to operate inside said tubular mixing chamber **115** and operationally connected to the feed screw **118** so as to rotate with it;
- pumping means **120** for introducing a mixing liquid into the tubular mixing chamber **115;**
- drive means **121** for driving said feed screw **118** and the mixing tool **119.**

[0087] In such an embodiment, the feed screw **118** comprises a bent bar **118a,** developing along a substantially helical line; such bent bar **118a** is fixed to a rotation shaft **118b,** also intended to be part of the feed screw **118.**

[0088] The mixing tool **119** comprises a rotating longitudinal body **125** placed to rotate about a longitudinal axis **X2** thereof.

[0089] From the rotating longitudinal body **125** a flexible scraping element **126** develops, configured to be in contact with the inner surface **122** of the tubular mixing chamber **115** at least when the rotating longitudinal body **125** rotates about its longitudinal axis **X2.**

[0090] The flexible scraping element **126** develops in the direction of said longitudinal axis **X2** between two connection points **128** and **129** with said rotating longitudinal body **125.**

[0091] In particular, in such a second embodiment of the invention, the mixing machine **110** has a tubular mixing chamber **115** positioned at a vertical axis **X3.**

[0092] The rotating longitudinal body **125** comprises a fork **130** whose two opposite symmetrical arms **130a, 130b** develop in an axial direction parallel to the inner surface **122** of said tubular mixing chamber **115.**

[0093] Said arms **130a** and **130b** develop between an upper crosspiece **135,** connecting to said feed screw **118,** and a lower crosspiece **136** placed between the lower ends of said arms **130a, 130b.**

[0094] The flexible scraping element **126** comprises a cable made of metallic material **127,** constrained to the rotating longitudinal body **125** between two connection points **128, 129,** a first connection point **128** being defined at the upper crosspiece **135,** a second connection point **129** being defined at the lower crosspiece **136.**

[0095] The metal cable **127** also develops from the second connection point **129,** which is lower, to a third connection point **128a,** which is higher, located at the upper crosspiece **135** on the opposite side with respect to the first connection point **128.**

[0096] The second connection point **129** is preferably, but not exclusively, defined at the centre of the lower crosspiece **136.**

[0097] The metal cable **127** develops between said first **128** and second **129** connection points and between said second **129** and third **128b** connection points according to a substantially helical line.

[0098] In this way, the metal cable **127** is configured to promote the advancement of the material being mixed.

[0099] The second connection point **129** is defined, for example, by an annular element fixed to the lower crosspiece **136.**

[0100] The metal cable **127** can be tied to the connection points **128, 129, 128a** in the same way as described above for the metal cables **27** and **34** relating to the first embodiment of the invention, i.e. such cable can be fixed at both ends, or have the possibility of sliding for at least one of the two ends.

[0101] The mixing machine **110** is to be understood to comprise, below the tubular mixing chamber **115,** a spray pump **150,** in a known manner per se, which spray pump is coaxially connected to the mixing tool **119,** as exemplified in figure 9.

[0102] The rotation shaft **118b** of the feed screw **118**

is rigidly fixed in the axial direction to the fork **130** of the mixing tool **119,** for example, but not exclusively, by welding.

[0103] Figures 10 and 11 show a third embodiment of a mixing machine according to the invention, which is indicated therein by the number **210.**

[0104] The mixing machine **210** in this third embodiment is also known in technical jargon as the 'plastering machine'.

[0105] In such a mixing machine **210,** the tubular mixing chamber **215** is positioned at an axis **X4** inclined with respect to the ground by an angle comprised between 20° and 70°.

[0106] Also in said third embodiment, the rotating longitudinal body **225** of the mixing tool **219** comprises a fork **230** whose two opposite symmetrical arms **230a, 230b** develop in an axial direction parallel to the inner surface of said tubular mixing chamber **215.**

[0107] The arms **230a, 230b** develop between an upper crosspiece **235,** connecting with the feed screw **218,** and a lower crosspiece **236** placed between the lower ends of said arms **230a, 230b.**

[0108] The flexible scraping element **226** comprises a cable **227** made of metallic material, constrained to the rotating longitudinal body **225** between two connection points **228, 229,** a first connection point **228** being defined at said upper crosspiece **235,** and a second connection point **229** being defined at said lower crosspiece **236.**

[0109] The cable **227** made of metallic material also develops from the second connection point **229,** which is lower, to a third connection point **228a,** which is higher, located at the upper crosspiece **235** on the opposite side with respect to the first connection point **228.**

[0110] The metal cable **227** develops between said first **228** and second **229** connection points and between said second **229** and third **228b** connection points according to a substantially helical line.

[0111] In this way, the metal cable **227** is configured to promote the advancement of the material being mixed.

[0112] The second connection point **229** is defined, for example, by an annular element fixed to the lower crosspiece **236.**

[0113] This second point of connection **229** is preferably, but not exclusively, defined at the centre of the lower crosspiece **236.**

[0114] Also in this embodiment, the mixing machine **210** comprises a spray pump **250** coaxially connected to the mixing tool **219.**

[0115] In a variant embodiment of the mixing tool **319** according to the invention, exemplified in figure 12, the flexible scraping element **326** comprises:

- a cable **327** made of metallic material, constrained to the rotating longitudinal body **325** between two connection points **328, 329,** a first connection point **328** being defined at said upper crosspiece **335,** and a second connection point **329** being defined at said lower crosspiece **336;**
- an anti-pinch terminal **340** fixed to a lower end **327a** of said cable made of metallic material **327.**

[0116] Such an anti-pinch terminal **340** may for example comprise a spherical body, which is larger than the distance between the inner surface of the tubular mixing chamber and the outer surface of the arms **330a** and **330b** of the fork **330.**

[0117] Such an anti-pinch terminal **340** has the double function of preventing the end **327a** of the metal cable **327** from being pinched between the fork **330** and the inner surface of the mixing chamber, and striking the same inner surface promoting the detachment of the material that may have adhered to it.

[0118] In such a peculiar embodiment, the metal cable **327** is constrained to the rotating longitudinal body **325** between two connection points **328, 329,** where a first connection point **328** is defined at a lateral side of the upper crosspiece **335** with respect to the longitudinal axis **X2** of the mixing tool **319,** and the second connection point **329** is defined at the opposite side of the lower crosspiece **336** with respect to the same longitudinal axis **X2.**

[0119] Such a configuration is easier to make and easier to assemble than the embodiments of the invention described above.

[0120] In another variant embodiment of the mixing tool **419** according to the invention, exemplified in figure 13, comprising a fork **430** as described above for the third embodiment of the invention, the flexible scraping element **426** comprises a cable **427** made of metallic material, constrained to the rotating longitudinal body **425** between two connection points, a first connection point being defined at the upper crosspiece, not illustrated for simplicity and to be understood as analogous to what is represented in figure 12, and a second connection point **429** being defined at said lower crosspiece **436.**

[0121] The lower end **427a** of the metal cable **427** is fixed to a terminal **440** which is in turn fixed to the lower crosspiece **436.**

[0122] The lower end **427a** is fixed by means of a threaded element **490** which is designed to press in a radial direction on the lower end **427a** through a corresponding radial threaded hole made on the terminal **440.**

[0123] In this embodiment, the terminal **440** consists of a spherical body made of metallic material.

[0124] The fixing means of the lower end **427a** to the rotating longitudinal body **425,** and in particular to the fork **430,** are to be understood to be also other, similar and technically equivalent means.

[0125] Advantageously, also in such a variant embodiment, the metal cable **427** is constrained to the rotating longitudinal body **425** between two connection points, where a first connection point is defined at a lateral side of the upper crosspiece with respect to the longitudinal axis **X2** of the mixing tool **419,** and the second connection point **429** is defined at the opposite side of the lower crosspiece **436** with respect to the same longitudinal axis

X2.

[0126] The flexible scraping elements, described above as defined by a cable made of metallic material, are to be understood to be capable of being made with other technically equivalent flexible elements, for example with predominantly longitudinal developing bodies made of plastic.

[0127] The present invention therefore overcomes the described drawbacks. Advantageously, the mixer of the invention simplifies mortar and plaster mixing operations and has better reliability than known mixers which require frequent manual intervention during operation.

[0128] This reduced need for operator intervention also increases the efficiency of its use.

[0129] With the present invention a mixing machine has been thus developed for the preparation of mortars and plasters for the construction industry, capable of obviating the aforementioned drawbacks and limitations of the known technique.

[0130] In particular, the invention provides a mixing machine whose tubular mixing chamber is easy to clean, even when dry, thanks to the constant scraping work that one or more metal cables perform against the inner surface of the tubular mixing chamber at the same time as the mixing operation itself.

[0131] Furthermore, the invention provides a mixing machine which allows to obtain a more constant output flow rate of mortar or plaster than similar machines of the known type, by preventing the formation of a thick layer of material on the inner surface of the tubular mixing chamber, a layer of material which, by coming detached irregularly from the inner surface, would alter the flow rate and density of the output mixture.

[0132] Thus, with the invention, a mixing machine has been developed which makes it possible to obtain at the outlet a mortar or a plaster having a more stable density, i.e. less variable, than similar machines of the known type; thanks to the 'whip' effect of the scraping metal cable, when mixing the residual material which in known machines sticks to the inner surface, in the mixing machine according to the invention this residual material no longer sticks, and therefore it no longer happens that the material suddenly detaches, mixing with the material being mixed and thus overturning the predetermined density of the material being mixed.

[0133] Again, the invention provides a mixing machine that is structurally simple and easy and cheap to maintain.

[0134] The invention further provides a mixing machine that can be set up in a number of different configurations according to needs and technical requirements.

[0135] In particular, the aim of maintaining a constant flow rate of mixed material coming out of the mixing machine is achieved, reducing the need for operators to continuously intervene through manual operations.

[0136] The invention thus conceived is susceptible of numerous modifications and variants, all of which are within the scope of the inventive concept; moreover, all the details may be replaced by other technically equivalent elements.

[0137] In practice, the components and materials used, as well as the dimensions and shapes, as long as they are compatible with the specific use, can be any according to requirements and the state of the art.

[0138] If the characteristics and techniques mentioned in any claim are followed by reference signs, these reference signs are to be intended for the sole purpose of increasing the intelligibility of the claims and, consequently, such reference signs have no limiting effect on the interpretation of each element identified by way of example by these reference signs.

Claims

1. Mixing machine (10, 110, 210) for the preparation of mortars and plasters for the construction industry, comprising:

- a loading tank (11, 111), in turn comprising a loading mouth (12, 112), one or more inclined walls (13, 113), and a bottom (14, 114) towards which said one or more inclined walls (13, 113) converge;
- a tubular mixing chamber (15, 115, 215), in turn comprising an inlet opening (16, 116) connected to said loading tank (11, 111), an inner surface (22, 122, 222), and an unloading mouth (17, 117) positioned on the opposite side of said tubular mixing chamber (15, 115, 215) with respect to said inlet opening (16, 116);
- a feed screw (18, 118, 218), rotating about a feed axis (X1), configured to determine the movement of a material to be mixed from said bottom (14, 114) of said loading tank (11, 111) towards said tubular mixing chamber (15, 115, 215);
- a mixing tool (19, 119, 219, 319, 419, 519), placed to operate inside said tubular mixing chamber (15, 115, 215) and operationally connected to said feed screw (18, 118, 218) so as to rotate with it;
- pumping means (20, 120) for introducing a mixing liquid into said tubular mixing chamber (15, 115, 215);
- drive means (21, 121) for driving said feed screw (18, 118, 218) and said mixing tool (19, 119, 219, 319, 419, 519),

said mixing tool (19, 119, 219, 319, 419, 519) comprising a rotating longitudinal body (25, 125, 225, 325, 425, 525) placed to rotate about a longitudinal axis (X2) thereof, from said rotating longitudinal body (25, 125, 225, 325, 425, 525) at least one flexible scraping element (26, 126, 226, 326, 426, 526a, 526b) developing, configured to be in contact with said inner surface (22, 122, 222) of said tubular mixing chamber (15,

115, 215) at least when said rotating longitudinal body (25, 125, 225, 325, 425, 525) rotates about said longitudinal axis (X2) thereof, said at least one flexible scraping element (26, 126, 226, 326, 426, 526a, 526b) developing in the direction of said longitudinal axis (X2) between two connection points (28, 29; 128, 129; 228, 229; 328, 329) with said rotating longitudinal body (25, 125, 225, 325, 425, 525),
characterized in that said at least one flexible scraping element (26, 126, 226, 326, 426, 526a, 526b) comprises a cable made of metallic material (27, 127, 227, 327, 427).

2. Mixing machine according to claim 1, **characterized in that** said tubular mixing chamber (15) is positioned with a horizontal axis, said rotating longitudinal body (25) comprising a rotation shaft (30), said rotation shaft (30) being of a length such that it longitudinally crosses said tubular mixing chamber (15) from said inlet opening (16) to said unloading mouth (17).

3. Mixing machine according to one or more of the preceding claims, **characterized in that** said two connection points (28, 29) are respectively positioned one in proximity to said inlet opening (16) and one in proximity to said unloading mouth (17), said at least one cable made of metallic material (27) being constrained to at least one of the two connection points (28) so as not to translate in a radial direction with respect to said longitudinal axis (X2).

4. Mixing machine according to one or more of the preceding claims, **characterized in that** it comprises an auxiliary flexible scraping element (31) developing in the direction of said longitudinal axis (X2) between two connection points (32, 33) with said rotating longitudinal body (25), said auxiliary flexible scraping element (31) being positioned at said unloading mouth (17) and being of such dimensions as to cross at least partially said unloading mouth (17) during rotation.

5. Mixing machine according to claim 4, **characterized in that** said auxiliary flexible scraping element (31) comprises a cable made of metallic material (34), said cable made of metallic material (34) being constrained to at least one of the two connection points (32) so as to translate in a radial direction with respect to said longitudinal axis (X2).

6. Mixing machine according to claim 1, **characterized in that** said tubular mixing chamber (115) is positioned at a vertical axis (X3), said rotating longitudinal body (125) comprising a fork (130) whose two opposite symmetrical arms (130a, 130b) develop in an axial direction parallel to the inner surface (122) of said tubular mixing chamber (115), said arms (130a, 130b) developing between an upper crosspiece (135), connecting to said feed screw (118), and a lower crosspiece (136) placed between the lower ends of said arms (130a, 130b).

7. Mixing machine according to the preceding claim, **characterized in that** said at least one flexible scraping element (126) comprises a cable made of metallic material (127), constrained to said rotating longitudinal body (125) between two connection points (128, 129), a first connection point (128) being defined at said upper crosspiece (135), a second connection point (129) being defined at said lower crosspiece (136), said cable made of metallic material (127) developing between said connection points (128, 129) according to a substantially helical line.

8. Mixing machine according to claim 1, **characterized in that** said tubular mixing chamber (215) is positioned at an axis (X4) inclined with respect to the ground by an angle comprised between 20° and 70°, said rotating longitudinal body (225) comprising a fork (230) whose two opposite symmetrical arms (230a, 230b) develop in an axial direction parallel to the inner surface (222) of said tubular mixing chamber (215), said arms (230a, 230b) developing between an upper crosspiece (235), which is connected to said feed screw (218), and a lower crosspiece (236), placed between the lower ends of said arms (230a, 230b), said at least one flexible scraping element (226) comprising a cable made of metallic material (227), constrained to said rotating longitudinal body (225) between two connection points (228, 229), a first connection point (228) being defined at said upper crosspiece (235), a second connection point (229) being defined at said lower crosspiece (236), said cable made of metallic material (227) developing between said two connection points (228, 229) according to a substantially helical line.

9. Mixing machine according to one or more of the preceding claims, **characterized in that** said at least one flexible scraping element (326) comprises:

- a cable made of metallic material (327), constrained to said rotating longitudinal body (325) between two connection points (328, 329), a first connection point (328) being defined at said upper crosspiece (335), and a second connection point (329) being defined at said lower crosspiece (336);
- an anti-pinch terminal (340) fixed to a lower end (327a) of said cable made of metallic material (327).

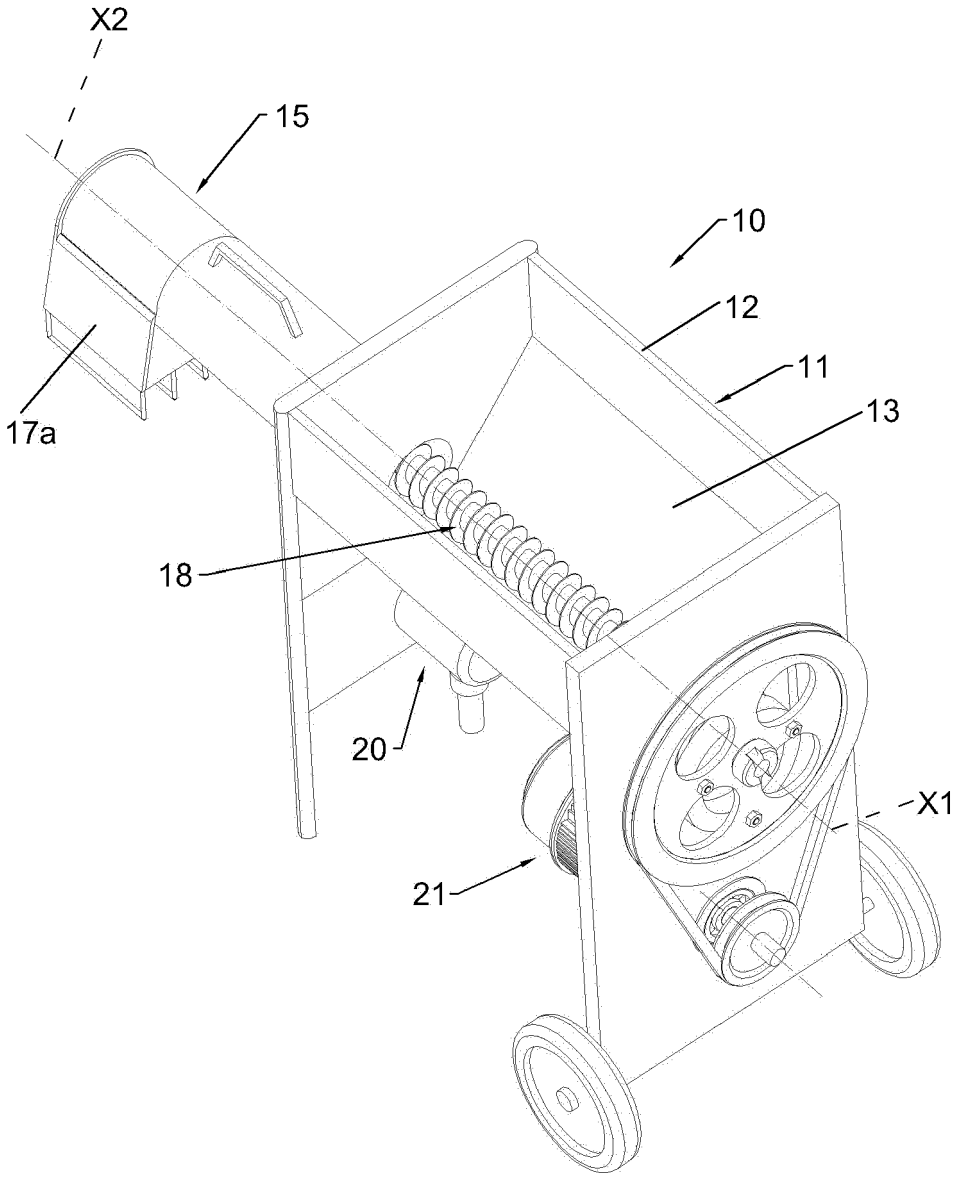
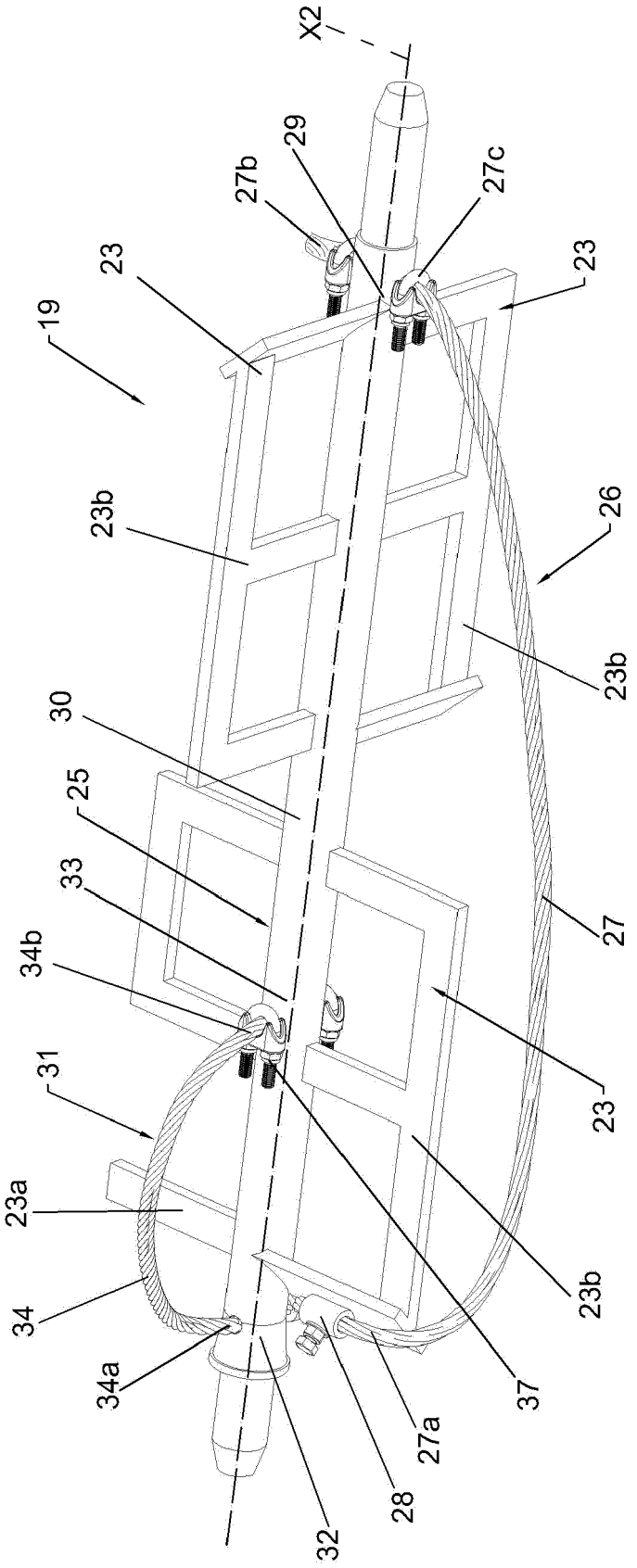


Fig. 1


X2
29
27b
27c
23
23
19
23b
26
23b
30
25
33
27
34b
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23
23a
23b
34
34a
37
27a
28
32

Fig. 2

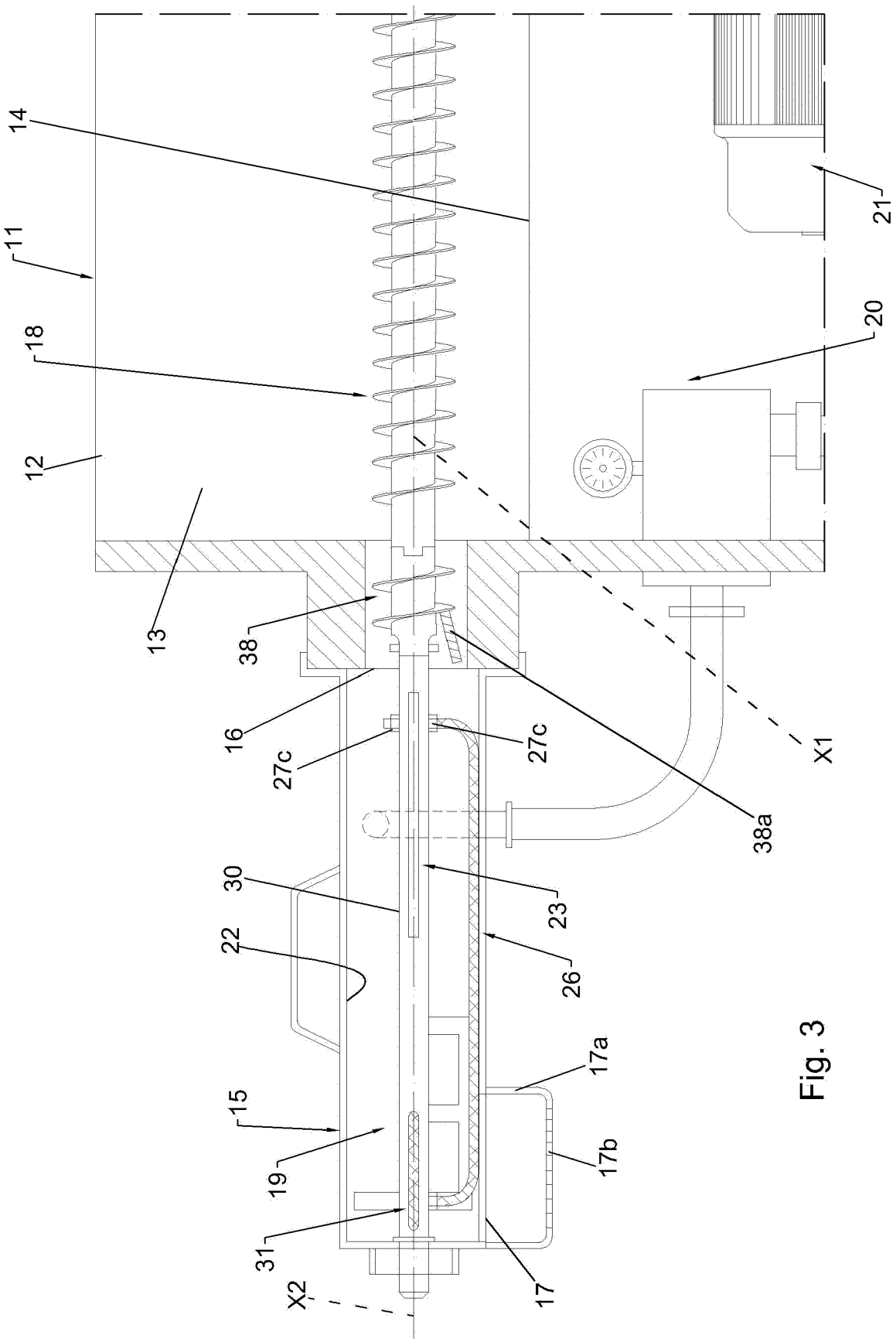
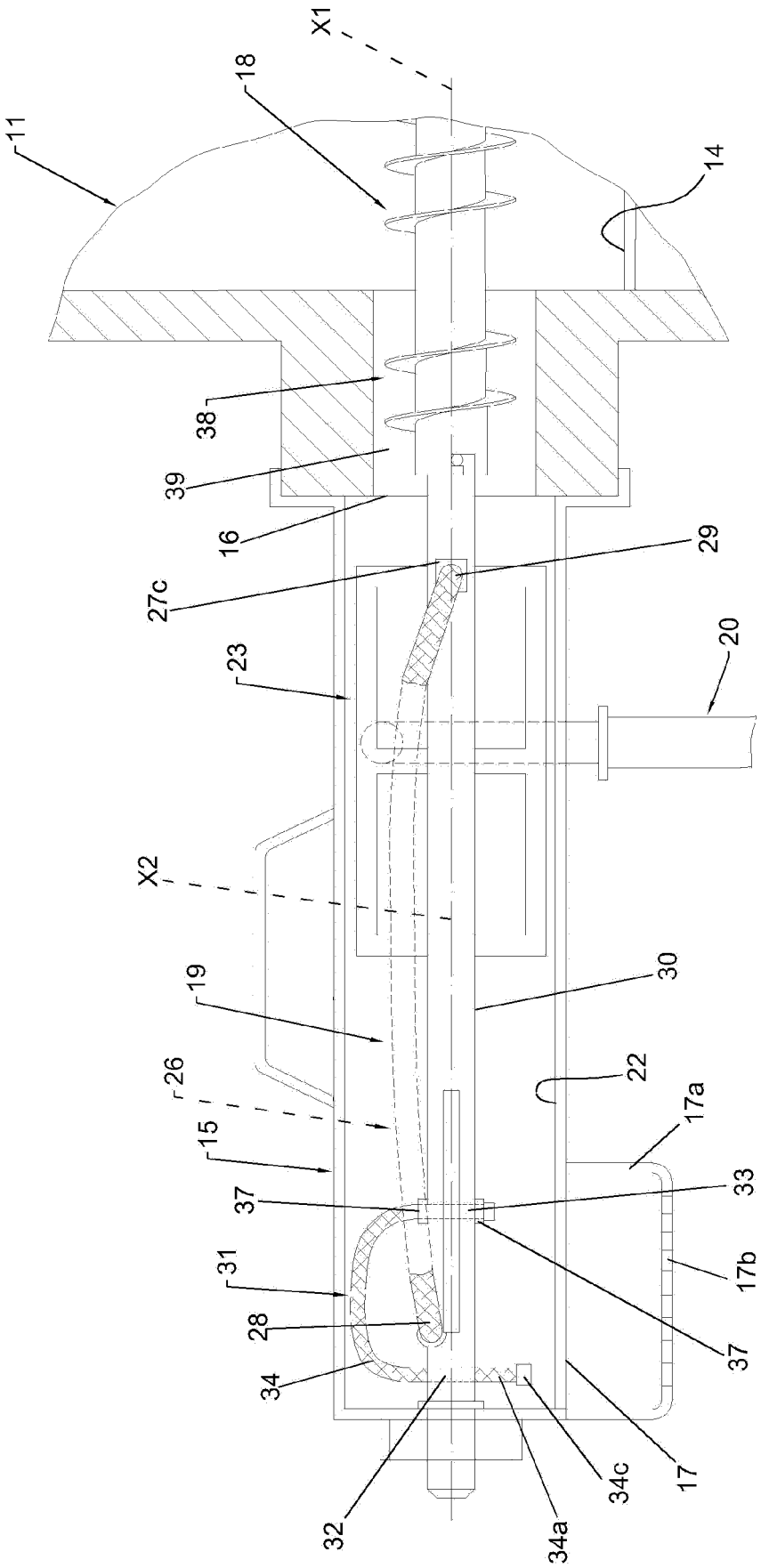

14
11
18
12
13
38
16
27c
27c
38a
X1
21
20
30
23
22
26
17a
15
19
17b
31
X2
17

Fig. 3


X1
18
11
14
38
39
16
29
27c
20
23
X2
30
19
26
22
17a
15
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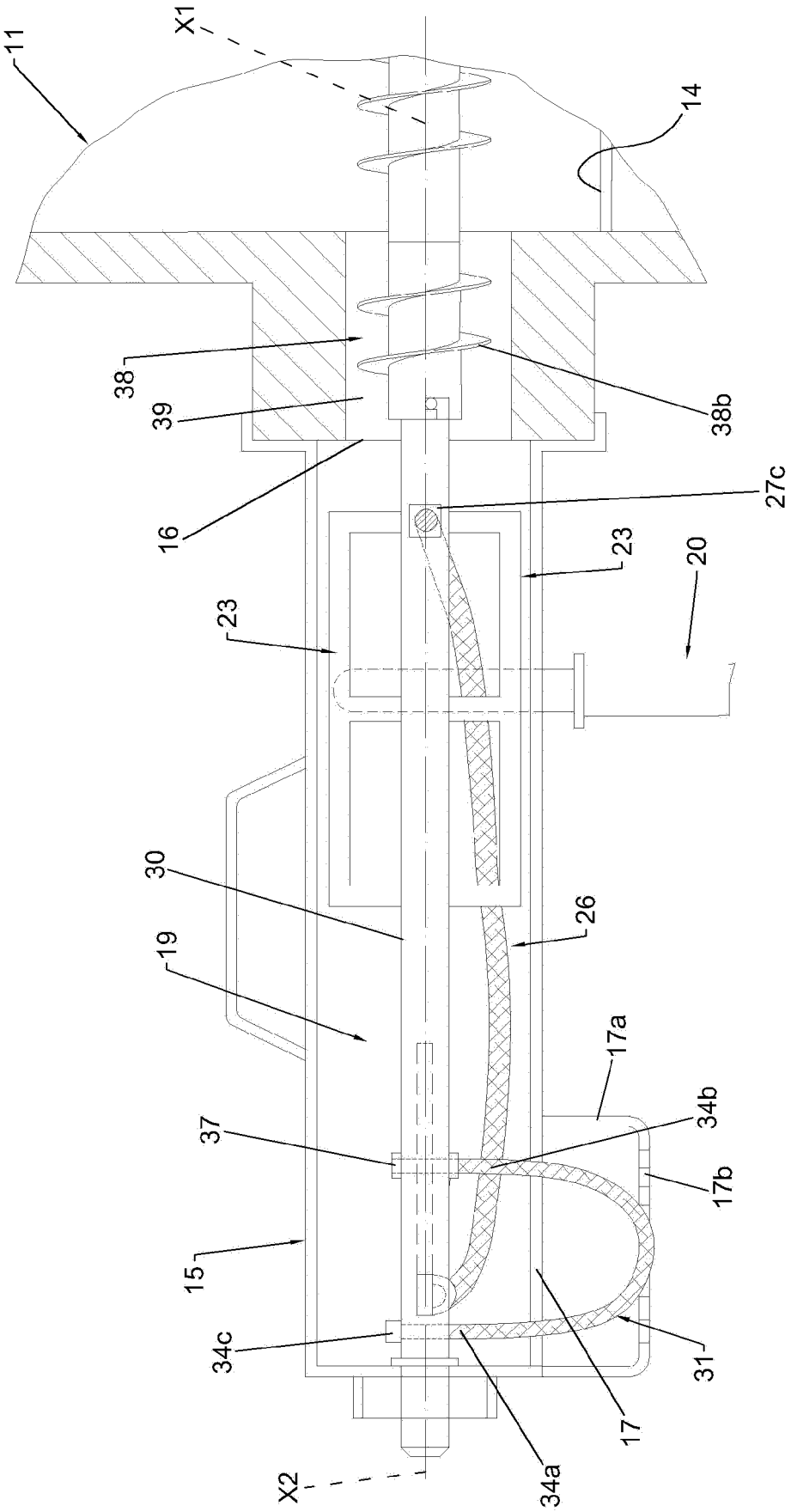
37
31
17b
28
37
34
17
34c
32
34a

Fig.4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38b
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34b
17b
15
34c
31
17
X2
34a

Fig.5

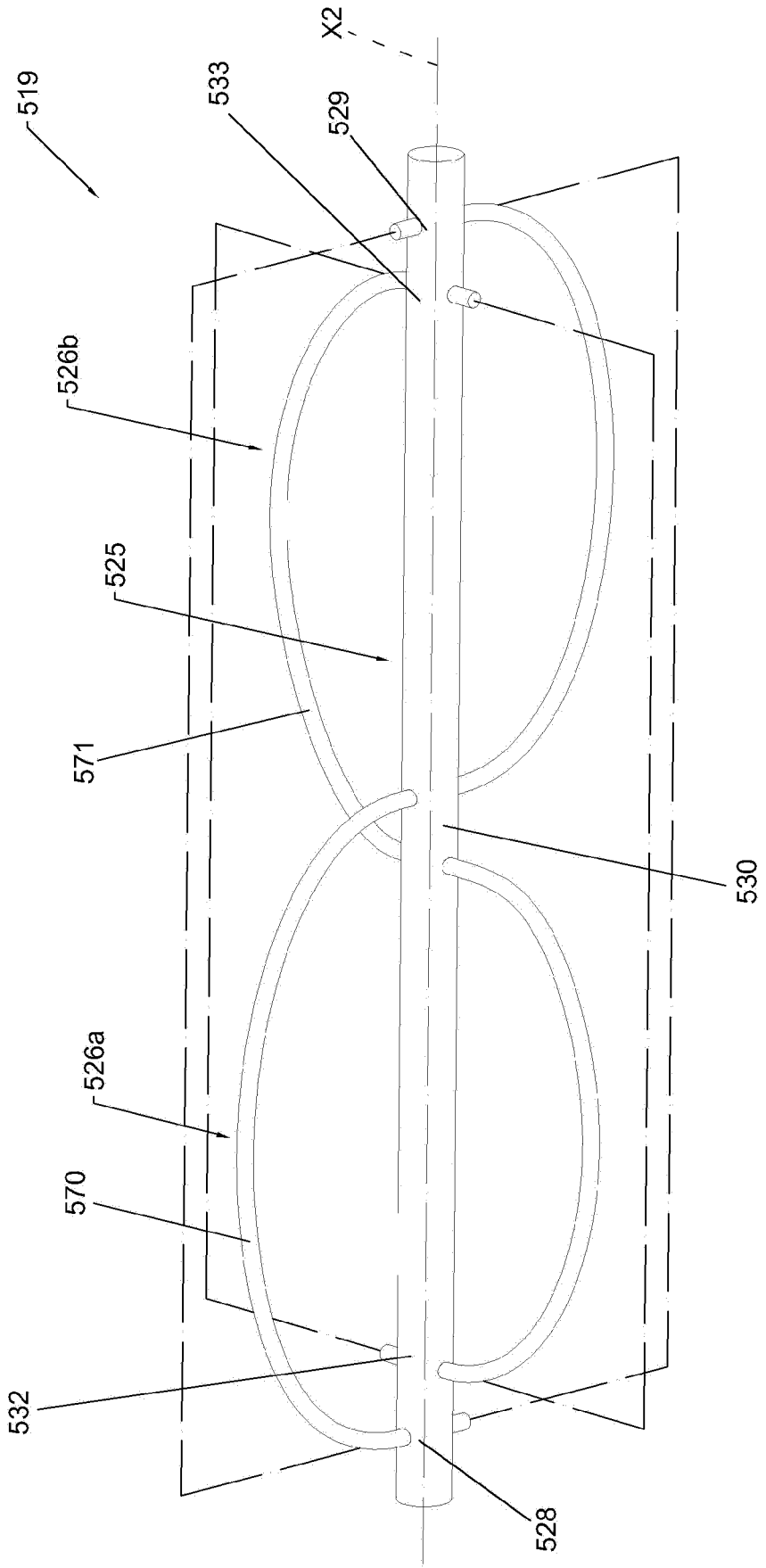

Fig.6

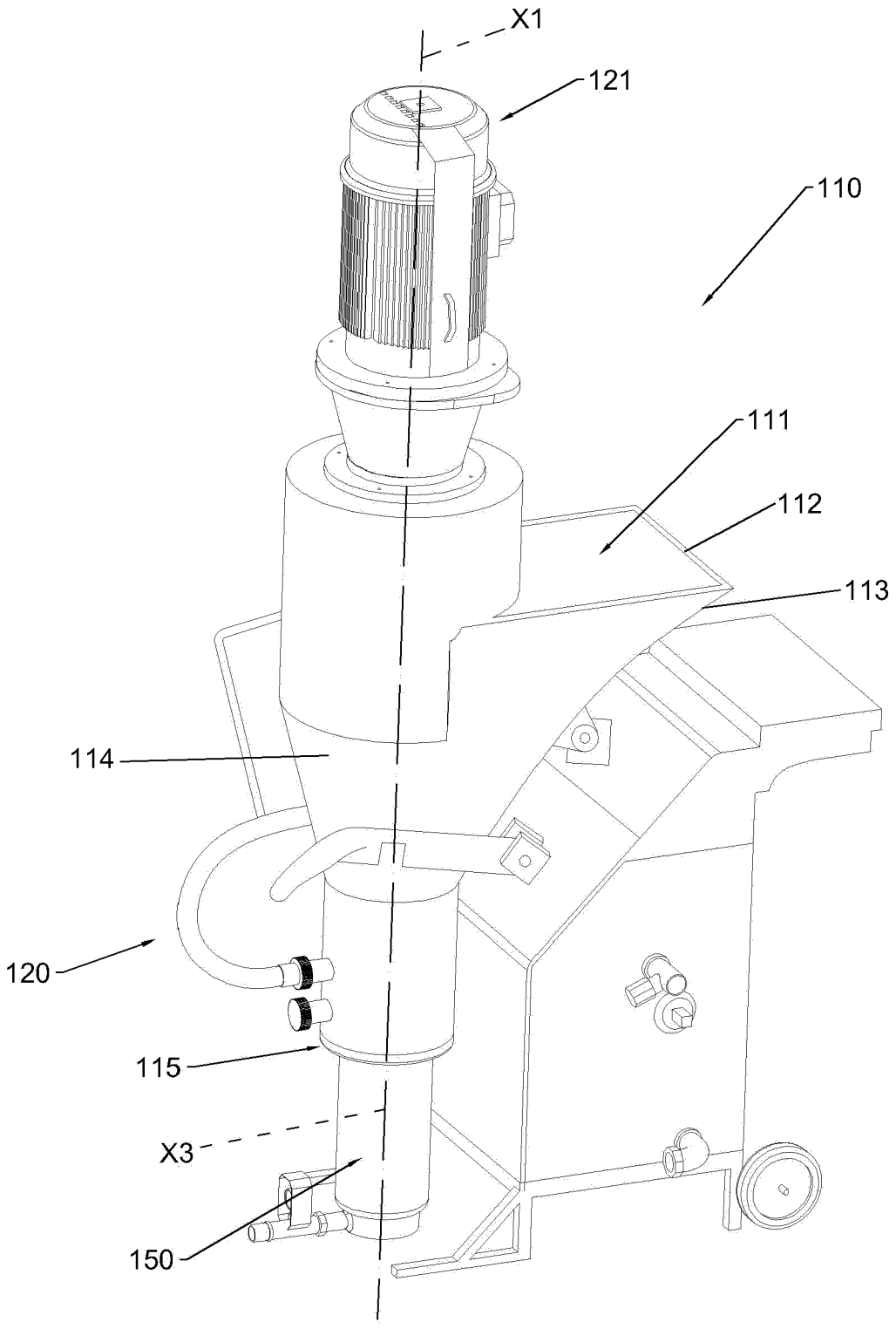

Fig. 7

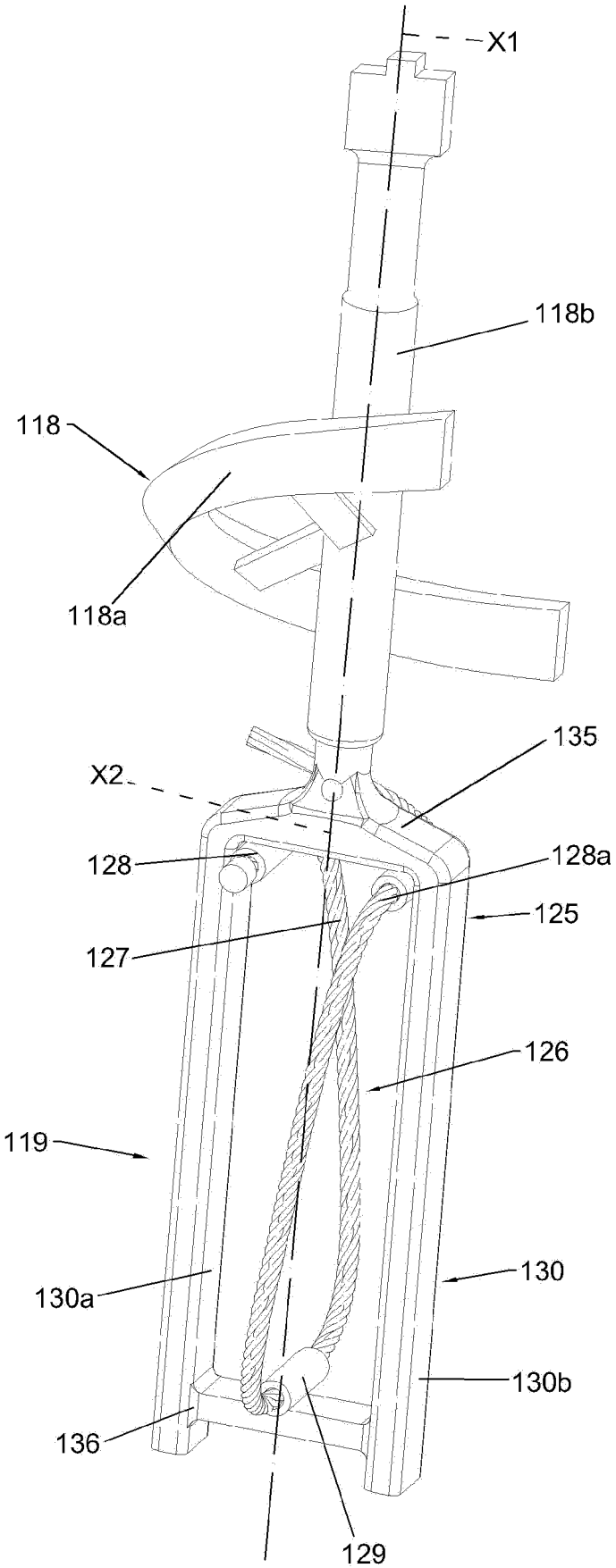
X1
118b
118
118a
135
X2
128
128a
125
127
126
119
130
130a
130b
136
129

Fig. 8

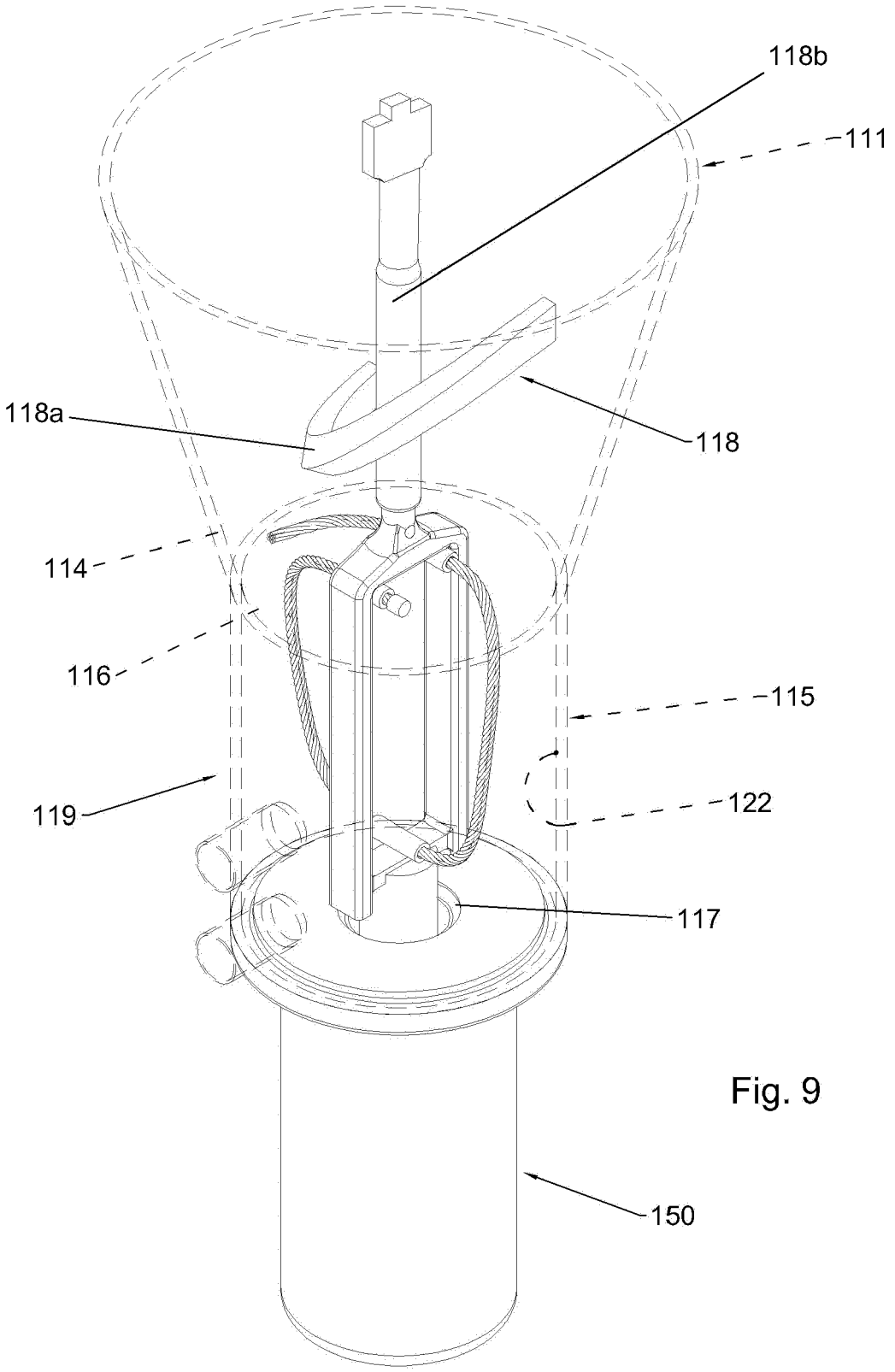

Fig. 9

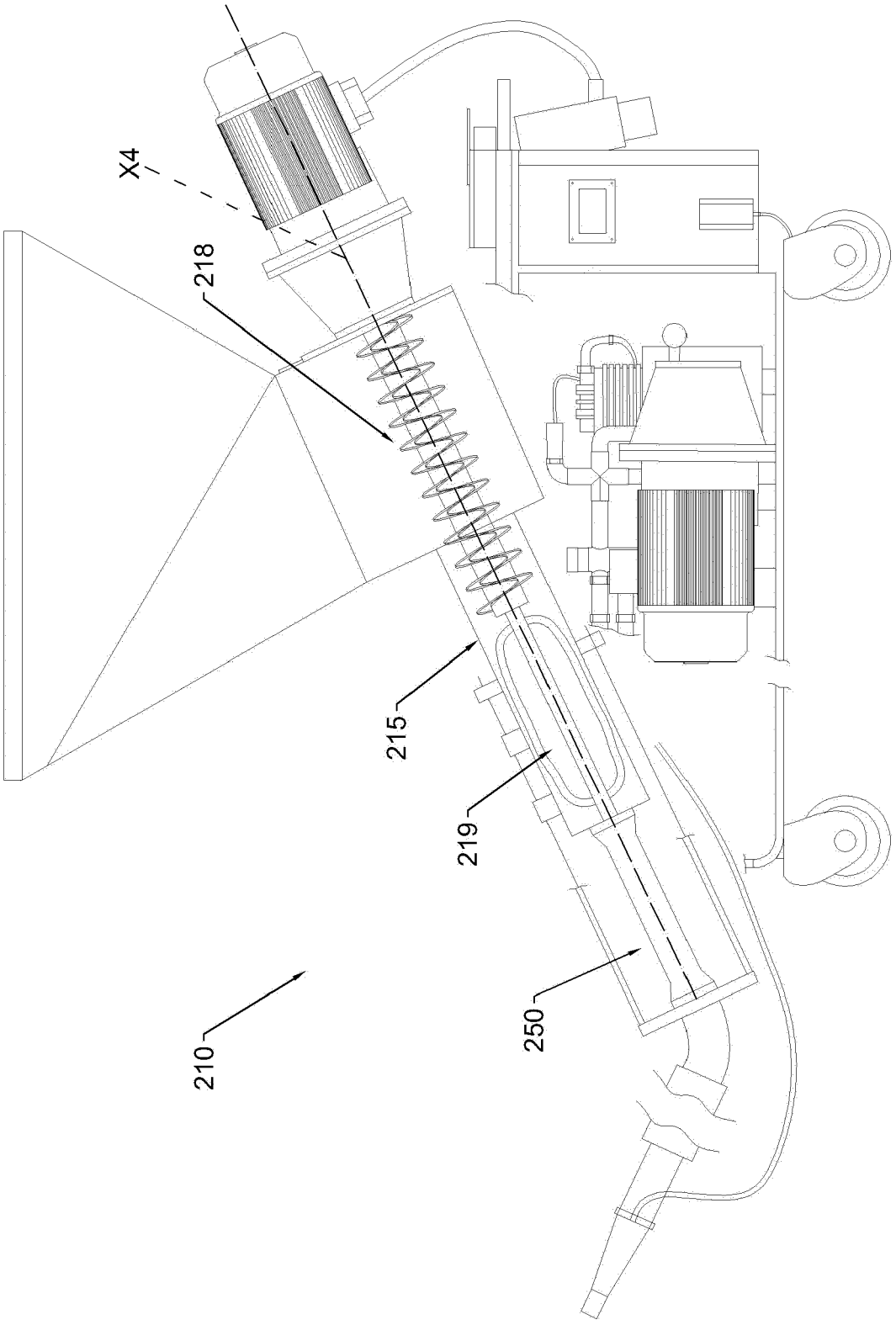

Fig. 10

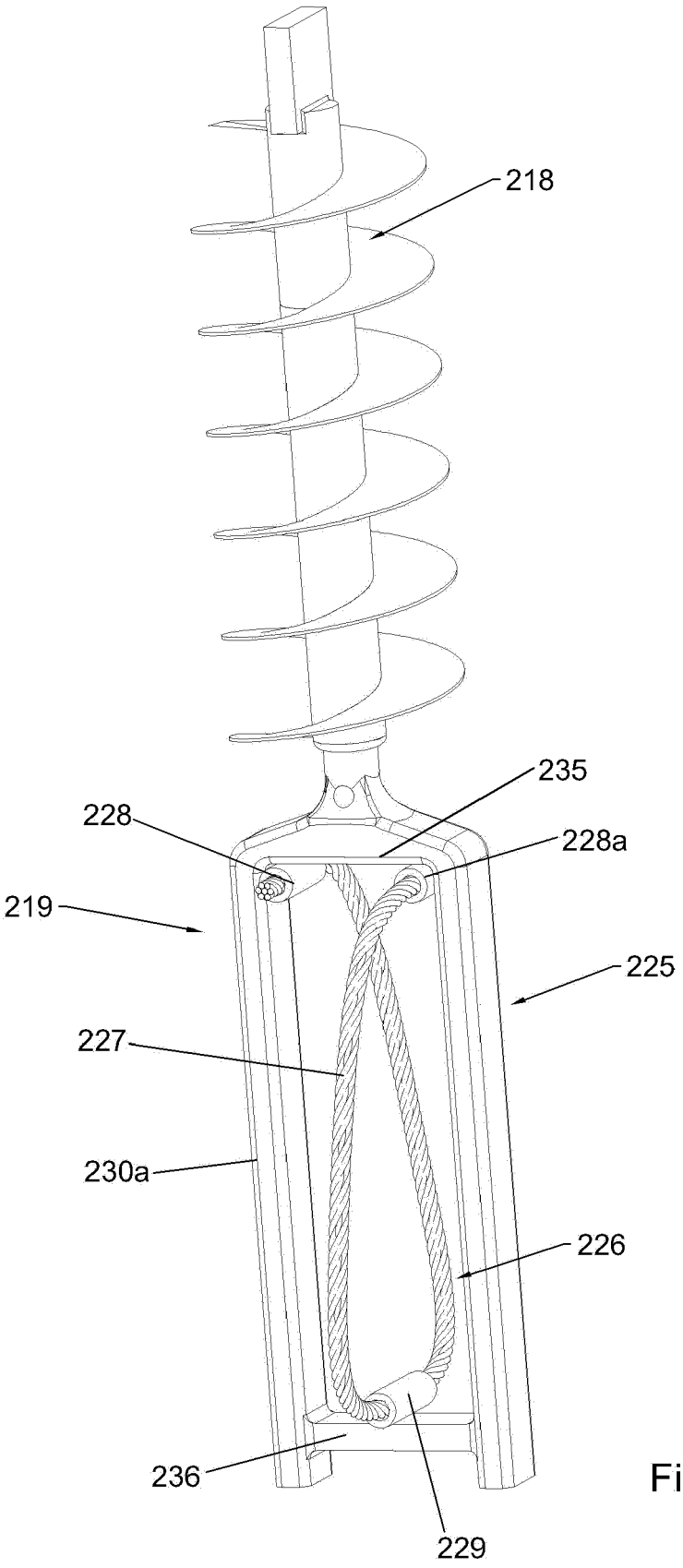

Fig. 11

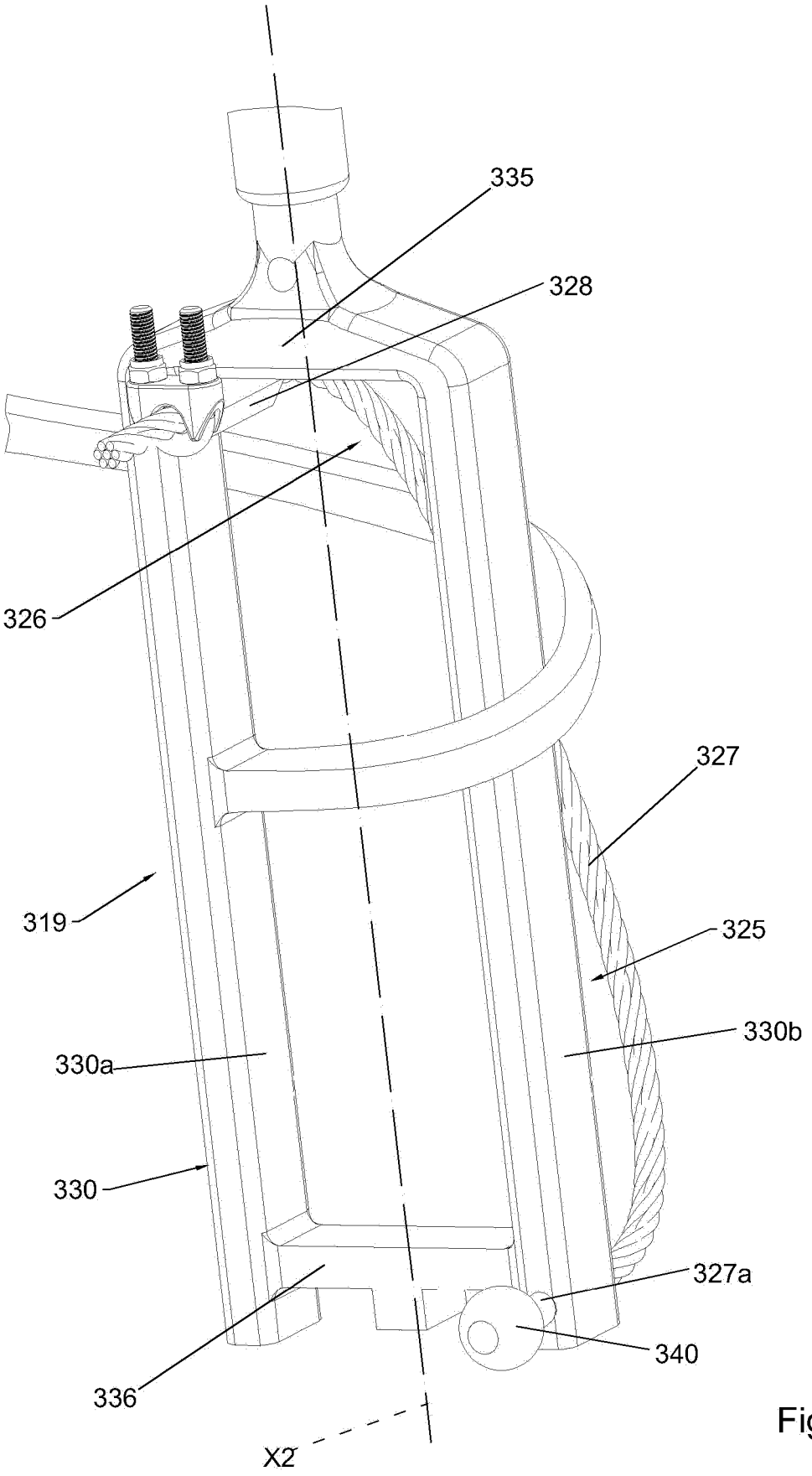

Fig. 12

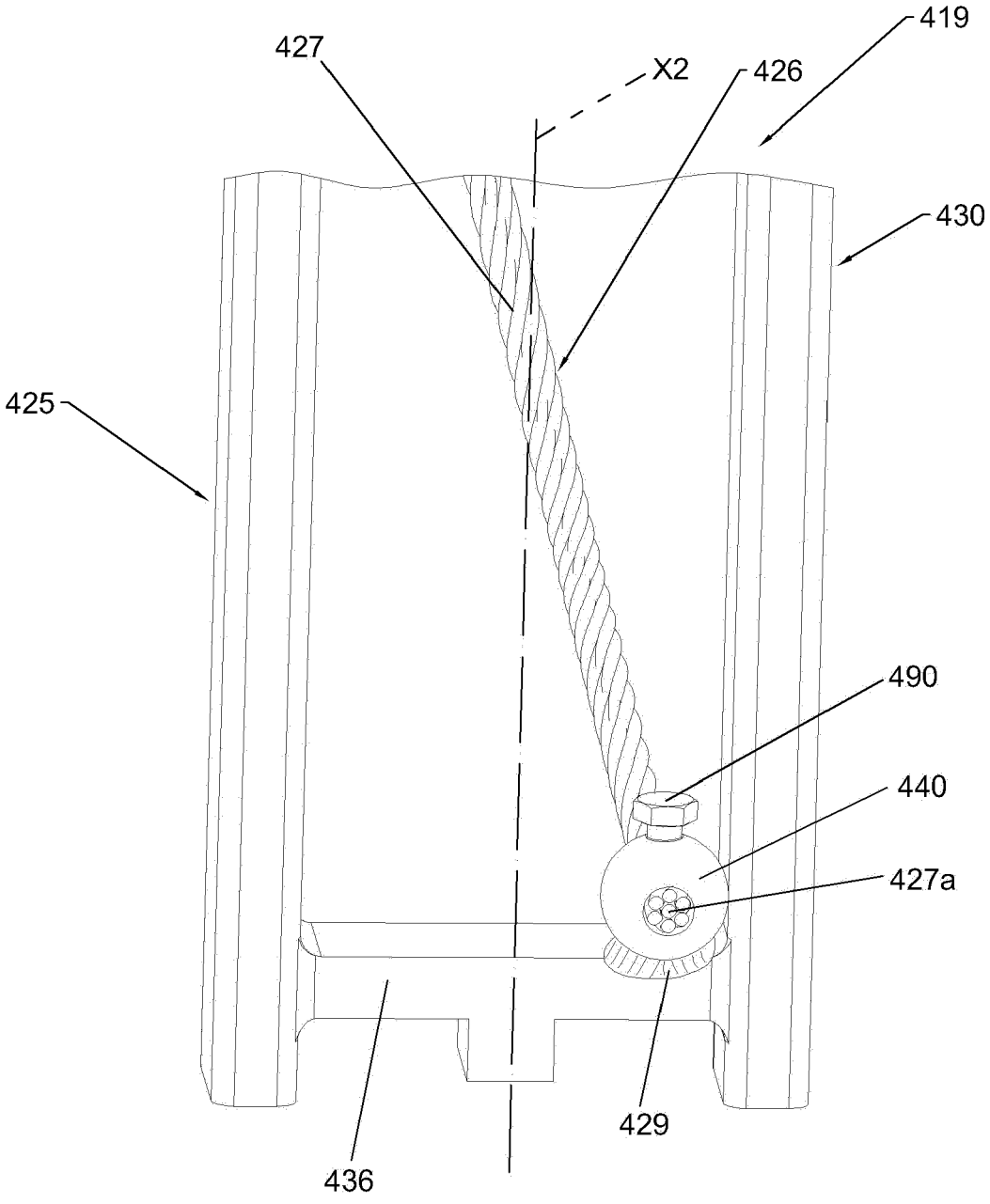

Fig. 13

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 7543

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 535 643 A1 (MAURER DIETRICH [DE]) 11 May 1984 (1984-05-11) * page 1, line 4 - line 8 * * page 10, line 1 - page 11, line 3 * * figures * -----	1-9	INV. B01F27/091 B01F27/13 B01F27/2121 B01F27/2123 B01F27/213
A	CN 204 748 925 U (HANGZHOU BOXIN ENGINEERING MACHINERY CO LTD) 11 November 2015 (2015-11-11) * figures * -----	1-9	B01F27/60 B01F27/70 B01F27/90 B28C5/14 B28C5/16
A	JP 3 004640 B1 (TOKAI SANDO KK; KFC LTD; TOBISHIMA CONSTRUCT CO LTD; MCM KK) 31 January 2000 (2000-01-31) * figures 10,11 * -----	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

B01F
B28C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 July 2022	Real Cabrera, Rafael

CATEGORY OF CITED DOCUMENTS

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04-07-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2535643 A1	11-05-1984	BE 898140 A	01-03-1984
		CH 662517 A5	15-10-1987
		DE 3241193 A1	10-05-1984
		FR 2535643 A1	11-05-1984
		IT 1161538 B	18-03-1987
CN 204748925 U	11-11-2015	NONE	
JP 3004640 B1	31-01-2000	JP 3004640 B1	31-01-2000
		JP 2000202823 A	25-07-2000

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