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(54) **TWISTING MACHINE FOR TWISTING THREAD-LIKE ELEMENTS AND TYING STRUCTURAL ELEMENTS**

(57) The invention is a twisting machine (1), particularly suitable for tying together two or more metal reinforcing bars (A) for concrete by means of a wire (B). The twisting machine (1) comprises: a pair of pincers (2) for twisting and cutting off the wire (B); an unwinding device (5) comprising a reel (40) supporting a hank (C) of wire (B); guiding means (7) suited to guide the wire (B) that is unwound by the pincers (2) along the pincers (2) and through the jaws (4); a tensile spring (8) which slidingly

accommodates the wire (B) and connects the guiding means (7) of the wire (B) to the unwinding device (5). When the jaws (4) are closed, a displacement of the pincers (2) stretches the tensile spring (8) and the wire (B) inside it, which is unwound from the hank (C), and when the tensile spring (8) shortens and the jaws (4) are opened a piece of wire (B) whose length corresponds to the shortening of the tensile spring (8) projects from the jaws (4).

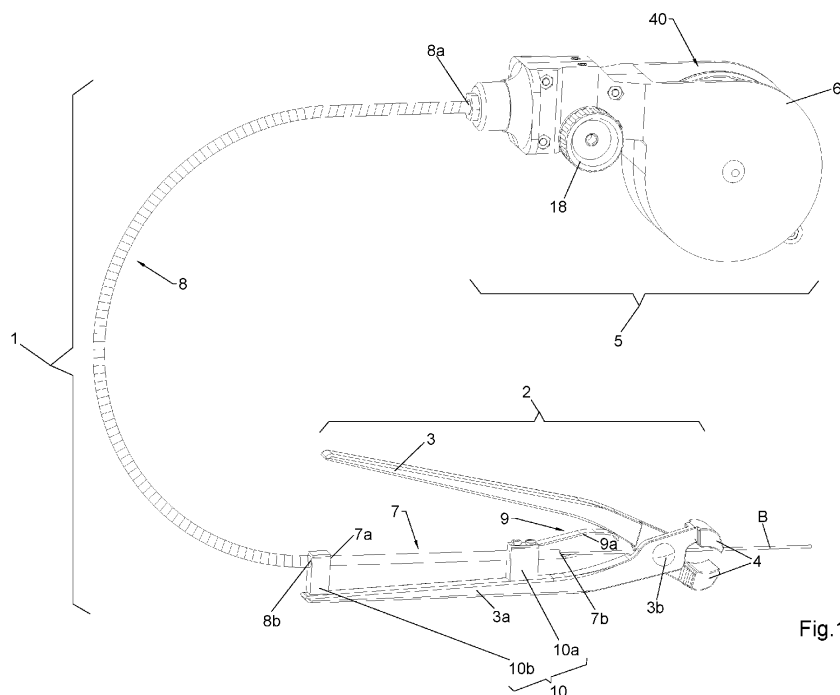


Fig. 1

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Description

[0001] The invention concerns a twisting machine for a thread-like element, preferably a wire, to be used for tying structural elements.

[0002] The twisting machine that is the subject of the invention is particularly suitable for tying together the metal bars that make up the reinforcement of concrete castings, commonly called "cages".

[0003] The invention also concerns a reel that supports a hank of wire of indefinite length suited to be used in the above-mentioned twisting machine.

[0004] The twisting machines for thread-like elements known to the applicant of the present patent application are operated manually and essentially comprise a tubular body housing a rectilinear rod that is set rotating by helical means located inside the tubular body.

[0005] More specifically, the helical means are fixed inside the tubular body and are also slidably coupled externally to the rectilinear rod, in such a way that if the tubular body is moved according to the longitudinal direction it defines, the rectilinear rod is set rotating on its own longitudinal axis.

[0006] At the end of the rectilinear rod projecting from the tubular body there is a hook that makes it possible to hook and twist a thread-like element, usually a wire called a "tie", after winding it astride the metal bars at their point of intersection. The metal bars are therefore tied together by twisting the tie, which can be obtained through the rotation of the rectilinear rod when the operator, as already mentioned above, moves the tubular sleeve without rotating it along the common longitudinal direction defined by the rectilinear rod and the tubular sleeve.

[0007] The ties used are commonly available on the market and essentially consist of a piece of wire with a preformed loop at each end, which facilitates attachment to the hook after the tie has been placed astride the metal bars to be tied.

[0008] Ties are sold packaged on reels and the operator, in order to tie the metal bars, removes a tie from the reel, places it astride the metal bars to be tied, attaches the loops of the tie to the hook of the twisting machine and then sets the rectilinear rod rotating by moving the tubular body as described above.

[0009] These twisting machines of the known type solve the problem of tying mainly longitudinal metal bars or similar elements together, but they have some known and acknowledged drawbacks.

[0010] A first drawback lies in that the operations of extraction of the tie and attachment to the hook, which precede each twisting operation, are considered to be downtime that strongly affects the total tying time, thus increasing production costs.

[0011] A further drawback is constituted by the fact that the operator is forced to carry a significant amount of reels of said ties to the work area and to continuously move them to other areas as the work progresses, which

results in considerable fatigue due to their significant weight.

[0012] Another drawback is constituted by the fact that the operator must have ties in different lengths depending on the diameter of the metal bars to be tied together, which leads to the additional inconvenience of needing a plurality of ties of different sizes in the work area.

[0013] A further drawback lies in that sometimes, in order to simplify the tying operation and to avoid the need for several types of ties, ties are used which are longer than would be necessary according to the diameter of the metal bars to be tied together.

[0014] However, it is clear that this inevitably leads to a sometimes high waste of material and a reduction in the quality of the tying carried out.

[0015] There is also a known patent application for an industrial invention which describes a piece of twisting equipment intended to eliminate the drawbacks described in the above-mentioned patent application, and particularly the drawback deriving from the use of ties.

[0016] More specifically, even the twisting equipment described comprises a tubular body and a rectilinear rod coaxially housed in the tubular body, which are connected by means of a helical coupling.

[0017] Similarly to what has just been described, the end of the rectilinear rod projecting from the tubular body supports a hook to which the end of a wire is attached, a wire that in this case, and differently from what has been previously described, is unwound from a hank.

[0018] The projecting end of the wire is then placed astride the metal bars at their point of intersection and attached to the hook, and the wire is then twisted by axially moving the tubular body so that the helical coupling inside it causes the rectilinear rod to rotate, twisting the wire and tying the metal bars.

[0019] The drawbacks that were previously found in the twisting equipment initially described are effectively overcome by the equipment just described, which thus achieves the set objects.

[0020] Firstly, the use of wire wound on a reel that is made advance continuously along the rectilinear rod of the twisting machine reduces downtime and therefore achieves shorter tying times compared to those required by the equipment using ties wound in a hank.

[0021] Furthermore, the use of wire wound in a hank avoids the need to transport the ties to the various work areas and reduces material waste, as it allows only the strictly necessary length of wire to be used for each tying operation.

[0022] Finally, said equipment allows higher quality tying to be obtained.

[0023] However, the twisting equipment described has the recognized drawback of being rather heavy, which causes excessive fatigue for the operator.

[0024] It also takes a significantly long time to change the hank on which the wire is wound.

[0025] Finally, another drawback of the twisting equipment described and of all twisting machines on the mar-

ket in general lies in that only wire hanks wound on disposable plastic reels can be loaded onto them.

[0026] This leads to a higher cost and an unnecessary increase in the consumption of plastic material.

[0027] The present invention therefore aims to overcome these drawbacks.

[0028] More specifically, it is a first object of the invention to provide a piece of equipment for twisting thread-like elements, particularly wire, having a limited weight, acceptable for manoeuvring by an operator and significantly lower than that of known equivalent equipment.

[0029] It is another object that the twisting equipment of the invention does not use a disposable reel for the thread-like element to be twisted.

[0030] It is another, yet not the least object that the twisting equipment of the invention uses a single reel, suited to be used repeatedly and to receive a hank of a thread-like element to be twisted that is wound with no need for the disposable reel.

[0031] The objects listed above are achieved by the twisting machine for thread-like elements which is the subject of the invention, whose characteristics are described in claim 1, to which reference is made.

[0032] The further claims describe other characteristics of the twisting machine of the invention and of the reel supporting the hank of the thread-like element that is twisted in said twisting machine.

[0033] Advantageously, the twisting machine of the invention, being rather lightweight, reduces the fatigue of the operator, who can work longer without getting tired. Further advantageously, the use of a single reusable reel removably associated with the twisting machine reduces the time required to change the hank.

[0034] This also avoids the use of disposable plastic reels and the costs due to the unnecessary waste of the plastic material from which they are made.

[0035] The objects and the advantages listed above are illustrated in greater detail in the description of a preferred embodiment of the invention, which is provided by way of non-limiting example and which makes reference to the attached drawings, wherein:

- Figure 1 shows an axonometric view of the twisting equipment of the invention;
- Figures from 2 to 6 show the twisting equipment of the invention in five different operating positions;
- Figures from 7 to 9 show three different axonometric views of the twisting equipment of the invention in three different operating stages;
- Figure 10 shows the twisting equipment of the invention in a rest position;
- Figure 10a shows a detail of Figure 10;
- Figure 11 shows the twisting equipment of the invention in another rest position;
- Figure 11a shows a detail of Figure 11;
- Figure 12 shows the twisting equipment of the invention in an operating position;
- Figures 12a, 12b, 12c, 12d show four details of Fig-

ure 12;

- Figure 13 shows a detail of Figure 1;
- Figure 14 shows a top view of the detail of Figure 13;
- Figures 15, 16 and 17 show the partial longitudinal sectional view of Figure 14 in three different operating positions;
- Figure 18 shows the exploded view of the detail shown in Figures from 15 to 17;
- Figure 19 shows the detail of Figure 13 partially disassembled;
- Figure 20 shows the exploded view of the detail shown in Figure 13.

[0036] The twisting machine that is the subject of the invention is shown in the axonometric view of Figure 1 and in the views of Figures 2 to 6 and 10 to 12, where it is indicated as a whole by **1**.

[0037] The twisting machine **1** is particularly suitable for tying together two or more structural elements, preferably two or more metal reinforcing bars **A** for concrete, which are shown in Figures 7 to 9, by means of a thread-like element **B** which is unwound from a hank **C**.

[0038] With reference to Figures 2 to 6, 10 to 12 and to the views of some of their details, it can be observed that the twisting machine **1** comprises a pair of pincers **2** for twisting and cutting off the thread-like element **B**, an unwinding device **5** suited to unwind the thread-like element **B** from a hank **C** and guiding means **7** suited to guide the thread-like element **B** and associated with the pincers **2**.

[0039] It can be observed that the pincers **2** comprise two grips **3**, **3a** hinged to each other and two jaws **4** located opposite each other at the ends of the grips **3**, **3a**, the latter being configured to be grasped by an operator to manoeuvre the jaws **4** in order to open and close them.

[0040] The unwinding device **5** used to unwind the thread-like element **B** comprises a case **6** configured to contain a reel **40** that is visible in Figures from 13 to 20 and supports the hank **C** of the thread-like element **B** to be unwound, which has an indefinite length.

[0041] It should be pointed out that a thread-like element **B** is understood to be any thin element of indefinite length, and in particular it is understood to be a wire. For this purpose, the term thread-like element **B** will hereinafter be used to refer to a wire, preferably but not necessarily made of mild steel.

[0042] In addition, the terms thread-like element and wire can be used as synonyms.

[0043] With regard to the guiding means **7** designed to guide the thread-like element **B** which are associated with the pincers **2** and in particular with the grip indicated by **3a**, they guide the thread-like element **B** as it moves along the pincers **2** and through the jaws **4** when an operator manoeuvres the pincers **2**, as is better specified below.

[0044] According to the invention, the twisting machine **1** also comprises a tensile spring **8** which slidably accommodates the thread-like element **B** and whose entry

end **8a** is fixed to the exit way **5b** of the unwinding device **5** and whose exit end **8b** is fixed to the entry way **7a** of the guiding means **7**.

[0045] The pincers **2** also comprise clamping means **9** which, when the jaws **4** are closed as shown in Figure 3, mutually constrain the pincers **2** and the thread-like element **B**.

[0046] Thus, if the pincers **2** are manually moved by the user through a displacement which causes the elastic elongation **L_m** of the tensile spring **8** shown in Figure 4, at the same time the thread-like element **B** is unwound from the hank **C** by a length **L_f** that is equal to the elastic elongation **L_m** of the same tensile spring **8**. When the tensile spring **8** is stretched and the jaws **4** of the pincers **2** are opened as shown in Figure 5, the clamping means **9** release the pincers **2** from the thread-like element **B** and allow the elastic shortening of the tensile spring **8** and the simultaneous retraction of the pincers **2**.

[0047] This moves the thread-like element **B** out of the jaws **4** of the pincers **2** by a length **L'_f** that is equal to the length **L'_m** of the elastic shortening of the tensile spring **8**.

[0048] Obviously, if the elastic shortening **L'_m** of the tensile spring **8** is equal to its previous elastic elongation **L_m**, the conditions will occur in which:

$$L_m = L_f = L'_m = L'_f.$$

[0049] Thus, the exit of the thread-like element **B** from the jaws **4** is generated by the simple manual operation performed by the operator who first extends the tensile spring **8** and then releases it after opening the jaws **4** to allow the thread-like element **B** to move outwards by a length corresponding to the shortening of the spring **8**.

[0050] With regard to the guiding means **7** and the clamping means **9**, it can be noted that they are supported by supporting means **10** which are fixed to one of the grips **3** of the pincers **2**, in particular to the grip indicated by **3a**.

[0051] More specifically, the supporting means **10** comprise a first prismatic block **10a** and a second prismatic block **10b** aligned with each other, which support the guiding means **7**, and it can be observed that the first prismatic block **10a** is arranged upstream of the hinge point of the grips **3**, **3a** to each other and is configured to also support the clamping means **9**.

[0052] The guiding means **7** comprise a tubular element **7c** whose exit end **7b** is arranged upstream of the jaws **4** in proximity to the point where the grips **3** are hinged to each other.

[0053] Furthermore, the exit end **7b** of the tubular element **7c** is coaxial with the pincers **2** and central to the jaws **4** so that the thread-like element **B** exits precisely centrally with respect to the jaws **4** themselves, as is shown in particular in Figures from 2 to 6.

[0054] With regard to the clamping means **9**, as shown in particular in the detail figure 12b, they comprise an elastic element **9a** configured to elastically interfere with

the thread-like element **B** when the grips **3** close the jaws **4** as shown in Figures 3, 4 and 6.

[0055] In addition, the twisting machine **1** also comprises friction means **11** which are shown in particular in the detail Figure 12c and which are associated with the case **6** of the unwinding device **5** upstream of the exit way **5b** of the unwinding device **5** and adhere to the thread-like element **B** to allow it only to move in the direction of exit from the unwinding device **5**, as indicated by the arrow in Figure 12c.

[0056] In particular, it can be observed that the friction means **11** comprise an elastic foil **10a** which is associated with a cylindrical bushing **12** housed in the case **6** and to which the entry end **8a** of the tensile spring **8** is fixed.

[0057] The twisting machine **1** also comprises a manual feeding unit **15** for feeding the thread-like element **B** which, as can be seen in Figures 12d and 20, is associated with the case **6** of the unwinding device **5** and is configured to unwind the thread-like element **B** from the hank **C** to make it advance along the tensile spring **8** and along the guiding means **7** until its end projects from the jaws **4**.

[0058] Specifically, it can be observed that the manual feeding unit **15** comprises a friction wheel **16** and a pressure wheel **17** tangentially opposite each other, between which there is the thread-like element **B**, arranged tangentially between said wheels **16**, **17**.

[0059] In addition, the friction wheel **16** is provided with knurls **16a** which ensure grip on the thread-like element **B** and is connected to a manoeuvring pawl **18** visible in Figures 12d and 20, which is actuated by an operator to rotate the friction wheel **16** and make the thread-like element **B** advance.

[0060] As regards the case **6** of the unwinding device **5**, it houses the reel **40** that supports the hank **C** of the thread-like element **B** of indefinite length for tying the metal bars **A**.

[0061] With particular reference to Figures from 13 to 20, it can be observed that the reel **40** comprises a disc **41** provided with a projecting pin **42** having an external thread **42a** and a counter-disc **43** provided with a projecting seat **44** with an internal thread **44a**.

[0062] When the disc **41** and the counter-disc **43** are coupled together by screwing the respective threads **42a**, **44a**, the hank **C** is supported by the projecting seat **44**, as shown in Figures from 15 to 18.

[0063] In addition, the projecting pin **42** and the projecting seat **44** are traversed axially and along their entire length by a through hole **46** in which an elastic pin **47** is inserted and comprises a compression spring **49** delimited by two caps **50**, **51**, each arranged at one of its ends.

[0064] Two operating conditions are possible for the elastic pin **47**, said conditions including:

- a first operating position **X**, shown in Figure 17, in which the compression spring **49** is compressed and the caps **50**, **51** are positioned back into the through hole **46** to allow the sliding insertion of the reel **40**

- into the case **6** in the direction indicated by the arrow;
 a second operating position **Y**, shown in Figure 15, in which the compression spring **49** is expanded and each of the caps **50, 51** projects from a through hole **6a** made in the case **6** to revolvingly constrain the reel **40** in the case **6**.

[0065] Between the first operating position **X** and the second operating position **Y** or vice versa there is an intermediate position **Z**, shown in Figure 16, in which the compression spring **49** and the caps **50, 51** are positioned back into the through hole **46** and coaxially aligned with the through hole **6a** made in the case **6**.

[0066] Operationally, the user of the twisting machine **1** must first of all place a hank **C** in the reel **40**, as shown in Figure 18, and then insert the reel **40** in the case **6** of the unwinding device **5**, performing in succession the manoeuvres shown in Figures from 15 to 17.

[0067] It can be noted that the hank **C** of thread-like element **B** is a hank commonly available on the market and has no disposable plastic reel for winding the thread-like element **B**.

[0068] After the insertion, the reel **40** with the hank **C** is arranged as shown in Figures from 13 to 15, where it is revolvingly constrained by the caps **50, 51** projecting from the hole **6a**.

[0069] At this point, the user grasps the pincers **2** and inserts the unwinding device **6** into a casing, not shown, which, for their convenience, can be clipped onto their belt or another supporting device.

[0070] The user then acts on the manual feeding unit **15** and makes the thread-like element **B** advance along the guiding means **7** and towards the jaws **4** of the pincers **2** until it projects from the jaws **4**, as can be observed in Figure 2.

[0071] In order to prevent the clamping means **9** from hindering the advance of the thread-like element **B**, it is necessary that the jaws **4** remain open during this operation.

[0072] Once these preliminary operations have been carried out, the user can start working by closing the jaws **4** as shown in Figure 3 in order to constrain the pincers **2** to the thread-like element **B** by means of the counteracting action exerted by the clamping means **9** which are arranged as shown in Figure 12b. Therefore, by displacing the pincers **2** to an extent which causes the elongation **L_m** of the tensile spring **8** shown in Figure 4, the user also causes an equal elongation **L_f** of the thread-like element **B** constrained to the pincers **2** and inside the compression spring **8**, as shown in Figure 4.

[0073] When the jaws **4** are opened as can be observed in Figure 5, the tensile spring **8** elastically withdraws the pincers **2** back to their initial position and the thread-like element **B** advances centrally through the jaws **4**, being guided by the tubular element **7c** and in particular by its exit end **7b** which positions it centrally with respect to the jaws **4** themselves.

[0074] The thread-like element **B** projects from the

jaws **4** of the pincers **2** by the length **L_f** which, as can be seen in Figure 5, is equal to the shortening **L_m** of the compression spring **8**.

[0075] During this operation, the pincers **2** are open and, as can be seen in Figure 5, the thread-like element **B**, although not constrained to the pincers by the clamping means **9**, cannot retract and be wound back onto the hank **C** due to the counteracting action exerted by the friction means **11**, which can be observed in particular in Figure 12c.

[0076] Obviously, after the retraction of the pincers **2**, the section of the thread-like element **B** projecting from the jaws **4** of the pincers **2** may be shorter than the initial elongation of the tensile spring **8** if the tensile spring **8** only withdraws the pincers **2** by a fraction of the initial elongation.

[0077] The section of thread-like element **B** projecting from the jaws **4** of the pincers **2**, which can be observed in Figure 6, is then first wound around the metal bars **A**, as shown in Figure 7, and then twisted, as shown in Figure 8, and finally cut off, as shown in Figure 9.

[0078] It is important to note that all these operations are performed by the user manually and using only one hand.

[0079] This is extremely important as with the other hand, which remains free, the user can wind the portion of thread-like element **B** that projects from the jaws **4** around the metal bars **A** and pick up the thread-like element **B** between the jaws **4**, as can be observed in Figure 7, in order to successively be able to twist it as shown in Figure 8 and finally cut it off as shown in Figure 9.

[0080] It is also important to note that in the twisting machine **1** of the invention there are no rotating elements, which instead are present in the known twisting machine mentioned in the introduction and also in other twisting machines available on the market.

[0081] Obviously, this makes the twisting machine **1** of the invention easier to construct and its operation more reliable, as it is less prone to jamming and breakage than the known twisting machines that have been mentioned.

[0082] At this point, one tying and twisting operation has been completed and another can be started.

[0083] Based on the above, it is understood that the twisting machine **1** and the reel **40** of the invention achieve the set objects.

[0084] First of all, it is achieved the object to provide a twisting machine for thread-like elements, particularly for wire, that has a limited weight and is significantly lighter than the known equivalent equipment.

[0085] In fact, it has been shown that the twisting machine **1** of the invention comprises a pair of pincers **2** which is known to be light and can be easily manoeuvred by an operator and an unwinding device **5** whose weight is supported by a case that houses the unwinding device **6** and is preferably hung from the belt of the user.

[0086] Advantageously, therefore, the twisting machine of the invention reduces the fatigue of the operator, who can work longer without getting tired and take fewer

breaks.

[0087] Advantageously, this also allows for an increase in production.

[0088] Moreover, advantageously, the operation of the twisting machine of the invention is totally manual and thus its construction and maintenance are simple and inexpensive.

[0089] It is also achieved the object that the user, when operating the twisting machine of the invention, can use only one hand, so that with the free hand he can easily perform all the accessory operations for the tying of the metal bars **A** and the subsequent twisting and cutting off of the thread-like element **B**.

[0090] It is also achieved the object to provide a reel **40** of the reusable type, which makes it possible to use hanks of thread-like elements **B** without a disposable plastic reel for winding the thread-like element.

[0091] Advantageously, therefore, compared to the known art, the same reel **40** is always used in the twisting machine **1** of the invention, thus avoiding the unnecessary waste of plastic material from which the disposable reels on which the hanks of the known art are wound, are made.

[0092] Upon implementation, the twisting machine and the reel of the invention can be subjected to modifications and variants which have been neither described herein nor represented in the attached drawings.

[0093] It is understood that, if said possible variants and modifications fall within the scope of the claims attached hereto, they shall be considered protected by the present patent.

Claims

1. Twisting machine (1) particularly suitable for tying together two or more structural elements, preferably two or more metal reinforcing bars (A) for concrete, by means of a thread-like element (B) wound in a hank (C), said twisting machine (1) comprising:

- a pair of pincers (2) for twisting and cutting off said thread-like element (B), said pincers (2) comprising two grips (3, 3a) hinged to each other and two jaws (4) opposite each other, each of which is positioned at the end of a respective one of said grips (3, 3a) which are configured to be grasped by an operator to operate said jaws (4);
- an unwinding device (5) for unwinding said thread-like element (B), comprising a case (6) configured to contain a reel (40) supporting a hank (C) of said thread-like element (B) of indefinite length to be unwound;
- guiding means (7) suited to guide said thread-like element (B) which are associated with said pincers (2) and guide said thread-like element (B) as it moves along said pincers (2) and

through said jaws (4),

said twisting machine (1) being **characterized in that** it also comprises a tensile spring (8) which slidably accommodates said thread-like element (B) and has its entry end (8a) fixed to the exit way (5b) of said unwinding device (5) and its exit end (8b) fixed to the entry way (7a) leading into said guiding means (7), said pincers (2) being provided with clamping means (9) which:

- when said jaws (4) are closed, constrain said pincers (2) to said thread-like element (B) in such a manner that a displacement of said pincers (2) causing the elongation of said tensile spring (8) simultaneously unwinds said thread-like element (B) from said hank (C) by a length that is equal to the elastic elongation of said tensile spring (8);
- when said tensile spring (8) is stretched and said jaws (4) of said pincers (2) are opened, release said pincers (2) from said thread-like element (B) and allow the elastic shortening of said tensile spring (8) and the simultaneous retraction of said pincers (2), making said thread-like element (B) exit from said jaws (4) of said pincers (2) by a length that is equal to the length of the shortening of said tensile spring (8).

2. Twisting machine (1) according to claim 1, **characterized in that** said guiding means (7) and said clamping means (9) are supported by supporting means (10) which are fixed to one of said grips (3, 3a) of said pincers (2).

3. Twisting machine (1) according to claim 2, **characterized in that** said supporting means (10) comprise a first prismatic block (10a) and a second prismatic block (10b) aligned with each other which support said guiding means (7), said first prismatic block (10a) being arranged upstream of the point where said grips (3) are hinged to each other and being configured to support said clamping means (9).

4. Twisting machine (1) according to claim 2, **characterized in that** said guiding means (7) comprise a tubular element (7c) whose exit end (7b) is arranged upstream of said jaws (4) in proximity to the point where said grips (3, 3a) of said pincers (2) are hinged to each other.

5. Twisting machine (1) according to claim 2, **characterized in that** said clamping means (9) comprise an elastic element (9a) configured to elastically interfere with said thread-like element (B) when said grips (3) close said jaws (4).

6. Twisting machine (1) according to any of the preced-

ing claims, **characterized in that** it also comprises friction means (10) associated with said case (6) of said unwinding device (5), said friction means (10) being arranged upstream of said exit way (5b) of said unwinding device (5) and adhering to said thread-like element (B) in order to allow said thread-like element (B) to move only in the direction leading out of said unwinding device (5).

7. Twisting machine (1) according to claim 6, **characterized in that** said friction means (10) comprise an elastic foil (10a) associated with a cylindrical bushing (11) housed in said case (6), to which said entry end (8a) of said tensile spring (8) is fixed.

8. Twisting machine (1) according to any of the preceding claims, **characterized in that** it also comprises a manual feeding unit (15) suited to feed said thread-like element (B), said manual feeding unit (15) being associated with said case (6) of said unwinding device (5) and being configured to unwind said thread-like element (B) from said hank (C) and to make it advance along said tensile spring (8) and along said guiding means (7) until the end of said thread-like element (B) protrudes from said jaws (4).

9. Twisting machine (1) according to claim 8, **characterized in that** said manual feeding unit (15) comprises a friction wheel (16) and a pressure wheel (17) tangentially opposite each other, between which there is said thread-like element (B), which is arranged tangentially to both said wheels (16, 17), a manoeuvring pawl (18) being connected to said friction wheel (16) and being suited to be operated by an operator to rotate said friction wheel (16) and make said thread-like element (B) advance.

10. Twisting machine (1) according to any of the preceding claims, **characterized in that** it comprises a reel (40) configured to support a hank (C) of a thread-like element (B) of indefinite length, wherein said reel (40) comprises:

- a disc (41) provided with a projecting pin (42) having an external thread (42a);
- a counter-disc (43) provided with a projecting seat (44) having an internal thread (44a) and configured to support said hank (C) when said projecting pin (42) and said projecting seat (44) are coupled by screwing together their respective external thread (42a) and internal thread (44a);
- a through hole (46) extending axially through said projecting pin (42) and said projecting seat (44) along their entire length;
- an elastic pin (47) inserted in said through hole (48) and comprising a compression spring (49) delimited by two caps (50, 51), each arranged

at one end of said compression spring (49),

wherein two operating conditions are possible for said elastic pin (47), said conditions including:

- a first operating position (X), in which said compression spring (49) and said caps (50, 51) are positioned back into said through hole (48) to allow the insertion of said reel (40) into said case (6);
- a second operating position (Y) in which said compression spring (49) is expanded and each of said caps (50, 51) projects from a through hole (6a) made in said case (6) to revolvingly constrain said reel (50) in said case (6).

11. Twisting machine (1) according to claim 10, **characterized in that** between said first operating position (X) and said second operating position (Y), or vice versa, there is an intermediate position (Z) in which said compression spring (49) and said caps (50, 51) are positioned back into said through hole (48) and coaxially aligned with respect to it.

12. Twisting machine (1) according to any of the preceding claims, **characterized in that** it comprises said hank (C) of a thread-like element (B) made of wire.

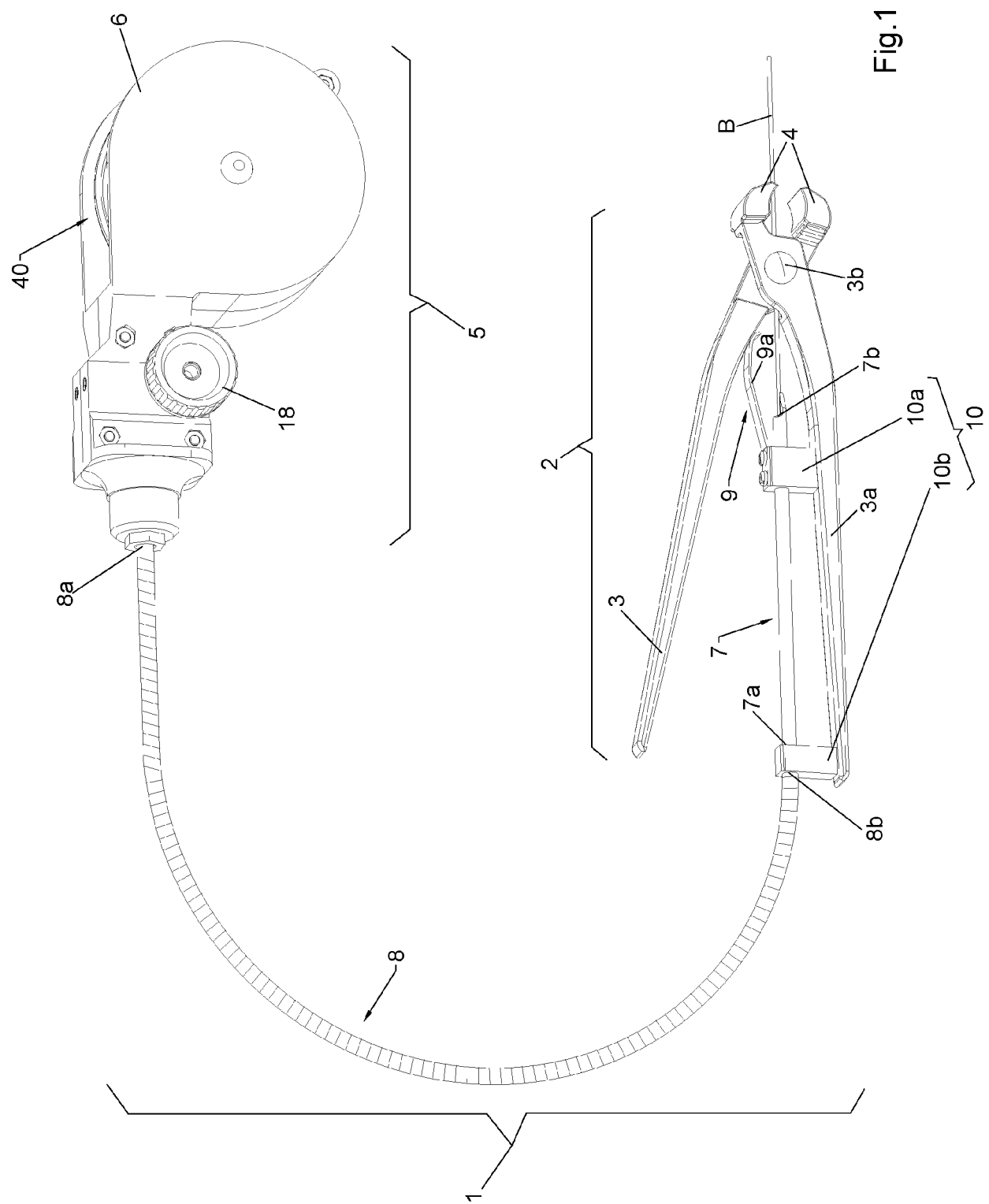
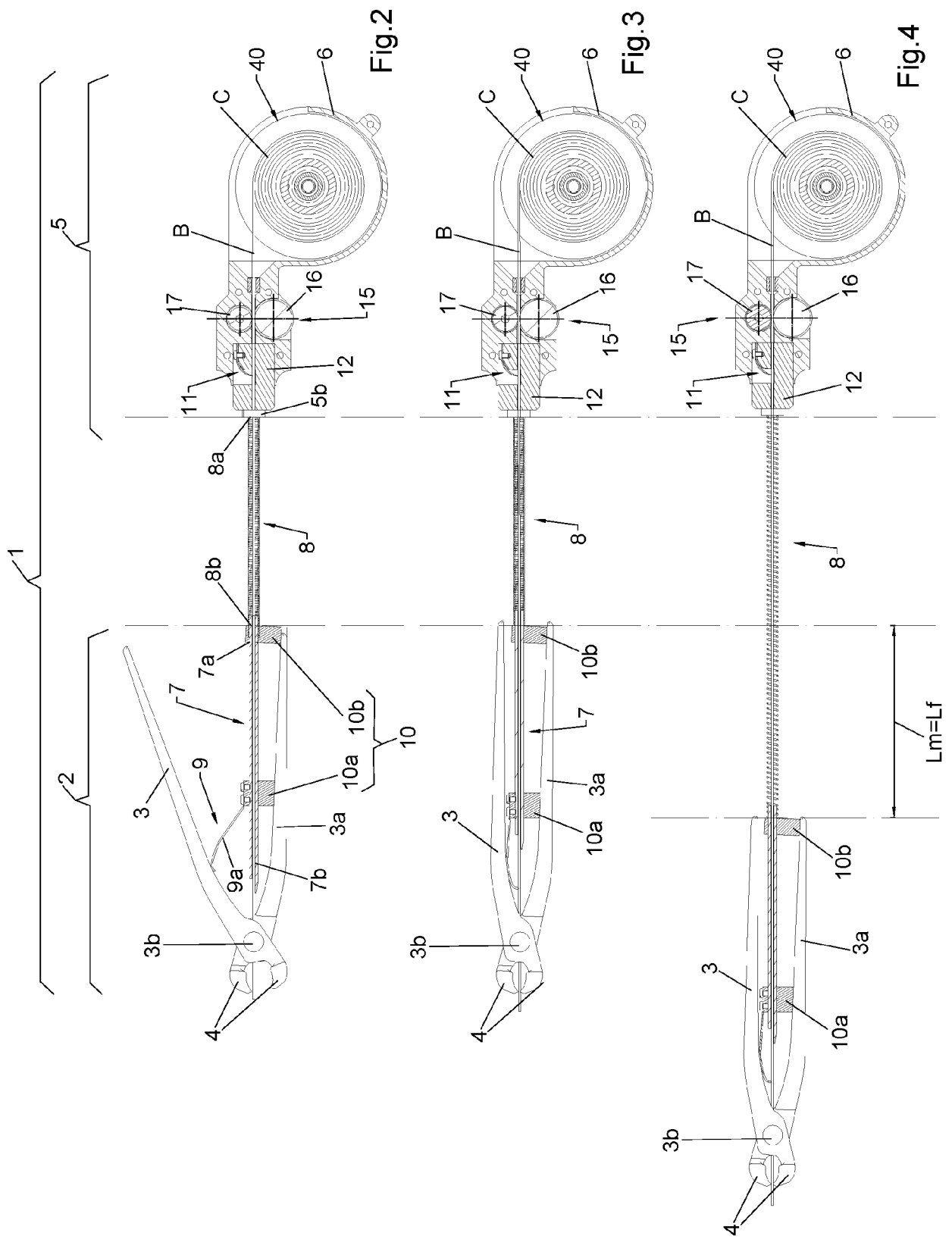
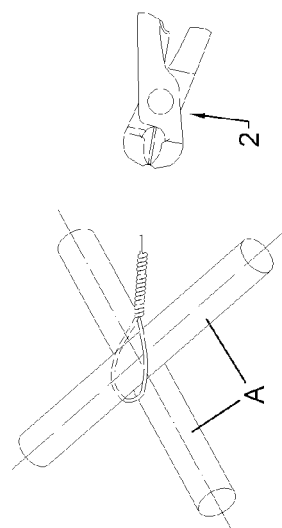
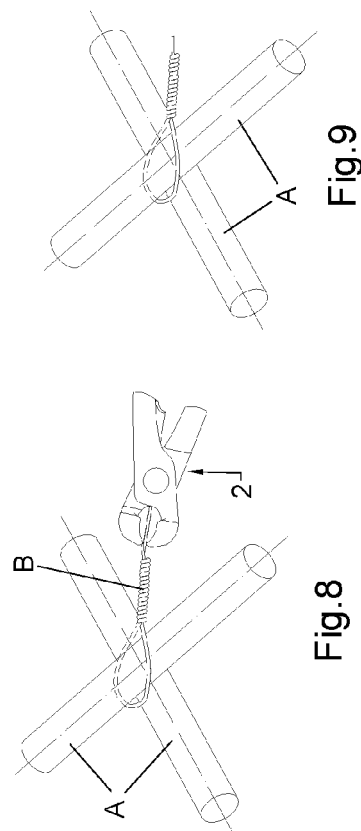
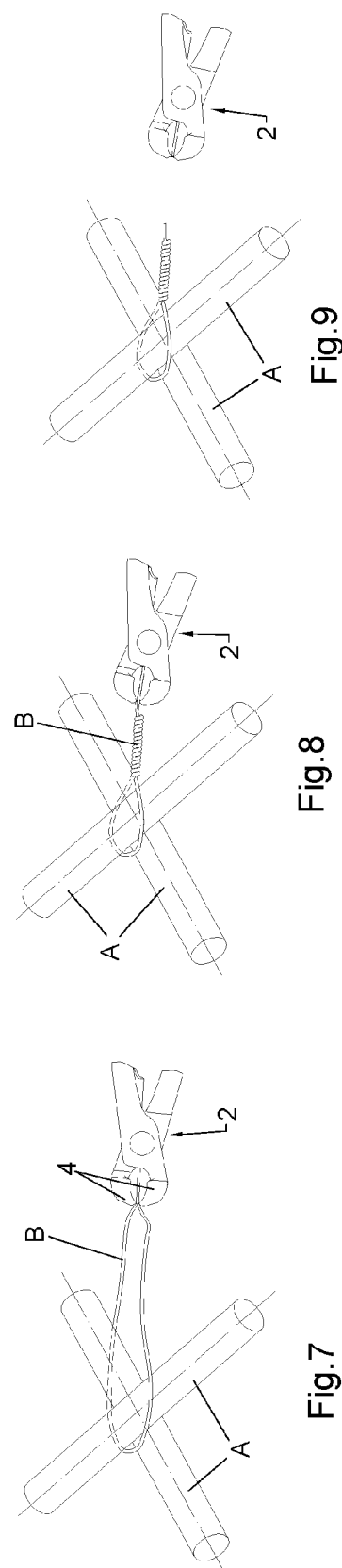
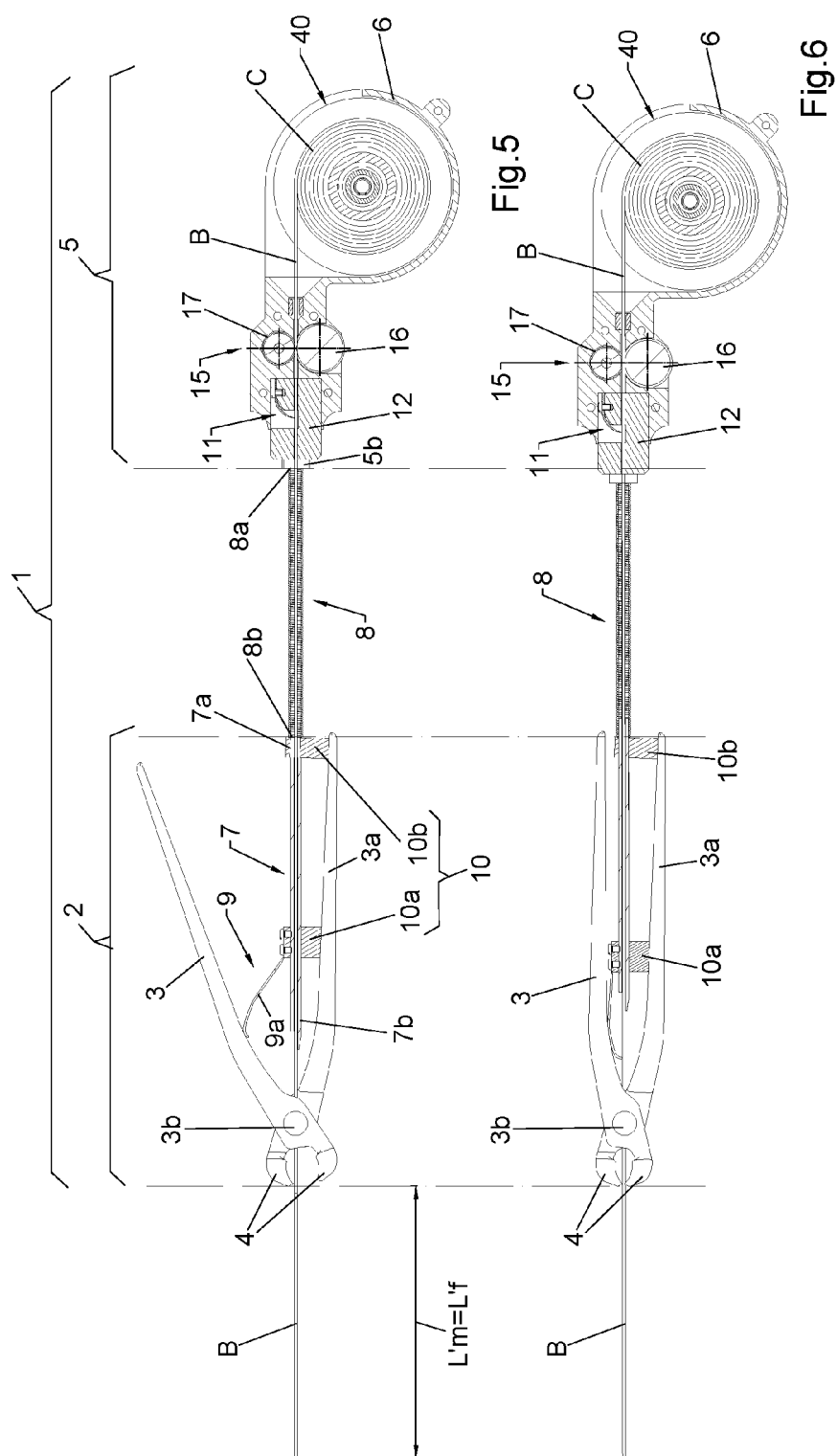


Fig.1





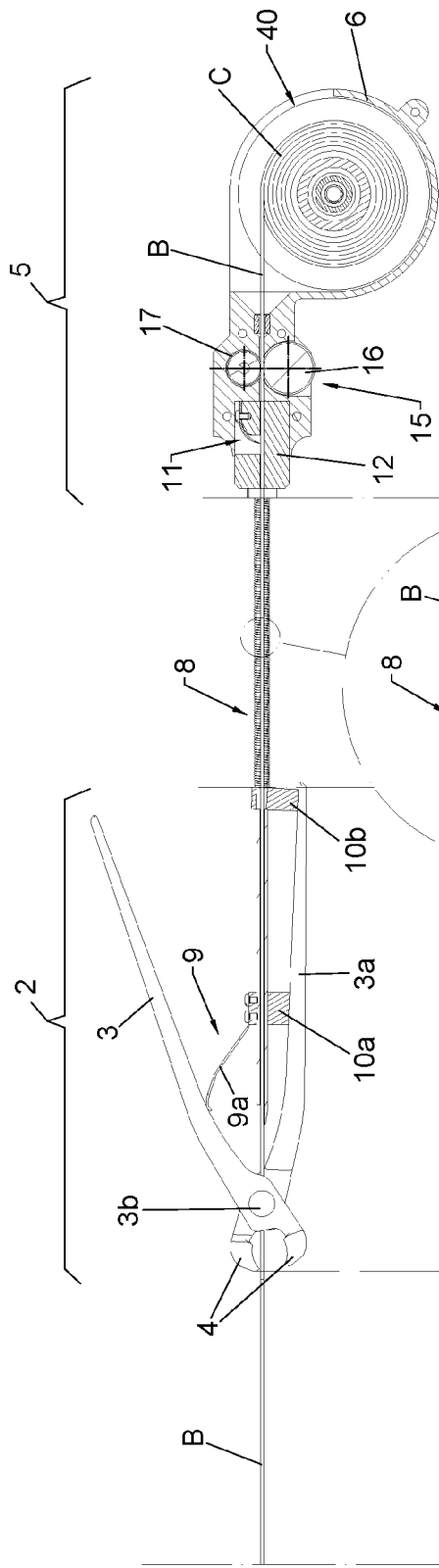


Fig. 10

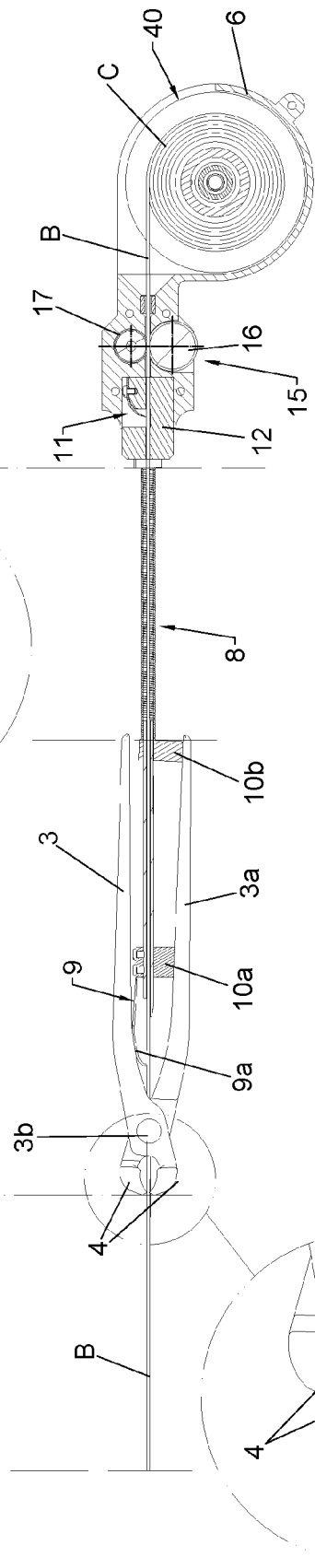
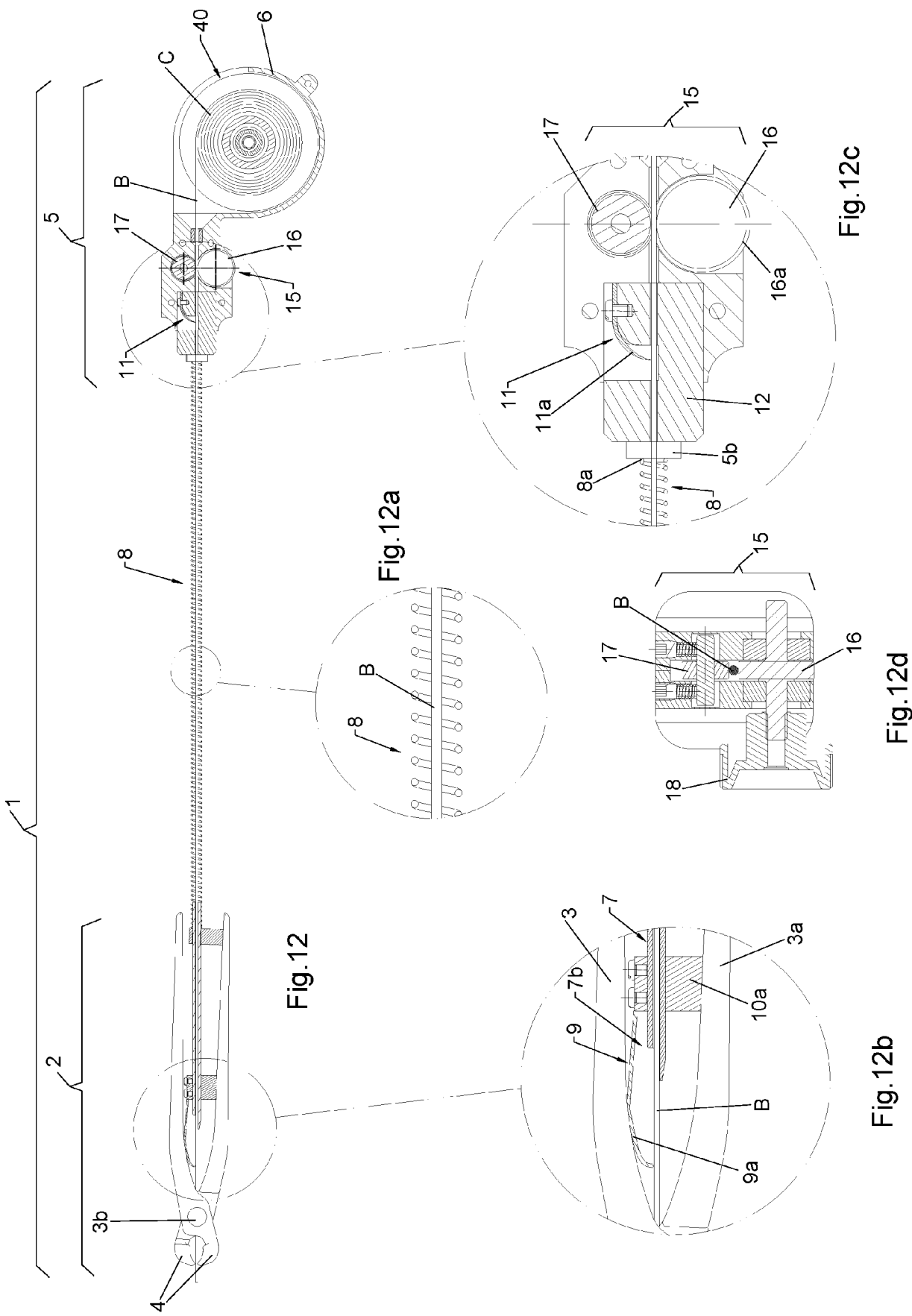


Fig. 11

Fig. 10a

Fig. 11a



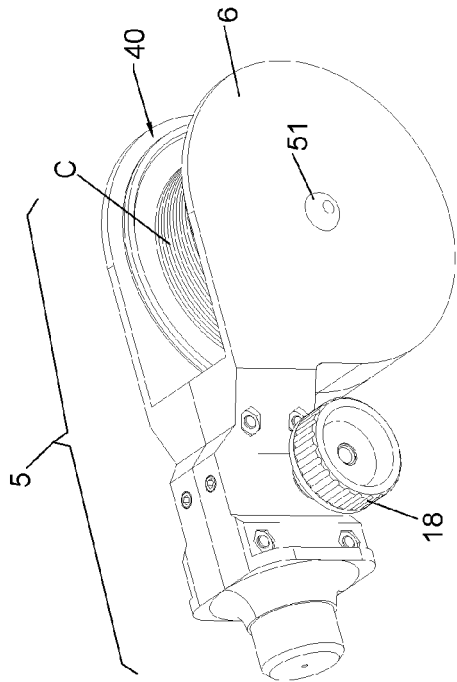


Fig. 13

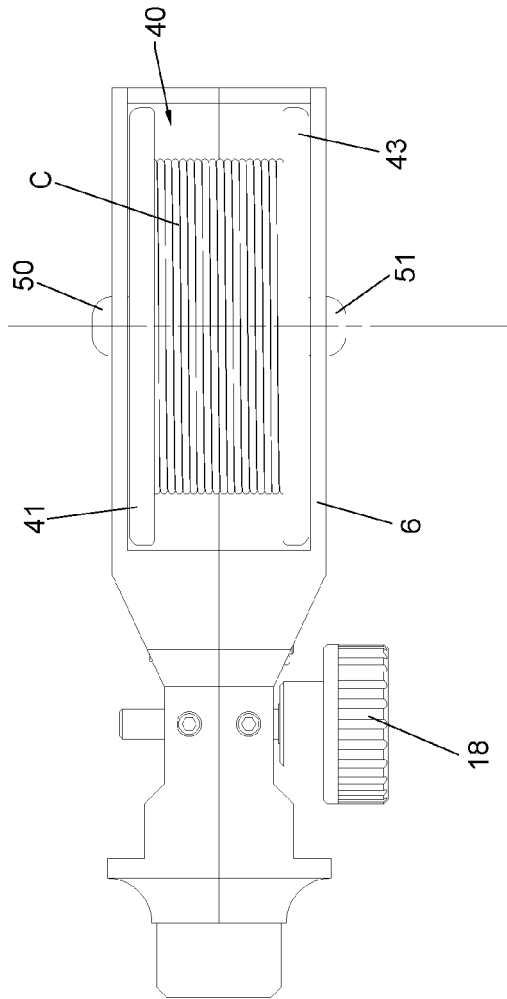


Fig. 14

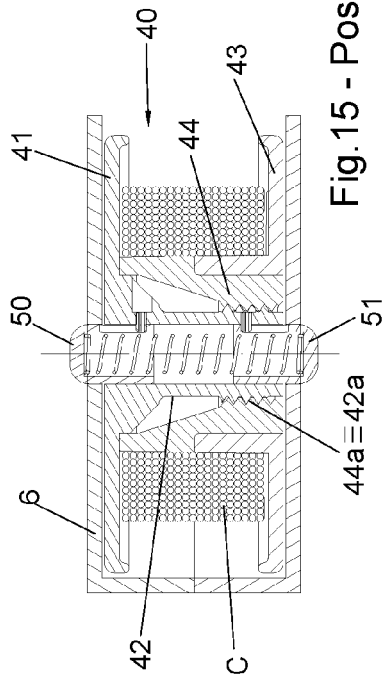


Fig. 15 - Pos. Y

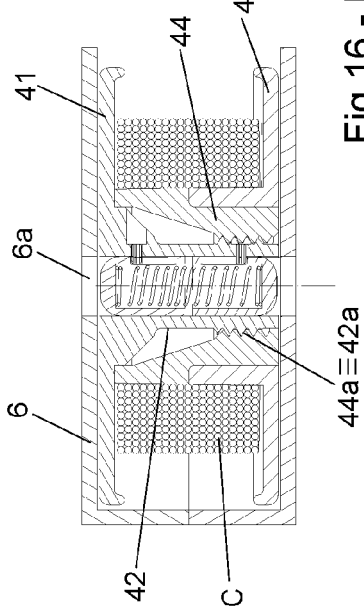


Fig. 16 - Pos. Z

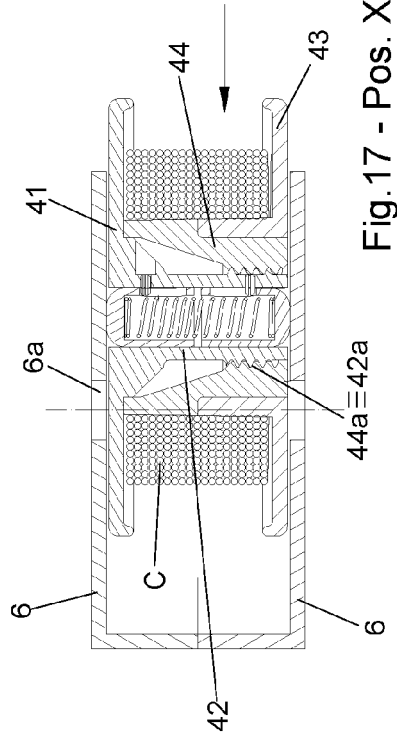


Fig. 17 - Pos. X

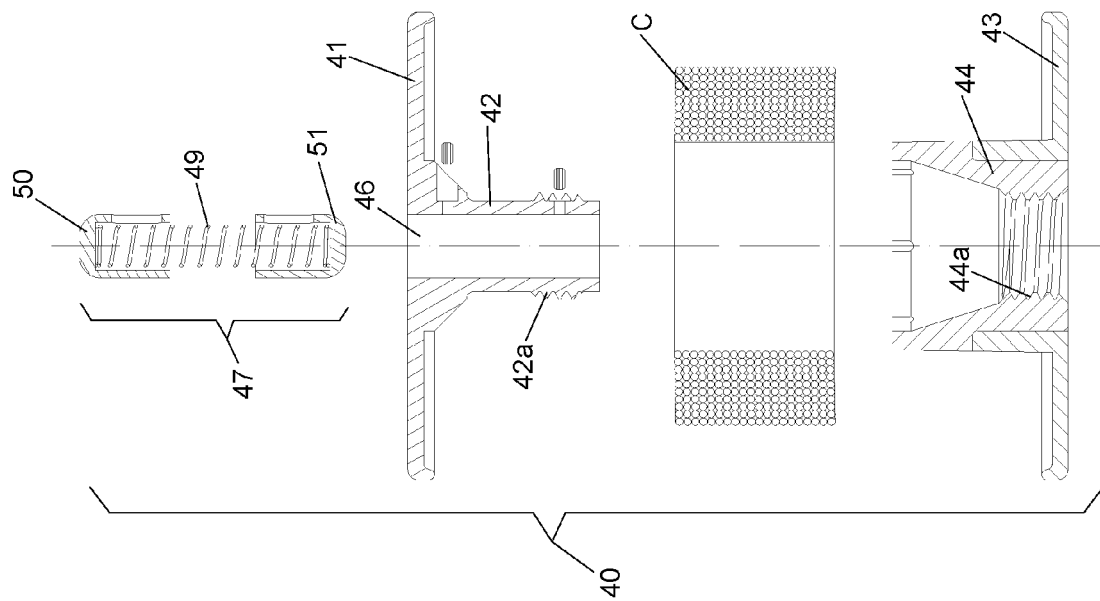


Fig. 18

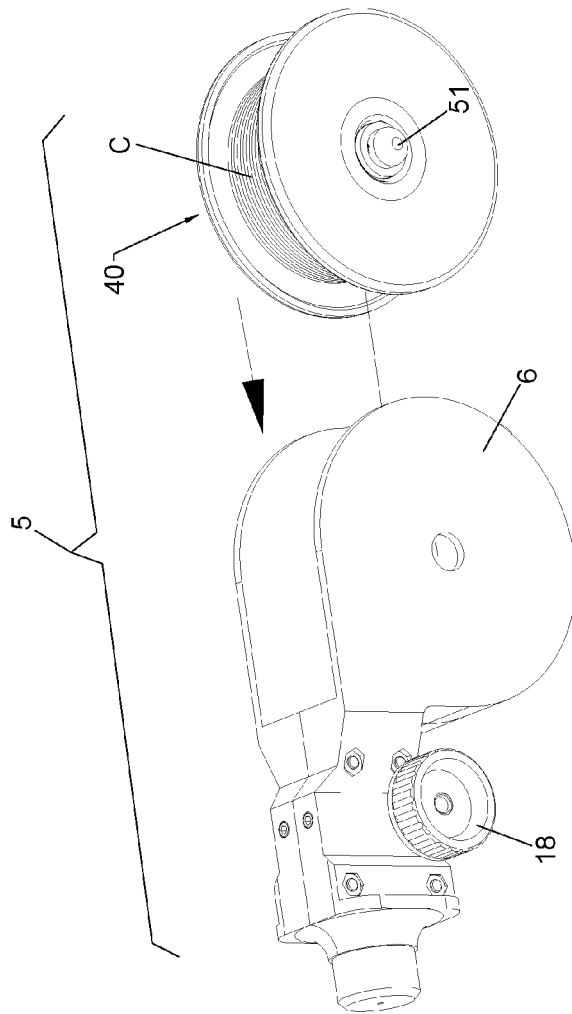


Fig. 19

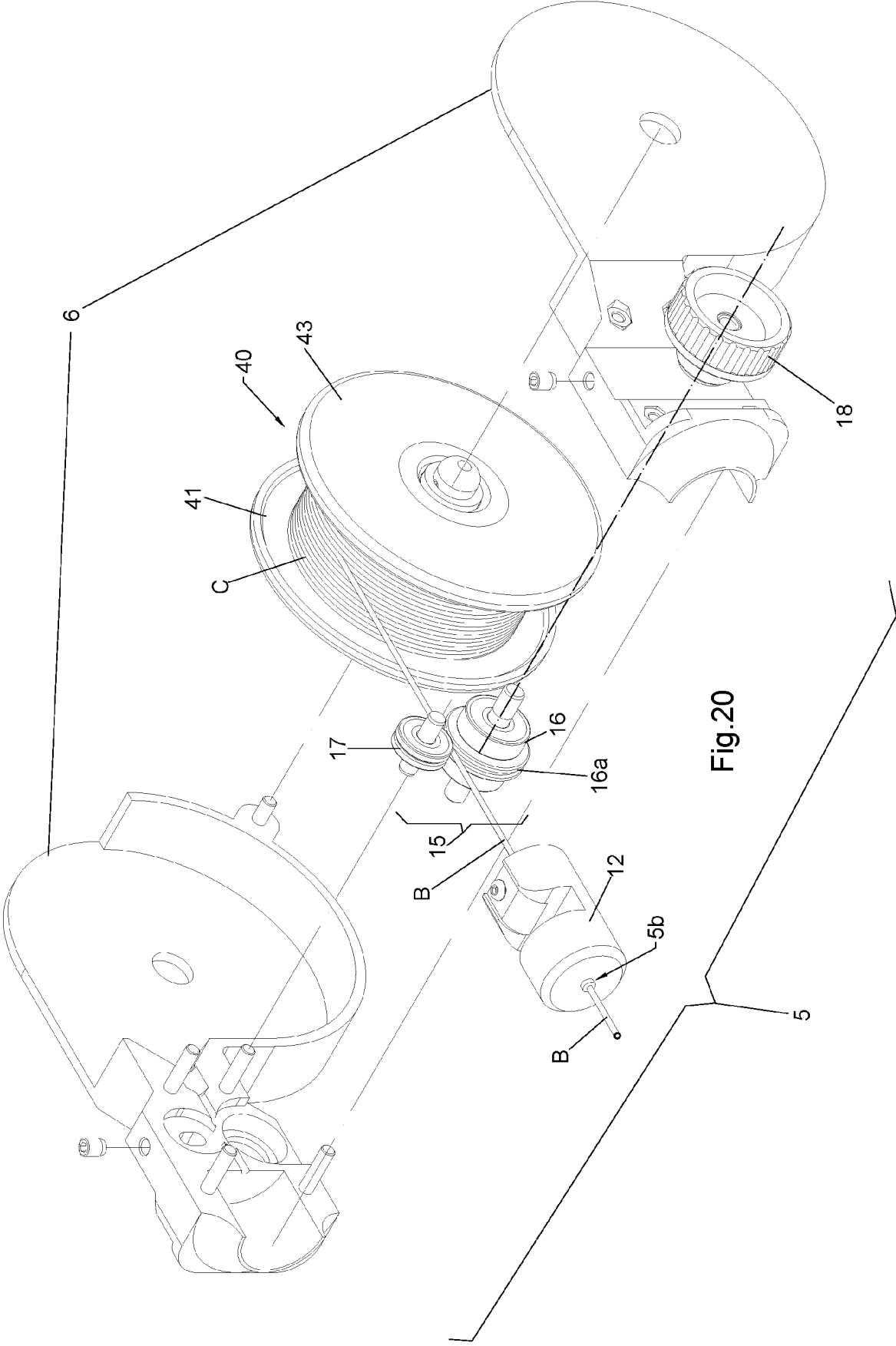


Fig.20



EUROPEAN SEARCH REPORT

Application Number

EP 24 16 0489

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	US 5 669 425 A (VERLATO GIUSEPPE [IT]) 23 September 1997 (1997-09-23) * page 6, line 5 - line 15; figures 5-7 * -----	1-12	INV. E04G21/12 B25B7/00 B21F15/04 B65B13/28
A	KR 2012 0004004 U (UNKOWN) 7 June 2012 (2012-06-07) * paragraph [0008] - paragraph [0018]; figures 1-4 * -----	1-12	
A	IT 9 064 277 U1 (MATASSINA DI DE ROSSI GIUSEPPE) 19 November 1991 (1991-11-19) * figures 1-2 * -----	1-12	
A	DE 35 14 492 A1 (MARTIN FRIEDRICH [DE]) 23 October 1986 (1986-10-23) * figures 1-3 * -----	1-12	
A	EP 0 234 569 A2 (ASPE SRL [IT]) 2 September 1987 (1987-09-02) * figures 1-4b * -----	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04G B25B B65B B21F A01G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		2 May 2024	Baumgärtel, Tim
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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

EP 24 16 0489

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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02-05-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5669425 A	23-09-1997	CA 2169801 A1 EP 0727549 A1 US 5669425 A	21-08-1996 21-08-1996 23-09-1997
KR 20120004004 U	07-06-2012	NONE	
IT 9064277 U1	19-11-1991	NONE	
DE 3514492 A1	23-10-1986	NONE	
EP 0234569 A2	02-09-1987	NONE	