

(19)



(11)

EP 1 753 558 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
13.08.2008 Bulletin 2008/33

(21) Application number: **05719016.7**

(22) Date of filing: **25.02.2005**

(51) Int Cl.:
B21C 47/12 (2006.01)

(86) International application number:
PCT/IT2005/000106

(87) International publication number:
WO 2005/087402 (22.09.2005 Gazette 2005/38)

(54) **IMPROVED WINDING-MACHINE FOR ROLLED OR DRAWN WIRE/ROD**

VERBESSERTE WICKELMASCHINE FÜR GEWALZTEN ODER GEZOGENEN DRAHT/STAB
ENROULEUSE AMELIOREE POUR FIL/TIGE LAMINE OU ETIRE

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**

(30) Priority: **12.03.2004 IT UD20040048**

(43) Date of publication of application:
21.02.2007 Bulletin 2007/08

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(56) References cited:
**WO-A-00/25950 WO-A-00/25952
DE-A1- 1 574 385**

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Description

Technical Field

[0001] This invention refers to a winding-machine for rolled or drawn wire/rod according to the characteristics of the preamble of the main claim.

Background art

[0002] Many types of winding-machines machines for rolled or drawn wire/rod are known. For example there is the GB2058703 d.4/1981 as automatic coiler with single wire/rod-guide pipe to carry out the reeling, towards both sides of the reel during the winding in order to follow the winding turns during winding.

[0003] More related is the DE0821666 d.11/1951 that describes a winding system for wire/rod alternatively in two winding reels (11,12, Fig.8) which includes a device to form wire/rod coils downstream of a wire/rod working installation, provided with wire/rod-guide (13/14) with wire/rod-guide movement means (15-13) to lead the wire/rod to the respective winding (11, 12) with wire/rod translation means (17) to move the end of the wire/rod-guide to the coil (13) on both sides above the respective reel (11-12) substantially parallelly to the reel axis.

[0004] Even more related to the object of the present invention is the US4664329 (May 12, 1987 in the name of Essex Group Fort Wayne Indian US). It refers to a winding system for a segment of wire/rod to form a wire/rod coil that contains the phases of rotating a mandrel by contact of the external surface of the mandrel with a belt in motion and conducting the wire/rod on the rotating mandrel between the belt and the external surface of the mandrel.

[0005] The belt keeping the wire/rod against the mandrel (reel) and when the mandrel rotates, the wire/rod is wound up in a coil on the external surface of the mandrel.

[0006] The belt continues to contact the external surface of the coil and to rotate the mandrel until the full length of the segment of wire/rod is wound up.

[0007] When the thickness of the coil increases, the belt partially loosens from the external surface of the coil to adjust the belt tension.

[0008] This US- patent in the whole description and figures also provides (Fig.1) a device to form a wire/rod coil in the winding-machine (26, 27) with winding reel, (508) situated downstream of a wire/rod working installation, provided with advancing rolls for the wire/rod (13) and thereafter:

- a first wire/rod-guide (24/25) with first wire/rod-guide driving means (510/511) to lead the wire/rod from said advancing rolls (13) to said winding-machine (26,27) and first translation means (504) to move the end of the guide element to the coil (510/511) on both sides over said reel (544) substantially parallel to the reel axis (579-508-588-589, see. Fig.5a and

Fig.5i) and second translation means (567, 577-579, 588-585-581-588-589-591 see also Fig.5i) in order to be able to move said end of said first wire/rod-guide element (24) in removal perpendicularly to the reel axis in order to follow the increase of diameter of the coil during winding-up (544-27) and

- a wire/rod-guide extension (510 from 24 / 511 from 25), separated from the first (24.25), able to lead at least one section of said wire/rod on said reel immediately before the winding.

[0009] Also known are winding-machines for wire/rod Mannesmann Demag of the type in preamble "Horizontal-Schwerbundhaspel / Horizontal Heavy Coiler" involving separate wire/rod-guide means near the coil, constituting a wire/rod-guide extension always orthogonal to the axis of the winding reel/mandrel and consisting of two parallel plates orthogonal to the axis of the reel/mandrel, said wire/rod-guide terminal being over-advanced by wire/rod-guide means consisting of a plurality of rollers rotating in opposed directions placed on a rotating axis parallel to the reel axis and having a wire/rod straightening/pre-bending function to facilitate its coil winding in the reel inside the respective mandrel.

[0010] Later also the WO0025952 (EP1126935 - Danieli, which corresponds to the preamble-non-characterizing part of the main claim explains and claims substantially the same structuring described above with the difference that said wire/rod-guide extension (510-511, 503-500) has devices to be maintained always constantly perpendicular to the rotation axis of said reel. See also WO 00/25950 A (Danieli & C. Officine Meccaniche Spa).

[0011] The US4664329 further discloses further movement means for the wire/rod-guide in orthogonal direction to the reel axis to adapt the wire/rod-guide end or extension to the diameter in continuous growth of the wound coil.

[0012] Other solution is disclosed in DE 1574385A1 (Maschinefabrik Niehoff KG) that uses two opposed rolls to guide the wire.

Drawbacks of the background art

[0013] The solution US4664329 presents an alignment angle of the wire/rod in variable winding according to the inclination of the first wire-guide, which can bring winding drawbacks, e. g. overlap of the spire of the wire/rod (on one side = end of forward winding movement) or removal from the adjacent wire/rod (from the other = start of the return), this particularly happening depending on the width of the reel, its diameter and the length of the first wire-guide.

[0014] The solutions Mannesmann Demag and WO-0025952 (Ep1126935), both using two vertical end guide plates, i. e. always orthogonal to the mandrel axis, aim to solve only a part of the problem with fixed position of the wire-guide extension that identifies with the said vertical parallel plates, obliging the wire, before the winding

to always be perpendicular to the reel axis.

[0015] This solution can work only with wires of small diameter compared to the reel diameter or coil diameter, while for wire of greater diameter (eg. rods) and particularly in the relation between wire diameter and unfavourable reel/coil diameter, there may arise spire overlap with malformation of the coil.

[0016] In fact with perpendicularity of the wire-guide always a friction between wound-up wire of the last spire and wire being wound up happens, which precisely due to its perpendicularity tends to always surmount the wound-up wire.

[0017] For this reason in unfavourable or particularly critic conditions the wire overlaps instead of sliding on the underlying winding layer, making the coil irregular.

[0018] Another big inconvenient is the fact that the turns being substantially almost perpendicular to the reel axis involves the formation of a coil that when one frees it from the movable external flange of the reel to take the coil and bring it to the binding-machine, the side turns of the coil can loosen and unwind from the coil, hampering both its transportation and its subsequent tying.

[0019] Serious additional drawback both of the solution Mannesmann Demag and the following WO-0025952 (EP1126935) is the excessive constraint of the wire-guide that can also cause undesirable overlaps of the spire particularly with important diameters. An additional problem is the high friction caused by crawling between the guide plates that have to "deviate" the wire when the main wire-guide is inclined, and very high consequent wearing of the guide frames that have to be changed often.

[0020] The danger of blockage of the wire however remains because of the impact of the wire on said canalizing plates shortly before the winding.

Aim of this invention

[0021] The aim of this invention is to avoid the above-mentioned drawbacks allowing to form the turns in the coil perfectly adjacent and without danger of overlaps or removals of one spire from the other and without danger of blockages due to crawling or change of direction during winding-up.

[0022] An additional aim is also to be able to form a much better wound coil and with less danger that its side turns might loosen or unwind during the extraction from the winding mandrel or reel and/or its transportation to a binding machine that is spaced and separated from the winding-machine.

[0023] An additional problem consists in the strong limitation due to the rubbing friction between wire/rod and wire/rod-guide in the wire/rod-guide end before winding-up due to the change of direction of the wire/rod, which thus is obliged to rub on the respective side-wall of the wire/rod-guide end.

[0024] This involves an important limitation to the increase of speed in the final winding phase, as it is known

that, particularly for wire/rod rolling-mills, it is possible to reach much greater speed.

[0025] This final throttling problem in winding thus obliges to slow the hourly production capacity of the entire rolling and wire/rod production plant.

Solution to the problem and statement of the invention

[0026] The problem is solved with the characteristics of main claim.

[0027] The subclaims give particularly advantageous solutions.

Advantages

[0028] In this way the great advantage of forming a wire/rod coil with aligned and perfectly adjacent and not overlapping turns is obtained at much higher speed as regards previous winding solutions and without danger of blockage or entangling.

[0029] In fact in this way one can never have overlap of the wire/rods because the wire/rod being wound up has the freedom of adapting itself to the same inclination of the spire already wound up.

[0030] Rubbing friction by change of direction is moreover completely eliminated and therefore the danger of blockages is reduced and winding speed can reach the maximum values of supply of wire/rod from the rolling-mill at its maximum speed.

Description of a preferred embodiment

[0031] The invention will now be better described with the help of the enclosed figures showing a preferred embodiment, wherein:

Fig. 1 represents a schematic elevation side view of the diverter group with wire/rod-guide and winding group, respectively with the whole wire/rod-guide (4) in its vertical oscillation from side to side of the reel, i. e. from its lowest position "B" to its highest position A, the reel (1) being placed with its rotation axis (1) vertical.

Fig. 1A represents the enlarged particular of the exit mouth of the single oscillating wire/rod-guide (4).

Fig. 2, schematically represents in top view the apparatus of Fig. 1., where the horizontally displacing system of the end of the single wire/rod-guide for adjusting to variation (growth) of the diameter of the coil (R) of wire/rod (F) in the reel (1) is better shown.

Detailed description of the figures

[0032] As disclosed by the previous figures, one clearly sees that the wire/rod (F) comes from a rolling-mill (but it could also come from an drawing installation), not shown, of known art.

[0033] Upstream there are therefore also wire/rod cut-

ting means, so that when the coil (R) is finished, one can deviate the wire/rod according to prior art to another winding-machine (only one illustrated), thus allowing to unload the coil already done, sending it to a binding-machine while at the same time another coil is formed.

[0034] Schematically therefore upstream of the single wire/rod-guide (4) there are advancing means for example with rolls (2) that convey the wire/rod (F) to a wire/rod-guide entrance (3) hinged to allow its oscillation to and from on vertical plane (4A-4B) for each passing of spires (5-6) and with oscillation on horizontal plane (6-8-50) in order to move away progressively from the mandrel of the reel/reeler (1), as the diameter of the coil grows.

[0035] These solutions being of known art, by means of base structure with horizontal guides (8) on which the slide moves carrying the wire/rod-guide group (6) which in turn on a vertical plate (5) bears a pivoting with jointed arm (41) of the end of said first wire/rod-guide (4).

[0036] In this way the end of the wire/rod-guide (4) can follow any coil-forming point (R) according to a determined program.

[0037] The single wire/rod-guide (4) is hinged movably longitudinally upstream (3-I), after the towing system for advancement of the wire/rod (2) and downstream with the same jointed vertical pivoting (II) on the respective vertical handling trolley (5) for moving both vertically (the Fig.2) and horizontally (II Fig1) with the aid of upstream jointed pivoting (I).

[0038] In this way the single tubular wire/rod-guide (4) moves in all directions of oscillation, both horizontally to follow the variation of diameter of the coil (R) and vertically for going on both sides (A-B) of the vertical reel (1) in following the to-and-fro spiral winding.

[0039] At the end of the wire/rod-guide (4) an wire/rod accompanying device with opposite rolls (7) with a pair of rotating parallel and opposite rolls on horizontal axis (71) is mounted, of which a lower one is mounted on a fixed roll support extension stirrup (70) and the other is mounted on a movable roll support stirrup (72) hinged (722) on the ends of the single wire/rod-guide (4). Said movable roll support stirrup (72) is able to swing so that the respective roll one can elastically move away from the opposite roll or approach it by means of a pressure spring (73) that reacts by a push when contacting (40) the end of the single wire/rod-guide (4).

[0040] In this way complex wire/rod-guide prolongations are eliminated and possibility of rub of the wire/rod (F) on the exit of the end of the wire/rod-guide for change of direction is completely eliminated.

[0041] Furthermore the use of opposite rolls eliminates any form of friction due to crawling, very noxious at the already high temperatures of the wire/rod.

[0042] Wear of the wire/rod-guide is eliminated and it is possible to operate at high speed otherwise prevented by the wire/rod-guide solutions of the known art.

[0043] Furthermore, as not only the opposite rolls but also the axial position of the opposite rolls has to be according to the invention orthogonal to the axis of the reel/

mandrel, the containment of the wire/rod in its alternated continuous right-hand and left-hand variations of the wire/rod, a complete safe containment and guide of the same is reached in a perfect way.

[0044] The compression elasticity with equally elastic yielding is advantageously adjustable with known art (for example by means of approaching and withdrawing screw of the spring rabbet (not shown).

[0045] In this way also variations of diameter of the wire/rod can be limited and blockage is also prevented.

[0046] Obviously the opposite rolls are at the peripheral end transversely recessed to substantially act as pulley of a rope.

[0047] In this way the wire/rod, cannot exit from the guide impressed by the clamping between the two containing rolls (71).

[0048] If need be, and in particular when the mandrel of the reel (1) hooked the wire/rod (F), the latter begins to draw, slightly pulling the wire/rod being wound up (F) and maintaining it more tensioned.

[0049] This suitable tensioning would not be possible with a known art wire/rod-guide system with end guide walls because this would cause excessive rub and additional friction with risk of breaking the hot wire/rod being wound up or to cause a block or tangling etc, for example due to lengthening and consequent deflection of the wire/rod.

[0050] The possibility to increase the tension/force of traction of the wire/rod thus improves efficiency and quality and winding performance, also making it possible to reach higher production speeds of the whole wire/rod line.

[0051] In a slightly more complex solution, not illustrated, at least one of the opposite containment rolls (71) could be power-operated.

[0052] In one variant the number of containment/containing rolls on horizontal axis (71) could be greater than two, even if this would make the new system more complicated and less operative in the functionality.

[0053] Finally the articulation of the wire/rod-guide (4) upstream (I) is very important because it allows not only oscillation in orientation of the wire/rod-guide (4) according to the vertical and perpendicular horizontal axes as to the intermediate theoretic line of wire/rod advancement, thus lying on a plane parallel to the reel axis, but also allowing the axial movement of the wire/rod-guide (4) withdrawing when it falls in line with the theoretic line of wire/rod advancement and in advancement when the wire/rod-guide (4) tilts to one side or the other, as the distance from the orthogonal plane that passes through the mandrel axis of the reel (1) is substantially constant at the wire/rod exit opening (7) but variable at the opposite end of upstream pivoting (3) of the wire/rod-guide (4).

[0054] In this way therefore the maximum functionality is obtained.

Claims

1. Winding-machine for rolled or drawn wire/rod (F) with device to form a wire/rod coil (R) in a winding-machine with one or more winding reels (1) placed downstream of a wire/rod working installation, provided with wire/rod-drawing means (2) with:

- a movable oscillating wire/rod-guide (4) with wire/rod-guide handling means (6) to lead the exit opening (7) of the wire/rod-guide (4) reel side to follow the winding so that the wire/rod (F) winds up in the respective reel (1) of said winding-machine with:

- first translation means (6-5) to move said exit opening (7) of said wire/rod-guide (4) to both sides over said reel/mandrel (1) substantially parallelly to the reel/mandrel axis (1) and
- second translation means (8-6) to move said exit opening (7) of said wire/rod-guide (4) in withdrawal/approach perpendicularly to the axis of said reel/mandrel (1) in order to follow the increase of diameter of the coil (R) during winding-up,

characterised in that at said exit opening (7) of said wire/rod-guide (4) and immediately before the point of winding-up on said reel/mandrel (1), there is provided at least one opposite pair of clamping and wire/rod containment rolls (71), which are:

- (i) with parallel axis between them;
- (II) with axis orthogonal to the wire/rod-winding reel/mandrel axis (1);
- (III) at least one of the two rolls being adapted to be pressed elastically and in a yielding way (73) against the other;
- (iv) in order to allow the wire/rod being wound up (F) to assume an inclination on the plane parallel to the rotation axis of said winding mandrel/reel (1) and orthogonal to the axes of said containment rolls as to the direction of the wire/rod (F) sliding upstream within said wire/rod-guide (4).

2. Winding-machine according to claim 1., **characterised in that:**

the elastically yielding handling on one of said rolls (71) is realised by means of movable roll support stirrup (72) hinged (722) on the side of said exit opening (7) of said wire/rod-guide (4) for elastically opening like the jaw of a mouth whose teeth are made up by the said opposite containment rolls (71), being provided a pressure spring (73) for approach between the rolls

(71) thus for closing said jaw that constitutes the wire/rod containment device in said exit opening (7).

3. Winding-machine according to claim 1 and/or 2., **characterised in that** the said opposite containment/containing rolls (71) are in the form of pulleys, i. e. have a recessed annular peripheral external surface to contain at least a substantial part of said wire/rod (F) in order to prevent its exit sideways to the opposed rolls, i. e. in axial direction as to said rolls (71).
4. Winding-machine according to claim 1 and/or 2., **characterised by** containing driving means of at least one of the two said opposite wire/rod containment rolls (71).
5. Winding-machine according to any of the previous claims, **characterised in that** the number of said opposite wire/rod containment rolls (71) is greater than two.
6. Winding-machine according to any of the previous claims, **characterised in that** said wire/rod-guide (4):

- has, on one side downstream, the movable position of said exit opening (7) substantially always equidistant from the plane orthogonal to the intermediate theoretic line of wire/rod advancement, passing through the rotation axis of said mandrel/reel (1);

- on the other side, upstream, a pivoting that not only allows them an oscillation according to at least two orthogonal axes passing through a plane orthogonal to the said theoretic median of wire/rod advancement (F) and therefore plane-parallel and spaced to the plane passing through said mandrel/reel rotation axis (1), but also a backwards axial movement or advancement (1), to compensate the said equidistance of said exit opening (7).

7. Rolling-mill for the production of hot wire/rod comprising a winding machine according to any of the previous claims.

Patentansprüche

1. Wickelmaschine für gewalzten oder gezogenen Draht/Stab (F) mit einer Vorrichtung zum Formen einer Draht-/Stab-Spule (R) in einer Wickelmaschine mit einer oder mehreren Wickelhaspeln (1), die einer Drahtbearbeitungsanlage nachgeschaltet sind, die mit Draht-/Stab-Ziehvorrichtungen (2) versehen ist, mit:

- einer beweglichen oszillierenden Drahtführung (4) mit Drahtführungs-Bedienvorrichtungen (6), um die Ausgangsöffnung (7) der haspelseitigen Draht-/Stabführung (4) zu leiten, um das Aufwickeln zu verfolgen, so dass der Draht/Stab (f) in der entsprechenden Haspel (1) der besagten Wickelmaschine aufgewickelt wird, mit:

- ersten Translationsmitteln (6-5) zur Verschiebung der besagten Ausgangsöffnung (7) der besagten Draht-/Stabführung (4) nach beiden Seiten hin auf die/den besagte(n) Haspel/Dorn (1) im wesentlichen parallel zur Achse der/des Haspel/ Dorns (1) und
- zweiten Translationsmitteln (8-6) zur Verschiebung der besagten Ausgangsöffnung (7) der besagten Draht-/Stabführung (4) zum Rückzug/Annäherung senkrecht zur Achse der/des besagten Haspel/Dorns (1), um die Vergrößerung des Durchmessers der Spule (R) während dem Aufwickeln zu verfolgen,

gekennzeichnet dadurch, dass an der Ausgangsöffnung (7) der besagten Draht-/Stabführung (4) und unmittelbar vor dem Aufwickelpunkt auf die/den Haspel/Dorn (1) mindestens ein Paar gegenüberliegende Klemmrollen und Draht-/Stab-Rückhalterrollen (71) vorhanden ist, welche folgendes umfassen:

- (i) eine parallele Achse zwischen ihnen;
- (II) eine rechtwinklig zur Achse der Drahtwickel-Haspel/Dorn (1) verlaufende Achse; und
- (III) mindestens eine der beiden Rollen so angepasst ist, um elastisch nachgiebig (73) gegen die andere gedrückt zu werden;
- (IV) um zu gestatten, dass der aufgewickelte Draht/Stab (F) eine Neigung auf der parallelen Ebene zur Drehachse des/der besagten Wickeldorns/-Haspel (1) und rechtwinklig zu den Achsen der besagten Rückhalterrollen in Bezug auf die Richtung des Drahtes/Stabs (F) vorzunehmen, der in Aufwärtsrichtung innerhalb der besagter Drahtführung (4) gleitet.

2. Wickelmaschine nach Anspruch 1, **gekennzeichnet dadurch, dass:**

die auf eine der besagten Rollen (71) angewandte Elastizitätsgrenze mittels einem beweglichen Rollentragbügel (72) hergestellt wird, der gelenkig (72) auf der Seite der besagten Ausgangsöffnung (7) der besagten Draht-/Stabführung (4) angebracht sind, um eine elastische Öffnung einer backenförmigen Mündung zu erreichen, deren Zähne aus den besagten gegenüberliegenden Rückhalterrollen (71) bestehen, wobei eine Druckfeder (73) zur Annäherung zwi-

schen den Rollen (71) vorgesehen ist, um die besagte Bakke zu schließen, die die Draht/Stab-Rückhaltervorrichtung in der besagten Ausgangsöffnung (7) bildet.

3. Wickelmaschine nach Anspruch 1 und/oder 2, **gekennzeichnet dadurch, dass** die besagten gegenüberliegenden Rückhalterrollen (71) die Form von Riemenscheiben aufweisen, d. h. sie haben eine ausgesparte ringförmige Randaußenfläche, um mindestens einen wesentlichen Teil des besagten Drahtes/Stabs (F) zu enthalten, um dessen seitlichen Austritt zu den gegenüberliegenden Rollen zu verhindern, d. h. in axialer Richtung zu den besagten Rollen (71).
4. Wickelmaschine nach Anspruch 1 und/oder 2, **gekennzeichnet dadurch, dass** sie Antriebsvorrichtungen von mindestens einer der zwei der besagten gegenüberliegenden Draht-/Stab-Rückhalterrollen (71) enthält.
5. Wickelmaschine nach einem der vorangehenden Ansprüche, **gekennzeichnet dadurch, dass** die Anzahl der besagten gegenüberliegenden Draht-/Stab-Rückhalterrollen (71) größer als zwei ist.
6. Wickelmaschine nach einem der vorangehenden Ansprüche, **gekennzeichnet dadurch, dass** bei der Draht-/Stabführung (4):

- auf der einen Seite in Abwärtsrichtung die Position der besagten Ausgangsöffnung (7) jeweils im wesentlichen abstandsgleich von der rechtwinkligen Ebene bis zur Sollmittellinie des Draht-/Stabvorschubs ist, durch die Drehachse des/der besagten Dorns/Haspel (1) hindurch;
- sie auf der anderen Seite in Aufwärtsrichtung drehbar ist, was ihr nicht nur eine Schwingung entsprechend mindestens zwei rechtwinkligen Achsen gestattet, indem sie durch eine rechtwinklig zur besagten Sollmittellinie des Draht/Stabvorschubs (f) liegende Ebene läuft und daher planparallel und im Abstand zu der Ebene liegt, die durch die besagte Dorn-/Haspel-Drehachse (1) führt, jedoch auch eine rückwärts axiale Bewegung oder einen Vorschub (I) vornimmt, zum Ausgleich der besagten Äquidistanz der genannten Ausgangsöffnung (7).

7. Walzwerk zur Herstellung von heißem Draht/Stab mit einer Wickelmaschine nach einem der vorangehenden Ansprüche.

Revendications

1. Enrouleuse pour fil/tige laminé ou étiré (F) avec un

dispositif pour former une bobine de fil/tige (R) dans une bobineuse avec une ou plusieurs dévideuses (1) placées en aval d'une installation d'usinage de fil/tige, pourvu avec des moyens d'étrépage du fil/tige (2) avec :

- un guide d'oscillation mobile de fil/tige (4) avec des moyens de manipulation du guide de fil/tige (6) pour diriger l'ouverture de sortie (7) du côté du dévidoir du guide de fil/tige (4) afin de suivre le bobinage de façon à ce que le fil/tige (F) s'enroule dans le dévidoir respectif (1) de ladite bobineuse avec :

- des premiers moyens de translation (6-5) pour déplacer ladite ouverture de sortie (7) dudit guide de fil/tige (4) vers les deux côtés au-dessus dudit axe de dévidoir/mandrin (1) de manière essentiellement parallèle à l'axe de mandrin/dévidoir (1) et
- des deuxièmes moyens de translation (8-6) pour déplacer ladite ouverture de sortie (7) dudit guide de fil/tige (4) en retrait/approche perpendiculairement à l'axe dudit dévidoir/mandrin (1) afin de suivre l'augmentation du diamètre de la bobine (R) pendant le bobinage,

caractérisée en ce que ladite ouverture de sortie (7) dudit guide de fil/tige (4) et immédiatement avant le point de bobinage sur ledit dévidoir/mandrin (1), au moins une paire opposée de rouleaux de serrage et de confinement du fil/tige (71) est pourvue, présentant :

- (i) un axe parallèle entre eux;
- (ii) un axe orthogonal à l'axe du dévidoir/mandrin de bobinage du fil/tige (1);
- (iii) au moins l'un des deux rouleaux étant adapté afin d'être serré élastiquement et de façon rentable (73) contre l'autre;
- (iv) afin de permettre que le fil/tige enroulé (F) adopte une inclinaison sur le plan parallèle à l'axe de rotation dudit mandrin/dévidoir de bobinage (1) et orthogonal aux axes desdits rouleaux de confinement ainsi qu'à la direction du fil/tige (F) glissant en amont dans ledit guide de fil/tige (4).

2. Enrouleuse selon la revendication 1, caractérisée en ce que:

la limite d'élasticité appliquée sur l'un desdits rouleaux (71) est réalisée au moyen d'un étrier de support de rouleau mobile (72) articulé (722) sur le côté de ladite ouverture de sortie (7) dudit guide de fil/tige (4) afin d'avoir une ouverture élastique sous forme de mâchoire de bouche

dont les dents sont formées par lesdits rouleaux de confinement opposés (71), pourvus d'un ressort de pression (73) pour se rapprocher entre les rouleaux (71) de manière à fermer ladite mâchoire qui constitue le dispositif de confinement du fil/tige dans ladite ouverture de sortie (7).

3. Enrouleuse selon la revendication 1 et/ou 2, caractérisée en ce que lesdits rouleaux opposés de confinement/contenance (71) se présentent sous forme de poulies, c'est-à-dire qu'ils ont une surface externe périphérique annulaire en creux pour contenir au moins une partie substantielle dudit fil/tige (F) afin d'empêcher sa sortie latéralement vers les rouleaux opposés, c'est-à-dire dans la direction axiale comme vers lesdits rouleaux (71).

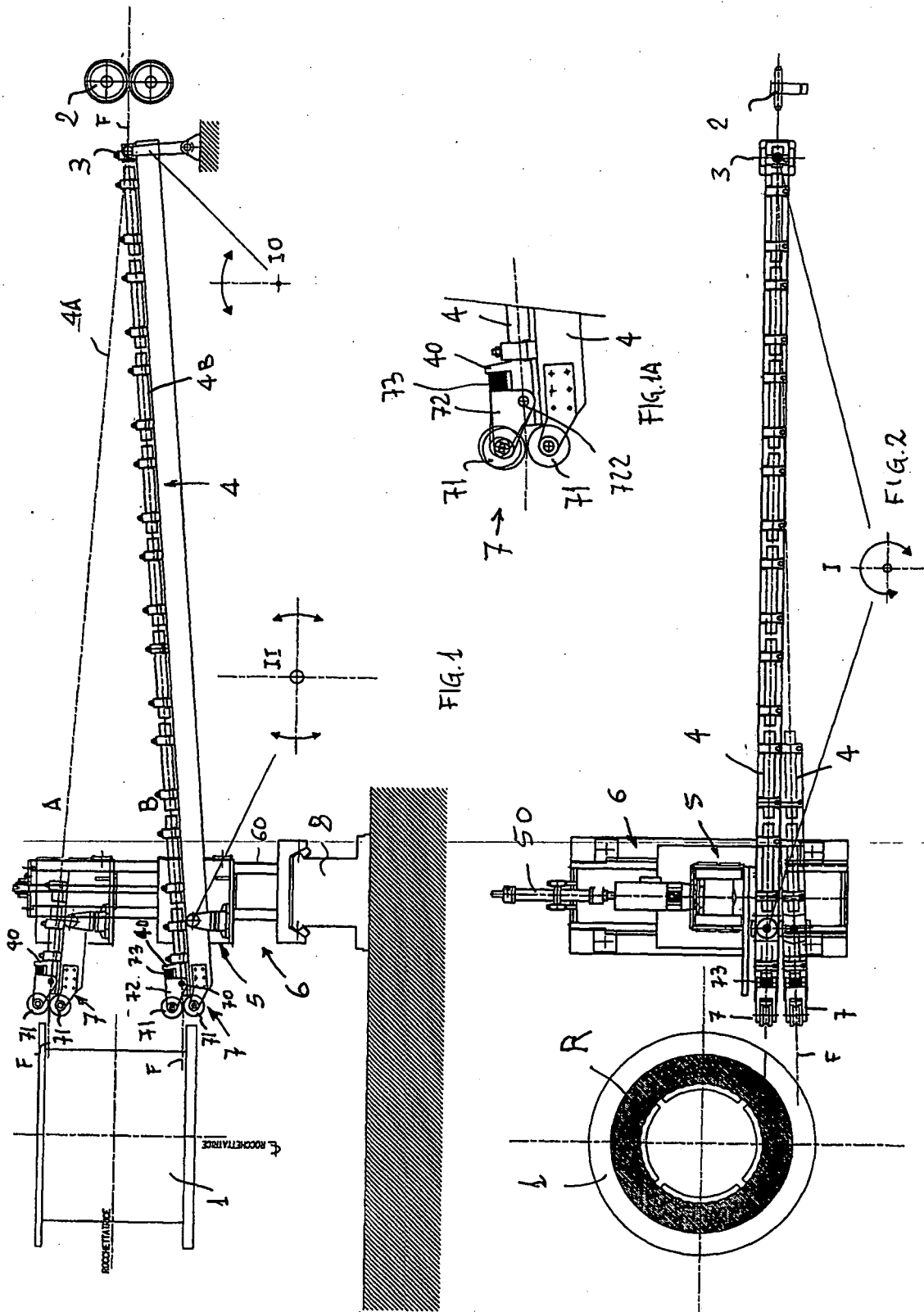
4. Enrouleuse selon la revendication 1 et/ou 2, caractérisée en ce que des moyens de d'entraînement d'au moins l'un desdits deux rouleaux opposés de confinement de fil/tige (71).

5. Enrouleuse selon l'une quelconque des revendications précédentes, caractérisée en ce que le nombre desdits rouleaux opposés de confinement de fil/tige (71) est supérieur à deux.

6. Enrouleuse selon l'une quelconque des revendications précédentes, caractérisée en ce que ledit guide de fil/tige(4) :

- présente sur un côté en aval, la position mobile de ladite ouverture de sortie (7) essentiellement toujours équidistante depuis le plan orthogonal jusqu'à la ligne théorique intermédiaire de l'avancée du fil/tige, en passant à travers l'axe de rotation dudit mandrin/dévidoir (1);
- de l'autre côté, en amont, un pivotement qui leur permet non seulement d'osciller conformément à au moins deux axes orthogonaux passant à travers un plan orthogonal à ladite médiane théorique de l'avancée de fil/tige (F) et par conséquent parallèle en plan et éloigné du plan passant à travers ledit axe de rotation du mandrin/dévidoir (1), mais également un mouvement axial vers l'arrière ou d'avancement (I), afin de compenser ladite équidistance de ladite ouverture de sortie (7).

7. Laminage pour la production de fil/tige à chaud comprenant une enrouleuse selon l'une quelconque des revendications précédentes.



REFERENCES CITED IN THE DESCRIPTION

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