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(54) **WINDING MACHINE FOR ROLLED WIRE OR DRAWN WIRE**

WICKELMASCHINE FÜR GEWALZTEN ODER GEZOGENEN DRAHT

BOBINOIR POUR FILS ENROULES OU FILS ETIRES

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Description

Technical Field

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

Background Art

[0002] Many winding machines for rolled wire or drawn wire are known.

[0003] GB2058703 d.4/1981 is cited as an example of an automatic coiler.

[0004] More pertinent is DE821666 d.11/1951 that describes a wire winding system alternatively in two winding reels (11,12, Fig.8) that includes a device to form wire coils downstream of a wire working plant, provided with a wire-guide (13/14) with wire-guide moving means (15-13) to guide the wire to the respective winding coil (11,12) with wire-guide moving means (17) to move the end of the wire-guide to the coil (13) on one side and on the other above the respective reel (11-12) substantially parallel to the reel axis.

[0005] Even more pertinent to the object of the present invention is US4664329 (May 12,1987 in the name of Essex Group Fort Wayne Indiana US). This refers to a winding system for a segment of wire to form a wire coil that contains the stages of rotating a mandrel by means of the contact of the external surface of the mandrel with a belt in motion and guiding the wire above the rotating mandrel between the belt and the external surface of the mandrel. The belt keeps the wire against the mandrel (reel) and when the mandrel rotates, the wire is wound in a coil on the external surface of the mandrel. The belt maintains contact with the external surface of the coil and rotates the mandrel until the full length of the segment of wire is wound. When the thickness of the coil increases, the belt partially loosens on the external surface of the coil to adjust the belt tension. In the entire description and figures this patent also provides (Fig.1) a device to form a wire coil in the winding machine (26, 27) with winding reel, (508) situated downstream of a wire working plant, provided with driver wire rollers (13) and thereafter:

- a first wire-guide (24/25) with first wire-guide movement means (510/511) to guide the wire from said driver rollers (13) to said winding machine (26,27) and first moving means (504) to move the end of the guide element to the coil (510/511) on one side and on the other over said reel (544) substantially parallel to the reel axis (579-508-588-589, see Fig.5a and Fig.5i) and second moving 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-guide element (24) as it moves away perpendicularly to the reel axis in order to follow the increase of diameter of the coil during the winding (544-27) and
- a wire-guide extension (510 from 24 / 511 from 25), separated from the first (24.25), capable of guiding at least one section of said wire immediately before to unwinding over said reel.

[0006] W00025952 (EP1126935 - Danieli), which forms the basis for the preamble of claim 1, explains and claims substantially the same structuring as described above with the difference that the said wire-guide extension (510-511, 503-500) has devices that are always to be held perpendicular to the rotation axis of said reel. A further prior art is represented by US2977747A (NYSTROM AXEL C ET AL) 4 April 1961 (1961-04-04). Both show a wire-guide extension in front of the reel always kept in the same position, which is substantially orthogonal to the rotational axis of the reel.

Drawbacks of the Background Art

[0007] The solution US4664329 presents a variable wire alignment angle during winding according to the inclination of the first wire-guide, that can lead to drawbacks during winding, e.g. the superimposing of the turn of the wire (on one side = end of winding run) or moving away from the adjacent wire (on the other = start of the return run), this taking place particularly depending on the width of the reel, its diameter and length of the first wire-guide.

[0008] The solution W00025952 (EP1126935), though trying to resolve only a part of the problem with the fixed position of the wire-guide extension, positions said cord in a fixed way perpendicular to the reel axis. This solution can work to a limited degree with wires of a small diameter with respect to the reel diameter or coil diameter, while for wires with a greater diameter and particularly in the unfavourable ratio between the wire diameter and the reel/coil diameter, it is possible to see the superimposing of the turn with the malformation of the coil. In fact with the perpendicularity of the wire-guide it is always possible to note friction between the wound wire of the last turn and the wire in winding that precisely for its perpendicularity tends to always surmount the wound wire. For this reason, in unfavourable or particularly critical conditions, instead of sliding on the winding layer positioned underneath, the wire is superimposed thus causing the deformation of the coil.

[0009] Another considerable drawback is the fact that when turns almost perpendicular to the reel axis are produced, the result is the formation of a coil that when released from the movable external flange of the reel to withdraw the coil and carry it to the binding-machine, the lateral turns of the coil can loosen and unwind from the coil hampering both its transportation and subsequent binding.

Aim of the Present Invention

[0010] The aim of this invention is to avoid the aforementioned drawbacks to allow the formation of perfectly

adjacent turns in the coil without the danger of superimpositions or the distancing of one turn from another.

[0011] An additional aim is also to be able to form a much more tightly wound coil with less danger that its lateral turns may loosen or unwind during the extraction from the winding mandrel or reel and/or its transportation to a binding machine that is at a distance and separated from the winding-machine.

Solution to the Problem and Disclosure of the Invention

[0012] The problem is solved with the characteristics of the main claim.

[0013] The depending claims provide particularly advantageous solutions.

Advantages

[0014] In this way it is possible to obtain the great advantage of a wire coil with perfectly aligned and adjacent turns and not superimposed according to the exact calculated angle of spiral winding (Y) that corresponds to the ratio between the diameter of the wire and the diameter of the reel/ diameter of the coil.

[0015] In fact, in this way it is impossible to superimpose wires since the wire in winding has the same angle and therefore the same inclination as the turn that is already wound.

[0016] The solution regarding the medium diameter of the coil Dm=(D-d)/2. Where D= maximum coil diameter and d= reel diameter.

[0017] Advantageously the inclination angle (Y) is determined by comparing the angle at the top of a triangle whose height corresponds to the diameter of the current or average coil (d, D, Dm) and whose base is equal to the diameter of the wire Df.

[0018] Advantageously, the orientation of the inclination devices (71) can be provided as variable according to the winding passes. Namely, decreasing progressively.

[0019] Furthermore it is well known that to avoid the superimposition of turns particularly for wires with a thin diameter, the solution is to carry out the winding substantially diagonally, namely with more inclined turns in the away and return direction. In this case the coil will have turns with crossed ends in positive and negative inclination, therefore no longer running the risk of being raised from the coil by elastic loosening when the coil must be extracted and carried to the binding-machine.

Description of a Preferred Form of Realization

[0020] The invention will be now better described with the aid of the enclosed figures showing a form of a preferred embodiment, wherein:

Fig. 1 and Fig. 1 A schematically represent two views, a lateral view of the winding group, respectively with the entire first wire-guide (4) and enlarged in the end portion of said first wire-guide on the winding machine-winding reel (1), wherein there is a single wire-guide (4) which is designed in double in its oscillation from side to side on the reel, namely from its maximally lowered position "B" to its maximally raised position "A", the reel being positioned by its vertical rotation axis (1).

Fig.2, 2A, schematically represent an overview with respect to the Figure 1, in full and partially enlarged on the reel side, in the stage with minimum diameter, namely at the beginning of coil formation (C position).

Fig.3, 3A, schematically represent an overview with respect to Figure 1, in full and partially enlarged on the reel side, in the stage with maximum diameter, namely at the end of coil formation (position D).

Detailed Description of the Figures

[0021] As disclosed by the previous figures, it is clear to see that the wire (F) originates from a rolling-mill plant or from a wire-drawing plant (not shown as prior art).

[0022] Wire-cutting means are also provided upstream, so that once the coil (R) is completed the wire can be deviated according to the prior art to another winding-machine (only one illustrated), thus allowing the unwinding of the coil already made by sending it to the binding-machine while at the same time another coil is formed.

[0023] Schematically therefore upstream of the first wire-guide (4) there are advancing means, for example, rolls (2) that convey the wire (F) to a wire-guide entrance (3) that is hinged to allow its second oscillation according to an away and return run on a vertical surface (4A-4B) for each run of turns (5-6) and with oscillation on a horizontal surface (6-8) to progressively distance from the mandrel of the reel/reel winder (1), as the diameter of the coil gradually grows.

[0024] These solutions are of the prior art, through the structure of the base with horizontal guides (8) on which the slide moves carrying the wire-guide group (6) which in turn supports on a vertical surface (5) an articulated arm hinge (41) of the end of said first wire-guide (4).

[0025] In this way the end of the wire-guide (4) can follow any forming point of the coil (R) according to an established program.

[0026] On the same vertical surface (5) a respective extension of the wire-guide (7) is hinged (70) with a respective countersunk entrance to allow the wire to proceed toward the reel (1) for the formation of the coil (R).

[0027] The wire-guide extension is carried near to a medium vertical surface passing through the axis of the reel for a suitable coil winder.

[0028] Thanks to said hinge (70) and with the aid of a suitable dynamic-fluid cylinder (71), said wire-guide extension (7) can be directed on one side and on the other inclined with respect to the orthogonal axis of the reel to achieve the perfect winding of the wire in turns without

the danger of superimposing one turn over the other that could otherwise occur with an orthogonal wire-guide extension fixed to the axis of the reel (front solution EP1126935).

[0029] In this way the problem of the wire-guide extension aligned to the first wire-guide (previous solution US4664329) that involves the enlargement of the turns to the ends and with the danger of superimposition in the intermediate zone as in the previous solution (EP1126935) is solved.

[0030] Furthermore with this solution it is possible to a greater degree to incline the turns allowing, thanks to the superimposing cross (+Y, -Y), a better winding that prevents the lateral or marginal turns of the coil from loosening precisely because they are crossed.

[0031] Obviously while the angle (Z) of the first wire-guide varies continuously, the angle (Y) of the wire-guide extension remains constant but alternates between positive and negative for each run.

[0032] The advantages of the new solution are therefore evident, in fact said wire guide extension cord always takes an orientation according to the hypotenuse of a right-angled triangle whose cathetus corresponds to the orthogonal to said axis reel/mandrel that is the corresponding angle to the height the turn inclination of the wire whose winding inclination therefore corresponds also to said hypotenuse, on the contrary to the solution explained in EP 1126935 Danieli, whose direction corresponds to said cathetus and contrarily to solution US 4664329 Essex Group, whose direction can in one case correspond to said cathetus (intermediate position of the wire guide) and with much difficulty or only in particular cases can correspond to said hypotenuse. And therefore, contrary to the present solution in which the direction always corresponds in a fixed way to said hypotenuse both clockwise and counter-clockwise according to the away or return movement on the reel for the formation of the turns.

Claims

1. Winding machine for rolled wire or drawn wire (F) with a device to form a wire coil (R) in a winding machine with one or more winding reels (1) placed downstream of a wire working plant, provided with wire advancing means (2-3) and thereafter:

   - at least one first wire-guide (4) with first wire-guide movement means (6) to guide the wire from said advancing means (2-3) to the reel or mandrel (1) in question of said winding machine with first moving means (6-5) to move the end (40) of said first wire-guide (4) to the coil (R) on one side and on the other over said reel/mandrel (1) substantially parallel to the axis reel/mandrel (1) and second moving means (8-6) in order to be able to move said end of said first wire-guide (4) in the away direction perpendicularly to the axis of said reel/mandrel (1) in order to continue with the increase in diameter of the coil (R) during winding and
   - a wire-guide extension (7), separated from the first wire-guide (4), capable of guiding at least one section of said wire (F) immediately prior to winding over said reel (1), **characterized in that** said wire-guide extension (7) includes:

     i. separate orientation means (71), for orientating said wire-guide extension means (4), independent from said first moving means (6-5) for the orientation of said wire-guide parallel to the axis of the reel or mandrel (1);
     ii. said separate orientation means (71) being conceived and being controllable in such a way that:

   - said wire-guide extension (7) inclines, with respect to said rotation axis of said reel or mandrel, in a constant way according to a positive spiral winding angle while said first wire-guide movement means moves the end of said first wire-guide in one direction over said reel or mandrel, and in a constant way according to the same, but negative spiral winding angle while said first wire-guide movement means moves the end of said first wire-guide in the opposite direction over said reel or mandrel, meanwhile, independently thereof, the inclination of said first wire-guide with respect to said rotation axis of said reel or mandrel varies continuously.

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

   said wire-guide extension (7) is hinged upstream (70) on a slide (5) that is adapted to move vertically, parallel to said reel axis (1) by means of control means and an independent guide (6); said separate orientation means (71) of said wire-guide extension (7) consisting of fluid dynamic cylinder means (71) with hinging on said slide (5) on one side and on an intermediate part of said wire-guide extension (7) on the other.

3. Winding machine according to claim 1 or 2, **characterized in that** it comprises control means such that said separate orientation means (71) are operated in inversion of the angle on one side (+y, - y) or vice-versa on the other (- y. +y), with contact means at the end of the oscillation run of said first wire-guide (4), namely when it inverses its direction of travel.

4. Winding machine according to claim 1 or 2, **characterized in that** it comprises control means such that

said separate orientation means (71) are operated at an angle width (Y) in relation to the average diameter of the coil Dm=(D-d)/2 in relation to the diameter of the wire (Df), where "D" is the maximum diameter of the coil and "d" is the minimum diameter of the coil, which corresponds to the diameter of the reel mandrel (1).

5. Winding machine according to claim 1 or 2, **characterized in that** it includes control means such that said separate orientation means (71) are operatable at an angle width (Y) according to the minimum diameter of the coil, which corresponds to the reel diameter (1), and the maximum diameter of the coil (Dm) in relation to the diameter of the wire (Df) with variable progression at every away and return run for one or more turns at a time.

6. Winding machine according to claim 1 or 2, **characterized in that** it comprises control means such that said separate orientation means (71) are operatable at an angle width (Y) that decreases progressively with the increase of the diameter of the forming coil (R).

7. Winding machine according to claim 1 or 2, **characterized in that** it comprises control means such that said separate orientation means (71) are operatable at an angle width (Y) that is the same or greater than the equivalent to an angle at the top of a triangle having for its height the turn winding diameter and as base the diameter of the wire "d", therefore for basic values equal to "d" or ">d".

Patentansprüche

1. Wickelmaschine für gewalzten oder gezogenen Draht (f) mit einer Vorrichtung, um ein Drahtbund (R) in einer Wickelmaschine mit einer oder mehreren Wickelhaspeln (1) zu bilden, einer Drahtverarbeitungsanlage nachgeschaltet, mit Drahtvorrückmitteln (2-3) und dahinter:

- mindestens eine erste Drahtführung (4) mit ersten Drahtführungsbewegungsmitteln (6), um den Draht von besagten Vorrückmitteln (2-3) zu der Haspel oder zum Dorn (1) der Wickelmaschine mit ersten Bewegungsmitteln (6-5) zu führen, um das Ende (40) von besagter erster Drahtführung (4) zu dem Bund (R) auf einer Seite zu bewegen und auf der anderen Seite über die Haspel/Dorn (1) im wesentlichen parallel zu der Achse Haspel/Dorn (1), und zweite Bewegungsmittel, (8-6) um das Ende von besagter erster Drahtführung (4) senkrecht zu der Achse von besagter Haspel/Dorn (1) wegbewegen zu können, um die Zunahme des Durchmessers des Bundes (R) während der Wicklung fortzusetzen und
- eine Drahtführungs-Erweiterung (7), von der ersten Drahtführung (4) getrennt, die fähig ist, mindestens einen Abschnitt von besagtem Draht (f) direkt vor dem Wickeln über besagte Haspel (1) zu führen, **gekennzeichnet dadurch, dass** besagte Drahtführungs-Erweiterung (7) umfasst:

i. separate Ausrichtungsmittel (71), um besagte Drahtführungs-Erweiterungsmittel (4) auszurichten, unabhängig von besagten ersten Bewegungsmitteln (6-5) zur Ausrichtung der Drahtführung parallel zu der Achse der Haspel oder des Dorns (1);
ii. ii. besagtes separates Ausrichtungsmittel (71) ist derart konzipiert und kontrollierbar, dass:

- besagte Drahtführungs-Erweiterung (7) neigt sich, in bezug auf die Drehachse der Haspel oder des Dorns, konstant entsprechend einem positiven Spiralenwicklungswinkel, während besagte erste Drahtführungsbewegungsmittel das Ende der ersten Drahtführung in einer Richtung über die Haspel oder den Dorn bewegt, und dementsprechend konstant, aber negativer Spiralenwicklungswinkel, während das erste Drahtführungsbewegungsmittel das Ende der ersten Drahtführung in der entgegengesetzten Richtung über die Haspel oder den Dorn bewegt, während unabhängig davon die Neigung der ersten Drahtführung in bezug auf die Drehachse der Haspel oder des Dorns fortlaufend variiert.

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

besagte Drahtführungs-Erweiterung (7) ist vorgeschaltet (70) mit einer Rutsche (5) gelenkig verbunden, die sich senkrecht bewegen kann, parallel zu besagter Haspelachse (1) mittels Steuermitteln und einer unabhängigen Führung (6);
besagte separate Ausrichtungsmittel (71) der Drahtführungs-Erweiterung (7) bestehen aus flüssigkeitsdynamischen Zylindern (71) mit Gelenkigverbindung auf besagter Rutsche (5) auf einer Seite und auf einem Zwischenteil der Drahtführungs-Erweiterung (7) auf der anderen.

3. Wickelmaschine nach einem der Ansprüche 1 oder 2, **gekennzeichnet dadurch dass** er Steuermittel umfasst, so dass die separaten Ausrichtungsmittel (71) in Umkehrung des Winkels auf einer Seite betrieben werden (+y, - y) oder umgekehrt auf der anderen (- y, +y), mit Kontaktmitteln am Ende des

Schwingungslaufs der ersten Drahtführung (4), und zwar wenn sie ihre Bewegungsrichtung umkehrt.

4. Wickelmaschine nach einem der Ansprüche 1 oder 2., **gekennzeichnet dadurch, dass** sie Steuermittel umfasst, so dass die separaten Ausrichtungsmittel (71) mit einer Winkelbreite (Y) in Bezug auf den durchschnittlichen Durchmesser des Bundes Dm= (D-d)/2 in Bezug auf den Durchmesser des Drahtes (Df) betrieben werden, wobei D der Höchstdurchmesser des Bundes ist und d der Mindestdurchmesser des Bundes, was dem Durchmesser des Haspeldornes (1) entspricht.

5. Wickelmaschine nach einem der Ansprüche 1 oder 2, **gekennzeichnet dadurch, dass** sie Steuermittel umfasst, so dass die separate Ausrichtungsmittel (71) in einer Winkelbreite (Y) entsprechend dem Mindestdurchmesser des Bundes arbeiten können, der dem Haspeldurchmesser (1) entspricht, und der Höchstdurchmesser des Bundes (DM) in Bezug auf den Durchmesser des Drahtes (Df) mit variabler Progression bei jedem Hin- und Rücklauf für eine oder mehrere Drehungen auf einmal.

6. Wickelmaschine nach einem der Ansprüche 1 oder 2, **gekennzeichnet dadurch, dass** sie Steuermittel umfasst, so dass die separaten Ausrichtungsmittel (71) in einer Winkelbreite (Y) arbeiten können, die sich fortschreitend mit der Zunahme des Durchmessers des sich bildenden Bundes (R) verringert.

7. Wickelmaschine nach einem der Ansprüche 1 oder 2., **gekennzeichnet dadurch, dass** sie Steuermittel umfasst, so dass die separaten Ausrichtungsmittel (71) mit einer Winkelbreite (Y) arbeiten können, die dieselbe ist oder größer als das Äquivalent zu einem Winkel an der Spitze eines Dreiecks mit als Höhe dem Drehungswicklungs-Durchmesser und als Basis dem Durchmesser des Drahtes d, daher für Basiswerte gleich "d oder >d.

Revendications

1. Machine de bobinage pour fil laminé ou fil étiré (f) ayant un dispositif pour former une bobine de fil (R) dans une machine de bobinage avec un ou plusieurs dévidoirs de bobinage (1) placés en aval d'une installation de formation du fil, pourvue de moyens d'avancement du fil (2-3) et successivement:

   - d'au moins un premier élément de guidage du fil (4) avec des premiers moyens de déplacement pour le guidage du fil (6) afin de guider le fil à partir desdits moyens d'avancement (2-3) vers le dévidoir ou mandrin (1) en question de ladite machine de bobinage avec des premiers moyens de déplacement (6-5) afin de déplacer l'extrémité (40) dudit premier élément de guidage du fil (4) vers la bobine (R) sur un côté et sur l'autre au-dessus dudit dévidoir/mandrin (1) essentiellement parallèle au dévidoir/mandrin de l'axe (1) et des seconds moyens de déplacement (8-6) susceptibles de déplacer ladite extrémité dudit premier élément de guidage de fil (4) dans la direction éloignée perpendiculairement à l'axe dudit dévidoir/mandrin (1) de manière à poursuivre l'augmentation du diamètre de la bobine (R) pendant le bobinage et
   - une extension guide de fil (7), séparée du premier élément de guidage du fil (4), susceptible de guider au moins une section dudit fil (F) précédant immédiatement le bobinage sur ladite bobine (1), **caractérisée en ce que** ladite extension guide de fil (7) comprend:

     i. des moyens d'orientation séparés (71), pour l'orientation desdits moyens d'extension guide de fil (4), indépendants desdits premiers moyens de déplacement (6-5) pour l'orientation dudit élément de guidage de fil parallèle à l'axe du dévidoir ou mandrin (1);
     ii. lesdits moyens d'orientation séparés (71) étant conçus et contrôlables de manière à ce que :

   - ladite extension guide de fil (7) s'incline, par rapport audit axe de rotation dudit dévidoir ou mandrin, d'une manière constante conformément à un angle positif de bobinage en spirale alors que lesdits premiers moyens de mouvement de guidage du fil déplacent l'extrémité dudit premier élément de guidage de fil dans une direction au-dessus dudit dévidoir ou mandrin, et d'une manière constante conformément à ce même angle, mais à un angle négatif de bobinage en spirale pendant que lesdits premiers moyens de guidage de déplacement du fil déplacent l'extrémité dudit premier élément de guidage de fil dans la direction opposée au-dessus dudit dévidoir ou mandrin, alors que, indépendamment de cela, l'inclinaison dudit premier élément de guidage du fil par rapport audit axe de rotation dudit dévidoir ou mandrin varie continuellement.

2. Machine de bobinage selon la revendication 1, **caractérisée en ce que**:

   ladite extension guide de fil (7) est articulée en amont (70) sur un coulisseau (5) qui est adapté afin de se déplacer verticalement, parallèle audit axe de dévidoir (1) par l'intermédiaire de moyens de contrôle et d'un guide indépendant

(6);
lesdits moyens d'orientation séparés (71) de ladite extension guide de fil (7) comprenant des moyens cylindriques dynamiques (71) ayant une articulation sur ledit coulisseau (5) sur un côté et sur l'autre sur une partie intermédiaire de ladite extension de guidage du fil (7).

3. Machine de bobinage selon la revendication 1 ou 2, **caractérisée en ce qu'**elle comprend des moyens de contrôle tels que lesdits moyens d'orientation séparés (71) fonctionnent en sens inverse à l'angle sur un côté (+y, - y) ou vice-versa sur l'autre (- y. +y), avec des moyens de contact à l'extrémité de la course d'oscillation dudit premier élément de guidage du fil (4), c'est-à-dire lorsque celui-ci inverse la direction de sa trajectoire.

4. Machine de bobinage selon la revendication 1 ou 2, **caractérisée en ce qu'**elle comprend des moyens contrôle tels que lesdits moyens d'orientation séparés (71) fonctionnent à une largeur d'angle (Y) par rapport à une moyenne de diamètre de la bobine Dm=(D-d)/2 par rapport au diamètre du fil (Df), où "D" est le diamètre maximum de la bobine et "d" est le diamètre minimum de la bobine, qui correspond au diamètre du mandrin de dévidoir (1).

5. Machine de bobinage selon la revendication 1 ou 2, **caractérisée en ce qu'**elle comprend des moyens de contrôle tels que lesdits moyens d'orientation séparés (71) puissent fonctionner à une largeur d'angle (Y) conformément au diamètre minimum de la bobine, qui correspond au diamètre du dévidoir (1), et au diamètre maximum du dévidoir (Dm) par rapport au diamètre du fil (Df) avec une progression variable de chaque course éloignée et de retour pour un ou plusieurs tours à la fois.

6. Machine de bobinage selon la revendication 1 ou 2, **caractérisée en ce qu'**elle comprend des moyens de contrôle tels que lesdits moyens d'orientation séparés (71) puissent fonctionner à une largeur d'angle (Y) qui décroît progressivement avec l'augmentation du diamètre de la bobine de formation (R).

7. Machine de bobinage selon la revendication 1 ou 2, **caractérisée en ce qu'**elle comprend des moyens de contrôle tels que lesdits moyens d'orientation séparés (71) puissent fonctionner à une largeur d'angle (Y) qui est la même ou bien supérieure à l'équivalent d'un angle sur la partie supérieure d'un triangle ayant pour hauteur le diamètre de bobinage du tour et comme base le diamètre du fil "d", par conséquent pour des valeurs de base égales à "d" ou ">d".

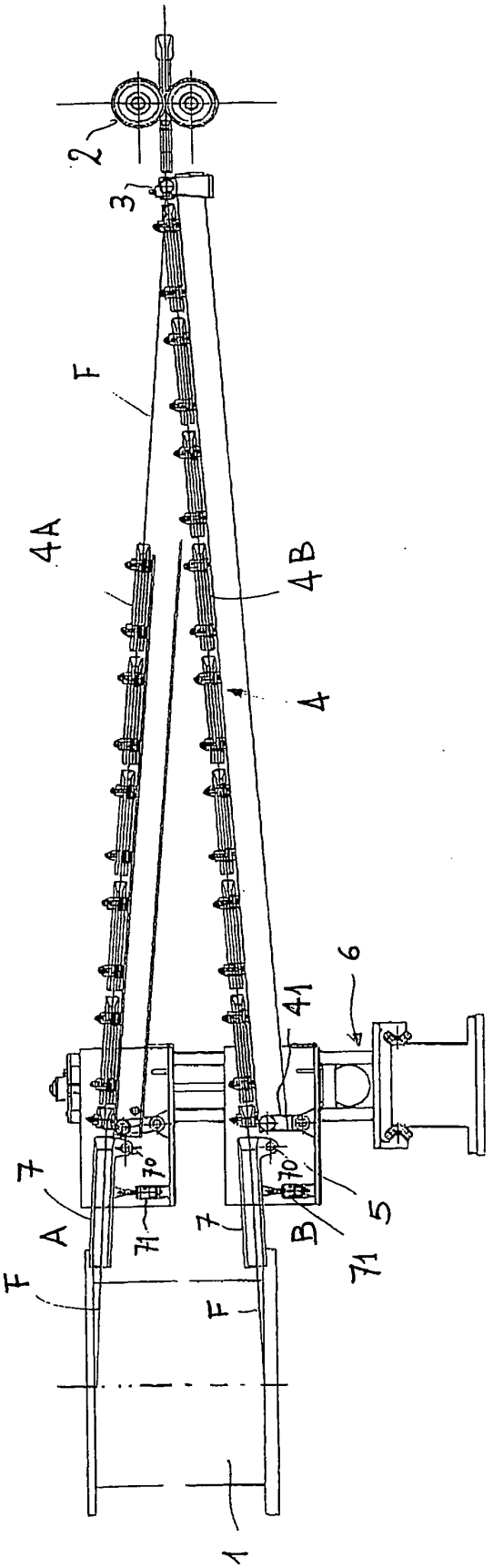


FIG. 1

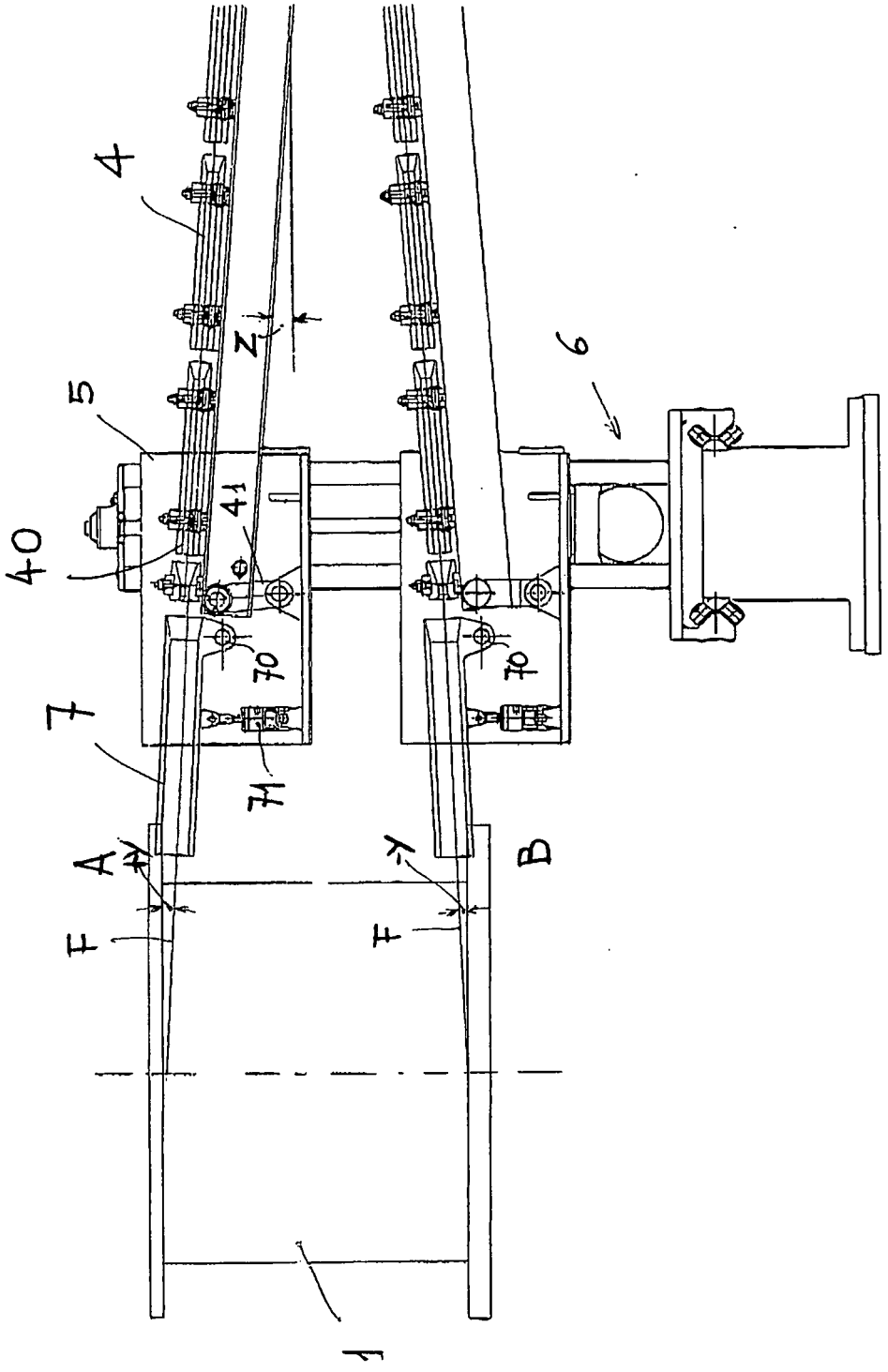


FIG.1A

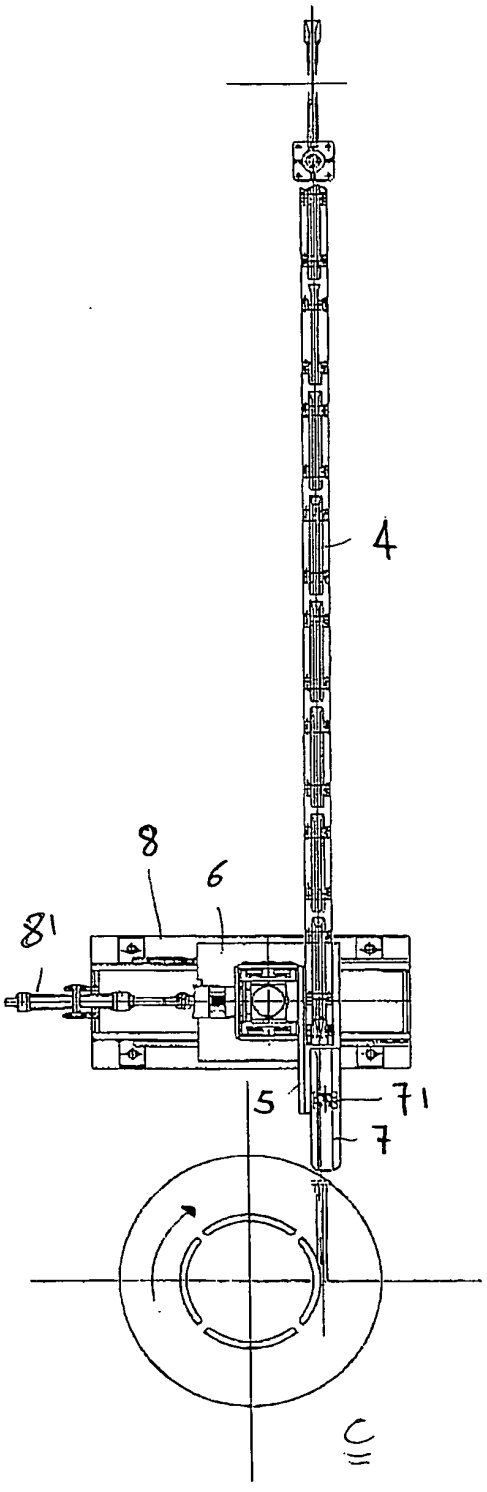


FIG.2

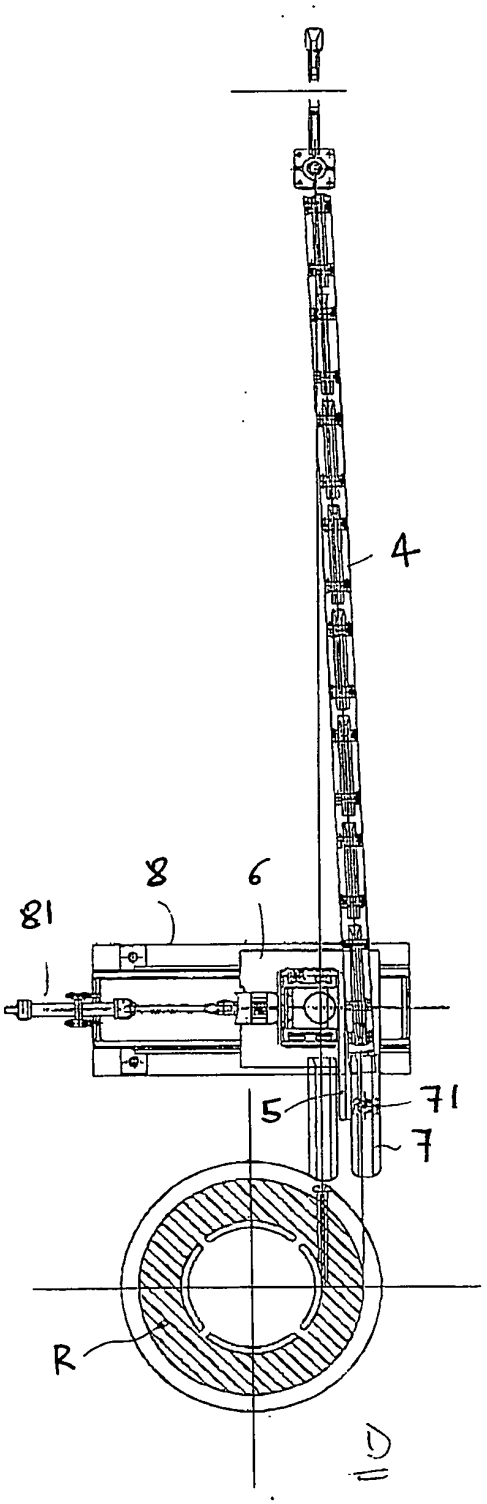


FIG.3

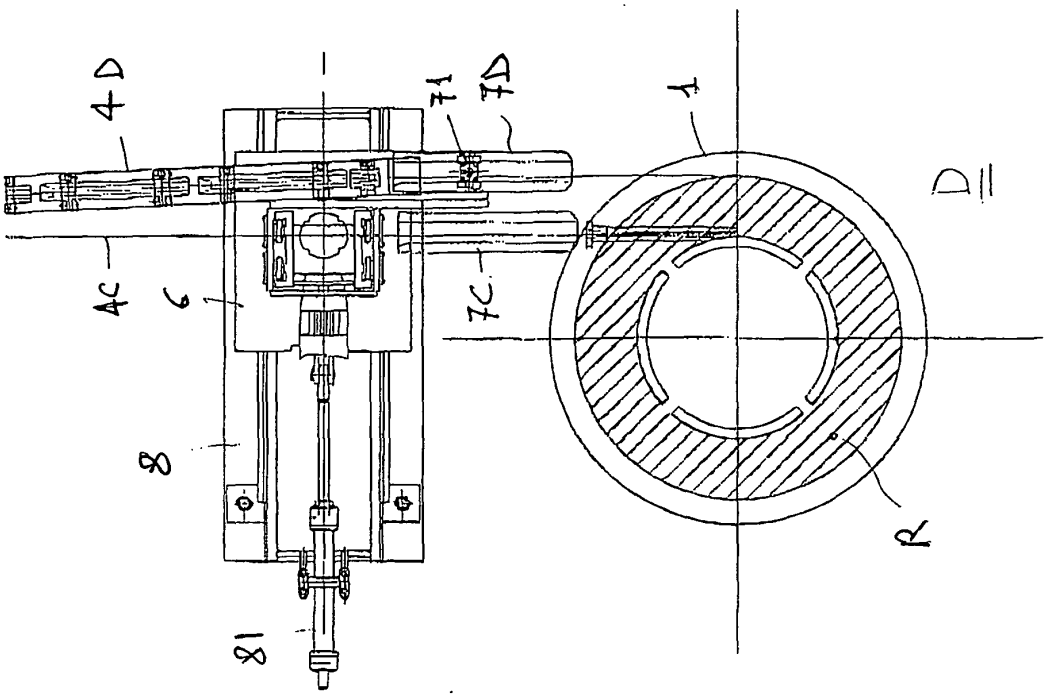


FIG.3A

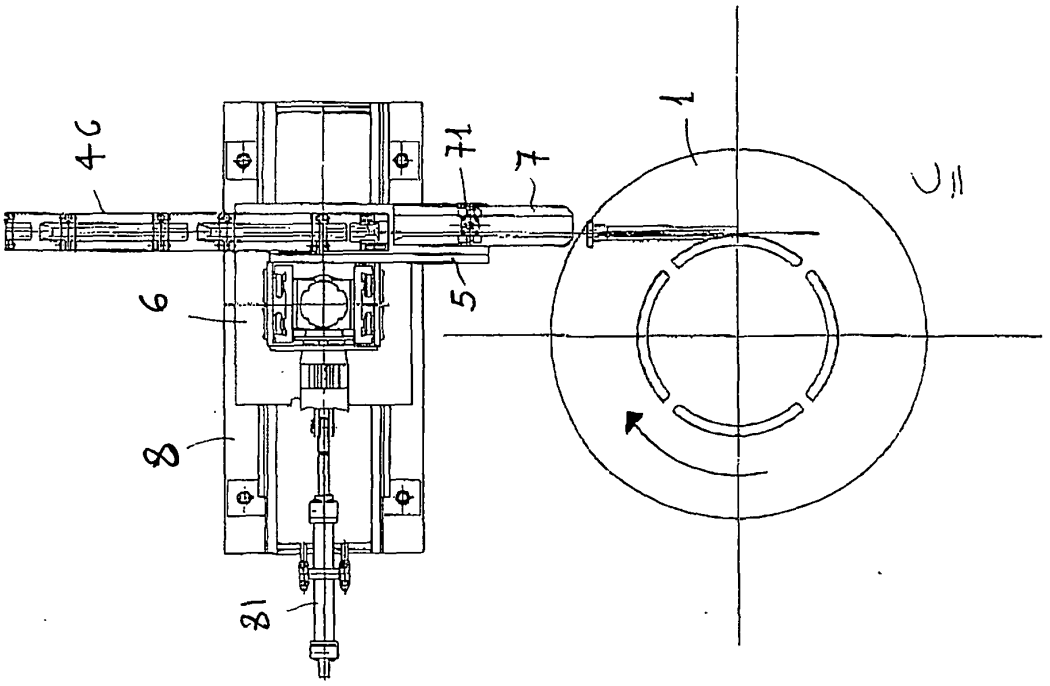


FIG.3B

REFERENCES CITED IN THE DESCRIPTION

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