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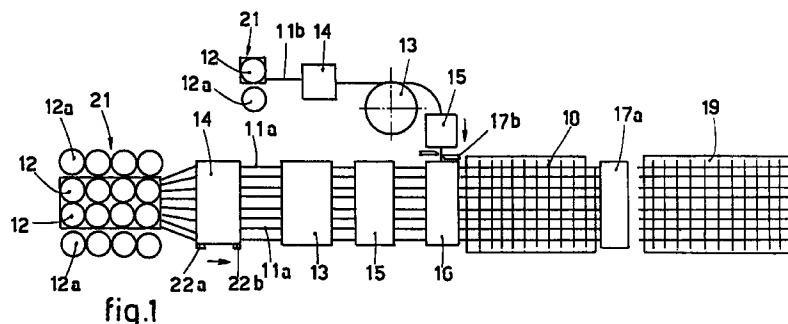
(54) **Method to produce welded or electrically welded reinforcement and relative device**

(57) Method to produce welded or electrically welded reinforcement, such as reinforcement, trestles, beams, mesh, etc., starting with steel wire rods, the reinforcement comprising a plurality of longitudinal wire rods (11a) welded to a plurality of transverse wire rods (11b), the wire rods (11a, 11b), smooth or ribbed, being fed to the welding machine directly from wound rolls or from lengths of rods pre-sheared to size directly as they arrive from a hot rolling line, in which:

- the starting material is subjected to a cooling process on the rolling line from a temperature of 800÷950°C at the loop-forming head to about 500°C at the end of the cooling conveyor in a period of time which varies from 2 to about 10 minutes;
- the temperature during the step when the reel is bound at the end of the loop cooling conveyor is about 200°C;
- the wire rod being fed to the reinforcement forming machine is subjected in line, on the machine, to a drawing and stretching deformation which causes

an elongation of between 1% and 7% and an Rm/Re ratio of at least more than 1.08.

Device to produce welded or electrically welded reinforcement from steel wire rods, the device comprising at least respective units (21) to unwind and feed longitudinal (11a) and transverse (11b) wire rods, respective pre-unwinding means (13), respective means (15) for feeding step-by-step, one or more welding units (16), respective shears (17a, 17b) and possible binding and packaging means (19), there being included between the respective unwinding and feeding units (21) and the welding units (16) one or more means (14) for the drawing and stretching of the wire rod arriving from the hot rolling process and fed from wound rolls (12) or in rods pre-sheared to size, this drawing and stretching action inducing on the wire rod (11) an elongation of between 1% and 7% and an Rm/Re ratio of at least more than 1.08.



Description

This invention concerns a method to produce welded or electrically welded reinforcement for use in the building trade and the relative production device, as set forth in the respective main claims.

The invention is applied to the production of welded or electrically welded reinforcement, beams, trestles and mesh consisting of a plurality of longitudinal and transverse wire rods crossed over each other and welded together by welding or electric welding.

The reinforcement thus produced is widely and consistently applied to the field of building constructions as a reinforcement for concrete castings.

Electrically welded reinforcement (mesh, trestles, etc.) is normally produced from steel which does not present any problems in welding and according to one of the following methods:

- a) using directly wire rods produced by hot rolling (with diameters mainly from 5.5 to 16 mm of smooth or ribbed wire rod, in rolls or in bars);
- b) using cold rolled wire rod (smooth or ribbed) or drawn wire rod (smooth) achieved by an intermediate production step.

When hot rolled wire rod is used, if the product is achieved with the types of steel which are traditionally on the market, the mechanical characteristics obtained are insufficient to meet the conditions imposed by the laws and regulations which are coming into force.

When the steel used is micro-alloyed, or when water quenching is used in order to improve the mechanical characteristics, apart from complicating the operating methods of the machine which forms the reinforcement (residual tensions, bars, weldability, etc.) the cost of producing the wire rod is considerably increased, and the product is made economically uncompetitive.

When cold rolled wire rod or drawn wire rod is used, this is far more commonly used.

However, even in this case there are considerable disadvantages, both from the technical and from the economic point of view.

From the technical point of view, with the types of steel normally used and with the cold deformations carried out to bring the wire rod to the required geometric characteristics, a level of ductibility is obtained which is at the limit of tolerability and even in some cases insufficient.

From the economic point of view, by introducing a transformation step between the hot rolling and the production of the reinforcement, considerable costs are incurred, in investment, staff, energy and water-use, as well as requiring considerable space for storage and working.

Nor should the ecological aspect be neglected: this transformation requires the use of stearates which, together with the scale, form dust which can only be

partly cleaned from the working environment into which they spread.

Moreover, by saving energy and water the environmental impact of these operations is reduced.

The technical and scientific arguments for the improvement of the ductile characteristics of welded and electrically welded reinforcement and, in general, of steel used for reinforcing concrete, are supported by conference publications and technical articles written by scholars of great reputation, such as for example Prof. G. Macchi (University of Pavia), Prof. L. Sanpaolesi (University of Pisa, Supreme Council at the Ministry of Public Works), Prof. A. Franchi (University of Brescia and Milan Polytechnic).

These arguments are also supported in technical and scientific committees (Dr. D. Russum, Chairman ECIS/TC 19) designated to draw up common technical regulations throughout Europe.

The ministerial decree of the Italian Government issued on 9/01/1996, and the European regulation ENV 10080 have begun to establish the lower limits of the ratio between the breaking characteristics and the stretching characteristics R_m/R_e .

These values have been set at 1.08 and 1.10 respectively for highly ductile steels (for which the total percentage elongation under load - Agt - must be > 5%) and for electrically welded mesh.

These limits, though they are still not sufficient for steel used in anti-seismic building work, provide a reasonable safety margin so as to be able to plan in accordance with the precepts of the new European code EC2, distributing the plastic deformations over extended sections of material.

This ratio is of fundamental importance to deal with extreme situations such as impacts, fires, the realisation of plastic hinges, deformations caused by temperature, shrinkage, viscosity, etc.

For applications in a seismic environment a higher R_m/R_e ratio - or work hardening- of at least 1.15-1.20, is advisable.

This parameter, together with the elongation under maximum force (Agt), allows a local plastic elongation of the stretched fibre and a distribution of the plasticization along the axis of the membrane in the reinforced concrete.

After all, the greater the work-hardening and Agt are, the smaller is the probability that a fragile breakage will take place.

In order to overcome the shortcomings of the state of the art, to obtain welded or electrically welded reinforcement which meets the technical requirements imposed by law, without causing increases in the production costs, and also to achieve further advantages, the present applicants have designed, tested and embodied this invention.

This invention is set forth and characterised in the respective main claims, while the dependent claims describe variants of the idea of the main embodiment.

The purpose of the invention is to provide a welded

or electrically welded reinforcement which has the required characteristics of ductility, obtained directly in the formation line of the reinforcement itself without any need for an intermediate cold working step.

According to the invention, it has been shown that it is possible to obtain steel wire rods with the desired characteristics by means of devices which draw the wire rod through a plurality of rolls or through rotating straightening systems.

In this case, the drawing force required is however considerably greater than that normally required for traditional machines which produce welded or electrically welded reinforcement.

Moreover, according to the invention, the wire rod is no longer unwound from a reel onto which it was wound during the cold working step, but from a roll coming directly from the hot rolling line.

The unwinding speed upstream of the production line is considerably lower than in the cold rolling process, and thus this step is simplified and also the removal of the scale produced is facilitated.

These operative methods however introduce a series of problems which the invention solves, such as:

- a) unwinding the wire rod from the roll with regularity, welding leading end and trailing end, reducing the scale to values which in any case make it possible to achieve a weld according to regulations;
- b) draw and deform the wire rod by a sufficient quantity to obtain the desired characteristics;
- c) perform these operations under controlled environmental conditions;
- d) achieve production units which are not affected by the type of steel being worked;
- e) improve or in any case not reduce the efficiency of the line producing the electrically welded reinforcement;
- f) obtain a product compatible with the requirements of the new legislation and of the market.

The advantages which derive from the solution of these problems are manifold:

- reduction of costs;
- savings in internal transport, water and energy, which contribute to reducing the environmental cost of these products;
- improvement of the production methods both from the operational point of view and from the ecological and ergonomical point of view;
- achievement of a higher quality product by subjecting (hot-ribbed) steel of the appropriate composition (but in any case able to be welded) to elongation of a limited amount (1-5%).

The deformations achieved upstream of the welding process can be obtained in various ways:

- a) by subjecting the wire rod to alternate flexions by

means of rolls arranged on single planes or several off-set planes (at 90° or 120°);

b) by elongating the wire rod with linear or rotary devices which cause it to be deformed;

c) by systems which are a combination of the previous two.

This invention therefore provides a method and the relative device for the production of welded or electrically welded reinforcement starting directly from wire rod consisting of hot rolled steel without the need of any preliminary or intermediate processing treatment, thus obviating the use of further devices and considerably reducing the processing times and costs and also reducing the labour force required and the necessary equipment.

Hereafter, to simplify the description, the application of the invention to electrically welded mesh is illustrated.

According to the invention the machine to produce the electrically welded mesh is fed with wound rolls of wire rod arriving directly from the hot rolling line.

These wound rolls arriving from a storage area or also directly from a pre-arrangement step downstream of the rolling line in the event of possible immediate use are positioned on an unwinding unit which feeds the mesh-forming machine with a number of wire rods according to the width of the mesh to be produced.

According to a variant the mesh-forming machine is fed with lengths of wire rod pre-sheared to size and pre-arranged at the outlet of the hot rolling line.

According to a preferred but non-restrictive embodiment of the invention, means suitable to impart a desired deformation to the wire rod which feeds the welding unit are included upstream of the unit performing the welding of the wire rod on the mesh-forming machine and between that unit and the unit unwinding the wound rolls.

The characteristics of ductility are measured with the ratio between the breaking tension and the stretching tension (R_m/R_e : known as work-hardening) and with the A_{gt} (total elongation under maximum load).

These values, with this process used, are at least 1.08 and 5% (ENV 10080) but values above 1.13 and 8% can be obtained, which are the characteristics of anti-seismic steel, now being legislated.

Optimum elongation obtained with the invention vary from 1.5 to 5%, with working values from 1 to 7%.

The process according to the invention makes it possible to control the elongation and thus prevent, or at least reduce, unwanted deformations introduced by: unwinding, movement and winding, which in the traditional process can be created.

The elongation can be controlled in various ways, including:

- by measuring the difference in speed as the wire rod enters and leaves the machine;
- by monitoring the absorption of the drawing unit;

- by monitoring the elongation of the material directly;
- by controlling the required characteristics.

By carrying out the process in line, it is possible to remove the calamine, thus preventing any possible formation of oxydes caused by rolls of material being deposited as they are waiting to be used in the welding machines, for the presence of oxydes reduces the quality of the weld.

The optimum composition of the steel used can be included within the following ranges: carbon content 0.16 to 0.20%, manganese content 0.60 to 0.80%, silicon content 0.20 to 0.30%, sulphur content max. 0.04%, phosphorus content max. 0.04%.

The cycle of the starting material in the cooling conveyor as it leaves the hot rolling mill is as follows: it passes from a temperature of 800/950°C at the loop-forming head to a temperature of about 500°C by the end of the cooling conveyor in a period of time which varies from 2 to 10 minutes according to the diameter of the wire rod.

When the reel formed at the end of the loop cooling conveyor is bound the temperature of the material is of about 200°C.

The wire rod according to the invention is hot ribbed directly in the hot rolling mill with diameters which vary from 5 to 16 mm.

The unwinding upstream of the welding machine can be performed upwards by using bundles or stationary reels: this makes it possible to weld the leading and trailing ends of the material while the machine is working, and thus ensures continuity of the working process.

Thanks to this continuity in the working process, without stopping and re-starting production, it is possible to have a product with a constant quality.

This is not possible when the unwinding includes the rotation of the packaged material, as in this case there are frequent variations of speed and jerks which might change the characteristics of the material.

The means which obtain the elongation of the wire rod can be straightener means, either on a single plane or on two or more off-set planes.

This gives a greater simplicity of use and a more accurate control of the elongation parameters.

Drawing and straightening is different from simply straightening, since in order to draw the material almost exclusively the central roll of the straightener is used, and the other rolls simply rest on the product.

The state of the art teaches that in straightening units usually the first rolls are used, progressively reducing the quantity of the deformation with the subsequent rolls.

According to the invention, this must not happen, as it would introduce unwanted rotary movements, which are prevented by adjusting the central roll.

It is also indispensable that the diameter and the distance between the axes of the rolls used should be of a dimension proportionate to the diameter of the wire

rod, in order to avoid unwanted vibrations and rotary movements.

According to a preferred embodiment, the following parameters are valid: diameter of the rolls from 60 to 100 mm, distance between the axes of the rolls 0.85 - 1.15 times the diameter of the rolls, where by distance between the axes we mean the distance between two contiguous rolls measured along the axis of the wire rod.

The invention includes the use of a wire rod straightening device with 5 or 7 rolls, on one or two planes, with the diameter of the rolls 60 mm and the distance between the axes 65 mm (optimum measurements for wire rod from 6 to 8 mm).

According to a variant one or more rolls of the straightening device can be motorised in order to draw the wire rod.

This makes it possible to avoid a crushing of the wire rod localised in correspondence with the drawing rolls, which could compromise the quality of the ribs of the wire rod.

The attached figures are given as a non-restrictive example and show some preferred embodiments of the invention as follows:-

- Fig.1 is a diagrammatic view from above of a device for the production of welded or electrically welded reinforcement according to the invention ;
- Fig.2 is a side view of the device of Fig.1;
- Fig.3 is a diagram of a possible device to straighten/draw wire rod employed in the device of Figs.1 and 2;
- Fig.4 shows another possible straightening/drawing device;
- Fig.5 shows another variant of Fig.3;
- Fig.6 is a diagram of part of the device of Fig.3.

The reference number 10 in the attached figures denotes generally a device to produce electrically welded mesh starting with hot rolled wire rod according to the invention.

The device 10 comprises a feeder-unwinding unit 21 which bears a plurality of wound rolls 12 of wire rod, either smooth or already ribbed, produced by a hot rolling line.

In this example the feeder-unwinding unit 21 comprises two aligned rows of wound rolls 12 engaged in the feeding step and two mating rows of wound rolls 12a acting as a reserve.

As the wound rolls 12 become exhausted they are exchanged, possibly with an automated process, with the reserve rolls 12a.

The use of wire rod arriving from the hot rolling process and wound in rolls 12 devoid of a central core and of ends enables those rolls 12 to be unwound upwards (Fig.2) with the ability to weld the trailing end of a wound roll 12 being unwound to the leading end of the reserve wound roll 12a; in this way it is possible to

obtain a continuous feed of the mesh-forming machine for a substantially unlimited time.

This continuity of feed ensures a constant quality of the product which is not possible in the case of traditional unwinding of the reels.

In this case, which is given merely as an example, the individual wire rod being unwound from the respective wound rolls 12, before the rods enter a welding unit or units 16, are subjected in-line to a deformation treatment able to cause an elongation of the material, of a small amount of between 1% and 5%, and a resulting work-hardening of the material together with an improvement of the mechanical and strength properties of the wire rod, but always maintaining a high level of ductibility.

Moreover, this deformation treatment causes, as an additional and auxiliary effect, the mechanical descaling of the surface of the wire rod, thus obviating the need to carry out this operation with specific preliminary operations, this descaling being necessary for the production of electrically welded mesh.

This deformation treatment is carried out by an appropriate means 14 located in the line between the feeder-unwinding unit 21 and the welding unit 16.

This device 14 may be of any type of the state of the art which can be adapted to inclusion in the line on an electrically welded mesh forming machine.

Fig.3 shows as an example a deformation device 14 which is equipped with two consecutive stretching units 23a, 23b which are positioned on planes perpendicular to each other and through which the wire rod 11 is drawn by multiple drawing units 24 consisting of powered rolls.

Each stretching unit 23a, 23b comprises a plurality of rolls, the number of which may vary from a minimum of three to a maximum of eleven or more, but advantageously between 5 and 7, which impart to the wire rod 11 passing through a stretching and consequent elongation suitable to increase the ductility and mechanical properties of the wire rod 11.

Even three or more of these stretching units 23a, 23b may be included and may act on alternately off-set planes, depending on the size of the machine, on the production requirements, on the intrinsic properties of the basic material and on other parameters known a priori.

There may be only one stretching unit 23a.

In such stretching units 23a, 23b the roll 25 which carries out the deformation on the wire rod 11 passing through is normally the central roll 25a, while the other rolls 25 remain simply resting on the wire rod 11 (see Fig.6).

The presence of adjustments limited to the central roll 25a prevents unwanted vibrations and rotations of the wire rod 11.

Moreover, in this case, the diameter of the rolls 25 is between 60 and 100 mm, while the distance between the axes "i" measured along the axis of the wire rod 11 between one roll 25 and the adjacent one is preferably

equal to about $0.8 \div 1.15$ of the said diameter.

According to the preferred embodiment of the invention, particularly in the case of 6 to 8 mm wire rod, the diameter of the rolls 25 is about 60 mm and the distance between the axis "i" is about 65 mm.

According to another embodiment of the invention, one or more rolls 25 are powered so as to prevent localised crushing of the wire rod 11 in correspondence with the drawing means 24.

Fig.4 shows a second possible deformation device 14 in which two rolls 20a, 20b on which the wire rod 11 is wound rotate at a different number of rotations, thus causing the drawing and controlled elongation of the wire rod 11.

According to another variant, which is not shown here, so as to obtain the drawing and/or elongation of the wire rod 11, a means is used which comprises a rotary element arranged with its axis substantially coinciding with that of the wire rod 11 being fed, this rotary element being equipped with hyperbolic bushes or rolls.

This means, which is of a type known in the state of the art and is normally used to straighten the wire rod, can also be used in cooperation with one or more of the stretching units 23a, 23b shown in Fig.3 and has also the task of drawing the wire rod 11, in the case of hyperbolic rolls.

According to the further variant shown in Fig.5, a device 14 is used which combines one drawing and/or stretching unit of the type shown in Fig.3 and another unit of the type shown in Fig.4.

According to yet another variant, the elongation of the wire rod 11 is achieved by gripper means.

In this case the method provides for a value of elongation normally between 1% and 7%, but advantageously between 1.5% and 5%, and this value can be pre-set and kept unchanged or can be controlled and adjusted moment by moment by means of appropriate adjustment means governed by sensors.

These sensors may consist, for instance, of speed monitoring means positioned at the inlet (22a) and at the outlet (22b) of the device 14 and monitoring the value of the elongation on the basis of the difference in speed.

According to a variant, sensors may be used which monitor the elongation of the wire rod 11 directly.

According to a further variant, the elongation may be monitored by measuring the absorption of the drawing means.

In the mesh-forming device 10 the drawn and work-hardened longitudinal wire rods 11a pass through a pre-unwinding means 13 and are fed to a step-by-step feeding means 15, which positions them in the welding unit 16.

The pre-unwinding means 13 has the function of a buffer stock between the feeder-unwinding unit 21 feeding the wire rod 11 continuously and the step-by-step feeding means 15.

For the feeding of the transverse wire rod 11b, one or more wire rods from the relative wound feeder rolls

12 are sent through an analogous device 14 to a longitudinal pre-unwinding means 13 and are then delivered by a step-by-step feeding means 15 to the welding unit 16 so as to cooperate perpendicularly with the longitudinal wire rods 11a.

According to a variant the longitudinal 11a and/or transverse 11b wire rods may also be fed from lengths of wire rod sheared to size and pre-arranged in a preliminary step.

The welding unit 16 welds the transverse wire rod or wire rods 11b to the longitudinal wire rod or wire rods 11a, and at the same time a shears 17b shears the transverse wire rods 11b to size.

The step-by-step feeding means 15 then carry out a step-by-step movement and arrange the wire rods 11a, 11b for the subsequent welding.

A shears 17a located downstream of the welding unit 16 shears the thus produced mesh 18 to the required length, and conveyor means 19 take the mesh 18 to the binding, packaging or any successive processing steps.

Claims

1. Method to produce welded or electrically welded reinforcement, such as reinforcement, trestles, beams, mesh, etc., starting with steel wire rods, the reinforcement comprising a plurality of longitudinal wire rods (11a) welded to a plurality of transverse wire rods (11b), the method being characterised in that the wire rods (11a, 11b), either smooth or ribbed, are fed to the welding machine in the form of wound roll or pre-sheared rods, directly as they arrive from a hot rolling line, in which:

- the starting material is subjected to cooling on the rolling line from a temperature of 800÷950°C at the loop-forming head to about 500°C at the end of the cooling conveyor in a period of time which varies from 2 to about 10 minutes;
- the temperature during the step when the reel is bound at the end of the cooling conveyor is about 200°C;
- the wire rod fed to the reinforcement forming machine is subjected in line, on the machine, to a drawing and stretching deformation which causes an elongation of the wire rod of between 1% and 7% and obtains an Rm/Re ratio of at least more than 1.08.

2. Method as in Claim 1, in which the drawing and stretching of the wire rod (11) is obtained by means of alternate flexions imparted to the wire rod (11) by at least one unit of consecutive unaligned rolls lying on a single plane.

3. Method as in Claim 1, in which the drawing and stretching of the wire rod (11) is obtained by means

of alternate flexions imparted to the wire rod (11) by two or more units of consecutive unaligned rolls lying on several planes off-set by at least 90°.

4. Method as in any claim hereinbefore, in which the drawing and stretching of the wire rod (11) is obtained by means of an elongation obtained by rotary devices.

5. Method as in any claim hereinbefore, in which the wire rod (11) employed possesses the following characteristics of its composition:

- content of C between 0.16% and 0.23%;
- content of Si between 0.13% and 0.32%;
- content of Mn between 0.7% and 1.3%;
- content of P < 0.04%;
- content of S < 0.04%.

6. Method as in any claim hereinbefore, in which the wound roll (12) of the wire rod (11) is unwound upwards.

7. Method as in Claim 6, in which the wire rod (11) is fed to the welding machine continuously, with the trailing end of the wound roll (12) in use being welded to the leading end of the next wound roll (12a)

8. Method as in any of Claims 1 to 7 inclusive, in which the value of the elongation of the wire rod (11) is pre-set and maintained unchanged during the whole cycle of formation of the welded or electrically welded reinforcement.

9. Method as in any of Claims 1 to 7 inclusive, in which the value of the elongation of the wire rod (11) is continuously controlled and is possibly varied during the cycle of formation of the welded or electrically welded reinforcement.

10. Method as in Claim 9, in which the control of the elongation of the wire rod (11) includes measuring the difference between the speed of the wire rod (11) entering the machine and the speed of the wire rod (11) leaving the machine.

11. Method as in Claim 9, in which the control of the elongation of the wire rod (11) includes the monitoring of the absorption of the drawing unit of the wire rod (11).

12. Method as in Claim 9, in which the control of the elongation of the wire rod (11) includes the direct monitoring of the elongation of the wire rod (11).

13. Method as in any claim hereinbefore, in which the wire rod (11) is ribbed on the hot rolling line.

14. Device to produce welded or electrically welded reinforcement from steel wire rods, the device comprising at least respective units to unwind and feed longitudinal (11a) and transverse (11b) wire rods, respective pre-unwinding means (13), respective means (15) for feeding step-by-step, one or more welding units (16), respective shears (17a, 17b) and possible binding and packaging means (19), the device being characterised in that there are included between the respective unwinding and feeding units (21) and the welding units (16) one or more means (14) for the drawing and stretching of the wire rods arriving from the hot rolling process and fed from wound rolls (12) or in rods pre-sheared to size, this drawing and stretching action inducing in the wire rods (11) an elongation of between 1% and 7% and an Rm/Re ratio of at least more than 1.08.
15. Device as in Claim 14, in which the drawing and stretching means (14) is of a type comprising at least one stretching unit (23a) comprising consecutive unaligned rolls (25) positioned on at least one plane and associated with a drawing unit (24).
16. Device as in Claim 14, in which the drawing and stretching means (14) comprises at least two stretching units (23a, 23b) each comprising consecutive unaligned rolls (25) positioned on at least two planes off-set at an angle of at least 90°.
17. Device as in Claim 15 or 16, in which each stretching unit (23a, 23b) comprises from 3 to 11 rolls (25).
18. Device as in any of Claims 15 to 17 inclusive, in which each stretching unit (23a, 23b) comprises at least the central roll (25a) which can be adjusted substantially in a transverse direction with respect to the axis of feed of the wire rod (11).
19. Device as in any of Claims 15 to 18 inclusive, in which the rolls (25) of the stretching units (23a, 23b) have a ratio of the distance between the axes ("i") to the diameter which is between 0.85 and 1.15.
20. Device as in Claim 19, in which the rolls (25) of the stretching units (23a, 23b) have a diameter of between 60 and 100 mm.
21. Device as in Claim 14, in which the drawing and stretching device (14) comprises a rotary element having its axis coinciding with the axis of the wire rod (11) and equipped with hyperbolic bushes and/or rolls.
22. Device as in Claim 14, in which the drawing and stretching means (14) is of a type with winding of the wire rod (11) on at least two rolls able to rotate at different speeds (Fig.4).
23. Device as in any of Claims 14 to 22 inclusive, in which the drawing and stretching means (14) is associated with means (22a, 22b) which control and possibly adjust the value of the elongation even during the cycle of formation of the electrically welded reinforcement.
24. Device as in Claim 23, in which the control means (22a, 22b) comprise means to measure the difference between the speed of the wire rod (11) entering the machine and the speed of the wire rod (11) leaving the machine.
25. Device as in Claim 23, in which the control means (22a, 22b) comprise means to measure directly the elongation of the wire rod (11).
26. Device as in Claim 23, in which the control means (22a, 22b) comprise means to measure the absorption of the drawing unit of the wire rod (11).
27. Device as in any of Claims 14 to 26 inclusive, in which at least the feeder-unwinding unit (21) feeding the longitudinal wire rods (11a) is suitable to support rows of wound rolls (12) being used and associated with rows of reserve wound rolls (12a).
28. Device as in Claim 27, in which at least the feeder-unwinding unit (21) feeding the longitudinal wire rods (11a) is associated with an automated system for the exchange of wound rolls (12) in use with reserve wound rolls (12a).

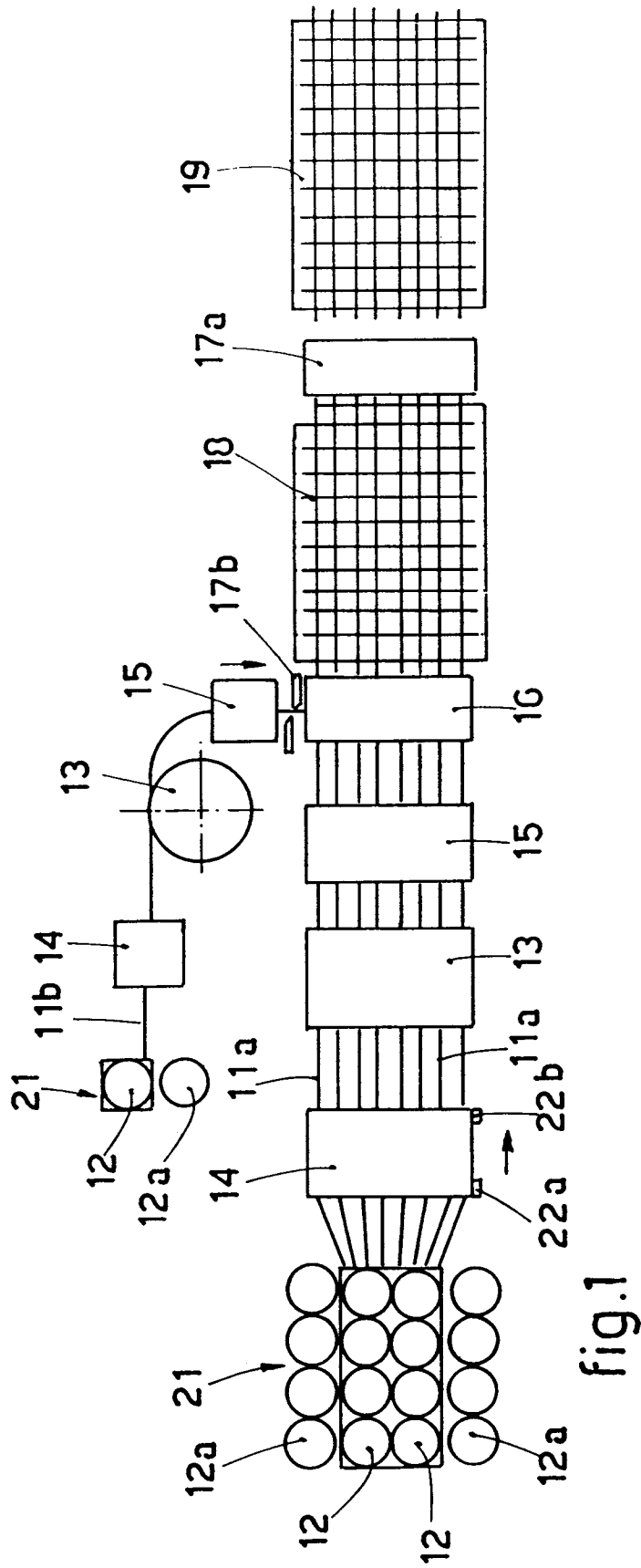


fig.1

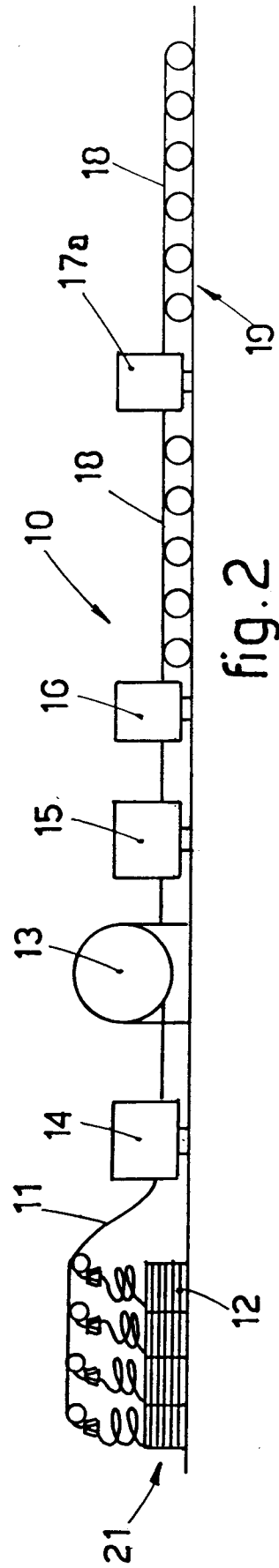


fig.2

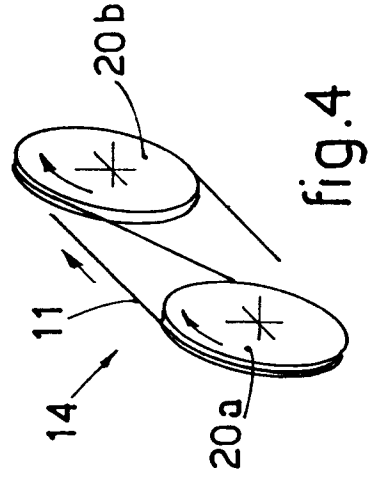


fig. 4

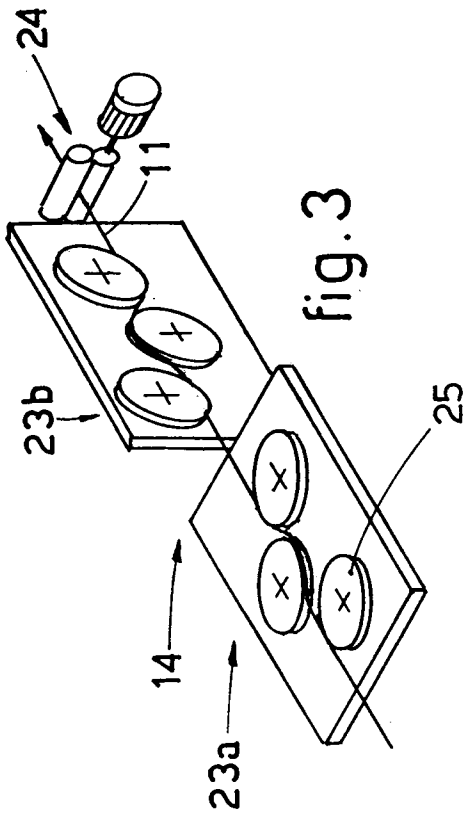


fig. 3

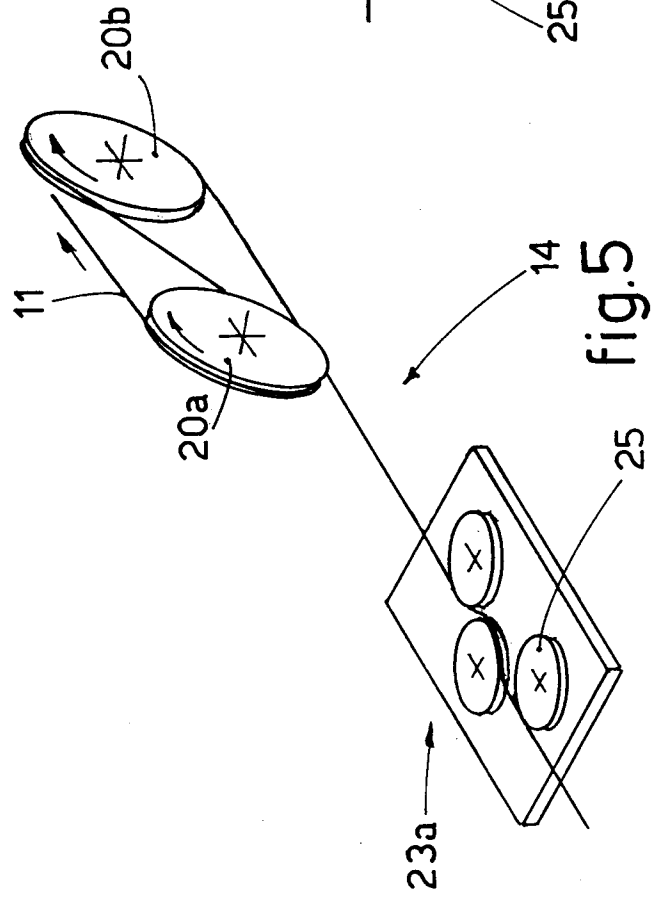


fig. 5

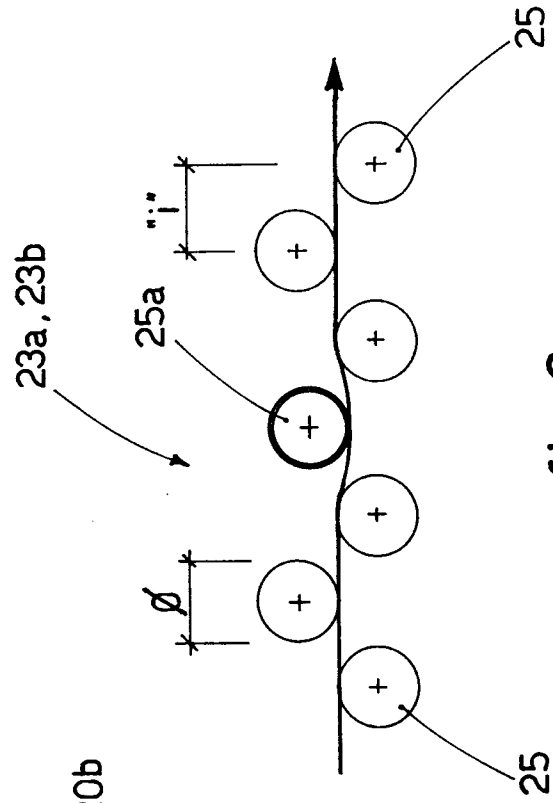


fig. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 12 0046

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	AT 214 241 A (EVG ENTWICKLUNGS- UND VERWERTUNGSGESELLSCHAFT M.B.H)	1-5	B21F27/10
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 April 1997	Examiner Barrow, J
CATEGORY OF CITED DOCUMENTS 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 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			

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