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(54) Machine for the realization of spiral-shaped, cylindrical or conical iron.

(57) The invention is a machine that realizes spiral-shaped, cylindrical and/or conical reinforcements (X) for piles or pillars made of reinforced concrete. The machine is equipped with longitudinal rollers, rod bending machine (B), electric shear (A), rod supporting forks (F), positioning forks (Fp), scythe-shaped metal parts (N) and with automatic welding machines (U). The shear (A) provides for the cutting of the produced spiral (X), the forks (F), position each longitudinal bar in contact with the spiral (X), while the mobile automatic welding machine (U) weld the longitudinal bars (L) to the spiral (X).

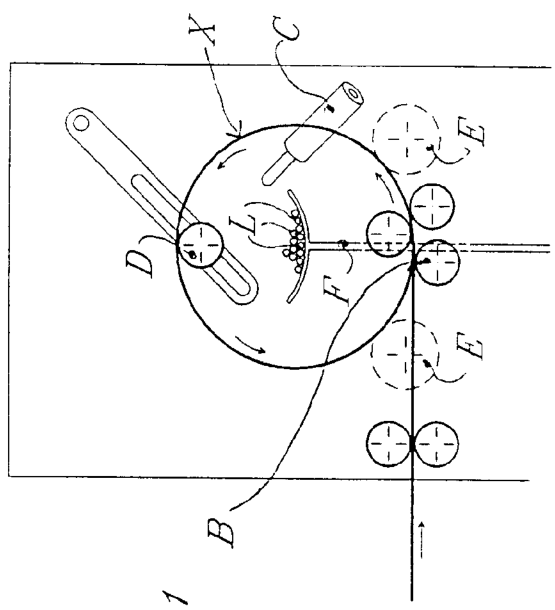


figure 1

EP 0 532 018 A1

In these days, for the production of metal spiral-shaped reinforcements bending machines are used to bend rods in continuous circles with constant diameter realizing a series of flanked coils; afterwards these coils are lengthened to realize a spiral of the desired length.

This method involves a waste of time for the stretching out of the coils and also the trouble caused by the fact that, once the spiral has been produced, it is necessary to insert the longitudinal bars manually into it and then to fix them. The present invention patent consists of a machine that realizes metal spirals of variable dimensions and pitch, where the coils are formed around the longitudinal bars; this machine, therefore, allows a considerable saving of time and of energies for the operators. The machine is constituted in its main parts by a series of bending rollers, which generate the coils, of a roller positioned near the exist of the iron piece from the bending rollers, which has an inclined axis with relation to the bending plane and to the horizontal direction and brings the already bent iron both outwards and toward a second upper roller; this second upper roller is idle and is perpendicular to the bending plane. The position of the inclined roller and of the idle upper roller can vary according to the needs.

The idle upper roller can translate vertically, so that it is possible to vary the diameter of the spiral, can translate frontally to adapt to the spiral pitch and can translate laterally for possible settings; the adjustement of this cylinder can be manual or electromechanical. Two long parallel cyclinders are positioned in front of the bending machine, slightly downward, perpendicularly to the iron bending plane. Between these cylinders there are mobile forks that support the reinforcement longitudinal bars.

The first operation to begin the process is the positioning on the forks of the reinforcement longitudinal bars, that afterwards will be fixed longitudinally along the spiral; these forks are positioned between the two front parallel cylinders, that are long enough to support the spiral in its complete development.

After having been loaded, the forks are raised higher than the parallel cylinders, so that the forming spiral doesn't touch the bars during the rotation.

During the working, in order to help the unrolling of the spiral, the two parallel cylinders rotate in the same direction, thus making the feed of the spiral itself easier. A shear is positioned in correspondence of the exit of the iron from the second bending machine. When the desired length, that has been prefixed by means of special commands, is reached, the bending process is stopped. The shear is brought near the iron, in one of its points near the exit from the second bending machine and then the shear is operated, cutting the iron and separating the whole spiral just produced from the iron hank that has still to be bent. When the spiral has been completed the rod supporting forks are lowered, so that it is possible to go on with the fixing of the longitudinal bars to the spiral.

On the machine, besides the forks that keep all the longitudinal bars inside the spiral, there is a second series of forks, called positioning forks, the upper part of which has an upper vertical notch slightly wider than the diameter of a single bar.

Once the shear has cut the iron the positioning forks are raised; thanks to their shape, these positioning forks raise only one longitudinal bar and from inside bring it near the upper part of the spiral.

At this pont the bar can be welded to the spiral by the automatic welding machines.

Each one of these automatic welding machines is mounted on a trolley running on one or more special rails, that are parallel to the cylinders that support the spiral.

The torch of the welding machine is mounted on the trolley by means of some mobile arms that bring the torch near the welding point, take the torch away from the welding point and rotate it around the welding point. Also some feelers are mounted on the trolley: they locate the point on which the welding has to be made, that is, the contact point between the longitudinal bar and the spiral.

For each longitudinal bar raised by the positioning forks, the welding machine is brought near the spiral and the feelers are positioned on the longitudinal bar. After that, the trolley advances and the feelers travel on the longitudinal bar.

When the feelers locate the contact point between the longitudinal bar and a tract of the spiral, they stop the trolley and operate the successive approach of the welding machine torch, that carries out the welding at the corresponding point.

Finally the torch is retracted and the trolley is set into motion again until the feelers locate another contact point between the longitudinal bar and the spiral.

Once the trolley has finished its run, the positioning forks are lowered and the whole spiral rotates on the cylinders for the required angle. The whole cycle is repeated, that is, the positioning forks are raised again to bring another longitudinal bar in contact with the spiral and the trolley with the welding machine slides again to weld the new bar to the spiral.

Both the feelers and the torch of the welding machine are mounted on a adjustable structure positioned on the trolley, so that they can adapt to the different sizes of the reinforcements to be realized.

In order to make the machine more efficient, it is possible to mount on the trolley two distinct feelers for the two sliding directions of the trolley, so that weldings can be made for every run of the trolley. Besides, it is possible to reduce the time required for the welding by using two or more welding machines that move contemporaneously along the spiral.

The operation of the shear, of the positioning forks, of the trolleys, of the feelers and of the welding machines is controlled by a specific electric/electronic circuit.

Once the fixing of the bars to the spiral has been completed, a series of overturning, scythe-shaped metal parts seize one of the longitudinal bars and provide for the extraction of the thus produced reinforcement.

The overturning scythe-shaped parts rotate on a plane that is perpendicular to the longitudinal bars; hooks equipped with a catch are hinged on their free end, in order to avoid the uncontrolled sliding of the reinforcement along the hooks themselves. These hooks are hinged to the scythe-shaped parts, so that their rotation with respect to the scythe-shaped parts themselves can be limited; a catch near the pivot of each hook doesn't allow them to rotate in the direction opposite to the reinforcement lifting direction, past the approximately aligned position of the hook with the scythe-shaped part.

If the constructor needs a very long-pitched spiral, the upper mobile cylinder is raised in such a way as not to interfere with the working. The inclined roller is coupled with a new series of bending rollers with a variable bending direction, depending on the spiral pitch. This way the spiral, after coming out of the bending machine, meets another series of rolls for the side bending.

The following is just one example among many of the practical applications of the invention in question, illustrated in the attached tables.

Figure 1 shows the machine provided with equipment for bending irons (B), provided with a roller (C) that is inclined with respect to the coil (X) plane and inclined downward, that causes the lateral bending of the iron and directs the coil (X) itself toward the idle upper roller (D), that realizes the spiral diameter. The mobile idle upper roller (D) can be moved manually or electromechanically, it can also move upward or downward to vary the diameter and parallely to the bending plane to conform with the coil (X) pitch.

The two front cylinders (E) support the spiral (X) in its formation and they both rotate in the same direction to help the feed of the forming spiral (X).

It is possible to sec one of the forks (F) that can be moved vertically and support the bars (L), that afterwards are fixed to the spiral (X) for its whole length.

Figure 2 shows an axonometric view of the machine, in which it is possible to notice the parallel cylinders (E), that support the spiral (X) for its whole length; at one end of the cylinders (E) there is the bending equipment (B).

Beside one of the cylinders (B) there are overturning scythe-shaped metal parts (N), that are equipped with hooks (G), so that they can grasp one of the longitudinal bars of the finished metal structure and extract it from the machine.

Figure 3 shows the bending unit of the machine, in case a very long-pitched spiral must be realized; it is possible to notice the bending rollers (B), the inclined roller (C) coupled with a second series of rollers (M), where the iron (X) is bent laterally.

Figures 4a, 4b, 4c, 4d show in detail the movement of one overturning scythe-shaped part (N), equipped with hook (G), that rests on and then grasps one bar (L) of the metal structure (R), resting on the parallel cylinders (E) and that rotating around the pivot (Q) raises and extracts the metal structure (R) from the machine.

Each hook (G) is provided with a catch that hinders the sliding of the structure along the hook (G) itself; besides, a tooth near the pivot (P) of each hook (G) doesn't allow the hook (G) itself to rotate in the direction opposite to that of the structure (R) lifting, past the approximately aligned position of the hook (G) with the scythe-shaped metal part (N).

In Figure 5 the forks (F) keep the longitudinal bars (B) at the centre of the spiral (S) while this is being formed.

The upper part of the positioning forks (Fp) is rhomboid-shaped, with an upper vertical notch slightly wider than a longitudinal bar (B). When these positioning forks (Fp) are raised, due to their form they take a single bar (B) from the group of longitudinal bars (B) to be welded and they raise it until the upper point inside the spiral (S), and then it has to be welded.

A shear, for example, an electropneumatic shear (A), is placed at the exit of the iron from the bending cylinders (B); it is controlled by an electromechanism connected with the machine, that provides for cutting the iron of the spiral (S), thus separating the spiral itself (S).

Beside the machine there is a trolley (J) that slides on rails (Rt) parallel to the rollers (R) that support the spiral (S).

The feelers (T) and the torch (Z) of the welding machine are mounted on this trolley (I); on the edge of the trolley (I) there is also the welding machine (U).

In particular, the feelers (T), that can be of any kind, preferably consist of a stem equipped with an electric contact that passes near the longitudinal bar (L) to be welded.

Once a longitudinal bar (L) has been raised by the positioning forks (Fp) until the inner upper part of the spiral (S), the trolley provides for positioning the feeler (T) near this longitudinal bar (B) and for dragging it for the whole length of the bar itself.

Since the longitudinal bars (L) are positioned inside the spiral (S), when the feeler stem (T) reaches a transversal tract of the spiral (S) in contact with the longitudinal bar (L), a signal is activated to the electric/electronic control circuit, that stops the trolley (I) and brings the welding machine torch (Z) closer, to carry out the welding between the longitudinal bar (L) and the point of the spiral (S) that intersects this bar

(L).

Once the welding has been completed, the torch (Z) is retracted and/or rotated and the trolley (I) is set into motion again until when the feeler (T) doesn't find another contact point between the bar (L) and the spiral (S).

When the whole longitudinal bar (L) has been covered the feeler is retracted, the positioning forks (Fp) are lowered, the whole spiral (S) is rotated by means of the rollers (E) on which it rosts and the positioning forks (Fp) are raised again to provide for a new welding cycle of another longitudinal bar (L).

In order to improve the efficiency of the machine it is possible to plan two different feelers (T), placed at the sides of the welding machine torch (Z), in such a way as to carry out the weldings in both the sliding directions of the trolley (I), that is, to weld one bar (L) while the trolley is moving in one direction (I) and the following one with the return movement of the trolley (I).

There is also the option to put two trolleys (I) on the same rails (Rt), each one of which operates on the spiral length (S); this way the welding times are halved.

Claims

1) Machine for the realization of spiral-shaped metal reinforcements, characterized by the fact that it has a series of rollers for the iron bending and at least a successive mobile roller, inclined in relation to the coils, where this roller translates with hortogonal component in relation to the plane of the bending rollers and realizes the side bending of the iron distancing the coils from one another and thus realizing the spiral pitch.

2) Machine for the realization of spiral-shaped metal reinforcements as in claim 1), characterized by the fact that it can utilize 2 bending units at the same time, and where the three rollers of the second unit have a bending direction that isn't parallel to the roller of the main bending unit, so that it can realize very long-pitched spirals, and where the position of the second bending group can be varied manually or electromechanically.

3) Machine for the realization of spiral-shaped metal reinforcements as in claims 1, 2, characterized by the fact that it has a roller placed over the bending rollers to form the diameter and the pitch of the spiral, and where this upper roller can be moved manually and/or mechanically to vary the pitch and the diameter of the spiral.

4) Machine for the realization of spiral-shaped metal reinforcements as in claim 1, characterized by the fact that it has two parallel cylinders that are perpendicular to the bending plane, in such a way as to support the spiral during its formation, and these cylinders can rotate around their axis and both in the same direction, in order to facilitate the feed of the spiral under formation.

5) Machine for the realization of spiral-shaped metal reinforcements as in claims 1, 2, 3, 4, characterized by the fact that it has a series of vertically mobile forks, placed between the two parallel cylinders for the support of the reinforcement longitudinal bars, so that the spiral rotates and develops around these longitudinal bars.

6) Machine for the realization of spiral-shaped metal reinforcements as per claims 1, 2, 3, 4, 5, characterized by the fact that it has a series of overturning scythe-shaped metal parts, equipped with hooks and placed beside one of the parallel cylinders for the extraction of the finished spirals, and where these hooks are provided with catches that block the sliding of the reinforcement along the hook itself and with teeth near the hook pivot to block the hook from rotating in the direction opposite to the reinforcement lifting direction, past the approximately aligned position of the hook with the scythe-shaped part.

7) Machine for the realization of spiral-shaped metal reinforcements, characterized by the fact that it has vertically mobile positioning forks, that have the upper part of any form or material and equipped with upper seat suitable for housing one longitudinal bar of the reinforcement, and where these bars, when they are elevated, raise a single longitudinal bar by means of their notch and bring it near the upper part of the spiral on the inner side.

8) Machine for the realization of spiral-shaped metal reinforcements as per claim 7, characterized by the fact that it has at least one welding machine, moved by electromechanical or electropneumatic actuators, and at least one feeler mounted on a rolley that moves parallely to the longitudinal bars, and where the feeler finds the contact point between the spiral and the longitudinal bar raised by the positioning forks and operates, directly or through electric/electronic circuit or thorugh other means, the welding machine that is brought near the contact point between spiral and bars and carries out the welding and retreating thereafter.

9) Machine for the realization of spiral-shaped metal reinforcements characterized by the fact that it has a shear that automatically cuts the spiral when it has reached the necessary length.

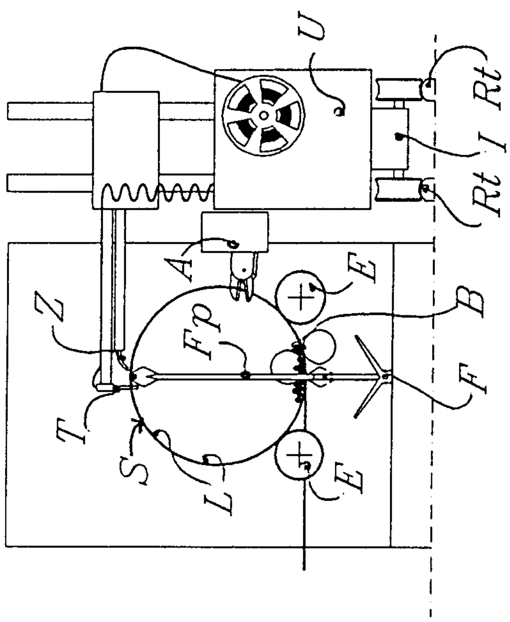


figure 5

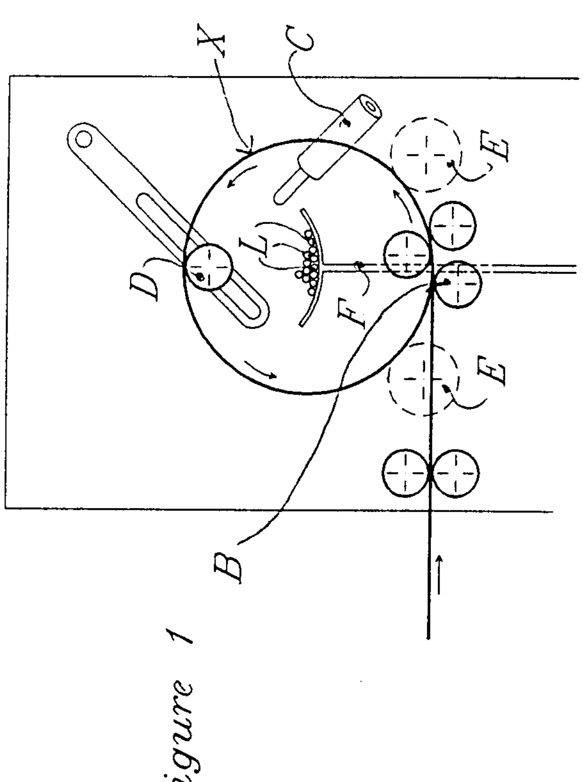


figure 1

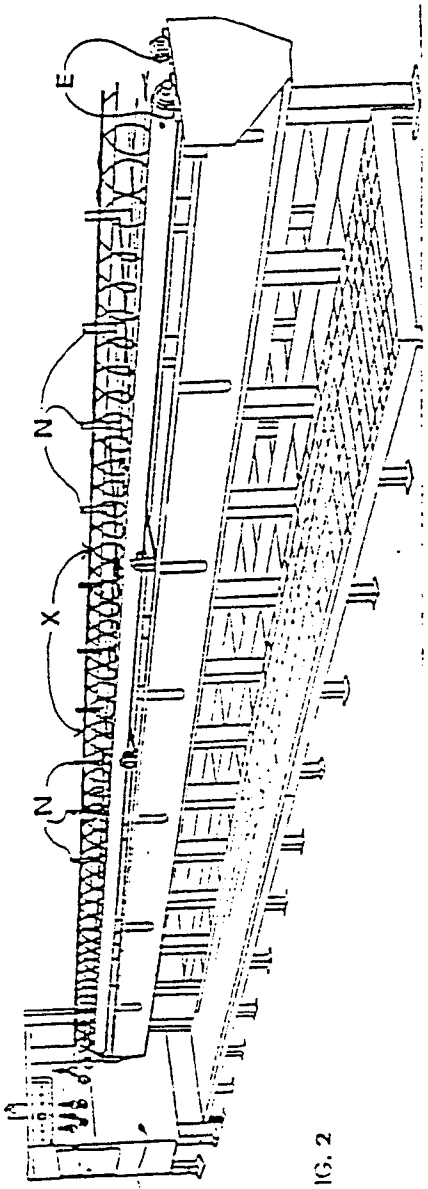


FIG. 2

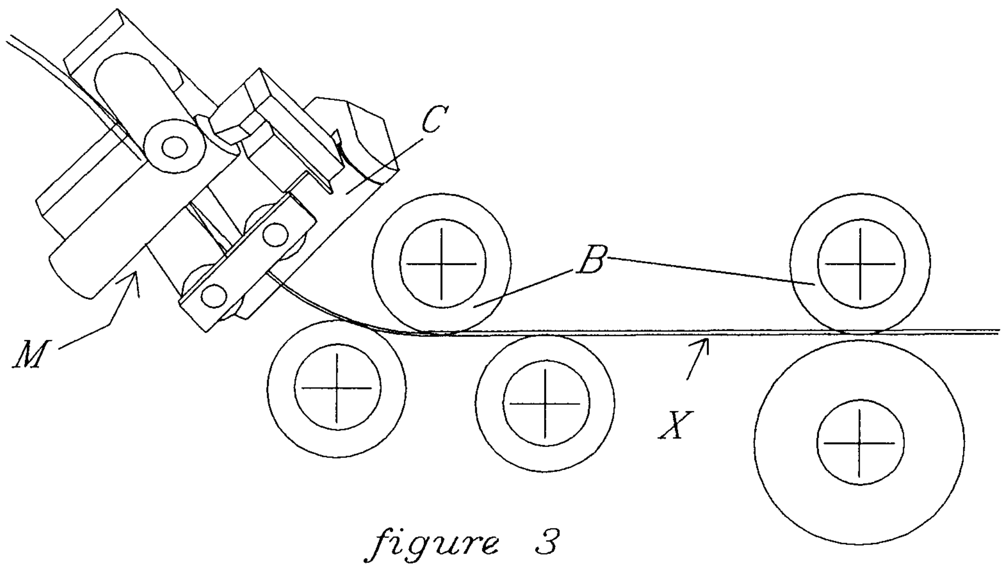


figure 3

figure 4a

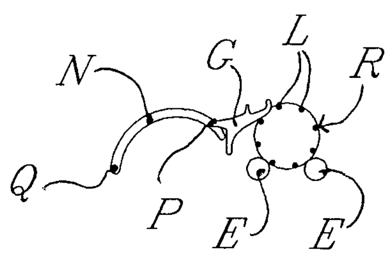
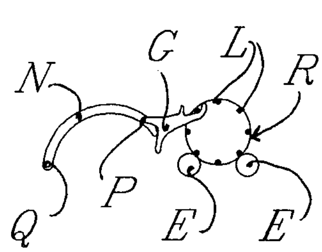


figure 4b



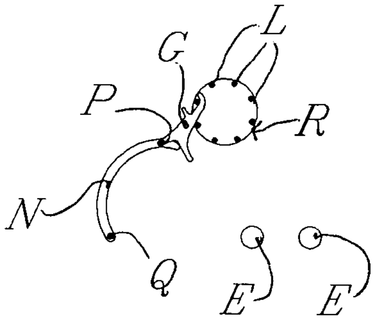


figure 4c

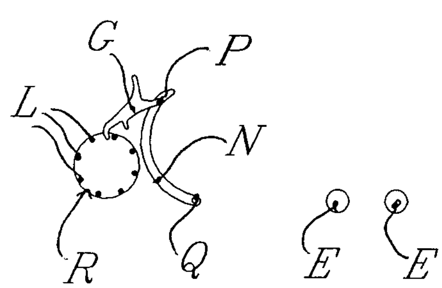


figure 4d

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EUROPEAN SEARCH REPORT

Application Number

EP 92 11 5554

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.5)
X	FR-A-2 123 116 (COMMISSARIAT A L'ENERGIE ATOMIQUE)	1	B21F27/20
A	* page 3, line 11 - line 31; figures *	2,3	

A	CH-A-481 339 (HALMSTADS JARNVERKS AB) * column 3, line 16 - line 55; figures *	1-4,9	

A	US-A-3 726 461 (YOSHIKIYO FUKUSHIMA) * column 3, line 39 - column 4, line 19; claims 1,5; figures *	4,5,7,8	

A	US-A-3 875 977 (COLBURN)	-	

A	US-A-2 903 553 (BUTLER)	-	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B21F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 DECEMBER 1992	BARROW J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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