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

Maschine und Verfahren zur Herstellung von zylindrischen oder konischen spiralförmigen Stahlbewehrungen

Machine et procédé pour la fabrication des armatures métalliques cylindriques ou coniques en forme de spirale

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(73) Proprietor:
Highstone Venture Capital N.V.
Willemstad, Curaçao (AN)

(72) Inventor: **Faggiotto, Elberino**
I-30024 Musile di Piave (IT)

(74) Representative:
Bruin, Cornelis Willem
Arnold & Siedsma,
Advocaten en Octrooigemachtigden,
P.O. Box 18558
2502 EN Den Haag (NL)

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EP 0 532 018 B1

Description

The invention relates to a method for the realization of spiral-shaped metal reinforcements, as described in the introductory part of claim 1.

A method of this kind is known from US-A-3 726 461. In this known method a spiral is formed directly against and fixed to longitudinal rods. These rods temporarily support the spiral. Reinforcement rods are connected in a later stage to the preformed spiral cage.

The method according to the invention as characterized in claim 1 allows a considerable saving of time and energy for the operators, as the spiral coil is separately formed around the longitudinal reinforcement bars which are supported in the center of the spiral while this is being formed. After forming of the spiral, the reinforcement rods only have to be lifted against the inner side of the spiral and connected therewith.

The invention also relates to a machine for producing spiral-shaped metal reinforcements as characterized in claim 2. Preferred embodiments are defined in the subclaims.

The first step when using the inventive method and machine 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 (E) 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 (I) that slides on rails (Rt) parallel to the rollers (E) 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 (L) 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. Method of producing spiral-shaped metal reinforcements (R) comprising the steps of forming a coil (X) and fixing a number of longitudinal reinforcement bars (L) to the inside of the coil, **characterized by** supporting said number of the longitudinal reinforcement bars (L) close to each other, forming the coil while rotating it, such that the coil develops around the supported longitudinal bars, after forming of the coil stopping rotation thereof and successively moving selected longitudinal reinforcement bars (L) against the inside of the coil and fixing these bars (L) to the coil (X) by a fixing machine (U) which is movable in the longitudinal direction of the coil.

2. Machine for producing spiral-shaped metal reinforcements (R) comprising a bending equipment for forming a coil having a series of bending rollers (B) and at least a successive roller (C) inclined and displaced in relation to the plane of the bending rollers (B), a series of vertically movable forks (F) placed in a longitudinal direction and provided with supporting means for supporting reinforcement longitudinal bars (L), said bending equipment being arranged stationary with the plane of the bending rollers perpendicular to the longitudinal direction, further comprising means for rotating and supporting the coil (S) such that the coil during forming develops around the longitudinal bars (L), and means (U) for fixing individual reinforcement bars against the inside of the coil, which is movable in the longitudinal direction of the coil.

3. Machine according to claim 2, comprising vertical mobile positioning forks (F_p) having an upper seat suitable for housing one longitudinal reinforcement bar (L), and wherein these forks (F_p) when they are elevated, raise a single longitudinal bar (L) by means of the upper seat and bring it near the upper part of the spiral (S) on the inner side thereof.

4. Machine according to claim 3, comprising at least one welding machine (U) movable by electromechanical or electro-pneumatic actuators, and at least one feeler (T) mounted on a trolley (T) movable parallel to the longitudinal bars (T), said feeler (T) being capable of detecting the contact point between the spiral (S) and the longitudinal bar (T) raised by the positioning forks (F_p) and capable of operating, directly or through electric/electronic circuit or through other means, the welding machine (U) that is brought near the contact point between the spiral (S) and bars (T) and carries out the welding.

5. Machine according to any of the claims 2 - 4, comprising a second bending unit (M) having three rollers defining a bending direction that isn't parallel to that of the main bending unit (B) so that it is capable of realizing very long-pitched spirals, and where the position of the second bending unit (M) can be varied manually or electro-mechanically.

6. Machine according to any of the claims 2 - 5, comprising an upper roller (D) placed over the bending rollers (B) to form the diameter and the pitch of the spiral (S) and where this upper roller (D) can be moved manually and/or mechanically to vary the pitch and the diameter of the spiral (S).

7. Machine according to any of the claims 2 - 6, comprising two parallel cylinders (E) perpendicular to the plane of the bending rollers (B) in such a way as to support the spiral (S) during its formation, said cylinders (E) being capable of rotating around their axis, in the same direction in order to facilitate the feed of the spiral (S) under formation.

8. Machine according to any of the claims 2 - 7, comprising a series of overturning scythe-shaped metal parts (N), equipped with hooks (G) and placed beside one of the parallel cylinders (E) for the extraction of the finished reinforcement (R), and where these hooks (G) are provided with catches that block the sliding of the reinforcement (R) along the hook (G) itself and with teeth near the hook pivot to block the hook (G) from rotating in the direction opposite to the reinforcement lifting direction, passed the approximately aligned position of the hook (G) with the scythe-shaped part (N).

9. Machine according to any of the claims 2 - 8, comprising a shear (A) that automatically cuts the spiral (S) when it has reached the necessary length.

Patentansprüche

1. Verfahren zum Herstellen von spiralförmigen Metallverstärkungen (R) mit den Schritten:
   Bilden einer Spule (X) und Befestigen einer Zahl von Längsverstärkungsstangen (L) an der Innenseite der Spule,
   gekennzeichnet durch Tragen der Zahl von Längsverstärkungsstangen (L) nahe zueinander, Bilden der Spule, während sie gedreht wird, derart, daß sich die Spule um die getragenen Längsstangen wickelt, nach dem Bilden der Spule Stoppen ihrer Drehung und aufeinanderfolgendes Bewegen ausgewählter Längsverstärkungsstangen (L) gegen die Innenseite der Spule und Befestigen dieser Stangen (L) an der Spule (X) durch eine Befestigungsmaschine (U), die in der Längsrichtung der Spule bewegbar ist.

2. Maschine zum Herstellen von spiralförmigen Metallverstärkungen (R) mit einer Biegeausrüstung

zum Bilden einer Spule mit einer Reihe von Biegerollen (B) und mindestens einer folgenden Rolle (C), die in Bezug auf die Ebene der Biegerollen (B) geneigt und versetzt ist, einer Reihe von vertikal bewegbaren Gabeln (F), die in einer Längsrichtung angeordnet sind und mit einem Tragmittel zum Tragen von Verstärkungslängsstangen (L) versehen sind, wobei die Biegeausrüstung stationär angeordnet ist, die Ebene der Biegerollen senkrecht zu der Längsrichtung ist, und weiter mit einem Mittel zum Drehen und Stützen der Spule (S) derart, daß die Spule sich während des Bildens um die Längsstangen (L) wickelt und einem Mittel (U) zum Befestigen der einzelnen Verstärkungsstangen gegen die Innenseite der Spule, das in die Längsrichtung der Spule bewegbar ist.

3. Maschine nach Anspruch 2 mit vertikalen bewegbaren Positioniergabeln (Fp) mit einem oberen Sitz geeignet zum Aufnehmen einer der Längsverstärkungsstangen (L), bei der diese Gabeln (Fp), wenn sie angehoben werden, eine einzelne Längsstange (L) mittels des oberen Sitzes anheben und nahe zu dem oberen Teil der Spirale (S) auf deren Innenseite bringen.

4. Maschine nach Anspruch 3 mit mindestens einer Schweißmaschine (U), die durch elektromechanische oder elektropneumatische Betätigungselemente bewegbar ist, und mindestens einem Fühler (T), der auf einem Wagen (I) angebracht ist, der Parallel zu den Längsstangen (L) bewegbar ist, wobei der Fühler (T) in der Lage ist, den Kontaktpunkt zwischen der Spirale (S) und der Längsstange (L) zu erkennen, die durch die Positioniergabeln (Fp) angehoben ist, und der in der Lage ist, direkt oder durch eine elektrische/elektronische Schaltung oder durch ein anderes Mittel die Schweißmaschine (U) zu betreiben, die nahe zu dem Kontaktpunkt zwischen der Spirale (S) und den Stangen (L) gebracht ist und das Schweißen ausführt.

5. Maschine nach einem der Ansprüche 2 bis 4 mit einer zweiten Biegeeinheit (M) mit drei Rollen, die eine Biegerichtung definieren, die nicht parallel zu der Hauptbiegeeinheit (B) so ist, daß sie in der Lage ist, Spiralen mit sehr langer Ganghöhe herzustellen, wobei die Position der zweiten Biegeeinheit (M) manuell oder elektromechanisch variiert werden kann.

6. Maschine nach einem der Ansprüche 2 bis 5 mit einer oberen Rolle (D), die über den Biegerollen (B) plaziert ist, zum Bilden des Durchmessers und der Ganghöhe der Spirale (S), wobei diese obere Rolle (D) manuell und/oder mechanisch zum Verändern der Ganghöhe und des Durchmessers der Spirale (S) bewegt werden kann.

7. Maschine nach einem der Ansprüche 1 bis 6 mit zwei parallelen Zylindern (E) senkrecht zu der Ebene der Biegerollen (B) auf solch eine Weise, daß die Spirale (S) während ihrer Bildung gelagert ist, wobei die Zylinder (E) sich um ihre Achsen in die gleiche Richtung drehen können zum Erleichtern des Vorschiebens der Spirale (S) unter Bildung.

8. Maschine nach einem der Ansprüche 2 bis 7 mit einer Reihe von umgekehrten sensenförmigen Metallteilen (N), die mit Haken (G) ausgerüstet sind und neben einem der parallelen Zylinder (E) zum Herausziehen der fertigen Verstärkungen (R) angeordnet sind, wobei diese Haken 8G) mit Riegeln versehen sind, die das Gleiten der Verstärkung (R) entlang des Hakens (G) selbst blockieren und Zähne nahe der Hakenschwenkachse aufweisen zum Blockieren des Hakens (G) vom Drehen in die Richtung entgegengesetzt der Verstärkungsanheberichtung über die ungefähr ausgerichtete Position des Hakens (G) mit dem sensenförmigen Teil (N) hinaus.

9. Maschine nach einem der Ansprüche 2 bis 8 mit einer Schere (A), die automatisch die Spirale (S) schneidet, wenn sie die notwendige Länge erreicht hat.

Revendications

1. Procédé pour la fabrication d'armatures métalliques (R) en forme de spirales comprenant les opérations suivantes : former un enroulement (X) et fixer un certain nombre de barres d'armature longitudinales (L) sur l'intérieur de l'enroulement, caractérisé par le support dudit nombre de barres longitudinales d'armature (L) proches l'une de l'autre, former l'enroulement, tout en le faisant tourner, de manière que l'enroulement se développe autour des barres longitudinales supportées, après formation de l'enroulement, arrêter sa rotation et déplacer successivement les barres longitudinales d'armature (L) contre l'intérieur de l'enroulement, puis fixer ces barres (L) à l'enroulement (X) au moyen d'une machine de fixation (U) qui est mobile dans la direction longitudinale de l'enroulement.

2. Machine pour la production d'armatures métalliques (R) en forme de spirales, comprenant un équipement de cintrage pour former un enroulement comprenant une série de rouleaux de cintrage (B), et au moins un, rouleau successif (C) incliné et déplacé par rapport au plan des rouleaux de cintrage (B), une série de fourchettes, mobiles verticalement (F), placées dans une direction longitudinale et équipées de moyens supports pour supporter les barres longitudinales d'armature (L), cet équipement de cintrage étant agencé en poste

fixe de manière que le plan des rouleaux de cintrage soit perpendiculaire à la direction longitudinale, comprenant encore des moyens pour faire tourner et supporter l'enroulement (S), de manière que l'enroulement pendant sa formation se développe autour des barres longitudinales (L), et des moyens (u) pour fixer individuellement les barres d'armature sur l'intérieur de l'enroulement, lesquelles sont mobiles dans la direction longitudinale de l'enroulement.

3. Machine selon la revendication 2, comprenant des fourchettes de positionnement mobiles verticalement (Fp) ayant un siège supérieur apte à loger une barre longitudinale d'armature (L), et dans laquelle ces fourchettes (Fp), lorsqu'elles sont surélevées, soulèvent une seule barre longitudinale (L) au moyen du siège supérieur et l'amènent à proximité de la partie supérieure de la spirale (S) sur la face intérieure de cette dernière.

4. Machine selon la revendication 3, comprenant au moins une machine de soudage (U) mobile au moyen d'actionneurs électromécaniques ou électropneumatiques, et au moins un palpeur (T) monté sur un chariot (T), mobile parallèlement aux barres longitudinales (T), ledit palpeur (T) étant capable de détecter le point de contact entre la spirale (S) et la barre longitudinale (T) soulevée par les fourchettes de positionnement (Fp), et capable de faire fonctionner directement ou par l'intermédiaire d'un circuit électrique/électronique ou de tout autre moyen, la machine de soudage (U) qui est amenée près du point de contact entre la spirale (S) et les barres (T) et effectue le soudage.

5. Machine selon l'une quelconque des revendications 2 à 4, comprenant une seconde unité de cintrage (M) ayant trois rouleaux définissant une direction de cintrage qui n'est pas parallèle à celle de l'unité principale de cintrage (B), de sorte qu'elle est capable d'effectuer des spirales à très long pas, et dans laquelle la position de la seconde unité de cintrage (M) peut être modifiée à la main ou par un procédé électromécanique.

6. machine selon l'une quelconque des revendications 2 à 5, comprenant un rouleau supérieur (D) placé au-dessus des rouleaux de cintrage (B) pour former le diamètre et le pas de la spirale (S), et dans laquelle ce rouleau supérieur (D) peut être déplacé à la main et/ou mécaniquement pour faire varier le pas et le diamètre de la spirale (S).

7. Machine selon l'une quelconque des revendications 2 à 6, comprenant deux cylindres parallèles (E) perpendiculaires au plan des rouleaux de cintrage (B), de manière à supporter la spirale (S) pendant sa formation, lesdits cylindres (E) étant capables de tourner autour de leur axe dans le même sens, afin de faciliter l'avance de la spirale (S) en cours de fabrication.

8. Machine selon l'une quelconque des revendications 2 à 7, comprenant une série de pièces métalliques (N) de retournement en forme de faucilles, équipées de crochets (G) et placées à côté d'un des cylindres parallèles (E) pour extraire l'armature finie (R), et dans laquelle ces crochets (G) sont équipés de crampons qui bloquent le glissement de l'armature (R) le long du crochet (G) lui-même, et avec des dents proches du pivot du crochet pour bloquer le crochet (G) en l'empêchant de tourner dans le sens opposé au sens de soulèvement de l'armature au-delà de la position du crochet (G) sensiblement alignée avec la pièce en forme de faucille (N).

9. Machine selon l'une quelconque des revendications 2 à 8, comprenant une cisaille (A) qui sectionne automatiquement la spirale (S) lorsque cette dernière a atteint la longueur nécessaire.

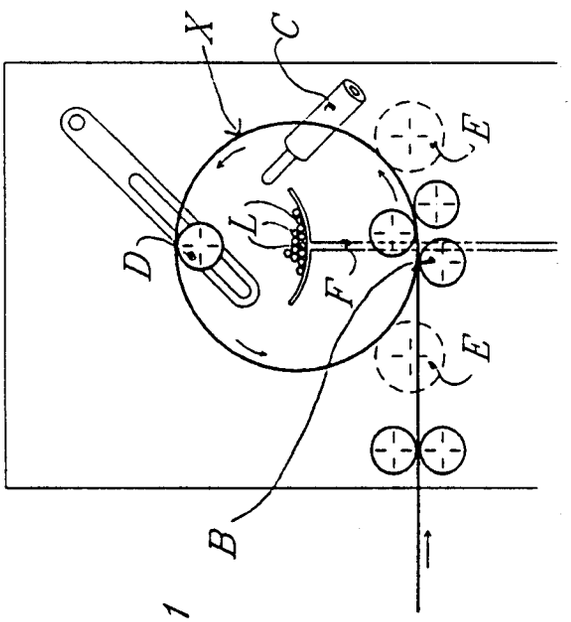


figure 1

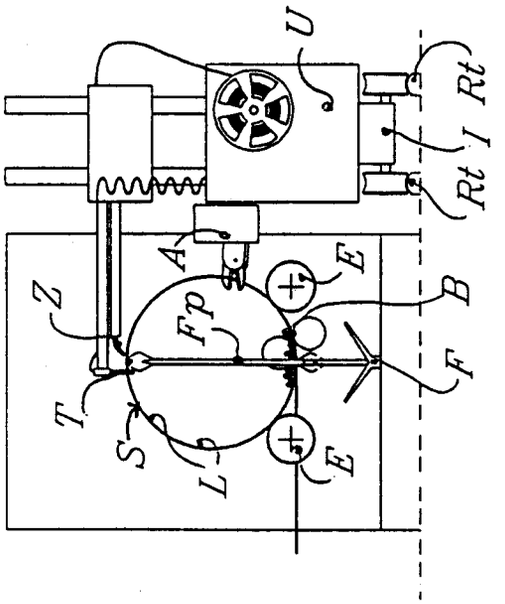


figure 5

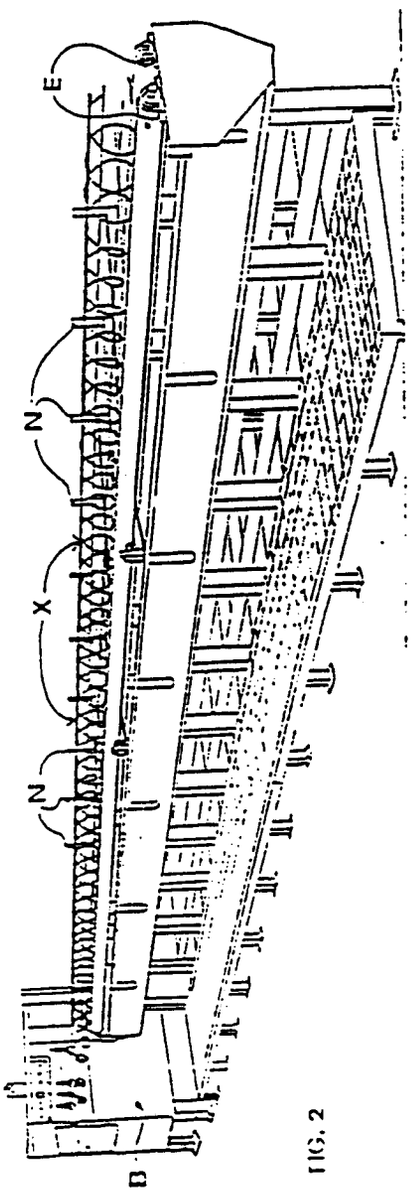


FIG. 2

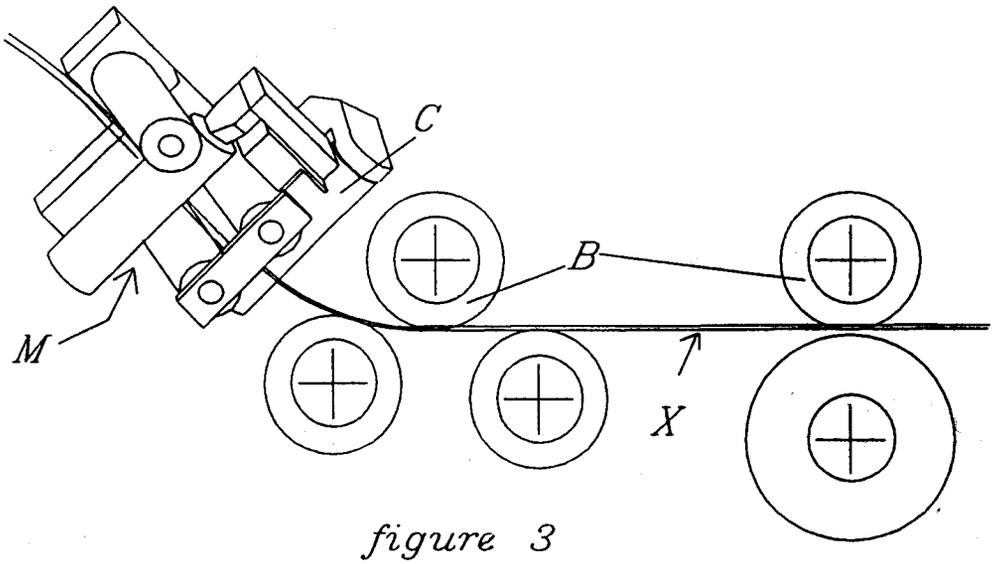
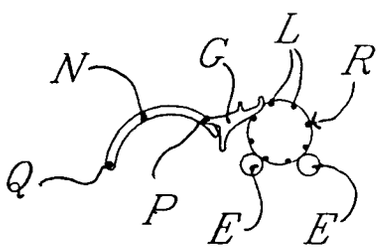
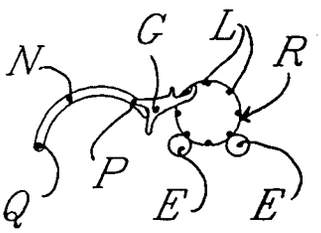


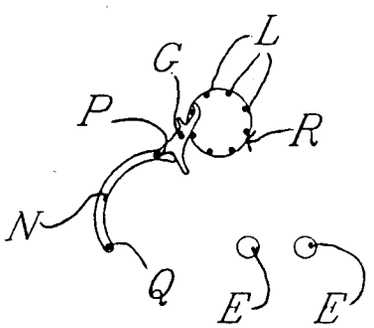
figure 3

figure 4a

figure 4b







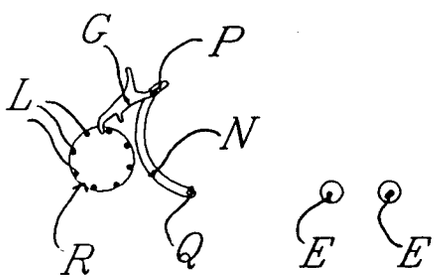


figure 4c

figure 4d