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(54) **WELDING METHOD IN MACHINES FOR MANUFACTURING METAL CAGES FOR REINFORCED CONCRETE AND CORRESPONDING MACHINE**

SCHWEISSVERFAHREN IN MASCHINEN ZUR HERSTELLUNG VON METALLKÄFIGEN FÜR STAHLBETON UND ENTSPRECHENDE MASCHINE

PROCÉDÉ DE SOUDAGE DANS DES MACHINES DE FABRICATION DE CAGES MÉTALLIQUES POUR BÉTON ARMÉ ET MACHINE CORRESPONDANTE

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Description

Technical Field

[0001] The present invention relates to a welding device destined to be used in machines for manufacturing metal cages for reinforced concrete and similar.

Background Art

[0002] It is known that, to realize the reinforcement of bearing piles, reinforced concrete pillars and similar, metal cages are used, with different shapes, for instance cylindrical or prismatic, consisting of a series of longitudinal iron bars outside which a rod is placed spiral wound onto the same bars, according to an adequately prearranged pitch; alternatively, a series of stirrups can be arranged adequately spaced one another. The longitudinal bars are distributed according to an adequate geometrical profile, polygonal or cylindrical; nonetheless examples of piles and pillars with different geometry are known, for instance elliptical, polygonal and similar.

[0003] In the specified sector are known methods and machines to form cages, as illustrated for instance in the documents EP 0035477, IT-B-1.330.256, IT 1.216.960 UD2004A000095.

[0004] Some machines of the known type are also equipped with an automatic welding device suited to carry out the welding, generally with deposit metal, of the longitudinal bars to the metal wire externally wound in the shape of a spiral. The welding device usually comprises welding members, guiding means of the metal wire in winding around the metal bars and sensors suited to detect the presence of a bar by the welding area and to operate the activation of the welding members. The welding device can be prearranged by the fixed or mobile head through which the bars are sliding, according to the type of machine on which it is applied.

[0005] Yet the welding devices of known type, such as for instance the one devised in patent IT 1.216.960 in the name of the same Applicant, do not solve the problem of satisfyingly and reliably carrying out the welding of metal cages for reinforced concrete with polygonal profile, by they are just limited to substantially circular shapes. In fact, in the circular sections, the guiding rollers of the welder, once adjusted on a certain diameter, do not undergo any substantial radial position variation during the rotation of the moulding to form the structure, and more precisely during the spiral winding phase. In fact, in this case, the guiding rollers are mounted on only one support, and they follow the movement of the welder. Vice versa, generally in case of cages with polygonal section, the wire that winds round tangentially to form the spiral during the rotation is subject to a radial dimension variation passing from the vertex to the middle of the side and consequently the same result applies to the guiding rollers, which thus cannot maintain The contact in these conditions.

GB 1 338 027 A discloses a machine for the continuous production of reinforcing cages having a polygonal profile by spirally winding a metal wire on longitudinal bars. A guiding means in form of a roller is pressed against the wire, and the weld between the wire and the bars is carried out by a welding member in form of a roller.

[0006] It is therefore difficult to follow the wire of the spiral during the winding phase and consequently it is even more difficult to follow the welding point by means of the welding members, so as to allow the jointing between bars and metal wire that spiralwinds while the same bars are borne in rotary motion by the respective support head. Therefore, even if the cited prior art documents relating to the formation of cages indicate the possibility to realize poles with polygonal section, actually the automatic welding is not realized or it is realized with high difficulty and with a quality and a productivity considered inadequate.

Disclosure

[0007] The aim of the present invention is to overcome the cited drawbacks by devising a welding method and device for machines suited to realize metal cages for reinforced concrete and similar, which allow to realize metal cages of any section, in particular with polygonal profile, also with section variable in the product length.

[0008] Within this scope, it is a further aim of the claimed invention to provide with a welding device that allows to realize the so-called free-hanging welding of the bars, that is welding while the product in preparation is moving, or the static welding, that is welding when the product results even just temporarily and substantially still.

[0009] Another aim of the present invention is to devise a welding device, which allows to realize metal cages for concrete reinforcements with a higher grade of automation and productivity.

[0010] A further aim of the present invention is to devise a welding device destined to be used in apparatuses to realise metal cages for reinforced concrete of simple conception, certainly reliable functioning, versatile use, and also relatively inexpensive.

[0011] The cited aims are reached, according to the claimed invention, by the welding method in apparatuses to realize metal cages for reinforced concrete according to claim 1 and by the machine according to claim 4.

Description of Drawings

[0012] Description details of the invention will be further evident in the illustrations of a preferred embodiment of the welding device for machines suited to realize metal cages for reinforced concrete, illustrated in the guidelines drawings attached, wherein:

[0013] Fig. 1 illustrates an overall perspective view of the welding device applied to a machine for manufacturing metal cages for reinforced concrete according to the

present invention;

[0014] Fig. 2, 3 and 4 respectively illustrate a front view, a side view and a plan view of the same device in one same operational phase;

[0015] Fig. from 5 to 8, from 9 to 12, from 13 to 16 respectively illustrate the same views of the welding device illustrated in the figures from 1 to 4 in different operational phases;

[0016] Fig. 17 and 18 respectively illustrate a front view and a side view of a different embodiment of the claimed welding device.

[0017] Fig. 19, 20 and 21, 22 illustrate a front view and a side view respectively, of different applications of the mentioned different embodiment of the welding device.

Best Mode

[0018] With reference to such figures, 1 refers to the welding device suited to be used in a machine for manufacturing metal cages 2 for the bearing piles reinforcement, reinforced concrete pillars and similar. The above-mentioned machine is not shown for the sake of simplicity.

[0019] The metal cage 2 to be manufactured consists of a series of longitudinal bars 3 arranged parallel and made integral, according to a provided geometry, through one metal wire 4, spiral-wound on the same bars 3 according to a suitably set pitch, or alternatively through a series of stirrups, as shown in the drawing. The metal wire or the stirrups 4 are welded externally to the bars 3 by means of the welding device 1. In the illustrated case, the bars 3 destined to form the metal cage 2 are arranged according to a polygonal transverse profile, and in particular a square profile, in order to determine the realization of a prismatic pile. It is clearly possible to provide for realizing cages with a different transversal profile, for instance prismatic, rectangular, circular or elliptical with symmetric or asymmetric distribution of the bars.

[0020] The metallic wire 4 is fed by a bobbin borne unwinding by a reel, not illustrated for the sake of simplicity, arranged sideways to the welding device 1. The longitudinal bars 3 are borne by two or more motorized heads, not illustrated either, in the exact fixing position to form the cage 2. In particular, the above-mentioned heads carry respective rotating members, for example disks or similar, arranged facing one another and coaxial according to a longitudinal axis, preferably horizontal. The disks are suited to bear in rotation the longitudinal bars 3 during the formation of the cage 2.

[0021] The feeding of the metal wire 4 takes place in such a way that the above mentioned rotation of the longitudinal bars 3 is combined to a translational movement of the head on which the distribution unit of the spiral of the cage in formation is mounted, along the longitudinal axis of the cage in formation. In this way the rotation combined with the shift movement of the distribution unit of the spiral determines the control of the spiral-winding of the metal wire 4 around the bars 3 according to the

cited prearranged pitch, in case even changeable.

[0022] The welding device 1 comprises a support frame 5 suited to be associated with one of the above-mentioned support and handling heads of the longitudinal bars 3. The support frame 5, as already stated, can be longitudinally fix or mobile depending on the type of machine. The support frame 5 is preferably arranged above the longitudinal bars 3 borne in rotation by the motorized heads. The support frame 5 carries a mobile welding member 6 suitable to perform the welding operation, in particular with deposit metal, between each longitudinal bar 3 and the metal wire 4 in winding around the cage in formation. In particular, the welding member 6 is constrained to a first sliding slide 7 for instance vertically on a first guide 8 front borne by the support frame 5. The first slide 7 is suited to be operated alternately with the aid of first actuator means 9, for example of pneumatic type, between an inactive position 7a (figure 3), detached from the cage 2 in formation, and an active welding position 7b approached to the spiral wire (figure 7), approached to cage 2 by the junction to be realized between a longitudinal bar 3 and the metal wire 4. The apparatus provides, in a known way, for sensor means suited to detect the arrival of the longitudinal bar 3 in the provided welding position, in alignment with the welding member 6, and consequently to control the lowering of the welding member 6 to start a welding cycle.

[0023] The first slide 7 further bears a fork-shaped centring member 10 adjacent to the welding member 6, suitable to engage the longitudinal bar 3 at the back of the metal wire 4, when the first slide is at the active position 7b. In practice, the fork 10 has a double function, centring for welding operations and hooking to the longitudinal bar 3. In this way, the hooked longitudinal bar 3 causes the welding member 6 to follow its movement deriving from the rotation around the longitudinal axis of cage 2 in formation, to allow the carrying out of the welding operations even when moving, as better hereby described.

[0024] The first slide 7 is mounted on a support frame 5 by interposition of a second slide 11 suitable to slide on a second guide 12 constrained to the support frame 5 and perpendicular to the first guide 8. The second slide 11 is movable on the second guide 12, both in consequence of said dragging action carried out by the fork 10 during the welding performed by the welding member 6, and upon operation of the actuator means 13, for instance of pneumatic type, during the return stroke of the welding member 6, in consequence of which the welding member 6 places itself to begin a new welding cycle. Basically the two orthogonal guides 8, 12 allow the welding member 6 to follow the welding point along the arch of a circle during the rotation made by the joint in the circular movement of formation of the cage 2.

[0025] In practice, the welding member 6 makes a welding active stroke during which the welding member 6 works in the active position 7b of the first slide 7 on the joint to be realized, following the longitudinal bar 3 in its rotation around the axis of the cage 2 in formation, from

an initial position to a final welding position, and an inactive stroke in which the welding member 6 goes back to the initial position and is lifted to inactive position upon control of the actuator means 9 working on the first slide 7.

[0026] It has to be noticed that, when the welding member 6 is hooked, it is first radially approached to the joint to be welded from a position in which it initially is, in order not to interfere with the edges of the cage in rotation. In this way the welding member is tangentially dragged, in order to follow the joint with no relative motion.

[0027] The support frame 5 is constrained to the respective fixed framework, not shown for the sake of simplicity, by the interposition of an articulation 14 suitable to allow the rotation of same frame 5 around an axis substantially perpendicular to the longitudinal axis of the cage 2 in formation, to arrange the welding device coplanar to the plane of unwinding of the loop, which obviously varies inclination according to the pitch of the spiral to realize, determined by the combination of the longitudinal translation speed and the rotation peripheral speed. In this way, the welding unit is spontaneously oriented by means of articulation 14, without the aid of actuator means and similar. Clearly, also other positions and orientations can be indicated, of said rotation axis of articulation 14, in order to obtain what stated.

[0028] The support frame 5 further bears guiding means 15 suitable to be associated with the metal wire 4 in unwinding. The guiding means 15 preferably comprises a pair of rolling guiding members 16 borne by support means 17 consisting for instance of respective arms to engage and keep always in contact the metal wire 4 in unwinding. The rolling guiding members 16 preferably consist of grooved rollers. The arms 17 are constrained to elastic means 18 suitable to contrast the detachment of the guiding members 16 from the metal wire 4. During the rotational movement the guiding members 16 must follow the variations of radial position caused by the fact that the rotation element has polygonal section and not circular. More precisely, the arms 17 are articulated to the support frame 5 by opposite parts as to the welding member 6, in order to rotate on a substantially vertical plane. The grooved rollers 16 are pivoted to the end of the arms 17, according to respective axis parallel to the joint axis of the same arms. Each grooved roller 16 is suitable to engage the metal wire 4 in unwinding, in correspondence with respective portions, from any side as to the welding member 6.

[0029] The elastic means 18 preferably consists of shock absorber means of the piston type, hydraulic or pneumatic, articulated to each arm 17. In particular, every shock absorber member 18 is pivoted to a central portion of the arm 17 and to the support frame 5 (see in particular figures 1 to 4). The shock absorber members 18 are adjusted so that, thanks to the jointing to the arms 17, the grooved rollers 16 remain constantly in contact with the metal wire 4 in any winding phase around cage 2 in formation. For example, in case the cage 2 has a polygonal transverse profile, the grooved rollers 16 can follow the

radial shifts of the metal wire, also in areas in correspondence with the vertex which have asperities difficult to cover.

[0030] The functioning of the described welding device is as follows.

[0031] During the formation phase of the metal wire 2, the longitudinal bars 3 cross the head of the caging apparatus, in which the welding device 1 is used. The longitudinal bars 3 are arranged around the longitudinal axis of the cage 2 in formation, according to the transversal profile to obtain and borne in rotation at least by a motorized head suitable for this purpose. At the same time the metal wire 4 is fed in unwinding from the respective bobbin placed sideways to the longitudinal bars 3. From the combination of the rotating movement of longitudinal bars 3 and the translation motion of the metal wire 4 in relation to the same bars 3, the metal wire 4 is spiral-wound externally to the bars 3. In particular, the metal wire 4 is suitable to be fixed through welding to bars 3 met along the described winding path.

[0032] In an initial phase of each welding operation, the welding member 6 is arranged in inactive position, detached from the cage 2 in formation (see figures 1 to 4).

[0033] When the sensor means associated with the machine detects the arrival of a bar 3 in the welding position, the operation of the actuators means 9 is controlled, in order to bring the first slide 7 bearing the welding member 6 in active position 7b, approached to the bar 3 by the crossover with the metal wire 4 (see figures 5 to 8). At the same time the first slide 7 brings the fork 10 to engage the bar 3 in the back of the crossover with the metal wire 4. Consequently the bar 3 is hooked to the fork 10.

[0034] The welding member 6 is operated so to perform the junction, in particular through deposit metal, between the hooked bar 3 and the metal wire 4. In this phase, the welding member 6 follows the bar 3 to which it is hooked through the fork 10 for the whole length of the effective stroke, necessary to guarantee the realization of an effective junction between the bar 3 and the wire 4. In this way, the welding is carried out at substantially null relative velocity between the welding member and the joint to be welded. In practice the welding member 6 is dragged by the bar 3, which rotates around the longitudinal axis of the cage 2 in formation, adequately sliding on the first slide 8 and the second slide 12. For the entire active stroke of the welding member 6, the grooved rollers 16 borne swivelling by the arms 17 and elastically pushed by the shock absorbers 18, remain in contact with the metal wire 4, front and back guiding it to the junction in progress of realization (see figures 9 to 12).

[0035] After all, the welding member 6 is borne free to autonomously move to follow the joint of the longitudinal bar 3 and of the metal wire 4 in welding phase, during the above-mentioned combined movement of rotation and translation.

[0036] Subsequently, the welding member 6 is operated by actuator means 9 to return to the inactive position

at some distance from cage 2 in formation (see figures 13 to 16). The actuator means 13 is operated to control the return stroke of the welding member 6 in order to prepare it to a new welding cycle between a subsequent longitudinal bar 3 and the metal wire 4. Also in this phase the grooved rollers 16 continue to be kept constantly in contact with the metal wire 4.

[0037] The described welding device reaches therefore the aim to realize metal cages for reinforced concrete of any shape, in particular with polygonal profile. This is made possible, in particular, thanks to the presence of at least one grooved roller 16, mounted on a relative support 17 suitable to undergo the contrast action of the corresponding shock absorber 18, to prevent from the detachment of the same roller 16 from the metal wire 4. Furthermore, thanks to the articulation between the damped arms 17 and the support frame 5, the grooved rollers 16 can effectively follow the metal wire 4 also in correspondence to the vertex of the transversal profile of the cage 2 in formation. Those vertex are the crucial positions of the winding path of the metal wire 4 around the longitudinal bars 3, since in correspondence with them the radial distance of the metal wire 4 from the longitudinal axis of the cage 2 varies with sudden discontinuity, thus inverting the motion. The shock absorbers 18 can promptly react to this variation, suitably modulating the operating force on the grooved rollers 16 in order to adapt the positioning of the grooved rollers 16 to the transversal profile of the cage, avoiding any risk of loss of contact of the grooved rollers 16 with the wire 4. The guide of the metal wire 4 is therefore assured along the entire winding path of the metal wire 4 around longitudinal bars 3.

[0038] In figures 17 and 18 a different embodiment of the welding device is shown, in which the grooved rollers 16 are borne, freely swivelling, to the opposite ends of a crossbar 19 lying on a vertical plane substantially transversal to bars 3. The crossbar 19 is pivoted, through a median pin 20, to a slide 21 that slides along a vertical guide 22 defined at the back to the support frame 5. The slide 21 is stressed by an actuator member 23 carried, in adequately adjustable position, by a bracket support 24 constrained to the support frame 5, in order to push and keep the grooved rollers 16 elastically in contact with the metal wire 4.

[0039] In fig. 19, 20 and 21, 22 different applications are illustrated of the said different embodiment of the welding device, for manufacturing cages with polygonal transversal profile.

[0040] Clearly, it is possible to provide for the rolling guiding members 16 to be supported by different means from those illustrated. For instance, the use of a sole guiding wheel can be provided, borne by slide means sliding in a direction substantially radial to the circular path of the vertex of the structure in formation.

[0041] It is important, in particular in case of polygonal transversal profile of the cage 2, that the force exerted by shock absorbers 18 can suitably be adjusted. In fact,

by suitably modulating this action it is possible to exert a compression on adjacent sides of the wound wire 4, such to cause a slight deflection (see fig. 21 and 22). This intentional compression is able to straighten in a suitable way the wire 4 in unwinding, thus compensating the natural tendency of the wire 4 during unwinding from the respective coil to place itself around the longitudinal bars 3 with a slight convexity turned towards the outside of the cage 2. Therefore, the contrast action of the rollers 16 allows to realize cages 2 with a polygonal transversal profile having sides with substantially straight development.

[0042] A peculiar feature of the welding device according to the invention is its capability to adapt to any shape of the winding of the metal wire 4 and in particular to any pitch of the winding spiral. In fact, thanks to the articulation 14, the grooved rollers 16 constrained to the metal wire 4 lead the rotation of the support frame 5 according to the axis of the articulation 14, in order to follow the inclination of the metal wire 4 in every kind of spiral winding, in particular in the case of variable winding pitch.

[0043] The welding member 6 is able to follow the joint between the bar 3 and the metal wire 4 thanks to the possibility to have a Cartesian movement according to two orthogonal axis, which allow to follow any curvilinear trajectory.

[0044] It must be noted that the claimed method and device allow the realization of the cages also starting from stirrups suitably spaced one another along the longitudinal bars. Furthermore, it is possible to realize so-called interrupted spiral cages, of the type illustrated for instance in Patent Application EP 1469135.

[0045] Materials adopted for the actual realisation of the invention, as well as their shapes and sizes, can be various, depending on the requirements.

[0046] Where technical features mentioned in any claims are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Welding method in machines for manufacturing metal cages for reinforced concrete, consisting of a series of longitudinal bars (3), arranged according to a prearranged geometrical profile and made integral through at least one metal wire (4), spiral-wound on the same bars (3) through the combination of a rotation movement around an axis coinciding with the axis of the cage (2) in formation and a translational one longitudinal according to said axis of the cage (2), **characterized in that** it comprises the phases of

- a. feeding said metal wire (4) in unwinding

- around said longitudinal bars (3) according to the orientation determined by said combined movement of rotation and translation;
- b. associating with said metal wire (4) guiding means (16) stressed by actuators (18) to maintain the same guiding means (16) in contact with said metal wire (4) and borne movable to follow said combined movement of rotation and translation of the said metal wire (4);
- c. approaching to said cage (2) in formation a welding member (6), oriented by said guiding means (16), to carry out the welding of one said longitudinal bar (3) to said metal wire (4);
- d. constraining said welding member (6) to the motion of said longitudinal bar (3) to be welded to said metal wire (4) to carry out said welding with substantially null relative motion.
2. Method according to claim 1, **characterized in that** it provides for individuating through said guiding means (16) the laying plan of said spiral defined by said metal wire (4), orientated in relation to the pitch of the same spiral determined by said combined movement of rotation and translation.
3. Method according to claim 1, **characterized in that** during said welding phase said guiding means (16) are kept circumferentially still compared with the longitudinal axis of said cage (2) in formation and they follow the orientation of said metal wire (4) to orientate the motion direction of said welding member (6) accordingly.
4. Machine for manufacturing metal cages for reinforced concrete, said cages consisting of a series of longitudinal bars (3), arranged according to a prearranged geometrical profile and made integral through at least one metal wire (4), spiral-wound on the same bars (3) through the combination of a rotation movement around an axis coinciding with the axis of the cage (2) in formation and a translational one longitudinal to said axis of the cage (2), **characterized in that** the machine comprises a welding device, said welding device comprising guiding means (16) suitable to engage said metal wire (4) in unwinding around said longitudinal bars (3) according to the orientation determined by said combined movement of rotation and translation and borne movable to follow the orientation of said metal wire (4) depending on said combined movement of rotation and translation; actuators (18) suitable to operate on said guiding means (16) to maintain the same guiding means (16) in contact with said metal wire (4); a welding member (6) oriented by said guiding means (16) and suitable to be approached to said cage (2) in formation, to operate the welding of one said longitudinal bar (3) to said metal wire (4); means (10) suitable to constrain said welding member (6) to said longitudinal bar (3) to be welded to said metal wire (4) in order to carry out said welding with a substantially null relative motion, during said welding phase said guiding means (16) being kept circumferentially still as to the longitudinal axis of said cage (2) in formation and following the orientation of said metal wire (4) to orientate the motion direction of said welding member (6) accordingly.
5. Machine according to claim 4, **characterized in that** said guiding means (16) are suitable to detect the laying plane of said spiral defined by said metal wire (4), oriented according to the pitch of the same spiral determined by said combined movement of rotation and translation.
6. Machine according to claim 4, **characterized in that** said guiding means (16) comprises at least one rolling member freely borne swivelling by support means (17) suited to be stressed by said actuators (18) to engage said metal wire (4) in unwinding.
7. Machine according to claim 6, **characterized in that** said guiding means (16) comprises a pair of said rolling members freely borne swivelling by respective arms (17) articulated to a support frame (5) by opposite parts as to said welding member (6).
8. Machine according to claim 4, **characterized in that** said actuators (18) consist of shock absorbers of fluid-dynamic type.
9. Machine according to claim 4, **characterized in that** said welding member (6) is suitable to operate said welding with material supply.
10. Machine according to claim 4, **characterized in that** said welding member (6) is borne free to autonomously move to follow the joint of said longitudinal bar (3) and said metal wire (4) in the welding phase, during said combined movement of rotation and translation.
11. Machine according to claim 10, **characterized in that** said welding member (6) is constrained to a first slide (7) sliding on a support frame (5) according to an axis substantially perpendicular to the longitudinal axis of said cage (2) in vertical formation and suited to be operated alternatively between and inactive position (7a), detached from said cage (2) in formation, and an active position (7b), approached to said cage (2) by the joint to realize between a longitudinal bar (3) and the said metal wire (4).
12. Machine according to claim 11, **characterized in that** said first slide (7) is mounted on said support frame (5) through the interposition of a second slide (11) sliding on the same support frame (5) in direction

substantially perpendicular to the motion direction of the said first slide (7) as consequence of the dragging action exerted by said means (10) suited to constrain said welding member (6) to said bar (3) to carry out said welding.

13. Machine according to claim 11, **characterized in that** said support frame (5) is constrained to a fixed framework through the interposition of an articulation (14) suited to allow the rotation of the same frame (5) according to an axis substantially perpendicular to the longitudinal axis of said cage (2) in formation.

14. Machine according to claim 4, **characterized in that** said means (10) suited to constrain said welding member (6) to said bar (3) to be welded to said metal wire (4) comprises a fork-shaped centring member adjacent to said welding member (6) and suited to engage said longitudinal bar (3).

Patentansprüche

1. Verfahren zum Schweißen in Apparaten zum Herstellen von Metallkörben für Stahlbeton, die aus einer Reihe von Längsstäben (3) bestehen, die gemäß einem vorbestimmten geometrischen Profil angeordnet und mit Hilfe von mindestens einem Metalldraht (4) fest miteinander verbunden werden, der mittels der Kombination einer Drehbewegung um eine mit der Achse des in Entstehung befindlichen Korbs (2) übereinstimmende Achse und einer Längsverschiebung bezogen auf diese Achse des Korbs (2) spiralförmig um die Stäbe (3) gewunden wird, **dadurch gekennzeichnet, dass** es die folgenden Phasen umfasst:

- Zuführen des um die Längsstäbe (3) gemäß der von der kombinierten Dreh- und Verschiebewegung bestimmten Ausrichtung abgewinkelten Metalldrahts (4);
- Verbinden dieses Metalldrahts (4) mit Führungsmitteln (16), die von Aktuormitteln (18) belastet werden, um diese Führungsmittel (16) in Kontakt mit dem Metalldraht (4) zu halten, und die beweglich getragen werden, um der kombinierten Dreh- und Verschiebewegung des Metalldrahts (4) zu folgen;
- Annähern eines Schweißelements (6), das von den Führungsmitteln (16) ausgerichtet wird, an den in Entstehung befindlichen Korb (2), um die Schweißung von einem Längsstab (3) an den Metalldraht (4) zu bewerkstelligen;
- Binden des Schweißelements (6) an die Bewegung des an den Metalldraht (4) zu schweißenden Längsstabs (3), um die Schweißung im Wesentlichen ohne Relativbewegung auszuführen.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** es das Bestimmen mit Hilfe der Führungsmittel (16) der Lageebene der Spirale vorsieht, die vom Metalldraht (4) definiert wird, der in Bezug auf die Steigung der Spirale ausgerichtet ist, die von der kombinierten Dreh- und Verschiebewegung bestimmt wird.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Führungsmittel (16) während der Schweißphase zirkumferenziell in Bezug auf die Längsachse des in Entstehung befindlichen Korbs (2) stillstehend gehalten werden und der Ausrichtung des Metalldrahts (4) folgen, um die Bewegungsrichtung des Schweißelements (6) entsprechend auszurichten.

4. Apparat zum Herstellen von Metallkörben für Stahlbeton, wobei diese Körbe aus einer Reihe von Längsstäben (3) bestehen, die gemäß einem vorbestimmten geometrischen Profil angeordnet und mit Hilfe von mindestens einem Metalldraht (4) fest miteinander verbunden werden, der mittels der Kombination einer Drehbewegung um eine mit der Achse des in Entstehung befindlichen Korbs (2) übereinstimmende Achse und einer Längsverschiebung bezogen auf diese Achse des Korbs (2) spiralförmig um die Stäbe (3) gewunden wird, **dadurch gekennzeichnet, dass** dieser Apparat eine Schweißvorrichtung umfasst, wobei diese Schweißvorrichtung Führungsmittel (16) umfasst, die geeignet sind, den um die Längsstäbe (3) gemäß der von der kombinierten Dreh- und Verschiebewegung bestimmten Ausrichtung abgewinkelten Metalldraht (4) in Eingriff zu nehmen, und die beweglich getragen werden, um der Ausrichtung des Metalldrahts (4) in Abhängigkeit von der kombinierten Dreh- und Verschiebewegung zu folgen; Aktuormittel (18), die geeignet sind, auf die Führungsmittel (16) einzuwirken, um diese Führungsmittel (16) in Kontakt mit dem Metalldraht (4) zu halten; ein Schweißelement (6), das von den Führungsmitteln (16) ausgerichtet wird und geeignet ist, an den in Entstehung befindlichen Korb (2) angenähert zu werden, um die Schweißung eines Längsstabs (3) an den Metalldraht (4) zu bewerkstelligen; Mittel (10), die geeignet sind, das Schweißelement (6) an den an den Metalldraht (4) zu schweißenden Längsstab (3) zu binden, um die Schweißung im Wesentlichen ohne Relativbewegung auszuführen, wobei die Führungsmittel (16) während der Schweißphase zirkumferenziell in Bezug auf die Längsachse des in Entstehung befindlichen Korbs (2) stillstehend gehalten werden und der Ausrichtung des Metalldrahts (4) folgen, um die Bewegungsrichtung des Schweißelements (6) entsprechend auszurichten.

5. Apparat nach Anspruch 4, **dadurch gekennzeichnet,**

net, dass die Führungsmittel (16) dazu geeignet sind, die Lageebene der Spirale zu bestimmen, die vom Metalldraht (4) definiert wird, der in Bezug auf die Steigung der Spirale ausgerichtet ist, die von der kombinierten Dreh- und Verschiebebewegung bestimmt wird.

6. Apparat nach Anspruch 4, **dadurch gekennzeichnet, dass** die Führungsmittel (16) mindestens ein Wälzelement umfassen, das frei drehbar von Tragmitteln (17) getragen werden, die geeignet sind, von den Aktuatormitteln (18) belastet zu werden, um den sich abwickelnden Metalldraht (4) in Eingriff zu nehmen. 10
7. Apparat nach Anspruch 6, **dadurch gekennzeichnet, dass** die Führungsmittel (16) ein Paar dieser Wälzelemente umfassen, die frei drehbar von entsprechenden Armen (17) getragen werden, die an einen Tragrahmen (5) auf entgegengesetzten Seiten bezogen auf das Schweißelement (6) angelenkt sind. 20
8. Apparat nach Anspruch 4, **dadurch gekennzeichnet, dass** die Aktuatormittel (18) aus Dämpferelementen des fluiddynamischen Typs bestehen. 25
9. Apparat nach Anspruch 4, **dadurch gekennzeichnet, dass** das Schweißelement (6) geeignet ist, die Schweißung mit Zufuhr von Material zu tätigen. 30
10. Apparat nach Anspruch 4, **dadurch gekennzeichnet, dass** das Schweißelement (6) derart frei getragen wird, dass es sich eigenständig bewegen kann, um der Verbindung des Längsstabs (3) und des Metalldrahts (4) in der Schweißphase während der kombinierten Dreh- und Verschiebebewegung zu folgen. 35
11. Apparat nach Anspruch 10, **dadurch gekennzeichnet, dass** das Schweißelement (6) an einen ersten Schlitten (7) gebunden ist, der auf einem Tragrahmen (5) gemäß einer im Wesentlichen zur Längsachse des vertikal in Entstehung befindlichen Korbs (2) perpendicularen Achse verschiebbar ist und alternativ zwischen einer inaktiven Position (7a), die von dem in Entstehung befindlichen Korb (2) abgerückt ist, und einer aktiven Position (7b), die an den Korb (2) in Entsprechung mit der herzustellenden Verbindung zwischen einem Längsstab (3) und dem Metalldraht (4) angenähert ist, betätigt werden kann. 40 45 50
12. Apparat nach Anspruch 11, **dadurch gekennzeichnet, dass** der erste Schlitten (7) mittels Einfügung eines zweiten Schlittens (11) auf den Tragrahmen (5) montiert ist, der auf demselben Tragrahmen (5) in einer im Wesentlichen zur Bewegungsrichtung des ersten Schlittens (7) perpendicularen Richtung infolge der von den Mitteln (10), die geeignet sind,

das Schweißelement (6) für die Ausführung der Schweißung an den Stab (3) zu binden, ausgeübten Schleppwirkung verschiebbar ist.

- 5 13. Apparat nach Anspruch 11, **dadurch gekennzeichnet, dass** der Tragrahmen (5) mittels Einfügung eines Gelenks (14), das geeignet ist, die Drehung des Rahmens (5) um eine im Wesentlichen zur Längsachse des in Entstehung befindlichen Korbs (2) perpendicularen Achse zuzulassen, an ein festes Gerüst gebunden ist. 10
14. Apparat nach Anspruch 4, **dadurch gekennzeichnet, dass** die zum Binden des Schweißelements (6) an den an den Metalldraht (4) zu schweißenden Stab (3) geeigneten Mittel (10) ein gabelförmiges Zentrierelement umfassen, das an das Schweißelement (6) angrenzt und geeignet ist, den Längsstab (3) in Eingriff zu nehmen. 15 20

Revendications

1. Méthode de soudage dans des machines pour réaliser des cages de métal pour béton armé, consistant en une série de barres (3) longitudinales, disposées selon un profil géométrique prédéterminé et rendues solidaires au moyen d'au moins un fil métallique (4), enroulé en spirale sur les mêmes barres (3) à travers la combinaison d'un mouvement de rotation autour d'un axe coïncidant avec l'axe de la cage (2) en formation et un mouvement de translation selon ledit axe de la cage (2), **caractérisée en ce qu'elle** comprend les étapes de
 - a. alimenter ledit fil métallique (4) en déroulement autour desdites barres (3) longitudinales selon l'orientation déterminée par ledit mouvement combiné de rotation et translation;
 - b. associer audit fil métallique (4) des moyens de guidage (16) sollicités par des actionneurs (18) pour maintenir les mêmes moyens de guidage (16) en contact avec ledit fil métallique (4) et portés mobiles pour suivre ledit mouvement combiné de rotation et translation dudit fil métallique (4);
 - c. approcher à ladite cage (2) en formation un organe de soudage (6), orienté par lesdits moyens de guidage (16), pour opérer le soudage d'une dite barre (3) longitudinale audit fil métallique (4);
 - d. contraindre ledit organe de soudage (6) au mouvement de ladite barre (3) longitudinale à souder audit fil métallique (4) pour opérer ledit soudage avec un mouvement relatif essentiellement nul.
2. Méthode selon la revendication 1, **caractérisée en**

- ce qu'elle prévoit de détecter au moyen desdits moyens de guidage (16) le plan de ladite spirale définie par ledit fil métallique (4), orienté en relation au pas de la même spirale déterminé par ledit mouvement combiné de rotation et translation.
3. Méthode selon la revendication 1, **caractérisée en ce que** durant ladite étape de soudage lesdits moyens de guidage (16) sont maintenus circonférentiellement arrêtés par rapport à l'axe longitudinal de ladite cage (2) en formation et ils suivent l'orientation dudit fil métallique (4) pour orienter la direction de mouvement dudit organe de soudage (6) en conséquence.
 4. Machine pour réaliser des cages de métal pour béton armé, lesdites cages consistant en une série de barres (3) longitudinales, disposées selon un profil géométrique prédéterminé et rendues solidaires au moyen d'au moins, un fil métallique (4), enroulé en spirale sur les mêmes barres (3) à travers la combinaison d'un mouvement de rotation autour d'un axe coïncidant avec l'axe de la cage (2) en formation et un mouvement de translation longitudinal audit axe de la cage (2), **caractérisée en ce que** ladite machine comprend un dispositif de soudage, ledit dispositif de soudage comprenant des moyens de guidage (16) propres à engager ledit fil métallique (4) en déroulement autour desdites barres (3) longitudinales selon l'orientation déterminée par ledit mouvement combiné de rotation et de translation et portés mobiles pour suivre l'orientation dudit fil métallique (4) en fonction dudit mouvement combiné de rotation et translation ; des actionneurs (18) propres à agir sur lesdits moyens de guidage (16) pour maintenir les mêmes moyens de guidage (16) en contact avec ledit fil métallique (4) ; un organe de soudage (6) orienté par lesdits moyens de guidage (16) et propres à être approchés à ladite cage (2) en formation, pour opérer le soudage d'une dite barre (3) longitudinale audit fil métallique (4) ; des moyens (10) propres à contraindre ledit organe de soudage (6) à ladite barre (3) longitudinale à souder audit fil métallique (4) pour opérer ledit soudage avec un mouvement relatif essentiellement nul, durant ladite étape de soudage lesdits moyens de guidage (16) étant maintenus circonférentiellement arrêtés par rapport à l'axe longitudinale de ladite cage (2) en formation et suivant l'orientation dudit fil métallique (4) pour orienter la direction de mouvement dudit organe de soudage (6) en conséquence.
 5. Machine selon la revendication 4, **caractérisée en ce que** lesdits moyens de guidage (16) sont propres à détecter le plan de ladite spirale définie par ledit fil métallique (4), orienté selon le pas de la même spirale déterminé par ledit mouvement combiné de rotation et translation.
 6. Machine selon la revendication 4, **caractérisée en ce que** lesdits moyens de guidage (16) comprennent au moins un organe de roulement porté librement tournants par des moyens de support (17) propres à être sollicités par lesdits actionneurs (18) pour engager ledit fil métallique (4) en déroulement.
 7. Machine selon la revendication 6, **caractérisée en ce que** lesdits moyens de guidage (16) comprennent une paire de dits organes de roulement portés librement tournants par des bras (17) respectifs articulés à un cadre de support (5) à des parties opposées par rapport audit organe de soudage (6).
 8. Machine selon la revendication 4, **caractérisée en ce que** lesdits actionneurs (18) sont constitués d'organes amortisseurs de type fluïdo-dynamique.
 9. Machine selon la revendication 4, **caractérisée en ce que** ledit organe de soudage (6) est propre à opérer ledit soudage avec apport de matériau.
 10. Machine selon la revendication 4, **caractérisée en ce que** ledit organe de soudage (6) est porté libre de se muer de façon autonome pour suivre le joint de ladite barre (3) longitudinale et dudit fil métallique (4) dans l'étape de soudage, durant ledit mouvement combiné de rotation et translation.
 11. Machine selon la revendication 10, **caractérisée en ce que** ledit organe de soudage (6) est contraint à un premier chariot (7) coulissant sur un cadre de support (5) selon un axe essentiellement perpendiculaire à l'axe longitudinale de ladite cage (2) en formation verticale et propre à être mise en mouvement alternativement entre une position inactive (7a), détachée de ladite cage (2) en formation, et une position active (7b), approchée à ladite cage (2) au niveau du joint à réaliser entre une barre (3) longitudinale et ledit fil métallique (4).
 12. Machine selon la revendication 11, **caractérisée en ce que** ledit premier chariot (7) est monté sur ledit cadre de support (5) à travers l'interposition d'un second chariot (11) coulissant sur le même cadre de support (5) en direction essentiellement perpendiculaire à la direction de mouvement dudit premier chariot (7) suite à l'action d'entraînement exercée par lesdits moyens (10) propres à contraindre ledit organe de soudage (6) à ladite barre (3) pour opérer ledit soudage.
 13. Machine selon la revendication 11, **caractérisée en ce que** ledit cadre de support (5) est contraint à un châssis fixe à travers l'interposition d'une articulation (14) propre à permettre la rotation du même cadre (5) selon un axe essentiellement perpendiculaire à l'axe longitudinal de ladite cage (2) en formation.

14. Machine selon la revendication 4, **caractérisée en ce que** lesdits moyens (10) propres à contraindre ledit organe de soudage (6) à ladite barre (3) à souder audit fil métallique (4) comprennent une organe de centrage à fourche adjacent audit organe de soudage (6) et propre à engager ladite barre (3) longitudinale.

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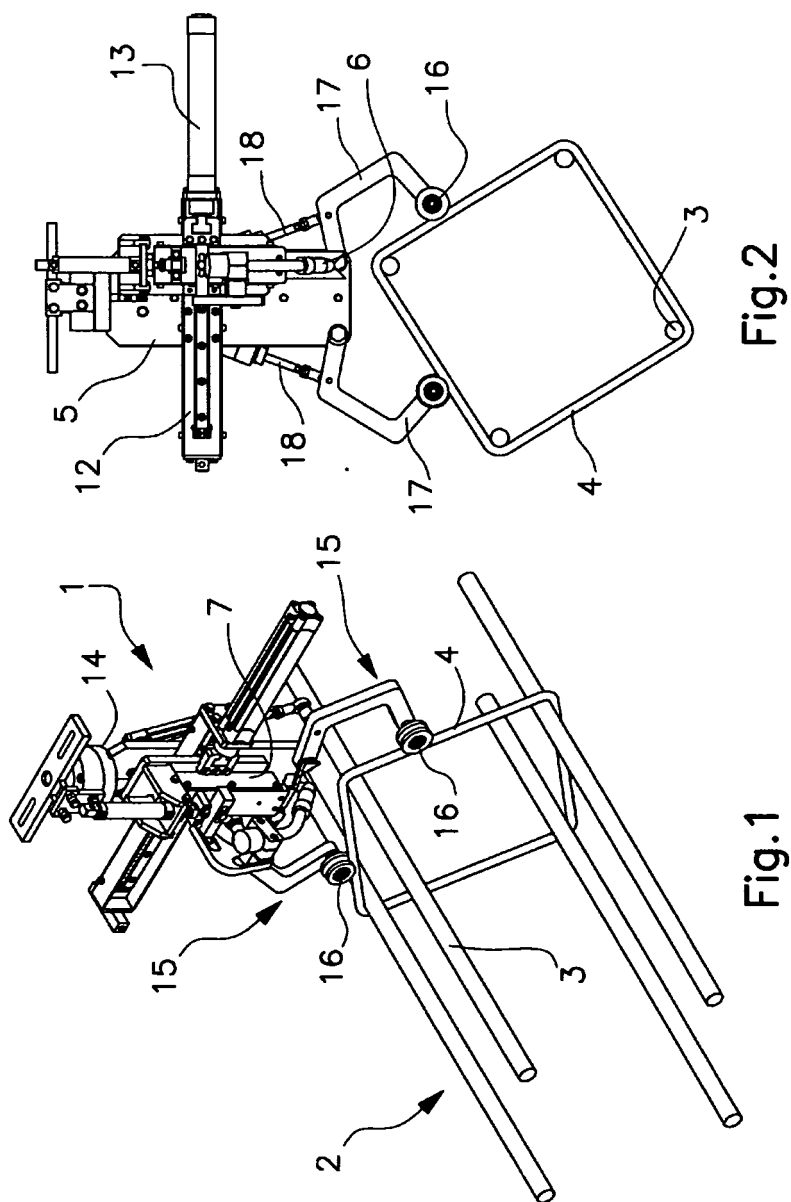
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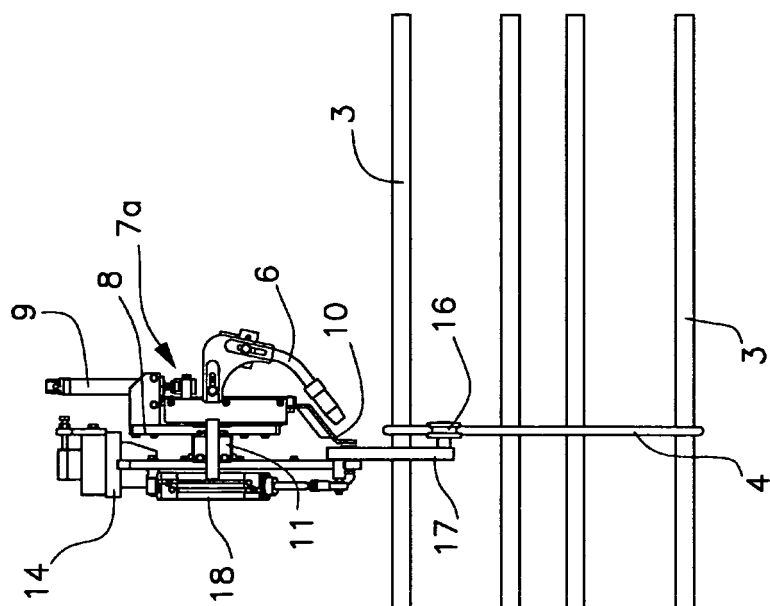


Fig.3

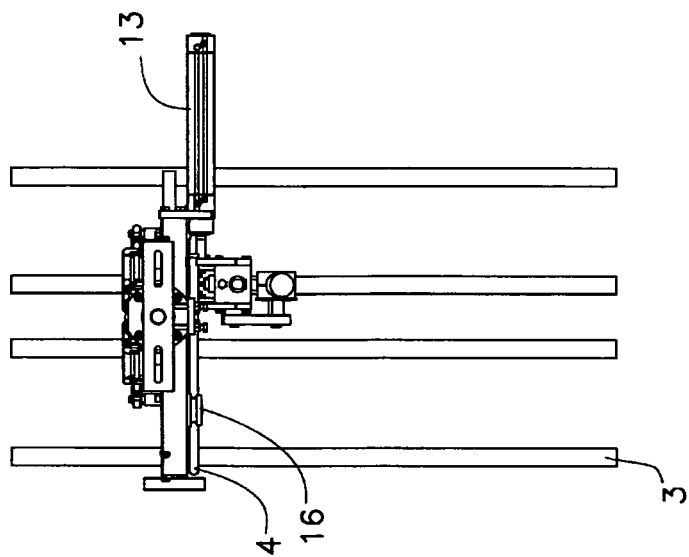


Fig.4

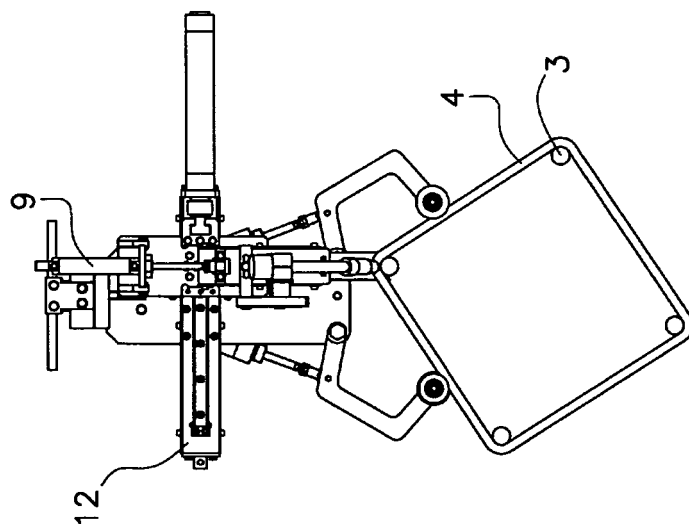


Fig.6

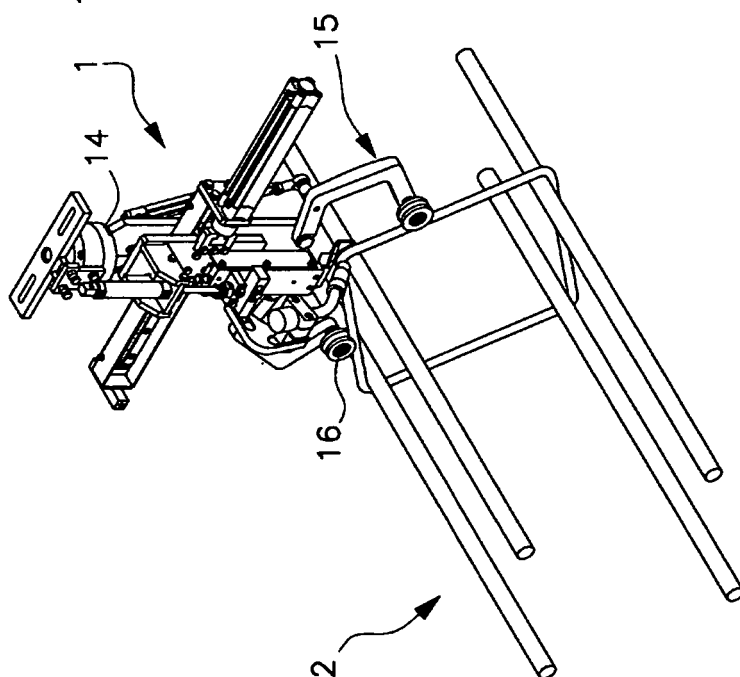


Fig.5

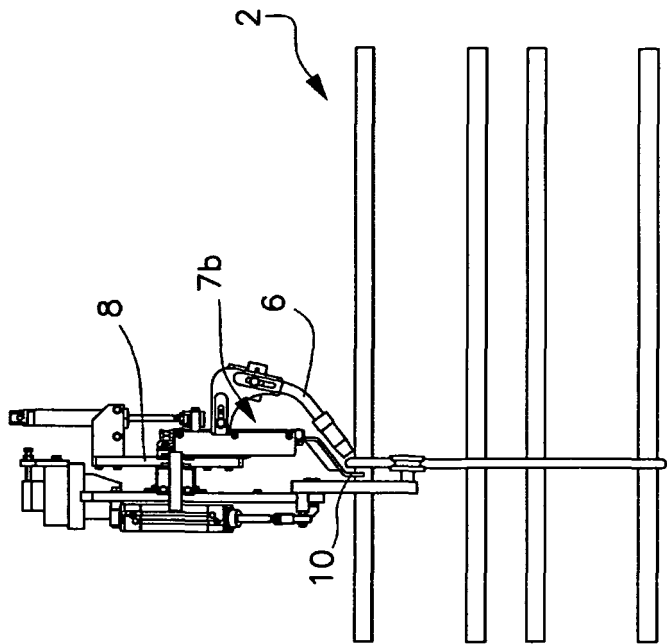


Fig.7

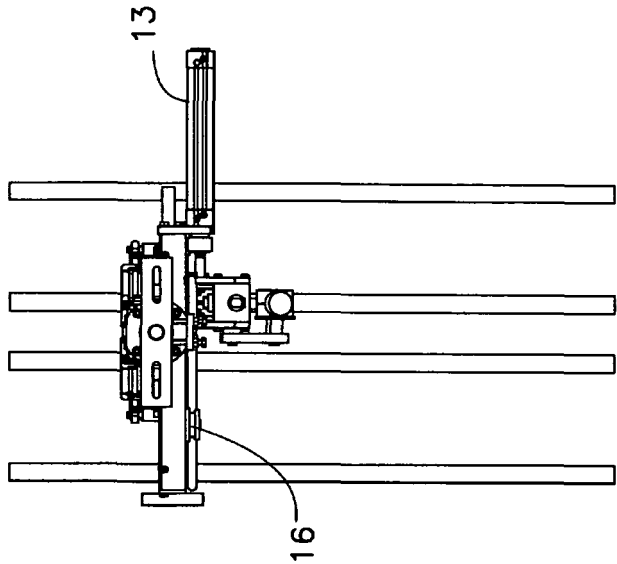


Fig.8

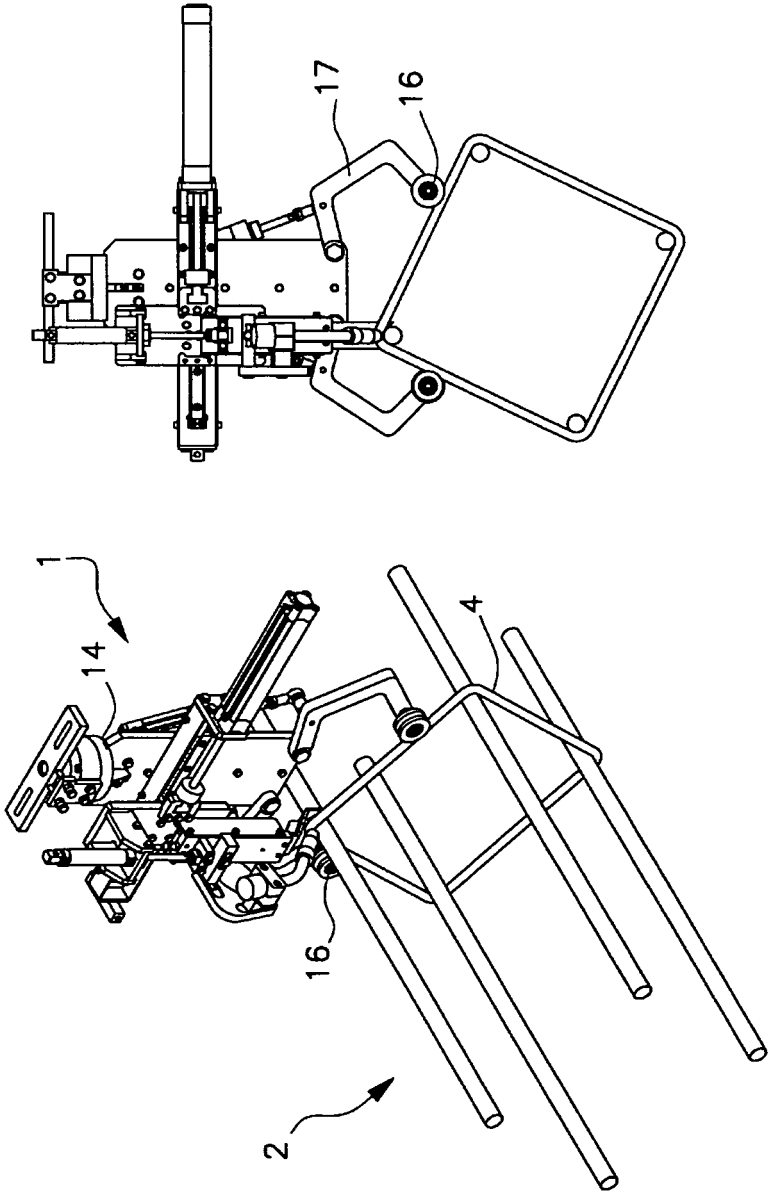


Fig.10

Fig.9

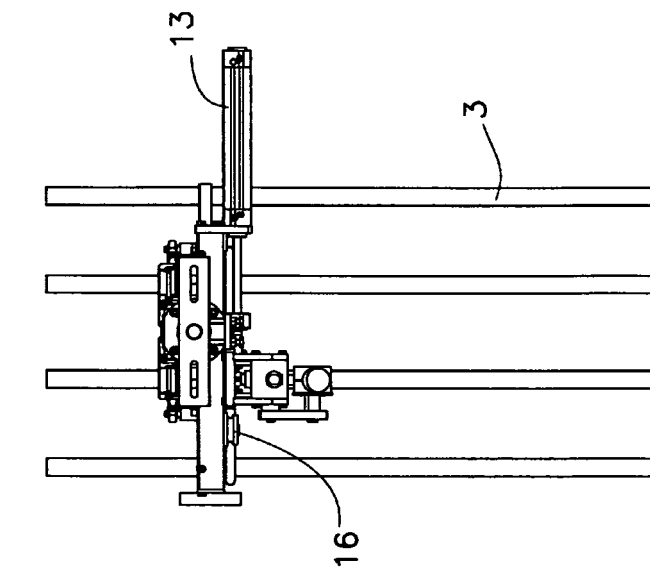


Fig. 11

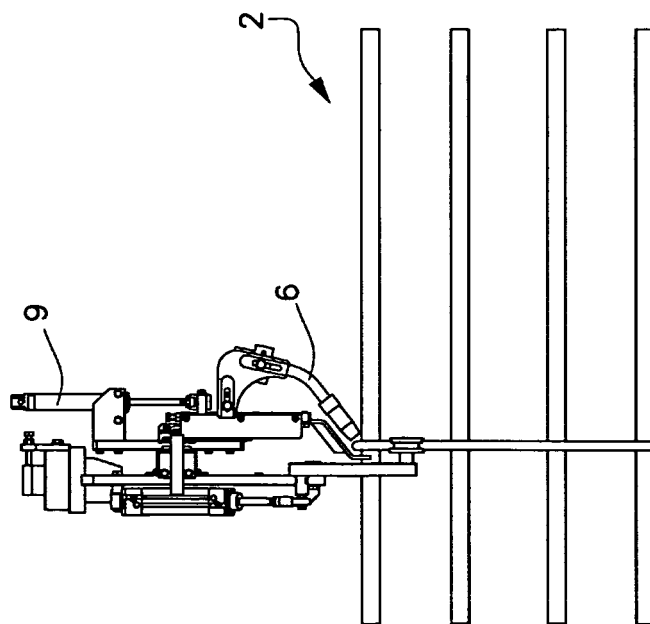


Fig. 12

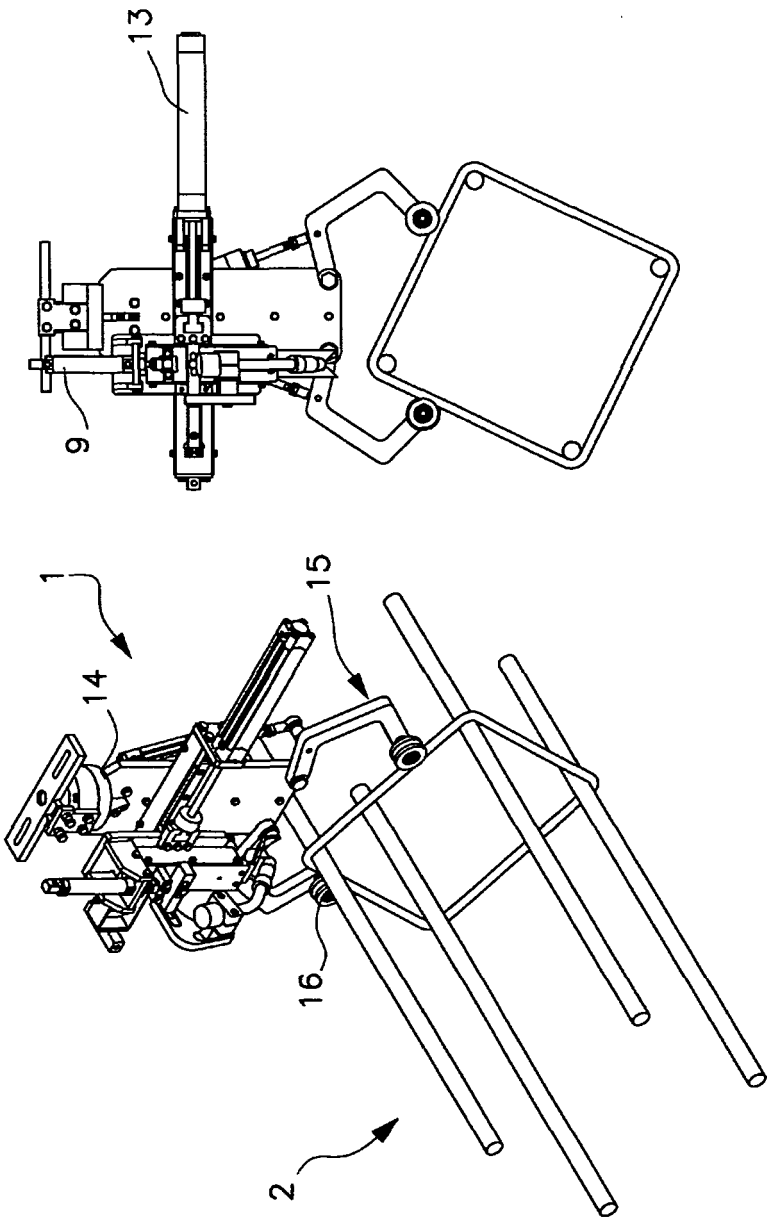


Fig.14

Fig.13

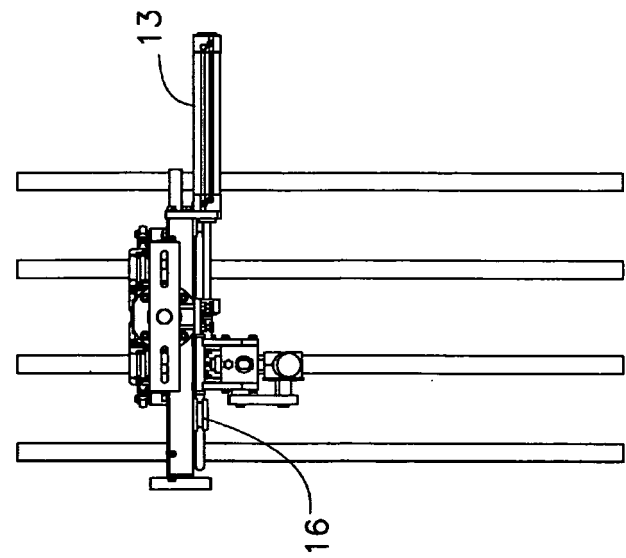


Fig.16

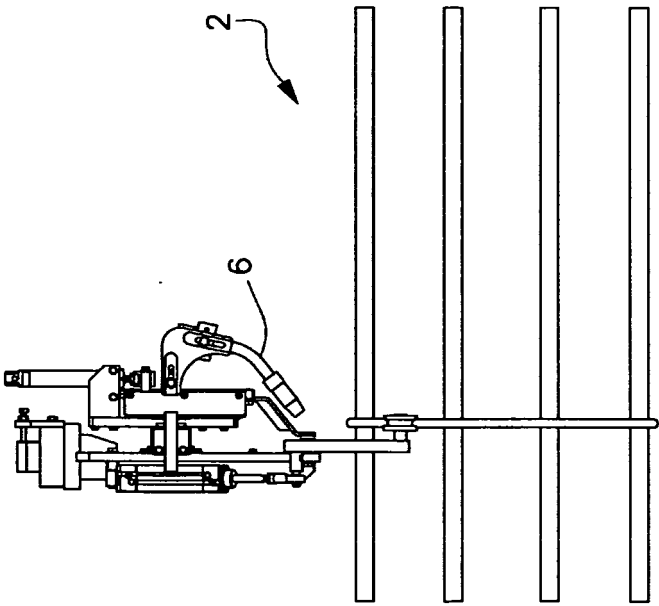


Fig.15

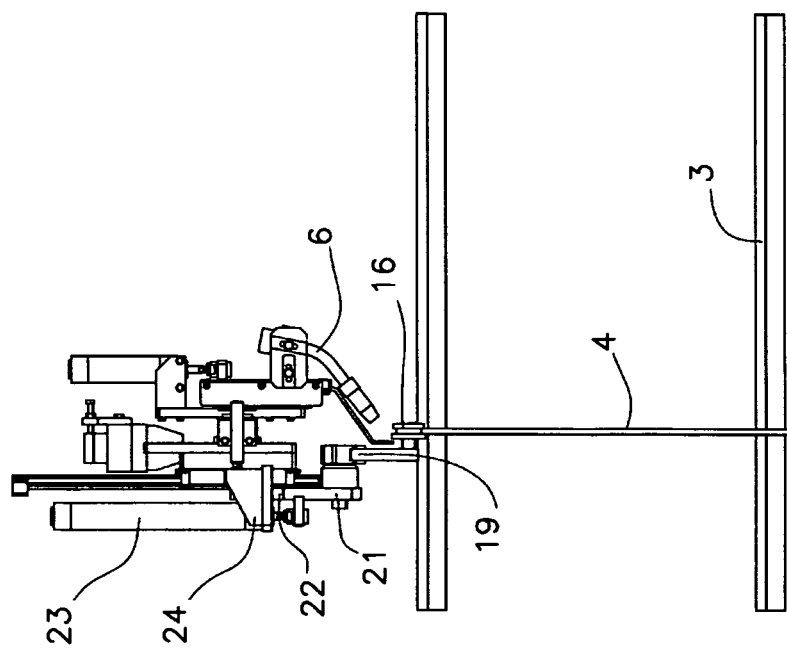


Fig.18

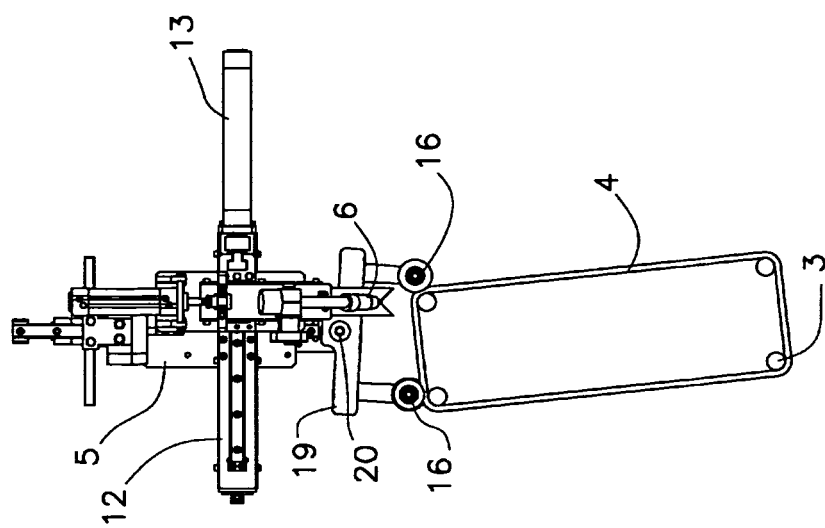


Fig.17

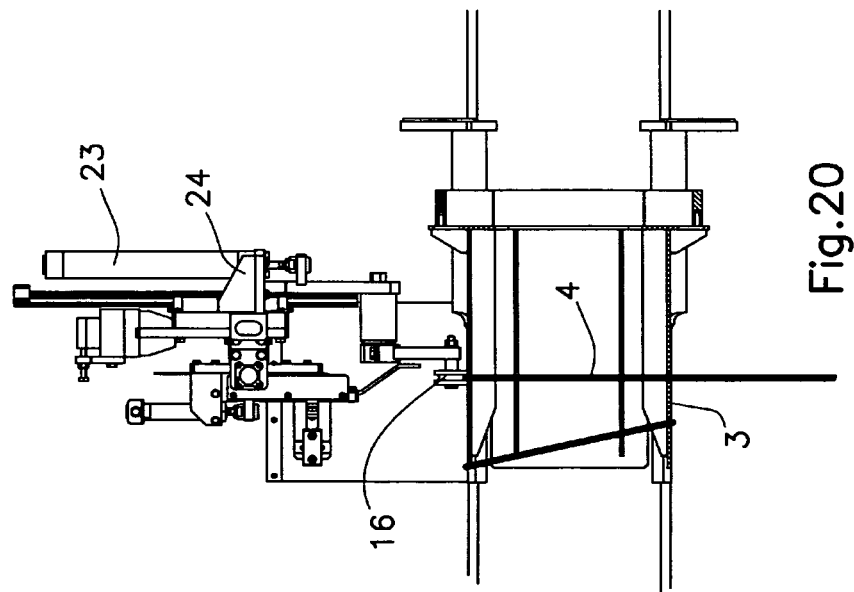


Fig. 20

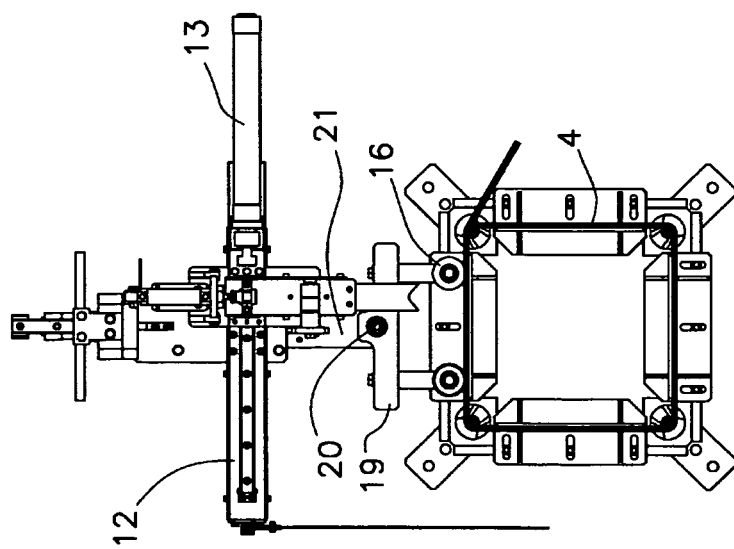
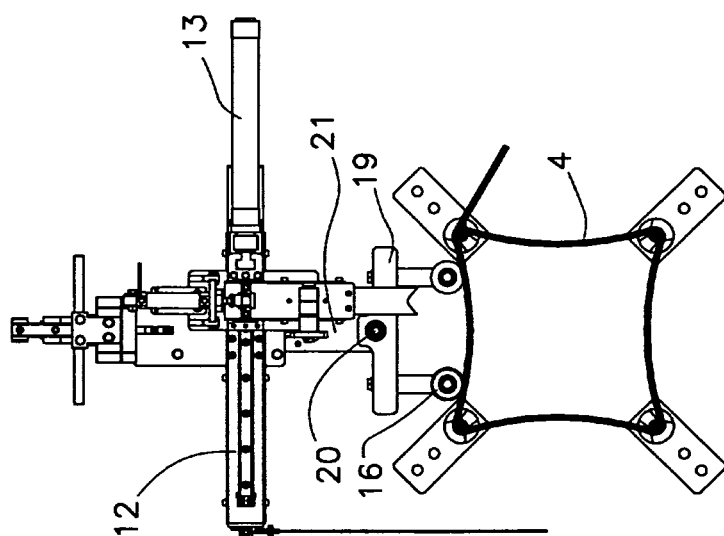
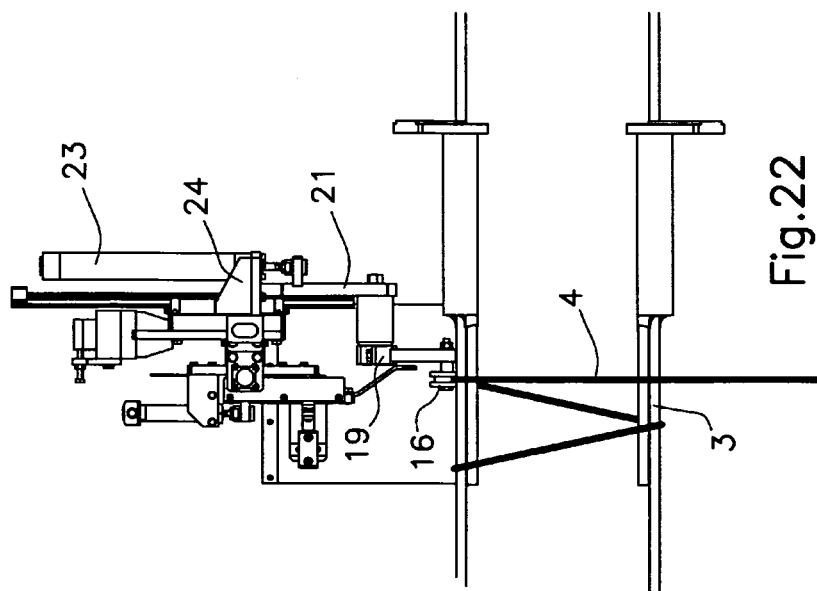


Fig. 19



REFERENCES CITED IN THE DESCRIPTION

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