(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 667 985 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
18.04.2018 Bulletin 2018/16

(21) Application number: **12705422.9**

(22) Date of filing: **20.01.2012**

(51) Int Cl.:
B21F 27/10 *(2006.01)* ***B21F 11/00*** *(2006.01)*

(86) International application number:
PCT/IB2012/050281

(87) International publication number:
WO 2012/101559 (02.08.2012 Gazette 2012/31)

(54) APPARATUS FOR MAKING A REINFORCEMENT MESH.

VORRICHTUNG ZUR HERSTELLUNG EINES VERSTÄRKUNGSNETZES

APPAREIL DE FABRICATION D'UN TREILLIS DE RENFORT

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **24.01.2011 IT BO20110020**

(43) Date of publication of application:
04.12.2013 Bulletin 2013/49

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(56) References cited:
EP-A1- 0 273 901
EP-A2- 1 177 851
WO-A1-2009/015401
DE-A1- 4 207 672
FR-A- 1 071 939

EP 2 667 985 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] This invention relates to an apparatus for making a reinforcement mesh.

Background Art

[0002] There are prior art apparatuses for making a reinforcement mesh comprising a plurality of longitudinal members and a plurality of transversal members which are joined to each other, the longitudinal and/or transversal members in particular taking the form of respective metal bars or wires, in particular made of steel, which are welded, in particular arc-welded, to each other to form the metal reinforcement mesh.

[0003] Said prior art apparatuses comprise means for positioning the transversal members of the mesh at the longitudinal members and means for joining the transversal members to the longitudinal members to form a longitudinally elongate mesh which is then cut to make a mesh having a predetermined length.

[0004] One problem seen in such prior art apparatuses relates to productivity, which is not as high as wanted. That productivity is also limited by the fact that the material to be processed, consisting of metal bars, is not ideal for handling and high operating speeds.

[0005] Moreover, a further requirement seen in the sector is that of maintaining the structure of pre-existing machines, so as to exploit economies of scale for implementing said apparatuses for making meshes.

[0006] An apparatus for making a reinforcement mesh according to the preamble of claim 1 is known e.g. from WO-A1-2009/015401.

Disclosure of the Invention

[0007] The aim of this invention is to provide a new solution as an alternative to the prior art solutions and, more specifically, to overcome or satisfy one or more of the above-mentioned disadvantages and requirements or those which may derive from the above.

[0008] Therefore, an apparatus according to claim 1 is provided. In this way, it is possible to achieve higher productivity and avoid speeding up the apparatus too much.

Brief Description of the Drawings

[0009] This and other innovative aspects of the invention are set out in the appended claims and the technical features and advantages of the invention are apparent from the detailed description which follows of a non-limiting example embodiment of it with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the rear part of a preferred embodiment of the apparatus made in accordance with this invention;

Figure 2 is a side view of the preferred embodiment of this apparatus;

Figure 3 is a side view of the front part of this embodiment of the apparatus;

Figure 4 is a cross-section of a detail of the side view of Figure 3, in particular illustrating means for joining the transversal members to the longitudinal members;

Figure 5 is a front view of the rear part of the front part of the apparatus, in particular illustrating means for joining the transversal members and the longitudinal members;

Figure 6 is a side view of the drawing means of this apparatus;

Figure 7 is a top plan view of the drawing means of this apparatus.

Detailed Description of the Preferred Embodiments of the Invention

[0010] The accompanying drawings illustrate a preferred embodiment 10 of an apparatus for making a reinforcement mesh 11', the mesh in particular having a predetermined length, and the mesh comprising a plurality of longitudinal members 13 which are parallel and coplanar with each other, and a plurality of transversal members 15 which are parallel and coplanar with each other, as well as being at right angles to the longitudinal members 13, and suitably joined to the longitudinal members 13.

[0011] The longitudinal members 13 and transversal members 15, in particular, take the form of respective metal bars or wires, in particular made of steel, which are welded, in particular arc-welded, to each other to form the metal reinforcement mesh.

[0012] As illustrated, the apparatus 10 comprises a supporting frame 12, means 14 for feeding the longitudinal members 13, means for positioning the transversal members 15 of the mesh at the longitudinal members 13, and means for joining the transversal members 15 to the longitudinal members to form a longitudinally elongate mesh 11, as well as means 24 for cutting a respective mesh 11' having a predetermined length from the longitudinally elongate mesh 11.

[0013] In particular, the feed means 14 for the longitudinal members are in the form of drawing means for the longitudinal members 13, which are fed from a respective magazine upstream of this apparatus.

[0014] The drawing means 14 also form thrust means for the elongate mesh 11 being processed and downstream of the drawing means 14.

[0015] In particular, the feed means 14 for the longitudinal members are designed to feed the longitudinal members and/or the elongate mesh 11 with an intermittent motion, alternating dwell steps with feed steps.

[0016] As may be inferred from Figure 7, the feed means are, in particular, formed by corresponding sliding

carriage means, in particular in the form of a first and a second sliding carriage 141, 142, which can move longitudinally between a respective back position for gripping the longitudinal members and a forward position for releasing the longitudinal members 13.

[0017] As illustrated, the first and second carriages 141, 142 are longitudinally aligned with each other and they are driven to move in opposite feed and return directions.

[0018] For the purpose of feeding the carriages 141, 142, which comprise respective grippers for grasping and releasing the longitudinal members 13 (not illustrated in detail in the accompanying drawings), there are shared actuator means comprising a chain 143, longitudinally elongate, and driven by a respective toothed driving gear 144, at one end of the chain, and guided by a further, driven gear 143' at the other end of the same chain, in such a way as to form respective longitudinal branches of the chain 143a, 143b, which can move longitudinally in opposite directions and to each of which a respective carriage 141, 142 is connected or fixed.

[0019] In practice, the drawing or feeding of the longitudinal members 13, that is to say, the thrust action on the longitudinal members and so also on the mesh 11 being formed downstream means that, while one respective carriage 141, 142 is gripping respective longitudinal members and feeding them longitudinally, a secondo carriage 141, 142 is performing its backward return step.

[0020] Corresponding means for gripping the longitudinal members are also provided at the joining means 19, in such a way as to hold the longitudinal members 13 still during the dwell step and joining of the transversal members 15 to the longitudinal members 13.

[0021] As illustrated, in particular in Figures 6 and 7, the feed means 14 are supported on a respective frame 11a, which also supports, at an upstream zone, units for straightening the longitudinal members, which are normally labelled 145 and which are not, in any case, fully shown in the accompanying drawings, since they are covered by a corresponding protective grille 146.

[0022] Moreover, the feed means 14 are connected to the remaining part of the apparatus which preferably comprises joining means 19 and cutting means 24 for a mesh 11' which has a predetermined length, as well as respective positioning means 18, and which is illustrated in Figure 3 and they are also able to move or be shifted longitudinally relative to the latter, sliding on corresponding tracks 12b, 12b, illustrated in Figure 1, thanks to respective rollers 12c provided at the lower end of the respective frame 12a of the drawing or feed means.

[0023] That allows disengagement, when required, of the feed means 14 from the remaining upstream part of the apparatus, so as to allow access to the operating zones, in particular to the joining means 19 and the performance of corresponding maintenance or mounting operations.

[0024] In practice, the frame 12 comprises a downstream supporting frame 12d for the joining means 19 and the cutting means 24, and an upstream supporting frame 12a for the longitudinal member 13 gripping and feed means 14.

[0025] In practice, the supporting frame 12a for the longitudinal member feed means 14 is provided, according to the direction of feed of the longitudinal members 13 and of the elongate mesh 11, upstream of the supporting means for the joining means 19.

[0026] The supporting means 12a for the longitudinal member feed means 14 can move longitudinally relative to the supporting means 12d for the joining means 19, between a position in which they are close to an joined with the part 12d of the apparatus which is downstream and a position far from said part 12d.

[0027] As illustrated, the mobile frame 12a comprises corresponding means 12'a for hooking to corresponding means 12'd located on the frame 12d for the joining means 19.

[0028] Advantageously, the means for positioning the transversal members 15 at the longitudinal members 13, in particular on top of the longitudinal members 13, comprise first means 16 for positioning a first transversal member of the mesh 15 at the longitudinal members 13, and second means 18 for positioning as second transversal member 15 at the longitudinal members 13.

[0029] In practice, with each dwell in the feeding of the longitudinal members 13, the first and second positioning means 16, 18 position a respective crosspiece, or transversal member, 15 on the longitudinal members 13.

[0030] In this way, it is possible to increase the productivity of the apparatus, without the need to excessively increase the feed speed of the entire apparatus, thus avoiding malfunctions which would be caused in operating conditions that would be at the limit of the capacity of the apparatus.

[0031] Advantageously, the first positioning means 16 and the second positioning means 18 are designed to position, at the longitudinal members 13 of the mesh, a first and a second transversal member 15, 15 of the mesh simultaneously, or substantially simultaneously, as may be inferred in particular from Figure 4.

[0032] In particular, the first positioning means 16 and the second positioning means 18 are designed to rest the respective transversal member 15, 15 of the mesh on top of the longitudinal members 13 of the mesh.

[0033] In practice, the first positioning means 16 and the second positioning means 18 are designed to position at, or on top of, the longitudinal members 13 of the mesh, a first and a second transversal member 15, 15 of the mesh at the same stop step in the feed of the longitudinal members 13 of the mesh.

[0034] In practice, the positioning means comprise first positioning means 16 located upstream and second positioning means 18 located downstream according to the longitudinal direction of feed of the longitudinal members 13.

[0035] Moreover, advantageously, the apparatus comprises positioning means, in particular first positioning

means 16, located upstream, according to the longitudinal direction of feed of the longitudinal members 13, of a respective joining zone or joining means 19.

[0036] Moreover, the positioning means, in particular the second positioning means 18, are located downstream, according to the longitudinal direction of feed of the longitudinal members 13, of a respective joining zone or joining means 19.

[0037] The upstream positioning means, in particular the first positioning means 16, can be moved between a position close to the joining zone or means 19 and a positioned distanced from the joining zone or means 19.

[0038] In particular, as illustrated, the upstream positioning means 16 can be moved longitudinally, in particular between a position close to the joining zone 19 and a positioned distanced from it.

[0039] The distanced position is a position such that it allows the passage of an operator or a person between the positioning means 16 in the distanced position and the joining zone 19, so as to perform maintenance operations or deal with a malfunction.

[0040] In particular, and advantageously, the upstream positioning means, in particular the first positioning means 16, are supported on the supporting means 12a for the longitudinal member feed means 14.

[0041] In this way, if the feed means 14 move, the upstream positioning means 16 also move.

[0042] As may be inferred, in particular from Figure 4, the means for joining the transversal and longitudinal members of the mesh comprise first means 20 for joining a first transversal member 15 to the longitudinal members 13 and second means 22 for joining a second transversal member 15 to the longitudinal members 13 of the mesh.

[0043] In particular, the first joining means 20 and the second joining means 22 are designed to join the first and second transversal members 15, 15 to the longitudinal members 13 of the mesh simultaneously, or substantially simultaneously.

[0044] As shown in Figure 4, even the joining means comprise first joining means 20 located upstream and second joining means 22 located downstream according to the longitudinal direction of feed of the longitudinal members 13.

[0045] Moreover, as may be inferred from Figure 4, the positioning means 16, 18 comprise respective means 161, 181 for conveying the transversal members towards a joining position.

[0046] Said means 161 for conveying the transversal members towards a joining position, in particular the conveyor means of the first positioning means, or upstream positioning means, convey the transversal members according to the longitudinal direction of feed of the longitudinal members 13.

[0047] Moreover, the means 181 for conveying the transversal members 15, in particular the conveyor means of the second positioning means, or downstream positioning means, convey the transversal members 15 according to a direction opposite to the direction of feed of the longitudinal members 13.

[0048] Moreover, both of the means 161, 181 for conveying the transversal members 15 towards a respective joining position convey the transversal members 15 downwards.

[0049] As illustrated, the conveyor means 161, 181 for the transversal members comprise a respective chute 161, 181 with a surface, in particular an upper surface, on which the transversal members 15 can engage and slide.

[0050] The chute, or the conveyor means 161, 181 extends, in particular in a straight line or linear configuration, between a position for picking up the respective transversal member 15 and a position for releasing the transversal member 15 at the respective joining zone.

[0051] As illustrated, the respective chute 161, 181 is angled downwards, forming a respective angle to the horizontal.

[0052] The positioning means, that is to say, both the upstream positioning means, or first positioning means 16, and the downstream positioning means, or second positioning means 18, comprise respective loading means, in particular in the form of a respective hopper which is open at the top, located at 162, 182.

[0053] There are, not illustrated in detail in the accompanying drawings, means, or a loader, for sequentially passing the transversal members 15 from the respective loading means, or hopper, 162, 182, to the conveyor means, or chute, 161, 181.

[0054] At the chutes, or angled conveyor means 161, 181, in particular at a zone which is a predetermined distance from their transfer end, which substantially coincides with an intermediate zone of the path formed by the respective chute, there are means for stopping and releasing the feed or sliding of a respective transversal member 15 towards the respective joining position. However, these means for stopping and releasing the transversal member are not illustrated in detail in the accompanying drawings.

[0055] Moreover, advantageously there are means 26, 28 for retaining the transversal member 15 in the zone, in particular in the position, for joining, or welding to the longitudinal members 13.

[0056] Advantageously, the retaining means comprise permanent magnet means 26, 28.

[0057] The retaining means 26, 28 are, in particular, at the transversal member 15 releasing end of the respective positioning means 16, 18.

[0058] In particular, the retaining means 26 are downstream of the conveyor means 161 of the first positioning means, or upstream positioning means 16.

[0059] In particular, the retaining means 28 are upstream of the conveyor means 181 of the second positioning means, or downstream positioning means 18.

[0060] In particular, as illustrated, the transversal member 15 retaining means 26, 28 can move vertically, as illustrated by the arrows in Figure 4.

[0061] In particular, the retaining means 26, 28 for the

transversal members 15 can move between a raised position for receiving the transversal member 15 from the respective positioning means, and for free passage of the transversal member 15, previously joined to the longitudinal members 13 in the downstream direction, after it has been joined to the longitudinal members 13, and a lowered position for placing the respective transversal member 15 at the position for joining to the longitudinal members 13.

[0062] In practice, in particular, there are upstream retaining means 26 for retaining a corresponding first transversal member 15 and downstream retaining means 28 for retaining a corresponding second transversal member 15.

[0063] As may be inferred from Figure 5, which shows the upstream retaining elements 26, and equally for the downstream retaining elements 28, the retaining means comprise a plurality of retaining elements 26, 28 which are distributed transversally to the apparatus, in particular at the joining or welding gantry 19.

[0064] The retaining means for the transversal member 15, in particular the respective retaining element, comprise a respective face 26a, 28a for engaging with and retaining the transversal member, or crosspiece, 15 of the mesh.

[0065] Said face 26a for engaging with and retaining the transversal member 15 faces upstream, or backwards, relative to the apparatus.

[0066] Moreover, the face 28a of the second retaining means for the transversal member 15 faces downstream, or forwards, relative to the apparatus.

[0067] In practice, the upstream retaining means comprise a respective face of a permanent magnet element which faces downstream and receives by engagement and retains a respective transversal member 15 released by the first, upstream positioning means 16, while the downstream retaining means 28 comprise a respective permanent magnet element 28 having a respective face 28a facing downstream towards the second, downstream positioning means 18.

[0068] The retaining means 26, 28 for retaining the transversal member 15 at the joining zone are supported by respective joining means 20, 22, in particular by the respective upstream joining means 20 and the respective downstream joining means 22.

[0069] Moreover, the retaining means 26, 28 for retaining the transversal member 15 in the joining zone are integral with the respective joining means 20, 22.

[0070] Moreover, there are supporting means for the retaining means 26, 28 which retain the transversal member 15 in the joining zone, said supporting means comprising means designed to electrically isolate the retaining means 26, 28 from the joining means 20, 22.

[0071] In particular, the retaining means 26, 28 for the transversal member 15 are supported by, or integral with, the mobile joining means 19a, 19a, as is explained in more detail below.

[0072] Moreover, the retaining means 26, 28 for retaining the transversal member 15 in the joining zone are supported by, or integral with, the respective upper joining means.

[0073] As may be inferred particularly from Figure 4, the retaining means 26, 28 for the transversal member 15 project perpendicularly beyond, in particular below, the surface, in particular the horizontal surface 191, of the joining means 20, 22, which forms the surface that engages with and pushes the transversal member 15 against the longitudinal members 13 of the mesh.

[0074] The retaining means 26 for the respective transversal member 15 are, in the joining position, located downstream, according to the direction of feed of the longitudinal members and of the elongate mesh 11, and substantially coplanar with the respective transversal member 15.

[0075] In turn, the retaining means 28 for the respective transversal member 15 are, in the joining position, located upstream, according to the direction of feed of the longitudinal members and of the elongate mesh 11, and substantially coplanar with the respective transversal member 15.

[0076] Moreover, the retaining means 28 are, in the joining position, located downstream, according to the direction of feed of the longitudinal members and of the elongate mesh 11, and substantially coplanar with the transversal member 15 retained by the upstream first retaining means 26.

[0077] The retaining means 26, 28 for retaining the transversal member 15 in the joining zone also comprise, not illustrated in detail, a holder for housing a plate of a permanent magnet, the holder being formed by a respective supporting body made of electrically insulating material.

[0078] The holder for the plate made of magnetic material, forming the face for engaging with and retaining the transversal member 15, may also comprise an end wall, in particular vertical, on which the magnetic plate is rested.

[0079] Moreover, there are means for retaining the magnetic plate in the holder, in particular comprising an edge on the outside of the end wall and having a respective inner engagement lip for the corresponding outer lateral edge of the magnetic plate.

[0080] In particular, the retaining plate is made in the form of a plate which substantially has a quadrangular or rectangular shape.

[0081] As illustrated, in particular in Figure 5, the retaining elements 26, 28 for retaining the transversal member 15 in the joining zone are transversally interposed between corresponding joining electrodes, as explained in more detail below.

[0082] As may be inferred from Figures 4 and 5, advantageously, the joining means 19 comprise opposite welding electrodes 19a, 19b, respectively upper and lower, for engaging with the transversal member 15 and the longitudinal members 13, the electrodes being connected to respective poles of corresponding electric trans-

formers 19c, through a block, or shaped plate, made of conducting material 19d.

[0083] In this way, it is possible to define a conducting path for the electric current which is suitable and has reduced extension and which allows reduced power dispersion compared with the prior art joining means, which in contrast use flexible cables to connect the poles of the transformer to the joining electrodes and which therefore require the use of increased electric power for joining or welding.

[0084] Advantageously, the block of conducting material 19d comprises an inner cavity 19e for the passage of a respective fluid, in particular a cooling liquid.

[0085] Advantageously, a respective transformer 19c is connected to corresponding joining electrodes 19a, 19b and 19a, 19b, both of the first and of the second joining means 26, 28.

[0086] As illustrated, the respective transformer 19c is positioned below the joining electrodes, in particular below the lower joining or welding electrodes 19b.

[0087] As illustrated, the block of conducting material 19d directly supports the conducting means or elements 19'b supporting the lower joining electrodes 19b.

[0088] The block of conducting material 19d is also suitably connected to conducting means or elements 19'a supporting the upper, or mobile, joining electrodes 19a.

[0089] As illustrated, the joining means are supported on a gantry structure comprising respective lateral uprights 19', 19' and an upper crossbeam 19".

[0090] Moreover, there are means 19f, in particular in the form of respective pneumatic cylinders, for driving the movement of the mobile electrodes, in particular between a lowered position for engagement and welding and a raised position for disengagement and free forward sliding of the longitudinal members and/or of the elongate mesh.

[0091] As illustrated in Figures 1 to 3, the actuator means or cylinders 19f are supported on the upper crossbeam 19" of the welding gantry 19.

[0092] As illustrated, in particular, three transformers 19c are used and six actuator cylinders 19f for the mobile electrodes.

[0093] In particular, as illustrated, the supporting elements for the electrodes of respective pairs of cylinders 19f, 19f are connected to each other electrically through a respective connection 19'f, so that they can suitably be powered by a respective electric transformer.

[0094] In practice, as illustrated, there is a respective plurality, or transversal row, of actuator cylinders 19f.

[0095] In practice, this apparatus comprises a respective movement actuator cylinder 19f, in particular for driving the vertical movement, of the upper or mobile electrodes 19a, of both the first and second joining means 20, 22.

[0096] As illustrated, each electrode holder block 19'a, 19'b supports a plurality of corresponding electrodes 19a, 19b transversally aligned with each other.

[0097] As illustrated, there are means 24 for cutting a mesh 11' from the elongate mesh 11 being processed, the cutting means being able to move longitudinally relative to the joining means 19, for adopting a suitable cutting position, in particular variable and selectable depending on the pitch or distance between the crosspieces or transversal members 15 of the respective mesh.

[0098] In particular, as illustrated, the cutting means 24 can be moved on respective longitudinal guides 24a at the upper part of the respective supporting means 12d, supporting the joining means 19 and the second positioning means 18 for the transversal members 15.

[0099] There are suitable actuator means for driving the longitudinal movement of the cutting means, or cutter, 24, which are in the form of a corresponding pneumatic cylinder, although this is not illustrated in detail in the accompanying drawings.

[0100] In practice, the cutting means 24 can be moved longitudinally to the apparatus, or longitudinally relative to the joining means 19, to adjust the position of the cutting means to the size of the mesh, or to the required pitch between the transversal members 15 of the mesh.

[0101] In particular, the cutting means may be moved longitudinally automatically, controlled by respective apparatus electronic control means.

[0102] There are also, advantageously, means designed to modify, or to adjust, the longitudinal distance, or pitch, present between the transversal members 15 of the mesh, in particular providing a size change-over for the metal mesh being produced.

[0103] For this purpose, for a size change-over, at the first and second joining elements 20, 22 corresponding electrodes 19a, 19b are positioned, which are suitable for welding transversal members 15 placed at a suitable and corresponding longitudinal distance.

[0104] In practice, for the size change-over, at the first and second joining elements 20, 22 corresponding electrodes 19a, 19b are positioned, which have a respective surface for engagement with the transversal and longitudinal member which are at a suitable and corresponding longitudinal distance from each other.

[0105] There are also means for lateral engagement and centring of the transversal members 15, labelled 30 in Figures 4 and 5, which extend, or are distributed longitudinally, so that they can engage with the respective crosspiece or transversal member 15 at a respective longitudinal position relative to a central position 30' of the joining means 19.

[0106] In particular, there is a plurality of surfaces for lateral engagement and centring 30, distributed longitudinally.

[0107] Advantageously, there are means 16, 18 for positioning the transversal members 15, 15, the positioning means being able to move longitudinally relative to the joining means 19.

[0108] In particular, there are first positioning means 16 able to move longitudinally relative to the joining means 19.

[0109] There are also second, downstream positioning means 18, able to move longitudinally relative to the joining means 19.

[0110] In particular, the respective positioning means 16, 18 can move longitudinally, sliding on respective longitudinal guides 20', 24a, in particular at the upper part of the respective supporting means 12a, 12d, or on the supporting means 12a of the feed means 12, or upstream supporting means, and on the downstream supporting means 12d which support the joining means and the cutting means 24.

[0111] In particular, the downstream positioning means 18 can move longitudinally on respective longitudinal guides 24a belonging to the cutting means 24.

[0112] Advantageously, the positioning means 16, 18 can move longitudinally to regulate the pitch of the transversal members 15 of the mesh being processed.

[0113] In practice, the respective positioning means 16, 18 can move by sliding on respective longitudinal guides 20', 24a, and can be locked on said guides, in the respective longitudinal operating position, using corresponding locking means or brakes, in particular in the form of pneumatically-controlled brakes, which are not illustrated in detail in the accompanying drawings.

[0114] The invention described is susceptible of industrial application. It would be obvious to one skilled in the art that several changes and modifications can be made to the invention without departing from the scope of the invention, as defined by the appended claims.

Claims

1. An apparatus (10) for making a reinforcement mesh (11'), the mesh comprising a plurality of longitudinal members (13) and a plurality of transversal members (15) which are joined to each other, the longitudinal and/or transversal members in particular taking the form of respective metal bars or wires, in particular made of steel, which are welded, in particular arc-welded, to each other to form the metal reinforcement mesh; the apparatus comprising means for positioning the transversal members (15) of the mesh at the longitudinal members (13) and mobile means for joining the transversal members (15) to the longitudinal members (13) to form a longitudinally elongate mesh (11); the positioning means comprising first means (16) for positioning a first transversal member (15) of the mesh at the longitudinal members (13) and second means (18) for positioning a second transversal member (15) at the longitudinal members (13); the apparatus comprising retaining means (26, 28) for retaining the transversal member (15) in the zone for joining to the longitudinal members (13); the first positioning means (16) and the second positioning means (18) are designed to rest the respective transversal member (15, 15) of the mesh on top of the longitudinal members (13) of the mesh; the retaining means (26, 28) for the transversal members (15) can move between a position for receiving the transversal member and free passage of the transversal member (15) previously joined to the longitudinal members in the downstream direction beyond the retaining means (26, 28), and a position for placing the respective transversal member (15) at the position for joining to the longitudinal members (13); **characterised in that** the retaining means (26, 28) for retaining the transversal member (15) in the joining zone are supported by, or integral with, the mobile joining means.

2. The apparatus according to claim 1, **characterised in that** the first positioning means (16) are located upstream of a respective joining zone (19) and the second positioning means (18) are located downstream of a respective joining zone (19).

3. The apparatus according to any of the foregoing claims, **characterised in that** the positioning means (16, 18) comprise first and second means (161, 181) for conveying the transversal members towards a joining position; in particular said first and second conveyor means (161, 181) for the transversal members (15) are adapted to convey the transversal members (15) downwards; preferably the first and second conveyor means (161, 181) comprise a respective chute (161, 181) with a surface on which the transversal members (15) can engage and slide.

4. The apparatus according to claim 3, **characterised in that** the fist means (161) for conveying the transversal members (15) towards a joining position are adapted to convey the transversal members (15) in the direction of feed of the longitudinal members (13); **in that** the second means (181) for conveying the transversal members (15) towards a joining position are adapted to convey the transversal members (15) in a direction opposite to the direction of feed of the longitudinal members (13).

5. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means comprise respective permanent magnet means (26, 28).

6. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for the transversal members (15) are at the releasing end of the respective positioning means (16, 18).

7. The apparatus according to any of the foregoing claims, **characterised in that** it comprises upstream retaining means (26) for retaining a corresponding first transversal member (15) and downstream retaining means (28) for retaining a corresponding sec-

ond transversal member (15); each comprising a plurality of retaining elements (26, 28) which are distributed transversally.

8. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for the transversal member (15) comprise a face (26a, 28a) for engaging with and retaining the transversal member (15).

9. The apparatus according to claim 8, **characterised in that** the respective face (26a, 28a) for engaging with and retaining the transversal member (15) faces upstream and/or downstream.

10. The apparatus according to any of the foregoing claims, **characterised in that** it comprises supporting means for the retaining means (26, 28) which retain the transversal member (15) in the joining zone, said supporting means comprising means designed to electrically isolate the retaining means (26, 28) from the joining means.

11. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for retaining the transversal member (15) in the joining zone are supported by, or integral with, the upper joining means.

12. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for retaining the transversal member (15) in the joining zone project perpendicularly beyond, in particular below, the surface of the respective joining means which is adapted to engage with and push the transversal member (15) against the longitudinal members (13) of the mesh.

13. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for retaining the transversal member (15) in the joining zone are transversally interposed between corresponding joining electrodes.

14. The apparatus according to any of the foregoing claims, **characterised in that** the retaining means (26, 28) for retaining the transversal member (15) in the joining zone comprise a holder for housing a plate made of magnetic material.

15. The apparatus according to any of the foregoing claims, **characterised in that** the joining means comprise first joining means (20) located upstream and second joining means (22) located downstream; in particular said joining means (19) comprise opposite welding electrodes (19a, 19b), respectively for engaging with the transversal member (15) and the longitudinal members (13), the electrodes being connected to respective poles of a corresponding electric transformer (19c).

Patentansprüche

1. Vorrichtung (10) zur Herstellung eines Verstärkungsnetzes (11'), wobei das Netz eine Vielzahl an Längselementen (13) und eine Vielzahl an Querelementen (15) umfasst, die miteinander zusammengefügt sind, wobei die Längs- und/oder Querelemente insbesondere die Form jeweiliger Metallstäbe oder Drähte annehmen, insbesondere bestehend aus Stahl, die miteinander insbesondere mittels Bogenschweißens verschweißt sind, um das Metallverstärkungsnetz zu formen, wobei die Vorrichtung Mittel zum Positionieren der Querelemente (15) des Netzes an den Längselementen (13) und mobile Mittel zum Zusammenfügen der Querelemente (15) mit den Längselementen (13) umfasst, um ein längsseitig langgezogenes Netz (11) zu formen, wobei die Positionierungsmittel erste Mittel (16) zum Positionieren eines ersten Querelements (15) des Netzes an den Längselementen (13) und zweite Mittel (18) zum Positionieren eines zweiten Querelements (15) an den Längselementen (13) umfassen, wobei die Vorrichtung Haltemittel (26, 28) zum Halten des Querelements (15) im Bereich für das Zusammenfügen mit den Längselementen (13) umfasst, wobei die ersten Positionierungselemente (16) und die zweiten Positionierungselemente (18) ausgestaltet sind, um das jeweilige Querelemente (15, 15) des Netzes auf die Oberseite der Längselemente (13) des Netzes aufzusetzen, wobei sich die Haltemittel (26, 28) für die Querelemente (15) zwischen einer Position zur Aufnahme der Querelemente und zum freien Durchgang des Querelements (15), der zuvor mit den Längselementen in Stromabwärtsrichtung jenseits der Haltemittel (26, 28) zusammengefügt wurde, und einer Position zum Platzieren des jeweiligen Querelements (15) an der Position zum Zusammenfügen mit den Längselementen (13) bewegen können, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) zum Halten des Querelements (15) im Zusammenfügungsbereich von den mobilen Zusammenfügungsmitteln gestützt werden oder fest mit diesen verbunden sind.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die ersten Positionierungsmittel (16) stromaufwärts eines jeweiligen Zusammenfügungsbereichs (19) angeordnet sind und die zweiten Positionierungsmittel (18) stromabwärts eines jeweiligen Zusammenfügungsbereichs (19) angeordnet sind.

3. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Posi-

tionierungsmittel (16, 18) erste und zweite Mittel (161, 181) umfassen, um die Quermittel hinführend zu einer Zusammenfügungsposition zu fördern, wobei die ersten und zweiten Fördermittel (161, 181) für die Querelemente (15) insbesondere ausgelegt sind, um die Querelemente (15) nach unten zu fördern, wobei die ersten und zweiten Fördermittel (161, 181) vorzugsweise eine Rinne (161, 181) mit einer Oberfläche umfassen, auf der die Querelemente (15) in Eingriff gelangen und rutschen können.

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die ersten Mittel (161) zum Fördern der Querelemente (15) hinführend zu einer Zusammenführungsposition ausgelegt sind, um die Querelemente (15) in die Zuführungsrichtung der Längselemente (13) zu fördern, sowie dadurch, dass die zweiten Mittel (181) zum Fördern der Querelemente (15) hinführend zu einer Zusammenfügungsposition ausgelegt sind, um die Querelemente (15) in eine Richtung zu fördern, die der Zuführungsrichtung der Längselemente (13) entgegengesetzt ist.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel jeweilige Permanentmagnetmittel (26, 28) umfassen.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) für die Querelemente (15) am Freigabeende der jeweiligen Positionierungsmittel (16, 18) angeordnet sind.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie stromaufwärts Haltemittel (26) zum Halten eines entsprechenden ersten Querelements (15) und stromabwärts Haltemittel (28) zum Halten eines entsprechenden zweiten Querelements (15) umfasst, wobei diese jeweils eine Vielzahl an Halteelementen (26, 28) umfassen, die in Querrichtung verteilt sind.

8. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) für das Querelement (15) eine Seitenfläche (26a, 28a) für den Eingriff mit dem Querelement (15) und dessen Halten umfassen.

9. Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** die jeweilige Seitenfläche (26a, 28a) zum Eingriff mit dem und zum Halten des Querelements (15) stromaufwärts und/oder stromabwärts gewandt ist.

10. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Stützmittel für die Haltemittel (26, 28) umfasst, die das Querelement (15) im Zusammenfügungsbereich halten, wobei die Stützmittel Mittel umfassen, die ausgelegt sind, um die Haltemittel (26, 28) elektrisch von den Zusammenfügungsmitteln zu isolieren.

11. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) zum Halten des Querelements (15) im Zusammenfügungsbereich von den oberen Zusammenfügungsmitteln gestützt werden oder fest mit diesen verbunden sind.

12. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) zum Halten des Querelements (15) im Zusammenfügungsbereich senkrecht jenseits und insbesondere unterhalb der Oberfläche der jeweiligen Zusammenfügungsmittel hervorstehen, die ausgelegt ist, um mit dem Querelement (15) in Eingriff zu gelangen und dieses gegen die Längselemente (13) des Netzes zu drücken.

13. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) zum Halten des Querelements (15) im Zusammenfügungsbereich quer zwischen entsprechenden Zusammenfügungselektroden eingesetzt sind.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Haltemittel (26, 28) zum Halten des Querelements (15) im Zusammenfügungsbereich einen Halter zur Unterbringung einer Platte umfassen, die aus Magnetmaterial besteht.

15. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Zusammenfügungsmittel erste Zusammenfügungsmittel (20) umfassen, die stromaufwärts angeordnet sind, und zweite Zusammenfügungsmittel (22), die stromabwärts angeordnet sind, wobei insbesondere die Zusammenfügungsmittel (19) gegenständig angeordnete Schweißelektroden (19a, 19b) umfassen, jeweils um mit dem Querelement (15) und den Längselementen (13) in Eingriff zu gelangen, wobei die Elektroden mit jeweiligen Polen eines entsprechenden elektrischen Transformators (19c) verbunden sind.

Revendications

1. Appareil (10) de fabrication d'un treillis de renfort (11'), le treillis comprenant une pluralité d'organes longitudinaux (13) et une pluralité d'organes transversaux (15) étant unis les uns aux autres, les orga-

nes longitudinaux et/ou transversaux se présentant, en particulier, sous la forme de fils ou de barres en métal respectifs, en particulier en acier, étant soudés, en particulier, soudés à l'arc les uns aux autres pour former le treillis de renfort métallique ; l'appareil comprenant des moyens pour positionner les organes transversaux (15) du treillis en correspondance des organes longitudinaux (13) et des moyens mobiles servant à unir les organes transversaux (15) aux organes longitudinaux (13) pour former un treillis allongé longitudinalement (11) ; les moyens de positionnement comprenant des premiers moyens (16) servant à positionner un premier organe transversal (15) du treillis en correspondance des organes longitudinaux (13) et des seconds moyens (18) servant à positionner un second organe transversal (15) en correspondance des organes longitudinaux (13) ; l'appareil comprenant des moyens de retenue (26, 28) servant à retenir l'organe transversal (15) dans la zone d'union aux organes longitudinaux (13) ; les premiers moyens de positionnement (16) et les seconds moyens de positionnement (18) sont conçus pour mettre en appui l'organe transversal (15, 15) respectif du treillis au sommet des organes longitudinaux (13) du treillis ; les moyens de retenue (26, 28) des organes transversaux (15) peuvent se déplacer entre une position servant à recevoir l'organe transversal et le libre passage de l'organe transversal (15) uni précédemment aux organes longitudinaux dans la direction en aval au-delà des moyens de retenue (26, 28), et une position servant à placer l'organe transversal (15) respectif en correspondance de la position d'union aux organes longitudinaux (13) ; **caractérisé en ce que** les moyens de retenue (26, 28) servant à retenir l'organe transversal (15) dans la zone d'union sont supportés par les/ou solidaire des moyens d'union mobiles.

2. Appareil selon la revendication 1, **caractérisé en ce que** les premiers moyens de positionnement (16) sont situés en amont d'une zone d'union (19) respective et les seconds moyens de positionnement (18) sont situés en aval d'une zone d'union (19) respective.

3. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de positionnement (16, 18) comprennent des premier et second moyens (161, 181) servant à convoyer les organes transversaux vers une position d'union ; en particulier, lesdits premier et second moyens d'acheminement (161, 181) des organes transversaux (15) sont adaptés pour convoyer les organes transversaux (15) vers le bas ; de préférence, les premier et second moyens d'acheminement (161, 181) comprennent une goulotte (161, 181) respective ayant une surface sur laquelle les organes transversaux (15) peuvent se mettre en prise et coulisser.

4. Appareil selon la revendication 3, **caractérisé en ce que** les premiers moyens (161), servant à acheminer les organes transversaux (15) vers une position d'union, sont adaptés pour acheminer les organes transversaux (15) dans la direction d'alimentation des organes longitudinaux (13) ; **en ce que** les seconds moyens (181), servant à acheminer les organes transversaux (15) vers une position d'union, sont adaptés pour acheminer les organes transversaux (15) dans une direction opposée à la direction d'alimentation des organes longitudinaux (13).

5. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue comprennent des moyens à aimants permanents (26, 28) respectifs.

6. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue (26, 28) des organes transversaux (15) sont situés à l'extrémité de libération des moyens de positionnement (16, 18) respectifs.

7. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens de retenue (26) en amont pour retenir un premier organe transversal (15) correspondant et des moyens de retenue (28) en aval pour retenir un second organe transversal (15) correspondant ; chacun comprenant une pluralité d'éléments de retenue (26, 28) étant répartis transversalement.

8. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue (26, 28) de l'organe transversal (15) comprennent un côté (26a, 28a) se mettant en prise avec/retenant l'organe transversal (15).

9. Appareil selon la revendication 8, **caractérisé en ce que** le côté (26a, 28a) respectif, servant à se mettre en prise avec/retenir l'organe transversal (15), est orienté en amont et/ou en aval.

10. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des moyens de support pour les moyens de retenue (26, 28) qui retiennent l'organe transversal (15) dans la zone d'union, lesdits moyens de support comprenant des moyens conçus pour isoler électriquement les moyens de retenue (26, 28) des moyens d'union.

11. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue (26, 28), servant à retenir l'organe transversal (15) dans la zone d'union, sont supportés par les/ou solidaires des moyens d'union supérieurs.

12. Appareil selon l'une quelconque des revendications

précédentes, **caractérisé en ce que** les moyens de retenue (26, 28), servant à retenir l'organe transversal (15) dans la zone d'union, dépassent perpendiculairement au-delà, en particulier en dessous, de la surface des moyens d'union respectifs étant adaptée pour se mettre en prise avec/et pousser l'organe transversal (15) contre les organes longitudinaux (13) du treillis.

13. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue (26, 28), servant à retenir l'organe transversal (15) dans la zone d'union, sont transversalement interposés entre des électrodes d'assemblage correspondantes.

14. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens de retenue (26, 28), servant à retenir l'organe transversal (15) dans la zone d'union, comprennent un support servant à loger une plaque constituée d'un matériau magnétique.

15. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens d'union comprennent des premiers moyens d'union (20) situés en amont et des seconds moyens d'union (22) situés en aval ; en particulier, lesdits moyens d'union (19) comprennent des électrodes de soudure (19a, 19b) opposées, pour respectivement se mettre en prise avec l'organe transversal (15) et les organes longitudinaux (13), les électrodes étant reliées aux pôles respectifs d'un transformateur électrique (19c) correspondant.

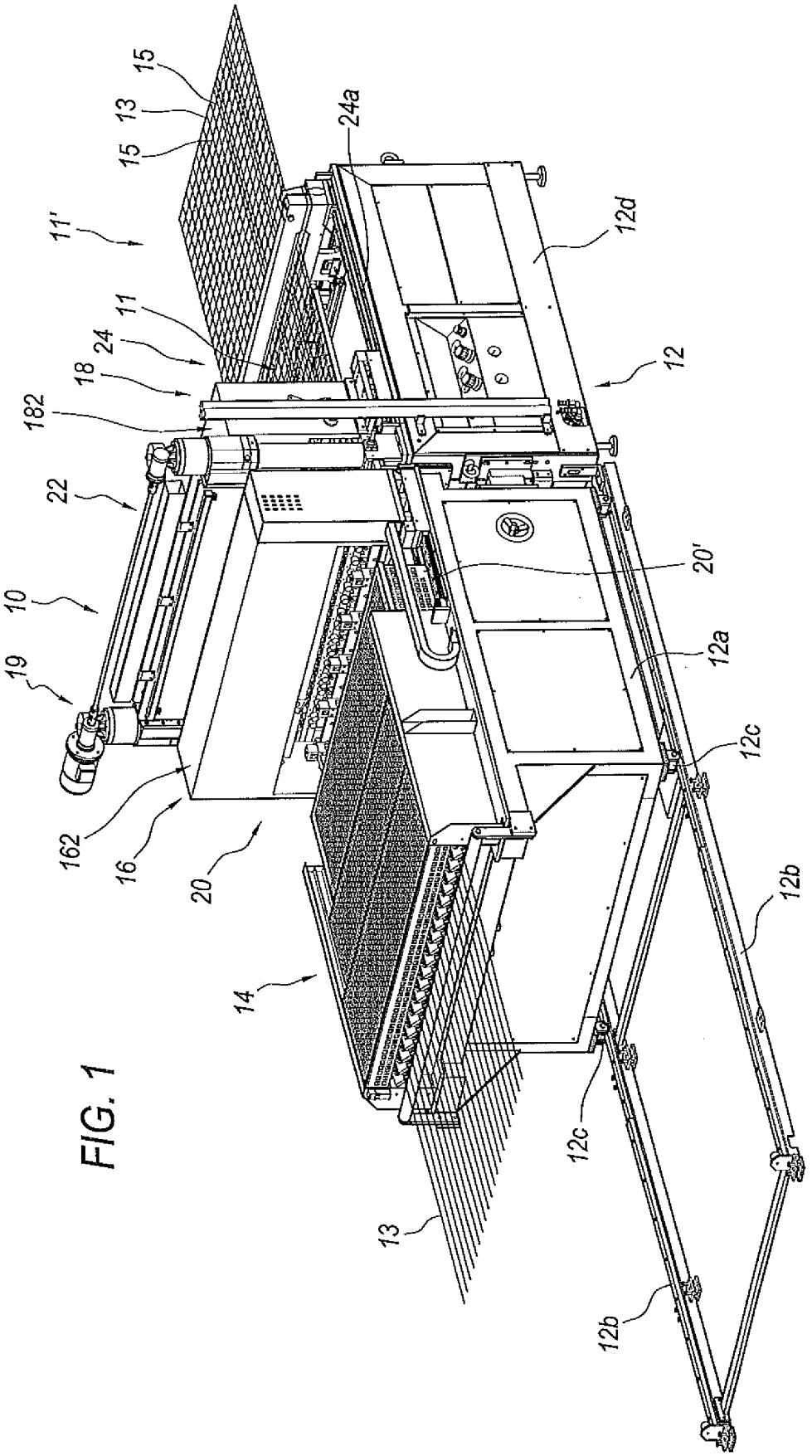

15
13
15
24a
11'
12d
11
24
18
12
182
22
20'
10
12a
19
12c
162
16
20
12b
14
12c
13
12b

FIG. 1

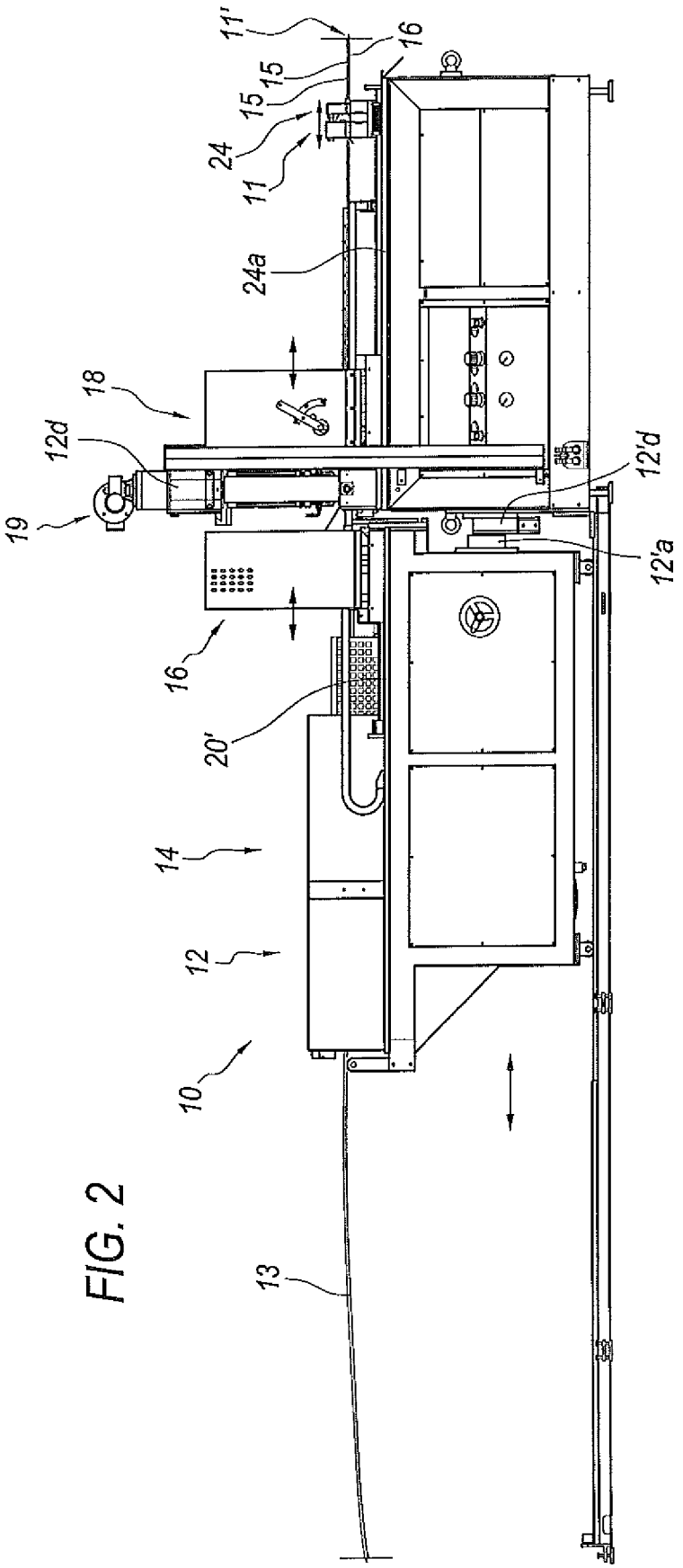
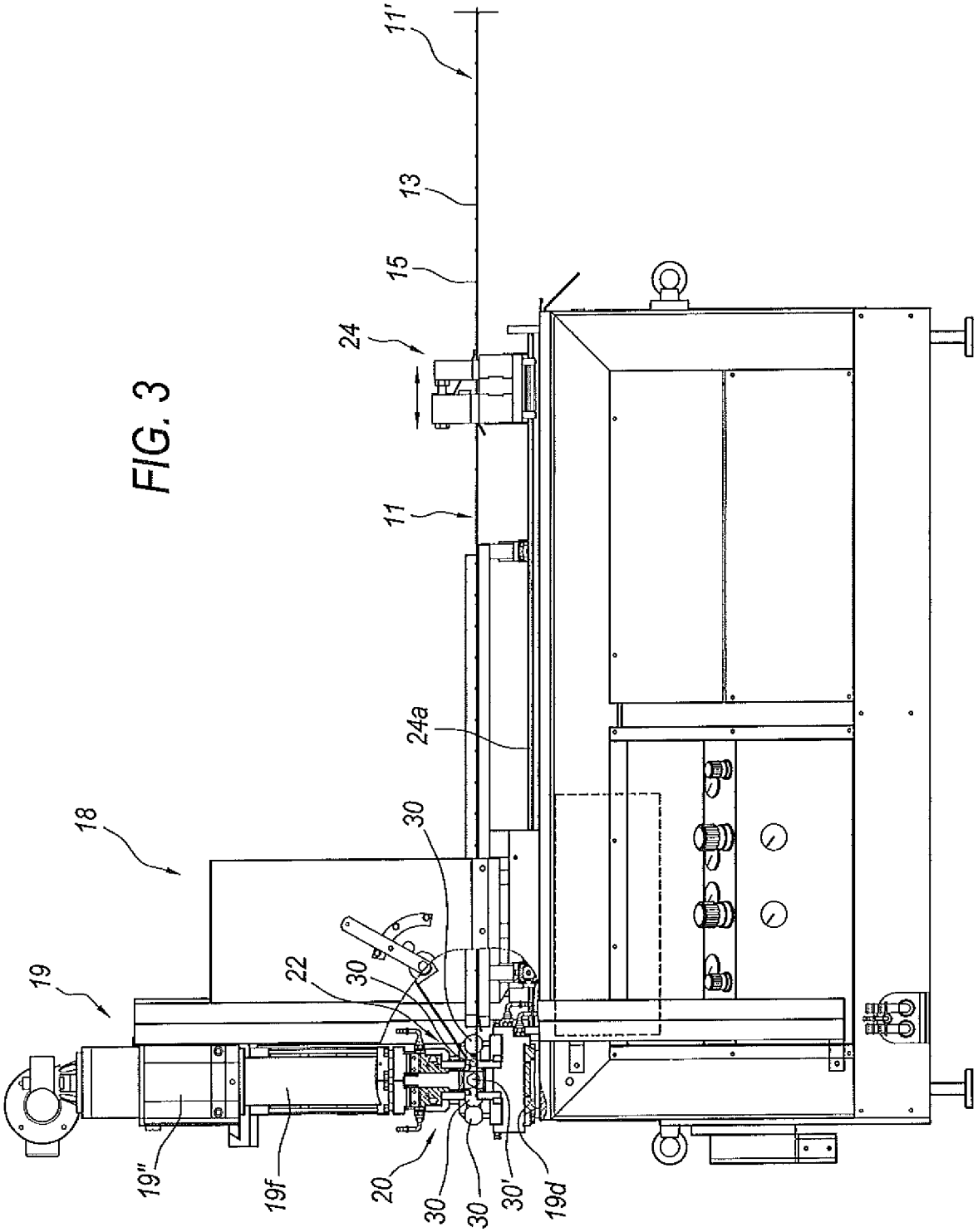


FIG. 2

FIG. 3



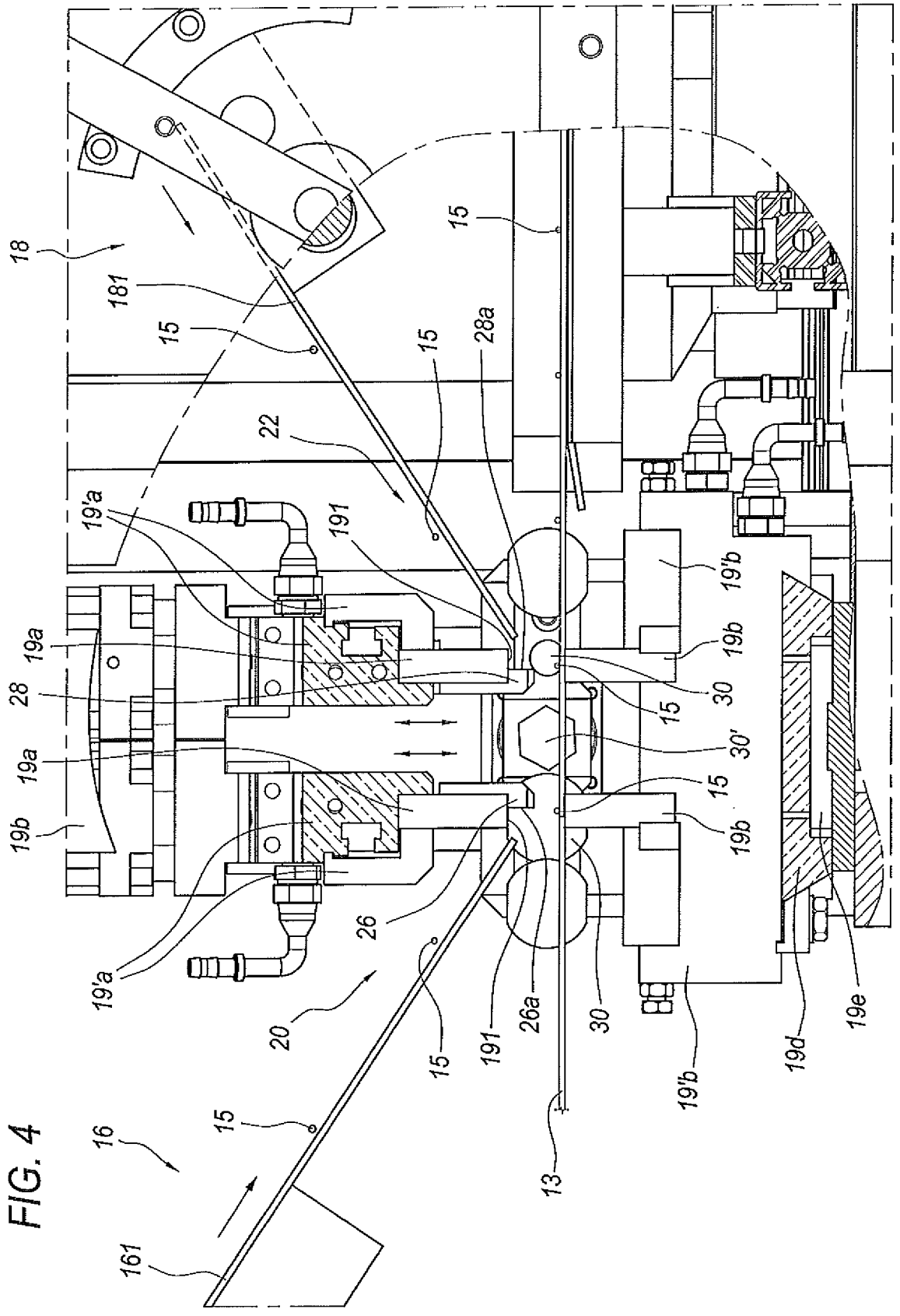

18
181
15
15
15
28a
22
19'a
191
19'b
19a
19b
28
30
30'
19a
19b
26
19'a
20
15
191
26a
30
19'b
19d
19e
16
15
161
13

FIG. 4

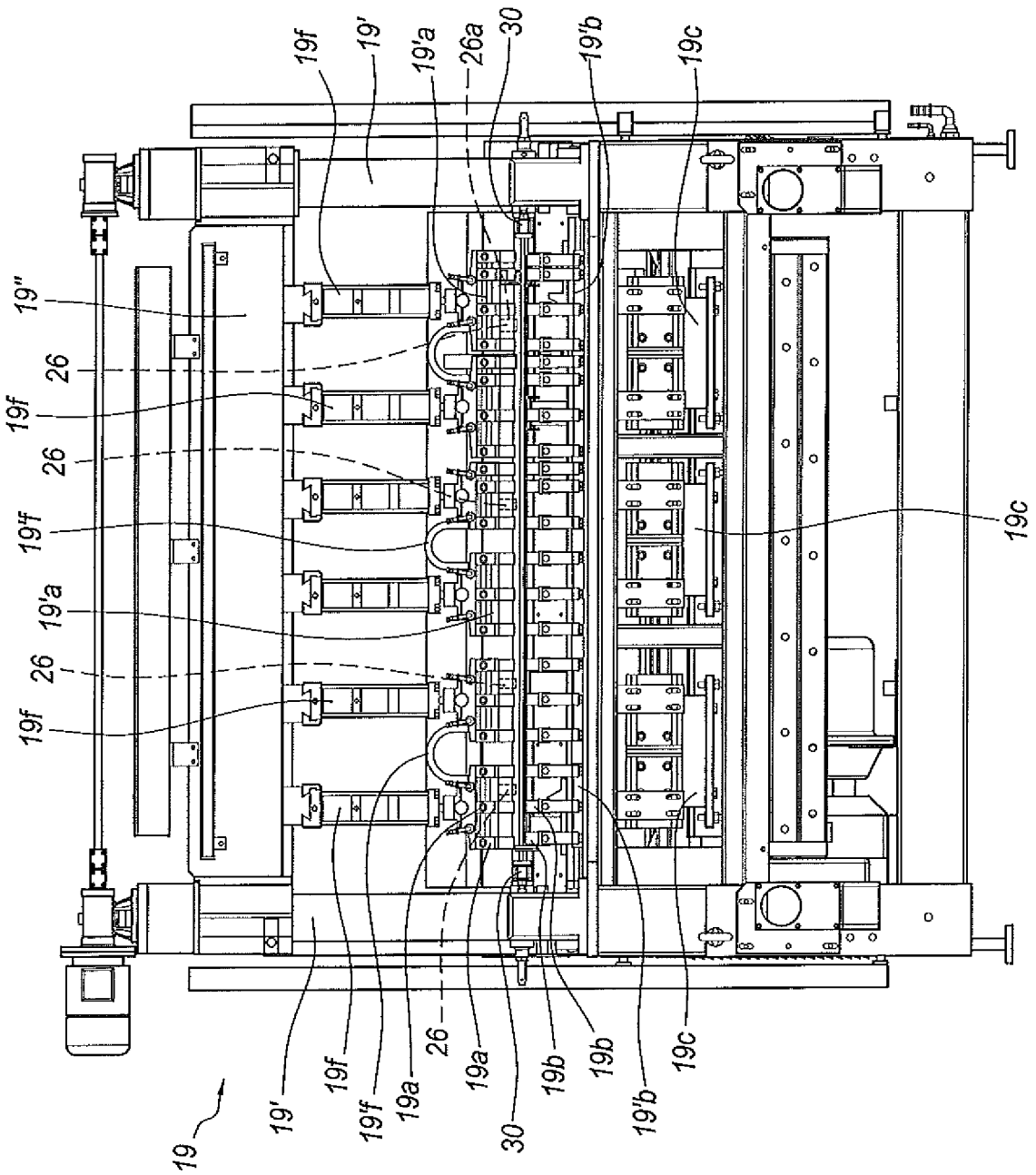

19f
19'
19'a
26a
30
19'b
19c
19''
26
19f
26
19f
19'a
26
19f
19c
19
19'
19f
19'f
19a
26
19a
30
19b
19b
19'b
19c

FIG. 5

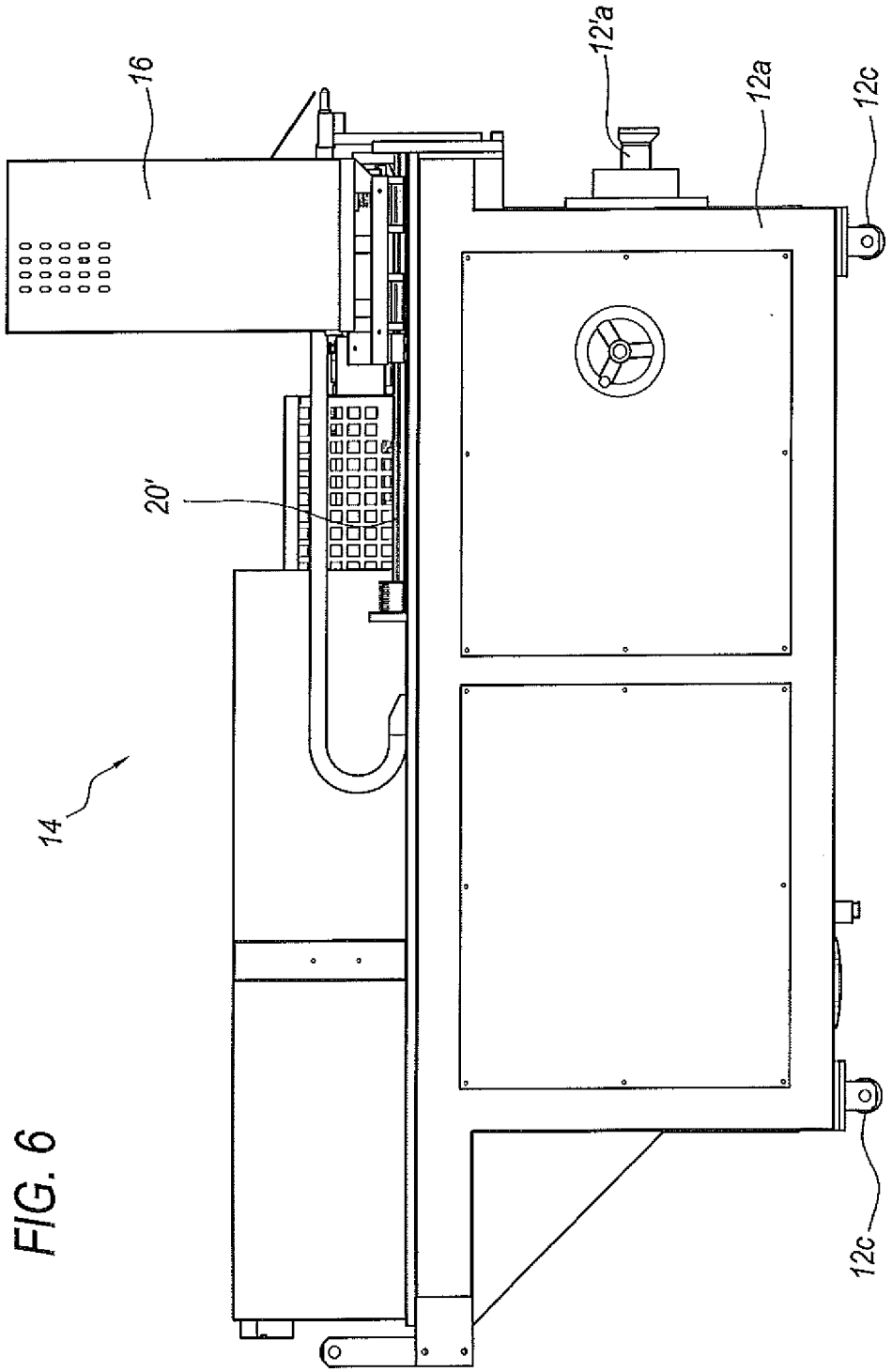


FIG. 6

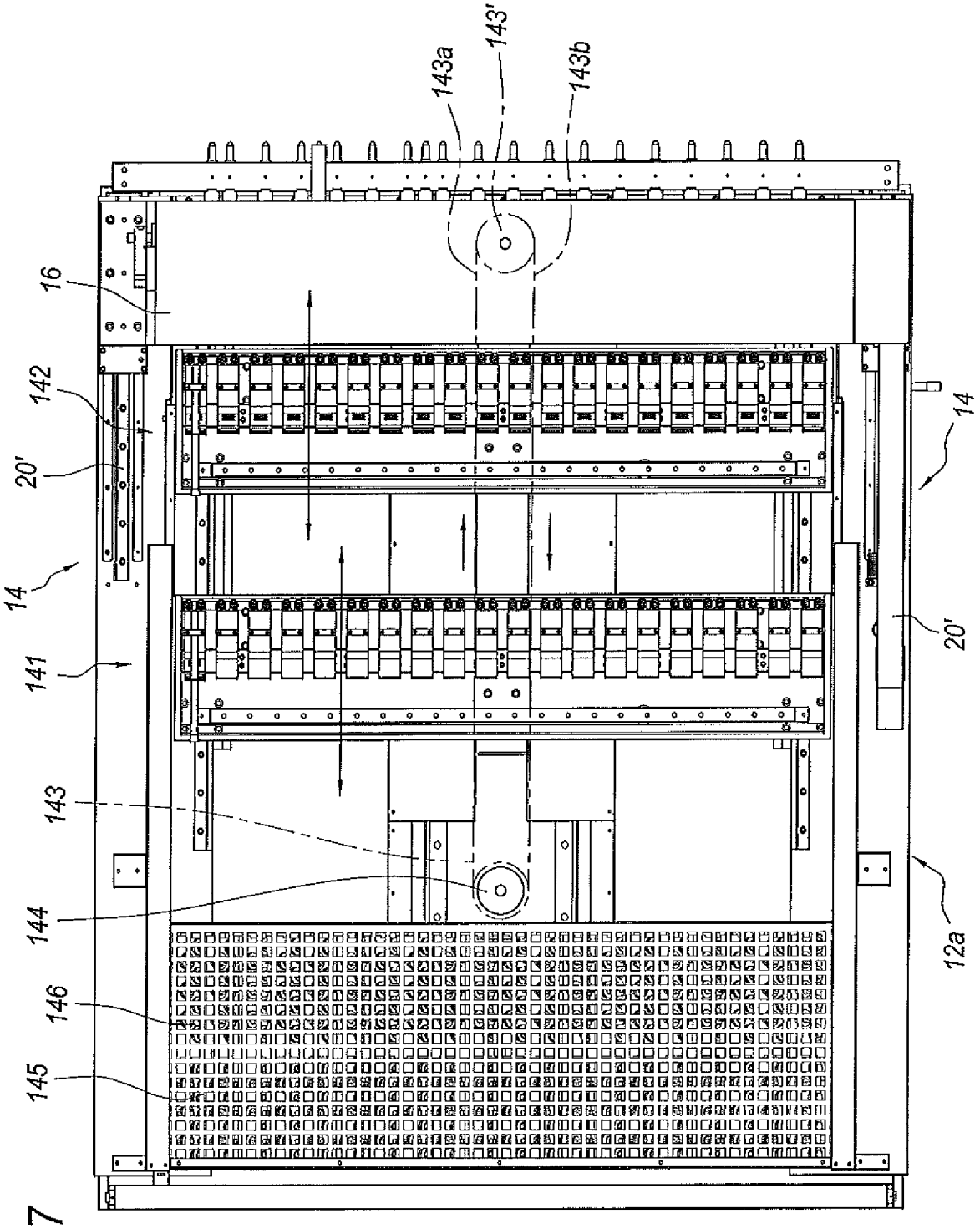


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2009015401 A1 **[0006]**