(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 March 2010 (11.03.2010)

PCT

(10) International Publication Number
WO 2010/026547 A1

(51) International Patent Classification:
B21F 27/12 (2006.01)

(21) International Application Number:
PCT/IB2009/053863

(22) International Filing Date:
4 September 2009 (04.09.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
BO2008A000541 8 September 2008 (08.09.2008) IT

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2010/026547 A1

(54) **Title**: METHOD AND DEVICE FOR POSITIONING BARS IN MACHINES FOR MANUFACTURING METAL CAGES

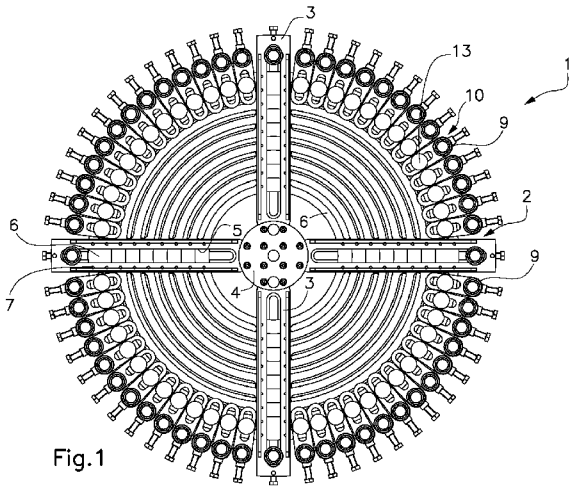

Fig.1

(57) **Abstract**: The method for positioning bars in machines for manufacturing metal cages, consisting of a series of longitudinal bars made integral by fastening a spiral-wound metal wire, provides for prearranging first support means (2), equipped with slots (5) radial to the axis of the cage in formation and mounted rotating with respect to the same axis, and for selectively constraining to said first support means (2) at least one further support (6), equipped with a slot (8) basically circumferential, in concentric position to the same first support means (2). A plurality of hoses (9) suitable to receive said longitudinal bars is mounted in sequence on said further support (6), accurately adjusting the radial and/or circumferential position of the same hoses (9) with respect to a fixed reference (20) arranged on the machine.

Description

Title of Invention: METHOD AND DEVICE FOR POSITIONING BARS IN MACHINES FOR MANUFACTURING METAL CAGES

Technical Field

[1] The present invention regards a method and a device for positioning longitudinal bars in machines for manufacturing metal cages in particular for reinforced concrete.

Background Art

[2] It is known that for making the reinforcement of piles, reinforced concrete pillars and the like, metal cages are used, especially of cylindrical shape, consisting of a series of longitudinal iron bars outside of which is placed a metal wire spiral-wound on the same bars, according to a suitably predetermined step. The longitudinal bars are distributed according to a suitable geometrical outline, usually cylindrical; but there are examplesof piles and pillars having different geometry, for example asymmetrical, elliptical, prismatic and the like.

[3] For manufacturing such metal cages nowadays are used machines that allow to seal the spiral on the longitudinal bars, prearranged according to the desired geometrical outline. Patent EP 0035477 illustrates for example a machine for manufacturing cages with spiral-windings comprising adrive flange and a free-turning flange borne by a trolley which can move in front of the drive flange, both flanges being prearranged to support the longitudinal bars in predetermined positions. To form the cage, the bars are placed rotating by the aforementioned flanges, while the metal wire, unrolled from a lateral coil and brought in longitudinal movement, spiral-winds progressively around the same bars.

[4] In the machine of the cited type there is the need of manufacturing metal cages having various dimensions and shapes, according to the specific requirements. To this end, various solutions have been proposed for supporting the bars on the rotating members, by means of hoses or bushes that substantially allow to arrange the bars in different positions and in particular at different radial distances with respect to the formation axis of the cage.

[5] Patent IT 1216960 illustrates for example the use of rotating support members consisting of disks equipped with holes arranged at different radial distances from the longitudinal axis of formation of the cage, coinciding with the rotation axis of the machine, for inserting the longitudinal bars. The longitudinal bars are in the suitably selected holes of the rotating support members through suitable hoses or bushes that also allow the sliding of the bars.

[6] Patent US 3,579,259 illustrates an analogous rotation support system for the bars

wherein the rotating members consist of disks having a series of radial slots, regularly spaced, designed to be engaged by the longitudinal bars. The bars are fastened in the desired position through suitable clamping members. An analogous solution is disclosed in the patent application UD2004A000095.

[7] But the aforementioned devices for supporting in rotation the longitudinal bars have the limit of preventing a wide liberty in the choice of the cage conformation. The disposition of the longitudinal bars on the rotating support members is in fact variable only within a predetermined number of positions, depending on the mounting positions of the hoses for inserting the bars. In other words, it is possible to vary the diametric dimensions of the cage and the number and the distribution of the bars used only for finite intervals and not with the liberty often necessary.

[8] Furthermore the known rotating support devices of the bars don't allow to manufacture in a simple way metal cages having a geometry different from the cylindrical one.

[9] In order to obtain a more flexible positioning of the longitudinal bars, various modes of supporting the bushes have been proposed. Patent application PS2001A000012 illustrates a solution wherein the rotating support members are equipped with an interchangeable ring on which can be applied, in different positions, the hoses for inserting the bars.

[10] A specific unsolved problem by the devices of the prior art consists of the fact that mounting the bushes on the rotating support members, in the provided positions, is generally difficult, without unequivocal points of reference. In fact the operator is usually equipped with simple measure instruments, of the type of the linear meter.

[11] It is to observe the necessity of accurately positioning the bars both in radial direction, with respect to the rotation axis of the cage in formation, and in circumferential direction, to distribute the bars to an appropriate reciprocal distance, for example at a uniform distance. An accurate radial positioning is necessary also to avoid that, in particular circumstances, the metal wire constituting the spiral loses contact with the bar at which it must be sealed, and so the sealing is not made.

Disclosure of Invention

[12] The task of the present invention is that of resolving the aforementioned drawbacks, devising a method which allows to accurately operate the radial and circumferential positioning of the longitudinal bars in the machines for manufacturing metal cages.

[13] A further object is that of providing a device which allows to actuate in an optimal way the aforementioned method, for forming metal cages having any conformation.

[14] Another object of the present invention is that of providing a device for positioning bars having a simple conception, a securely reliable functioning and versatile use, as

well as a relatively economic cost.

[15] The above mentioned scopes are attained, according to the present invention, by the method for positioning bars in machines for manufacturing metal cages according to claim 1.

Brief description of the Drawings

[16] Details of the invention shall be more apparent from the detailed description of a preferred embodiment of the device for positioning bars in machines for manufacturing metal cages according to the invention, illustrated for indicative purposes in the attached drawings, wherein:

[17] figure 1 shows a front view of the device for positioning bars according to the present invention;

[18] figure 2 shows an exploded perspective view of the device according to the invention;

[19] figure 3 shows a detail view of a detail of the device according to the invention;

[20] figure 4 shows a front view of the device in use configuration;

[21] figure 5 shows an analogous front view of the device prearranged for the formation of a prismatic-shaped cage.

Best Mode of Carrying out the Invention

[22] With particular reference to such figures, the device for positioning bars in machines for manufacturing metal cages, particularly for the reinforcement of piles, reinforced concrete pillars and the like, is indicated in its entirety with 1.

[23] As described and illustrated in the patent application BO2007A000828, the metal cage to be manufactured consists of a series of longitudinal bars arranged parallel and made integral, according to the provided geometry, through a metal wire spiral-wound on the same bars, according to a suitably predeterminedpitch. In particular it is provided for arranging the bars designed to form the metal cage according to a transverse circular outline, so as to cause the manufacture of a cylindrical pile. Obviously, it is possible to provide for the manufacture of cages having a different transverse outline, for example elliptical, polygonal, with asymmetrical distribution of the bars or the like.

[24] The positioning device 1 provides for a rotating member suitable to support the longitudinal bars in the fastening positions for manufacturing the cage. Such a rotating member is suitable to be operated rotating by a suitable motor member, according to the axis of the cage in formation, to bear rotating the longitudinal bars during the manufacture of the cage.

[25] The rotating member comprises first support means 2 consisting of a cross-support 2 substantially made of one or more crossbars 3 which are arranged on a plane or-

thogonal to the axis of the cage in formation. More specifically, as illustrated, the cross-support 2 consists of a couple of crossbars 3 arranged perpendicular to each other and reciprocally coupled, in central position, through a suitable jointing member 4. The orthogonal arms defined by the crossbars 3 have respective anchorage zones constituted by longitudinal slots 5. Therefore the slots 5 are, in work configuration, radial to the axis of the cage in formation.

[26] To the cross-support 2 are suitable to be selectively constrained a series of further supports 6, preferably made circular, for example ring-shaped, having different diametric dimensions. The circular supports 6 are fastened concentric to the cross-support 2, in correspondence with said radial slots 5, through suitable screw members 7. The screw members 7 go through holes 17 made in the circular supports 6. The circular supports 6 are respectively equipped with a substantially circumferential slot 8. Practically the circumferential slot 8 preferably consists of a series of circular sectors, interrupted by brief solid portions wherein are made the holes 17 designed for the passage of the screw members 7 with which the fastening to the cross-support 2 is accomplished.

[27] In fig. 2 is represented, as an example, a complete series of circular supports 6 having different diametric dimensions. Obviously one or more supports 6 can be mounted as long as they don't interfere one another. Furthermore the supports 6 can be manufactured with geometries different from the circular one, according to the necessity of use.

[28] The circular support 6 fastened to the cross-support 2 is designed to bear a plurality of fastening members 10 for respective hoses 9 suitable to receive, in a known manner, the longitudinal bars suitably distributed in circumferential direction. The hoses 9 are suitable to be fastened in radially adjustable positions in correspondence with the circumferential slot 8 of the circular support 6, through the respective fastening members 10. The hoses 9 are suitable to be fastened as well, as described in the following, in correspondence with the radial slots 5 of the cross-support 2.

[29] As it can be seen in detail in fig. 3, the fastening members 10 are constituted by a plate with an elongated shape having a hole 11 for engaging the hose 9 and equipped with a slot 12, in use arranged radial to the axis of the cage in formation, suitable to allow the adjustment of the radial positioning of the longitudinal bars on the rotating member. The hose 9 engages in the hole 11 by means of a bush 19. The fastening members 10 are fastened to the circular support 6 through suitable screw members 13 that go through the respective slots 12 and are tightened by relative nuts 15. In particular, the screw members 13 have a prismatic portion 14 through which they are suitable to engage the slots 12 such as to prevent an undesired rotation of the whole fastening member 10 as an effect of the stresses deriving from the working.

[30] It is to note that the screw members 13 are conformed in such a way as to be able to mount the fastening members 10 both outwards and inwards, thus increasing the flexibility of use because it is possible to cover two ranges of diameters, taking advantage of the adjustment along the slots 12 both inwards and outwards. Moreover the bushes 19 and the hoses 9 can be mounted directly on the circumferential slot 8 made on the supports 6.

[31] The method for positioning longitudinal bars through the described device is as follows.

[32] Firstare determined with the aid of suitable electronic control means the circumferential positions of the longitudinal bars to be arranged according to the predetermined geometrical outline, based on the number of the same longitudinal bars.

[33] Depending upon the diametric dimensions of the metal cage to be manufactured, the most suitable circular support 6 among the series of available supports (see fig. 2) is selected. Such a support 6 is fastened concentric to the cross-support 2, suitably prearranged on the machine and mounted rotating with respect to the axis of the cage in formation; the support 6 is fastened by means of the screw members 7 which engage the crossbars 3 of the cross-support 2. In fact, the support 6 can have any geometry so as to match with the type of article to be manufactured, not only circular.

[34] Then the hoses 9 are constrained to the circular support 6 through the respective fastening members 10. In particular, the fastening members 10 of the hoses 9 are constrained in predetermined positions distanced along the circumferential slot 8 of the circular support 6, through the relative screw members 13. The slot 12 of the fastening members 10, in use arranged radial to the rotating member or radial to the axis of the cage in formation, allows to adjust the radial position of the longitudinal bars on the rotating member.

[35] Itis to observe that for the continuity of the angular distribution of the hoses 9 it is also possible to constrain some hoses 9 directly on the radial slots 5 of the cross-support 2, in correspondence with the solid portions of the circular support 6, wherein the interruption of the continuity of the circular slot 8 does not allow the mounting of the fastening member 10 (see fig. 2).

[36] The fastening members 10 of the hoses 9 can be mounted by hand by the operator in the provided positions for the longitudinal bars along the prefixed geometrical outline. However this could lead to an inaccurate result, particularly in the case of metal cages equipped with an elevated number of bars or with a particular geometrical outline.

[37] Therefore to operate the correct positioning of the longitudinal bars it is provided for blocking the fastening member 10 with respect to a fixed reference 20 suitably and previously adjusted in radial sense, prearranged on the machine to indicate the distance from the axis of the cage in formation. Such a fixed reference 20 preferably consists of

a stop member, which can be positioned with the aid of a metric rod (see fig. 4). Obviously the stop member 20 can be adjustable by hand or automatically by means of known actuator means possibly controlled by the same elaboration control unit of the machine. The bushes 19 and the hoses 9 are supposed to be preassembled inthe holes 11 of the fastening members 10 equipped with the slot 12.

[38] To this end the cross-support 2 is angularly rotated in a way as to prearrange the support 6 in a predetermined angular position with respect to the fixed reference 20 (fig. 4), depending upon the position of the bar to be mounted. The fastening member 10 of the first hose 9 designed to receive a respective longitudinal bar is mounted, basically in correspondence of the above mentioned fixed reference 20 and in this way the radial and circumferential (or angular) position of such a hose 9 is accurately adjusted withrespect to the fixed reference.

[39] Usefully the fixed reference 20 constituted by the aforementioned stop member is L-shaped. In this way, a radial stop and a circumferential stop are made in only one member. Furthermore if such a L-shaped stop member 20 is articulated through a suitable hinge member 21, an angular rotation of the same stop member is made possible, as indicated with dashed line 20a in fig.4, such as to avoid the consequences of undesired interferences with the hoses 9 already positioned, in case the rotation of the rotating member 1 is unintentionally operated.

[40] Obviously it is possible to provide for making the reference 20 through different means, both material and immaterial, as for example a beam, a painted sign or the like.

[41] At the end of the mounting of the first fastening member 10, the machine is allowed to proceed with the mounting of the second element. So the rotating member 1 is rotated by a suitable angle for positioning, according to the predetermined pitch, the second fastening member 10 with analogous modes. Always in analogous manner the mounting in sequence of the fastening members 10 of the other hoses 9 provided for the formation of the cage is provided successively and quickly, accurately adjusting the hoses 9 with respect to the fixed reference 20. After mounting the last fastening member 10, the stop member 20 is positioned in a non-interference position preferably retracted.

[42] The described method and device attain the object of carrying out in an optimal way the positioning of the longitudinal bars in machines for manufacturing metal cages for reinforced concrete, particularly allowing the formation of metal cages having any conformation.

[43] Thanks to the radial slots 5 of the cross-support 2 and to the slots 12 of the fastening members 10 it is in fact possible to accurately and continuously adjust the radial distance of the hoses 9 for supporting the longitudinal bars with respect to the axis of formation of the cage, while thanks to the circumferential slot 8 of the support 6 it is

possible to adjust the quantity and the circumferential distribution of the same hoses 9 on the rotating member. In particular, unlike the technique known at present, the hoses 9 are suitable to be accurately fastened on the support member 1 in both circumferential and radial positions. Furthermore such a radial and circumferential position is defined in a very quick manner thanks to the fixed reference suitably laid out with respect to the axis of the cage in formation.

[44] A characteristic of the device according to the invention consists of the fact that it also allows the formation of cages having geometries different from the cylindrical one, for example elliptical, prismatic and the like. In fact the hoses 9 can be arranged at different radial distances from the axis of the cage in formation and practically in any suitable position, thanks to the wide possibility of adjustment allowed by the aforementioned slots 5, 8 and 12 of the support members. In fig. 5 is illustrated as an example the formation of a cage 30 with rectangular outline with the aid of fastening members suitably dimensioned.

[45] In practice, the embodiment of the invention, the materials used, as well as the shape and dimensions, may vary depending on the requirements.

[46] Should the technical characteristics mentioned in each claim be followed by reference signs, such reference signs were included strictly with the aim of enhancing the understanding the claims and hence they shall not be deemed restrictive in any manner whatsoever on the scope of each element identified for exemplifying purposes by such reference signs.

Claims

[Claim 1] Method for positioning bars in machinesfor manufacturing metal cages consisting of a series of longitudinal bars, arranged according to a predetermined geometrical outline and made integral by fastening at least one metal wire, spiral-wound onto the same bars through the combination of traverse movement and rotation around an axis that coincides with the axis of the cage in formation,**characterized in that** it provides for

a. determining the radial and/or circumferential positions of hoses (9) suitable to receive respective longitudinal bars, to be arranged according to a predetermined geometrical outline depending upon the geometry of said cage in formation;

b. prearranging first support means (2), equipped with slots (5) radial to the axis of said cage in formation and mounted rotating with respect to the same axis of the cage in formation;

c. selectively constraining to said first support means (2) at least one further support (6), equipped with a slot (8) basically circumferential, in concentric position to the same first support means (2);

d. in case, rotating said first support means (2) in order to prearrange said further support (6) in a predetermined angular position with respect to at least one fixed reference (20), arranged on the machine;

e. adjusting the radial position of said fixed reference (20) with respect to the axis of said cage in formation, according to said positions of the longitudinal bars to be mounted;

f. mounting on said further support (6) a first hose (9) suitable to receive a respective longitudinal bar, basically in correspondence with said fixed reference (20);

g. accurately adjusting the radial and/or circumferential position of said first hose (9) with respect to said fixed reference (20);

h.mounting in sequence onto said further support (6) a plurality of further hoses (9) suitable to receive said respective longitudinal bars, bringing each time the said support (6) in the said predetermined angular positions and accurately adjusting the radial and/or circumferential position of the said hoses (9) with respect to said fixed reference (20).

[Claim 2] Method according to claim 1,**characterized in that** it provides for mounting said hoses (9) along said circumferential slot (8) of the

further support (6) through respective fastening members (10) equipped with a radial slot (12), in use, to said axis of the cage in formation.

[Claim 3] Method according to claim 1 or 2,**characterized in that** it provides for determining with the aid of electronic control equipments said circumferential and/or radial positions of the longitudinal bars to be arranged according to the predetermined geometric outline through an adequate rotation of said first support means (2).

[Claim 4] Method according to claim 2,**characterized in that** it provides for operating said adjustment through a relative movement of said hoses (9) and/or of said fastening members (10) with respect to a couple of fixed references (20), respectively radial and circumferential, at least one of which is mobile.

[Claim 5] Device for positioning bars in machines for manufacturing metal cages consisting of a series of longitudinal bars, arranged according to a predetermined geometric outline and made integral through the fastening of at least one metal wire, spiral-wound onto the same bars through the combination of a rotation around an axis coinciding with the axis of said cage in formation and a traverse movement,**characterized in that** it comprises:

-first support means (2) suitable to be mounted rotating onto the machine according to said axis of the cage in formation;

-a series of further supports (6) having different sizes and equipped with a slot (8) basically circumferential, suitable to be selectively constrained to said first support means (2) with said circumferential slot (8) concentric to said axis of the cage in formation;

-a plurality of hoses (9) suitable to receive respectively said longitudinal bars and to be fastened, in adjustable positions in radial and/or circumferential directions, in correspondence with at least said circumferential slot (8) of said further supports (6);

-reference means (20) fixed to the structure of the machine suitable to accurately adjust the radial and/or circumferential position of said hoses (9) to support said longitudinal bars in the fastening positions to form said cage.

[Claim 6] Device according to claim 5,**characterized in that** said hoses (9) are suitable to be fastened to said circumferential slot (8) of said further supports (6) through respective fastening members (10) equipped with a radial slot (12), in use, to said axis of the cage in formation.

[Claim 7] Device according to claim 5,**characterized in that** said fixed reference

means (20) consist of a stop member, which can be placed in position adjustable radial to said axis of the cage in formation.

[Claim 8] Device according to claim 6,**characterized in that** said stop member (20) is L-shaped to function as reference both for the radial position and for the circumferential position of said hoses (9) and/or of said fastening members (10).

[Claim 9] Device according to claim 5,**characterized in that** said reference means (20) are associated to articulations (21) to allow their handling through dragging in a position (20a) of non-interference such to avoid the damaging of equipments of the machine.

[Claim 10] Device according to claim 5,**characterized in that** said further supports (6) have circular shape, with different diameters.

[Claim 11] Device according to claim 5,**characterized in that** said first support means (2) consist of a cross-member made of at least a pair of crossties (3) arranged on a plane basically orthogonal to said axis of the cage in formation, and reciprocally coupled, in central position, through a jointing member (4).

[Claim 12] Device according to claim 11,**characterized in that** said crossties (3) longitudinally have respective slots (5) radial to said axis of the cage in formation for mounting further hoses (9).

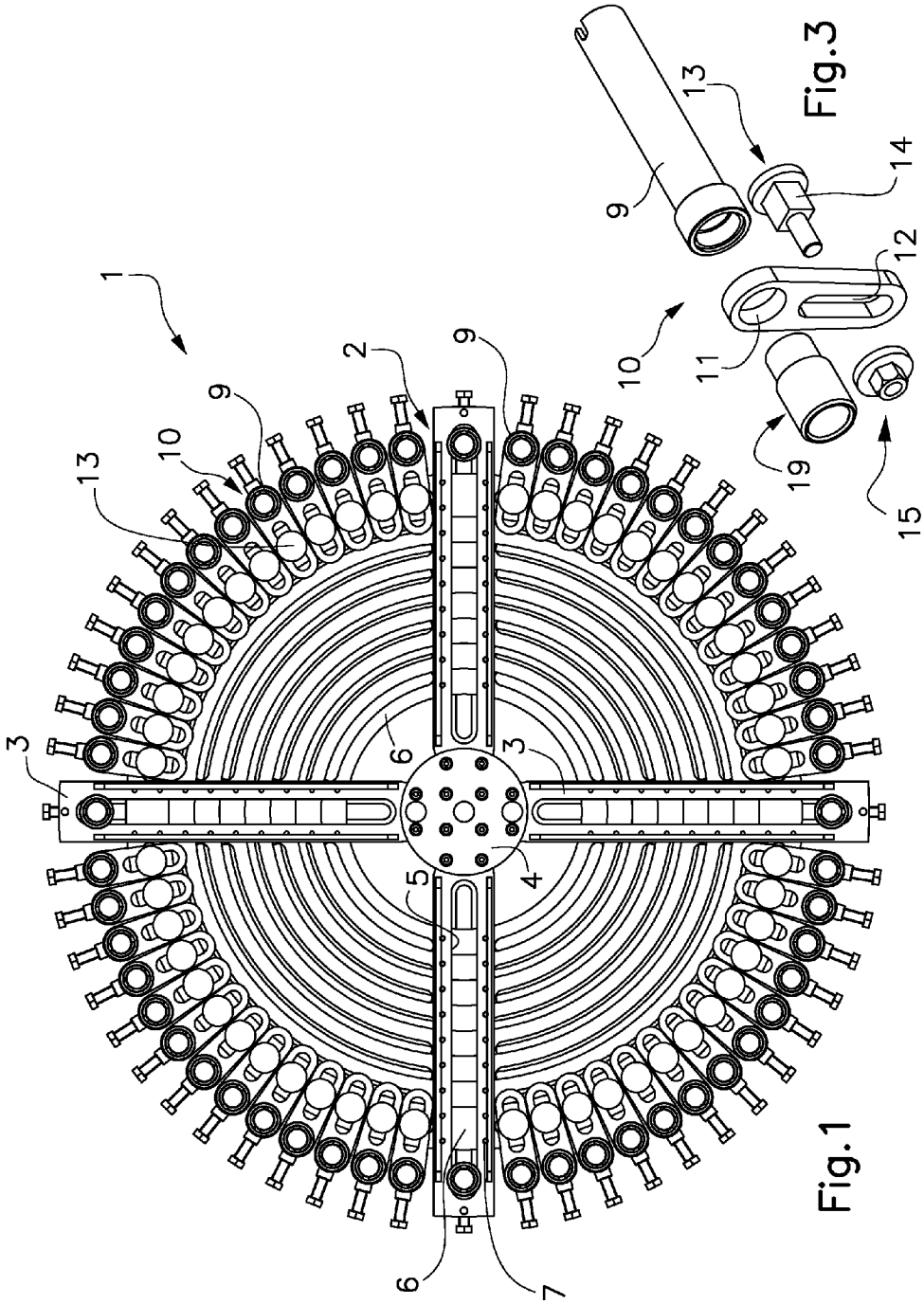

Fig.1

Fig.3

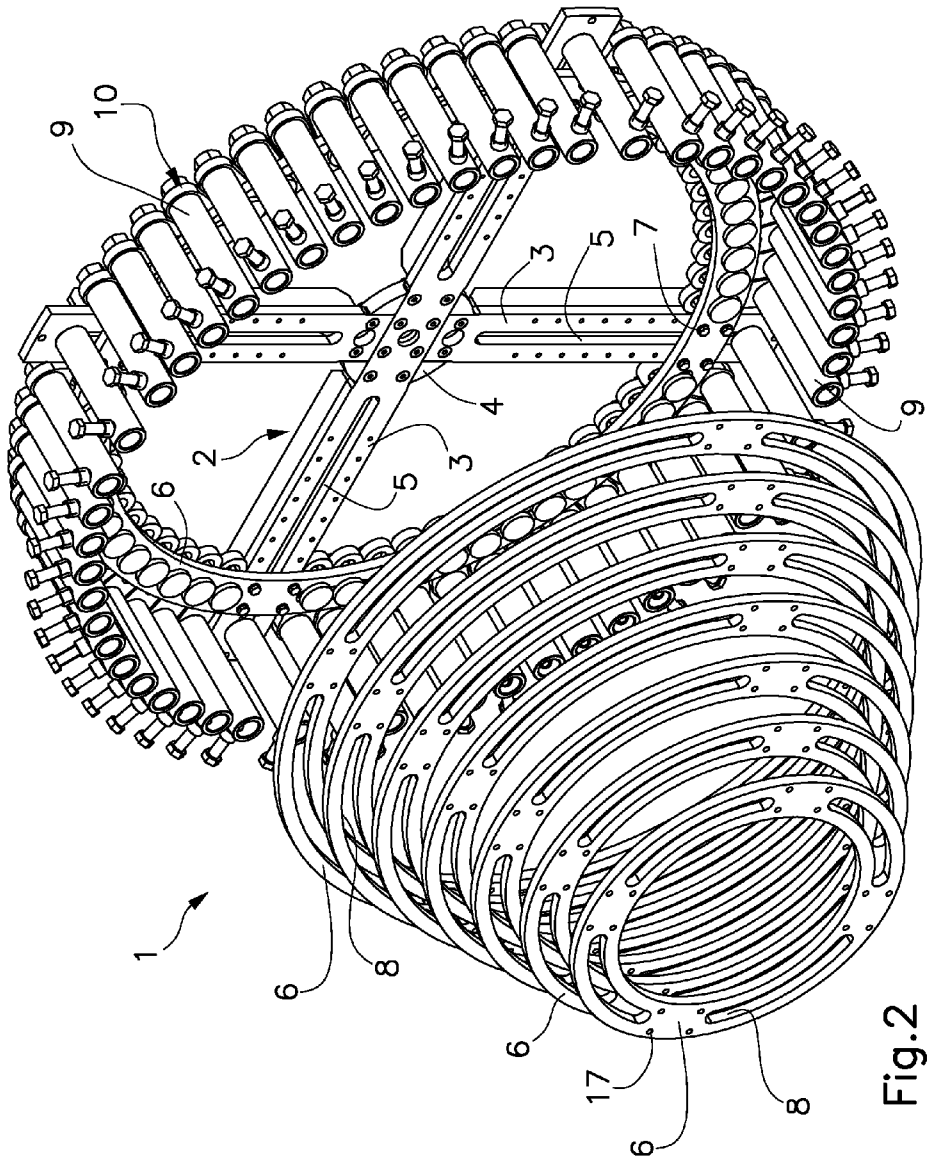

Fig.2

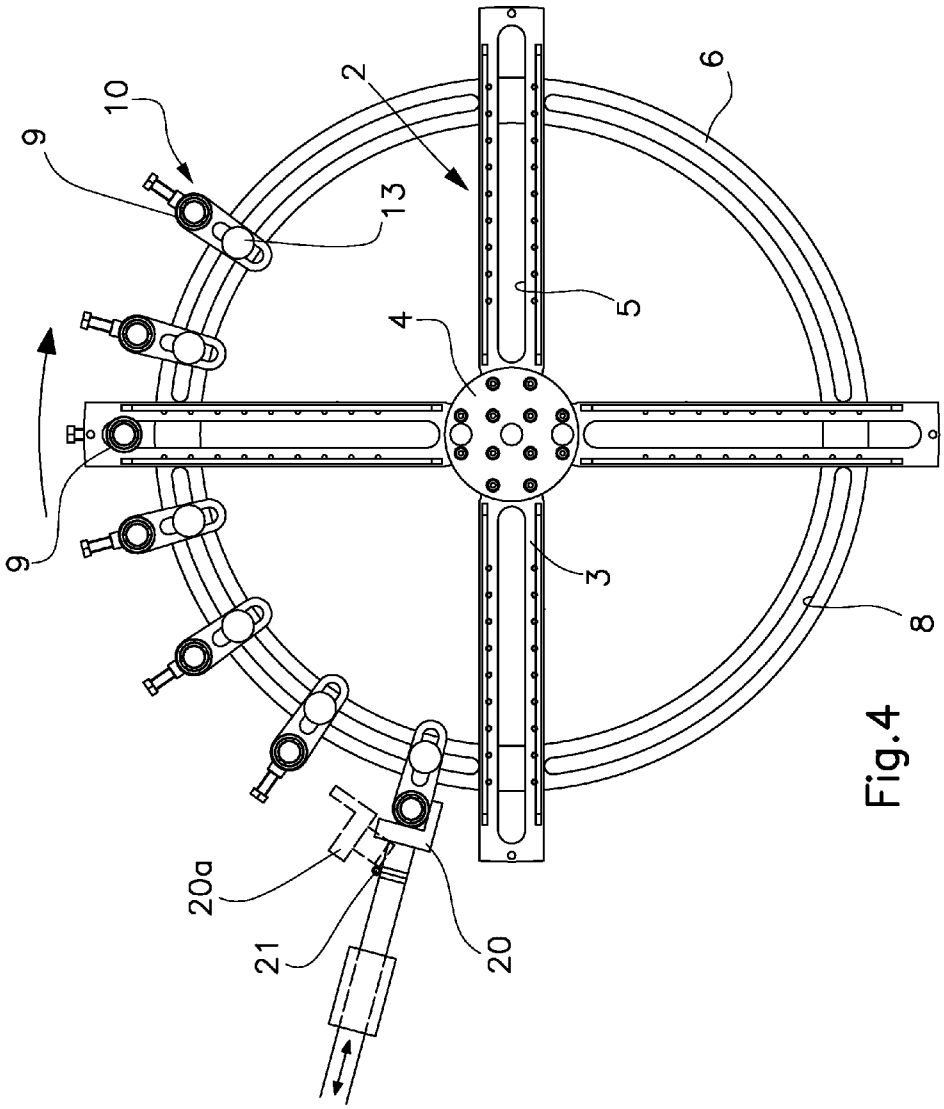

Fig.4

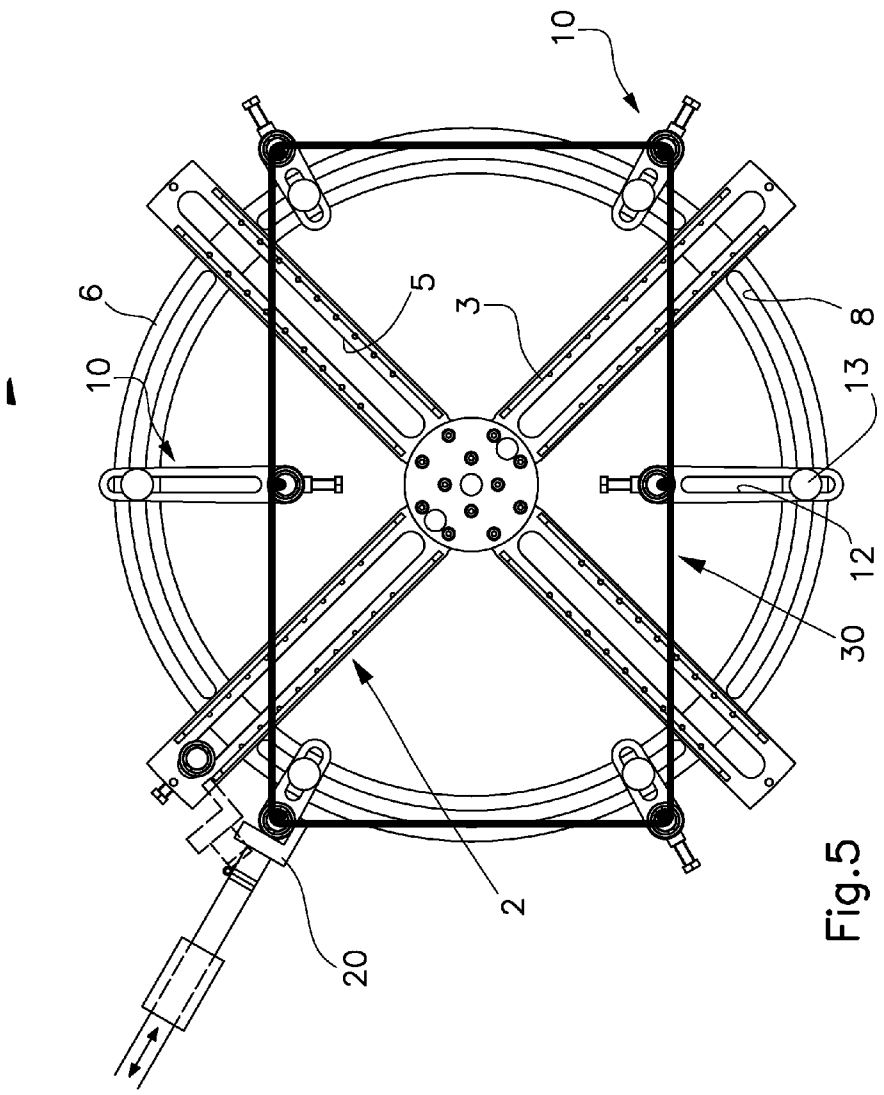

Fig.5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/053863

A. CLASSIFICATION OF SUBJECT MATTER
INV. B21F27/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 035 477 A (REMA MACCHINE UTENSILI SPA [IT]) 9 September 1981 (1981-09-09) cited in the application page 9, line 25 - page 10, line 14; figures 3,4	1,5
A	US 4 625 773 A (PFENDER GEORG [DE]) 2 December 1986 (1986-12-02) column 4, line 4 - line 31; figure 1	1,5
A	WO 2005/084848 A (PIEGATRICI MACCH ELETTR [IT]; DEL FABRO GIORGIO [IT]; FABRO MARCELLO D) 15 September 2005 (2005-09-15) page 9, line 13 - page 10, line 12; figures 8,9	1,5
A	WO 02/26417 A (BARDEN WAYNE [AU]) 4 April 2002 (2002-04-04) page 18, line 20 - line 35; figures 17-19	1,5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
1 December 2009	10/12/2009

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2009/053863

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0035477 A	09-09-1981	IT 1141782 B	08-10-1986
US 4625773 A	02-12-1986	DE 3422420 A1	19-12-1985
		DK 207285 A	17-12-1985
		FR 2565857 A1	20-12-1985
		IT 1184581 B	28-10-1987
WO 2005084848 A	15-09-2005	EP 1720672 A1	15-11-2006
WO 0226417 A	04-04-2002	AT 345887 T	15-12-2006
		CA 2423310 A1	04-04-2002
		DE 60124756 T2	11-10-2007
		EP 1332010 A1	06-08-2003
		ES 2278780 T3	16-08-2007
		US 2004049910 A1	18-03-2004