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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 April 2012 (19.04.2012)

PCT

(10) International Publication Number
WO 2012/049244 A1

(51) International Patent Classification:
B21F 23/00 (2006.01)

(21) International Application Number:
PCT/EP2011/067880

(22) International Filing Date:
13 October 2011 (13.10.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
BO2010A000618 14 October 2010 (14.10.2010) 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, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, 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, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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(54) Title: DRAWING ASSEMBLY FOR MACHINES FOR WORKING METAL PROFILES

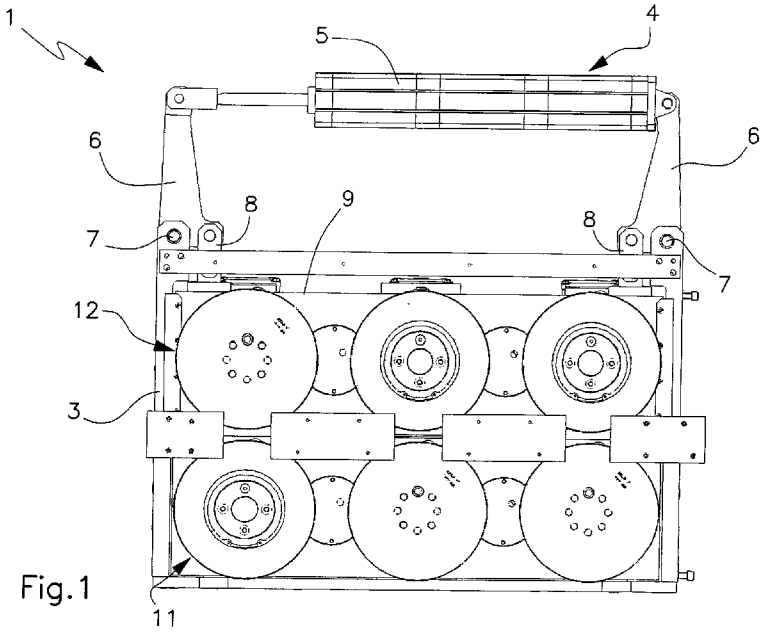


Fig.1

(57) Abstract: The drawing assembly in machines for working metal profiles comprises at least one couple of counter-rotating drawing wheels (11, 12), between which are tightened the metal profiles (2) to be fed. Said drawing wheels (11, 12) are doubled so that each couple of wheels defines a first wheel (11a, 12a) and a second wheel (11b, 12b), independent from each other, arranged side by side and coaxial to each other. At least one (11a, 12a) of said first and second wheel placed side by side is motor driven and is counter-rotating with an opposite pressure wheel (11b, 12b) freely rotatable or equally motor driven, coplanar to it, to tighten a respective metal profile (2).

WO 2012/049244 A1

Published:

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

Description

DRAWING ASSEMBLY FOR MACHINES FOR WORKING METAL PROFILES

Technical Field

[01] The present invention regards a drawing assembly designed to be applied in machines for working metal profiles, in particular iron rods for reinforced concrete.

Background Art

[02] It has been known that shaped irons, used for example to realize reinforcements for reinforced concrete, are generally obtained from metal profiles consisting of iron rods in rolls or in bars. To such an end, the metal profiles are fed, one or more, to operating machines which perform automatically the working thereof transforming them in a series of desired products.

[03] In particular, machines for working metal profiles in rolls generally provide a drawing assembly suitable to perform the feed of the same profiles to the operating members of the machine, arranged along a predetermined feed line. Usually along the feed line are further provided straightening members suitable to perform the correction of the curvature of the profiles, in particular if coming from rolls. As an example, according to a known typology, the drawing assembly can be arranged in an intermediate position between a first group of straightening members, lying on a substantially horizontal plane, and a second group of straightening members, lying on a substantially vertical plane.

[04] The drawing assembly is generally formed by couples of counter-rotating wheels, arranged in series. For example the drawing assembly can consist

of a series of drawing wheels suitably motor driven and a series of contrast wheels freely rotatable or motor driven as well, arranged substantially on a same longitudinal plane, suitable to determine therebetween a feed path for the metal profiles to be fed to the machine. The wheels of the drawing assembly can be flat or grooved, i.e. having an annular throat which is engaged in use by the profile moving forward. A drawing assembly of this type is illustrated for example in patent application EP 1706233.

[05] Machines designed to work more than one profile at the same time have been also known, for example the so-called bifilar machines which allow to work a couple of iron rods at the same time; nevertheless machines able to work more than two wires simultaneously have also been known. Obviously in this case the drawing assembly must be able to feed to the machine at least one couple of profiles, arranged side by side along the feed line. In the case of the bifilar machines, the wheels of the drawing assembly can be flat or have a double groove, engaged in use by the aforesaid couple of irons.

[06] In the considered field, anomalies of working are often complained; in particular in the case of machines designed to work at the same time more than one metal profile, it happens that the final length of the profiles can result different from each other, even if they are fed at the same time by the same drawing members.

[07] It has been well known that the drawing assembly of such machines can normally operate on two or more rods only up to an upper limit of the diameter of the same rods, beyond which the power of the apparatus is not enough to produce the feeding. Above the aforesaid limit, it is usual practice to use the drawing assembly to feed one only rod at time, to such

an end usually using the most internal annular throat of the drawing wheels. Therefore a bigger wear and tear of one of the annular throats with respect to the other one can appear in the time, and as a consequence a different behaviour of such throats in operation of drawing two rods. The drawing wheels being made in a single piece, the number of turns of both annular throats is the same but the most worn throat will obviously have a lower diameter and so will determine a lower feed with respect to the throat placed beside. Furthermore, the rod which engages the most worn throat will result tightened with a lower strength, so favouring undesired slipping which can trigger a degenerative phenomenon at the expense of the same throat. Owing to this, it can be easily verified that metal profiles fed at the same to the machine have a different feed and so give rise to irons having different lengths.

[08] Patent IT 1267278 discloses a drawing assembly provided with a device compensating for the lengthening of at least two metal rods. Such a compensator device provides a couple of counter-rotating grooved rollers, at least one of which is mobile parallel to itself on the plane containing the axis of the same rollers, while the other one is tilting on said plane containing the axis and is subjected to adjustment means. By inclining differently the tilting roller, it is possible to exert a different pressure on the rods in the throats of the rollers, recovering the different lengthening of the rods.

Disclosure

[09] The task of the present invention is that of solving the aforementioned problems, devising a drawing assembly which allows to feed in an optimal

manner more than one metal profile to a machine for working such metal profiles, in particular ensuring the correct length of each profile supplied to the machine when this latter works more than one profile at the same time.

[10] Within such task, it is a further scope of the present invention that of providing a drawing assembly which is able to control the length of the singles profiles fed to the machine.

[11] A further scope of the present invention is that of providing a drawing assembly which allows to obtain an independent drawing for profiles being work simultaneously, so as to produce at the same time profiles with lengths identical or intentionally different to each other even if worked parallel and at the same time by the same machine.

[12] Another object of the present invention is that of providing a drawing assembly having a simple conception, a securely reliable functioning and versatile use, as well as relatively economic cost.

[13] The cited scopes are attained, according to the present invention, by the drawing assembly according to claim 1.

[14] According to the present invention, the drawing assembly comprises one or more couples of counter-rotating drawing wheels, having a work position wherein the drawing wheels are tightened on the metal profiles to be fed, to draw the same metal profiles, at least one of which wheels is doubled so as to define a first wheel and a second wheel independent from each other, arranged side by side and coaxial to each other, at least one of said first and second wheels placed beside being motor driven and counter-rotating with an opposite pressure wheel freely rotatable or equally motor driven, coplanar to it, in order to tight said metal profile.

[15] The present invention also concerns a method for drawing metal profiles which provides for feeding a first profile to a first motor driven wheel of a drawing assembly comprising couples of counter-rotating drawing wheels, between which are suitable to be tightened the metal profiles to be fed in a machine for working such metal profiles; tightening said first profile by means of a first pressure wheel counter-rotating with respect to said first motor driven wheel; feeding a second profile to a second wheel of said drawing assembly, motor driven in an independent way with respect to said first motor driven wheel; tightening said second profile by means of a second pressure wheel counter-rotating with respect to said second motor driven wheel; actuating in an independent manner the drawing of said first and said second profile tightened respectively between said first motor driven wheel and said first pressure wheel and between said second motor driven wheel and said second pressure wheel.

Description of Drawings

[16] Details of the invention shall be more apparent from the detailed description of a preferred embodiment of the drawing assembly according to the present invention, illustrated for indicative purposes in the attached drawings, wherein:

[17] figure 1 shows a side view of the drawing assembly in hand;

[18] figure 2 shows a section view thereof according to a vertical plane, transverse to the feed direction of the metal profiles;

[19] figure 3 shows a detail view of a drawing wheel in section according to a horizontal plane, longitudinal to the feed direction of the metal profiles;

[20] figure 4 shows a section view according to a transverse plane of a different

embodiment of the drawing assembly in hand;

[21] figures 5, 6, 7, 8, 9 and 10 show schematic representations of various embodiments of the drawing assembly.

Best Mode

[22] With particular reference to such figures, the drawing unit designed for use in machines for working metal profiles 2 is indicated in its entirety with 1.

[23] The drawing assembly 1 comprises a series of drawing wheels 11, 12 suitably motor driven, arranged in couples on a same vertical plane and suitable to determine between them a feed path for the metal profiles 2 to be fed to the machine. More particularly, the drawing assembly 1 provides a series of drawing wheels 11 having preferably a fixed axis, arranged at the lower side of the feed path of the profiles 2, and a corresponding series of counter-rotating wheels 12, preferably mobile on their own lying plane, arranged at the upper side of the aforesaid feed path. In the illustrated case, the drawing assembly 1 provides three couples of drawing wheels 11, 12, but it is obviously possible to provide a different number of drawing wheels, according to the specific requirements of use.

[24] The upper wheels 12 are carried by an actuation device 4, suitable to perform the shifting of the same upper wheels 12 between a raised opening position and a lowered position wherein such upper wheels are pressed towards the underlying lower wheels 11.

[25] The actuation device 4 preferably provides a single actuator member 5 mounted, with a substantially horizontal axis, between a couple of lever arms 6, practically squaring shaped and pivoted, at corresponding pins 7, to the fixed framework 3 of the drawing assembly. The squaring levers 6 are

articulated by means of connecting rods 8 to a frame 9 which carries the upper wheels 12. The actuation in extension of the actuator member 5 triggers the divarication of the lever arms 6, so as to determine the simultaneous lifting of the upper wheels 12 in the opening position of the drawing assembly 1. The opposite closing movement of the actuator member 5 obviously determines the simultaneous descent of the same upper wheels 12 in the position for drawing the metal profiles.

[26] For a higher certainty of the correct pressure exerted on the profiles by the upper wheels 12, it is possible to provide that the drawing wheel arranged in central position is provided with an autonomous handling with respect to the frame 9.

[27] According to the present invention, the drawing wheels 11, 12 are doubled in a way as to define each a first wheel 11a, 12a and a second wheel 11b, 12b arranged side by side and coaxial to each other (see figures 2 and 3). Such first wheel 11a, 12a and second wheel 11b, 12b have a respective annular throat 10 in which is tightened the metal profile 2 moving forward. In substance, between the doubled counter-rotating drawing wheels 11, 12 is drawn a couple of metal profiles 2 placed side by side in longitudinal direction.

[28] The first wheel 11a, 12a and the second wheel 11b, 12b of the drawing wheels 11, 12 are alternatively motor driven, through the connection to a suitable motor member 13, 14, or carried freely rotatable according the same rotation axis.

[29] More in particular, according to a preferred embodiment of the drawing assembly 1, the drawing wheels 11, 12 are respectively constituted by a

first motor driven wheel 11a, 12a which is arranged beside a second pressure wheel 11b, 12b freely rotatable according to the same rotation axis (see also the scheme of fig. 5). The motor driven wheels 11a, 12a are carried overhang by a motor shaft 15, 16 mounted in axis to the motor member 13, 14 and supported rotatable, through suitable bearing members 17, 18, on the fixed framework 3. The motor driven wheels 11a, 12a are fixed frontally to the motor shaft 15, 16 through suitable mechanical fixing members 19, 20, while the freely rotatable pressure wheels 11b, 12b are mounted on the motor shaft 15, 16 by interposition of bearing members 21, 22. Nevertheless it is possible to provide that the pressure wheels are autonomous, as can be seen for example in the scheme of figure 6.

[30] Each motor driven wheel 11a, 12a cooperates with an opposite antagonist wheel, also called pressure wheel 11b, 12b, freely rotatable to tighten the wire 2 by means of a relative movement, coplanar to it (see again fig. 2). In substance, each metal profile 2 of the couple of profiles simultaneously fed by the drawing assembly is tightened respectively between a motor driven wheel 11a, 12a and a freely rotatable counter-rotating pressure wheel 11b, 12b of the drawing wheels 11, 12. Suitably, for a better balance of the stresses, the drawing wheels 11, 12 arranged in series have the motor driven wheels 11a, 12a and the pressure wheels 11b, 12b staggered in longitudinal direction, i.e. alternatively arranged towards the inside and towards the outside of the drawing assembly.

[31] The functioning of the drawing assembly is easy to understand from the preceding description.

[32] In use, the metal profiles 2 to be fed to the machine move forward side by

side along the feed line defined by the counter-rotating drawing wheels 11, 12. In particular, the metal profiles 2 are tightened between the annular throats 10 of such drawing wheels 11, 12 when the upper wheels 12 have been taken by the actuation device 4 into the work position lowered against the lower wheels 11. The drawing wheels 11, 12 being doubled in a first motor driven wheel 11a, 12a and a second freely rotatable pressure wheel 11b, 12b, the forward motion of each metal profile 2 is determined by the actuation of the motor driven wheels 11a, 12a by which the profile is directly engaged, independently from the metal profile placed beside thereto. In such a way it is possible to control the forward motion of the single profile, for example through encoder means, necessarily doubled as well, and as a consequence it is possible to determine with precision and autonomously the length of the tract of each profile fed to the machine.

[33] In such a way the length of the tract of profile fed to the machine is irrespective of possible wear and tear phenomena of the throats of the drawing wheels, mechanical impediments or other motives of irregularity of the drawing strength. In particular, it is possible to feed at the same time to the machine metal profiles having diameters not perfectly identical even if nominally equal, ensuring the correct length of each one of them.

[34] In figure 4 is illustrated a different embodiment of the drawing assembly according to the present invention, wherein a drawing wheel 12 of the couple of doubled drawing wheels 11, 12 is composed of a first and a second wheel both motor driven, for major clarity indicated with 12c, 12d, while the counter-rotating drawing wheel 11 is composed of a first and a second antagonist wheel or pressure wheel 11c, 11d both freely rotatable

(see also the scheme of fig. 7).

[35] The motor driven wheels 12, 12d are carried overhang by respective motor shafts 23, 24 coaxial to each other and suitable to be actuated by respective motor members, not represented. To such an end, the motor shaft 24 of the second motor driven wheel 12d is realized in tubular shape and carries axially inserted, longitudinally passing in, the motor shaft 23 of the first motor driven wheel 12c. The tubular shaft 24 is supported rotatable, through suitable bearing members 25, on the fixed framework 3, and carries rotatable the coaxial shaft 23 through further bearing members 26.

[36] It is to observe that in the illustrated case the motor driven wheels 12c, 12d have the peripheral surface flat, the annular throats 10 being practiced only on the opposite pressure wheels 11c, 11d.

[37] According to a different embodiment, not illustrated in the attached drawings, the first wheels 11a, 12a and the second wheels 11b, 12b can be all motor driven.

[38] In figures 8, 9 and 10 is illustrated a further embodiment of the drawing assembly according to the present invention, wherein only one of the metal profiles 2 placed beside is tightened and drawn between a driving wheel and an opposite pressure wheel, lacking the action of the pressure wheel on the second profile. Vice versa such a second profile is tightened and drawn between a driving wheel and an opposite pressure wheel of the successive couple of drawing wheels, while the first profile is free from the pressure wheel. In such a case, the lower wheels which do not operate the drawing of the metal profile carry out a function of guide for the same profiles.

[39] In an analogous manner the drawing of more than two metal profiles placed side by side can be realized, providing driving wheels equipped with two or more annular throats suitable to be engaged by respective metal profiles, one only of which tightened by a suitable antagonist wheel.

[40] The same result can be achieved increasing the bottom diameter of the throat of the lower wheels, so as to avoid the tightening of the profiles which engage them.

[41] The drawing assembly in hand therefore attains the scope of feeding in an autonomous manner more than one metal profile to a machine for working such metal profiles, in particular ensuring the correct length of each profile supplied to the machine, when this latter works more than one metal profile at the same time.

[42] Such a result is obtained substantially thanks to the inventive idea of doubling the counter-rotating drawing wheels, in a way as to allow the independent motor driving of each one of the wheels placed beside and coaxial which compose such drawing wheels. In such a way it is possible to control with precision the forward motion of the metal profiles fed simultaneously to the machine, for example through conventional encoder.

[43] A characteristic of the drawing assembly in hand is that of allowing to keep tightened more than one profile at the same time, but to draw only one or alternatively both in order to control singly the length thereof. It is evident that to such an end it is also necessary that the wheels of the straightening members are doubled, as the members measuring the metal profiles, for example consisting of conventional measure wheels, must be doubled.

[44] The present solution of doubling the drawing wheels results even more

efficient if associated with the use of a roller straightener wherein the single straightening wheels are doubled as well. In fact in such a case the lines of both profiles moving forward in parallel would be completely autonomous and separated. A single profile could also be maintained arrested in order not to produce further pieces, without having to extract the same profile with an unavoidable stop of the machine. In such a way is also solved the known problem of producing pieces in uneven quantities, an impossible task with the traditional bifilar working or with the known correction systems. In definitive the present invention turns out to be very flexible, and in particular such as to allow also the simultaneous production of pieces with different lengths.

[45] The present solution can obviously be applied to drawing assemblies anyway shaped as for arrangement and dimensions of the drawing wheels, as well as for the shape of the throats of such drawing wheels. It is for example possible to provide that the throats have different diameters for working metal profiles having different diameters.

[46] The drawing assembly described for indicative purpose is susceptible of various modifications and variants according to the exigencies. In particular the inventive idea of doubling the drawing wheels in order to control in an independent manner the forward motion of the single metal profiles can be usefully applied also to drawing assemblies using belt means, pliers means or other similar ones, known in the considered field and constituting in every respect technical equivalents of the counter-rotating drawing wheels.

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

[48] 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

1. Drawing assembly in machines for working metal profiles, comprising one or more couples of drawing wheels (11, 12) counter-rotating, between which are tightened the metal profiles (2) to be fed, **characterized in that** said drawing wheels (11, 12) are doubled so that each couple of wheels defines a first wheel (11a, 12a) and a second wheel (11b, 12b), independent from each other, arranged side by side and coaxial, and in that at least one wheel (11a, 12a) of said first and second wheel placed side by side is motor driven and counter-rotating with an opposite pressure wheel (11b, 12b) freely rotatable or equally motor driven, coplanar to it, to tighten a respective metal profile (2).
2. Drawing assembly according to claim 1, **characterized in that** said first wheel (11a, 12a) and second wheel (11b, 12b) placed side by side have a respective annular throat (10) in which said metal profile (2) is guided moving forward.
3. Drawing assembly according to claim 1 or 2, **characterized in that** said drawing wheels (11, 12) are respectively constituted by a said first wheel (11a, 12a) motor driven which is arranged side by side with a said second pressure wheel (11b, 12b) freely rotatable according to the same rotation axis.
4. Drawing assembly according to claim 1 or 3, **characterized in that** said motor driven wheels (11a, 12a) are carried overhang by a motor shaft (15, 16) suitable to be actuated by a motor member (13, 14) and rotatably supported, through bearing members (17, 18), on a fixed frame (3).

5. Drawing assembly according to claim 4, **characterized in that** said pressure wheels (11b, 12b) freely rotatable are mounted on said motor shaft (15, 16) through interposition of bearing members (21, 22).

6. Drawing assembly according to claim 1 or 2, **characterized in that** a doubled drawing wheel (12) of said couples of counter-rotating drawing wheels (11, 12) is composed by a said first and a said second wheel (12c, 12d), both motor driven, while the counter-rotating drawing wheel (11) is composed by a said first and a said second pressure wheel (11c, 11d) both freely rotatable.

7. Drawing assembly according to claim 6, **characterized in that** said motor driven wheels (12c, 12d) are carried overhang by respective motor shafts (23, 24) coaxial to each other and suitable to be actuated by respective motor members, the motor shaft (24) of said second motor driven wheel (12d) being realized in a tubular shape and carrying axially inserted, longitudinally passing, the motor shaft (23) of said first motor driven wheel (12c).

8. Drawing method in machines for working metal profiles, **characterized in that** it provides for

a. feeding a first metal profile (2) to a first motor driven wheel (11a) of a drawing assembly comprising one or more couples of counter-rotating drawing wheels (11, 12), between which there are suitable to be tightened in a work position the metal profiles (2) to be fed to the machine;

b. tightening said first metal profile (2) through a first pressure wheel (12b) counter-rotating with respect to said first motor driven wheel (11a);

c. feeding a second metal profile (2) to a second wheel (12a) of said drawing assembly, said second wheel (12a) being motor driven

independently with respect to said first motor driven wheel (11a);

d. tightening said second metal profile (2) through a second pressure wheel (11b) counter-rotating with respect to said second wheel (12a) motor driven;

e. actuating in an independent way the drawing of said first and said second metal profile (2) respectively tightened between said first motor driven wheel (11a) and first pressure wheel (12b) and between said second motor driven wheel (12a) and second pressure wheel (11b).

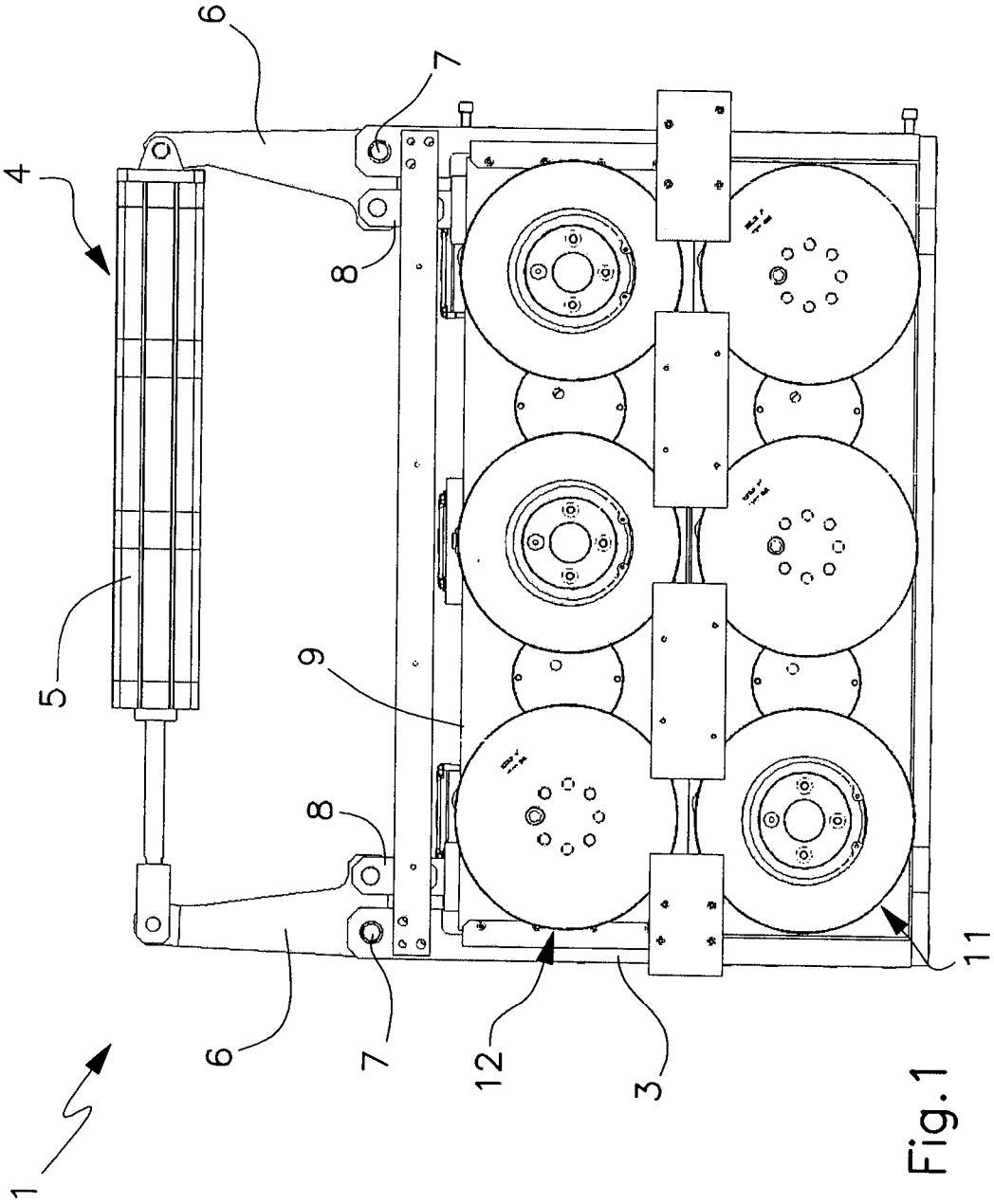
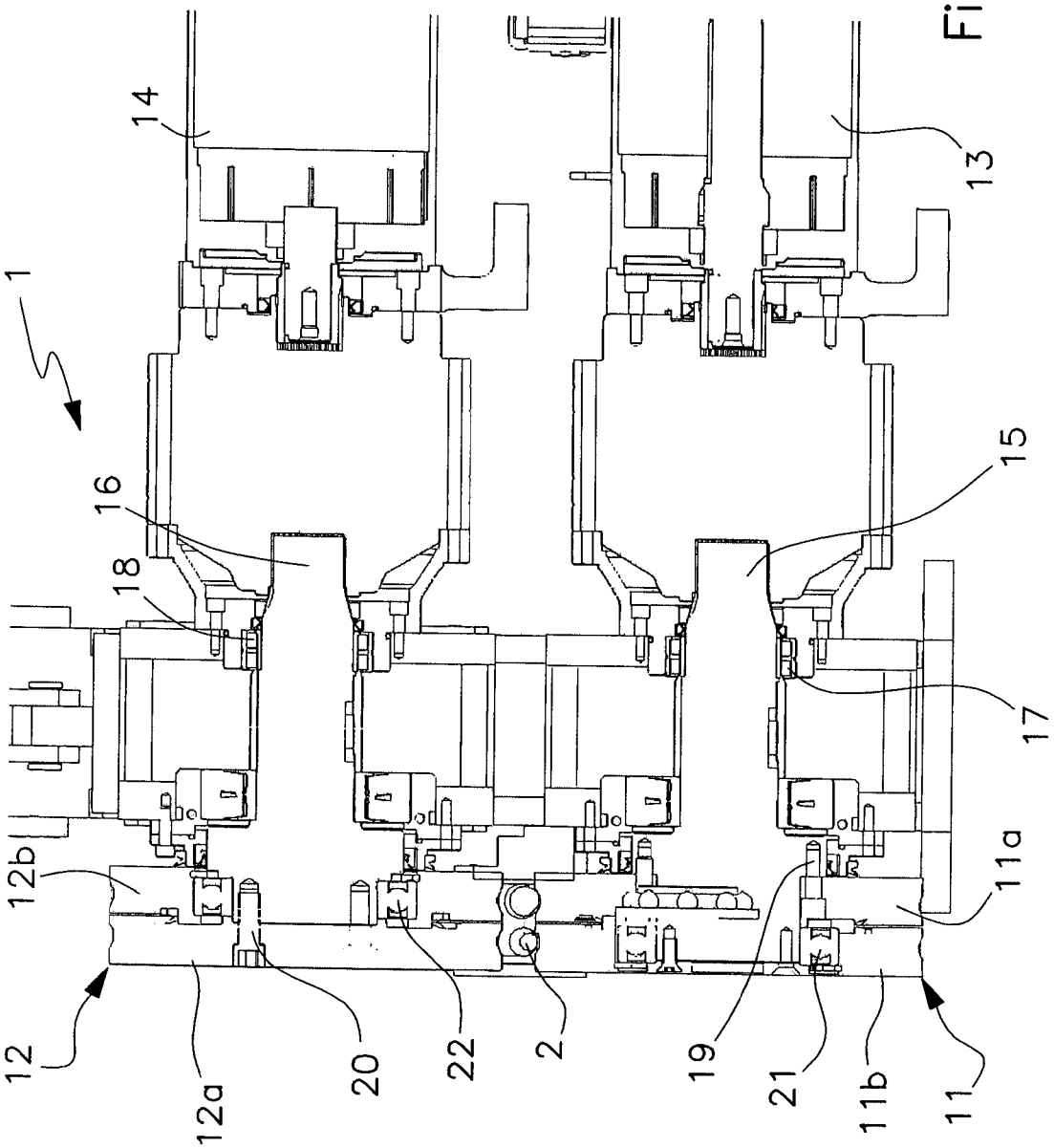


Fig.1

Fig.2



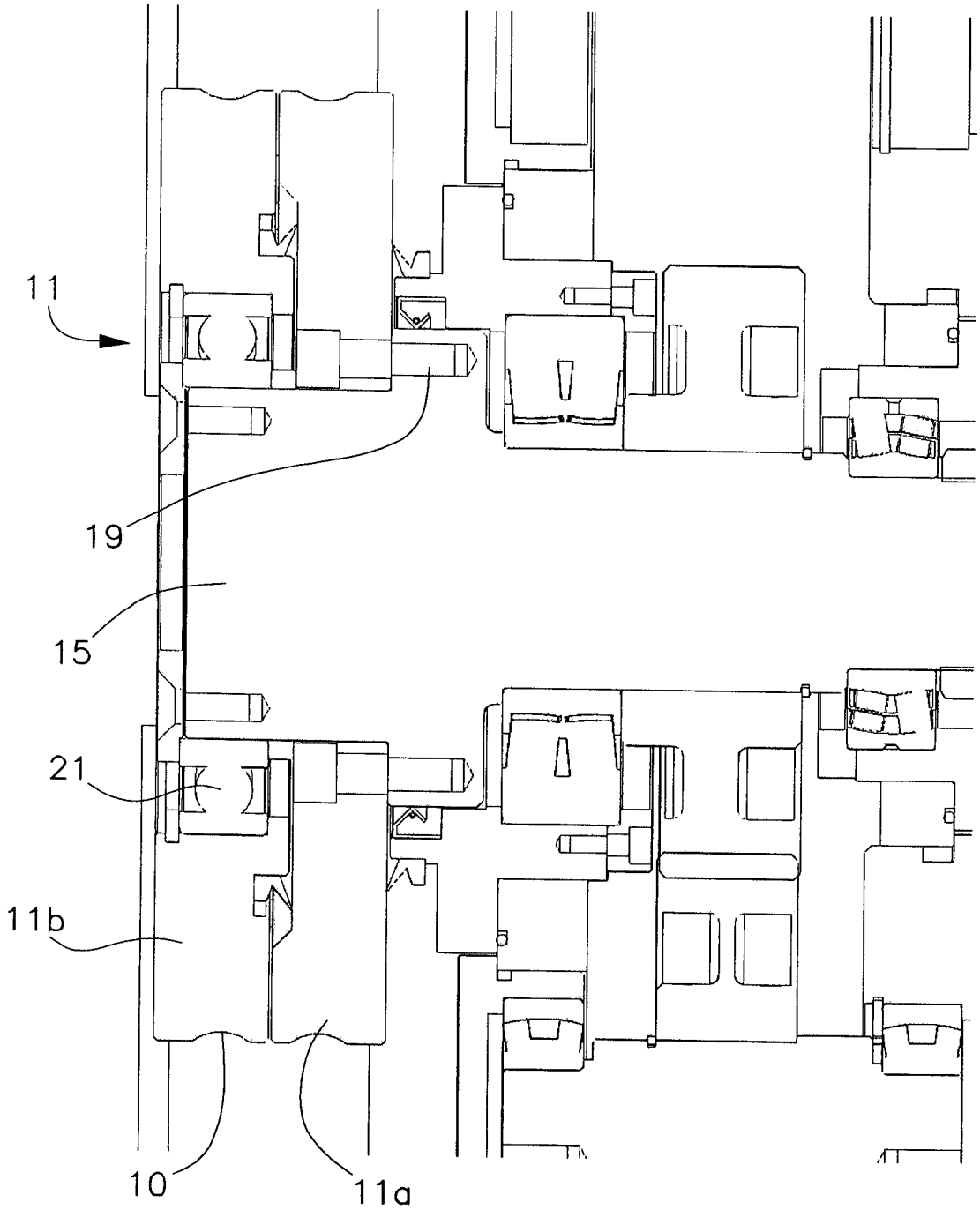


Fig.3

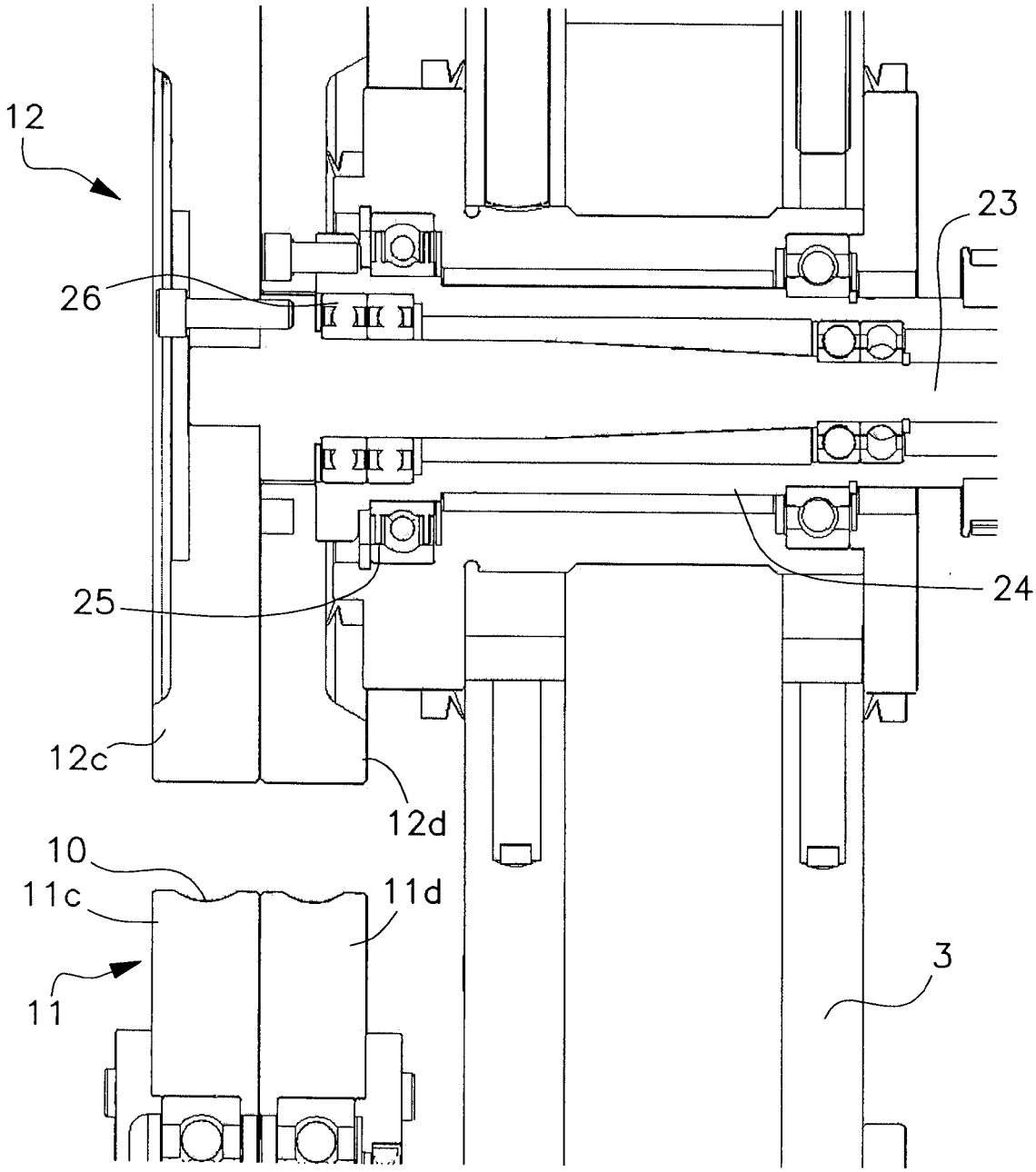


Fig.4

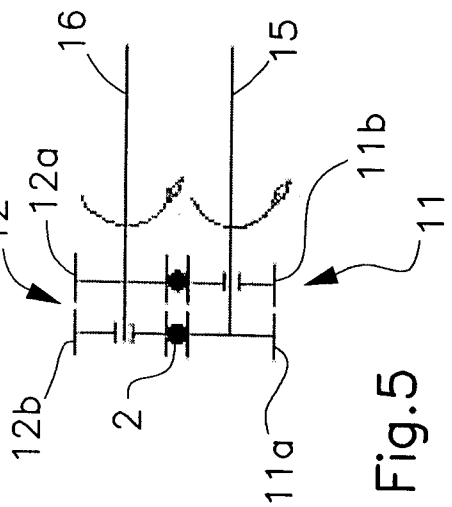


Fig.5

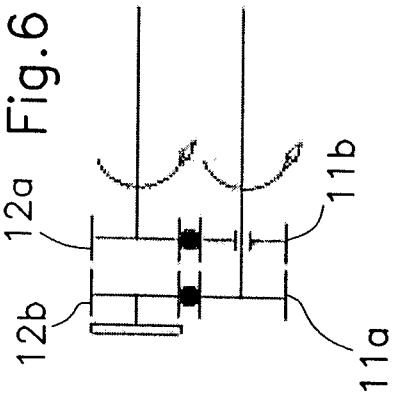


Fig.6

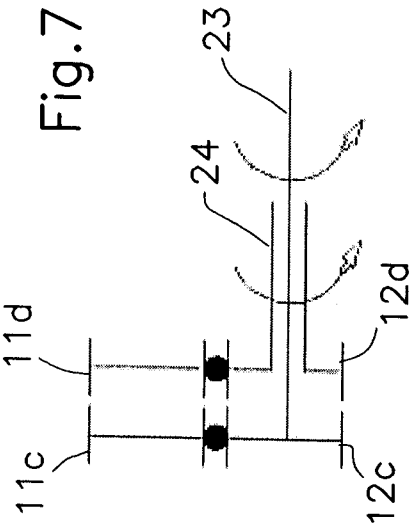


Fig.7

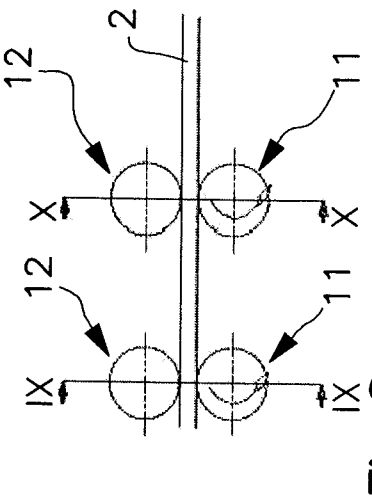


Fig.8

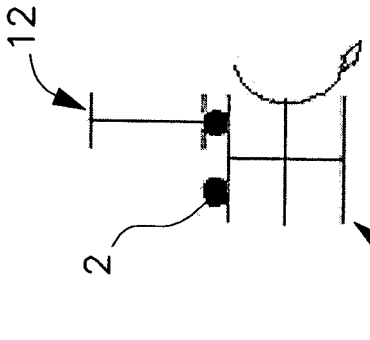


Fig.9

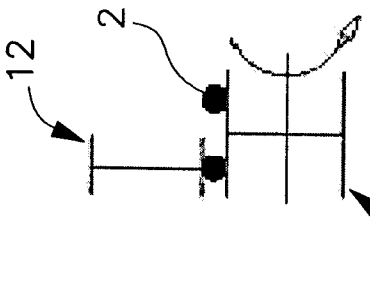


Fig.10

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/067880

A. CLASSIFICATION OF SUBJECT MATTER
INV. B21F23/00
ADD.

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 B65H B23K B21C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 161 481 A5 (SOUDURE AUTOGENE FRANCAISE) 6 July 1973 (1973-07-06) page 1, line 31 - line 35 page 2, line 26 - page 3, line 1; figures 3-5	1,2,6,8
A	WO 2010/043611 A1 (PIEGATRICI MACCH ELETTR [IT]; DEL FABRO GIORGIO [IT]) 22 April 2010 (2010-04-22) page 4, line 18 - line 31 page 6, line 6 - line 14 page 6, line 25 - line 32; figures	1,8
A	DE 94 08 880 U1 (JAEGER EMIL GMBH CO KG [DE]) 1 September 1994 (1994-09-01) page 2, line 9 - line 20; figures	1,8

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2011	22/12/2011

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/067880

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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