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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 March 2009 (26.03.2009)

PCT

(10) International Publication Number
WO 2009/037320 A1

(51) International Patent Classification:
B21C 1/28 (2006.01) *B21C 1/30* (2006.01)

(21) International Application Number:
PCT/EP2008/062463

(22) International Filing Date:
18 September 2008 (18.09.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
UD2007A000170
20 September 2007 (20.09.2007) IT

(71) Applicant *(for all designated States except US)*: **DANIELI & C. OFFICINE MECCANICHE SPA** [IT/IT]; Via Nazionale, 41, I-33042 Buttrio (IT).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **CHIUCH, Bruno** [IT/IT]; Via Crostù, 83, I-33040 S. Leonardo (IT). **VOGRIG, Enzo** [IT/IT]; Via Giuseppe Quarina, 1, I-33049 San Pietro Al Natisone (IT).

(74) Agents: **PETRAZ, Gilberto** et al.; Glp Srl, Piazzale Cavedalis, 6/2, I-33100 Udine (IT).

(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, 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, 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, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(54) **Title:** DRAWING ASSEMBLY FOR DRAWING MACHINES AND RELATED METHOD

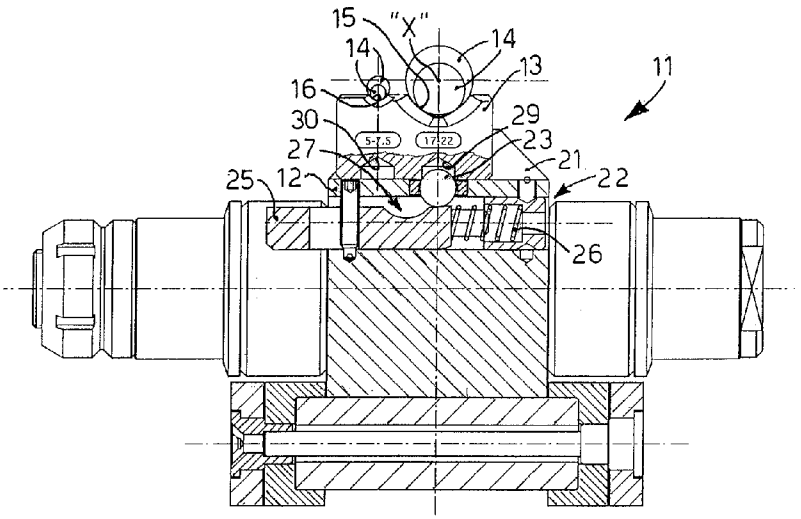


fig. 2

(57) **Abstract:** Drawing assembly (10) comprising two opposite and counter-rotating tracks (11), each consisting of a plurality of links (12) constrained to each other and each supporting a relative drawing clamp (13) which grips the product to be drawn (14), wherein each drawing clamp (13) is able to be selectively clamped inside a housing seating (21) of the relative link (12) by means of corresponding rapid attachment/detachment members (22) associated with the link (12). The drawing clamp (13) comprises two external hollows (15, 16) of different sizes and in each of which a determinate range of cross sections of the product to be drawn (14) is positioned. The invention also relates to a corresponding method for drawing metal products.

WO 2009/037320 A1

"DRAWING ASSEMBLY FOR DRAWING MACHINES AND RELATED METHOD"

* * * * *

FIELD OF THE INVENTION

The present invention concerns a drawing assembly for drawing machines for metal products, such as bars or tubes. In particular, the drawing assembly according to the invention is of the generally continuous type and comprises at least two opposite and counter-rotating tracks, each consisting of a plurality of links disposed in sequence and able to grip the metal products in order to achieve the axial drawing thereof. The invention relates also to the drawing method that uses the drawing assembly.

BACKGROUND OF THE INVENTION

Drawing machines for metal bars are known, comprising a drawing assembly provided with two counter-rotating tracks opposite with respect to the drawing axis.

Each track consists of a plurality of links constrained to each other in sequence, and on each of which a drawing clamp is mounted which during use acts on the bar to be drawn.

In particular, each drawing clamp cooperates with a corresponding clamp of the opposite track, so as to grip the bar to be drawn from opposite sides.

Each clamp is provided with a hollow, which is shaped specifically with respect to the cross section of the bar in its segment already drawn.

In this way, the bar to be drawn is gripped between two hollows of two opposite clamps, and the rotation of the two tracks achieves the clamping and substantially continuous drawing of the bar, so as to achieve the drawing process.

The drawing clamps are removable from the respective links, so they can be completely removed in the event of wear or a variation in section of the bar to be drawn.

It is known to produce a large number of different series of inter-replaceable clamps, normally 4-5 series for solid bars and 10 or more series for tubular bars.

Each series of clamps has the relative hollow of a size that differs from one series to the other, so that each series of clamps is suitable to effectively grip a coordinated range of bars with different diameters.

Applicant has found that in order to effect the complete replacement of the clamps from both tracks (even 50 or more for each track) it requires two qualified operators employed for about 15-20 minutes.

According to Applicant's estimates, these operations to replace the clamps, without considering the ordinary and extraordinary maintenance operations, must be carried out with the machine shut down about every 4-5 hours.

Therefore, with the drawing clamps used in the state of the art, there are high costs and long times, both in production and management, of the drawing assembly and consequently the entire drawing machine on which it is assembled.

Furthermore, the known solution needs a large store for storing the series of clamps not used.

Purpose of the present invention is to achieve a drawing assembly for drawing machines in which the replacement of the drawing clamps for effectively gripping bars with different diameters has reduced times and costs, of both production and management, compared with the state of the art.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

In accordance with said purpose, a drawing assembly according to the present invention comprises at least two opposite and counter-rotating tracks, each consisting of a plurality of links constrained to each other and each supporting a relative drawing clamp able to grip the product to be drawn.

Each drawing clamp is selectively able to be clamped in a housing seating of the relative link by means of corresponding rapid attachment/detachment means associated with the link. According to a characteristic feature of the present invention, the drawing clamp comprises at least two hollows having different sizes and in each of which a determinate range of cross sections of said product to be drawn is able to be positioned. In a further improvement of the present invention, the drawing clamp is configured to be selectively moved, for example

laterally translated, with respect to the respective link, so as to align the selected hollow with the drawing axis of the product to be drawn.

With the present invention the same clamp, having at least two hollows of different sizes, is able to guarantee the effective gripping of at least two different ranges in size of the product to be drawn.

In this way, it is possible to at least halve the different series of clamps provided in the state of the art so as to cover the same ranges in sizes of products to be drawn.

Furthermore, with the solution according to the present invention, to pass from one range of sizes of the products to be drawn to another, it is not necessary to completely replace the clamps of the relative links, it is sufficient to translate them, or more generally move them, with respect to the link, so as to align the new hollow with the drawing axis of the product to be drawn.

Applicant has estimated that with the solution according to the present invention, in order to equip the machine for a new range of sizes of products to be drawn, it is sufficient to have one operator intervene, with the machine shut down, for a time of about 5 minutes.

We therefore have a considerable reduction in times and costs, both of production and of management, of the drawing assembly.

According to a variant, the two hollows provided on the same drawing clamp have a size such as to allow the effective gripping of ranges in size of products to be drawn, with completely different values.

According to another variant, the two hollows provided on the same drawing clamp have a size such as to allow the effective gripping of ranges in size of products to be drawn, having at least partly common values.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a partial and lateral view of a drawing assembly according to the invention;
- fig. 2 shows a cross section from II to II of fig. 1, with the drawing clamp in the clamped condition;

- fig. 3 shows the track from fig. 2, with the drawing clamp in its unclamped condition;
- fig. 4 shows some drawing clamps usable in the drawing assembly in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to the attached drawings, a drawing assembly 10 according to the present invention is part of a drawing machine for a bar 14, of a known type and not shown in detail in the drawings.

The drawing assembly 10 comprises two counter-rotating tracks 11, shown partly in fig. 1, which are disposed symmetrical and opposite, above and below, with respect to the drawing axis "x" of the bar 14.

Each track 11 substantially consists of a plurality of links 12 constrained to each other by means of suitable articulated joints.

A relative drawing clamp 13 is mounted, selectively removably on each link 12.

Each drawing clamp 13 is provided on the upper part, in this case, with two hollows, respectively a first 15 and a second 16, substantially parallel to the axis of feed "x".

Each hollow 15 or 16 is selectively positionable in an operating condition in which it is aligned with the axis of feed "x" and cooperates with a corresponding hollow 15 or 16 of the opposite track 11, to retain a segment of the bar 14.

In this way, the bar 14 is drawn by the tracks 11 during the drawing process.

According to the invention, the first hollow 15 and the second hollow 16 have different sizes, coordinated with different ranges of size of bars 14 to be drawn.

In this case, the first hollow 15 is conformed to allow the effective gripping of a bar 14 with a diameter comprised between about 17 mm and about 22 mm.

The second hollow 16, of a much smaller size than the first hollow 15, is conformed to allow the effective clamping of a bar 14 with a diameter comprised between about 5 mm and about 7.5 mm.

As shown in fig. 4, the two hollows 15 and 16 provided on each drawing clamp 13 are conformed in such a manner as to allow the effective gripping not only of very different ranges of sizes of bars 14, but also of ranges of sizes that have common limit values, for example from about 11 mm to about 17 mm the

first 15, and from about 7.5 mm to about 11 mm the second; or ranges of sizes that intersect for some values, for example from about 11 mm to about 17 mm the first 15 and from about 9 mm to about 14 mm the second 16.

The two tracks 11, in a known manner, are mounted on respective rigid supporting plates 17, they are made to rotate continuously by toothed wheels 19 and exert a pressure on the bar 14, in cooperation with intermediate chains 20 of the roller type, imparting to the bar 14 the drawing action along the axis "x".

Each clamp 13 has two front faces 13a, inclined and converging towards the outside, and is disposed in a relative housing seating 21 with a dovetailed conformation. The housing seating 21 is made transversely through on the external face of the respective link 12.

The dovetailed couplings of the links 12 and the relative clamps 13 determine a constraint that prevents both the accidental fall and also the longitudinal removal of the clamps 13.

In order to replace them, or to selectively position a hollow 15, 16 in the condition aligned with the axis of feed "x", the clamps 13 can be released from the relative links 12 only by means of lateral extraction from the relative housing seatings 21.

Each link 12 comprises a rapid attachment/detachment member 22, provided with a central clamping element and a relative activation element, in order to clamp stably, and removably, the relative clamp 13 inside the housing seating 21.

In this case, the clamping element consists of a ball 23, while the activation element consists of a thruster 25 associated at the rear with a spring 26.

The thruster 25 comprises at the upper part a cavity 27, substantially semi-spherical in shape, which functions as a positioning cam profile for the ball 23.

When the thruster 25 is in its clamping position (fig. 2), the ball 23 cooperates with the upper edge of the cavity 27.

In this way, the ball 23 is thrust towards the outside and is partly inserted inside a first blind hole 29 provided on the lower surface of the clamp 13, thus clamping the latter to the relative link 12.

The first blind hole 29 is made in a position such that the partial insertion therein of the ball 23 guarantees the aligned positioning of the first hollow 15 with the axis of feed "x".

Displacing the thruster 25 axially in the release position (fig. 3), by compressing the spring 26, the ball 23 is located inside the cavity 27, lowering itself and becoming released from the blind hole 29.

In this way, the clamp 13 is released and can be translated laterally with respect to the relative link 12.

In this released condition, the clamp 13 can be translated until it takes the ball 23 into substantial alignment with a second blind hole 30 provided on the lower surface of the clamp 13.

The second blind hole 30 is made in a position such that the partial insertion therein of the ball 23 guarantees the aligned positioning of the second hollow 16 with the axis of feed "x".

Then, returning the thruster 25 to the clamping position, the ball 23 is lifted, taking it into partial insertion in the blind hole 30 and thus clamping the clamp 13 to the link 12, with the second hollow 16 in an operating position aligned with the axis of feed "x".

It is clear, however, that modifications and/or additions of parts may be made to the drawing assembly 10 as described heretofore, without departing from the field and scope of the present invention.

For example, it comes within the field of the present invention to provide that each drawing clamp 13 is provided with three or more hollows of different sizes and each conformed to effectively grip a different range of sizes of bars 14.

It also comes within the field of the present invention to provide that instead of the ball 23 the central clamping element comprises a clamping pin, mounted axially sliding inside a cavity made on the link 12, substantially orthogonal to the plane on which the clamp 13 lies and communicating with the housing seating 21.

It also comes within the field of the present invention to provide that the activation element comprises a thruster mounted laterally on the link 12 and located substantially orthogonal to said clamping pin.

It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of drawing assembly for drawing machines, having

the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

5

CLAIMS

1. Drawing assembly comprising at least two opposite and counter-rotating tracks (11), each consisting of a plurality of links (12) constrained to each other and each supporting a relative drawing clamp (13) able to grip the product to be drawn (14), wherein each drawing clamp (13) is able to be selectively clamped inside a housing seating (21) of the relative link (12) by means of corresponding rapid attachment/detachment means (22) associated with said link (12), characterized in that said drawing clamp (13) comprises at least two external hollows (15, 16) of different sizes and in each of which a determinate range of cross sections of said product to be drawn (14) is able to be positioned.

2. Drawing assembly as in claim 1, characterized in that said drawing clamp (13) is configured to be selectively moved with respect to the respective link (12), so as to align the selected hollow (15 or 16) with the feed axis ("x") of the product to be drawn (14).

3. Drawing assembly as in claim 1 or 2, characterized in that said two external hollows (15, 16) have sizes such as to allow the effective gripping of two coordinated ranges of sizes of said products to be drawn (14) having completely different values.

4. Drawing assembly as in claim 1 or 2, characterized in that said two external hollows (15, 16) have sizes such as to allow the effective clamping of two coordinated ranges of sizes of said products to be drawn (14) having at least partly common values.

5. Drawing assembly as in any claim hereinbefore, characterized in that said rapid attachment/detachment means (22) comprises at least a clamping element (23) mobile axially along an axis substantially orthogonal to the plane on which said track (11) lies, and an activation element (25) mobile axially and able to displace said clamping element (23) between a clamping position in which it cooperates with a mating seating (29, 30) made on a lower surface of said drawing clamp (13), and a second release position in which it is released from said seating (29, 30).

6. Drawing assembly as in claim 5, characterized in that said activation element (25) is associated with elastic means (26) able to maintain said clamping element (23) in said first clamping position.

7. Drawing assembly as in claim 5 or 6, characterized in that said clamping element comprises a spherical or semi-spherical element (23) able to be at least partly inserted inside said seating (29, 30), and in that said activation element (25) comprises a cavity (27) made in an upper segment thereof cooperating with said spherical or semi-spherical element (23).

8. Drawing assembly as in claim 5, 6 or 7, characterized in that said drawing clamp (13) comprises at least two seatings (29, 30) for said clamping element (25), each seating (29, 30) being made in such a manner as to define the positioning of a respective one of said at least two external hollows (15, 16), in a condition aligned with said axis of feed "x".

9. Drawing assembly as in any claim hereinbefore, characterized in that said drawing clamp (13) comprises three or more external hollows (15, 16).

10. Drawing method for drawing metal products (14), such as bars or tubes, comprising a step wherein a product (14) is gripped by two opposite and counter-rotating tracks (11), each consisting of a plurality of links (12) constrained to each other and each supporting a relative drawing clamp (13) by means of corresponding rapid attachment/detachment means (22), characterized by the further steps of:

- providing on each of said clamps (13) at least two external hollows (15, 16) of different sizes and in each of which a determinate range of cross sections of said product to be drawn (14) is able to be positioned;

- moving said clamps (13) with respect to the respective link (12), so as to align the selected hollow (15 or 16) with a feed axis ("x") of the product to be drawn (14) depending on the size of said product (14).

11. Drawing method as in claim 10, characterized in that the direction of the movement of the clamp (13) with respect to the respective link (12) is a lateral translation along an axis substantially orthogonal to the plane on which said track (11) lies.

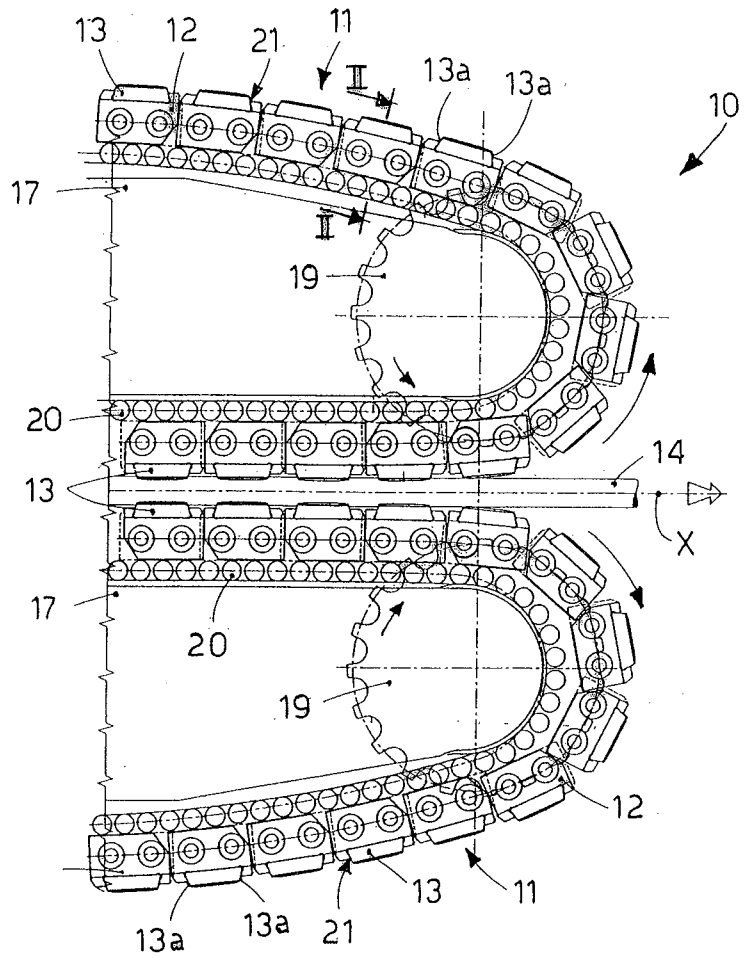

13
12
21
11
II
13a
13a
10
17
II
19
20
14
13
X
17
20
19
12
13
11
13a
13a
21

fig. 1

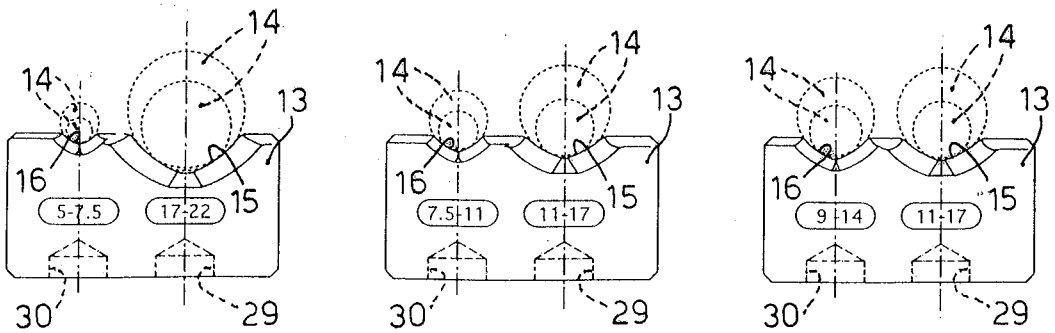

14
14
13
16
5-7.5
17-22
15
30
29
14
14
13
16
7.5-11
11-17
15
30
29
14
14
13
16
9-14
11-17
15
30
29

fig. 4

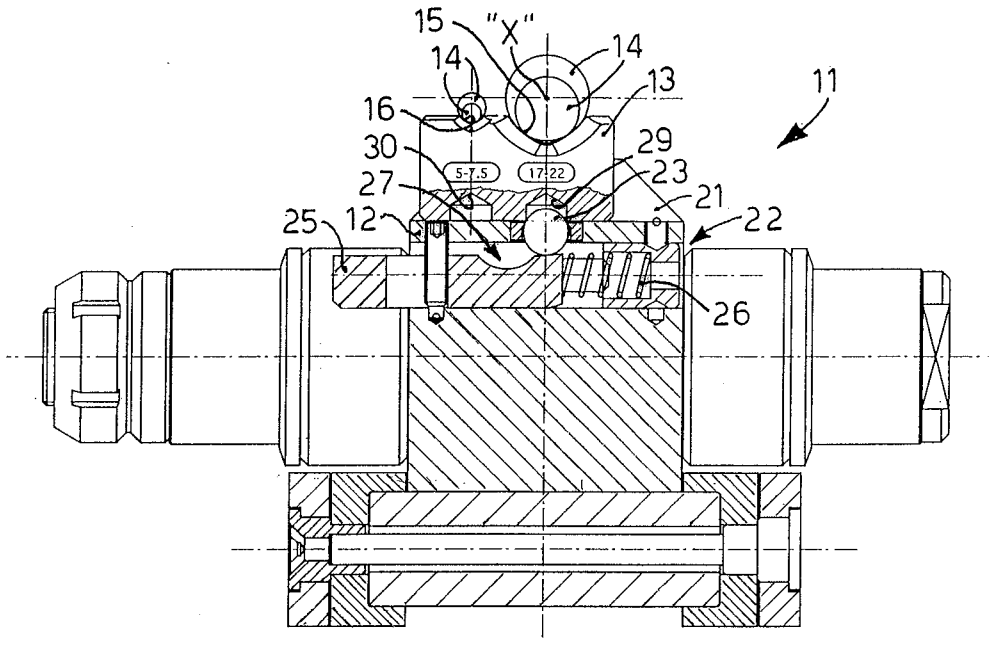

15
"X"
14
14
13
11
16
30
29
5-7,5
17-22
23
27
21
25
12
22
26

fig. 2

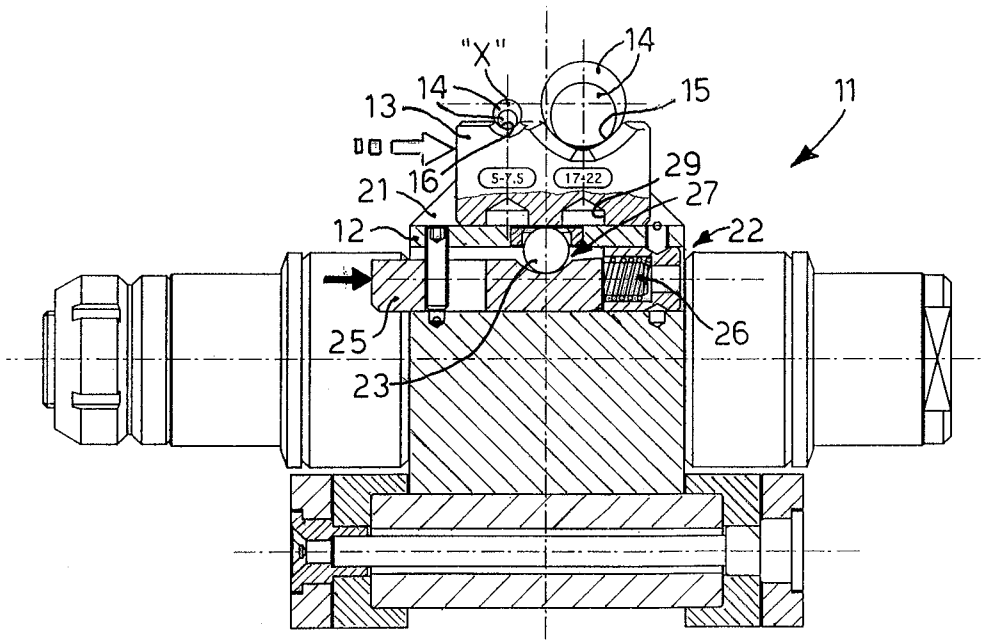

"X"
14
14
15
11
13
16
29
5-7,5
17-22
27
21
12
22
26
25
23

fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/062463

A. CLASSIFICATION OF SUBJECT MATTER
INV. B21C1/28 B21C1/30

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)
B21C B65G B65H

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.
X	JP 10 277631 A (MIYAZAKI IRON WORKS) 20 October 1998 (1998-10-20)	1,3,4,9
Y	abstract; figures 1-5	5-7
A		2,10,11
Y	WO 01/14076 A (DANIELI CT MASKIN S P A [IT]; CHIUCH BRUNO [IT]) 1 March 2001 (2001-03-01)	5-7
A	page 9, line 11 - page 12, line 27; figures 4a,4b	8
X	GB 1 450 136 A (DANIELI L; OFFICENE MECCANICHE DANIELI) 22 September 1976 (1976-09-22)	1,3,9
A	page 1, line 71 - line 89; claims 1,4-7	10

-/--

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

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 January 2009	05/02/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ritter, Florian

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/062463

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 112 730 A (GREVEN JOHANN ET AL) 12 September 1978 (1978-09-12) column 4, line 51 - line 60; figure 4	1
A	US 5 094 340 A (AVAKOV VLADIMIR A [US]) 10 March 1992 (1992-03-10) column 3, line 41 - column 4, line 3; figures 9-12	1
A	DE 37 24 473 C1 (BUELTMANN MONIKA) 18 August 1988 (1988-08-18) the whole document	1
A	US 4 013 205 A (FABRE-CURTAT MICHEL ET AL) 22 March 1977 (1977-03-22) the whole document	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/062463

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 10277631 A	20-10-1998	JP 2986758 B2	06-12-1999
WO 0114076 A	01-03-2001	AT 246058 T	15-08-2003
		AU 4425000 A	19-03-2001
		DE 60004250 D1	04-09-2003
		DE 60004250 T2	27-05-2004
		EP 1210187 A1	05-06-2002
		ES 2204579 T3	01-05-2004
		IT UD990152 A1	26-02-2001
		US 6644467 B1	11-11-2003
GB 1450136 A	22-09-1976	FR 2238538 A1	21-02-1975
		IT 991338 B	30-07-1975
US 4112730 A	12-09-1978	BR 7706151 A	14-11-1978
		DE 2716657 A1	26-10-1978
US 5094340 A	10-03-1992	EP 0486324 A2	20-05-1992
DE 3724473 C1	18-08-1988	NONE	
US 4013205 A	22-03-1977	CA 1031800 A1	23-05-1978
		DE 2526071 A1	08-01-1976
		DK 275575 A	19-12-1975
		FR 2275386 A1	16-01-1976
		GB 1506407 A	05-04-1978
		IT 1039083 B	10-12-1979
		JP 51014163 A	04-02-1976
		NL 7507219 A	22-12-1975
		NO 752156 A	19-12-1975
		SE 400063 B	13-03-1978
		SE 7506941 A	19-12-1975
		SU 591158 A3	30-01-1978