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(54) Title: TYRE-CHANGING MACHINE

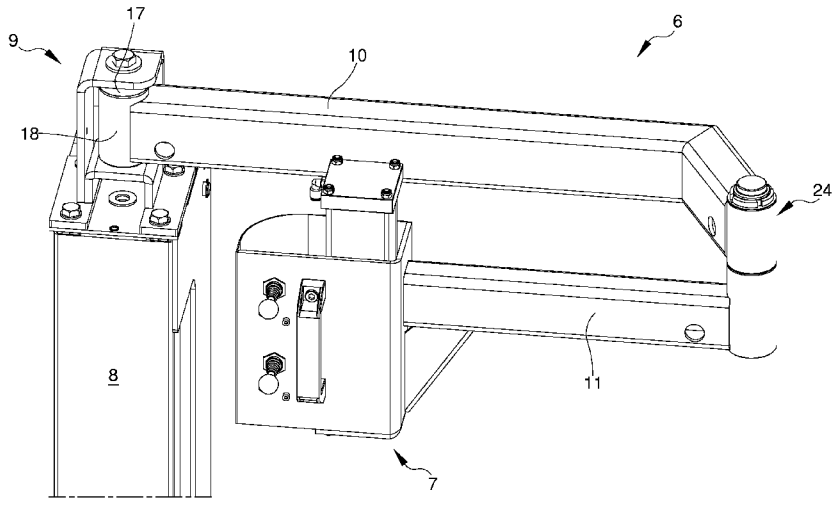


Fig. 2

(57) Abstract: The tyre-changing machine (1) comprises: a base frame (2) which can rest on the ground; a gripping and rotation unit (3) of a wheel mounted on the frame (2); a main arm (4) mounted on the frame (2) and carrying removal/fitting means for removing and/or fitting the tyre from/on the wheel; an auxiliary arm (6) mounted on the frame (2), carrying aiding means (7) for aiding the fitting/removal and suitable for moving between a work position where the aiding means (7) are positioned in correspondence to the unit (3) and an idle position where the aiding means (7) are moved away from the unit (3); and locking means (13, 14, 15, 16, 20) to lock in a releasable way the auxiliary arm (6) in the idle position.

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TYRE-CHANGING MACHINE

Technical Field

The present invention relates to a tyre-changing machine.

Background Art

The use is known of tyre-changing machines employed in garages for the rim and/or tyre maintenance or replacement.

These machines comprise a base frame that supports a gripping and rotation unit of the wheel and a tool-carrying main arm, which surmounts such unit, having at least one tool suitable for the tyre removal/fitting job.

In detail, the main arm is mounted horizontally on an upright which extends from a rear portion of the base frame.

Some tyre-changing machines are equipped with an auxiliary arm that cooperates with the main arm in the tyre removal/fitting operations.

Generally, the auxiliary arm is equipped with a bead-pressing tool, used to facilitate the removal/fitting operations from/to the rim, especially in the case of particularly hard tyres.

The auxiliary arm is placed horizontally and is hinged to its own upright, or to the upright of the main arm, and is suitable for rotating as a weathervane.

In the removal phase, an operator positions and locks the wheel rim to be worked on said group and then adjusts the position of the removal/fitting tool according to the specific dimensions of the wheel.

After that, the operator actuates the rotation unit in order to extract the tyre.

At this point, the operator rotates the auxiliary arm from an idle position to a work position, wherein the tool carried by it is arranged in correspondence to a suitable portion of the tyre, to favor the bead extraction.

The auxiliary arm and the relative tool are used in a similar way also when fitting the tyre on the rim.

When the removal/fitting operation has been completed, the operator manually returns the arm in its idle position.

It often happens that the operator is hindered by the auxiliary arm in his/her maneuvers of wheel positioning or extraction on/from the rotation unit.

In fact, if the hinge axis of the auxiliary arm is not perfectly vertical, the

auxiliary arm tends to come out of the idle position, rotating in the direction of the work position, thus positioning in the operator's maneuvering area.

Description of the Invention

The main aim of the present invention is to provide a tyre-changing machine of the type comprising an auxiliary arm that allows a user to operate on the machine itself, e.g. in correspondence to the gripping and rotation unit, without being hindered by the auxiliary arm.

Another object of the present invention is to provide a tyre-changing machine which allows to overcome the mentioned drawbacks of the prior art within the ambit of a simple, rational, easy and effective to use as well as affordable solution.

The above mentioned objects are achieved by the present tyre-changing machine made in accordance with claim 1.

Brief Description of the Drawings

Other characteristics and advantages of the present invention will become better evident from the description of a preferred, but not exclusive, embodiment of a tyre-changing machine, illustrated by way of an indicative, but not limitative example in the accompanying drawings in which:

Figure 1 is an axonometric view of the machine according to the invention;

Figure 2 is an axonometric view of the auxiliary arm and of the hinge which connects it to an upright of the machine according to the invention;

Figure 3 is an exploded view of the hinge of the previous illustration;

Figure 4 is a longitudinal sectional view of the hinge, taken when the auxiliary arm is in its idle position; and

Figure 5 is a view of the previous illustration, taken when the auxiliary arm has come out of the idle position.

Embodiments of the Invention

With particular reference to these figures, globally indicated by 1 is the tyre-changing machine of the invention.

The machine 1 comprises a base frame 2, which can rest on the ground, which carries a gripping and rotation unit 3 of a wheel.

The proposed machine 1 also includes a main arm 4, mounted on the frame 2,

which main arm 4 carries removal/fitting means (not shown in the attached figures) for the extraction and/or fitting of the tyre from/on the rim.

In practice, the gripping and rotation unit 3 is arranged on a front part of the frame 2, while a supporting post 5 of the main arm 4 protrudes from a rear part of the frame 2 itself.

The main arm 4 is mounted cantilevered on the post 5 so that said removal/fitting means surmount the aforementioned unit 3 and, in use, can be lowered/lifted to intervene on the tyre of rim fixed to the unit 3.

In this way, the gripping unit 3 and the removal/fitting means carried by the main arm 4 cooperate from a functional point of view to extract the tyre from the rim or to fit on it.

The machine 1 of the invention is of the type equipped with an auxiliary arm 6 which carries aiding means 7 for aiding the fitting/removal and which is suitable for moving between a work position, wherein said aiding means 7 are positioned in correspondence to the aforementioned unit 3 to be employed on the tyre, and an idle position wherein the aiding means 7 are moved away from unit 3.

In detail, the proposed machine 1 includes a vertical upright 8 for the auxiliary arm 6 on which the latter is mounted in a rotatable way, by means of a hinge 9, so as to be moved manually between the two positions mentioned above, rotating as a weathervane.

The hinge 9, in particular, defines a substantially vertical rotation axis for the rotation of the auxiliary arm 6.

The auxiliary arm 6, on the contrary, is arranged horizontally and, thanks to the hinge 9, moves on a plane of movement which is also horizontal.

Preferably, the auxiliary arm 6 is articulated and is formed by a plurality of stretches 10, 11 rotoidally coupled the one to the other, each of which is horizontal.

In detail, one of these stretches, in particular the proximal stretch 10, i.e. closer to the upright 8, may have a bend or an elbow.

In correspondence to the distal extremity of the auxiliary arm 6, i.e. the one farthest from the upright 8, are fixed the aiding means 7 provided for

cooperating with said removal/fitting means and the gripping unit 3 to obtain a more effective removal.

There are several possible types of aiding means 7.

In the embodiment illustrated in the attached drawings, they comprise a pneumatically operated bead presser 7.

In this case, the articulation of the auxiliary arm 6 allows the bead presser 7 to remain in correspondence to a certain given section of the tyre to which it is applied also during the rotation of the wheel upon actuation of the gripping and rotation unit 3, according to *per se* known procedures.

However, different aiding means are possible, comprising e.g. rollers or discs or more.

It should be noticed in fact that the machine 1 of the invention also comprises a bead pressing roller 12, which can be lifted and lowered along the upright 8 which carries the auxiliary arm 6.

According to a very important aspect of the invention, the machine 1 comprises locking means 13, 14, 15, 16, 20 to lock in a releasable way the auxiliary arm 6 in said idle position.

The locking means 13, 14, 15, 16, 20 are preferably included in the aforementioned hinge 9.

In the preferred embodiment of the invention, the locking means 13, 14, 15, 16, 20 comprise a pin 13, e.g. of substantially cylindrical shape, suitable for alternately fitting into and coming out of a suitable seat 14.

In detail, the hinge 9 may comprise a first hinging element 17 mounted on the upright 8 and a second hinging element 18 fixed to the auxiliary arm 6, which are suitable for the mutual rotation and can be associated in a sliding way.

In this case, the seat 14 is obtained in one of the two elements 17, 18, e.g. in the second element 18, as shown in the attached tables, while the pin is carried by the other element (specifically, the first element 17, see the attached illustrations).

It should be noticed that the first element 17 can be fixed in the upright 8, as in the embodiment shown in the figures, or can be carried by a carriage suitable for sliding vertically along the height of the upright 8.

For accuracy, the locking means 13, 14, 15, 16, 20 also comprise a housing 19, wherein the pin 13 can slide axially, to fit into or come out of the seat 14, which housing 19 is obtained in the hinging element 17 which carries the pin 13 and which is devoid of the seat 14.

The seat 14 and the housing 19 can be both blind holes of cylindrical shape.

The locking means 13, 14, 15, 16, 20 may then comprise elastic means 20, comprising e.g. a spring, positioned within the housing 19, between an internal extremity of the pin 13 and the bottom of the housing 19 itself, which elastic means 20 are suitable for stressing the pin 13 within the seat 14 and in any case away from the bottom of the housing 19.

In practice, when the pin 13 is inserted in the seat 14, the mutual rotation of the first and of the second element 17, 18 is prevented, while when it is retracted into the housing 19, or in any case it has come out of the seat 14, the mutual rotation of the two hinging elements 17, 18, and consequently of the auxiliary arm 6 with respect to the upright 8, is allowed.

Preferably, as shown in the illustrations, the first and the second elements of hinge 9 comprise a respective annular element 17, 18 fitted on a shaft 21, included in the upright 8.

The annular elements 17, 18 have respective surfaces 22, 23, e.g. in the shape of a circular crown, facing one another, on which the housing 19 and the seat 14 are obtained.

These surfaces 22, 23 of the annular elements 17, 18 may be in contact and slide the one with respect to the other.

The positions of the seat 14 and of the housing 19 are chosen so that, when they are coaxial, which means that they have their respective mouths facing each other, then the auxiliary arm 6 is in the idle position, and the pin 13 can be inserted into the seat 14.

In detail, in the case of arm 6 being formed by several hinged rectilinear stretches 10, 11, the locking means 13, 14, 15, 16, 20 may be present only on the hinge 9 located in correspondence to the upright 8 or even on one or more hinges 24 that join these stretches.

In the first case, the rotational lock only occurs between the upright 8 and the

proximal stretch 10 of the auxiliary arm 6, that is the one protruding directly from the upright 8.

In the preferred embodiment of the invention, the pin 13 comprises a rounded or curved head 25, e.g., substantially hemispherical in shape, in correspondence to its external extremity, which head 25 is meant to be inserted into the seat 14.

The head 25 is therefore placed in the extremity of the pin 13 opposite to that in contact with the aforementioned elastic means 20.

Moreover, the access mouth of the seat 14 also has with a rounded hem, i.e. internally beveled.

In addition, the housing 19 may also have an access mouth with beveled hem.

The operation of the invention is as follows.

Once tyre removal/fitting operations have occurred, the operator manually moves the auxiliary arm 6 away from its operational position in correspondence to the rim fixed to the gripping and rotation unit 3, causing it to rotate with respect to the upright 8.

When the auxiliary arm 6 reaches the idle position, the seat 14 and the housing 19 are aligned and therefore the pin 13, pushed by the spring 20, is inserted into the seat 14, to lock the arm 6 and the upright 8 to one another (see figure 4).

By so doing, even if the axis of the hinge 9 is not perfectly vertical, the force of gravity or an accidental collision would not shift the auxiliary arm 6 from the idle position, and therefore the latter would not hinder the operator's job.

When the operator needs again to employ the aiding means 7 mounted on the auxiliary arm 6, he/she can easily unlock the arm 6 with a simple rotation in the direction of its work position.

In fact, since the head 25 of pin 13 and the hem of seat 14 are rounded, then the simple manual pressure is able to bring the pin 13 out of seat 14, as the two curved surfaces slide one above the other.

In practice, the rotation of the seat 14 formed in the second element 18 of the hinge 9 leads to a compression of the spring 20 connected to the pin 13, the pin 13 protruding from the seat 14.

During the rotation towards the work position, the head 25 of pin 13 abuts the sliding surface 23 of the second hinging element 18 and therefore the pin 13

remains inside the housing 19 (see Figure 5).

This condition is maintained as long as the arm 6 is away from the idle position.

In practice it has been found how the described invention achieves the intended objects and in particular the fact is underlined that it provides a tyre-changing machine 1 equipped with an auxiliary arm 6 that does not hinder the operators' job.

CLAIMS

1) Tyre-changing machine (1) comprising: at least a base frame (2) which can rest on the ground; at least a gripping and rotation unit (3) of a wheel mounted on said frame (2); at least a main arm (4) mounted on said frame (2) and carrying removal/fitting means for removing and/or fitting the tyre from/on said wheel; and at least an auxiliary arm (6) mounted on said frame (2), carrying aiding means (7) for aiding the fitting/removal and suitable for moving between a work position where said aiding means (7) are positioned in correspondence to said unit (3) and an idle position where said aiding means (7) are moved away from said unit (3); characterized by the fact that it comprises locking means (13, 14, 15, 16, 20) to lock in a releasable way said auxiliary arm (6) in said idle position.

2) Machine (1) according to claim 1, characterized by the fact that said frame (2) comprises at least an upright (8) on which said auxiliary arm (6) is mounted rotatable by means of a hinge (9).

3) Machine (1) according to claim 2, characterized by the fact that said hinge (9) defines a rotation axis substantially vertical for the rotation of said auxiliary arm (6).

4) Machine (1) according to claim 2 or 3, characterized by the fact that said locking means (13, 14, 15, 16, 20) are included in said hinge (9).

5) Machine (1) according to one or more of the preceding claims, characterized by the fact that said locking means (13, 14, 15, 16, 20) comprise at least a pin (13) suitable for alternately fitting and coming out from a seat (14) comprised in the locking means (13, 14, 15, 16, 20).

6) Machine (1) according to claims 4 and 5, characterized by the fact that said hinge (9) comprises a first hinging element (17) mounted on said upright (8) and a second hinging element (18) fixed to said auxiliary arm (6), wherein said seat (14) is obtained in one of said first and second hinging elements (17, 18), while said pin (13) is carried by the other.

7) Machine (1) according to claim 5 or 6, characterized by the fact that said locking means (13, 14, 15, 16, 20) comprise a housing (19) wherein said pin (13) can slide axially.

8) Machine (1) according to claims 6 and 7, characterized by the fact that said housing (19) is obtained in said hinging element (17) which carries the pin (13).

9) Machine (1) according to one or more of the claims from 5 to 8, characterized by the fact that said locking means (13, 14, 15, 16, 20) comprise elastic means (20) for stressing said pin (13) to be inserted into said seat (14).

10) Machine (1) according to one or more of the claims from 5 to 9, characterized by the fact that said pin (13) comprises a rounded head (25) meant to be inserted into said seat (14).

11) Machine (1) according to one or more of the claims from 5 to 10, characterized by the fact that said seat (14) comprises an access mouth with a rounded hem.

12) Machine (1) according to one or more of the claims from 6 to 11, characterized by the fact that said first and second hinging elements comprise a respective annular element (17, 18) fitted on a shaft (21), said annular elements (17, 18) having respective surfaces (22, 23) facing the one to the other on which said housing (19) and said seat (14) are obtained.

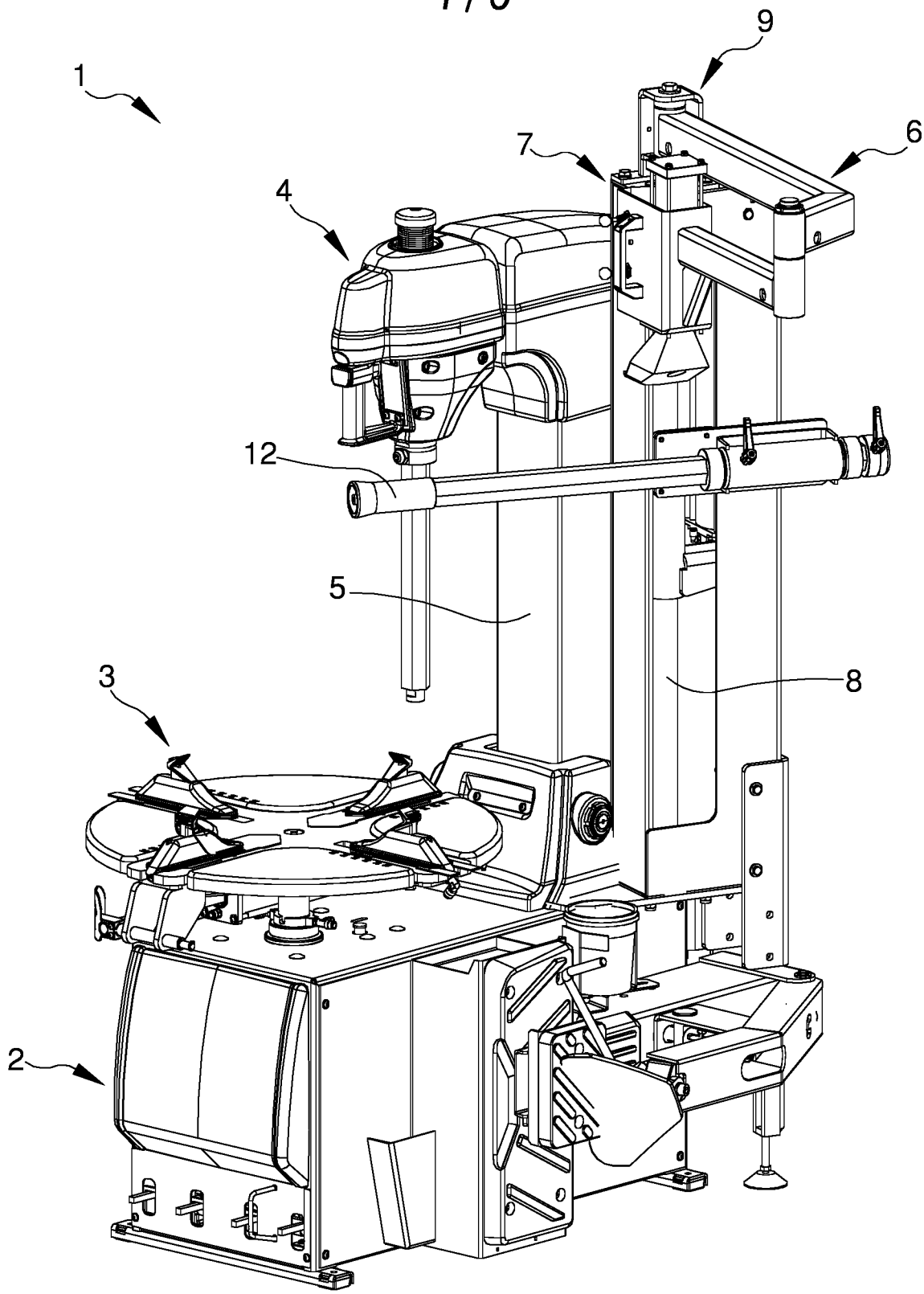


Fig. 1

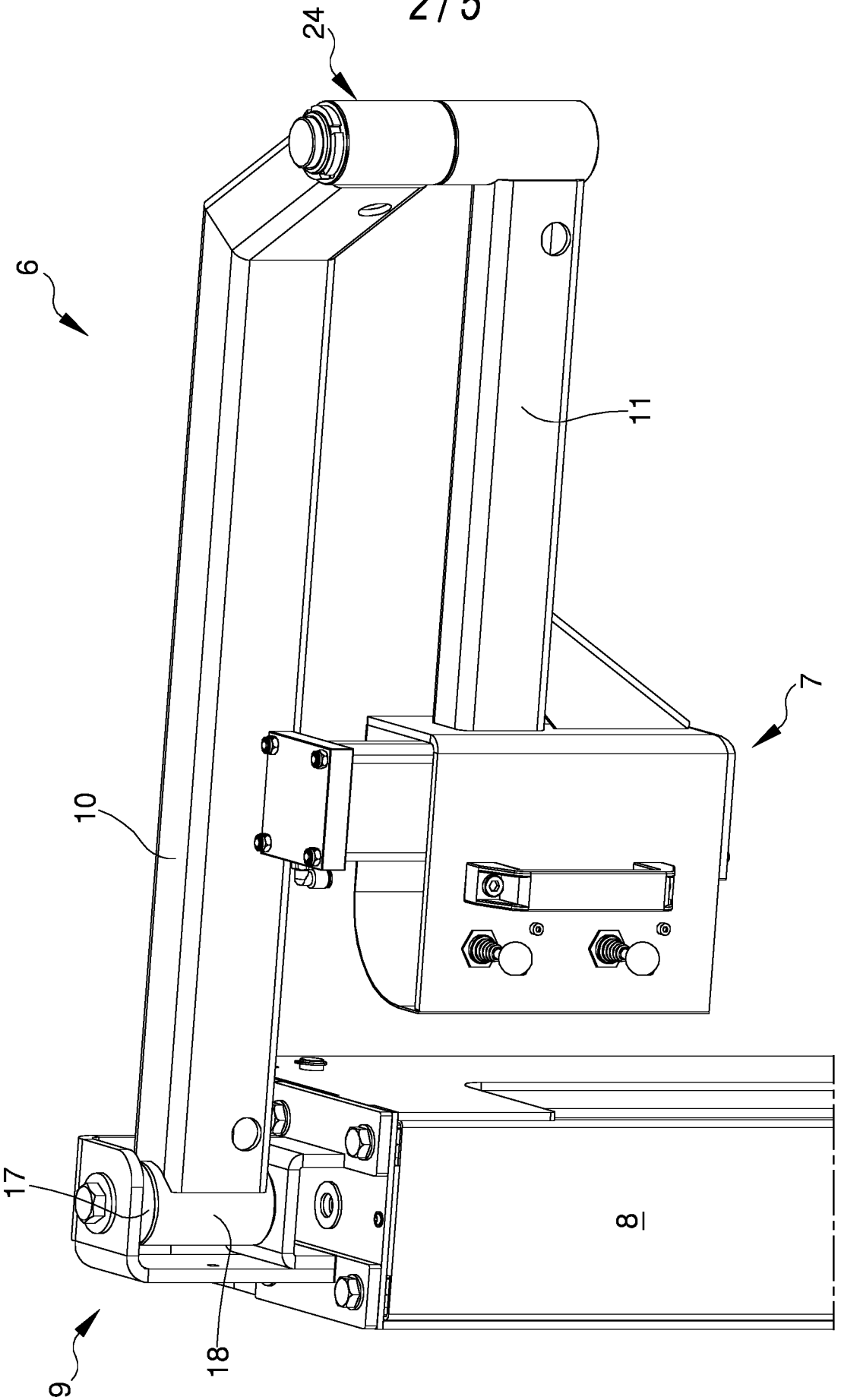


Fig. 2

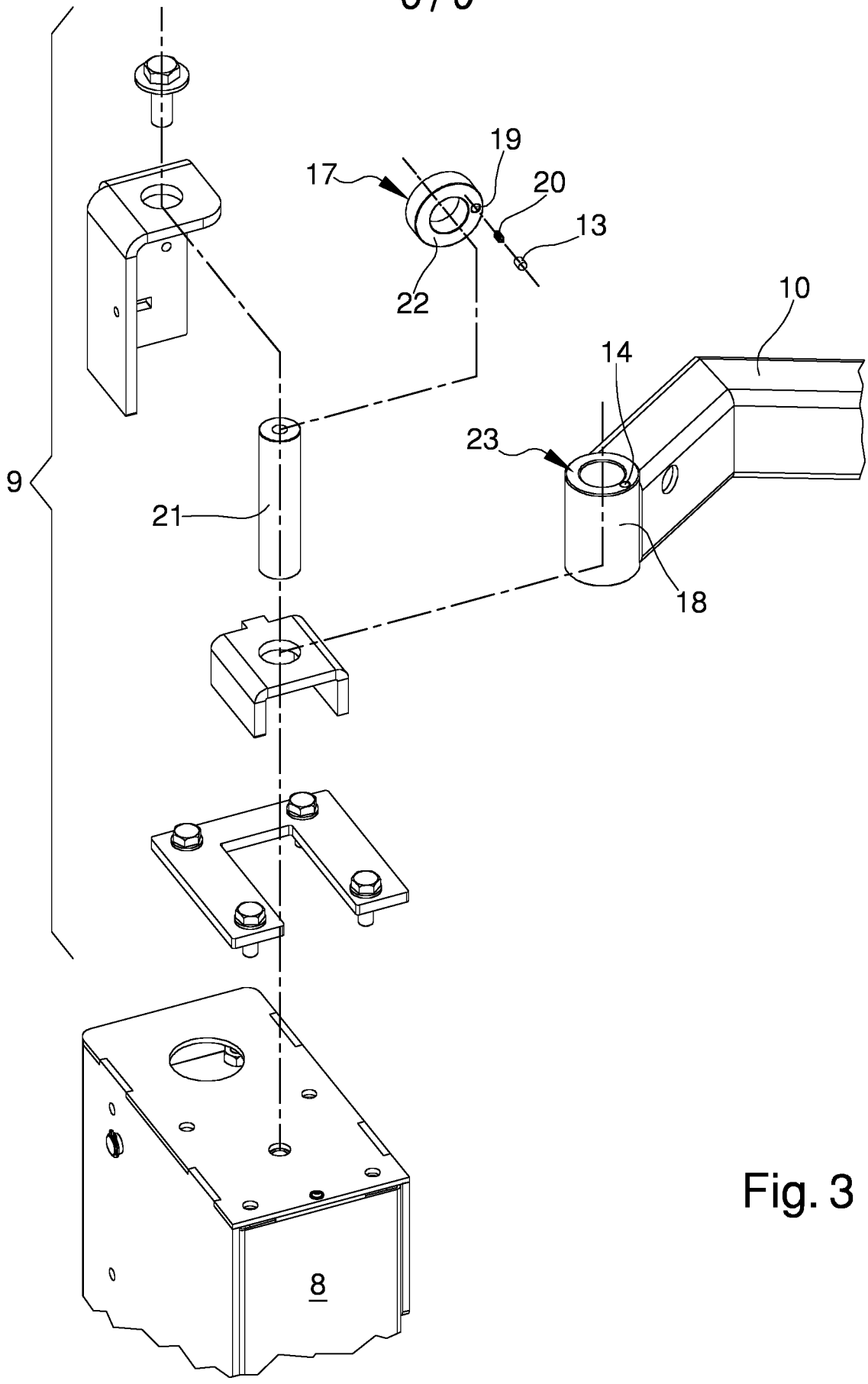


Fig. 3

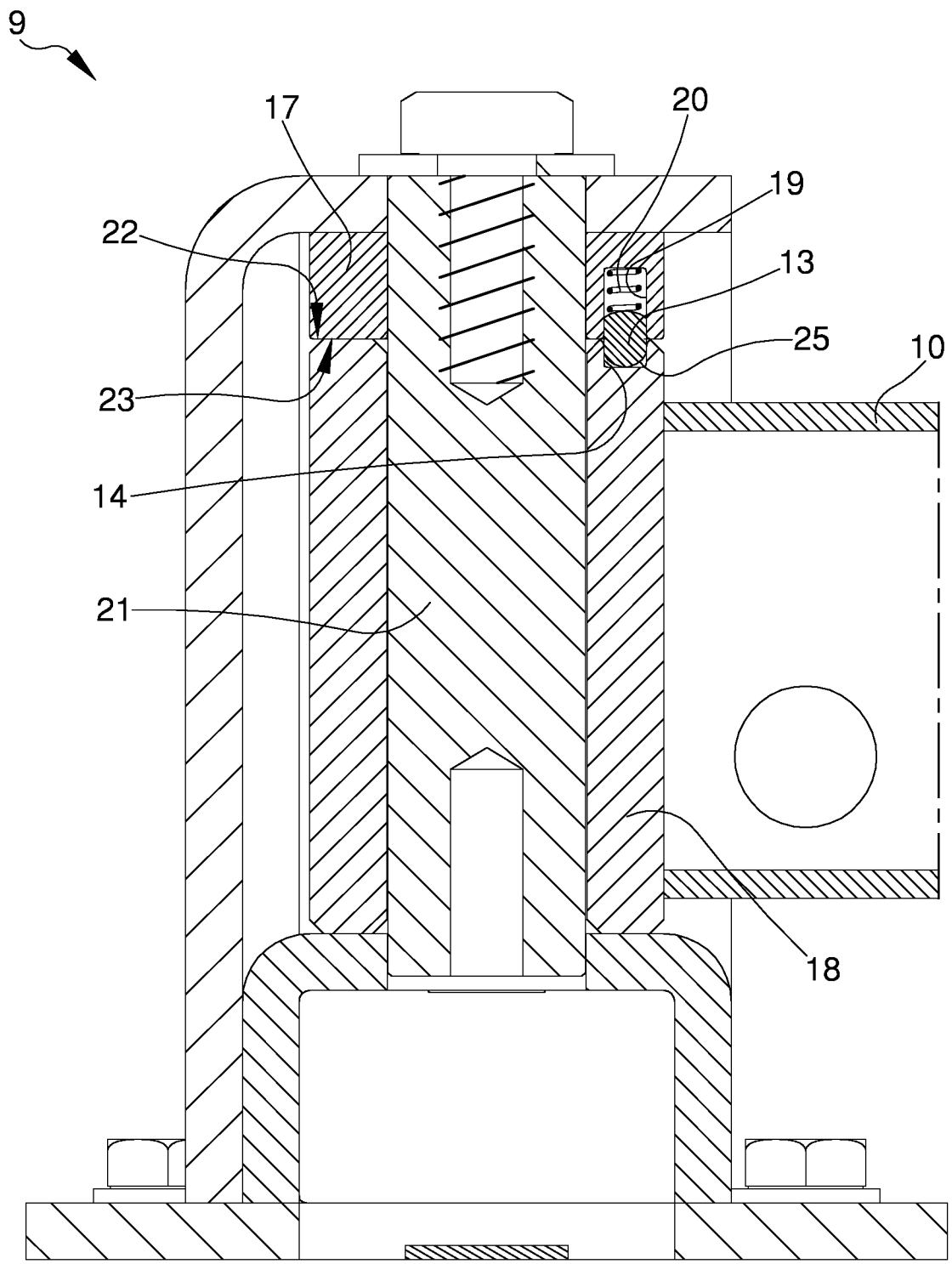


Fig. 4

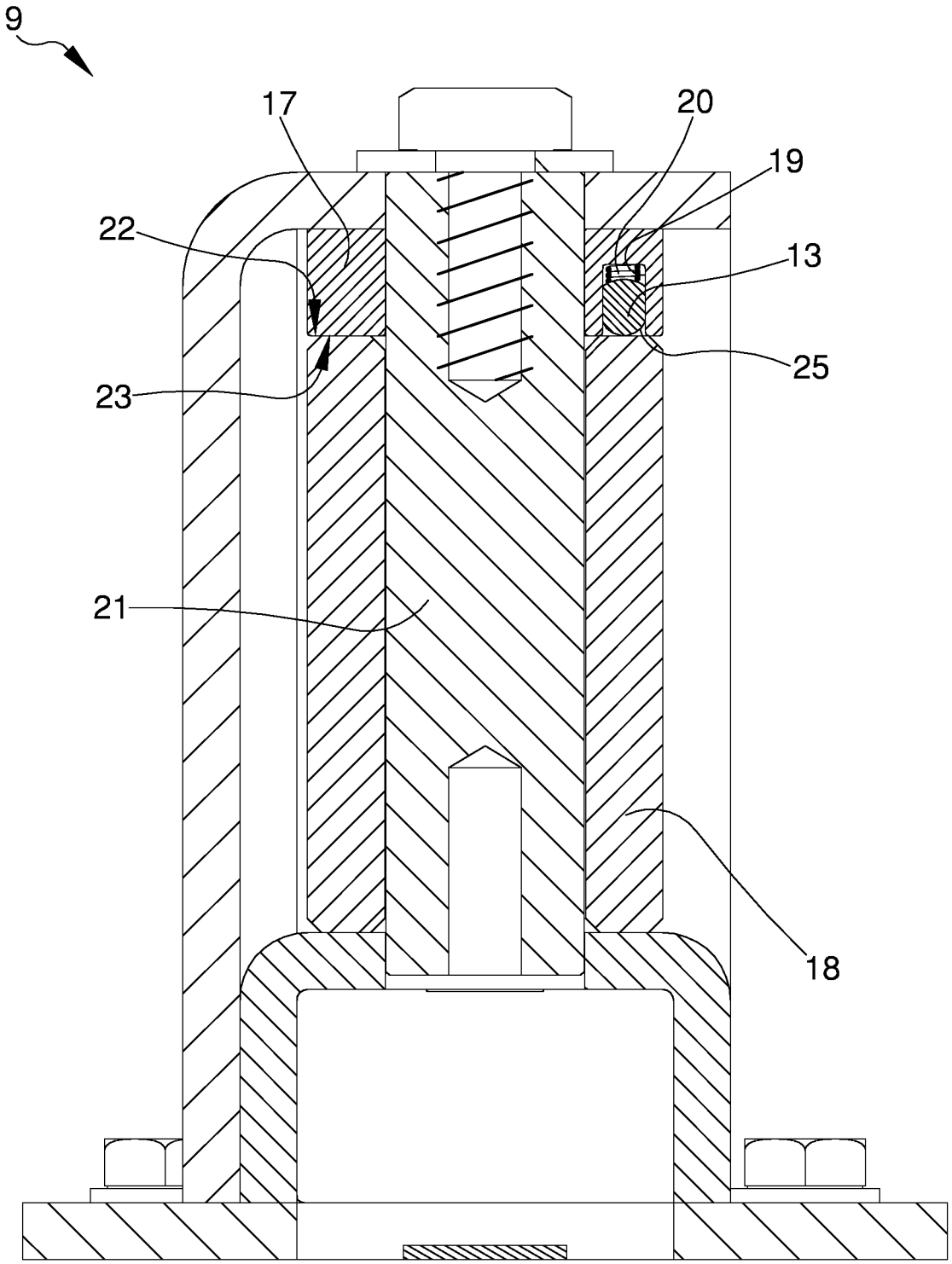


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/064917

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60C25/138
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)
B60C

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 practicable, 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	EP 1 157 860 A2 (CORGHI SPA [IT]) 28 November 2001 (2001-11-28) paragraphs [0041], [0042]; claims; figures	1-4
X	EP 0 659 597 A1 (SICESP ELETTROMECCANICHE [IT]) 28 June 1995 (1995-06-28)	1-9
A	column 4, lines 15-22 claims; figures 1,3	10-12
X	US 8 250 915 B1 (VOELLER DAVID A [US] ET AL) 28 August 2012 (2012-08-28) claims; figures 7-9	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 November 2014	17/12/2014

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	Thanbichler, Peter

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2014/064917

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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