

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 July 2008 (10.07.2008)

PCT

(10) International Publication Number
WO 2008/081235 A2

(51) International Patent Classification: **Not classified**

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(21) International Application Number:

PCT/IB2007/003682

(22) International Filing Date:

30 November 2007 (30.11.2007)

(25) Filing Language:

Italian

(26) Publication Language:

English

(30) Priority Data:

MO2006A000398

4 December 2006 (04.12.2006) IT

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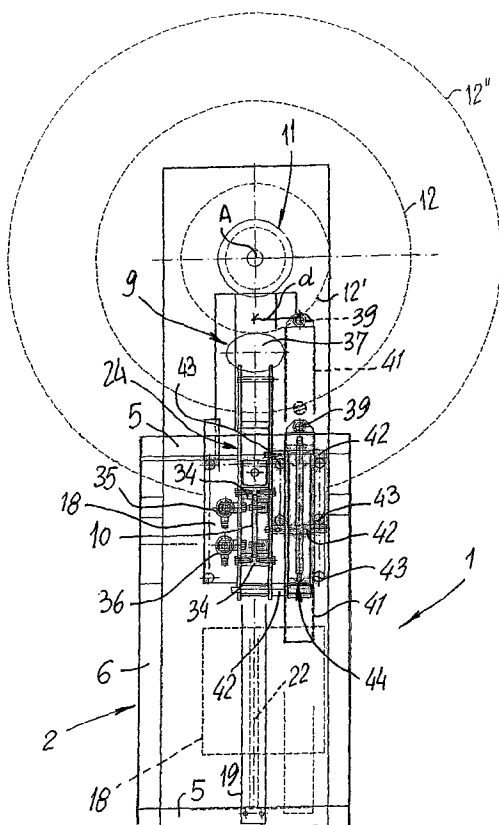
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, 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, 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, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,

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(54) Title: APPARATUS FOR TYRE-CHANGING MACHINES

(57) Abstract: The apparatus for tyre-changing machines (1) comprising a base (2) that has a face (23) turned upwards, a supporting and locking platform (11) of wheels (12, 12', 12''), mounted rotating on said face (23) around a rotation axis (A) and defining a supporting and locking table (P1), support means (8) of tools (9) extending upwards from said base (2), said support means (8) being movable along said base (2) in a direction of movement perpendicular to said rotation axis (A) so as to move nearer or away from said rotation axis (A).





PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished
upon receipt of that report*

APPARATUS FOR TYRE-CHANGING MACHINES

TECHNICAL FIELD

The invention relates to an apparatus for tyre-changing machines.

The tyre-changing machines comprise a base frame, generally boxed, that supports, on the face, a swivel platform, on which the wheels are rested and secured, and on which the operators have to fit and remove tyres, and a fixed turret that extends upwards and is ready to support a protruding tool-carrying arm.

TECHNOLOGICAL BACKGROUND

To perform these fitting operations, the beads of the tyre must first of all be bead broken from the edges of the rims on which they are normally fitted during wheel use.

To perform this operation, two technical solutions are provided.

According to a first technical solution, the tyre-changing machines have an arm on the side of the base frame that has one end jointed to the base frame, so as to turn on a plane parallel to the ground, that has an opposite end with a bead breaker blade.

To bead break the beads, an operator turns the arm outwards, so as to move it away from the side of the base frame, and then positions a wheel with the tyre previously deflated, against the side in a substantially vertical position and, finally, starts a linear actuator located between the base frame and the arm, so this is recalled towards the side and that, at the same time, the bead breaker blade presses on a bead segment of the tyre, detaching this from the edge of the rim.

This operation is repeated several times, every time turning the wheel so the blade operates on the entire circumference of a bead turned outwards and then, after turning the wheel on itself, is also repeated for the other bead.

When the tyre is completely bead broken, it is substantially loose on the rim and the operator grips it and places it, together with the rim, on the swivel platform; on the latter the rim is secured by means of special grip parts and the operator proceeds to remove the tyre from the rim.

For this operation, the operator uses a tool fitted on the fixed turret with the interposition of an adjustable support arm and which is shaped so as to be able to be wedged between the rim and the tyre so that when the swivel platform is turned, the tool causes the bead to gradually exit from the edge of the rim with the consequent

removal of a first side of the bead.

It must be pointed out that to wedge the tool between the tyre and the edge of the rim, the operator must also use a lever with which he manually lifts a first portion of the tyre off the rim, in such a way as to obtain a passage wide enough to insert the tool.

5 According to another technical solution, used to bead break the tyres of particularly delicate wheels, such as, for example, the wheels of sports cars with light-alloy rims, the tyre-changing machines have one or two bead-breaking tools that operate on the beads of the tyres when the wheel is already positioned and fixed on the swivel platform.

10 Each tool consists of a disc shaped like a truncated cone and supported free to turn at the end of a corresponding support arm mounted on the tyre-changing machine alongside the fixed turret.

Each disc has the edge of larger diameter intended to be placed in contact with the tyre bead, at a point very close to the edge of the rim.

15 Each arm has its own operating system that raises or lowers it and which, therefore, determines the pressure of the disc on the bead turned upwards or the lifting from below upwards of the bead turned towards the ground; the operating system also normally envisages turning the arm, or each arm, when there are two, between a work position turned towards the swivel platform and a rest position away from this, and
20 vice versa.

When there are two discs, one is mounted on an arm so it can press in a direction from the top downwards on the upper bead while the other is mounted on another arm so it can press on the bead turned towards the ground in a direction from below upwards.

The pressing action is normally done in a coordinated and contemporaneous way and
25 the tyre is completely beaded by rotating the platform while both discs press on the respective beads, turning freely on these.

Subsequently, to remove the tyre from the rim, the operator proceeds as previously described both using the lever and completing removal by means of the tool fitted on the arm of the column of the tyre-changing machine.

30 This state of the art has a number of drawbacks.

A first drawback is that to support the beading tools, the tyre-changing machines must

have special arms alongside the fixed turret on which, as has been said, are fitted the tools for removing and fitting the tyres on the rims.

Another drawback is that the arms must be positioned independently the one from the other and in such a way that the edge that has to be placed in contact with the bead is
5 neither too close to the edge of the rim nor too far from this.

In the first case, the rims could be damaged during bead breaking operations, while in the second case, damage could be caused to the side of the tyre, i.e. the side area of the tyre between the beads and the tread and which is considerably more flexible and fragile than the beads.

10 A further drawback is that the correct positioning of the lower arm and, therefore, of the relevant disc on the corresponding lower bead, is very difficult because visibility is strongly reduced by the tyre itself, by the rim, by the platform and by the base frame of the tyre-changing machine.

Furthermore, the free space between the platform and the base frame is strongly
15 limited and for this reason it is even more difficult for the operator to visually control, in a direct way, the correct positioning of the lower bead breaking disc.

Some manufacturers of tyre-changing machines, to try and at least partially solve this problem, have equipped the tyre-changing machines with a reflection member, in point of fact a mirror, fitted near the lower face of the swivel platform and which
20 allows the operator to observe the image reflected from below upwards of the tyre area on which the bead breaking disc has to rest.

Other manufacturers have decided to fit a camera instead of the mirror and have also equipped the tyre-changing machine with a small screen connected to the camera that allows the operator to observe the bead area during the positioning of the lower bead-
25 breaking disc.

These solutions do have further drawbacks.

Another drawback is that the costs of the reflecting devices or of the cameras and of the screens connected to these negatively affect the total costs of the tyre-changing machines.

30 Another drawback is that the field of vision of the reflecting devices or of the cameras is considerably limited and in any case produces an indirect vision which is therefore

subject to optical distortions.

Another drawback is that the operating space in the area between the lower face of the platform, in itself already very small, is further reduced by the presence of these devices.

- 5 A further drawback is that both the reflecting devices and the cameras are subject to becoming quickly dirty and, therefore, to be able to help the operator in his/her work, they require frequent cleaning and maintenance.

A further drawback of the known tyre-changing machines is that the arms that support the bead-breaking tools are fitted on the base frame of the tyre-changing machines
10 separately from the fixed turret and each of these has to be driven by its own actuator. This results in a considerable increase in the overall dimensions of the tyre-changing machines and in their having a fairly complicated structure both in terms of manufacture and function.

OBJECTS OF THE INVENTION

- 15 One object of the invention is to improve the state of the art.

Another object of the invention is to make an apparatus for tyre-changing machines that allows bead breaking the beads of the tyres from the relative edges of the rims on which they are fitted and removing or fitting the tyres from/on the rims quickly and in a way without any risk of damage.

- 20 A further object of the invention is to make an apparatus for tyre-changing machines that allows bead-breaking the beads of the tyres without requiring auxiliary devices in order to see the beads turned towards the ground in the beading position on the work platforms.

Another object of the invention is to develop an apparatus for tyre-changing machines
25 that has a much simpler structure compared to the known state of the art, restricting the number of actuators needed for bead breaking and for fitting or removing the tyres on/from the relative rims.

DESCRIPTION OF THE INVENTION

According to one aspect of the invention, an apparatus is provided for tyre-changing
30 machines comprising a base that has a face turned upwards, a supporting and locking platform of wheels, mounted rotating on said face around a rotation axis and defining

a supporting table, support means of tools extending upwards from said base, characterized in that said support means are moving along said base in a direction of movement perpendicular to said rotation axis so as to move nearer or away from said rotation axis.

- 5 According to another aspect of the invention, a method is provided suitable for fitting or removing wheel tyres on/from rims, comprising: tightening said wheels on a platform of a tyre-changing machine rotating around a rotation axis; positioning fitting or removal tools in an operating position near said wheels, characterized in that said fitting or removal tools can be fitted on a common support element, movable
10 on/with respect to said tyre-changing machine between a fitting or removal position near said platform and an idle position, away from this, and vice versa.

The apparatus for tyre-changing machines and the method thus permit fitting or removing tyres from the rims and bead-breaking the beads of the tyres from the rims in a precise and safe way, without any danger of damaging the sides of the tyres or of
15 the rims on which they are fitted and without the need to have at disposal auxiliary devices to see the positioning of the introduction element turned towards the ground.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will appear more evident from the detailed description of a bead-breaking apparatus for tyre-changing machines,
20 illustrated indicatively by way of non limiting example, in the attached drawings wherein:

Figure 1 is a side schematic view of a tyre-changing machine with an apparatus for tyre-changing machines;

Figure 2 is a front schematic view of the tyre-changing machine of Figure 1;

- 25 Figure 3 is a detailed view of a bead-breaking tool and of an introduction member that can be fitted on tool-carrying support means;

Figure 4 is a side schematic and interrupted view and on enlarged scale of the bead-breaking tool and of the introduction member of Figure 3, in a configuration assembled on tool-carrying support means;

- 30 Figure 5 is a schematic plan view of the tyre-changing machine of Figure 1;

Figure 6 is a side interrupted view of the tyre-changing machine of Figure 1 with an

apparatus for tyre-changing machines in a further possible embodiment.

EMBODIMENTS OF THE INVENTION

With reference to the Figures 1, 2, 5, by 1 has been generally indicated a tyre-changing machine that comprises a base 2 and a frame 3 that extends upwards and
5 which is formed of uprights 4, transoms 5 and upper side members 6.

The transoms 5 bear a centred and straight upper longitudinal guide 7 turned towards the base 2, the function of which will be explained later on.

From the base 2, a supporting and locking platform 11 also rises up, in short a platform 11, that can turn round a rotation axis "A", driven by its own motor unit
10 inside the base 2, and which defines a supporting table "P1" and for locking on this wheel tyre rims 12 or 12' or 12'' of vehicles, that can have different diameters and which are indicated in Figure 1 with the broken lines.

The rotation axis "A" is normally vertical, nevertheless, according to other possible embodiments of tyre-changing machines 1, the rotation axis "A" could also be
15 oblique.

The column 10 has a substantially flat rib and parallelepiped shape defining an upper side 13 and a lower side 14 parallel with each other and a first front edge 15 turned towards the platform 11, and an opposite and parallel second edge 16 turned in the opposite direction.

20 The top side 13 has a first cross wing 117 connecting together the concurrent upper ends of the uprights 4 and which supports pairs of coupling members, for example a series of rollers 17 that are free to turn, and which can be coupled to the upper longitudinal guide 7, while the bottom side 14 features a second cross wing 18 which, on the lower face, has a pair of runners 19 that couple in a sliding way to a lower
25 longitudinal guide 20 fastened on the base 2 and having one end located near the platform 11.

The upper longitudinal guide 7 and the lower longitudinal guide 20 are aligned and parallel with each other so as to keep the column 10 vertical both when this is stopped and when it moves towards, or away from, the platform 11.

30 The lower longitudinal guide 20 is also straight and lies on a vertical plane that also contains the column 10; the lower longitudinal guide 20 has one end indicated by 21,

located close to the supporting and locking platform 11.

The column 10 is therefore mobile forwards and backwards, parallel with itself, along the upper longitudinal guides 7 and lower longitudinal guides 20 with respect to the rotation axis "A" of the platform 11 and the movement can be started by means of a linear actuator unit 22 located inside the base 2, below an upper face 23 of the latter and which has ends integral with the latter and with the second cross wing 18 respectively, so as to push or pull it, also dragging along with it the column 10 which is thus able to approach the platform 11 or move away from it.

Along the column 10 are fitted sliding support means for supporting the tools 9 and which comprise two carriages 24 and 25.

The carriage 24 is located above the carriage 25, as can be seen in the Figure 1, and these are located on the opposite side respectively with respect to the supporting table "P1"; these comprise a portion that protrudes out towards the platform 11: the two portions of each carriage, which have fixed lengths, are indicated by 124 and 125 respectively.

With reference to the Figure 1 and to the Figure 4, it will be seen that each portion 124 or 125 has a coupling seat, indicated by 26 and 27 respectively, for coupling the tools 9.

The latter correspondingly have their own tang 28 and 28' for coupling in the seats 26 and 27 which have respective locking parts 29 of the tangs 28 and 28', also suitable for preventing the rotation of the tools 9 when they are fitted on the respective carriages 24 and 25 and are ready for use.

These locking parts 29 comprise, for each of the seats 26 and 27, a fluid-dynamic operating cylinder 30 housed on the carriages 24 and 25 in special housings envisaged on the latter and which is supported with transversal axis with respect to the seats 26 and 27.

The fluid dynamic cylinder 30 has the rod 31 ready to be introduced into a transversal opening 32 obtained in both the tang 28, and in the tang 28', in such a position that when the tools 9 are fitted on their respective carriages 24 and 25, the transversal opening 32 is aligned with the rod 31, which can introduce itself into it and prevent the tangs 28 and 28' both from moving in an axial direction and from turning.

Each of the carriages 24 and 25 has respective coupling means 33 sliding and guided along the first front edge 15 and the second rear edge 16.

The coupling means 33 comprise pairs of runners 34 that are shaped with "C" cross section, so they can be engaged and slide on the first front edge 15 and on the second rear edge 16 of the column 10.

The sliding of the carriages 24 and 25 is by means of a pair of linear actuators 35 and 36, each of which is made to move one of the carriages along the column 10.

The tools 9 that can be fitted on the carriages 24 and 25 comprise respective bead-breaking discs 37 and 37', and an extraction claw 38 and an introduction member 39.

According to one embodiment, on the upper carriage 24 are supported a bead-breaking disc 37 and the extraction claw 38, paired together and fitted on a head 40 which houses them both, but in contrasting operating positions, i.e. in such positions that they can be used one instead of the other and never together; the alternative use occurs by releasing the tang 28, turning the head 40 so the bead-breaking disc 37 or the extraction claw 38 is turned towards the platform 11, or vice versa, and then blocking again the tang 28 and with the rod 31 of the fluid dynamic cylinder 30: these two positions can be seen in the Figure 3 and in the Figure 1 respectively.

The introduction member 39 is on the other hand supported at the carriage 24 by means of a specific arm 41 that is parallel and lateral to this and which is made integral with it by means of a series of cross elements 42: this way, the introduction member 39 follows the movement of the carriage 24 towards the platform 11 or in an opposite direction, in fact downwards or upwards.

Furthermore, the arm 41 is in turn sliding horizontally between vertical guide elements indicated by 43 so as to convey the introduction member 39 towards the platform 11 or to withdraw it from this.

In detail, with reference to the Figures 1-3 it will be seen that this introduction member 39 comprises a body with an upper portion 139 that is substantially cylindrical and is connected to a lower tapered portion 239, which shapes a sort of blade with the rounded point kept turned towards the platform 11.

The forward and backward sliding of the arm 41 is obtained by means of a fluid dynamic linear actuator 44 that pushes the arm 41 towards the platform 11 or

withdraws it from this.

According to a first possible alternative embodiment, the arm 41 can also be operated manually by an operator and, in this case, the presence of the fluid dynamic linear actuator 44 is not necessary.

- 5 According to a further alternative embodiment shown in the Figure 6, the arm, in this case indicated by 141, can have one end opposite that in which the introduction member 39 is fitted, hinged directly to the carriage 24 with a hinge 45 having horizontal axis, in such a way that it is possible to lift the introduction member 39 when this does not have to be used or lower it towards the platform 11 when it has to
10 be used to press on the beads of a tyre, cooperating with the bead-breaker disc 37, as will be described later on.

The operation of the bead-breaking apparatus for tyre-changing machines is the following: when a tyre has to be removed from the rim of a wheel, an operator places the wheel on the platform 11, and locks the rim on this.

- 15 The tyre can be deflated before or after, indifferently, once the wheel 12 has been locked on the platform 11.

During the locking of wheel 12 on the platform 11, the column 10 is moved to a position away from the latter, so as not to interfere with the locking operations.

- The movement of the column 10 is by means of the operation of the linear actuator
20 unit 22 that makes it slide along the upper longitudinal guides 7 and the lower longitudinal guides 19.

- On the carriages 24 and 25 are previously coupled the tools 9 which have to be used in the tyre beading and removal operations; on the upper carriage, the head 40 is fitted, inserting the tang 28 in the relative seat 26 obtained in the carriage 24 and
25 arranging the head so the bead-breaking disc 37 is turned towards the wheel 12, or 12' or 12'', while the extraction claw 38 is turned upwards, meaning in a non-operating position.

- When the positioning of the head 40 has been completed, the fluid dynamic cylinder 30 is started, which expels its rod 31 which is inserted in the transversal opening 32 of
30 the tang 28, locking both its axial sliding and the rotation.

Similarly, a further bead-breaking disc 37' is fitted on the carriage 25 inserting the

corresponding tang 28' of the corresponding head 40' in the specific seat 27 defined in the carriage 25.

This tang 28' is also blocked as described for the previous one, even though, the head 40' does not in this case have the claw 39 because this is not required in the tyre removal operations.

It is important to note that when the two heads 40 and 40' are fitted on the respective carriages 24 and 25 the two bead-breaking discs 37 and 37' are aligned vertically the one with the other or, more precisely, the edges of these which come into contact with the tyre beads during bead-breaking operations are aligned.

In other words, the distances of both the bead-breaking discs 37 and 37' and the rotation axis of the platform 11, and therefore the distances between these and the edges of a rim of a wheel 12, are the same and remain constantly the same, even when the column 10 moves towards the platform 11 or moves away from this.

In other words, in work position, there is no relevant movement between the bead-breaking discs 37 and 37', the claw 39 and the column 10.

When both the bead-breaking discs 37 and 37' are fixed to the respective carriages 24 and 25, the column 10 is made to move towards the platform 11 until the operator positions the upper bead-breaking disc 37 in a correct beading position: the lower bead-breaking disc 37' is therefore automatically positioned in the same correct beading position as the upper disc, without the operator having to check this position, which, as has been said, is achieved automatically, the two bead-breaking discs 37 and 37' being equidistant from the column 10.

The operator then operates the linear actuators 35 and 36 and makes both the bead-breaking discs 37 and 37' converge towards the beads of a tyre of the wheel 12 and when these bead-breaking discs come into contact with the beads, they start to apply a pressure on these in the direction of the inner keying channel of the rim, until, making the platform 11 turn around its rotation axis "A", both the beads completely detach from the respective edges of the rim.

To completely remove the tyre from the rim, the operator therefore moves the carriages 24 and 25 slightly from the wheel 12 and proceeds to turn the head 40 fitted on the upper carriage 24.

In order to perform this operation, he/she deactivates the corresponding fluid dynamic cylinder 30 which withdraws its rod 31 outside the transversal opening 32 of the tang 28, which this way is free and can be turned inside the seat 26 until the extraction claw 38 is turned upwards as can be seen in the Figure 4 or else also in the Figure 1.

5 This way, the operator again makes the carriages 24 and 25 converge towards the supporting table "P1" of the platform 11; because the beaded tyre is positioned inside the inner keying channel of the rim, it is loose with respect to this and the extraction claw 38 can easily introduce itself between the tyre bead turned towards the operator and the corresponding edge of the rim.

10 The shape of the bead-breaker claw 38 is known and such as to fasten onto the relevant bead inside the tyre and fully extract it from the rim when the carriage 24 is recalled upwards and, at the same time, the platform 11 is turned.

When the operator has to fit a tyre on the rim already locked on the platform 11, he/she performs the previously described operations in the opposite sequence.

15 In point of fact, he/she manually introduces the first bead of the side turned towards the platform 11 into the central keying channel of the rim and then, using only the bead-breaking disc 37 and therefore only the upper carriage 24, applies a pressure on the other bead turned towards him/herself and still outside the edge of the rim.

Nevertheless, the pressure applied in just one point is not by itself enough to ensure
20 that, even by turning the platform 11, the bead completely comes over the edge of the rim, completing the fitting of the tyre.

This is caused by the elasticity of the beads which allows the deformation of the tyre only in the area where the bead-breaking disc 37 presses, while the other parts of the remaining circumference of the tyre tend to react to the imposed deformation and
25 spontaneously recover their initial shape, correcting the deformation generated by the bead-breaking disc 37.

This characteristic of the beads allows them to come over the edge of the rim and move inside the central keying channel, only in the bead area where contact occurs with the corresponding bead-breaking disc 37, while all the other areas, even if they
30 have already been introduced inside the keying channel of the rim, tend to come out of this again.

To avoid this drawback, the operator uses the introduction member 39, letting the arm 41 slide towards the platform 11 until the tapered portion 239 is aligned on the bead to be introduced into the keying channel of its own rim.

By lowering the carriage 24 towards the wheel 12 (or 12' or 12''), the introduction member 39 fits in between the bead of the tyre and the edge of the rim and, in this position, keeps the bead taut in a substantially diametral direction, holding inside the keying channel the opposite bead areas already introduced into this by a previous pressure of the bead-breaking disc 37, notwithstanding the spontaneous tendency to come out, as has been previously said.

To obtain this result, the introduction member 39 is placed at a pre-established distance "d" on the bead circumference, with respect to the bead-breaking disc 37, so that both the traction force of the introduction member 39 and the pressure force of the bead-breaking disc 37 are applied to the tyre at the same time, at a distance the one from the other and forcing the bead to remain towards the inside of the keying channel during the rotation of the platform 11.

This rotation must have a direction of rotation such that on the bead, the first to be applied is the introduction member 39 and then the bead-breaking disc 37: this way, the bead of the tyre is forced to fully come over the edge of the rim and the tyre fitting operation is completed.

The arm 41 that supports the introduction member 39 can be operated both manually and automatically by means of a special actuator 44: in both cases stopping means are envisaged for stopping the sliding of the arm 41 with respect to the carriage 24, such as, for example, a transversal key that can be fitted manually or automatically, when the introduction member 39 is fitted between the bead of the tyre to be fitted and the relevant edge of the rim.

In the further embodiment shown in the Figure 6, the introduction member 39 is positioned, instead of for sliding, by turning the arm 141 around the hinge 45, towards the platform 11 while, when it is not used, the arm 141 is turned upwards with respect to the carriage 24.

CLAIMS

1. Apparatus for tyre-changing machines (1) comprising a base (2) that has a face (23) turned upwards, a supporting and locking platform (11) of wheels (12, 12', 12''), mounted rotating on said face (23) around a rotation axis (A) and
5 defining a supporting table (P1), support means (8) of tools (9, 39) extending upwards from said base (2), characterized in that said support means (8) are moving along said base (2) in a direction of movement perpendicular to said rotation axis (A) so as to move nearer or away from said rotation axis (A).
2. Apparatus according to claim 1, wherein said rotation axis (A) is substantially
10 perpendicular to said face (23).
3. Apparatus according to claim 1, wherein said rotation axis (A) is oblique with respect to said face (23).
4. Apparatus according to claim 1, wherein said perpendicular direction comprises a substantially horizontal direction.
- 15 5. Apparatus according to claim 1 or 4, wherein said face (23) is parallel to said direction.
6. Apparatus according to claim 1, wherein between said base (2) and said support means (8) are placed movement means (19, 20, 22) of said support means (8) towards, or from, said rotation axis (A).
- 20 7. Apparatus according to claim 6, wherein said movement means comprise: guide means (20) obtained on said face (23) in a longitudinal direction, having at least one end (21) converging towards said rotation axis (A) and ready to engage a concurrent engaging end of said support means (8); actuator means (22) placed in between said concurrent end and said base (2).
- 25 8. Apparatus according to claim 7, wherein said engaging end comprises: a second wing (18) fastened crosswise perpendicular to said support means (8) and fastened to these; running means (19) obtained on a surface of said second wing (18) turned towards said guide means (20) and ready to engage sliding with the latter.
- 30 9. Apparatus according to any of the claims 1 to 8, wherein said support means (8) comprise: a flat and straight column (10) raising from said base (2) and that

defines a bottom side (14) turned towards said guide means (20), an opposite top side (13) turned opposite said guide means (20), two opposite edges (15, 16) parallel to each other and perpendicular to said top side (13) and bottom side (14), a first edge (15) being turned towards said platform (11), a second edge (16) being turned the opposite side; first carriage means (24) and second carriage means (25) fitted sliding along said first edge (15) and second edge (16).

10. Apparatus according to claim 9, wherein said column (10) defines a lying plane on which also said rotation axis (A) lies.

11. Apparatus according to claim 9, wherein said first carriage means (24) and second carriage means (25) are operated moving with operating means (35, 36) in directions converging to, or diverging from, said supporting table (P1).

12. Apparatus according to claim 3, wherein said first carriage means (24) and second carriage means (25) can be operated moving at the same time.

13. Apparatus according to claim 11, wherein said directions are substantially perpendicular to said supporting table.

14. Apparatus according to claim 1, wherein said tools comprise bead-breaking elements (37, 38) to bead break and/or remove beads of tyres from rims of wheels (12, 12', 12'') on which said tyres are fitted.

15. Apparatus according to claim 9 or 14, wherein said first carriage means (24) and second carriage means (25) have sliding and guided coupling means (33) to said first edge (15) and second edge (16); actuator means (35, 36) to move said first carriage means (24) and second carriage means (25) along said first edge (15) and second edge (16); removable coupling means (26, 27, 28, 29) of said bead-breaking elements (37, 38) to said first carriage means (24) and second carriage means (25).

16. Apparatus according to claim 15, wherein said coupling means (33) comprise pairs of runners (34) that can be coupled to said first edge (15) and second edge (16).

17. Apparatus according to claim 14, wherein said bead-breaking elements (37, 38) further comprise at least one introduction member (39) fitted on said first

carriage means (24) and ready to hold said beads inside respective rims cooperating with said bead-breaking elements (37, 38).

18. Apparatus according to claim 1 or 9 or 16, wherein said first carriage means (24) and second carriage means (25) are fitted on said column (10) in positions respectively opposite to said supporting table (P1).

19. Apparatus according to claim 18, wherein said first carriage means (24) are fitted on said column (10) in a position above that of said second carriage means (25).

20. Apparatus according to claim 15, wherein said removable coupling means comprise: respective coupling and retention seats (26, 27) obtained/defined in each of said first carriage means (24) and second carriage means (25); locking parts or locking (29) of said bead-breaking elements (37, 38) in said respective seats (26, 27).

21. Apparatus according to claim 14 or 20, wherein said bead-breaking elements (37, 38) fitted on said first carriage means (24) comprise: a head (40) that has a first end (140) and an opposite second end (240), said first end (140) having a coupling tang (28), which can be coupled in said one seat (26) of said respective seats, said second end (240) having a first disc-shaped pressure body (37) and a second extraction claw body (38) usable alternatively to said first disc-shaped pressure body (37) with rotations of said head (40) with respect to said one seat (26).

22. Apparatus according to claim 14 or 20, wherein said bead-breaking elements fitted on said carriage means (25) comprise a head (40') that has a first end (140') and an opposite second end (240'), said first end (140') having a tang (28') which can be coupled in a seat (27) of said respective seats and said second end (240') having a further disc-shaped pressure body (37').

23. Apparatus according to any of the claims 1, 21, 22, wherein said first disc-shaped pressure body (37) and further disc-shaped pressure body (37') have respective pressure edges aligned together on an alignment plane parallel to said rotation axis (A).

24. Apparatus according to claim 16 or 18, wherein said introduction member (39)

is fitted on said first carriage means (24).

25. Apparatus according to claim 24, wherein between said introduction member (39) and said first carriage means (24) support means (41) are provided adjustable according to an adjustment direction parallel to said movement direction.

26. Apparatus according to claim 1 or 25, wherein said adjustable support means comprise an arm (41) mounted sliding according to said adjustment direction on said first carriage means (24) and having a first end turned towards said supporting and locking platform (11) and an opposite second end, said arm (41) being operated manually or automatically.

27. Method suitable for fitting or removing tyres of wheels (12, 12', 12'') on/from rims, comprising: tightening said wheels (12, 12', 12'') on a supporting and locking platform (11) of a tyre-changing machine (1), rotating around a rotation axis (A) and defining a supporting and locking table (P1); positioning fitting or removal tools (37, 37', 38, 39) in an operating position near said wheels (12, 12', 12''), characterized in that said fitting or removal tools (37, 37', 38, 39) can be fitted on a common support element (8), and that said positioning comprises moving said common support element (8) on/with respect to said tyre-changing machine (1) between a fitting or removal position near said platform (11) and an idle position, away from this, and vice versa.

28. Method according to claim 27, wherein said common support element (8) comprises a support column (10) raising from said tyre-changing machine (1).

29. Method according to claim 27 or 28, wherein said fitting or removal tools (37, 37', 38, 39) can be fitted on said support column (10) with removable fitting means (26, 26', 28, 28', 29).

30. Method according to claim 27, wherein said moving comprises moving in a direction of movement towards said platform (11) or the opposite side.

31. Method according to claim 27 or 30, wherein said direction of movement is straight and perpendicular to said rotation axis (A).

32. Method according to claim 27, wherein said fitting or removal tools comprise bead-breaking tools (37, 37'), introduction tools (39), extraction tools (38).

33. Method according to any of the claims 27, or 28, wherein said positioning comprises further moving said bead-breaking tools (37, 37'), extraction tools (38) along said column (10) in converging or diverging directions from said supporting and locking table (P1).

5 34. Method according to claim 27 wherein said fitting or removal tools further comprise an introduction element (39) ready to be fitted between beads of tyres and rims of wheels in a fitting operation of tyres on said rims.

10 35. Method according to any of the claims 27, 29, 32, 34 wherein said positioning comprises further moving said introduction element (39) with respect to said column (10) in a direction parallel to said one direction of movement.

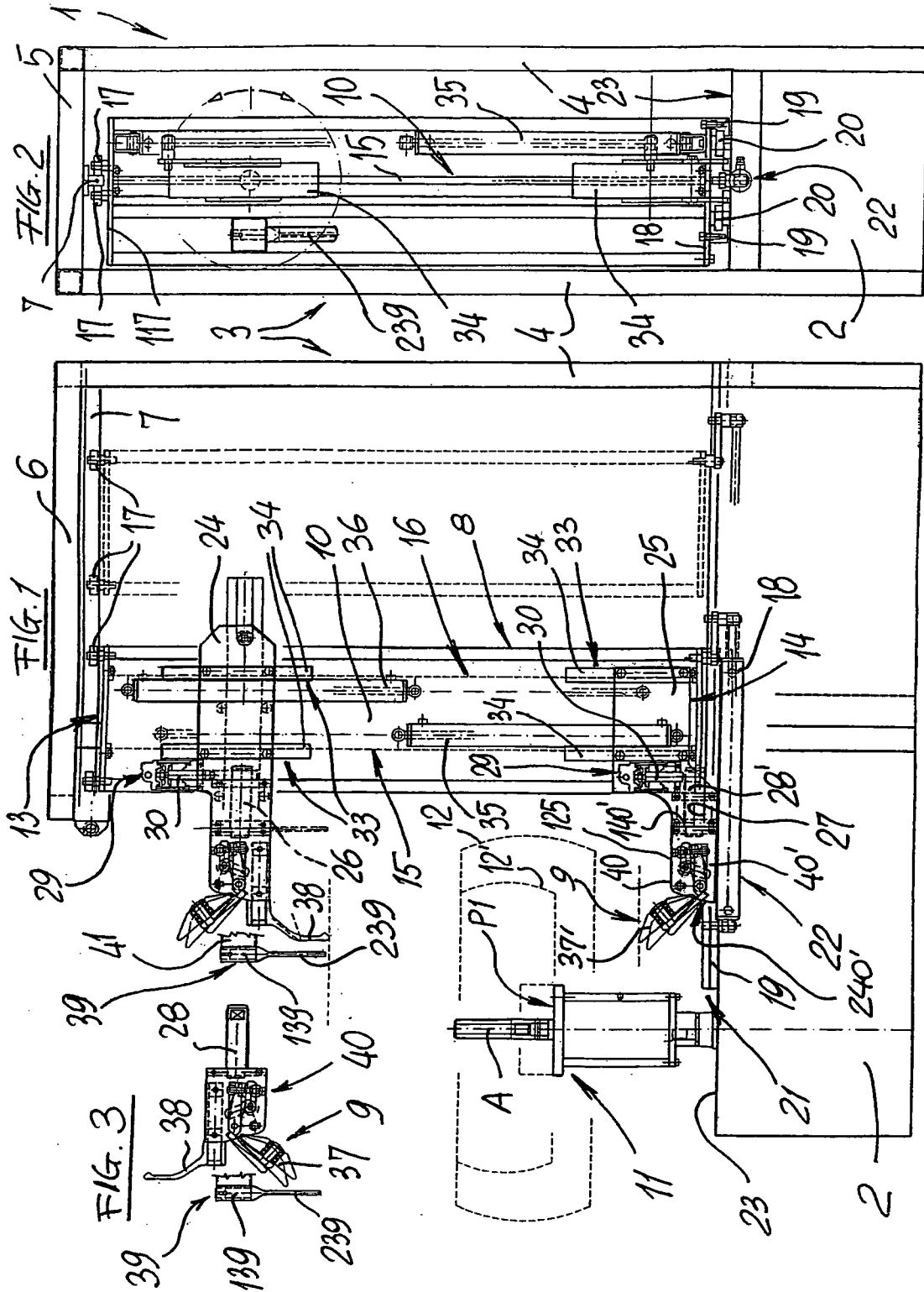
36. Method according to any of the claims 27 to 5 wherein said bead-breaking tools (37, 37'), extraction tools (38) in a configuration mounted on said column (10) have constant distances from this.

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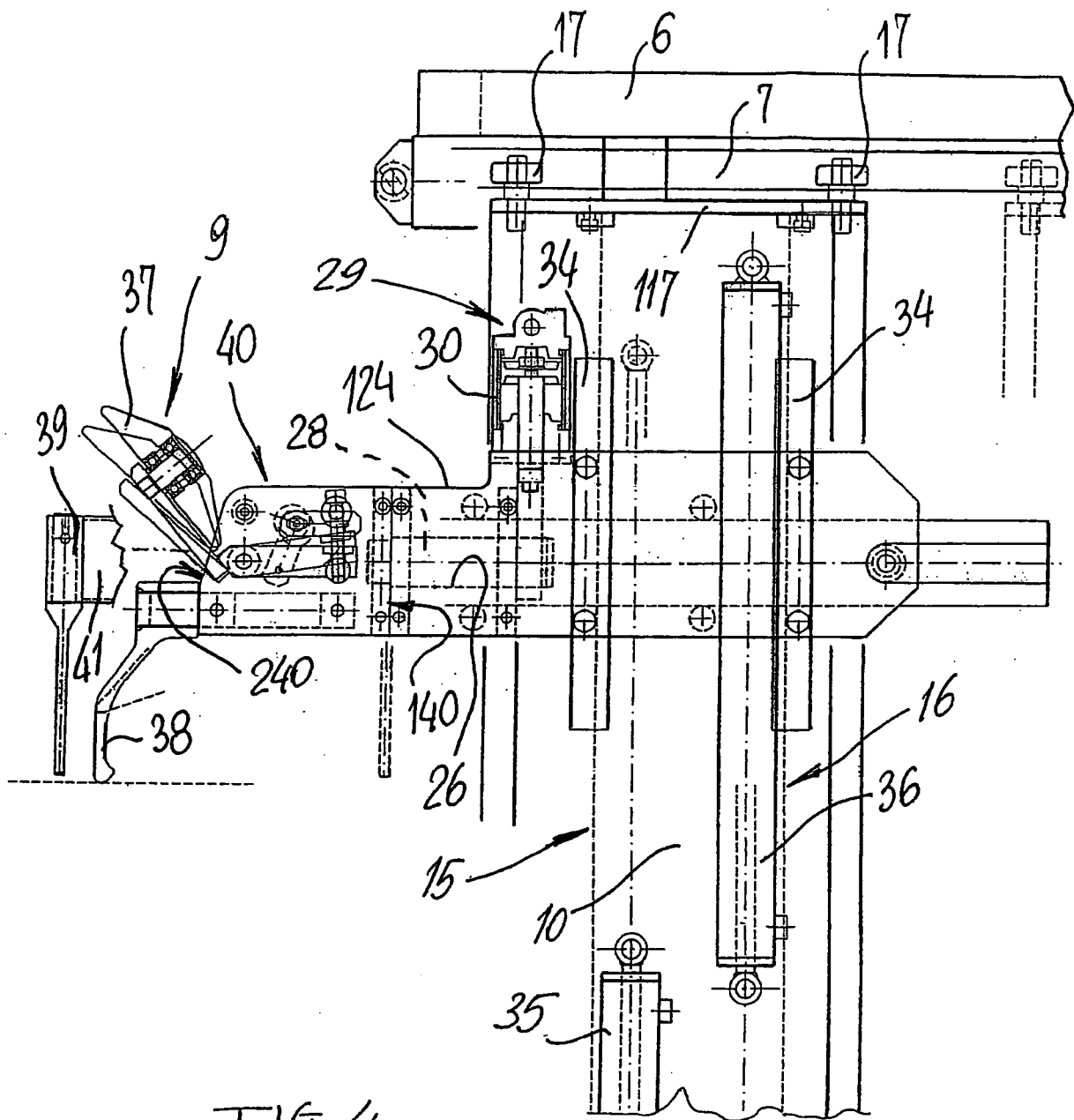


FIG. 4

