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(71) Applicant and

(72) Inventor: **BARISONZO, Luca** [IT/IT]; Corso Europa  
333/11, I-16132 Genova (IT).

(74) Agents: **PORSIA, Attilio** et al.; Succ. Ing. Fischetti &  
Weber, 3/2, Via Caffaro, I-16124 Genova (IT).

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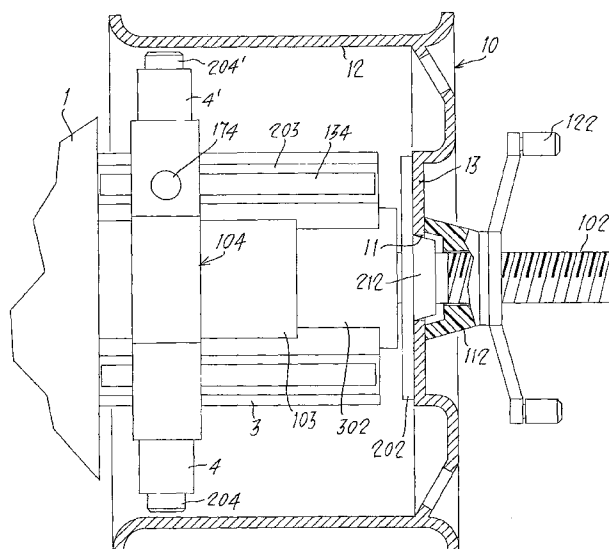
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(57) Abstract: Apparatus for restoring the centering of tire rims, comprising: a rod (2) which can be inserted into the centring hole (11) for engaging a rim (10) with the hub of a motor vehicle and provided with means (202, 212, 102, 112) for locking, coaxial with the said rod, the fixing plate (13) of the said rim (10) so as to position said rod (2) along the direction of the axis of said rim (10); thruster means (4, 4') able to act in any direction perpendicular to the said rod (2), movable in a direction parallel to the rod (2) itself and provided with adjusting and support means (3, 104) and means (164, 174) for fixing their position along the said rod (2), said rod (2) being mounted- rotatably relative to its axis, provided with actuating means (101) -and connected to means (201, 301, 401) for detecting the balancing and geometrical deformation; as well as a method for use thereof.



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**TITLE:** APPARATUS FOR RESTORING THE CENTERING OF TIRE RIMS**DESCRIPTION**

The present invention relates to an apparatus for re-truing or restoring the centering of tire rims.

The increasingly widespread use of alloy rims as a standard fitting on motor vehicles, as well as parts designed for special optional applications and the usual tendency to combine them with tyres commonly known as "low profile tyres", has highlighted the evident problem of deformation of the rim well following occasional impacts against obstacles such as pavements, stones, holes and the like, should the resilience of the tyre not be sufficient to absorb the entire force thereof. Until a short time ago the damage was repaired by means of essentially manual operations, hammering the damaged rim part, with consequent dents and approximate centering. Some highly specialized operators in the sector use the lathe for this kind of repair, nevertheless with obvious limitations in terms of centering and in many cases resulting in structural damage to the rim such that suitable and safe operation thereof cannot be ensured. Others use hydraulic presses which are suitably equipped to "remould" the circular form of the rim in the hot state (deep-drawing), with consequent alteration of the structure of the material from which the rim is made and possible alteration of the original measurements of the rim due to elongation stress-relief caused by heating and subsequent pressure exerted by the device operated by the press.

The document EP-A-1424145 describes an apparatus for re-centering the rims for tyres, comprising: a rod, which can be connected to a suitable support, can be inserted inside the hole for engaging a rim with the hub of a wheel and provided with means for locking, coaxial with the said rod, the plate of the said rim, so as to position said rod along the direction of the axis of said rim; thruster means able to act in any

direction perpendicular to the said rod, movable along the latter and provided with means for adjusting and fixing their position along the said rod.

With the apparatus described above, owing to its constructional and geometrical characteristics in relation to coupling with the rim, it was possible to verify perfectly the degree of concentricity of the rim with respect to its axis, providing a clear indication, by means of a quantitative analysis performed by the user during the various stages of re-centering. This was performed by means of "comparison" namely by means of frictional contact between two bodies coaxially rotating relative to each other. Therefore the degree of accuracy of the repair could be guaranteed 100%, but was still dependent upon the user.

Moreover, determining the appropriate thrusting force to be applied was complex; in this connection, it was thought to use a wheel balancing apparatus of the known type and commercially available in order to verify the degree of deformation and consequently determine quantitatively the degree of accuracy during the successive stages of repair. In this case, however, carrying out checks whenever a single thrusting force was applied to the rim meant that a considerable amount of time was lost.

The object of the present invention, therefore, is to provide an apparatus which is able to make the rim repair operations more precise and easier, allowing an analytical evaluation of the degree of damage during all the stages of re-centering and an accurate check as to the force applied.

The present invention therefore relates to an apparatus for restoring the centering of tire rims, comprising: a rod which can be inserted into the centring hole for engaging a rim with the hub of a motor vehicle and provided with means for locking, coaxial with the said rod, the fixing plate of the said rim so as to position said rod along the direction of the axis of said rim; thruster means able to act in any

direction perpendicular to the rod itself, movable in a direction parallel to the said rod and provided with adjusting and support means and means for fixing their position along the said rod, said rod being mounted rotatably with respect to its axis, provided with actuating means and connected to means for detecting the balancing and geometrical deformation.

In a preferred embodiment, said thruster means are arranged on support means which are mechanically and statically completely independent of said rod. Said thruster means may comprise two hydraulic jacks which are situated diametrically opposite each other relative to the axis of the said rod and mounted on a common support which is movable in a direction parallel to the said rod and can be fixed by suitable means in any position with respect to the said rod.

Said hydraulic jacks are incorporated in a hydraulic circuit which allows them to be controlled so that a first jack is able to bear against the inner side wall of the rim and a second rim able to apply a given thrusting force along the same direction and in a sense diametrically opposite to the first jack, which counterbalances the effect thereof.

The present invention also relates to a method for restoring the centering of tire rims by means of the apparatus described above, comprising the steps of:

- positioning the rim on the said rod and clamping the said rim;
- detecting the deformation of the rim and consequent eccentricity with respect to its axis by means of a device for detecting/determining the eccentricity;
- positioning and locking the thruster means;
- applying a given thrusting force on the rim by means of said thruster means;

- verifying the effect of the thrusting force by means of a device for detecting/determining the eccentricity;
- repeating steps d) and e) in succession until the rim has been re-trued.

Further advantages of the apparatus according to the present invention and the method for use thereof will become clear from the following detailed description of an embodiment thereof, provided by way of a non-limiting example, with reference to the accompanying illustrations in which:

Figure 1 is a side elevation view of an embodiment of the apparatus according to the present invention;

Figure 2 is a front elevation view of a detail of Figure 1, with parts cross-sectioned;

Figure 3 is a plan view of a detail of the apparatus according to the invention, shown with a rim mounted for machining; and

Figure 4 is a schematic diagram of the hydraulic circuit of an embodiment of the apparatus according to the invention.

Figure 1 shows an embodiment of the apparatus according to the present invention; 1 denotes the support frame of the said apparatus, inside which the rod 2 is joined to the actuating means 101 which are connected to detection means 201 in turn connected to the central processing unit 301 which supplies the data acquired and processed to the monitor 401. The rod 2 has, at the opposite end to that connected to the said actuating means 101, a threaded portion 102 having, joined thereto, the rim fixing bush 112 provided with gripping means 122. The threaded

portion terminates, as will appear more clearly from the figures described below, in a disk 202 which is keyed onto the rod 2. The means 3 for guiding the thrusters 4 and 4', which are connected together by means of the stirrup 104, are arranged concentric with the rod 2. The said guide means 3 are connected stably to the bracket 5 projecting out from the frame 1 in the manner better described below.

Figure 2 shows a front elevation view, with parts cross-sectioned, of a detail according to Figure 1; identical parts have been given the same numbers. The rod 2, which is shown cross-sectioned, is surrounded by the support bearing 302 which has, arranged around it, the two guides 3 joined together by means of the bridge-piece 103. On the bottom side, the two guides 3 are fixed, by means of the fixing means 225, to the right-angled section 205 which, by means of the fixing means 215, is connected to the U-shaped section 105 which is in turn joined to the bracket 5 connected to the support frame of the apparatus. Each of the two guides 3 is provided on the top side with a channel 203 inside which a rail 134 is situated; inside one of the two channels 203, the slide 124 is mounted on the rail 134, said slide being connected to the stirrup 104 which joins the two thruster means which in the example illustrated are the hydraulic jacks 4 and 4'. Inside the other channel 203, the slide 144 is mounted on the rail 134 and is passed through by a screw pin 164 provided with a knob 174, the other free end of which is able to make contact with the rail 134. The hydraulic jacks 4 and 4' are connected to the ends 114 of the stirrup 104 in a diametrically opposite position relative to the rod 2 and are provided with the movable pistons 204 and 204', respectively, the movement of which is radial with respect to the rod 2.

Figure 3 shows the same detail in a plan view from above, with the sole difference that in this case a rim is positioned on the apparatus; here also identical parts have been indicated by the same numbers. As can be noted, the rim 10 is arranged with its hole 11 for centring with the hub of the vehicle wheel mounted on the threaded end 102 of the rod 2 and co-operating with the frustoconical end-piece

212 projecting from the disk 202, while the plate 13 of the said rim rests on the disk 202. The side wall 12 of the rim is ready to enter into contact with the thrusters 4, 4'.

Finally, Figure 4 shows schematically an embodiment of the hydraulic circuit of the apparatus according to the present invention; 6 denotes the pump of the circuit, which by means of the filter 706 draws the hydraulic fluid, i.e. oil, from the tank 806, and is operated by the motor 106. The pump supplies two circuit branches both provided with maximum pressure valves 206; one branch, which terminates in the hydraulic jack 4' with its piston 204' and the resilient recall means 214', has, arranged along it, a filling/emptying valve 406 which, when it is operated, allows positioning of the piston 204' bearing against the side wall 12 of the rim 10. The other branch, which terminates in the jack 4 with its piston 204 and the resilient recall means 214, incorporates therein a maximum pressure valve 306, a filling/emptying valve 506 and, at the jack connection point, a regulating valve 606 and a pressure gauge 616.

The operating principle of the apparatus according to the invention and the method for re-centering rims by means of this apparatus will become clear from the description provided below. Removing the bush 112 from the threaded portion 102 of the rod 2, the rim may be positioned on the disk 202 by means of its plate 13; subsequent tightening of the bush causes centring of the hole 11 on the end-piece 212. At this point the first check is carried out on the rim, causing rotation of the rod and detecting, by means of the detection device 201 and the processing unit 301, the deformation of its geometrical form, both in terms of magnitude and in terms of position. After completing the analysis, the thruster means 4, 4' are conveniently positioned in order to perform repair, sliding the bracket 4 along the guides 3 and then suitably locking in position the slide 144 by means of the knob 174 which operates the threaded pin 164.

The next step envisages operation of the thruster 4', the piston 204' of which is brought into contact with the side wall 12 of the rim at the point diametrically opposite

to that where the deformation has been encountered. The degree of thrusting force to be applied with the piston 204 of the thruster 4 is suitably metered, making use of the controlling action which the valve 606 is able to have on the fluid filled in the end portion of this branch of the circuit and detecting at the same time the pressure by means of the pressure gauge 616. The pistons 204 and 204' are then retracted and the rim will again undergo a check as to its concentricity. The thrusting operations and checks will be repeated until the rim has a degree of concentricity which is within the tolerance limits prescribed by the manufacturer.

Another important aspect of the design of the apparatus according to the present invention is associated with positioning of the thruster means 4, 4' with respect to the rod 2 which must be able to rotate without being subject to influences of any kind, since, from its rotation with the rim-mounted as shown in Figure 3, it is possible to deduce the data relating to the position and the degree of damage to be repaired. In this respect, it is necessary to mention how in Figure 2 the connection between the means for guiding the thruster means 4, 4' and the frame of the apparatus is shown; basically, by means of the sections 105 and 205, the guides 3 are fixed to the bracket 5 without affecting in any way the static condition of the rod 2, and this type of arrangement allows any interference with rotation of the rod, and therefore any corruption of the data detected by the device 201 connected to the said rod, to be avoided. The means for positioning the stirrup 104 along the guides 3 and the locking means may also be designed as servo-controlled means, instead of substantially manual control means, as illustrated in the embodiment shown.

**CLAIMS**

1. Apparatus for restoring the centering of tire rims, comprising: a rod which can be inserted into the centring hole for engaging a rim with the hub of a motor vehicle and provided with means for locking, coaxial with the said rod, the fixing plate of the said rim so as to position said rod along the direction of the axis of said rim; thrusters means able to act in any direction-perpendicular to the said rod, movable in a direction parallel to the said rod and provided with adjusting and support means and means for fixing their position along the said rod, said rod being mounted rotatably with respect to its axis, provided with actuating means and connected to means for detecting the balancing and geometrical deformation.
2. Apparatus according to Claim 1, in which said thruster means (4, 4') are arranged on support means (104, 3) mechanically and statically completely independent of said rod (2) and connected to a support frame (1) of the said apparatus.
3. Apparatus according to Claim 2, in which said rod (2) is oriented along an axis substantially parallel to the plane of the ground on which said support frame (1) rests.
4. Apparatus according to any one of the preceding Claims 1 to 3, in which said thruster means comprise two hydraulic jacks (4, 4') which are situated diametrically opposite each other relative to the axis of the said rod (2) and are mounted on a common support (104) which is movable along a guide (3) parallel to the said rod and can be fixed in position using suitable means (164, 174) relative to the said guide (3).
5. Apparatus according to Claim 2 or 3 and Claim 4, in which said guide comprises two parts (3) which are situated diametrically opposite each other relative to the said rod (2) and connected to a bracket (5) projecting out from the support frame (1) of the said apparatus, in a direction parallel to that of the said rod (2).
6. Apparatus according to any one of the preceding Claims 4 or 5, in which said hydraulic jacks (4, 4') are incorporated in a hydraulic circuit which allows control thereof so that a first jack (4') is able to bear against the inner side wall (12) of the rim (10) and so that a second jack (4) is able to apply the thrusting force at a given intensity.

7. Method for restoring the centering of tire rims by means of the apparatus according to any one of the preceding Claims 1 to 6, comprising the steps of:  
positioning the rim (10) on the said rod (2) and clamping the said rim (10) using suitable means (102, 112, 202, 212);  
detecting the centring/concentricity defect of the rim by means of the device for detecting the eccentricity (201, 301);  
positioning and fixing in position the thruster means (4, 4');  
applying the thrusting force onto the rim by means of said thruster means (4) at a given intensity;  
checking the effect of the thrust applied by means of the device for detecting the eccentricity (201, 301);  
repeating steps d) and e) in succession until the rim (10) has been re-trued.

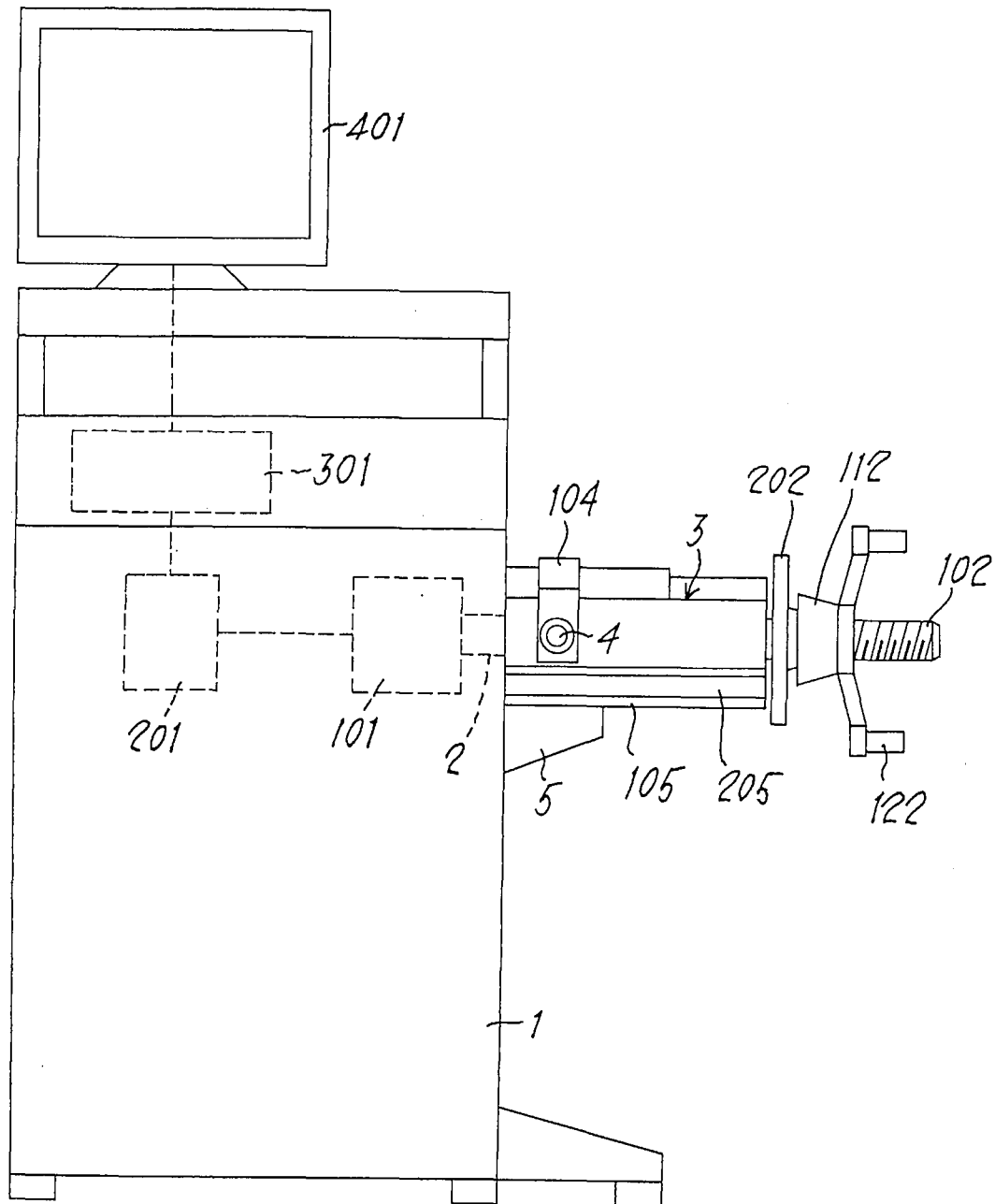
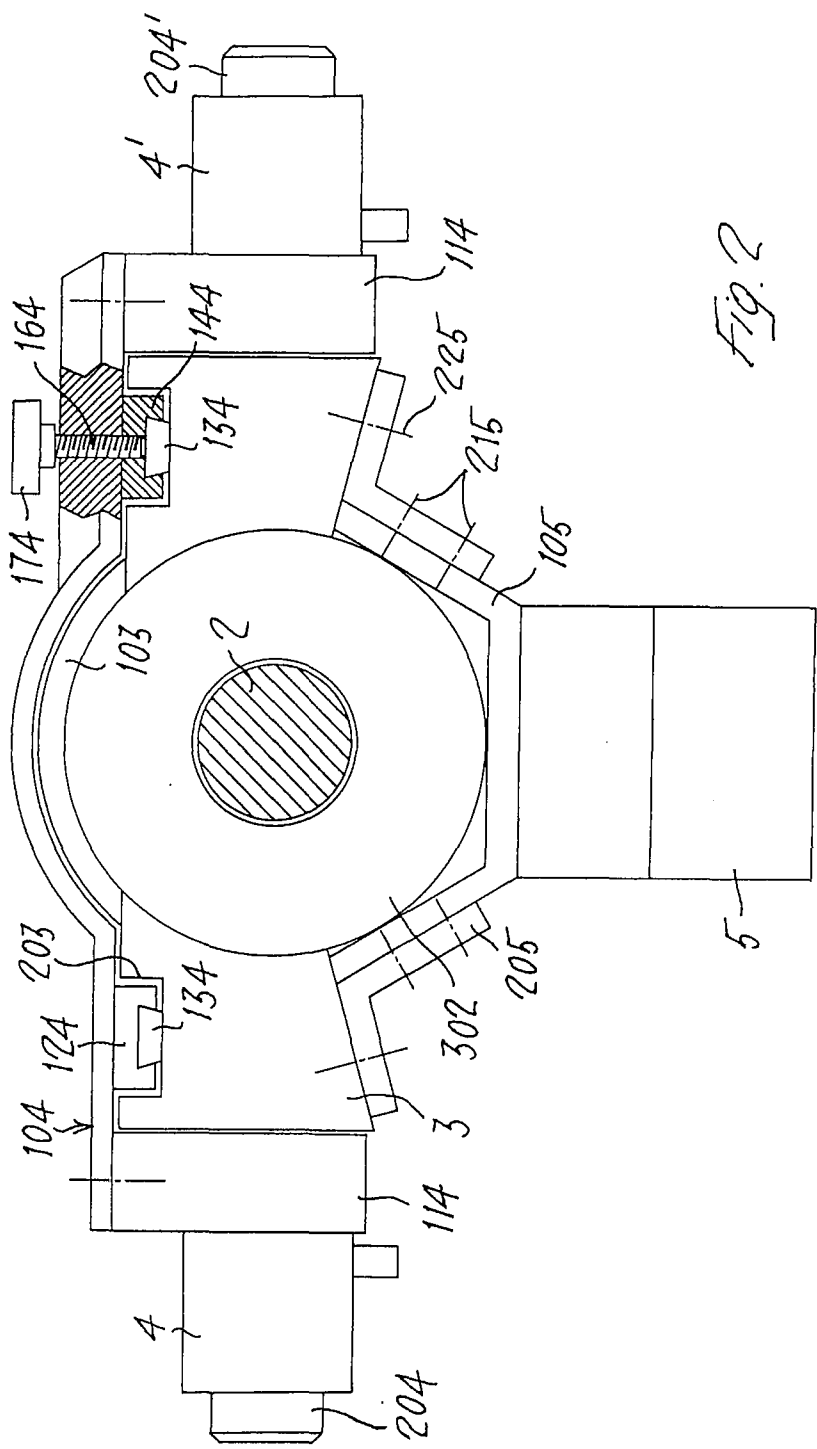


Fig. 1



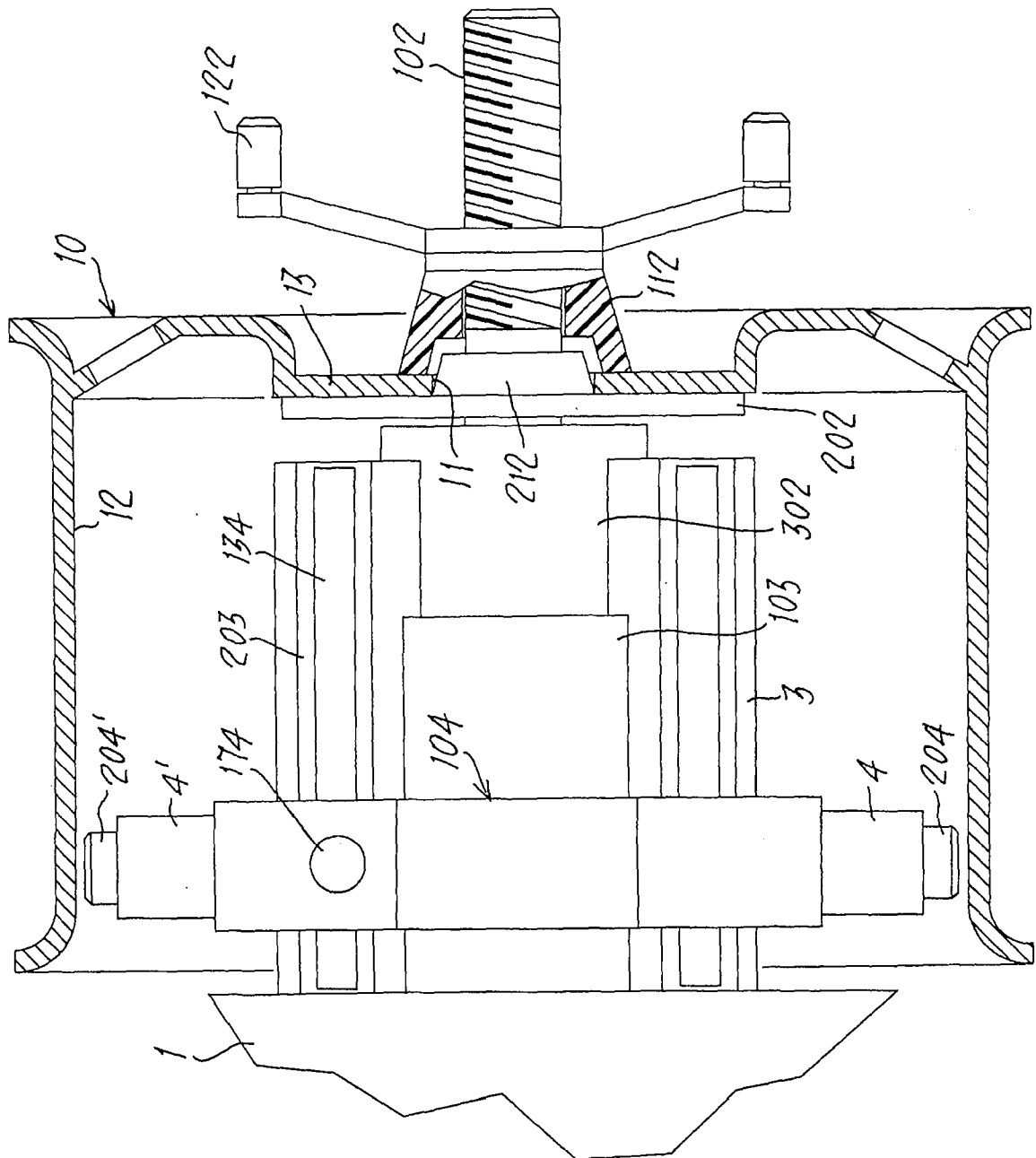


Fig. 3

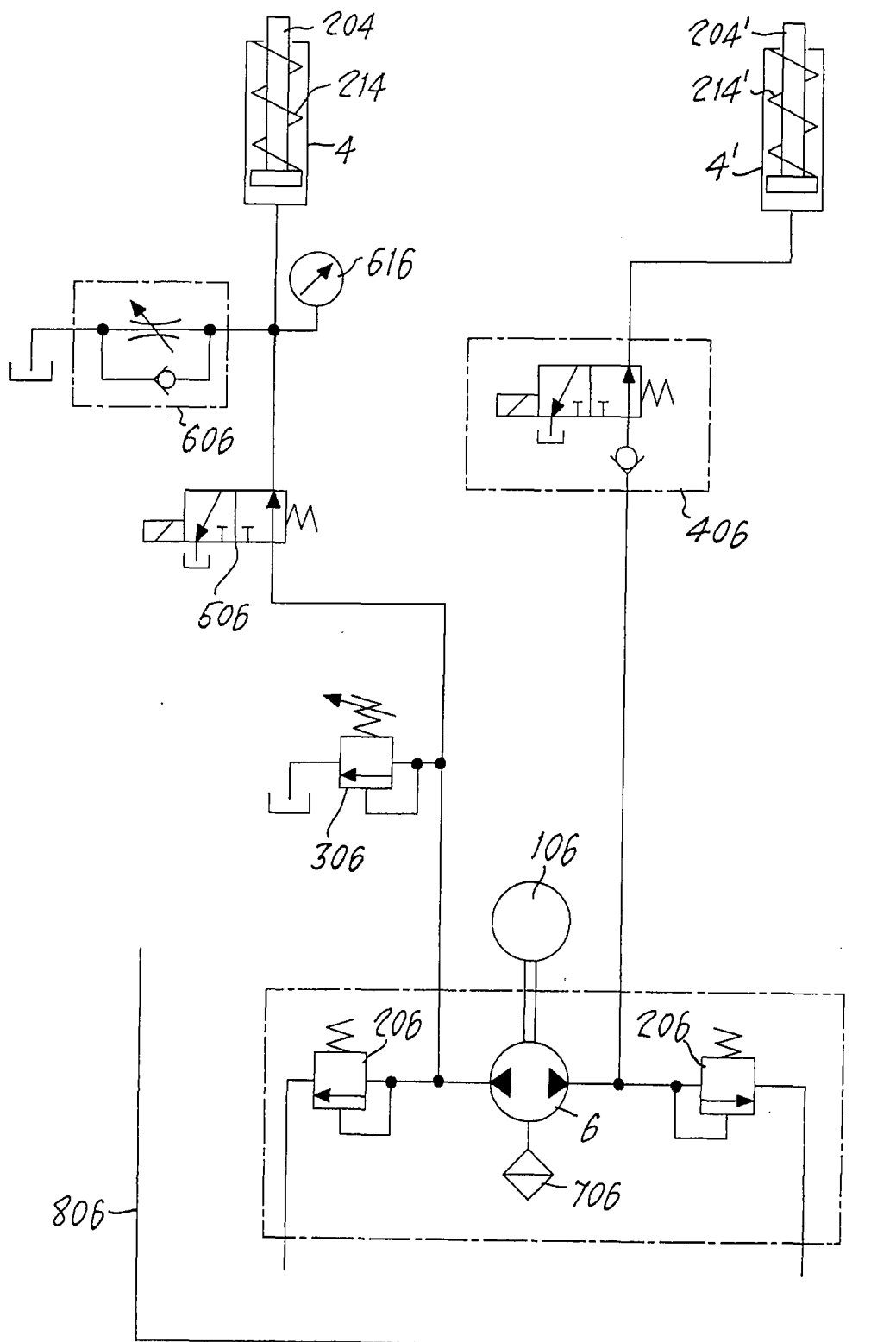


Fig. 4