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(54) **Floor cleaning machine**

(57) Floor cleaning machine (1) comprising at least one brush (2) that is drivable via a substantially vertical shaft (3) to rotate, at least one squeegee (4) that is arranged to the rear of said at least one brush (2), opposite to the travel direction of said floor cleaning machine (1), and means (5) for rotating said at least one squeegee

(4), at least in part, around said at least one brush (2), **characterized in that** said rotating means (5) comprise an elongated element (6) that is provided with a first portion (6a), rotatably freely coupled to said vertical shaft (3), and a second (6b) portion, coupled directly, or indirectly, to said at least one squeegee (4).

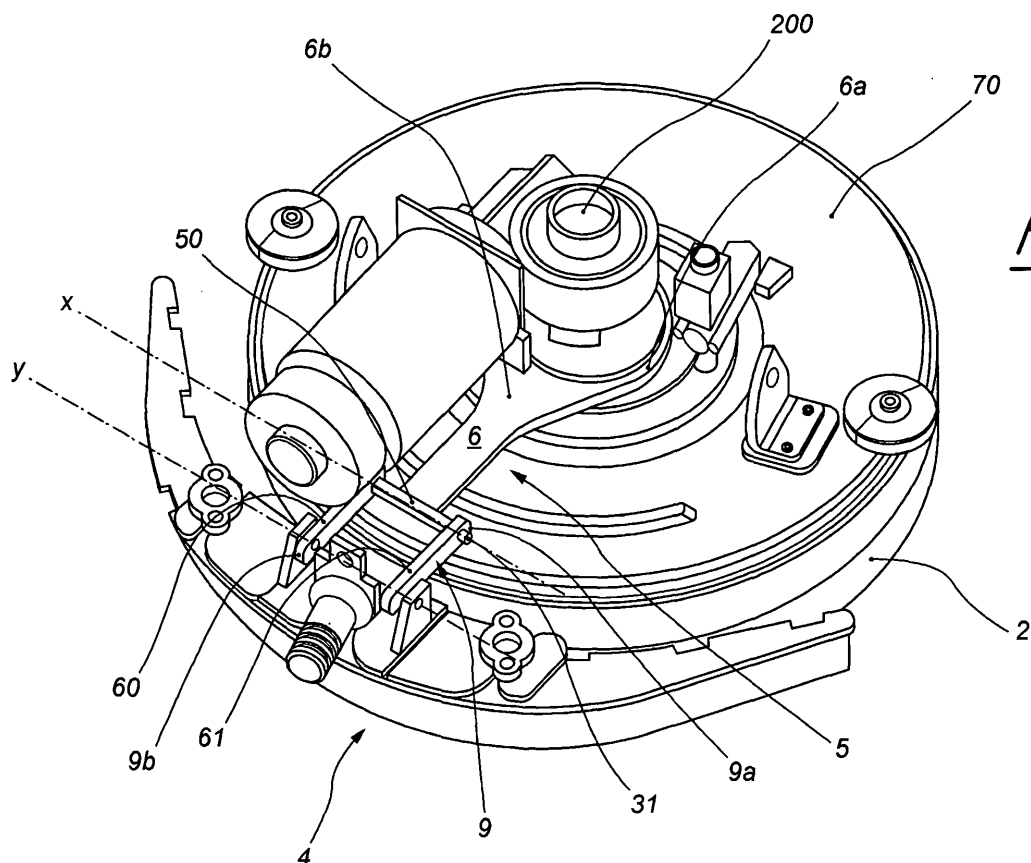


Fig. 5

Description

[0001] The present invention relates to a floor cleaning machine, preferably for industrial field. In particular the present floor cleaning machine is of the type comprising a brush that is drivable via a substantially vertical shaft to rotate and a squeegee that is arranged to the rear of such a brush, opposite to the travel direction of the floor cleaning machine. Furthermore such a kind of flooring machine, that can be moved by an operator or preferably provided with independent drive, comprises means for rotating the squeegee around the brush as a consequence of directional changes of the machine. Even more in detail the squeegee, which is a strip or blade of elastic material such as, rubber or the like, collects the washing liquid and the dirt removed by the action of the brush, being provided with suction means to suction the dirt and the washing liquid in order to leave the floor clear and dry.

[0002] The solutions of prior art floor cleaning machines present the drawback that the shaft around that the squeegee pivots is different from the shaft around that the brush pivots, thus making very hard and time consuming both the assembly and disassembly of the machine in case of maintenance. Another drawback of the prior art floor cleaning machines is that the means for rotating the squeegee, albeit provided with a relative low inertial moment, are manufactured in more than one component welded or coupled each other to form said means for rotating the squeegee. Such a configuration of the rotating means increases the costs and the time for manufacturing the floor cleaning machine.

[0003] The aim of the present invention therefore, is to provide a floor cleaning machine that can be quickly assembled and disassembled.

[0004] Further object of the present invention is to provide a floor cleaning machine that is provided with rotating means that can be manufactured just in one piece and, at same time, provided with reduced inertial moment.

[0005] These and other aims are achieved by the present floor cleaning machine that comprises at least one brush that is drivable via a substantially vertical shaft to rotate, at least one squeegee that is arranged to the rear of said at least one brush, opposite to the travel direction of said floor cleaning machine, and means for rotating said at least one squeegee, at least in part, around said at least one brush, **characterized in that** said rotating means comprise an elongated element that is provided with a first portion, rotatably freely coupled to said vertical shaft, and a second portion, coupled directly, or indirectly, to said at least one squeegee. In this way the assembly and disassembly of the machine is extremely quick since all components of the floor cleaning machine are mounted on the vertical shaft for rotating said brush and said squeegee.

[0006] Furthermore said elongated element is arranged horizontally and is substantially flat; besides said first portion is provided with a hole that is concentric to said vertical shaft so that the elongated element can be

manufactured just in one piece. It should be remarked that substantially flat means that the thickness of said elongated element has dimensions negligible with respect to the other two spatial dimensions. Therefore said elongated element is similar to a thin and narrow plate that rotates around an axis perpendicular to the two base surfaces of the plate.

[0007] According to a second embodiment of the invention, said rotating means comprise a connecting element that is provided with a first end rotatably freely coupled around a first horizontal axis to the second portion of said elongated element, and a second end freely rotatably coupled about a second horizontal axis to said at least one squeegee. In such a way the squeegee can be moved up and down by the operator or automatically adjusts in case the floor is not perfectly smooth.

[0008] Again both first and second embodiment of said floor cleaning machine comprise means for reducing the friction between said horizontal elongated element and said vertical shaft, at least during their relative rotation. Said friction reducing means are arranged into the inner portion of said hole and comprise a bushing or a ball bearing which are preferably formed in one piece with said hole.

[0009] Alternatively, said friction reducing means comprise a plurality of spherical balls that roll on the external surface of said shaft, along a track for said plurality of balls. Each ball being is radially arranged into the inner portion of said hole and housed in a cavity of said inner portion.

[0010] According to a preferable embodiment, the first portion of said horizontal elongated element is substantially circular and the second portion of said horizontal elongated element is substantially rectangular, wherein the ratio of the transversal dimensions of the first portion of said horizontal elongated element to the transversal dimensions of the second portion of said elongated element is comprised between 1 and 5, preferably 4.

[0011] A description of certain embodiments of the present invention will now be provided purely as a non-limiting example, with reference to the appended drawings, wherein:

- figure 1 shows a perspective view of the floor cleaning machine;
- figure 2 shows a top view of the floor cleaning machine according to figure 1, wherein only the inferior part of the floor cleaning machine is visible;
- figure 3 shows a top perspective view of the friction reducing means of the machine according to figure 2;
- figure 4a shows a top view of the machine according to figure 2, wherein the squeegee is placed in a first angular position with respect to the brush;
- figure 4b shows a top view of the machine according to figure 2, wherein the squeegee is placed in a second angular position with respect to the brush;
- figure 5 shows a perspective view of the floor cleaning machine according to a second embodiment of

the invention, wherein only the inferior part of the floor cleaning machine is visible;

- figure 6 shows a perspective view of the elongated element.

[0012] In all figures, the floor cleaning machine according to the invention is identified throughout by the numeral 1.

[0013] The floor cleaning machine 1 comprises a chassis 100 that supports a brush 2 that is drivable by means of an electrical motor 200 via a substantially vertical shaft 3 to rotate, a squeegee 4 that is arranged to the rear of said brush 2, opposite to the travel direction of said floor cleaning machine 1, and means 5 for rotating said at least one squeegee 4, at least in part, around said a brush 2. The brush 2 is protected by an housing 70 that completely surrounds and in operation is integral with the brush during its rotation.

[0014] It should be noted that the floor cleaning machine 1 can also comprise more than one brush without falling out from the scope of protection of the present invention.

[0015] The above mentioned rotating means 5 comprise an elongated element 6 that is provided with a first portion 6a, rotatably freely coupled to said vertical shaft 3, and a second portion 6b, directly coupled to said squeegee.

[0016] As shown in figure 1, said elongated element 6 is arranged horizontal, i.e. parallel to the floor 300 to be cleaned, and it is substantially flat. Therefore said elongated element 6 is shaped as a plate, i.e. it is provided with a thickness that has dimensions negligible with respect to the other two dimensions, which rotates around an axis perpendicular to the two base surfaces 6e, 6f (figure 6) of the elongated element 6.

[0017] Such a configuration of the elongated element 6 is particularly advantageous as the inertial momentum is extremely low and the elongated element can be manufactured very quickly. Furthermore such a configuration allows the elongated element to be lightly and elastically bent in case the machine 1 slides on a floor 300 which is not perfectly smooth. In practise, the flattened shape of the elongated element, consequently its capacity of lightly bending, allows the squeegee to adapt to the different surfaces of the floor without any rotational coupling between the squeegee and the elongated element.

[0018] Indeed, even if it has been herein described an elongated element 6 of the type wherein the base surfaces are perpendicular to the rotational axis, as it will be apparent to the skilled person in the art from the description, the inventive object of the invention might be applied in the same way in the floor cleaning machine too wherein the base surfaces 6e, 6f of the elongated element 6 are parallel to the rotational axis.

[0019] Furthermore the first portion 6a of said elongated element 6 is provided with a hole 6c that is concentric to said vertical shaft 3. Said hole 6c can be obtained during the same operation for manufacturing the elon-

gated element thus reducing costs and saving money.

[0020] In operation said elongated element 6 freely rotates around the shaft 3 during the functioning of the machine 1. In particular, such a rotation of the elongated element 6 occurs when the apparatus changes its direction, due to the friction caused by the sliding of the squeegee 4 on the floor 300, so as to follow the machine in every directional change and avoid some regions of the floor not to be dried by the squeegee 4. Figures 4a and 4b show two different angular positions of the squeegee with respect to the brush as consequences of the rotation of the elongated element 6 about the shaft 3. According to a second embodiment (figure 5), said rotating means 5 comprise a connecting element 9 that is provided with a first end 9a rotatably freely coupled around a first horizontal axis X to the second portion 6b of said elongated element 6, and a second end 9b freely rotatably coupled about a second horizontal axis Y to said at least one squeegee 4. Said connecting element 9 comprises two different rods 60, 61 that pivot about two hinges 30, 31 connected to the end 50 of the second portion 6b of said elongated element 6. In such a case said elongated element 6 is coupled indirectly to said squeegee 4. The second embodiment allows the squeegee 4 to be moved up and down during any working condition of the machine 1 or to automatically adjust in case the floor is not perfectly smooth. According to both first and second embodiment, said machine 1 comprises means 10 for reducing the friction between said horizontal elongated element 6 and said vertical shaft 3, at least during their relative rotation. Said friction reducing means 10 are arranged into the inner portion 6d of said hole 6c and they can be chosen between a bushing or a ball bearing (both alternatives not shown), which can be separated from the hole 6 or formed in one piece with said hole 6.

[0021] Alternatively, said friction reducing means 10 comprise a plurality 14 of spherical balls 14a that roll on the external surface 18 of said shaft 3. According to a preferable embodiment of the invention, each ball 14a is radially arranged into the inner portion 6d of said hole 6c and housed in a cavity 16 of said inner portion 6d. In order to minimize the friction of the balls that roll on the shaft 3, said shaft 3 comprises a track 17 for said plurality 14 of balls.

[0022] According to any one of the disclosed embodiments, said first portion 6a of said elongated element 6 is substantially circular and the second portion 6b of said horizontal elongated element 6 is substantially rectangular. The applicant has advantageously found out that the ratio of the transversal dimensions D of the first portion 6a of said horizontal elongated element 6 to the transversal dimensions L of the second portion 6b of said elongated element has to be comprised between 1 and 5, preferably 4, in order to obtain the most efficient rotation of said rotating means 5 around the shaft 3.

Claims

1. Floor cleaning machine (1) comprising at least one brush (2) that is drivable via a substantially vertical shaft (3) to rotate, at least one squeegee (4) that is arranged to the rear of said at least one brush (2), opposite to the travel direction of said floor cleaning machine (1), and means (5) for rotating said at least one squeegee (4), at least in part, around said at least one brush (2), **characterized in that** said rotating means (5) comprise an elongated element (6) that is provided with a first portion (6a), rotatably freely coupled to said vertical shaft (3), and a second (6b) portion, coupled directly, or indirectly, to said at least one squeegee (4). 5
2. Floor cleaning machine according to claim 1, **characterized in that** said elongated element (6) is arranged horizontally and is substantially flat. 10
3. Floor cleaning machine according to claim 1 or 2, **characterized in that** said first portion (6a) of said elongated element (6) is provided with a hole (6c) that is concentric to said vertical shaft (3). 15
4. Floor cleaning machine according to one or more of the previous claims, **characterized in that** said rotating means (5) comprise a connecting element (9) that is provided with a first end (9a) rotatably freely coupled around a first horizontal axis (X) to the second portion (6b) of said elongated element (6), and a second end (9b) freely rotatably coupled about a second horizontal axis (Y) to said at least one squeegee (4). 20
5. Floor cleaning machine according to one or more of the previous claims, **characterized in that** it comprises means (10) for reducing the friction between said horizontal elongated element (6) and said vertical shaft (3), at least during their relative rotation, said friction reducing means (10) being arranged into the inner portion (6d) of said hole (6c). 25
6. Floor cleaning machine according to claim 5, **characterized in that** said friction reducing means (10) comprise a bushing. 30
7. Floor cleaning machine according to claim 5, **characterized in that** said friction reducing means (10) comprise a ball bearing. 35
8. Floor cleaning machine according to any one of the claims from 5 to 7, **characterized in that** said friction reducing means (10) are formed in one piece with said hole (6). 40
9. Floor cleaning machine according to claim 5, **characterized in that** said friction reducing means (10) comprise a plurality (14) of spherical balls that roll on the external surface (18) of said shaft (3), each ball (14) being radially arranged into the inner portion (6d) of said hole (6c) and housed in a cavity (16) of said inner portion (6d). 45
10. Floor cleaning machine according to claim 9, **characterized in that** said shaft (3) comprises a track (17) for said plurality of balls. 50
11. Floor cleaning machine according to any one of the previous claims, **characterized in that** it comprises an electrical motor (5) for actuating in rotation said vertical shaft (3). 55
12. Floor cleaning machine according to any one of the previous claims, **characterized in that** the first portion (6a) of said elongated element (6) is substantially circular and the second portion (6b) of said horizontal elongated element (6) is substantially rectangular. 5
13. Floor cleaning machine according to any one of the previous claims, **characterized in that** the ratio of the transversal dimensions D of the first portion (6a) of said horizontal elongated element (6) to the transversal dimensions of the second portion (6b) L of said elongated element is comprised between 1 and 5. 5

Fig. 1

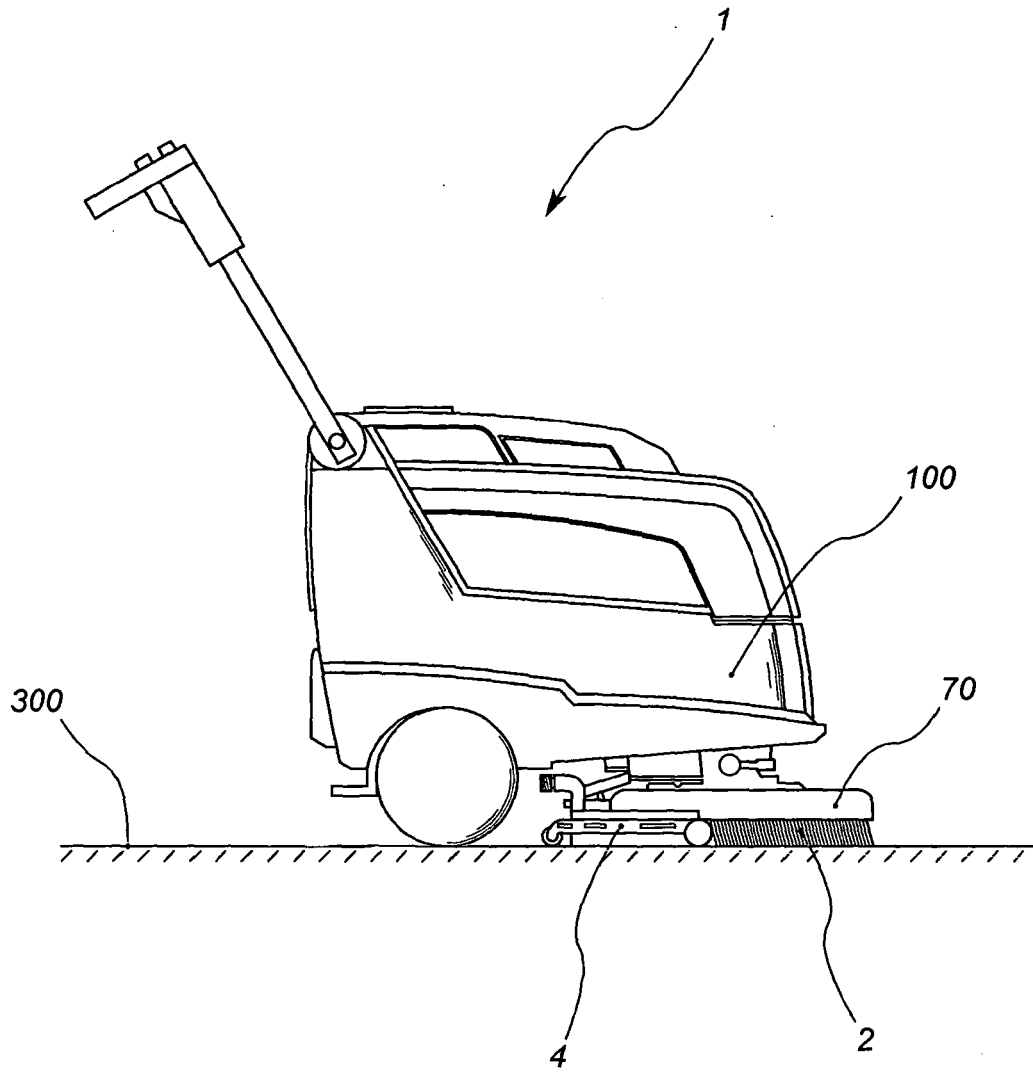
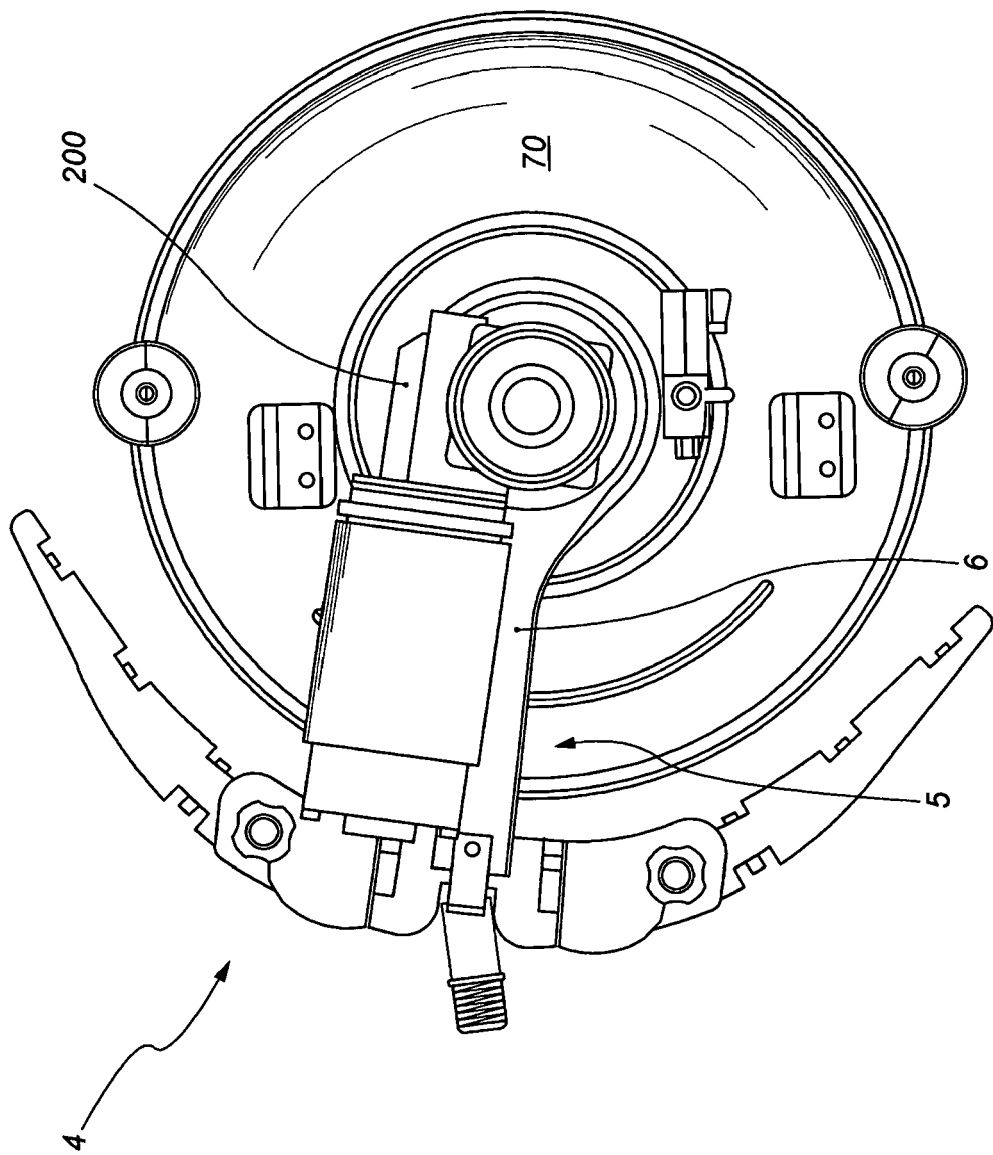


Fig. 2



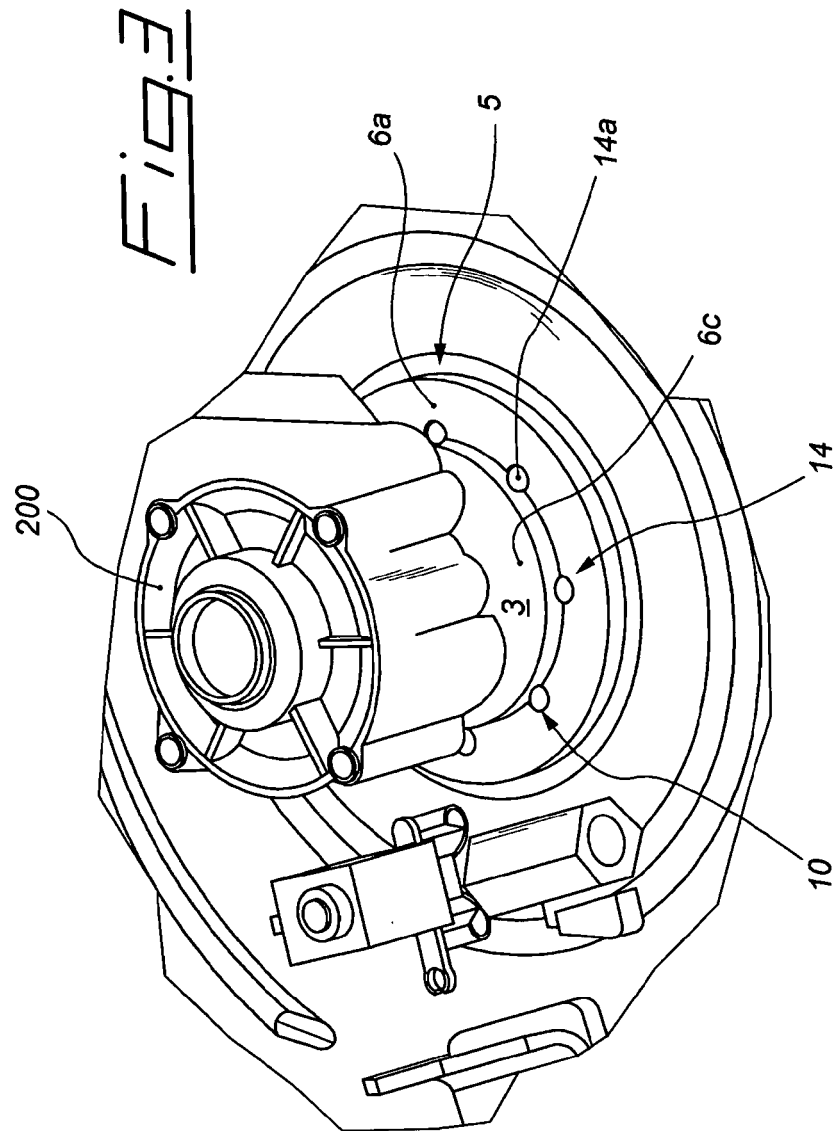


Fig. 4a

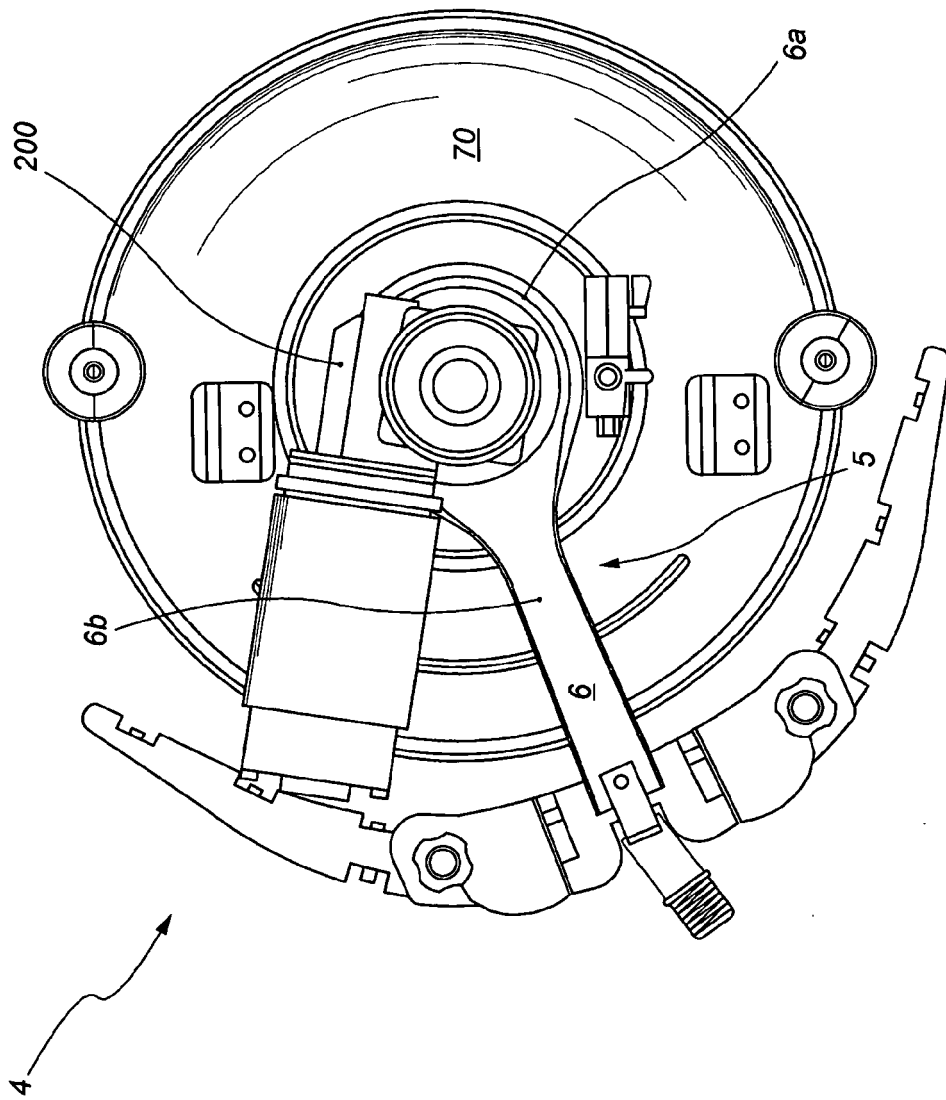


Fig. 4b

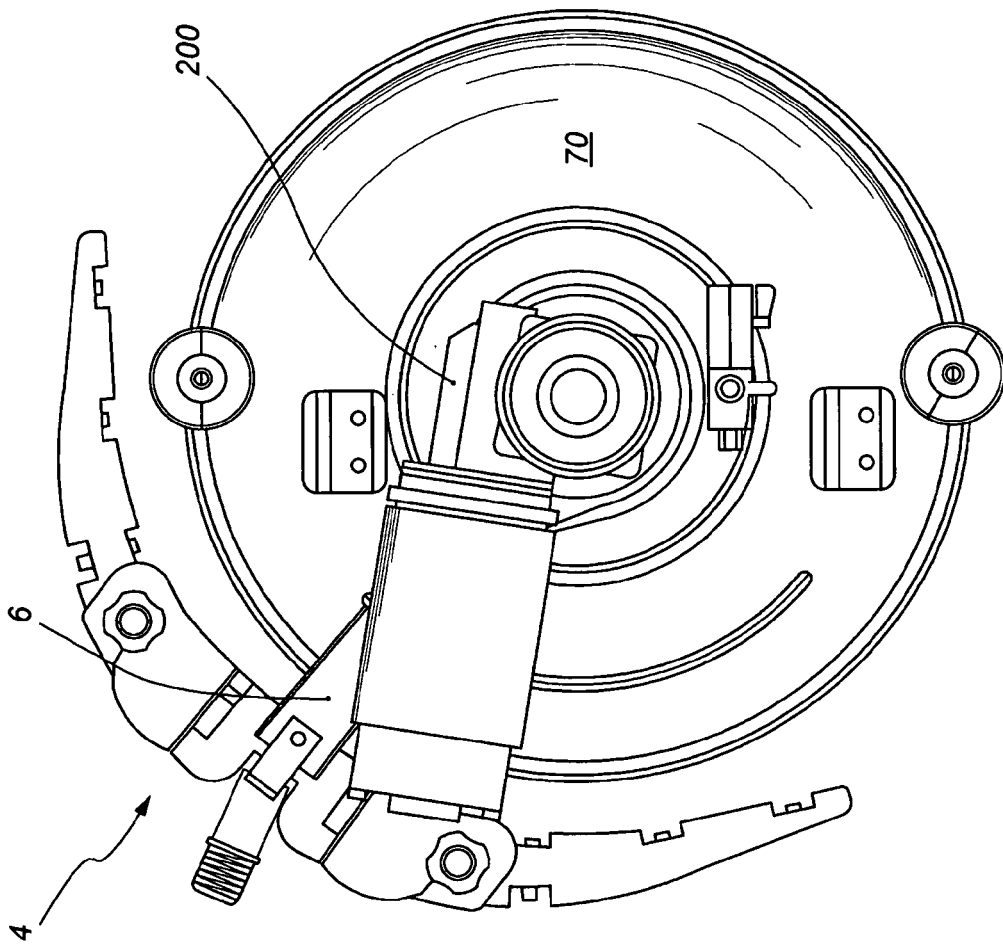


Fig. 5

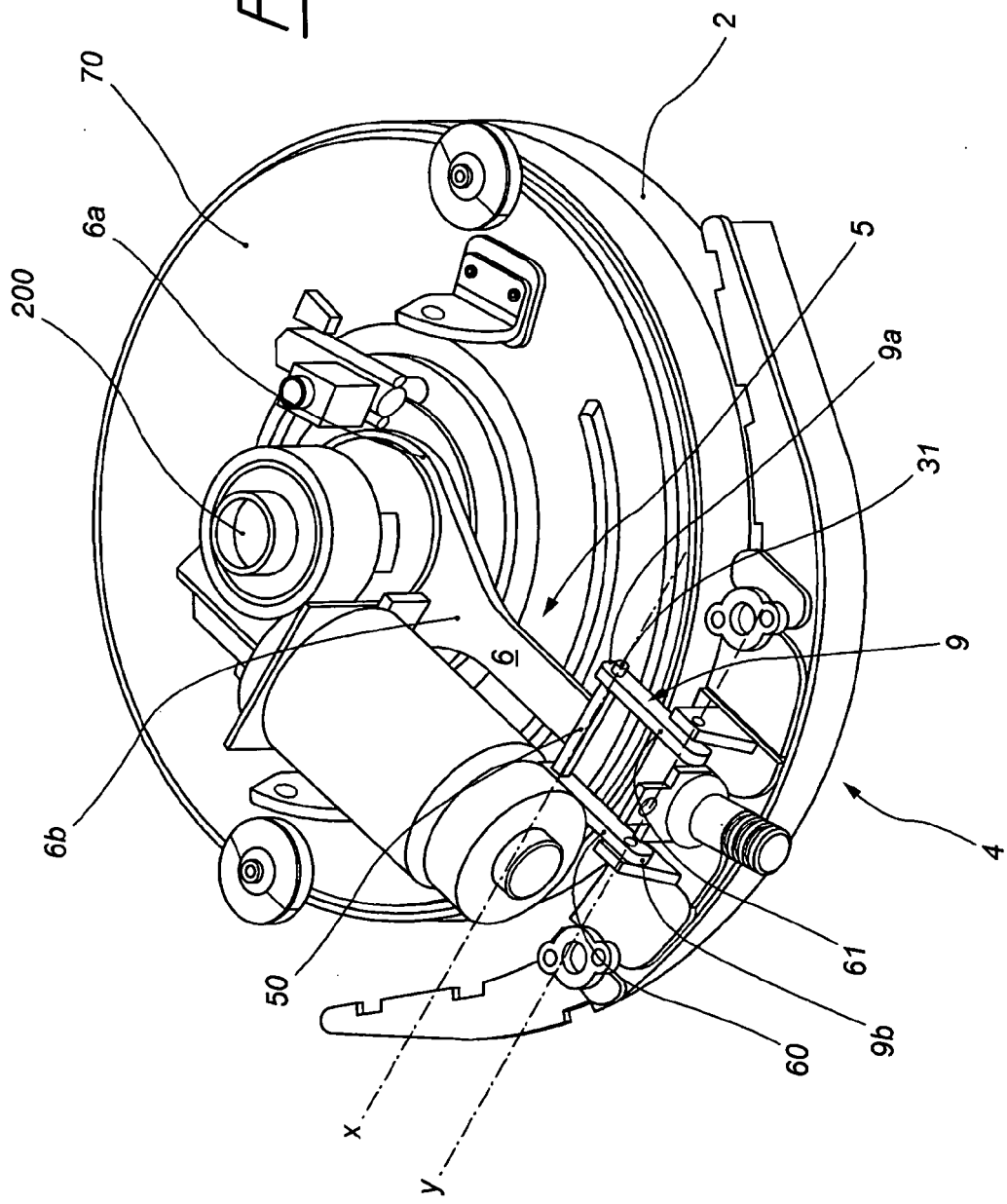
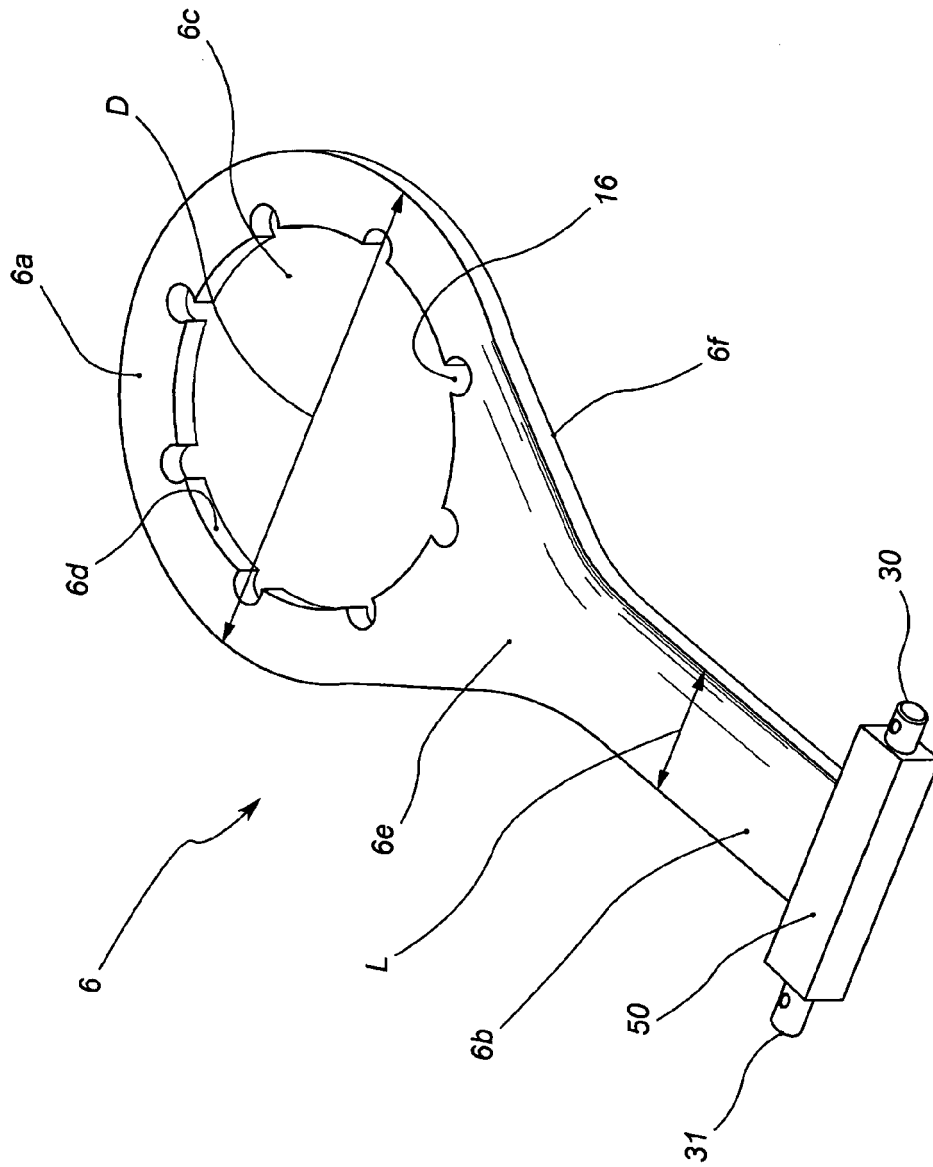


Fig. 6





EUROPEAN SEARCH REPORT

Application Number
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Place of search Munich		Date of completion of the search 14 October 2009	Examiner Hubrich, Klaus
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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