



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:
16.12.2020 Bulletin 2020/51

(51)

Int Cl.:
A47L 11/162 (2006.01)
A47L 11/283 (2006.01)
A47L 11/164 (2006.01)
A47L 11/40 (2006.01)
- (21)

Application number: 20165885.3
- (22)

Date of filing: 26.03.2020

(84) Designated Contracting States: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR Designated Extension States: BA ME Designated Validation States: KH MA MD TN	(71) Applicant: Ghibli & Wirbel S.p.A. 27020 Dorno PV (IT) (72) Inventors: • Beretta, Roberto 27020 Dorno PV (IT) • Lenzi, Luca 27020 Dorno PV (IT) (74) Representative: Perani & Partners S.p.A. Piazza Armando Diaz, 7 20123 Milano (IT)
(30) Priority: 17.05.2019 IT 201900006938	

(54)

SINGLE-BRUSH ROTARY-ORBITAL MACHINE

(57) A single-brush rotary-orbital machine (1) comprising: a frame (2) comprising a rear drag handle (21) for providing control of the machine (1), moving means (22) of the machine (1) and a front portion (23) having a passage opening (231); a base (3) for supporting a work tool (4), situated below the front portion (23); a motor (5) configured to actuate the work tool (4) with a rotary-orbital motion, the motor extending through the passage opening (231) of the front portion (23) of the frame (2) and being supported by the base (3); wherein the front portion (23) of the frame (2) and the base (3) are connected to each other in a direction of connection (X-X) by elastic damping means (6) which allow the front portion (3) of the frame (2) and the base (3) to move relative to each other in the direction of connection (X-X).

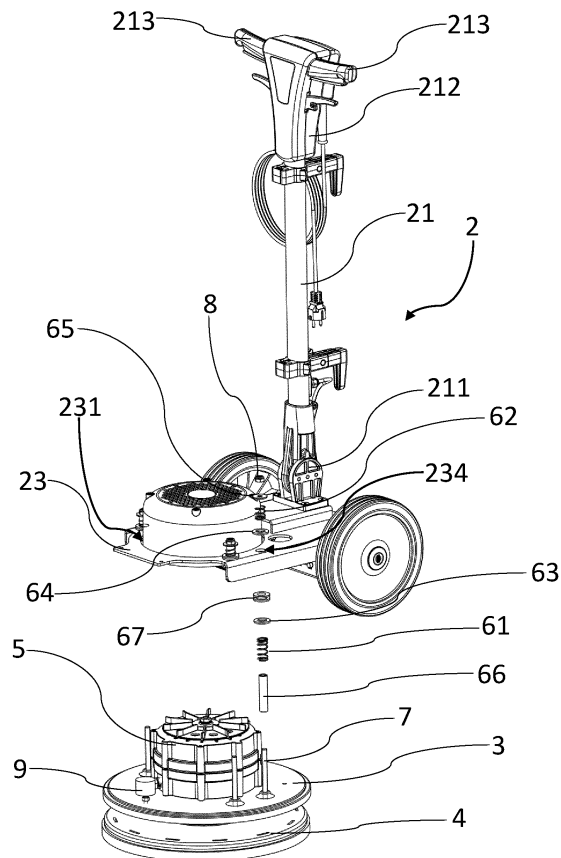


FIG.5

Description

Field of the invention

[0001] The present invention relates to a single-brush rotary-orbital machine, for example adapted to perform different types of treatment on a floor of a building.

Background art

[0002] Single-brush machines are known in the art, which have a small size and are also easily maneuverable by an operator. For example, WO2018/177958 discloses a single brush rotary-orbital machine adapted to perform different types of treatment on a floor.

[0003] This machine comprises a frame comprising a rear drag handle for providing control of the machine and a first and a second front bases. The second front base is located below the first front base. A pair of wheels are connected to the rear of the frame to allow movement of the machine.

[0004] In addition, the machine comprises a motor adapted to actuate a work tool with a rotary-orbital motion. This motor is supported by the second front base and extends through a passage opening in the first front base. In particular, the work tool is supported at a bottom surface of the second front base. In operation, i.e. when this single-brush machine is used for treatment of a floor, the bottom surface faces the floor. Conversely, the motor is supported at a top surface of the second front base, opposite to the bottom surface.

[0005] As disclosed in WO2018/177958, the second front base is supported by the first front base to idly rotate about an oscillation that is parallel to the floor and perpendicular to the forward moving direction of the machine.

Problem of the prior art

[0006] One drawback of the single-brush rotary-orbital machines of the prior art, i.e. similar to those disclosed in WO2018/177958, is that they entail a considerable transfer of vibrations produced by the motor upon rotary-orbital actuation of the work tool. These vibrations are transferred to the drag handle of the frame and hence to the operator who uses the machine.

[0007] The high intensity of the vibrations received by the operator dramatically reduces the continuous operation time of this single-brush machine. That is, the greater the intensity of the vibrations received by an operator, the greater the health risks for the operator in case of prolonged use of the machine.

[0008] Another drawback is that vibrations increase when the single-brush machine of the prior art is used to perform a treatment on an imperfectly smooth surface, such as a carpet. As a result, the continuous operation time of this machine dramatically drops when the surface to be treated exhibits a high degree of roughness.

Summary of the invention

[0009] Therefore, the technical purpose of the present invention is to provide a single-brush rotary-orbital machine that can obviate the drawbacks of the prior art.

[0010] In particular, an object of the present invention is to provide a single-brush rotary-orbital machine that can afford easy maneuverability while ensuring prolonged use by operators.

[0011] A further object of the present invention is to provide a single-brush rotary-orbital machine that is able to effectively perform a cleaning treatment on various types of surfaces without limiting the continuous operation time of the single-brush machine.

[0012] The aforementioned technical purpose and objects are substantially fulfilled by a single-brush rotary-orbital machine which comprises the technical features as disclosed in one or more of the accompanying claims.

Benefits of the invention

[0013] With the preferred embodiment of the invention, the vibrations produced by the motor upon rotary-orbital actuation of the work tool can be effectively damped.

[0014] With the preferred embodiment of the invention, easy maneuverability and prolonged use of the machine by an operator can be afforded on various types of surfaces.

BIEF DESCRIPTION OF THE DRAWINGS

[0015] Further features and advantages of the present invention will result more clearly from the illustrative, non-limiting description of a preferred, non-exclusive embodiment of a rotary-orbital single-brush as shown in the annexed drawings, in which:

- Figure 1 is a perspective view of a single-brush machine of the invention, having a covering case;
- Figure 2 is a perspective view of the single-brush machine of Figure 1, without covering case;
- Figure 3 is a front view of the single-brush machine of Figure 2;
- Figure 4 is a partially sectional side view of a portion of the single-brush machine of Figure 2;
- Figure 5 is an exploded perspective view of the single-brush machine of Figure 2;
- Figure 6 is an exploded perspective view of a detail of the single-brush machine of Figure 2.

DETAILED DESCRIPTION

[0016] Referring to the accompanying figures, numeral 1 designates a single-brush rotary-orbital machine.

[0017] This machine 1 comprises a frame 2 comprising a rear drag handle 21 for providing control of the machine 1. The drag handle 21 extends between a lower portion 211 and an opposite upper portion 212 in a longitudinal

direction Y-Y. Preferably, the drag handle 21 comprises a pair of knobs 213 located at the upper portion 212 and adapted to be held by an operator for controlling the machine 1.

[0018] The frame 2 also comprises moving means 22 of the machine 1. Preferably these moving means 22 comprise a pair of wheels 221 for resting on the floor, which are mutually opposite with respect to the drag handle of 21. These wheels 221 are placed proximate to the lower portion 211 of the rear drag handle 21.

[0019] In addition, the frame 2 comprises a front portion 23 having a passage opening 231. This front portion 23 projects out of the lower portion 211 of the drag handle 21 in the direction of forward movement of the machine 1. In operation, the direction of forward movement of the machine 1 is parallel to the floor. Preferably, this front portion 23 has a substantially plate-like shape.

[0020] The machine 1 comprises a support base 3 for a work tool 4, for example a brush, for a polishing pad or a floor-treating liquid dispensing nozzle connected to a reservoir, not shown. This base 3 has a bottom surface 31 that faces the floor when the machine 1 is in operation, and an opposite top surface 32. The work tool 4 is supported by the base 3 at the bottom surface 31 of the base 3.

[0021] The base 3 is placed below the front portion 23. Thus, the top surface 32 of the base 3 faces the front portion 23. Therefore, this front portion 23 has a bottom surface 232 that faces the base 3 and, in particular the top surface 32 of the base 3, and an opposite top surface 233.

[0022] The machine 1 further comprises a motor 5 which is adapted to actuate the work tool 4 supported by the base 3, preferably with a rotary-orbital motion. The motor 5 extends through the passage opening 231 of the front portion 23 of the frame 2 and is supported by the base 3. The motor 5 is supported by the base 3 at the top surface 32 of the base 3.

[0023] The front portion 23 of the frame 2 and the base 3 are connected to each other in a direction of connection X-X by elastic damping means 6. The direction of the connection X-X is perpendicular to the front portion 23 and to the base 3.

[0024] The elastic damping means 6 allow the front portion 23 of the frame 2 and the base 3 to move relative to each other in the direction of connection X-X. In operation, the damping means 6 allow the front portion 23 to move toward and away from the base 3 in the direction of connection X-X.

[0025] Advantageously, the elastic damping means 6 allow the front portion 23 and the base 3 to move relative to each other, thereby enhancing maneuverability of the machine 1 by an operator while effectively dampening the vibrations produced by the motor 5 which actuates the working tool 4 with a rotary-orbital motion.

[0026] According to a preferred embodiment of the invention, the front portion 23 of the frame 2 and the base 3 are only connected to each other by the elastic damping

means 6. Advantageously, the front portion 23 of the frame 2 and the base 3 have no additional connection means, such as hinge connecting means, that would transfer the vibrations produced by the motor 5 to the rear drag handle 21 and hence to the operator that controls the machine 1.

[0027] Preferably, the front portion 23 of the frame 2 and the base 3 are connected to each other by at least two elastic damping means 6 mutually opposite with respect to the motor 5. In other words, the front portion 23 of the frame 2 and the base 3 are connected to each other by at least two elastic damping means 6 mutually opposite with respect to the passage opening 231 of the front portion 23. Still preferably, these two elastic damping means 6 are symmetric about a plane of symmetry of the front portion 23 identified by an axis of symmetry Z-Z of the front portion 23. This axis of symmetry Z-Z is perpendicular to the direction of forward movement of the machine 1.

[0028] More preferably, the front portion 23 of the frame 2 and the base 3 are connected to each other by at least four elastic damping means 6 arranged around the motor 5. In other words, the front portion 23 of the frame 2 and the base 3 are connected to each other by at least four elastic damping means 6 arranged around the passage opening 231 of the front portion 23. Even more preferably, these four elastic damping means 6 are arranged in such positions as to define two pairs of elastic damping means 6, which are symmetric to each other about the plane of symmetry of the front portion 23.

[0029] According to the preferred embodiment, each elastic damping means 6 comprises a first 61 and a second 62 spring damping elements.

[0030] The first spring damping element 61 is interposed between the base 3 and the front portion 23 of the frame 2. In other words, the first spring damping element 61 is interposed between the top surface 32 of the base 3 and the bottom surface 232 of the front portion 23.

[0031] On the other hand, the second spring damping element 62 is situated on the side opposite to the first spring damping element 61 with respect to the front portion 23. In other words, the second spring damping element 62 is placed above the top surface 233 of the front portion 23. In yet other words, the second spring damping element 62 projects out of the top surface 233 of the front portion 23 in the direction of connection X-X.

[0032] Advantageously, the presence of the first 61 and the second 62 spring damping elements provides vibration damping both when the front portion 23 moves toward the base 3 and when the front portion 23 moves away from the base 3.

[0033] Preferably, the elastic stiffness of the first spring damping element 61 is smaller than the elastic stiffness of the second spring damping element 62. Therefore, the range of movement of the front portion 23 away from the base 3 is smaller than the range of movement of the front portion 23 toward the base 3. Still preferably, the range of movement of the front portion 23 toward the base 3 is

limited by a limit-stop element 9 that is fixed to the top surface 32 of the base 3. Advantageously, the front portion 23 does not contact the top surface 32 of the base 3 upon mutual movement of the front portion 23 relative to the base 3, which avoids the risk of wear of and damage to the front portion 23 and the base 3. Still advantageously, the limit-stop element 9 allows the range of movement of front portion 23 toward the base 3 to be adjusted as needed for the control of the machine 1.

[0034] According to the preferred embodiment of the invention, each elastic damping means 6 comprises a first abutment member 63 placed at the bottom surface 232 of the front portion 23 of the frame 2. This first abutment member 63 has a substantially plate-like shape. The first spring damping element 61 is configured to have a compression/extension operation between the base 3 and the first abutment member 63. In other words, the first spring damping element 61 extends between a lower end 611 and an opposite upper end 612 in the direction of connection X-X. During both compression and extension of the first spring damping element 61, the lower end 611 of the first spring damping element 61 abuts the base 3, whereas the upper end 612 of the first spring damping element 61 abuts the first abutment member 63.

[0035] Still according to the preferred embodiment of the invention, each elastic damping means 6 comprises a second abutment member 64 placed at the top surface 233 of the front portion 23 of the frame 2, and a third abutment member 65 placed above the top surface 233 of the front portion 23. Both the second 64 and the third 65 abutment members have a substantially plate-like shape. The second spring damping element 62 is configured to have an extension and compression operation between the second 64 and the third 65 abutment members. In other words, the second spring damping element 62 extends between a lower end 621 and an opposite top end 622 in the direction of connection X-X. During both compression and extension of the second spring damping element 62, the lower end 621 of the second spring damping element 62 abuts the second abutment member 64, whereas the upper end 622 of the second spring damping element 62 abuts the third abutment member 65.

[0036] As the front portion 23 moves toward the base 3, the first spring damping element 61 is compressed due to the thrust exerted by the front portion 23, while the second spring damping element 62 is being extended. Conversely, when the front portion 23 moves away from the base 3, the second spring damping element 62 is compressed due to the thrust exerted by the front portion 23, while the first spring damping element 61 is being extended.

[0037] According to a first embodiment, the third abutment member 65 is fixed above the top surface 233 of the front portion 23 of the frame 2 by means of a screw 7 and nut 8 assembly. According to this first embodiment, each abutment member 63, 64 and 65 comprises a respective hole 631, 641, 651.

[0038] The screw 7 is coupled to the base 3 and extends through the first 61 and the second 62 spring damping elements and through a corresponding hole 234 in the front portion 23 of the frame 2. In addition, this screw extends through each hole 631, 641, 651 of each of the abutment members 63, 64 and 65.

[0039] By tightening the nut 8 on the screw 7, the third abutment member 65 is fixed above the top surface 233 of the front portion 23, also as a result of the thrust exerted by the front portion 23 as the latter moves away from the base 3.

[0040] According to a second embodiment of the machine 1, which may be implemented in combination with the first embodiment, each elastic damping means 6 comprises a sleeve 66 locked in a respective hole 234 in the front portion 23 of the frame 2 by means of a lock element 67. This sleeve 66 extends through the first 61 and the second 62 spring damping elements. Advantageously, this sleeve 66 can hold the first 61 and the second 62 spring damping elements in position upon movement of the front portion 23 relative to the base 3. That is, the sleeve 66 prevents any excessive deviation of the first 61 and the second 62 spring damping elements along directions transverse to the direction of connection X-X, upon movement of the front portion 23 relative to the base 3.

[0041] Preferably, the lock element 67 comprises a through channel 671 that extends between a lower flange 672 and an opposite upper flange 673 in the direction of connection X-X. Such lock element 67 fits in a corresponding hole 234 of the front portion 23 of the frame 2 such that the lower flange 672 will abut the bottom surface 232 of the front portion 23 whereas the upper flange 673 abuts the top surface 233 of the front portion 23. In other words, the lock element 67 fits in a corresponding hole 234 in the front portion 23, thereby holding the edge of such hole 234 of the front portion 23 between the lower flange 672 and the upper flange 673.

[0042] The sleeve 66 is locked in the through channel 671 of the lock element 67.

[0043] In this second embodiment, the first abutment member 63 is placed at the lower flange 672 of the lock element 67, whereas the second abutment element 64 is placed at the upper flange 673 of the lock element 67.

[0044] In this second embodiment, if the third abutment member 65 is fixed above the top surface 233 of the front portion 23 by means of the screw 7 and the nut 8, the screw 7 is introduced into the sleeve 66 so that a terminal end 71 of the screw 7 will come out of the sleeve 66 above the top surface 233 of the front portion 23. Then, the third abutment member 65 is fixed by means of the nut 8 at the terminal end 71 of the screw 7. In other words, the third abutment member 65 is interposed between the sleeve 66 and the nut 8.

[0045] According to the preferred embodiment, the machine 1 further comprises a covering case 10. This covering case 10 may be removably placed on top of to the front portion 23 of the frame 2 and of the base 3 to

protect them during operation of the machine 1.

Claims

1. A single-brush rotary-orbital machine (1) comprising:

- a frame (2) comprising a rear drag handle (21) for providing control of the machine (1) and moving means (22) of the machine (1), said frame (2) comprising a front portion (23) having a passage opening (231);
- a base (3) for supporting a work tool (4), the base (3) being situated below said front portion (23);
- a motor (5) configured to actuate the work tool (4) supported by the base (3), said motor (5) extending through the passage opening (231) of the front portion (23) of the frame (2) and being supported by the base (3);

characterized in that the front portion (23) of the frame (2) and the base (3) are connected to each other in a direction of connection (X-X) by elastic damping means (6), said elastic damping means (6) allowing the front portion (23) of the frame (2) and the base (3) to move relative to each other in the direction of connection (X-X).

2. A machine (1) as claimed in claim 1, wherein each elastic damping means (6) comprises a first (61) and a second (62) spring damping elements, the first spring damping element (61) being interposed between the base (3) and the front portion (23) of the frame (2), the second spring damping element (62) being placed on the side opposite to the first spring damping element (61) with respect to the front portion (23).

3. A machine as claimed in claim 2, wherein each elastic damping means (6) comprises:

- a first abutment member (63) placed at a bottom surface (232) of the front portion (23) of the frame (2), said bottom surface (232) facing the base (3);
- a second abutment member (64) placed at a top surface (233) of the front portion (23) of the frame (2) opposite to the bottom surface (232);
- a third abutment member (65) placed above the top surface (233) of the front portion (23); and wherein the first spring damping element (61) is configured to have a compression/extension operation between the base (3) and the first abutment member (63), whereas the second spring damping element (62) is configured to have an extension/compression operation between the second (64) and the third (65) abut-

ment members.

4. A machine (1) as claimed in claim 3, wherein the third abutment member (65) is fixed above the top surface (233) of the front portion (23) of the frame (2) via a screw (7) and nut (8) assembly, said screw (7) being coupled to the base (3) and extending through the first (61) and the second (62) spring damping elements and through a corresponding hole (234) of the front portion (23) of the frame (2).

5. A machine (1) as claimed in any of claims 3 to 4, wherein each elastic damping means (6) comprises a sleeve (66), which is locked within a respective hole (234) of the front portion (23) of the frame (2) by means of a lock element (67), said sleeve (66) extending within the first (61) and second (62) spring damping elements.

6. A machine (1) as claimed in claim 5, wherein the lock element (67) comprises a through channel (671) that extends between a lower flange (672) and an opposite upper flange (673) in the direction of connection (X-X), said lock element (67) fitting in a corresponding hole (234) of the front portion (23) of the frame (2) with the lower flange (672) abutting the bottom surface (232) of the front portion (23) and the upper flange (673) abutting the top surface (233) of the front portion (23), the sleeve (66) being thus locked within the through channel (671).

7. A machine (1) as claimed in any of the preceding claims, wherein the front portion (23) of the frame (2) and the base (3) are only connected by the elastic damping means (6).

8. A machine (1) as claimed in any of the preceding claims, wherein the front portion (23) of the frame (2) and the base (3) are connected to each other by at least two elastic damping means (6) mutually opposite with respect to the motor (5).

9. A machine (1) as claimed in any of the preceding claims, wherein the front portion (23) of the frame (2) and the base (3) are connected to each other by at least four elastic damping means (6) arranged around the motor (5).

10. Machine (1) as claimed in any of claims 2 to 9, wherein the elastic stiffness of the first spring damping element (61) is smaller than the elastic stiffness of the second spring damping element (62).

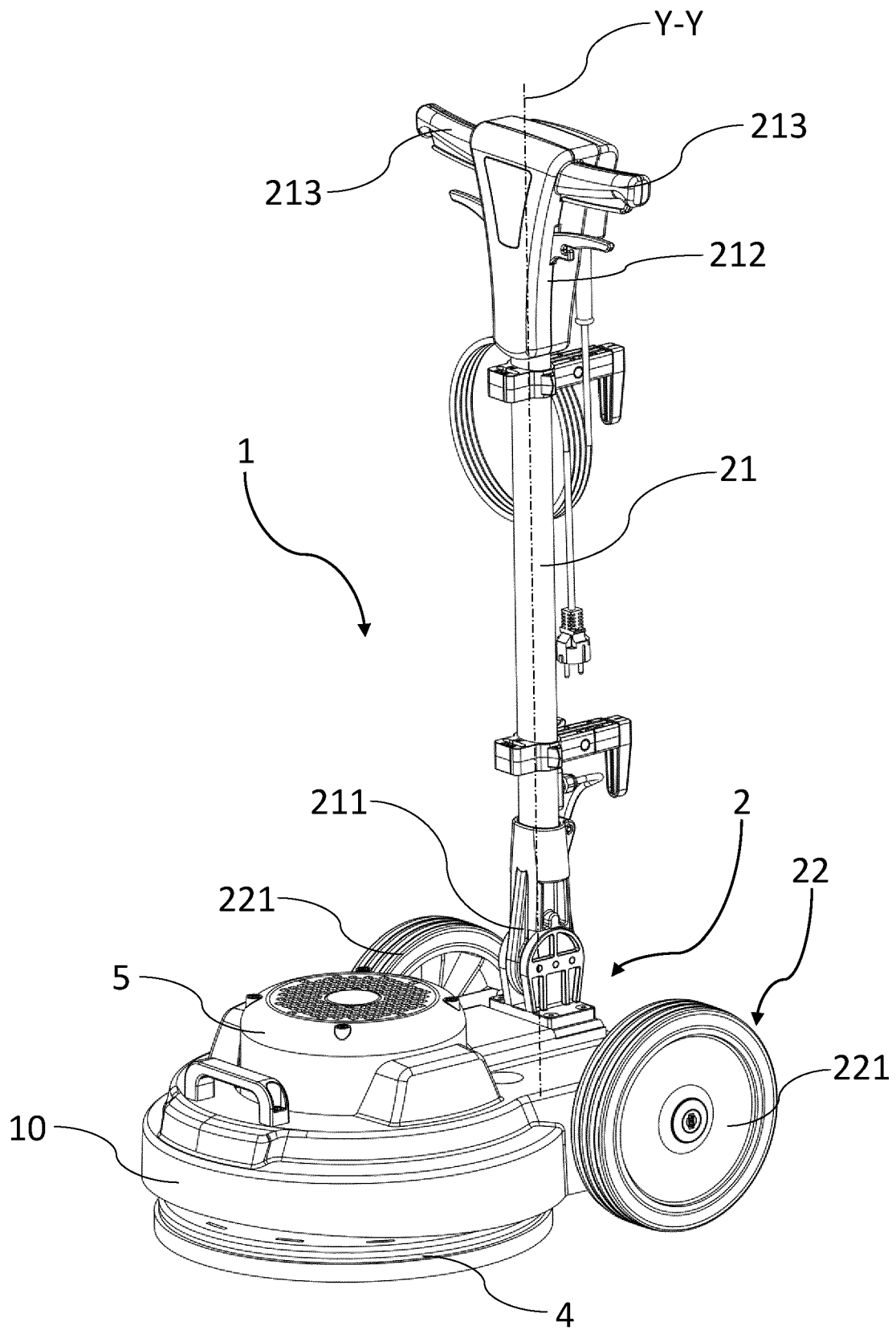


FIG.1

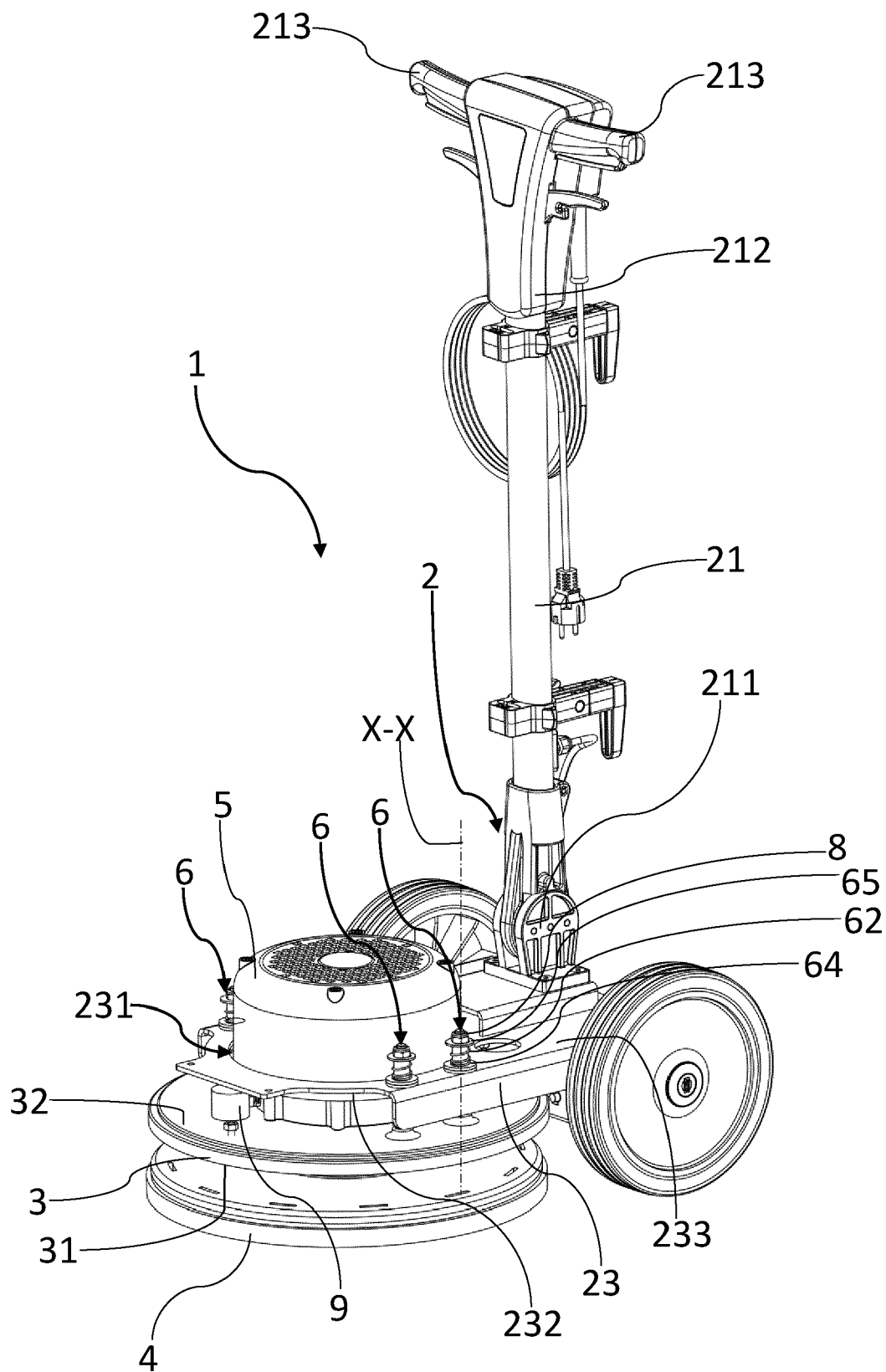


FIG.2

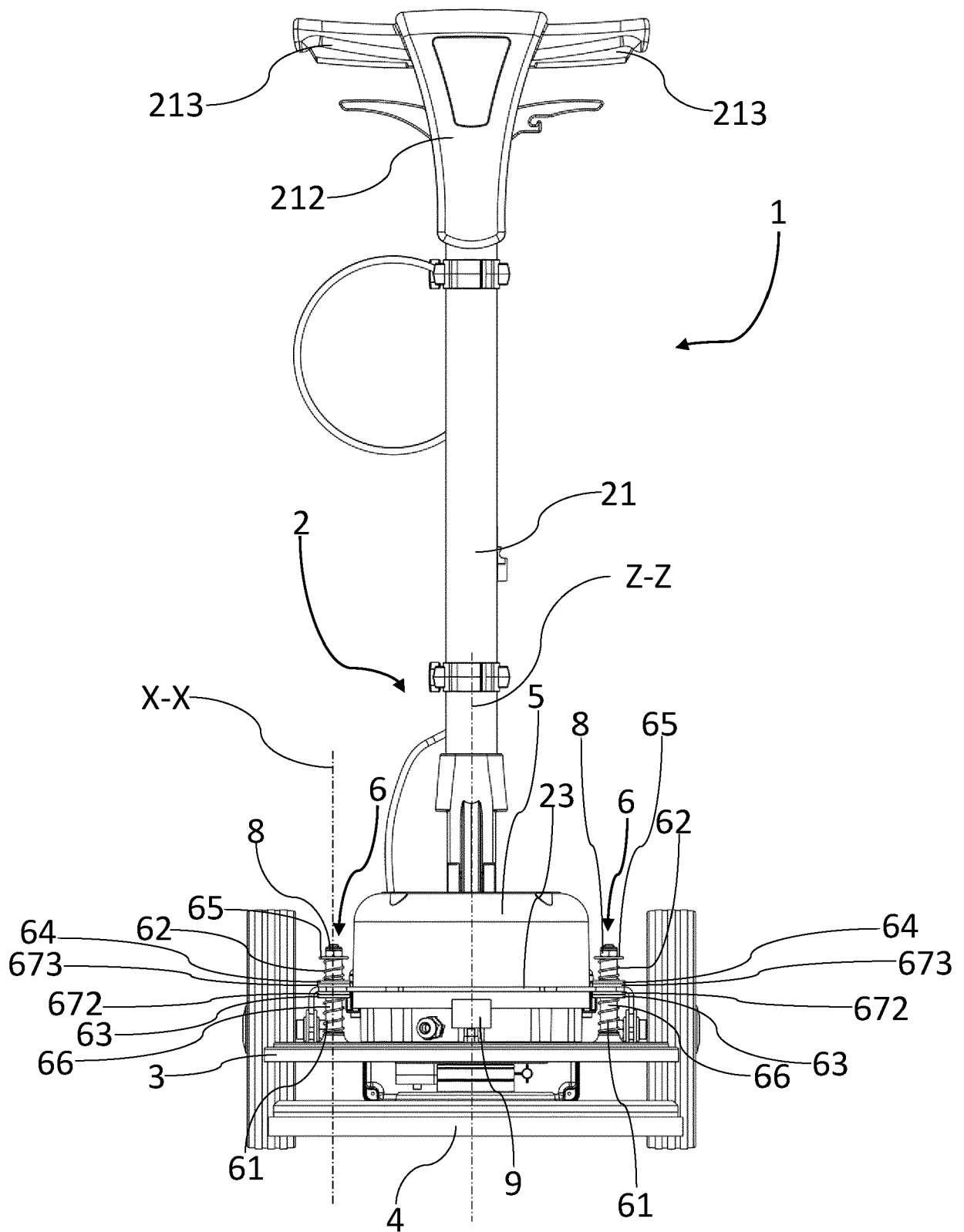


FIG.3

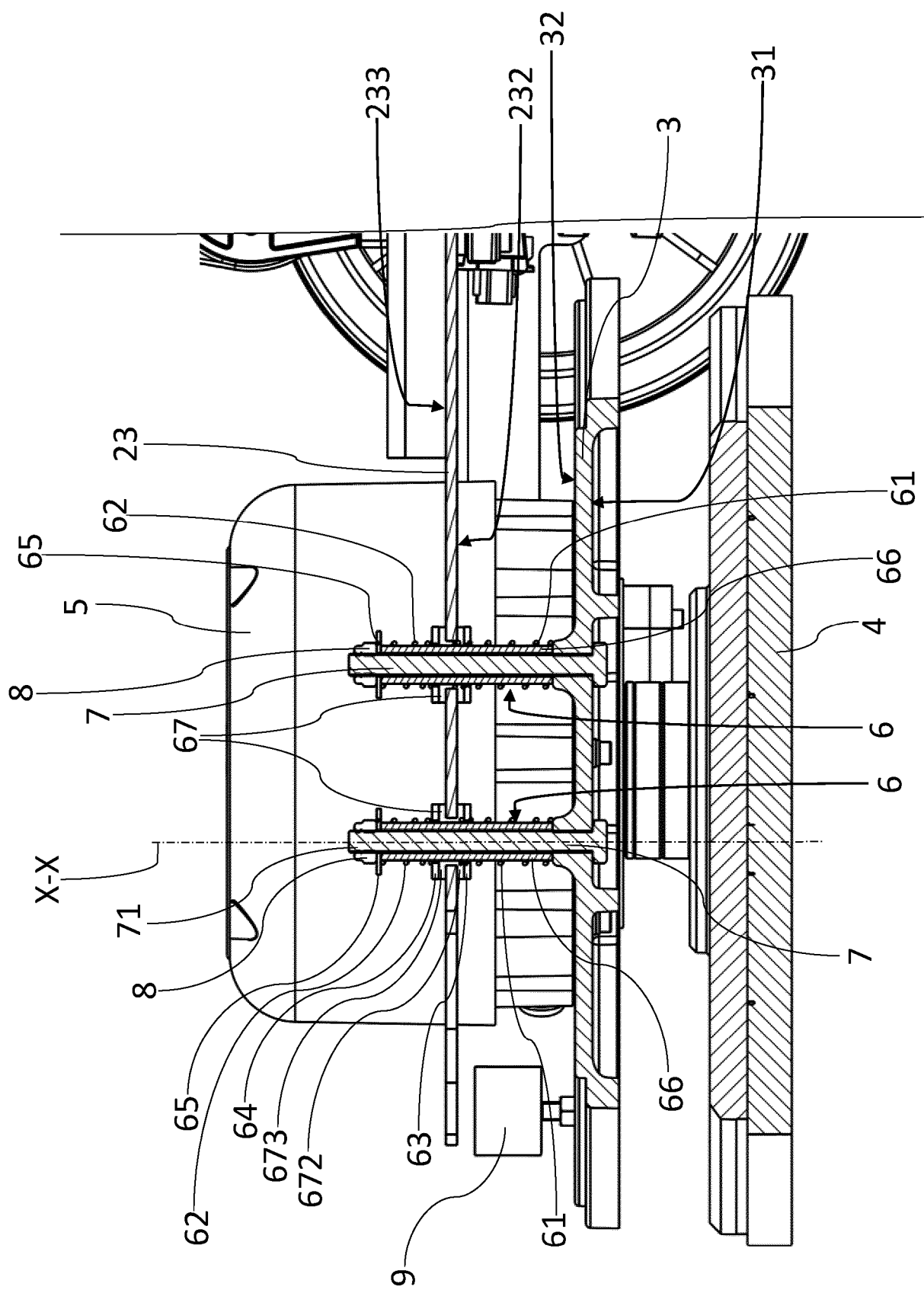


FIG.4

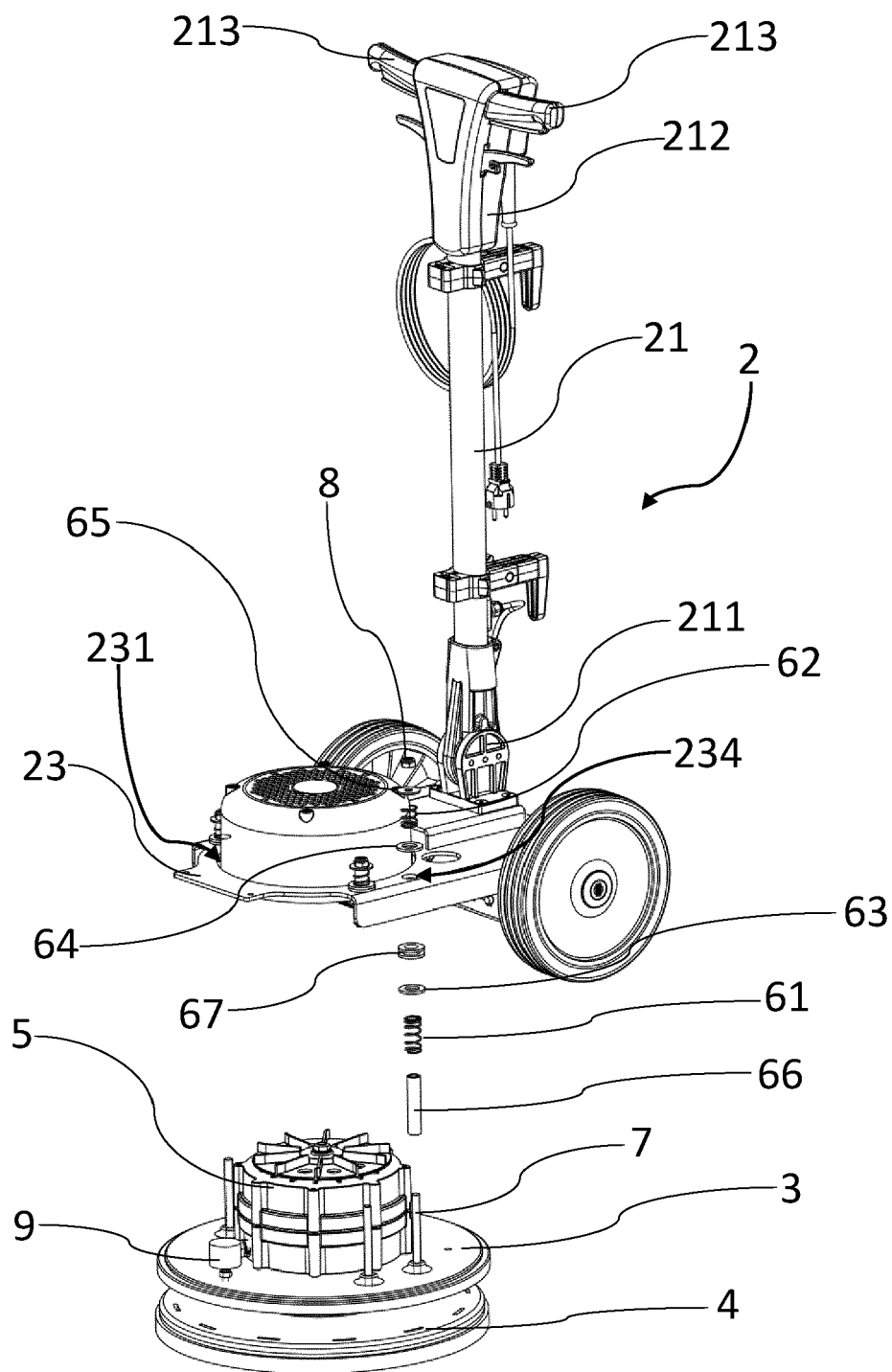


FIG.5

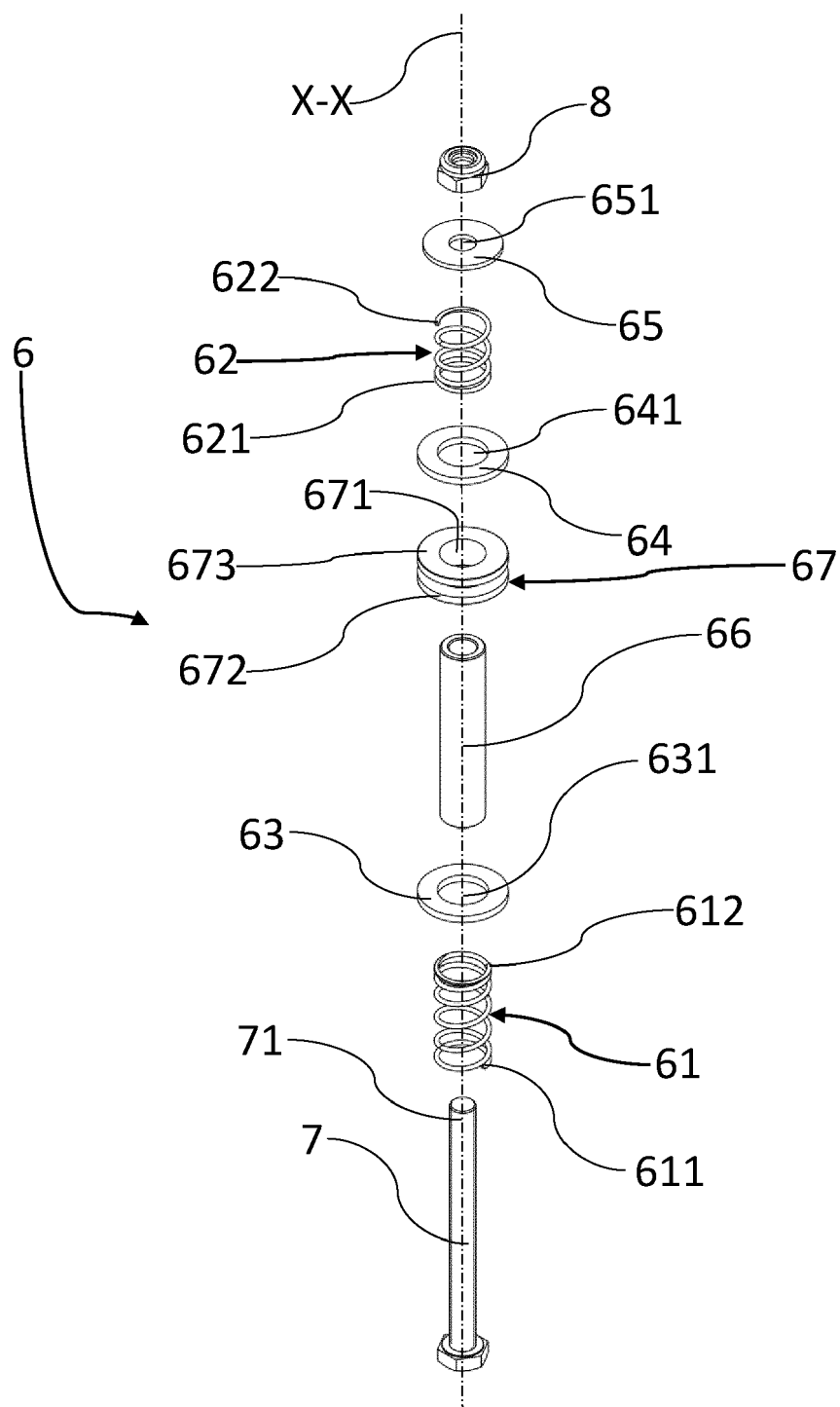


FIG.6



EUROPEAN SEARCH REPORT

 Application Number
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