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(54) Title: TILTABLE VACCUM CLEANER NOZZLE WITH ELASTIC STOP ELEMENT

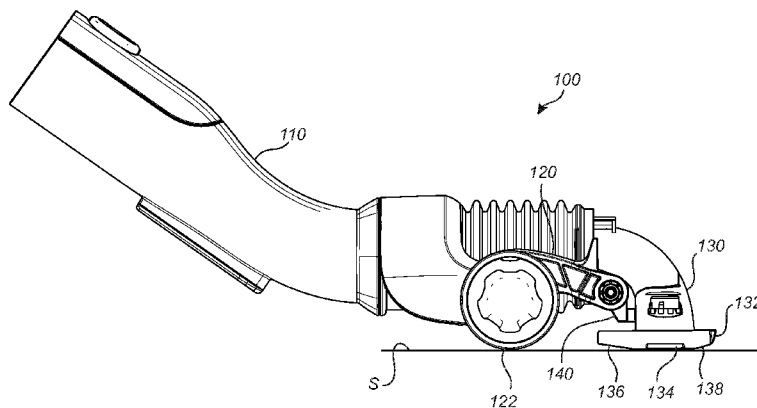


Fig. 1

(57) Abstract: A passive nozzle (200) for a vacuum cleaner is disclosed. The nozzle comprises an outlet part (110, 210) adapted to be coupled to a hose of the vacuum cleaner, an intermediate part (120, 220) and an inlet part (130, 230) which is hingedly connected to the intermediate part such that a tilting motion of the inlet part is allowed relative to the intermediate part within a tilt range. The nozzle further comprises a stop element (140, 240) arranged to limit the tilting motion of the inlet part, wherein the stop element comprises an elastic portion such that an end position of the tilting range is adjustable based on a force exerted on the stop element by said inlet part.

TILTABLE VACCUM CLEANER NOZZLE WITH ELASTIC STOP ELEMENTField of the invention

The present invention relates to the field of passive nozzles for vacuum cleaners. In particular, the present invention relates to nozzles that can be
5 tilted.

Background of the invention

A vacuum cleaner is a device that uses a suction force generated by a fan or motor unit to create a particular vacuum or underpressure to suck up objects like dust, particles, fibres, hair etc. from surface such as e.g. floorings and
10 carpets. Typically, this is done by means of a vacuum cleaner nozzle that is connected via a nozzle outlet to an extension tube and/or suction hose to a dust compartment, in which dust can be separated from a dust laden air stream.

The underpressure at the nozzle may e.g. be determined by the size of the air
15 flow entering the nozzle, and the suction power generated by the motor unit. An increased suction power may lead to improved dust pick up capability, but also to increased energy consumption of the motor unit and an increased motion resistance of the nozzle as it is moved across the surface being vacuumed.

20 The issue of increased motion resistance has been addressed in WO 02/26097 A1, in which a vacuum cleaner nozzle is disclosed which is pivotally mounted with respect to a nozzle outlet. As the nozzle is moved in a forward or backward direction, one of two working edges of the vacuum cleaner nozzle is slightly raised from the surface to allow air to bleed into the
25 nozzle, thereby reducing the motion resistance of the nozzle.

Although different vacuum cleaner nozzles and vacuum cleaning techniques are known, there is still a need for improved vacuum cleaner nozzles that are more user friendly and easier to use at different suction powers.

Summary of the invention

To better address one or more the above mentioned concerns, a passive vacuum cleaner nozzle having the features defined in the independent claim is provided. Preferable embodiments are defined in the dependent claims.

5 Hence, according to a first aspect, a passive nozzle for a vacuum cleaner is provided. The nozzle comprises an outlet part adapted to be coupled to a hose of the vacuum cleaner, an intermediate part hingedly connected to the outlet part, and an inlet part comprising a suction opening. The inlet part is hingedly connected to the intermediate part so as to allow for the inlet part to
10 tilt relative to the intermediate part within a tilt range. The nozzle further comprises a stop element arranged to limit the tilting motion of the inlet part, wherein the stop element comprises an elastic portion such that an end position of the tilting range is adjustable based on a force exerted on the stop element by said inlet part.

15 According to a second aspect, a vacuum cleaner is provided, comprising a nozzle according to the first aspect.

During operation of the nozzle, i.e. during vacuuming of a surface of e.g. a flooring or a carpet, the nozzle may be pushed and pulled across the surface in a reciprocating movement in which an underside of e.g. a suction plate of
20 the nozzle, i.e. a side or portion at which the suction opening of the nozzle may be located, may be arranged substantially horizontal or parallel to the surface. Hence, the tilting motion of the inlet part may be realized as a relative change in angle between the underside of the inlet part and the surface being vacuumed. The tilting motion may be caused by the motion resistance, i.e.
25 frictional forces, between the nozzle and the surface as the nozzle is moved across the surface. The frictional forces may exert a torque on the hinged connection between the inlet part and the intermediate, thereby causing a rotation of tilting motion of the inlet part relative to the intermediate part.
During a forward stroke of the nozzle, the inlet part may as a result tilt such
30 that a rear portion of its underside is slightly raised from, or at least exerts a reduced pressure on, the surface being vacuumed. Consequently, air may be

allowed to flow through a gap between the rear portion of the underside of the inlet part and the surface. The increased air flow may reduce the underpressure at the nozzle and hence the motion resistance during the forward stroke.

- 5 The same reasoning may be applied for a backward stroke, during which the inlet part may tilt such that a front portion of its underside is slightly raised from the surface being vacuumed to allow an increased air flow through a gap formed between the front portion of the inlet part and the surface and, as a consequence, reduce the motion resistance during the backward stroke.
- 10 The stop element may be arranged to limit the tilting motion of the inlet part by defining an end position of the tilting range in which further motion or tilting of the inlet part relative to the intermediate part is suppressed or restrained by a force exerted on the stop element by the inlet part. Hence, the end position of the tilting range may define a maximum tilt angle or gap between the inlet
15 part and the surface being vacuumed.

By using an elastic portion that allows the end position of the tilting range to be adjusted, in particular based on the force exerted on the stop element by the inlet part, the maximum tilt angle and hence the gap between the inlet part and the surface may be adjusted based on the motion resistance or friction
20 forces between the nozzle and the surface.

In one example, the power of the motor unit may be increased to generate an increased air flow and suction power. This may result in an increased underpressure and motion resistance of the nozzle. This may, in the end position of the tilting range, cause the elastic portion of the stop element to
25 deform or be compressed such that the air flow into the nozzle may be increased and the increase in motion resistance hence be counteracted or mitigated.

In another example, the power of the motor unit may be reduced to generate a reduced air flow and suction power. Consequently, the motion resistance of
30 the nozzle may be reduced such that the force exerted by the inlet part on the stop element in the end position of the tilt range may be reduced. Reducing

the force on the stop element may lead to less deformation or compression of the elastic portion in the end position and hence to a reduced maximum tilt angle. Thus, the reduced motion resistance due to the lower motor power may be at least partly compensated by a reduced air flow into the nozzle.

- 5 By adjusting the maximum tilt angle based on the motion resistance of the nozzle and/or the suction power generated by the motor unit, a balance may be achieved between motion resistance and applied suction power. In other words, the use increase in motion resistance caused by an increased suction power may be at least partly counteracted or alleviated by an increased
10 maximum tilting angle.

The term "stop element" may refer to any element or structure capable of limiting or suppressing the tilting motion of the inlet part within a tilt range, such as e.g. an angular interval relative to the intermediate part or the surface being cleaned. The stop element may e.g. be formed of an end-stop or a
15 block that may be arranged to define a maximum tilt angle by mechanically or physically obstruct or prevent further motion of the inlet part relative to the intermediate part. The stop element may e.g. be adapted limit or stop the tilting motion as the inlet part is in or close to the end position of the tilting range, by exerting a counteracting force on at least a portion of the inlet part
20 or vice versa. The counteracting force may e.g. be realised by the tilt adjusting element abutting or engaging with the inlet part and/or intermediate part at least at the end position of the tilting motion range.

The elastic portion of the stop element may, in the context of the present application, refer to a portion being able to resume a normal or nominal shape
25 after being deformed or reshaped, such as e.g. compressed, squeezed or bent relative a nominal shape. The term shape may refer to at least an extension between a portion of the inlet part and a portion of intermediate part, or between any other structures or parts mechanically coupled to the intermediate part and the inlet part, respectively. A nominal shape could refer
30 to an initial, normal or original shape. The force exerted by the elastic portion

on the inlet part, may increase with an increasing compression of the elastic portion.

The stop element may be arranged at, or attached to the inlet part, the intermediate part or both parts, or arranged as a separate part that can be
5 introduced between a portion of the inlet part and the intermediate part.

According to an embodiment, the stop element may be arranged to limit the tilting motion of the inlet part when the nozzle is moved in a forward stroke. During a forward stroke of the nozzle, the inlet part may tilt such that a rear portion of its underside may be slightly raised from, or at least exert a reduced
10 pressure on, the surface being vacuumed. Consequently, air may be allowed to flow through a gap between the rear portion of the underside of the inlet part and the surface so as to reduce the underpressure at the nozzle and hence the motion resistance during the forward stroke. Thus, the present embodiment allows for the maximum tilt angle relative to the surface during
15 the forward stroke, and hence the maximum gap between the rear portion of the underside of the inlet part and the surface, to be adjusted based on the motion resistance.

According to an embodiment, the stop element may be arranged to limit the tilting motion by engaging with a rear portion of the inlet part and/or a portion
20 of the intermediate part. Further, the stop element may be arranged to engage with the portion of the inlet part and/or the portion of the intermediate part as a tilt angle of the inlet part relative to a surface to be cleaned exceeds 0° or more.

By e.g. arranging the stop element between or at the intermediate part and
25 the rear portion of the inlet part, the maximum tilting between those parts during a forward stroke may hence be adjusted or varied as the elastic portion of the stop element is deformed by the force on it during the stroke.

Reducing or counterbalancing an increase in motion resistance in the forward stroke may increase the user friendliness of the nozzle, since the user of the
30 nozzle typically experience a higher motion resistance when pushing the nozzle forward as compared to pulling it backwards. The applied pushing

force may comprise a force component directed downwards, thereby contributing to the motion resistance, whereas the applied pulling force may comprise a force component directed upwards, thereby reducing the motion resistance.

- 5 According to an embodiment, the stop element is arranged to allow a maximum tilt angle of the inlet part relative to a surface to be cleaned of 10° or less.

According to some embodiments, the elastic portion of the stop element may comprise or be formed of a spring member or an elastic material such as a
10 polymer or natural rubber.

According to some embodiments, the stop element or the elastic portion of the stop element may be attached to, or formed of, a portion of the intermediate part or a portion of the inlet part. In one example, the elastic
15 portion may comprise two parts arranged at the inlet part and the intermediate part, respectively.

According to an embodiment, the intermediate part may comprise a support portion arranged to support the intermediate part on a surface to be cleaned. The support portion may e.g. comprise at least one wheel or roller, which reduces the risk of the intermediate part or support portion scratching the
20 surface being vacuumed. Alternatively, or additionally, the support portion may comprise at least one sliding surface adapted to slide on the surface.

It is noted that embodiments of the invention relates to all possible combinations of features recited in the claims.

25 Brief description of the drawings

These and other aspects will now be described in more detail in the following illustrative and non-limiting detailed description of embodiments, with reference to the appended drawings.

Figure 1 is a side view of a nozzle according to an embodiment.

Figures 2a and b are side views showing different tilt positions of a nozzle according an embodiment.

Figure 3 is a side view of a portion of a nozzle according to another embodiment.

- 5 All the figures are schematic, not necessarily to scale, and generally only show parts which are necessary in order to elucidate the embodiments, wherein other parts may be omitted. Like reference numerals refer to like elements throughout the description.

10 Detailed description of embodiments

Figure 1 is a side view of a passive nozzle for a vacuum cleaner according to an embodiment. The nozzle 100 comprises an inlet part 130, an intermediate part 120 and an outlet part 110 which may be adapted to be coupled to an extension tube or suction hose of the vacuum cleaner (not shown). The outlet
15 part 110 and the inlet part 130 may be hingedly or pivotally coupled to the intermediate part 120 so as to allow a rotational of tilting motion around a respective connection. The intermediate part 120 may comprise a support portion 122, such as e.g. at least one wheel or roller 122, arranged to support the nozzle on the surface S being vacuumed during operation of the vacuum
20 cleaner. Further, the nozzle 100 may comprise a stop element 140 for limiting a tilting motion of the inlet part 130 relative to the intermediate part 120. The stop element will be described in more detail with reference to figures 2a and b.

The inlet part 130 may comprise a suction plate 132, having an underside at
25 which a suction opening 134 may be arranged. During operation, underpressure may be created at the underside of the inlet part 130, thereby allowing an air flow between the surface being vacuumed and the underside of the nozzle 100. The air flow may enter the nozzle 100 and the suction hose via the suction opening 134.

The hinged connection between the inlet part 130 and the intermediate part 120 allows for rotational or tilting movement of the inlet part 130 relative to the intermediate part 120. As a result, a rear portion or rear working edge 136 of the underside of the inlet part 130 may be slightly raised from the surface during a forward stroke of the nozzle. Similarly, a front portion or front working edge 138 of the nozzle 100 may be slightly raised from the surface during a backward stroke of the nozzle 100. The hinged connection between the inlet part 130 and the intermediate part 120 hence allows for a tilting motion of the inlet part relative to the surface being vacuumed, such that a gap may be formed or varied between at least a portion of the underside of the inlet part 130 and the surface. The size of the gap, which may be determined by a tilting angle or the inlet part 130, may affect the size of the air flow entering the suction opening 134 of the nozzle 100, the underpressure at the nozzle and a motion resistance during e.g. a forward or a backward stroke of the nozzle across the surface.

Figures 2a and b show in more detail a nozzle in two different tilting positions relative to the intermediate part and to the surface being cleaned. The nozzle 200 comprises an outlet part 210, and intermediate part 220 and an inlet part 230, and may be similarly configured as the nozzle described with reference to figure 1.

As shown in figures 2a and b, the stop element 240 may be arranged to limit the tilting motion of the inlet part 230, or, in other words, a relative motion between the inlet part 230 and the intermediate part 220. According to the present embodiment, the stop element 240 may be attached to, or formed of, a portion 231 of the inlet part 230 and comprise an elastic part or portion 240 arranged to define an end position of a tilting range, in which end position the elastic portion 240 may abut or engage with e.g. a portion 221 of the intermediate part 220. As the elastic portion 240 abuts or engages with the portion 221 of the intermediate part 220, it may exert a force on the intermediate part 220 so as to counteract or suppress further tilting motion of the inlet part 230 towards the intermediate part 220. Hence, the stop element

240 may define a maximum tilt angle α or gap between the inlet part 230 and the surface S.

It will however be appreciated that the stop element may be attached to, or formed of, a portion of the intermediate part 220, such as e.g. the portion 221,
5 and/or comprise two parts arranged at the inlet part 230 and the intermediate part 220, respectively.

In figure 2a, the underside of the inlet part 230 is arranged substantially horizontally or parallel to the surface S to be vacuumed. The tilting angle between the inlet part 230 and the surface S may hence be approximately 0° .

10 As the nozzle 200 is being moved in a forward direction, the motion resistance between the inlet part 230 and the surface S may cause the inlet part 230 to rotate or tilt such that a rear portion 236 of the underside of the inlet part 230 or suction plate 232 is slightly raised from the surface S. As a result, the stop element or elastic portion 240 may be moved or pressed
15 towards the portion 221 of the intermediate part 220, and hence exert a compressing contact force on the elastic portion 240 during the tilting motion.

Figure 2b illustrates an end position of the tilting range in which the elastic portion 240 is in a compressed state as compared to the state in figure 2a. The degree of compression may be determined by the force exerted on the
20 elastic portion 240 by the portion 221 of the intermediate part 220, wherein an increased force may result in a more compressed state of the elastic portion 240. Accordingly, the end position of the tilting range may be moved by compressing the elastic portion 240. Such a move of the end position may result in an increased tilting range and an increased maximum tilt angle α or
25 gap between the rear portion 236 of the underside of the inlet part 230 and the surface S. In figure 2b, a gap is shown that is larger than the gap in figure 2a.

Figure 2a illustrates a case wherein the motion resistance of the nozzle 200 is relatively low as compared to the motion resistance of the nozzle 200 in figure
30 2b. As the motion resistance increases, the end position of the tilting range

may shift such that the gap between the nozzle 200 and the surface S is increased and the increase in motion resistance is reduced or mitigated.

Figure 3 shows a portion of a nozzle which may be similarly configured as the nozzles described with reference to any one of the previous figures. The nozzle comprises an inlet part 230 which is hingedly connected to an intermediate part 320, and a stop element 340 comprising an elastic portion formed as a coil spring 342. The coil spring 342 may be arranged in a tilting space or gap between a portion 321 of the intermediate part 320 and a rear portion 331 of the inlet part 330, and may be arranged such that an end position of the tilting range of the inlet part 330 may be adjustable based on a force exerted on the coil spring 342 by the inlet part 330 and the intermediate part 320.

In summary, nozzle is disclosed which comprises an outlet part, an intermediate part and an inlet part, wherein the inlet part is hingedly connected to the intermediate part to allow a tilting motion between the inlet part and the intermediate part. Further, a stop element is disclosed, which comprises an elastic portion arranged to adjust an end position of a tilting range of the inlet part, such that e.g. a larger tilting angle to the surface being vacuumed may be achieved with an increasing motion resistance of the nozzle.

The person skilled in the art realizes that the present invention by no means is limited to the embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims.

Additionally, variations to the disclosed embodiments can be understood and effected by the skilled person in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS

1. A passive nozzle (200) for a vacuum cleaner, the nozzle comprising:
5 an outlet part (110, 210) adapted to be coupled to a hose of the vacuum cleaner;
 an intermediate part (120, 220) hingedly connected to the outlet part;
 an inlet part (130, 230) comprising a suction opening (134, 234)
10 and being hingedly connected to the intermediate part such that a tilting motion of the inlet part is allowed relative to the intermediate part within a tilt range; and
 a stop element (140, 240) arranged to limit the tilting motion of the inlet part;
15 wherein the stop element comprises an elastic portion such that an end position of the tilting range is adjustable based on a force exerted on the stop element by said inlet part.
2. The nozzle as defined in claim 1, wherein the stop element is arranged
20 to limit the tilting motion of the inlet part when the nozzle is moved in a front stroke.
3. The nozzle as defined in claim 1 or 2, wherein the stop element is
25 arranged to engage with a portion (231) of the inlet part and/or a portion of the intermediate part as a tilt angle (α) of the inlet part relative to a surface (S) to be cleaned exceeds 0° or more.
4. The nozzle as defined in any one of the preceding claims, wherein the
30 stop element is arranged to allow a maximum tilt angle of the inlet part relative to a surface to be cleaned of 10° or less.

5. The nozzle as defined in any one of the preceding claims, wherein the elastic portion comprises a spring member (342) arranged to be compressed by said force.
- 5 6. The nozzle as defined in any one of claims 1 to 4, wherein the elastic portion comprises an elastic material, such as a polymeric material or natural rubber.
- 10 7. The nozzle as defined in any one of the preceding claims, wherein said stop element is arranged to limit the tilting motion by engaging with a portion of the inlet part.
- 15 8. The nozzle as defined in any one of the preceding claims, wherein the elastic portion of the stop element is attached to the inlet part and/or the intermediate part.
- 20 9. The nozzle as defined in any one of claims 1 to 6, wherein the elastic portion of the stop element is attached to a portion of the inlet part.
- 25 10. The nozzle as defined in any one of claims 1 to 6, wherein the elastic portion of the stop element is attached to a portion (221) of the intermediate part.
- 30 11. The nozzle as defined in any one of claims 1 to 6, wherein the elastic portion comprises a first part attached to a portion of the intermediate part and a second part attached to a portion of the inlet part.
- 30 12. The nozzle as defined in any one of the preceding claims, wherein the intermediate part comprises a support portion (122, 222) arranged to support the intermediate part on a surface to be cleaned.

13. A vacuum cleaner comprising a nozzle as defined in any one of the preceding claims.

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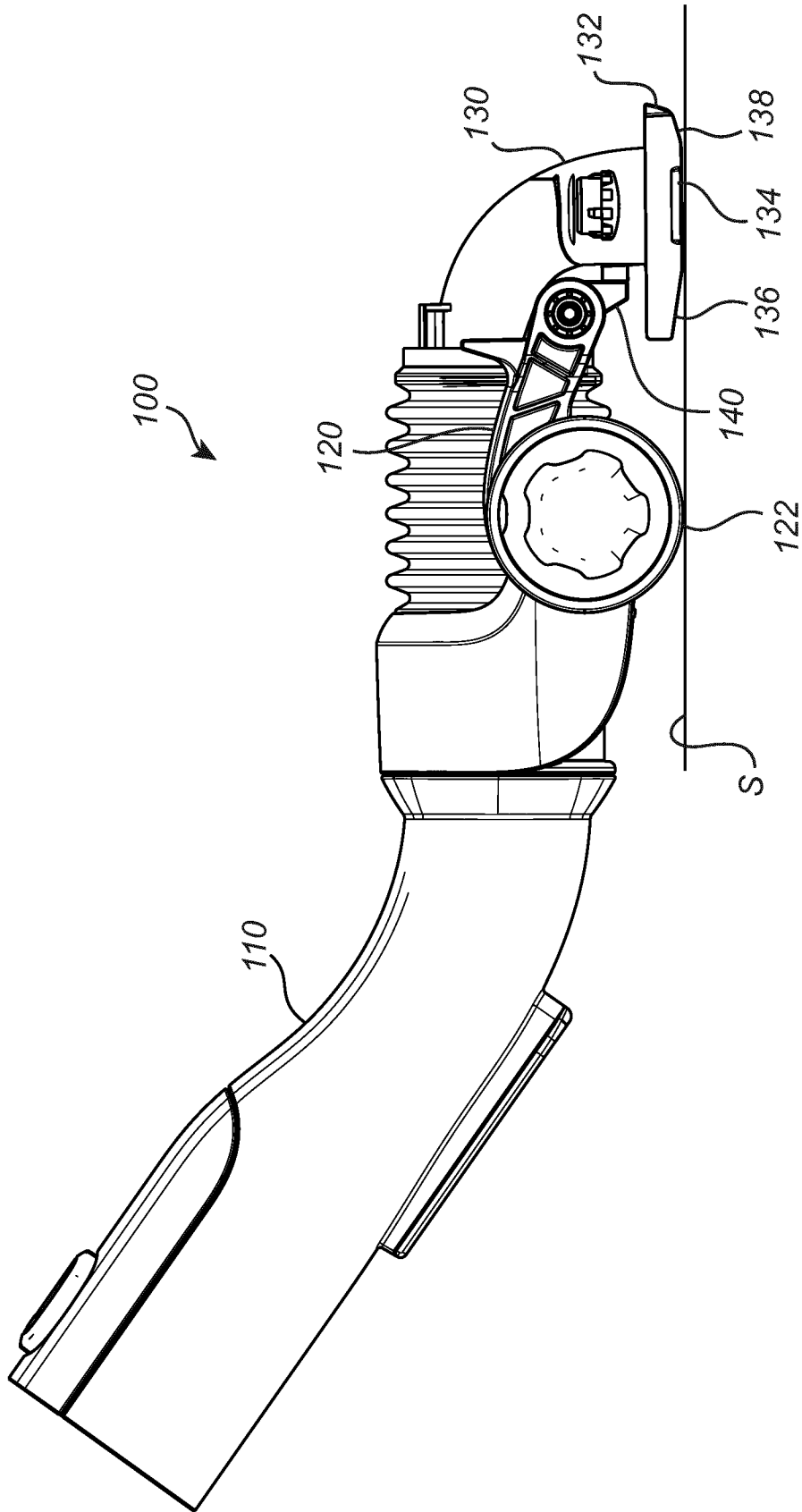
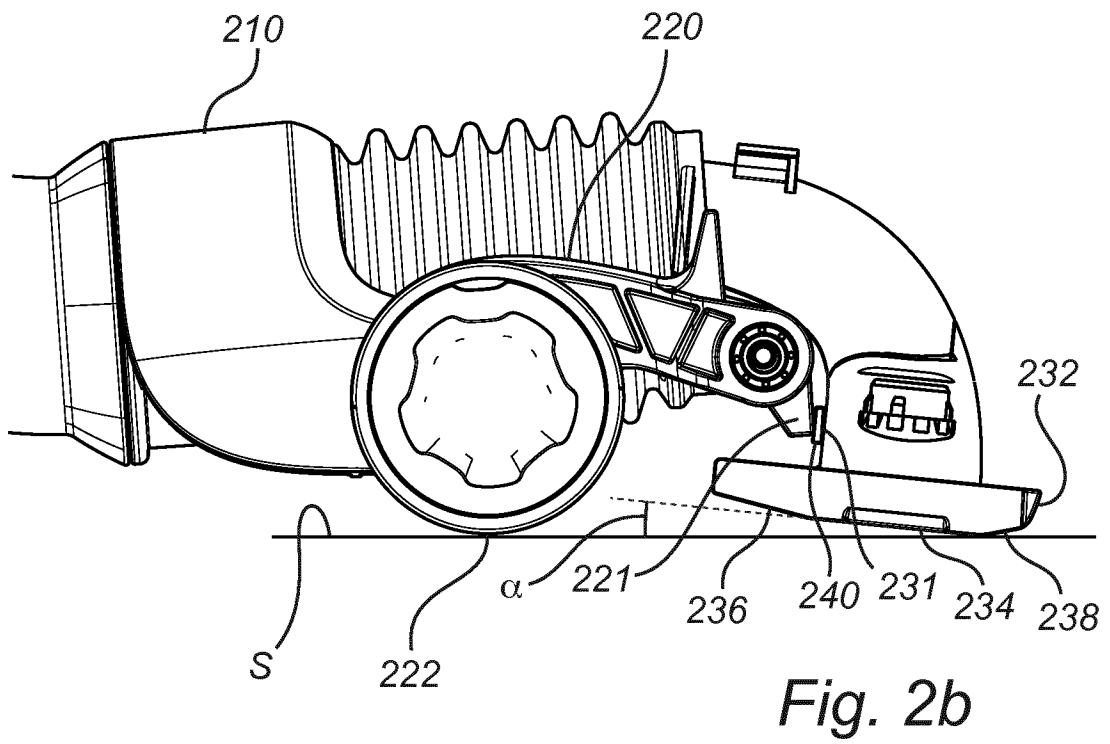
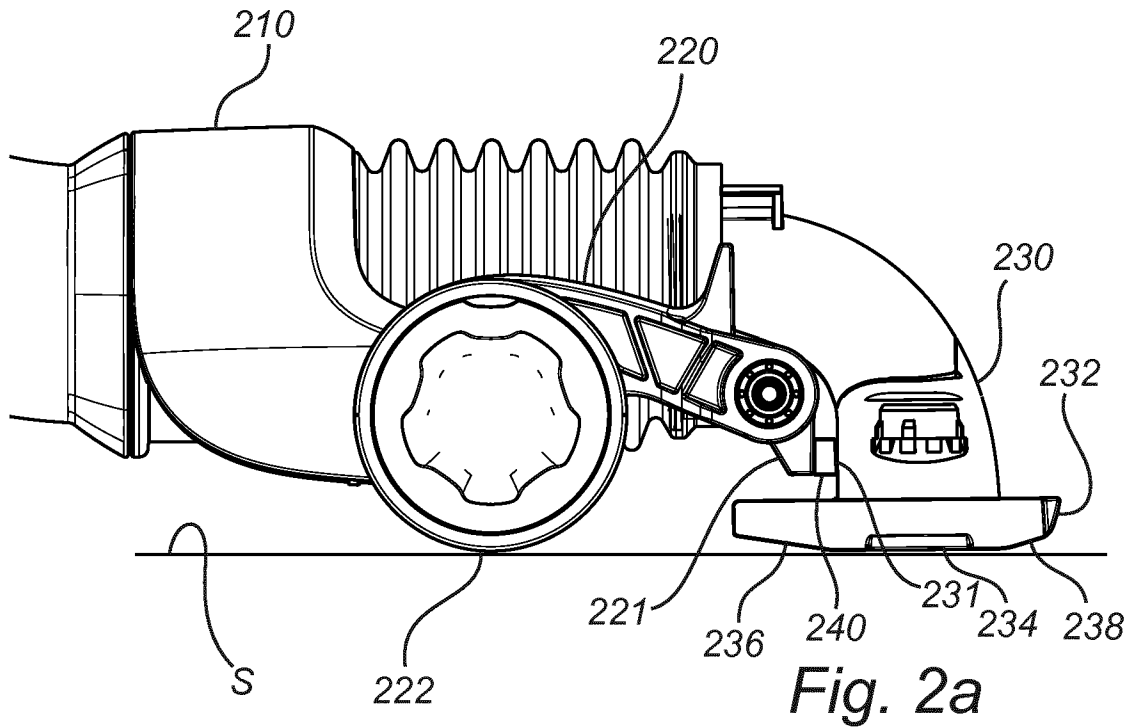


Fig. 1



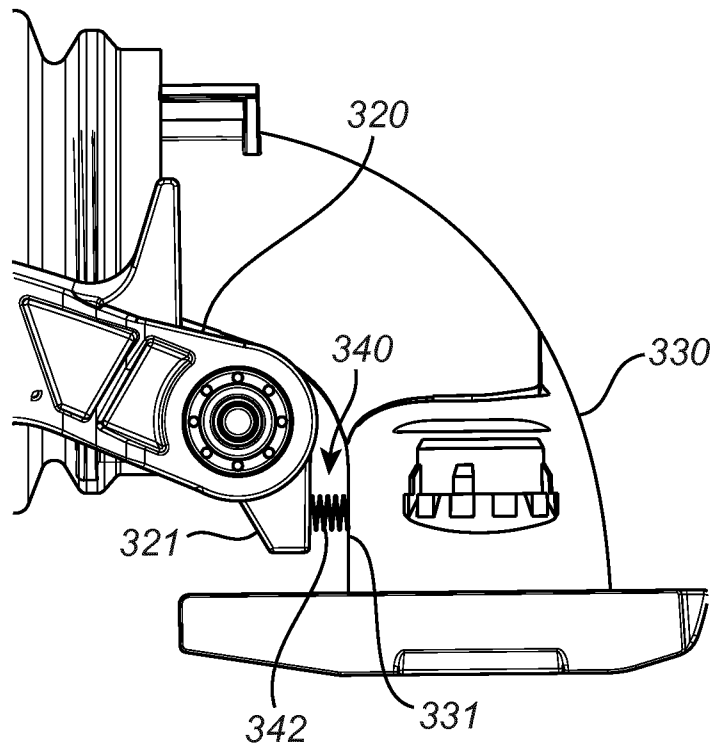


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/079374

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L9/02 A47L9/24
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
A47L
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 109 224 A (ELECTROLUX LTD) 2 June 1983 (1983-06-02) page 1, line 42 - page 2, line 10; figures 1-4	1-13
X	DE 23 64 750 A1 (WESSEL HANS) 3 July 1975 (1975-07-03) page 4, paragraph 3 - page 5, paragraph 5; figure 2	1-13
A	EP 2 338 399 A2 (MIELE & CIE [DE]) 29 June 2011 (2011-06-29) figure 1	1-13

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

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Trimarchi, Roberto

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/079374

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2109224	A	02-06-1983	DE 3238814 A1 11-05-1983
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