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(54) **SURFACE CLEANING MACHINE**

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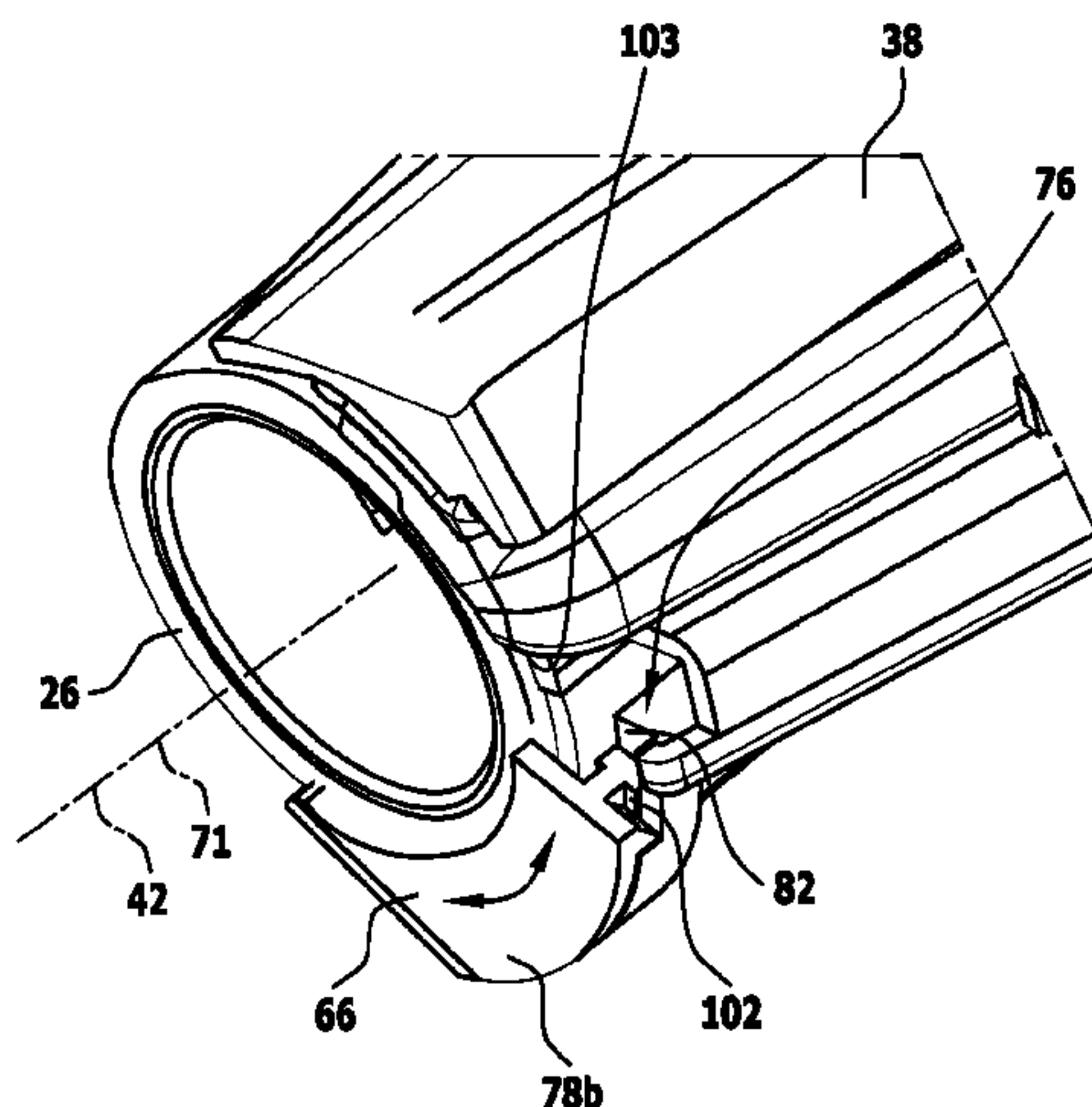
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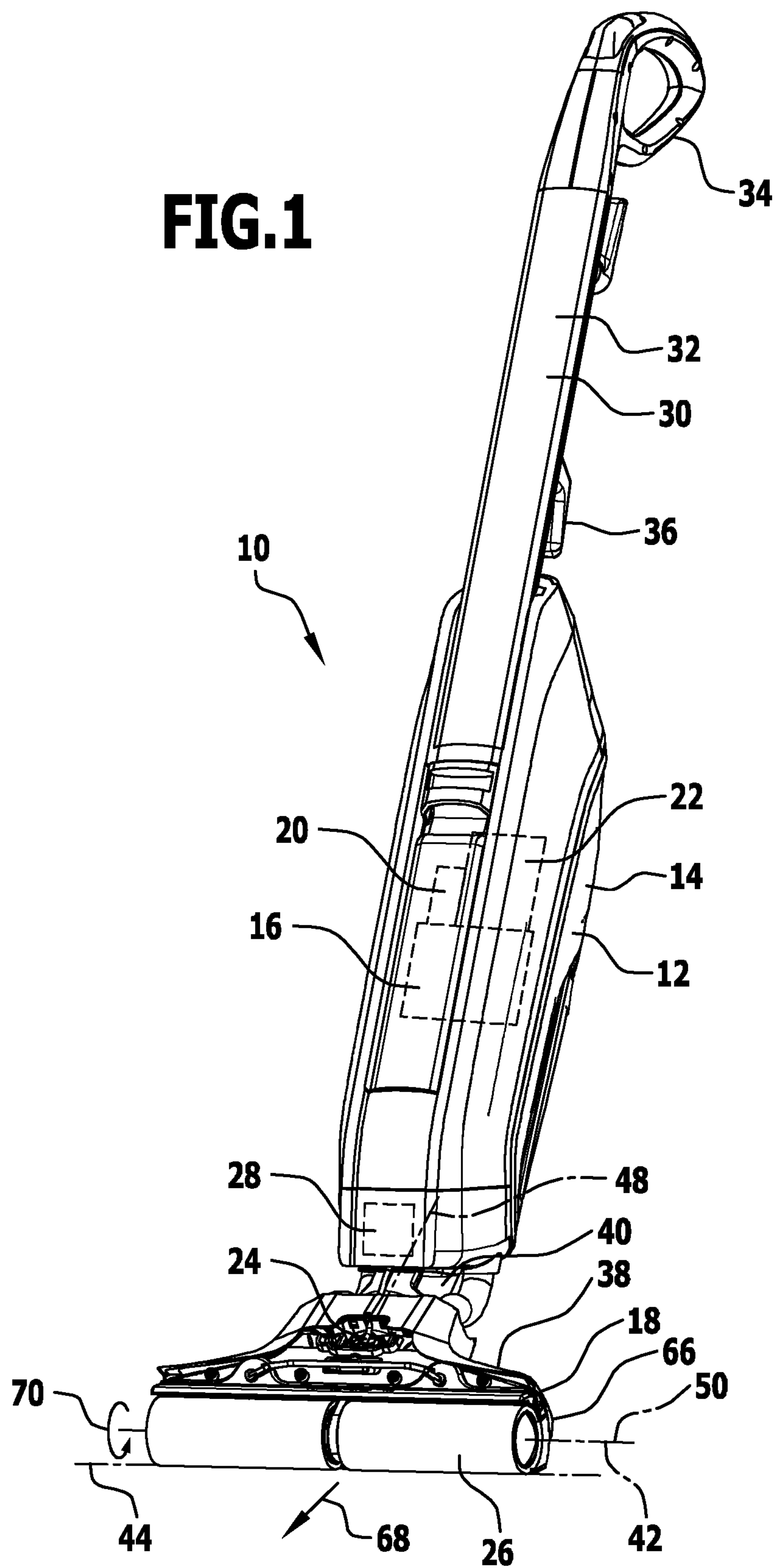
(57) **ABSTRACT**
A surface cleaning machine is provided, including a clean-
ing roller holder, a cleaning roller that is arranged on the
cleaning roller holder, a drive device for rotary driving of the
cleaning roller, and a sweeping element that is associated
with the cleaning roller and supplies swept material to the
cleaning roller, wherein the sweeping element is arranged
rotatably on the cleaning roller holder.

32 Claims, 11 Drawing Sheets



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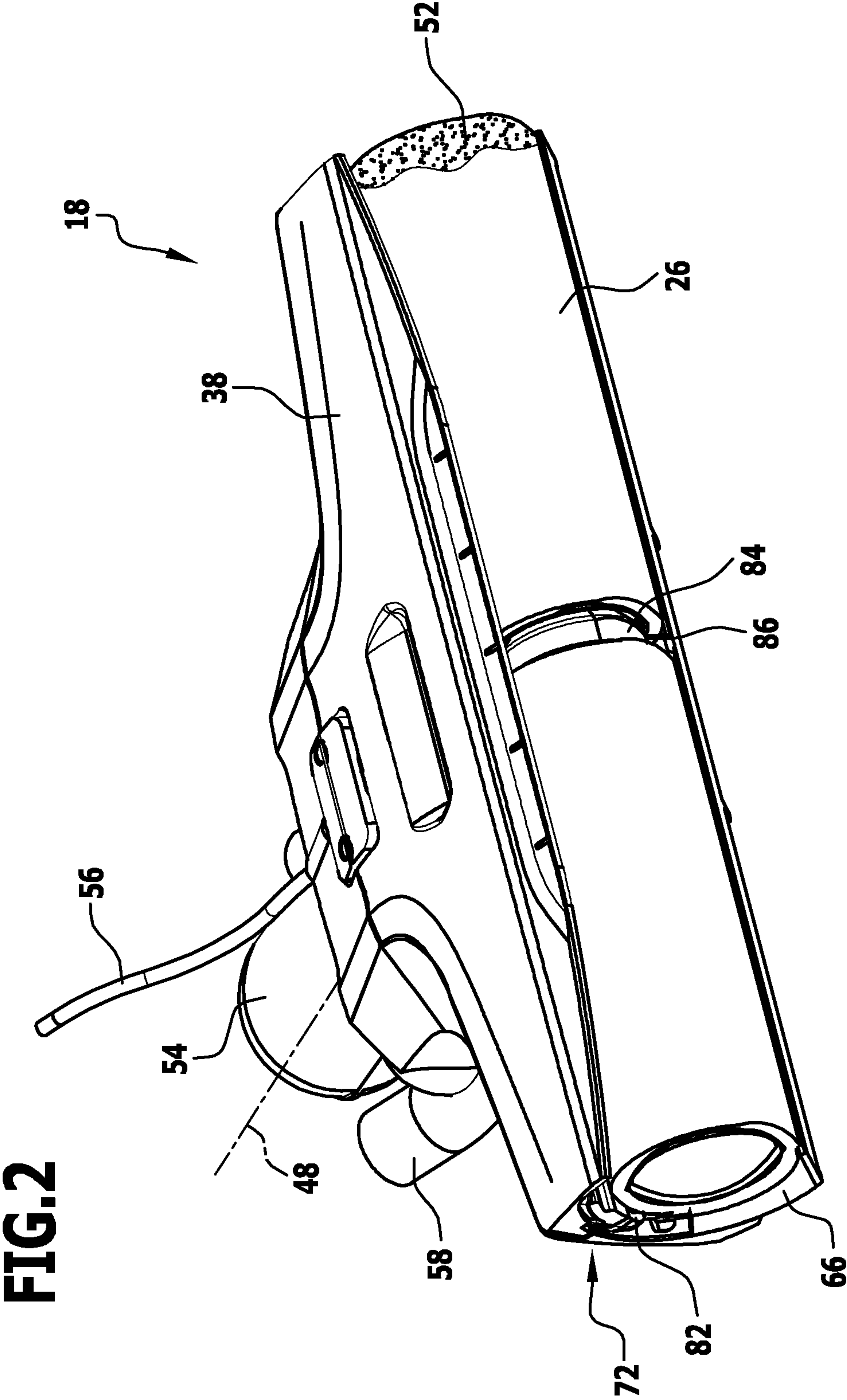


FIG.3

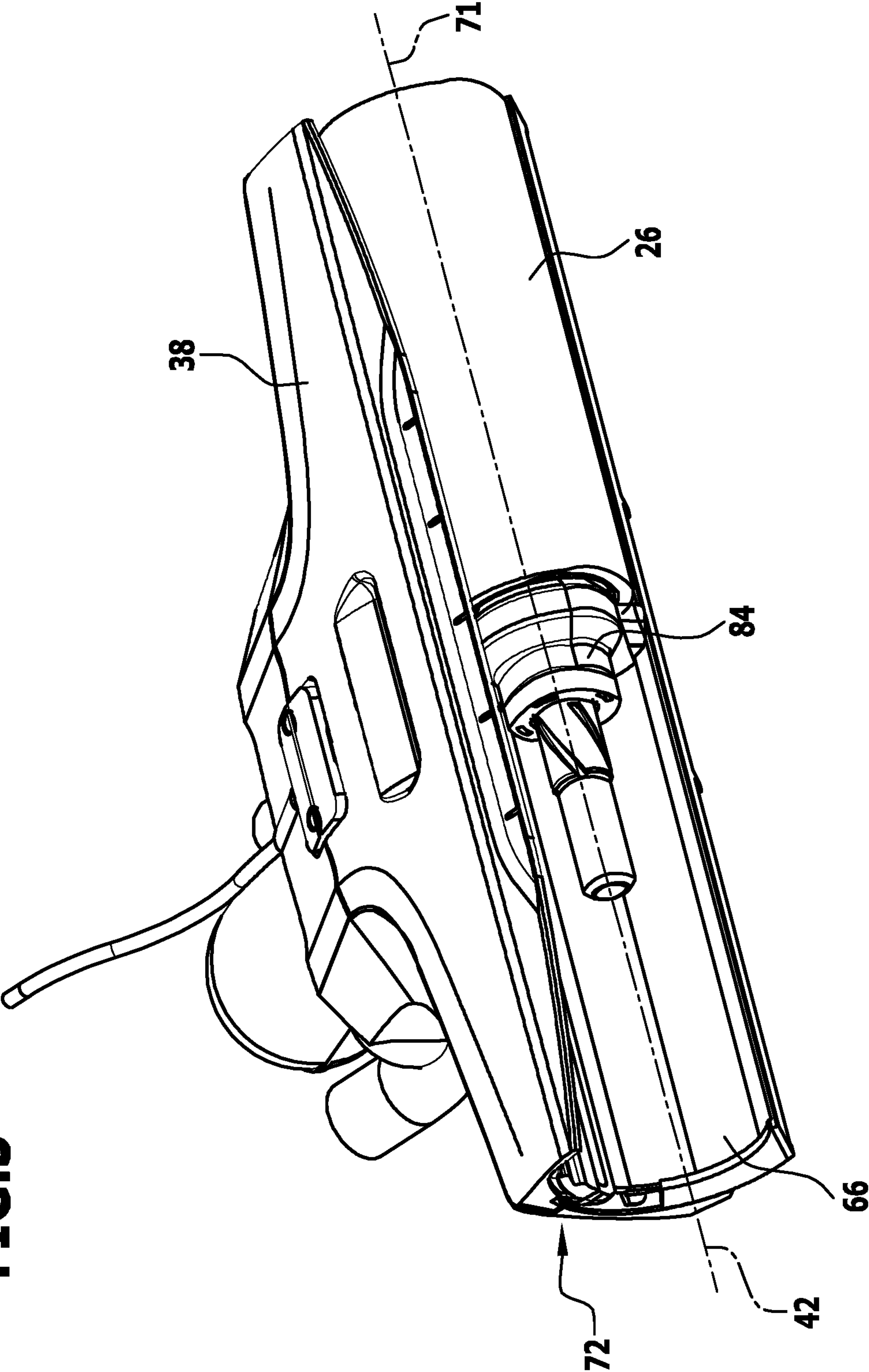
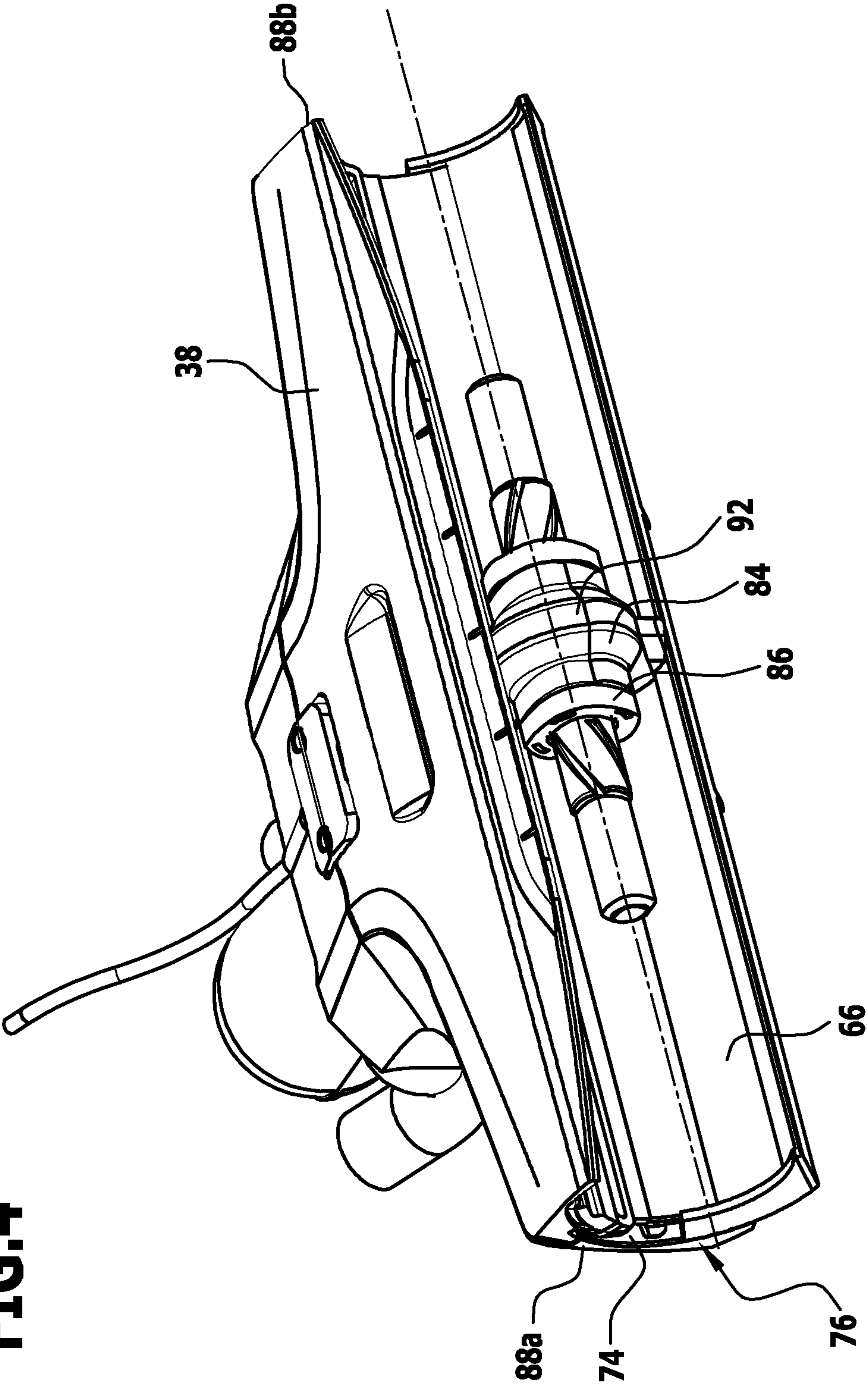
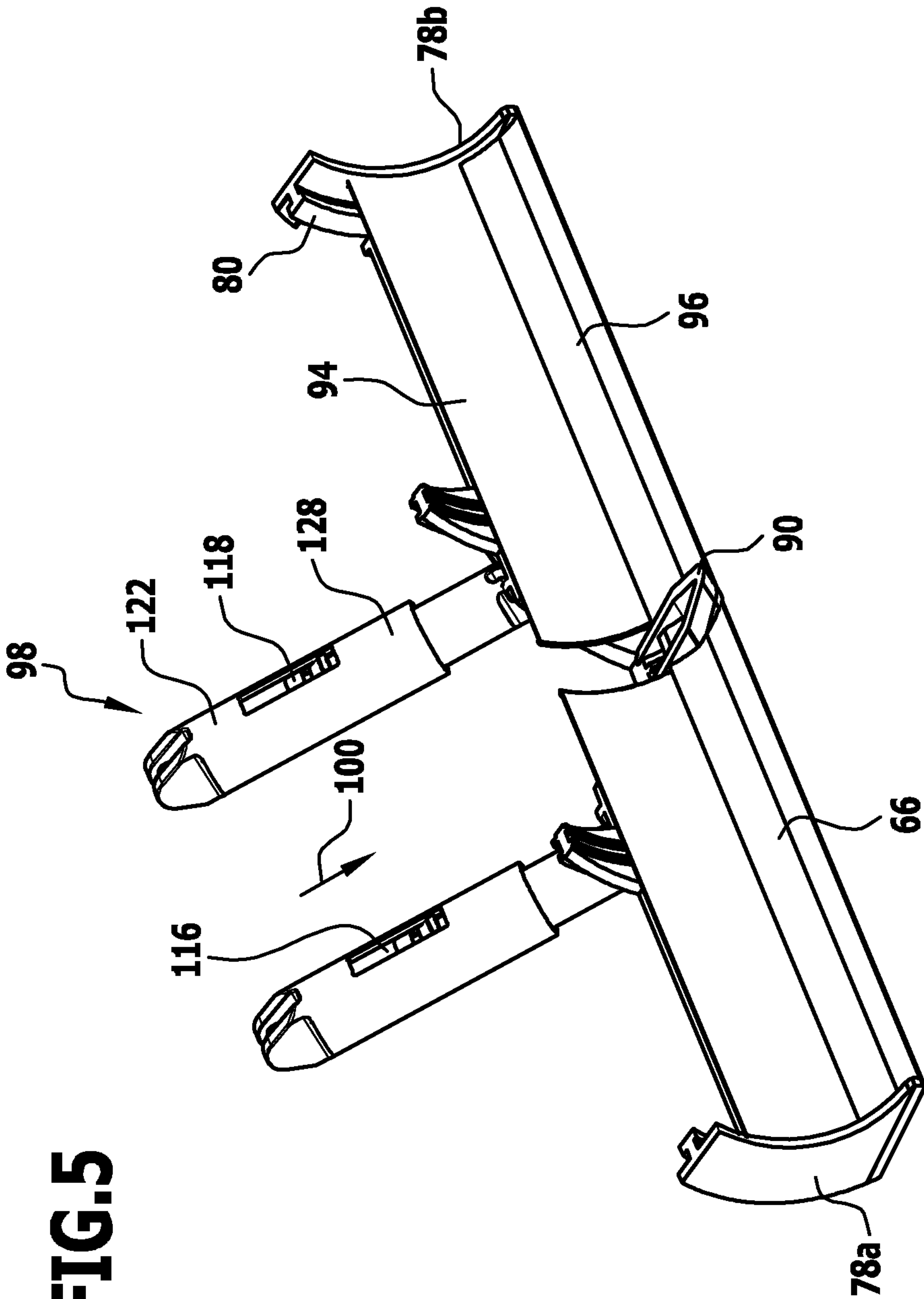


FIG.4





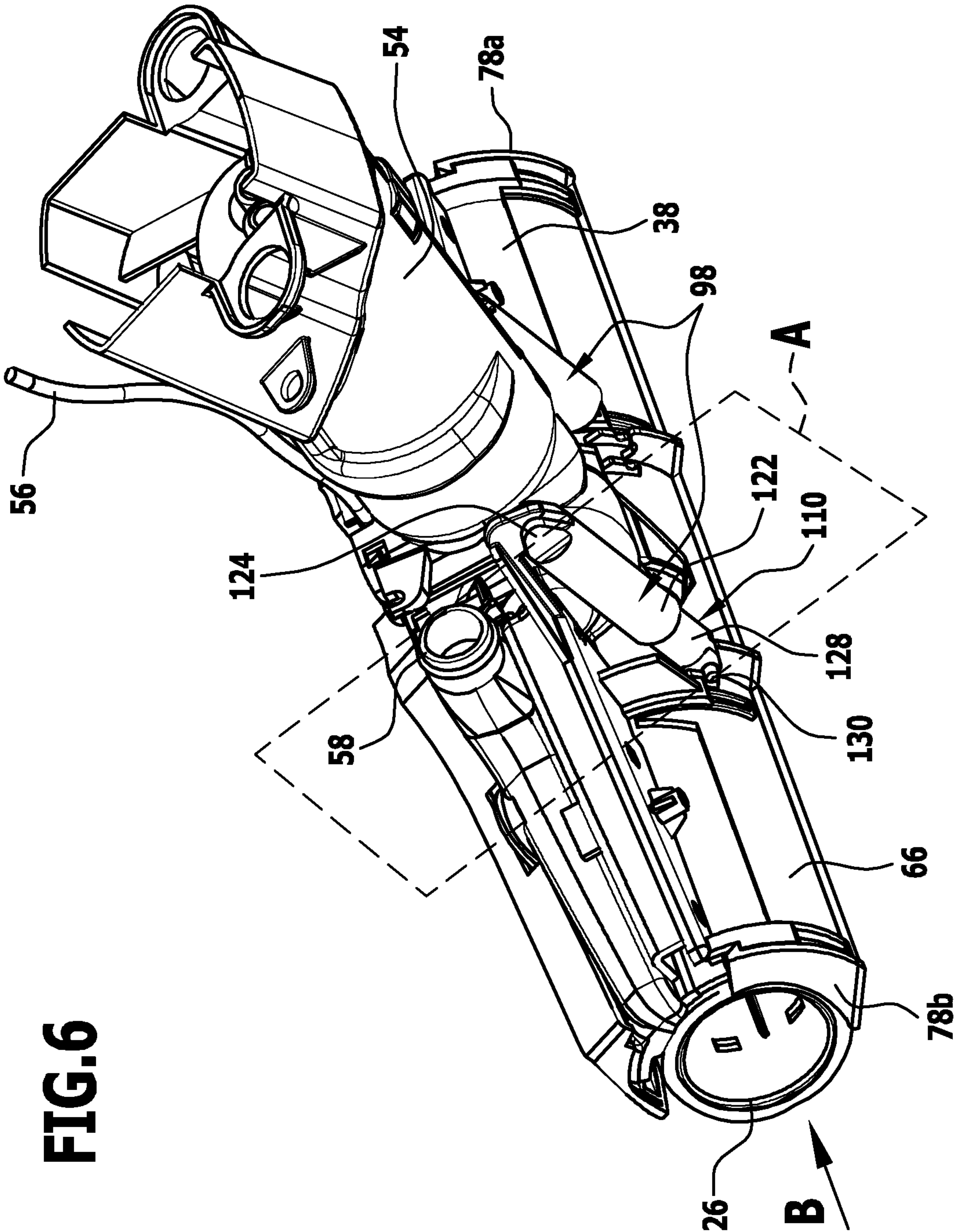


FIG. 7

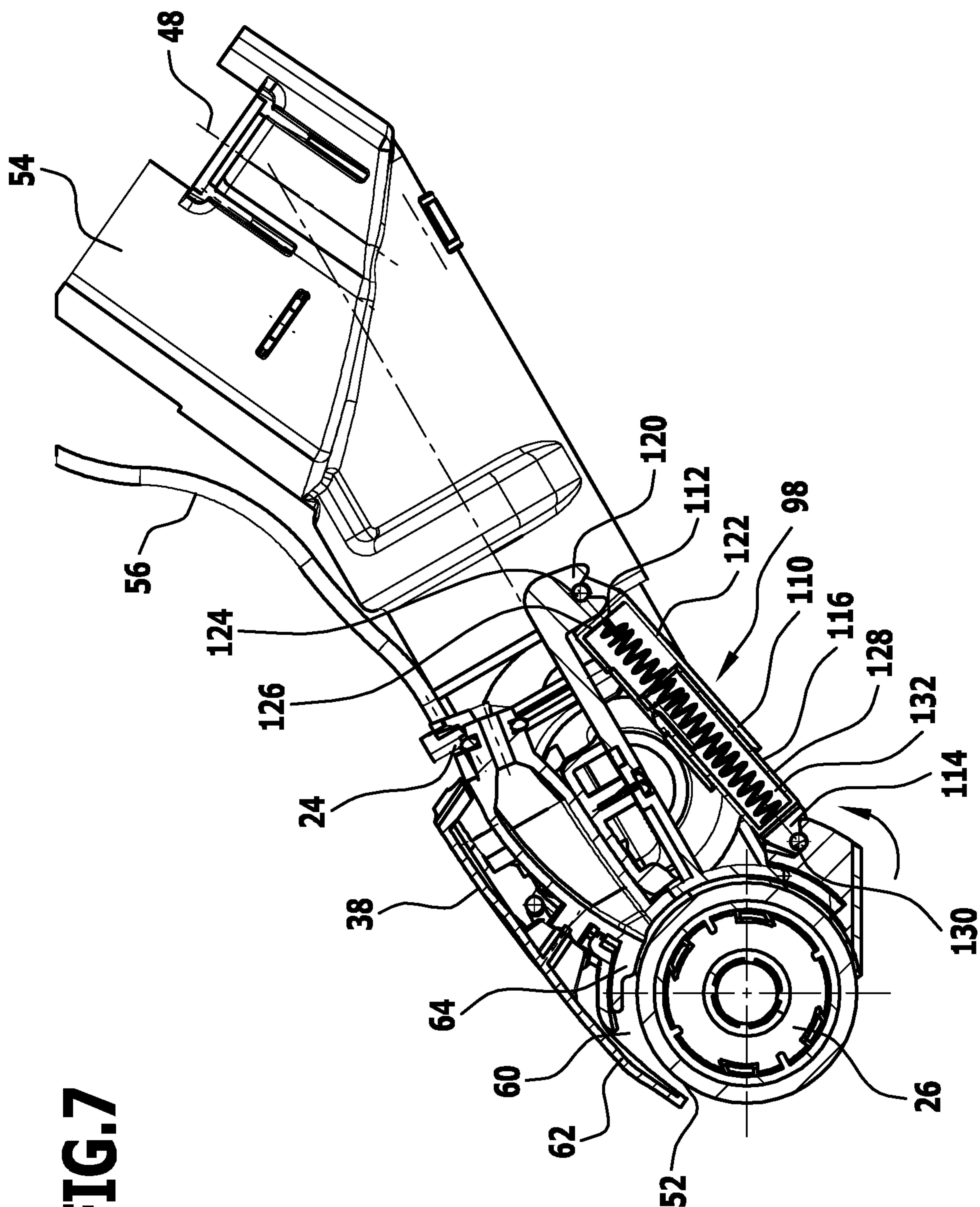
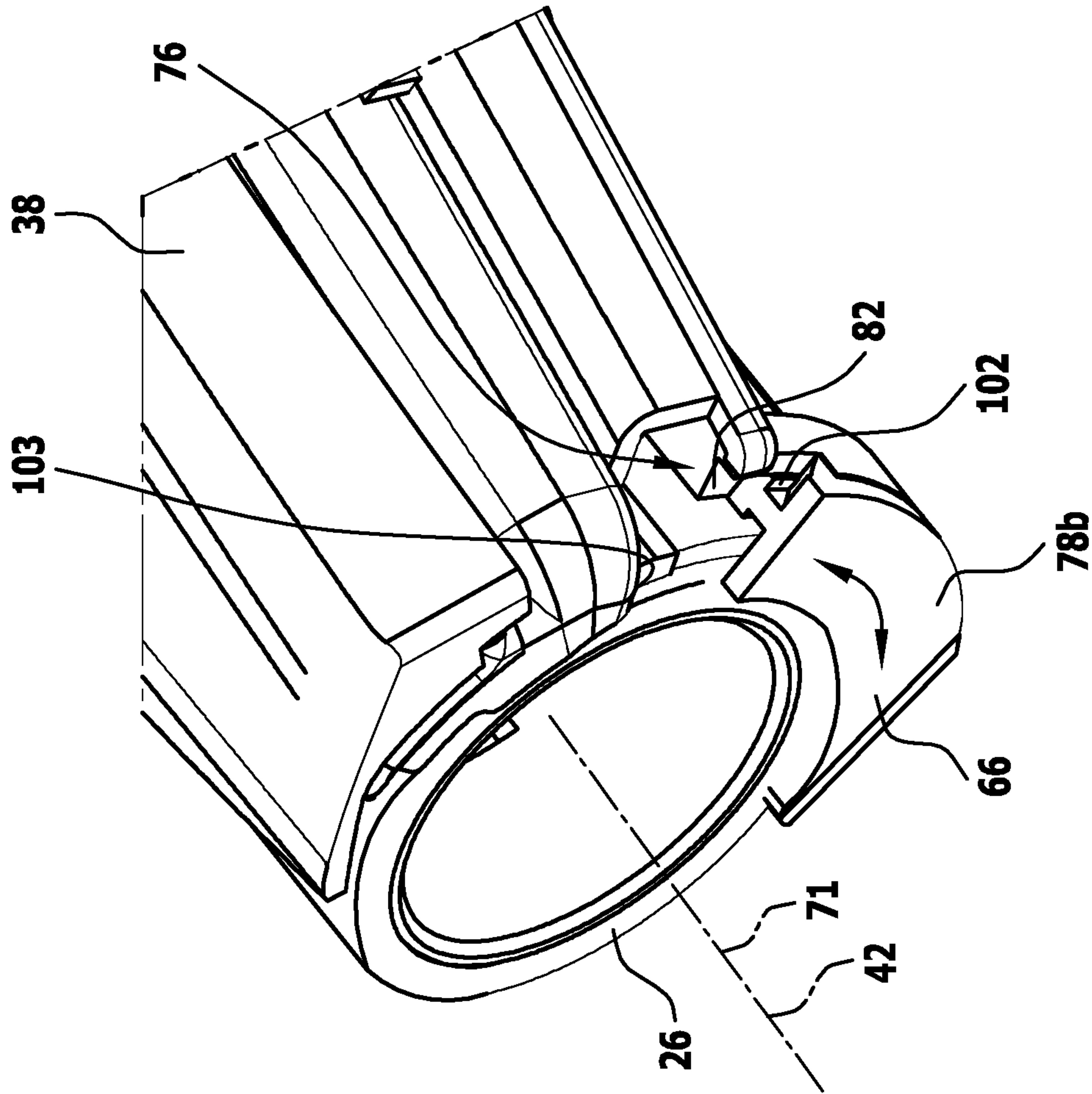


FIG.8



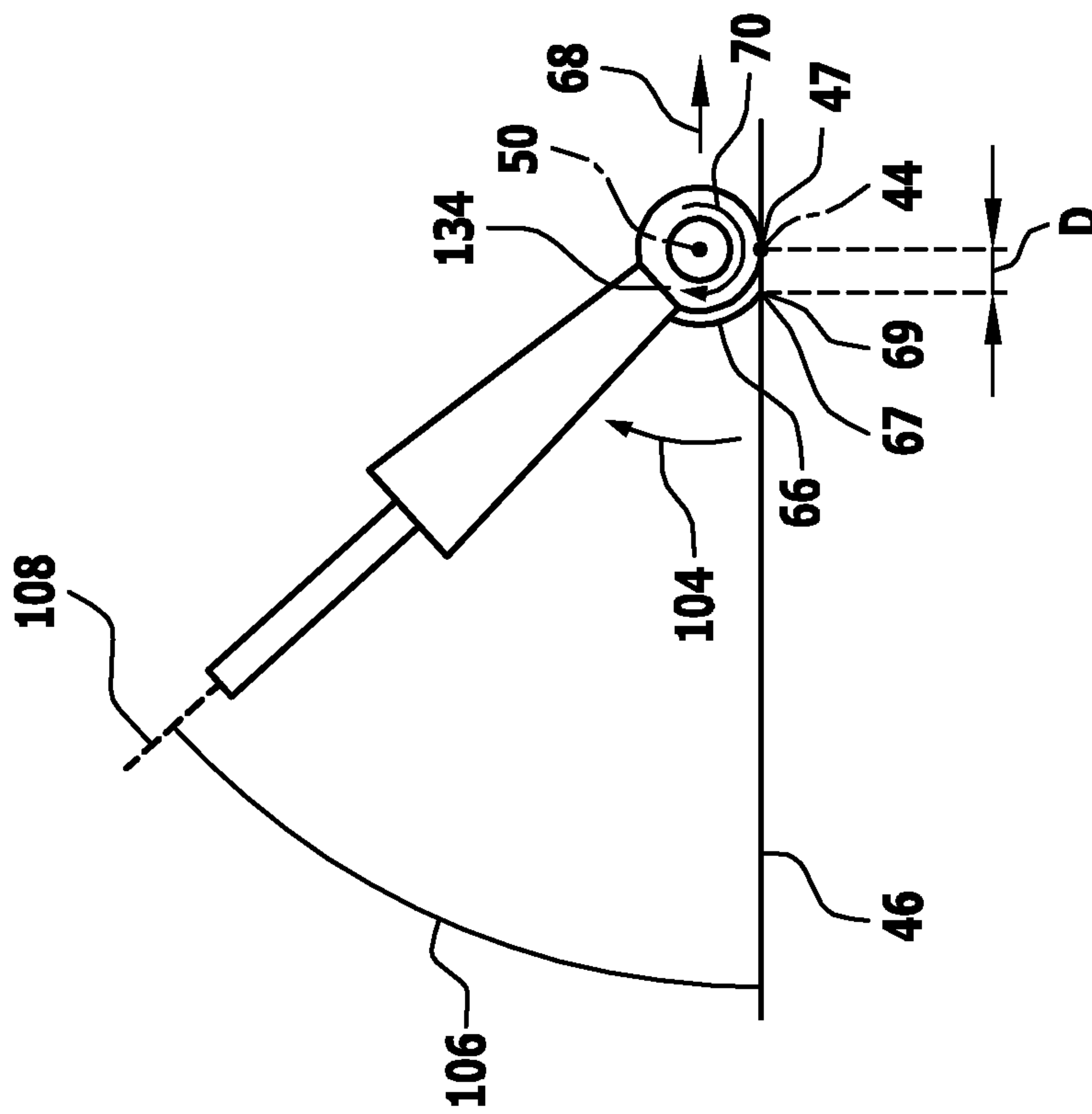


FIG. 9(a)

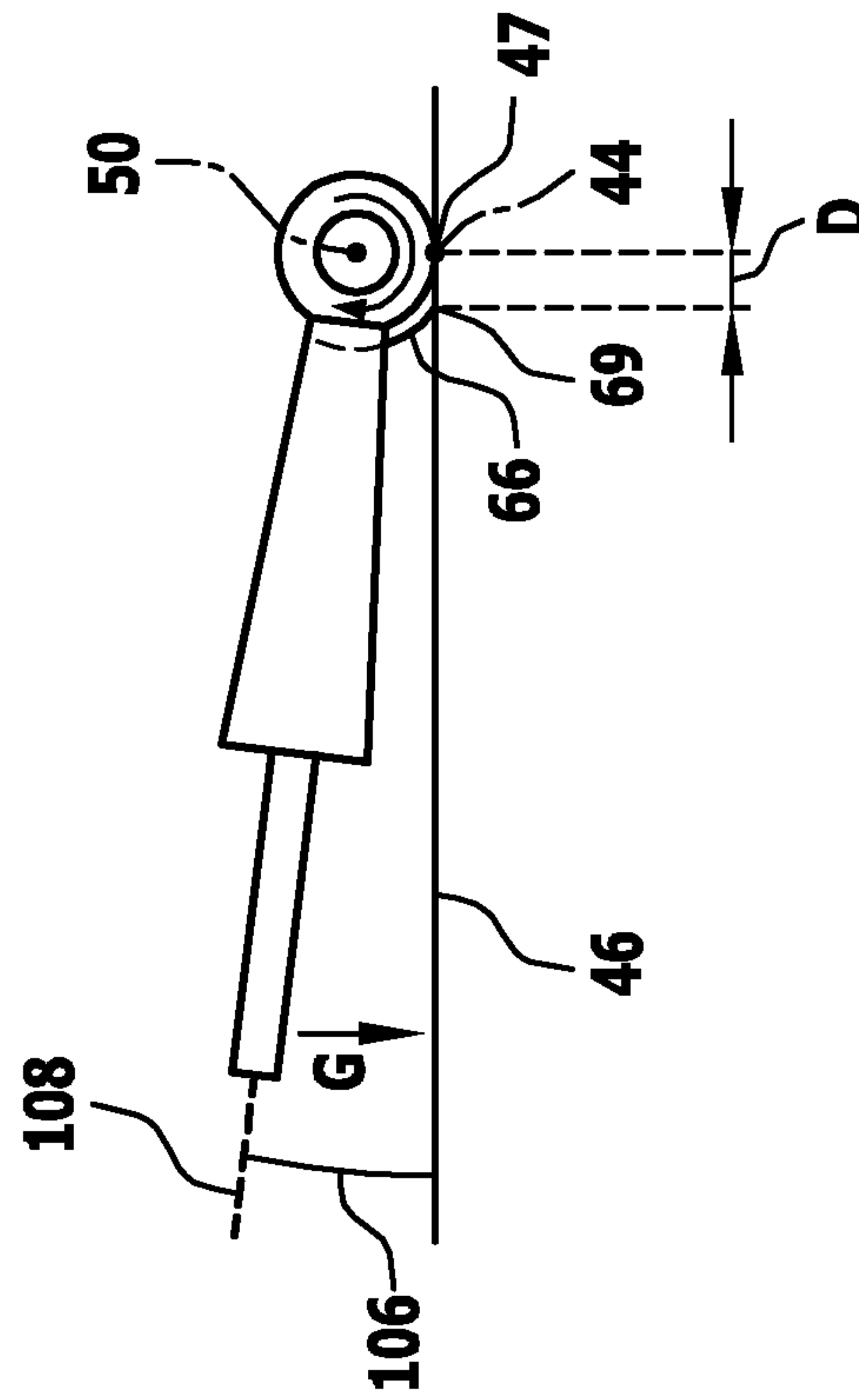


FIG. 9(b)

FIG.10

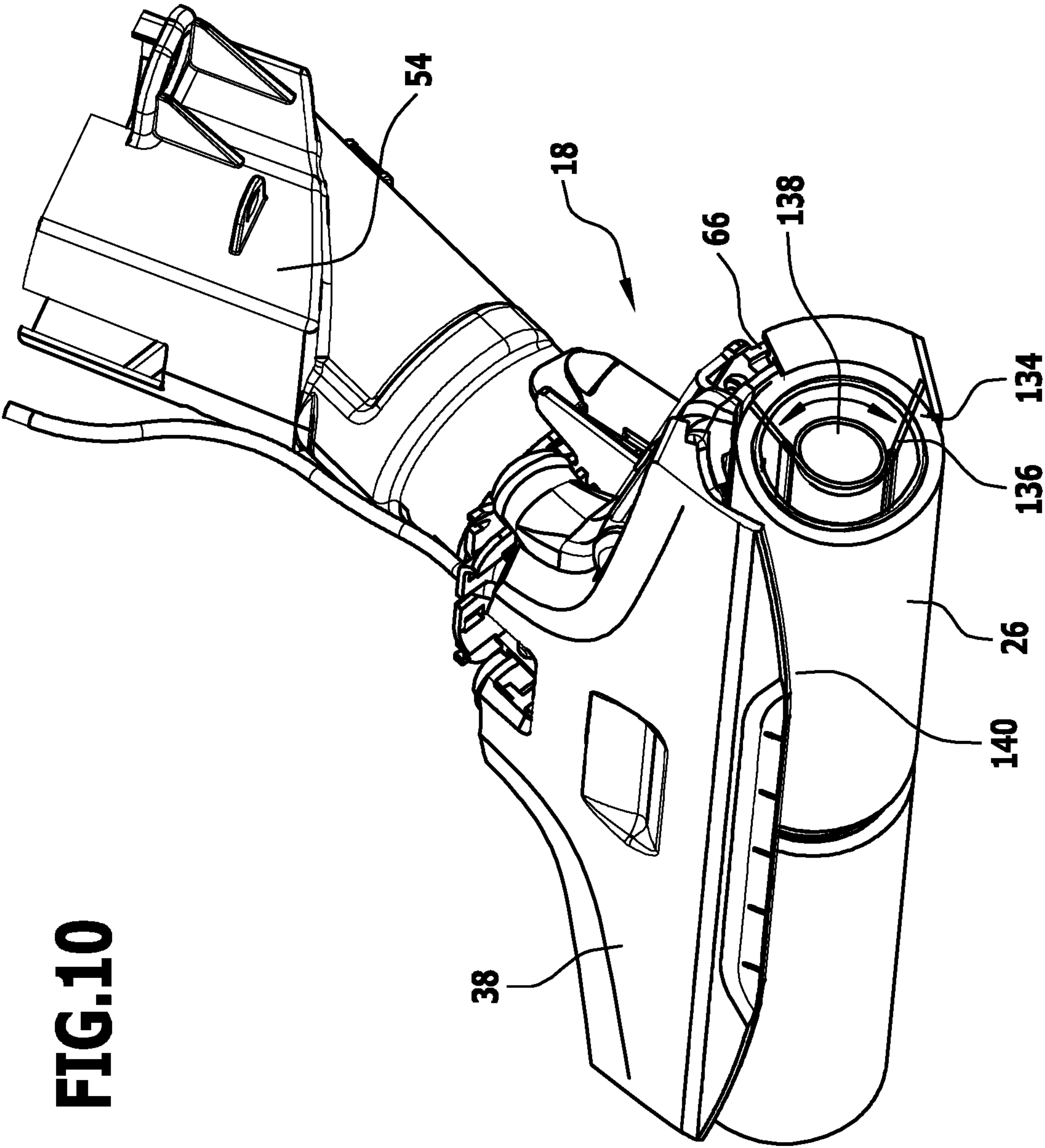
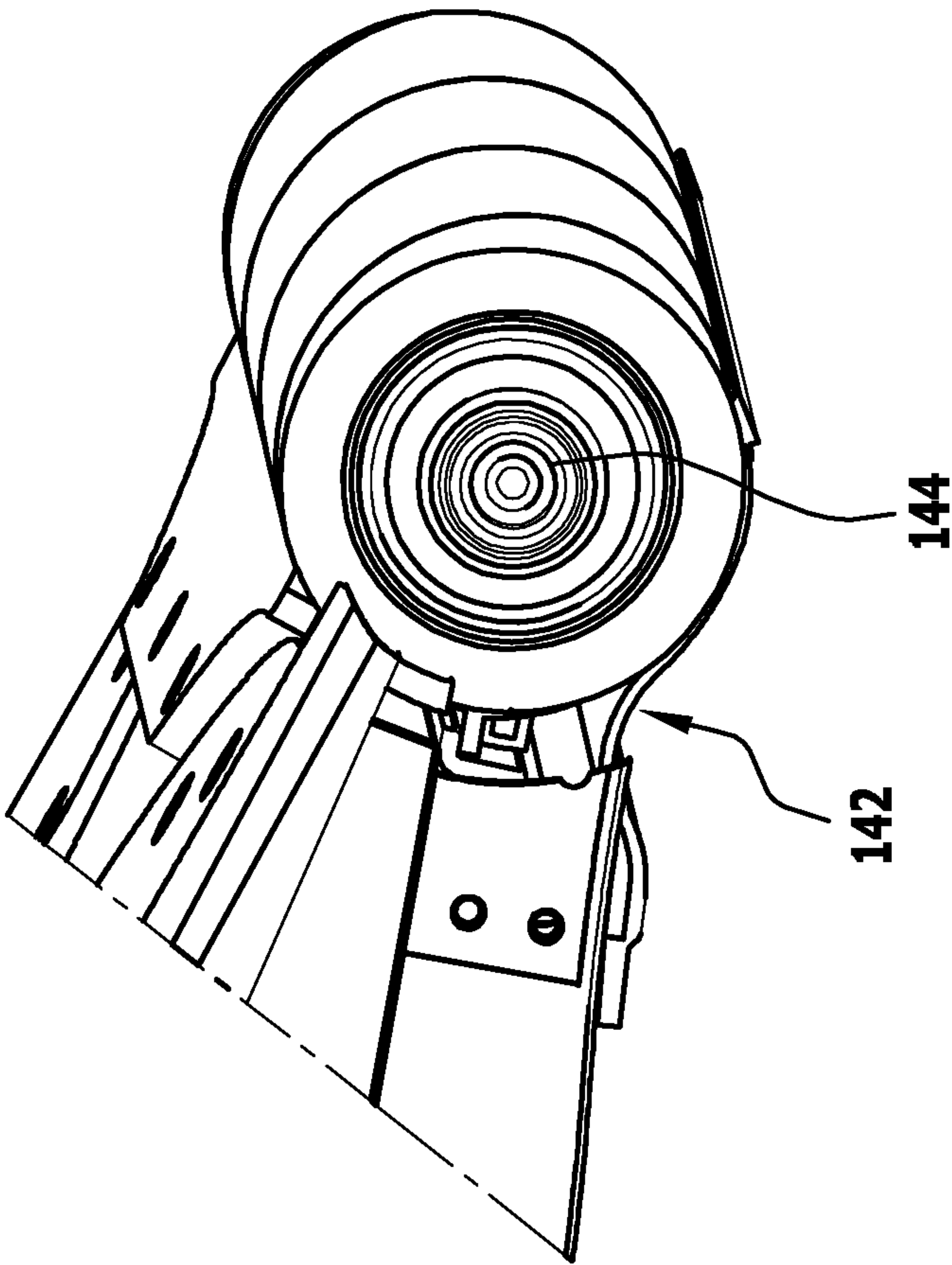


FIG.11



SURFACE CLEANING MACHINE**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation of international application number PCT/EP2015/073315 filed on Oct. 8, 2015 and claims the benefit of German application number 10 2014 114 776.6 filed on Oct. 13, 2014, which are incorporated herein by reference in their entirety and for all purposes.

BACKGROUND OF THE INVENTION

The invention relates to a surface cleaning machine, comprising a cleaning roller holder, a cleaning roller that is arranged on the cleaning roller holder, a drive device for rotary driving of the cleaning roller, and a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller.

WO 2013/027140 A1 or US 2014/0182079 A1 discloses a cleaning device for cleaning a surface that includes a rotatable brush. Further provided is a rubber wiping element that is at a spacing from the brush and is secured to an underside of a nozzle housing.

WO 2013/027164 A1 also discloses a cleaning device having a rotatable brush and a single rubber wiping element.

EP 2 177 128 A1 discloses a device for distributing fluid on a brush.

DE 41 17 157 A1 discloses a method for cleaning or swabbing a preferably smooth surface, in which the surface to be cleaned is wiped off with a substantially cloth-like wiping element, during which dirt is taken up by the wiping element, and then the dirty wiping element is moistened and thereafter the dirt is removed from the wiping element by suction.

WO 2010/140967 A1 discloses a method for cleaning a dirty surface.

CH 607 578 discloses a brush device that is connectable to a water line.

EP 0 186 005 A1 discloses a brush suction nozzle that is provided with wheels.

FR 2 797 895 discloses a brush.

US 2002/0194692 A1 discloses a method for mechanically removing dirt from a surface.

DE 102 42 257 B4 discloses a floor dust collecting device that has an electric motor drive, a dust collecting container, a covering lid and a brush. As it is rotated, the brush throws dust particles in a particular direction, wherein, associated with the brush, there is provided a ramp that is arranged oriented in relation to the direction in which dust is thrown and is deflectable in the direction in which dust is thrown.

EP 1 465 518 B1 discloses a surface cleaning device that includes a substantially continuous surface cleaning strip that extends over an underside of a housing.

SUMMARY OF THE INVENTION

In accordance with the present invention, a surface cleaning machine is provided, by means of which optimum cleaning results are produced on a surface to be cleaned and in particular a hard surface to be cleaned.

In accordance with an embodiment of the invention, the sweeping element is arranged rotatably on the cleaning roller holder.

As a result of the rotatable arrangement, the sweeping element is movable in relation to the cleaning roller holder

and hence also to the cleaning roller. It is thus possible to achieve a constant spacing between the rotating cleaning roller and the sweeping element, regardless of an angular position of the surface cleaning machine in relation to the surface to be cleaned, when the cleaning roller is placed on the surface to be cleaned. The rotatable movability of the sweeping element enables a corresponding adaptability.

The sweeping element serves to sweep up coarse dirt, which can then be carried along by the rotating cleaning roller. The fact that the sweeping element is movable by way of rotatability on the cleaning roller holder makes possible a constant spacing between a contact line of the at least one cleaning roller and a contact line of the sweeping element, with a surface to be cleaned. Consequently, it enables the angle to be variable in respect of a longitudinal direction of the surface cleaning machine in relation to the surface to be cleaned. In this way, for example cleaning under furniture and similar can also be achieved. Optimized cleaning results are produced, with a comprehensive range of possible operating modes.

The rotatability of the sweeping element is independent of the rotation of the at least one cleaning roller. With reference to this rotation, the sweeping element is positioned non-rotatably on the cleaning roller holder.

The length of an arc between a surface to be cleaned and an opening in a suction duct at the surface to be cleaned can be bridged in variable manner as a result of the movability of the sweeping element. Even if the cleaning roller and the sweeping element are the only points of contact with the surface to be cleaned, coarse dirt can be swept up in all angular positions (within an operating range) of the surface cleaning machine with the aid of the rotating cleaning roller, with no centrifugal effect.

As a result of the arrangement of the sweeping element such that it can move rotatably on the cleaning roller holder, good resistance to wear can be achieved with the possibility of a structurally advantageous construction.

It is particularly favorable if an axis of rotation of the sweeping element is oriented at least approximately parallel to, and in particular coaxial with, an axis of rotation of the cleaning roller. This produces optimized guidance of the sweeping element. Angular offsets from a precisely parallel arrangement, of for example up to 20° or up to 10°, can occur as a result of an uneven thickness of the sweeping element.

It is most particularly favorable if a resilient device is provided that acts with a spring force on the sweeping element, wherein in particular the spring force presses the sweeping element and hence a sweeping edge against a surface to be cleaned when the cleaning roller is placed on the surface to be cleaned. This produces an optimized sweeping result and an optimized effect of carrying along coarse dirt (with no centrifugal effect) by the rotating cleaning roller. Coarse dirt is carried along regardless of the angular position of the surface cleaning machine in relation to the surface to be cleaned. The resilient device provides a restoring force such that there is a substantially constant spacing between a contact line of the rotating cleaning roller and a contact line of the sweeping element, in any angular position of the surface cleaning machine in relation to the surface to be cleaned. This in turn produces an optimized cleaning result.

In one embodiment, the resilient device is dimensioned such that the sweeping element is rotatably movable in opposition to the spring force as a result of the force of the weight of the surface cleaning machine. The force of the weight of the surface cleaning machine then allows the

sweeping element to be relocated in dependence for example on an angular position of the surface cleaning machine. In this way, the possibility of a simple structural construction of the surface cleaning machine is produced.

Advantageously, the resilient device is dimensioned such that the sweeping element is not pushed under the at least one cleaning roller by the action of the spring force. As a result, the possibility that the at least one cleaning roller will be raised by the sweeping element is avoided.

Advantageously, the resilient device is supported on the sweeping element and the cleaning roller holder, or a device connected to the cleaning roller holder, and is in particular articulated thereto. This allows a required restoring force to be achieved by the resilient device.

The resilient device has for example at least one helical spring or torsion spring or rubber spring or pneumatic spring in order to provide an appropriate spring force.

In one embodiment, the resilient device includes at least a first spring and a second spring which are spaced from one another, wherein the drive device is at least partly located between the first spring and the second spring. With an arrangement of this kind, the resilient device is integrated into the surface cleaning machine in a structurally simple manner. It produces optimized utilization of space. Moreover, the symmetrical arrangement allows an even application of force by the sweeping element to be achieved.

In particular, a direction of rotation of the sweeping element in opposition to the spring force is clockwise, and in particular a direction of rotation of the sweeping element when it moved by the spring force is counterclockwise. With a structurally simple construction, optimized cleaning results are produced.

It is most particularly advantageous if there is provided a suction device, having a suction unit and at least one suction nozzle which is fluidically connected to the suction unit and is directed towards the cleaning roller for the removal of fluid at the cleaning roller by suction. The cleaning roller allows dirt to be carried along, and this dirt is then removed by suction through the suction device.

In particular, in a cleaning mode, the sweeping element is located between a surface to be cleaned, towards which the cleaning roller is directed, and the at least one suction nozzle. As a result, coarse dirt may also be carried along and removed by suction.

In particular, the surface cleaning machine is of a type in which, in a cleaning mode, it is placed or supported on a surface to be cleaned solely by way of the cleaning roller. This allows good cleaning results to be produced with a simple structural arrangement. In particular, the corresponding surface cleaning machine can be of a weight-saving and space-saving construction. This produces good maneuverability; consequently, even areas that are otherwise difficult to access can be cleaned by machine.

For example, the sweeping edge is arranged to be movably rotatable on the cleaning roller holder such that, in any angular position relative to the surface to be cleaned within an operating range of the surface cleaning machine, a spacing between the sweeping element and the cleaning roller, and in particular a spacing between the sweeping element and a contact region of the cleaning roller on the surface to be cleaned, is at least approximately constant. The result is that coarse dirt is carried along in a constant manner and optimized cleaning results are produced.

In one exemplary embodiment, in the cleaning mode with the surface cleaning machine being pushed forwards, a direction of rotation of the cleaning roller is clockwise. This produces an optimized dirt detaching effect.

For example, an angular range for the rotatability of the sweeping element on the cleaning roller holder comprises at least 20° and in particular at least 30° and in particular at least 40° in relation to a starting position (zero degree position), wherein in the starting position the sweeping element is deflected, by way of a sweeping edge, to a minimal extent in relation to the cleaning roller holder, that is to say projects to a minimal extent beyond the cleaning roller holder. The starting position is defined for example by abutment against a barrier element.

It is favorable if the sweeping element has a sliding region for sliding on the cleaning roller holder. This produces a structurally favorable guidance on the cleaning roller holder.

In that case, it is favorable if the sliding region takes the form of a cylinder shell or part of a cylinder shell, in order in particular to be able to provide a circular guidance.

For the same reason, it is favorable if the cleaning roller holder has an inside that faces the cleaning roller and on which the sliding region of the sweeping element is slidable.

It may be provided in this case for the sliding region to have a rigid construction and in this case to be of a sufficiently rigid construction for normally occurring dirt not to buckle the sliding region.

As an alternative, it may be provided for the sliding region to be of a sufficiently flexible construction for it to be bucklable away from the cleaning roller as a result of accumulations of dirt. In that case, coarse dirt can accumulate there. Once the sweeping element has undergone a rotational movement, this coarse dirt can be carried along by the rotating cleaning roller. The rotational movement is in turn brought about by a change in the angular position of the surface cleaning machine in relation to the surface to be cleaned.

It is further favorable if the sweeping element has a region for abutment (abutment lip) and in particular a resilient region for abutment against a surface to be cleaned that is arranged in particular on a sliding region of the sweeping element. This produces an optimized sweeping function for collecting coarse dirt, wherein this coarse dirt may in turn then be carried along by the rotating cleaning roller and removed by suction.

It is favorable if there is arranged on the cleaning roller holder a first guide device and on the sweeping element a second guide device that cooperates with the first guide device for the purpose of rotatable guidance of the sweeping element on the cleaning roller holder. This produces, in a structurally simple manner, a movable arrangement of the sweeping element on the cleaning roller holder. In particular, guidance of the sweeping element on a circular track may be achieved in a simple manner.

For example, the second guide device has guide elements that are arranged on end sides of the sweeping element and cooperate with counter-guiding elements of the first guide device that are arranged on end sides of the cleaning roller holder, wherein the first guide device and/or the second guide device provides a guide track. A corresponding guidance may be produced in a structurally simple manner. For example, an abutment for defining a starting position may be integrated into a guide of this kind in a simple manner.

In a structurally advantageous embodiment, the sweeping element is guided on a circular track on the cleaning roller holder. For the purpose of variability of the sweeping element, which ensures a gap that is as constant as possible between the cleaning roller and the sweeping element, the sweeping element as a whole is arranged movably on the cleaning roller holder.

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In particular when the surface cleaning machine having a cleaning roller placed on a surface to be cleaned is pushed in a forward direction, the sweeping element is remote from the forward direction and covers the cleaning roller to the rear and lies on the surface to be cleaned at least over a length of the cleaning roller. This produces an optimized sweeping function. In particular, there is a gap between the sweeping element and the cleaning roller. This gap is dimensioned such that coarse dirt that accumulates at the sweeping element can be correspondingly carried along by the rotating cleaning roller.

It is further favorable if a wetting device is provided for the cleaning roller. This allows the rotating cleaning roller to be moistened. In this way, dirt on the surface to be cleaned can be detached and carried along better.

The description below of preferred embodiments serves, together with the drawings, to explain the invention in more detail.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective illustration of an exemplary embodiment of a surface cleaning machine;

FIG. 2 shows a perspective illustration of a roller region of the surface cleaning machine in FIG. 1;

FIG. 3 shows a partial illustration of the roller region in FIG. 2;

FIG. 4 shows a further partial illustration of the roller region in FIG. 2;

FIG. 5 shows a perspective view of an exemplary embodiment of a sweeping element that is arranged on the roller region in FIG. 2;

FIG. 6 shows a further perspective illustration of the roller region in FIG. 2;

FIG. 7 shows a sectional view along the plane of section A in FIG. 6;

FIG. 8 shows a plan view of the roller region in the direction B in FIG. 6;

FIGS. 9(a), (b) show different angular positions of the surface cleaning machine in relation to a surface to be cleaned, with different rotary positions of a sweeping element;

FIG. 10 shows a perspective illustration of the roller region of a further exemplary embodiment of a surface cleaning machine; and

FIG. 11 shows a partial illustration of the roller region of a further exemplary embodiment of a surface cleaning machine according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

An exemplary embodiment of a surface cleaning machine according to the invention that is shown in FIG. 1 serves for cleaning (hard) floors. It is thus a floor cleaning machine. The floor surface cleaning machine 10 includes a device body 12 having a housing 14. Arranged protected in the housing 14 are components of the floor surface cleaning machine 10.

In an exemplary embodiment, there is arranged in the housing 14 a suction unit 16 that includes a fan device and a motor device (in particular an electric motor device) for driving the fan device. By way of the suction unit 16, a suction stream is generated in order to bring about removal by suction at a cleaning head 18.

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Further arranged in the housing 14 is a separating device 20 that separates off from one another solid and liquid components in a suction stream.

Further arranged in the housing 14 is a reservoir device 22 for dirty liquid (drawn in by suction). The reservoir device 22 is in particular removably located on the housing 14.

The surface cleaning machine 10 includes a wetting device 24 by way of which a cleaning roller 26 of the cleaning head 18 can be supplied with cleaning liquid (water, or water with an additional detergent). Arranged in the housing 14 is a reservoir device 28 for cleaning liquid that provides the wetting device 24 with this cleaning liquid.

The surface cleaning machine 10 is hand-held. A holder 30 is arranged on the device body 12. This holder 30 includes a holding rod 32, on the end region whereof a handle 34 is seated. The handle 34 in particular takes the form of a stirrup-shaped handle. Operating elements, and in particular a switch for switching on and off corresponding devices of the surface cleaning machine 10, are arranged in the region of the handle 34.

A winding device 36 for a mains cable may be arranged on the holding rod 32.

The cleaning head 18 is located on the device body 12 at an end remote from the handle 34. It is for example arranged to be pivotal on the device body 12.

The cleaning head 18 includes a cleaning roller holder 38 on which the cleaning roller 26 is seated.

Associated with the cleaning roller 26 is a drive device 40 that includes in particular a drive motor. The drive device 40 is arranged in the housing 14 or in the cleaning head 18.

In one exemplary embodiment, part of the drive device 40 is arranged in the housing 14 and part is arranged on the cleaning head 18.

The drive device 40 in particular includes an electric motor. The latter provides a torque for the purpose of driving the cleaning roller 26 in rotation about an axis of rotation 42.

In one mode of the surface cleaning machine 10, the latter is placed on the surface to be cleaned by way of the cleaning roller 26 and is supported thereon solely by the cleaning roller 26. A person operating the surface cleaning machine 10 holds it by the handle 34, wherein in normal operation the person is standing. The person operating the surface cleaning machine 10 can adjust an angular position thereof (an angular position of the holding rod 32) in relation to the surface to be cleaned. This is done by way of the angular positioning of the whole device 10 in relation to the surface to be cleaned.

A pivot axis 44 for an angular movement of this kind (compare also FIGS. 9(a) and 9(b)) is formed by the region for abutment of the cleaning roller 26 against a surface 46 to be cleaned.

A pivot axis 48 for the possibility of pivoting by the cleaning head 18 in relation to the device body 12 lies transversely to this pivot axis 44 or transversely to the axis of rotation 42.

The cleaning roller 26 has a longitudinal axis 50. This longitudinal axis 50 is coaxial with the axis of rotation 42. In a cleaning mode of the surface cleaning machine 10, the longitudinal axis 50 lies coaxially with the surface 46 to be cleaned. The pivot axis 44 for pivoting of the whole device 10 in relation to the surface 46 to be cleaned is at least approximately parallel to this longitudinal axis 50.

As indicated in FIG. 2 by the reference numeral 52, the cleaning roller 26 is provided with a jacket.

The cleaning head 18 (compare also FIGS. 3 to 8) having the cleaning roller holder 38 is provided for an in particular detachable connection to the device body 12. It includes a

connection piece **54** that is arranged on the cleaning roller holder **38** and by way of which the cleaning head **38** is pivotally mounted on the device body **12**.

One or more liquid lines **56** lead from the wetting device **24**, which is arranged in particular on the housing **14**, to the wetting device **24** of the cleaning head **18**. Arranged on the cleaning roller holder **38** are nozzles by way of which cleaning liquid may be applied to the cleaning roller **26**.

For operation of the surface cleaning machine **10**, it is provided in particular for cleaning liquid not to be applied directly to the surface **46** to be cleaned but for the cleaning roller **26** to be moistened by means of its jacket **52** and then for the moistened cleaning roller **26** to be applied to the surface **46** to be cleaned.

Further, one or more connectors **58** for a suction stream are provided on the cleaning head **18**, in this case on the cleaning roller holder **38**. A connector **58** of this kind is fluidically connected to the suction unit **16** by way of one or more suction lines.

There is arranged on the cleaning roller holder (at least) one suction nozzle **60** (compare FIG. 7) that is directed towards the cleaning roller **26**. The suction nozzle **60** is fluidically connected to the connector **58** and hence to the suction unit **16**. A stream having a negative pressure acts on the suction nozzle **60**. This stream removes dirt by suction.

In one exemplary embodiment, when the cleaning roller **26** is placed on the surface **46** to be cleaned, the suction nozzle **60** is arranged above the cleaning roller **26** in relation to the surface **46** to be cleaned.

In one exemplary embodiment, the suction nozzle **60** has a first nozzle wall **62** and a second nozzle wall **64**. Formed between these is the suction nozzle **60**, with a corresponding nozzle opening. The first nozzle wall **62** lies above the second nozzle wall **64**. The first nozzle wall **62** and/or the second nozzle wall **64** abut against the jacket **52** of the cleaning roller **26** or in particular project into it. This embodiment is described in the international patent application PCT/EP2013/076445, dated 12 Dec. 2013, of the same Applicant, which is not a prior publication. Reference is made to the content of that document in its entirety.

The cleaning head **18** has a sweeping element **66** that is associated with the cleaning roller **26**.

In a ("normal") cleaning mode, for example the surface cleaning machine **10** is pushed forwards in a forward direction **68** (compare FIG. 1). The cleaning roller **26** rotates in a clockwise direction **70**. A region of the cleaning roller **26** is moistened by the wetting device **24** before it makes contact with the surface **46** to be cleaned. This region then rotates towards the surface **46** to be cleaned. Dirt is loosened. By rotating the cleaning roller **26** on the surface **46** to be cleaned, dirt is carried along and supplied to the suction nozzle **60**. Removal by suction can take place there.

Coarse dirt which was for example not carried along directly by the cleaning roller **26** can be "collected" by the sweeping element **66** and then carried along by way of the cleaning roller **26**.

The sweeping element **66** is arranged on the cleaning roller holder **38**. The sweeping element **66** is transported in a translational movement as a result of being fixed to the cleaning roller holder **38**. The sweeping element **66** is mechanically uncoupled from rotation of the cleaning roller **26**.

In a cleaning mode, the sweeping element **66** covers a rear side of the cleaning head **18**, wherein the rear side lies behind the cleaning roller **26**, in the opposite direction to the forward direction **68**. The sweeping element **66** extends at least and in particular substantially exactly over the length of

the cleaning roller **26** along the longitudinal axis **50**. In normal operation, the sweeping element **66** abuts against the surface **46** to be cleaned.

In a normal operation, the sweeping element **66** is located between the surface **46** to be cleaned and the suction nozzle **60**.

The sweeping element **66** is held rotatably on the cleaning roller holder **38**. An axis of rotation **71** (compare for example FIG. 3) for rotatability of the sweeping element **66** on the cleaning roller holder **38** is parallel to, and in particular coaxial with, the axis of rotation **42** about which the cleaning roller **26** rotates.

The sweeping element **66** is in particular guided on a circular track.

For this purpose, the cleaning roller holder **38** is provided with a first guide device **72** for the sweeping element **66**. The first guide device **72** (FIGS. 2 to 6) is arranged on an inside **74** of the cleaning roller holder **38** that faces the cleaning roller **26**.

The sweeping element **66** is provided with a second guide device **76** that cooperates with the first guide device **72** of the cleaning roller holder **38**, for guiding the sweeping element **66** on a circular track on the cleaning roller holder **38**.

The second guide device **76** (FIG. 5) has guide elements **78a**, **78b** arranged on end sides of the sweeping element **66**. The guide elements **78a**, **78b** each have an insertion region **80**, for example in a dovetail shape.

The first guide device **72** has, associated with the guide elements **78a**, **78b**, guide tracks **82** that are in each case on end sides of the cleaning roller holder **38** and into which the respective insertion region **80** penetrates. This therefore produces a forced guidance (on a circular track) of the sweeping element **66** on the cleaning roller holder **38**.

The drive device **40** includes a transmission **84**. This in turn includes a partial region **86** (FIGS. 2 to 4) that is arranged on the cleaning roller holder **38**, facing the inside **74**. This region **86** is in this case arranged centrally between opposite end sides **88a**, **88b** of the cleaning roller holder **38**.

The cleaning roller **26** is for example made in two parts and is seated on, and driven by way of, the region **86**.

A separator **90** is seated on the cleaning roller holder **38**, on the inside **74** and centrally between the end sides **88a**, **88b**. This separator **90** serves to separate dirt and dirty fluid to left and right.

The sweeping element **66** includes a sliding region **94**. This sliding region **94** takes the form for example of a cylinder shell or part of a cylinder shell. The sliding region **94** is for example made from a metal material and for example from a metal sheet.

The sliding region **94** abuts against the inside **74** of the cleaning roller holder **38** and, when the sweeping element **66** is moved in rotation, slides thereon.

A region **96** for abutment is seated on the sliding region **94** of the sweeping element **66**. The region **96** for abutment forms an abutment lip against the surface **46** to be cleaned. The region **96** for abutment is made from a resilient material and in particular rubber material, in order to achieve an abutment that may be well adapted to the surface **46** to be cleaned.

In principle, the sliding region **94** may be made with a rigidity such that in normal mode there is no flexible deformation.

In an alternative embodiment, the sliding region **94** is made sufficiently flexible for buckling of the cleaning roller **26** away downwards (in opposition to the forward direction

68) to be possible. Buckling of this kind may result from an accumulation of dirt and may in some circumstances enhance the cleaning action.

In addition, the sweeping element 66 is supported by way of a resilient device 98 on the cleaning roller holder 38 (FIGS. 5 to 7). The resilient device 98 provides a spring force 100 that tends to press the sweeping element 66, with the region 96 for abutment, onto the surface 46 to be cleaned. This spring force 100 causes the sweeping element 66 to rotate counterclockwise in relation to the cleaning roller holder 38. The spring force 100 tends to produce a maximum (rotational) deflection of the sweeping element 66 in relation to the cleaning roller holder 38.

This maximum rotatability is limited by an abutment. In particular, an abutment of the guide elements 78a, 78b against a corresponding abutment element of the guide track 82 limits further rotatability.

For rotation of the sweeping element 66 in relation to the cleaning roller holder 38 in a clockwise direction (indicated in FIG. 9(a) by the reference numeral 104), the spring force 100 of the resilient device 98 must be overcome.

The resilient device 98 in particular takes a form such that the force G of the weight of the surface cleaning machine 10 is sufficient to overcome the spring force.

Further, the resilient device takes a form such that the sweeping element 66 does not slide below the cleaning roller 26 under the action of the spring force 100 and raise it. By an appropriate dimensioning of the resilient device 98, the possibility that the cleaning roller 26 will be raised as a result of the sweeping element 66 is thus avoided.

Changing an angular position 106 of the floor surface cleaning machine 10 (in relation to a longitudinal axis 108 of this machine) then has the effect that the sweeping element 66 is automatically brought into a correct rotary position relative to the cleaning roller holder 38. As a result, an optimum sweeping result and hence cleaning result can be achieved, regardless of the angular position 106 of the floor surface cleaning machine 10.

An angular range for the rotatability of the sweeping element 66 on the cleaning roller holder 38 on its circular track lies in the range of at least 20° and in particular at least 30° and in particular at least 40°. In one exemplary embodiment, this angular range is about 55°. A starting position (zero angle) is defined by minimum deflection. For this, an abutment 102 is arranged on the sweeping element 66 (FIG. 8). The cleaning roller holder 38 has a counter-element 103, and when the abutment 102 abuts against the counter-element 103 the starting position (0° position) prevails. Taking this position as a starting point, rotation in the above-mentioned angular range may then be made possible.

As already mentioned above, the actual angular position of the sweeping element 66 in relation to the cleaning roller holder 38 and hence the rotary angle in relation to the starting position then depends on the angular position 106 of the surface cleaning machine 10 in relation to the surface 46 to be cleaned.

The resilient device 98 includes a spring device 110 which is supported at one end 112 against the cleaning roller holder 38 and at an opposite end 114 against the sweeping element 66, in order that the corresponding spring force 100 for rotary driving of the sweeping element 66 can be exerted. (If the cleaning head 18 is seated immovably on the device body 12, the spring device 110 can also be supported against the device body 12 at the end 112.)

In one exemplary embodiment, the spring device 110 includes a first spring 116 and a second spring 118. The first spring 116 and the second spring 118 take the form for example of helical springs.

The first spring 116 and the second spring 118 are spaced in a direction between end sides of the sweeping element 66.

The first spring 116 and the second spring 118 are arranged such that a part of the drive device 40 is guided between them to the region 86.

The separator 90 lies between the first spring 116 and the second spring 118.

For fixing the spring device 110, a support element 120 is arranged on the cleaning roller holder 38, respectively associated with the first spring 116 and the second spring 118. A first housing part 122 is articulated to pivot on this support element 120 at a pivot bearing 124. A pivot axis of the pivot bearing 124 lies parallel to the axis of rotation 71 of the sweeping element 66.

The first housing part 122 takes for example a cylindrical form.

The corresponding spring 116 or 118 is supported by way of its end 112 against a base 126 of this first housing part 122, wherein this base 126 is closest to the pivot bearing 124.

Further, a second housing part 128 is provided. This second housing part 128 is pushed onto the first housing part 122 in the manner of a sleeve.

The second housing part 128 is articulated to pivot on the sweeping element 66 by way of a pivot bearing 130. A pivot axis of the pivot bearing 130 is parallel to the pivot axis of the pivot bearing 124 and hence parallel to the axis of rotation 71.

The second housing part 128 has a base 132 that is closest to the pivot bearing 130. The corresponding spring 116 or 118 is supported against the base 132 by way of the end 114.

The first housing part 122 and the second housing part 128 form a housing. The corresponding spring 116 or 118 is arranged protected in the interior thereof.

As a result of the pivotal articulation of the spring 116 and 118 respectively both on the cleaning roller holder 38 and on the sweeping element 66 by way of the first housing part 122 and the second housing part 128, the spring force 100 may be exerted in any rotary position of the sweeping element 66 in relation to the cleaning roller holder 38 on the corresponding circular track.

For cleaning a surface 46 to be cleaned (for example a floor surface), the surface cleaning machine 10 functions as follows:

The surface cleaning machine 10 is placed on the surface 46 to be cleaned by the cleaning roller 26, with a load-bearing line 47. A person operating the surface cleaning machine 10 holds it for example with one hand, by the handle 34. In so doing, the person adjusts an angular position 106 between the surface cleaning machine 10 and the surface 46 to be cleaned. This angular position 106 can be varied (compare FIG. 9(b)) in order for example to carry out cleaning under an item of furniture.

By actuating a switch, the surface cleaning machine 10 is set in operation. Here, rotation of the cleaning roller 26 about the axis of rotation 42 is actuated. This is driven by the drive device 40. Further, the suction unit 16 is actuated, and this generates a suction stream that is applied to the cleaning roller 26 at the suction nozzle 60. Further, the cleaning roller 26 is wetted by the wetting device 24.

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If for example the surface cleaning machine **10** is pushed forwards, in the forward direction **68** (FIG. 1), then the cleaning roller **26** preferably rotates in a clockwise direction **70**.

The moist cleaning roller **26** applies moisture to the surface **46** to be cleaned, and this detaches dirt. The rotation of the cleaning roller **26** on the surface **46** to be cleaned causes dirt to be carried along by the cleaning roller **26**. Removal by suction is performed at the suction nozzle **60**.

The sweeping element **66** serves to collect coarse dirt that has not (initially) been carried along by the cleaning roller **26** and to supply it to the cleaning roller **26**. This coarse dirt can then be carried along by the cleaning roller **26** and removed by suction. The sweeping element **66** abuts against the surface **46** to be cleaned by means of the sweeping edge **67**, over a load-bearing line **69**.

The region **96** for abutment abuts against the surface **46** to be cleaned and ensures that material is carried along appropriately.

According to the invention, the sweeping element **66** is held rotationally movably on the cleaning roller holder **38**. The sweeping element **66** is spring-loaded by the resilient device **98**.

This automatically ensures that the sweeping element **66** abuts with the region **96** for abutment against the surface **46** to be cleaned in all angular positions **106** of the surface cleaning machine **10** in relation to the surface **46** to be cleaned. The spring force **100** of the resilient device **98** presses this region **96** for abutment with the sweeping edge **67** against the surface **46** to be cleaned.

If the angle **106** is made smaller (compare FIG. 9(b)), then, as a result of the rotational movability of the sweeping element **66**, the latter can be entrained. When the spring force **100** is overcome, there is a movement in a clockwise direction **104**. In particular, the force **G** of the weight of the surface cleaning machine **10** is sufficient to overcome the spring force **100** accordingly. Where appropriate, a (slight) pressure by the person operating the machine can provide for the movement.

A spacing **D** between the load-bearing lines **69** and **47** (taking the form of a spacing between the points of contact of the sweeping element **66** and the cleaning roller **26** on the surface **46** to be cleaned) is minimized, regardless of the angle **106**.

This produces a substantially constant spacing (gap) between the rotating cleaning roller **26** and the sweeping element **66**, and in particular between the region **96** for abutment, where there is abutment against the surface **46** to be cleaned, and a load-bearing region of the cleaning roller **26** on the surface **46** to be cleaned. There is no skewing. The sweeping element **66**, with a sweeping edge, provides for sweeping up coarse dirt, and guiding away by way of the cleaning roller **26** is ensured at any angular position **106**.

The variability of the angular position **106** has the effect of ensuring a constant spacing, because of the rotational movability of the sweeping element **66** on the cleaning roller holder **38**. A region between the sweeping element **66** and the cleaning roller **26** forms a suction duct **134** that is fluidically connected to the suction nozzle **60**. As a result of the rotational movability of the sweeping element **66**, the length of an arc between the surface **46** to be cleaned and a projection of a nozzle of the duct **132** onto the surface **46** to be cleaned is bridged in a variable manner, and the corresponding spacing is kept substantially the same, regardless of the angular position **126**.

Regardless of the angular position **106** of the surface cleaning machine **10**, coarse dirt that accumulates at the

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sweeping element **66** can be swept up and guided away with the aid of the cleaning roller **26**.

By means of its spring force **100**, the resilient device **98** restores the sweeping element **66** if for example the angle for an angular position **106** is made larger (change-over from the position in FIG. 9(b) to the position in FIG. 9(a)).

As already mentioned above, in principle the sliding region **94** of the sweeping element **66** may have a rigid construction. In the case of a flexible construction, buckling away from the cleaning roller **26** may be allowed. In a corresponding buckling region, it is then possible to accumulate coarse dirt in particular during lowering (as the angle for the angular position **106** is made smaller). When the surface cleaning machine **10** is raised (as the angle for the angular position **106** is made larger), this accumulated coarse dirt can then be transported away.

In an alternative embodiment which is shown schematically in FIG. 10, the cleaning head is in principle of the same construction as that described above. For like elements, like reference numerals are used. This exemplary embodiment differs in the construction of the resilient device. In this case, a resilient device **134** is provided. The resilient device **134** includes torsion springs **136** that are arranged on each end side of the corresponding sweeping element **66**. A torsion spring **136** is in this case supported against the sweeping element **66**. Further, a torsion spring **136** is supported against an element **138** that is part of the cleaning roller holder **38** or is fixedly connected thereto. This element **138** is arranged in an interior **140** of the cleaning roller holder **38**. The cleaning roller **26** is also located in this interior **140**.

The element **138** is for example a rod that lies coaxially with the cleaning roller **26** and lies for example in an interior of the cleaning roller **36**. Here, the cleaning roller **36** in particular takes the form of a hollow roller.

In a further exemplary embodiment (FIG. 11), a resilient device **142** is provided that has a rubber spring **144** for generating the spring force **100**. This rubber spring **144** is in turn supported against the cleaning roller holder **38** and the sweeping element **66**.

LIST OF REFERENCE NUMERALS

- 10** Surface cleaning machine
- 12** Device body
- 14** Housing
- 16** Suction unit
- 18** Cleaning head
- 20** Separating device
- 22** Reservoir device
- 24** Wetting device
- 26** Cleaning roller
- 28** Reservoir device
- 30** Holder
- 32** Holding rod
- 34** Handle
- 36** Winding device
- 38** Cleaning roller holder
- 40** Drive device
- 42** Axis of rotation
- 44** Pivot axis
- 46** Surface to be cleaned
- 47** Load-bearing line
- 44** Pivot axis
- 50** Longitudinal axis
- 52** Jacket
- 54** Connection piece
- 56** Line

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58 Connector
 60 Suction nozzle
 62 First nozzle wall
 64 Second nozzle wall
 66 Sweeping element
 67 Sweeping edge
 68 Forward direction
 69 Load-bearing line
 70 Clockwise direction
 71 Axis of rotation
 72 First guide device
 74 Inside
 76 Second guide device
 78a, b Guide element
 80 Insertion region
 82 Guide track
 84 Transmission
 86 Region
 88a, b End side
 90 Separator
 92 Sliding surface
 94 Sliding region
 96 Region for abutment
 98 Resilient device
 100 Spring force
 102 Abutment
 103 Counter-element
 104 Clockwise direction
 106 Angular position
 108 Longitudinal axis
 110 Spring device
 112 End
 114 End
 116 First spring
 118 Second spring
 120 Support element
 122 First housing part
 124 Pivot bearing
 126 Base
 128 Second housing part
 130 Pivot bearing
 132 Duct
 134 Resilient device
 136 Torsion spring
 138 Element
 140 Interior
 142 Resilient device
 144 Rubber spring

The invention claimed is:

1. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and
 a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder;

wherein, in a cleaning mode, the surface cleaning machine is placed or supported on a surface to be cleaned solely by way of the cleaning roller;

wherein the sweeping element is arranged to be movably rotatable on the cleaning roller holder such that, in any angular position relative to the surface to be cleaned within an operating range of the surface cleaning machine, a spacing between the sweeping element and the cleaning roller is at least proximately constant.

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2. The surface cleaning machine according to claim 1, wherein an axis of rotation of the sweeping element is oriented at least approximately parallel to, and in particular coaxial with, an axis of rotation of the cleaning roller.

3. The surface cleaning machine according to claim 1, comprising a resilient device that acts with a spring force on the sweeping element, wherein the spring force presses the sweeping element against a surface to be cleaned when the cleaning roller is placed on the surface to be cleaned.

4. The surface cleaning machine according to claim 3, wherein the resilient device is dimensioned such that the sweeping element is rotatably movable in opposition to the spring force as a result of the force of the weight of the surface cleaning machine.

5. The surface cleaning machine according to claim 3, wherein the resilient device is dimensioned such that the sweeping element is not pushed under the at least one cleaning roller by the action of the spring force.

6. The surface cleaning machine according to claim 3, wherein the resilient device is supported on the sweeping element and on the cleaning roller holder, or a device connected to the cleaning roller holder, and is in particular articulated thereto.

7. The surface cleaning machine according to claim 3, wherein the resilient device has at least one helical spring or torsion spring or rubber spring or pneumatic spring.

8. The surface cleaning machine according to claim 3, wherein the resilient device includes at least a first spring and a second spring which are spaced from one another, and wherein the drive device is at least partly located between the first spring and the second spring.

9. The surface cleaning machine according to claim 3, wherein a direction of rotation of the sweeping element in opposition to the spring force is clockwise, and in particular a direction of rotation of the sweeping element when it is moved by the spring force is counterclockwise.

10. The surface cleaning machine according to claim 1, comprising a suction device having a suction unit and at least one suction nozzle which is fluidically connected to the suction unit and is directed towards the cleaning roller for the removal of fluid at the cleaning roller by suction.

11. The surface cleaning machine according to claim 10, wherein, in a cleaning mode, the sweeping element is located between a surface to be cleaned, towards which the cleaning roller is directed, and the at least one suction nozzle.

12. The surface cleaning machine according to claim 1, wherein a spacing between the sweeping element and a contact region of the cleaning roller on the surface to be cleaned is at least approximately constant.

13. The surface cleaning machine according to claim 1, wherein, in a cleaning mode with the surface cleaning machine being pushed forwards, a direction of rotation of the cleaning roller is clockwise.

14. A surface cleaning machine according to claim 1, wherein an angular range for the rotatability of the sweeping element on the cleaning roller holder comprises at least 20° in relation to a starting position, wherein in the starting position the sweeping element is deflected to a minimal extent in relation to the cleaning roller holder.

15. The surface cleaning machine according to claim 1, wherein the sweeping element has a sliding region for sliding on the cleaning roller holder.

16. The surface cleaning machine according to claim 15, wherein the sliding region takes the form of a cylinder shell or part of a cylinder shell.

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17. The surface cleaning machine according to claim 15, wherein the cleaning roller holder has an inside that faces the cleaning roller and on which the sliding region of the sweeping element is slidable.

18. The surface cleaning machine according to claim 15, wherein the sliding region has a rigid construction.

19. The surface cleaning machine according to claim 15, wherein the sliding region is of a sufficiently flexible construction for it to be bucklable away from the cleaning roller as a result of accumulations of dirt.

20. The surface cleaning machine according to claim 1, wherein the sweeping element has a region for abutment against a surface to be cleaned that is arranged in particular on a sliding region of the sweeping element.

21. The surface cleaning machine according to claim 1, wherein there is arranged on the cleaning roller holder a first guide device and on the sweeping element a second guide device that cooperates with the first guide device for the purpose of rotatable guidance of the sweeping element on the cleaning roller holder.

22. The surface cleaning machine according to claim 21, wherein the second guide device has guide elements that are arranged on end sides of the sweeping element and cooperate with counter-guiding elements of the first guide device that are arranged on end sides of the cleaning roller holder, and wherein at least one of the first guide device and the second guide device provides a guide track.

23. The surface cleaning machine according to claim 1, wherein the sweeping element is guided on a circular track on the cleaning roller holder.

24. The surface cleaning machine according to claim 1, wherein when the surface cleaning machine having a cleaning roller placed on a surface to be cleaned is pushed in a forward direction, the sweeping element, remote from the forward direction, covers the cleaning roller to the rear and lies on the surface to be cleaned at least over a length of the cleaning roller.

25. The surface cleaning machine according to claim 1, comprising a wetting device for the cleaning roller.

26. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller;

wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

wherein an axis of rotation of the sweeping element is oriented at least approximately parallel to an axis of rotation of the cleaning roller.

27. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller;

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; and

a resilient device that acts with a spring force on the sweeping element, wherein the spring force presses the sweeping element against a surface to be cleaned when the cleaning roller is placed on the surface to be cleaned,

wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

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wherein the resilient device includes at least a first spring and a second spring which are spaced from one another, and wherein the drive device is at least partly located between the first spring and the second spring.

28. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

wherein an angular range for the rotatability of the sweeping element on the cleaning roller holder comprises at least 20° in relation to a starting position, wherein in the starting position the sweeping element is deflected to a minimal extent in relation to the cleaning roller holder.

29. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

wherein the sweeping element has a sliding region for sliding on the cleaning roller holder.

30. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

wherein the sweeping element has a region for abutment against a surface to be cleaned that is arranged in particular on a sliding region of the sweeping element.

31. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

wherein there is arranged on the cleaning roller holder a first guide device and on the sweeping element a second guide device that cooperates with the first guide device for the purpose of rotatable guidance of the sweeping element on the cleaning roller holder.

32. A surface cleaning machine, comprising:

a cleaning roller holder;

a cleaning roller that is arranged on the cleaning roller holder;

a drive device for rotary driving of the cleaning roller; and

a sweeping element that is associated with the cleaning roller and supplies swept material to the cleaning roller; wherein the sweeping element is arranged rotatably on the cleaning roller holder, and

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wherein the sweeping element is guided on a circular
track on the cleaning roller holder.

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