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(54) Title: A NOZZLE FOR A VACUUM CLEANER

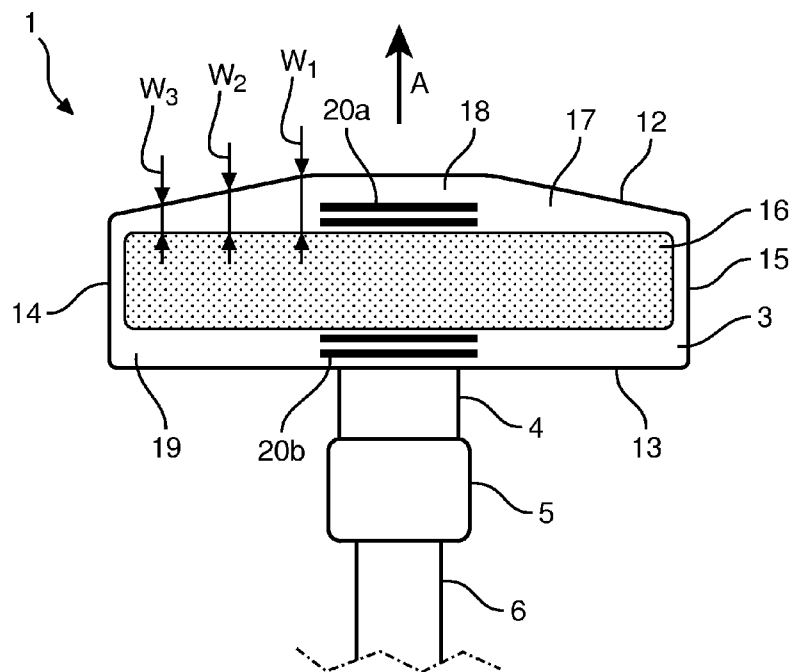


FIG. 2

[Continued on next page]



MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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(57) Abstract: The present application relates to a nozzle (1) for a vacuum cleaner having side edges, a leading edge extending between the side edges and a slot adjacent to said leading edge and having a length that extends between the side edges and through which debris is sucked from a surface being vacuumed. The leading edge is shaped so that a distance between the leading edge and the slot reduces from a point between the side edges toward each side edge for the entire length, or substantially the entire length, of the slot.

A nozzle for a vacuum cleaner

FIELD OF THE INVENTION

The present invention relates to a nozzle for a vacuum cleaner and to a vacuum cleaner comprising the nozzle of the invention.

5 BACKGROUND OF THE INVENTION

Vacuum cleaners clean surfaces using suction to collect dust and debris. A common type of vacuum cleaner generally comprises a motor that drives a fan to generate an air flow, and a collection vessel. A conduit fluidly communicates the collection vessel with a nozzle. A conventional nozzle is disclosed in CA2087456 and comprises a body portion with
10 a soleplate that contacts and slides over a surface to be cleaned. A slot extends through the soleplate such that, when the vacuum cleaner is in use and the nozzle is passed over a surface to be cleaned, dirt and debris is lifted from the surface by suction through the slot and travels along the conduit and into the collection vessel.

15 SUMMARY OF THE INVENTION

The present invention provides a nozzle for a vacuum cleaner having side edges and a front, the front being defined by a leading edge that extends between and protrudes beyond the side edges and a slot adjacent to said leading edge and having a length that extends between the side edges and through which debris is sucked from a surface being
20 vacuumed, wherein the leading edge is shaped so that a distance between the leading edge and the slot reduces from a point between the side edges toward each side edge for the entire length, or substantially the entire length, of the slot. As the distance between the slot and the leading edge is at a minimum towards the side edges, the suction slot may be positioned closer to the edge of an obstacle around which the vacuum cleaner is being used.

25 Preferably, said point is midway between said side edges. This means that the distance between each side edge and the leading edge is at a minimum and so a user can position either side edge adjacent to an obstacle.

In some embodiments, the rate at which the distance reduces is constant. However, it will be appreciated that a constant rate of decrease is not essential and the rate at which the distance changes may vary.

The slot may comprise at least one substantially linear section extending
5 between the side edges. In this case, the or each substantially linear section may extend transversely in a direction across the width of the nozzle between said side edges. As the slot extends transversely, cleaning performance may be optimized by maintaining the direction of nozzle travel generally perpendicular to the direction in which the slot extends such that any tilting of the nozzle during vacuuming does not reduce the effectiveness of the suction along
10 the length of the slot.

The substantially linear section may comprise a mid-section and two end sections, each end section extending from a respective end of the mid-section.

Preferably, the mid-section and each end section extend parallel to each other and the mid-section may be joined to each end section by an arcuate region to form a
15 continuous slot.

In some embodiments, at least a portion of the leading edge may be arcuate in shape. Alternatively, the leading edge is substantially V-shaped or have a truncated chevron shaped profile. These profiles may provide alternative leading edge profiles to facilitate movement of the nozzle along obstacle edges and around corners.

20 Preferably, the nozzle comprises a body and a soleplate and the slot is provided in the soleplate. The leading edge may then be formed on the body. This may optimize a seal with the surface being cleaned around the slot and thereby minimize leakage of atmospheric air into the slot to maintain the pressure differential between the nozzle slot and atmosphere and, therefore, maximizes the suction force and debris pick up performance.

25 The soleplate may be received in or on the body. Alternatively, the soleplate is integrally formed with the body. The soleplate may be a separate component to the nozzle body secured thereto with suitable fastening means such as adhesive or screws. This may enable the soleplate and nozzle body to be made separately and/or of different materials. Alternatively, the soleplate may be integrally formed with the body which may enable
30 cheaper and/or simpler manufacture.

According to another aspect, there is also provided a vacuum cleaner comprising a nozzle according to the invention.

It has been found that a straight linear slot or a slot formed from linear sections or substantially linear sections is desirable rather than other shaped slots, such as, for

example, curved, 'V'-shaped or cross-shaped, as a linear slot maintains a good line contact with the carpet, even as the user tilts or moves the nozzle, resulting in a good seal between the carpet and the area of the soleplate that surrounds the slot. A good seal reduces the leakage of atmospheric air into the slot and so maintains the pressure differential between the nozzle slot and atmosphere and, therefore, maximizes the suction force and debris pick up performance. However, a nozzle with a straight slot can be difficult to position to clean dirt and debris from areas of surfaces that are adjacent to obstacles, for example, next to a skirting board, wall or in a corner, as the area of soleplate surrounding the slot can make it difficult to get the slot close to said obstacles, resulting in a surface being unsatisfactorily cleaned near to the obstacles edges.

It should be appreciated that the slot can be straight for its entire length, i.e. the front edge of the slot may form a straight line. However, it is envisaged that good line contact with the carpet can still be maintained with small deviations away from being exactly straight and so slots that deviate away from being strictly linear, whilst still maintaining effective contact with the carpet are still considered to fall within the scope of the present invention. Hence, a slot which has a small degree of curvature but which still maintains good line contact with the carpet when the nozzle is tilted is still considered to fall within the scope of this invention.

It is also envisaged that the slot could be formed from sections, each section being in itself linear and extending parallel to the other sections. One or more sections could be spaced at a different distance from the leading edge of the nozzle than the other sections. The sections may be joined to each other, such as by non-linear curved regions, to form one continuous slot that is substantially linear, except for at the non-linear curved regions. The leading edge of the nozzle may then be shaped so that a distance between at least one section of the slot and the leading edge varies in a direction along the length of that section. These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows a perspective view of a vacuum cleaner nozzle of a first embodiment of the invention;

Figure 2 shows a view of the underside of the vacuum cleaner nozzle shown in Figure 1;

Figure 3 shows a view of the underside of a vacuum cleaner nozzle of a second embodiment of the invention;

5 Figure 4 shows a view of the underside of a vacuum cleaner nozzle of a third embodiment of the invention;

Figure 5 shows a view of the underside of a vacuum cleaner nozzle of a fourth embodiment of the invention;

10 Figure 6 shows a view of the underside of a vacuum cleaner nozzle of a fifth embodiment of the invention;

Figure 7 shows a view of the underside of a vacuum cleaner nozzle of a sixth embodiment of the invention;

Figure 8 shows a view of the underside of a vacuum cleaner nozzle of a seventh embodiment of the invention; and

15 Figure 9 shows a view of the underside of a vacuum cleaner nozzle of an eighth embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring now to Figures 1 and 2, a vacuum cleaner nozzle 1 of a first
20 embodiment of the present invention is shown. The nozzle comprises a body 2 and a soleplate 3. The soleplate 3 is integrally formed with the body 2, and forms a flat surface that, in use, contacts and passes over a surface to be cleaned, such as a carpet.

A duct 4 extends from the body and is in fluid communication with a port 5.
A rigid tubular conduit 6 extends from the port 5 and may be connected to a flexible hose
25 (not shown) of a vacuum cleaner.

The nozzle 1 comprises a front defined by a leading edge 12, a rear edge 13 and two sides 14, 15. The leading edge 12 is the edge of the body 2 or soleplate 3 that is furthest from the port 5/ conduit 6, and which is normally forward-facing when the user pushes the nozzle 1 in a direction away from them (as shown by arrow 'A' in Figure 2). As
30 will become apparent, the leading edge 12 is shaped so that it protrudes forwardly of the nozzle beyond the side edges, i.e. in the direction in which it would normally be pushed away from a user.

A linear slot 16 is formed in the soleplate 3 and is fluidly communicated with the duct 4 and port 5 through the body 2 of the nozzle 1. The slot 16 extends in a straight line

in a direction perpendicular to the forward direction A of the nozzle 1. This straight slot 16 configuration has the benefit of providing a good line contact with the carpet, as described above, even in a case when the user tilts or moves the nozzle 1. In other embodiments, the slot may include extensions 70 (see Figure 8) at each end that overlap each side 14, 15 of the nozzle. These extensions may be narrower or be smaller in width than the remainder of the slot. The extensions enable the slot to be placed very close to skirting boards or furniture to pick up trapped debris in these areas. Although the extensions 70 are only shown in Figure 8, it will be appreciated that the extensions may be formed with the slots according to any of the embodiments of the invention.

Although the slot illustrated in Figures 1 to 7 is straight, it is also envisaged that the slot could be formed from a number of parallel, straight sections. For example, as shown in Figure 8, the slot may have a central section 71a offset from end sections 71b, 71c so that the central section 71a is closer to the leading edge than the edge sections 71b, 71c. In this case, the sections may be joined to each other, such as by non-linear curved regions 72, to form one continuous slot that is linear, except for at the non-linear curved regions 72. The leading edge of the nozzle may then be shaped so that a distance between the at least one section 71a, 71b, 71c of the slot and the leading edge 22 varies along the length of that section 71a, 71b, 71c of the slot. In the drawing of Figure 8, the leading edge is shaped so the distance decreases from a mid-point between the sides 14, 15 all the way to each side 14, 15, although it will be appreciated that the leading edge may take different forms, as described with reference to the other embodiments.

In another embodiment, illustrated in Figure 9, the slot 80 may take the form of a shallow curve. This form of slot still exhibits the advantages of having a straight or substantially linear slot in that it good line contact with the surface being cleaned is maintained even when the nozzle is tilted. However, it is preferable if the slot is only slightly curved so that it approximates a linear or substantially linear slot.

The area of the soleplate 3 between the slot 16 and the leading edge 12 comprises a leading soleplate surface 17. A central portion of the leading soleplate surface 17 has a constant width W1 and forms a soleplate guide section 18. In an alternate embodiment (not shown), however, the soleplate guide section 18 may be offset from the centre of the soleplate front 17. The guide section 18 acts as a support surface against the carpet and is configured to allow the nozzle 1 to glide over the carpet surface when the nozzle 1 is moved by the user and prevent the nozzle 1 from snagging or sucking itself into the carpet, which

would require a user to exert an unacceptably large force to move the nozzle 1 over the carpet.

The width of the leading soleplate surface 17, i.e. the distance between the slot 16 and the leading edge 12, decreases from the soleplate guide section 18 towards the nozzle sides 14, 15, as shown in Figure 2 by $W_1 > W_2 > W_3$. The reduced width of the leading soleplate surface 17 towards the nozzle sides 14, 15 allows the user to position the slot 16 closer to obstacles such as walls or skirting boards, allowing for dust and debris to be collected that have accumulated on the carpet closer to said obstacles than would be possible if the leading soleplate surface 17 was of a constant width from the guide section 18 to the nozzle sides 14, 15. It should be noted that it would not be a feasible alternative to reduce the width of the leading soleplate surface 17 across the entire width of the nozzle 1, as the enlarged section of the leading soleplate surface 17 that forms the guide section 18 is required to help the nozzle 1 glide over the carpet surface, as described above. It has been found that the minimum distance $W_{\min}$ should be not be less than 5mm, as the nozzle tends to dig into the surface, such as a carpet, at distances below this value.

The area of the soleplate 3 between the slot 16 and the rear edge 13 comprises a trailing soleplate surface 19. The trailing soleplate surface 19 has a uniform width across its entire length, between both of the nozzle sides 14, 15. A thread lifting strip 20a is provided on a portion of the guide section 18 and a thread lifting strip 20b on a portion of the trailing soleplate surface 19, to dislodge debris and hair/threads, respectively, from the carpet so that it may be sucked through the slot 16 and into the collection vessel of the vacuum cleaner.

The soleplate 3 may be received on the body 2 or in a recess in the body 2, and secured thereto with appropriate known fastening means. Alternatively, the soleplate 3 may be integrally formed with the body 2 of the nozzle.

A vacuum cleaner nozzle 21 according to a second embodiment is shown in Figure 3. As with the first embodiment, the nozzle 21 comprises a leading edge 22 and a soleplate 23 that comprises a slot 16. A leading soleplate surface 27 is formed between the slot 16 and the leading edge 22. The difference between the first and second embodiments is that the soleplate front 27 does not have a portion of constant width. Instead, the width of the leading soleplate surface 27 decreases from a mid-point of the nozzle 21 towards each nozzle side 14, 15. The leading edge 22 therefore has a chevron-shaped profile and comprises two straight lines that extend from opposing nozzle sides 14, 15 and meet at an apex midway between the nozzle sides 14, 15, and a section of the leading soleplate surface 27, adjacent to where the two straight lines meet, forms the guide section 28.

As with the first embodiment, the reduced leading soleplate surface 27 width, and therefore the reduced distance between the slot 16 and the leading edge 22, towards the nozzle sides 14, 15 allows for the user to position the slot 16 closer to obstacles, allowing for more dust and debris to be collected that have accumulated on the carpet in a closer proximity to such obstacles.

In an alternative embodiment (not shown), the width of the leading soleplate surface 27 may decrease from a point offset from the centre of the leading soleplate surface 27 towards each nozzle side 14, 15. In this embodiment, the area of the leading soleplate surface 27 of increased width, at the point offset from the centre, comprises the soleplate guide section 28, having a relatively large surface area that contacts the carpet to prevent the nozzle 21 snagging on or being sucked into the carpet.

A vacuum cleaner nozzle 31 according to a third embodiment of the invention is shown in Figure 4. As with the embodiments described previously, the nozzle 31 comprises a leading edge 32 and a soleplate 33 that comprises a slot 16. A leading soleplate surface 37 is formed between the leading edge 32 and the slot 16. In this embodiment, the leading edge 32 has an arcuate profile, so that the soleplate front 37 width reduces towards each of the nozzle sides 14, 15 in a curved, gradual, or non-linear manner. The third embodiment of the invention provides the same benefits as the first and second embodiments afforded by having a reduced soleplate 33 width towards the nozzle sides 14, 15 that allows for the slot 16 to be positioned close to obstacles so that dust and debris may be collected closer to the obstacles. The widest section of the leading soleplate surface 37 may be formed at the centre of the leading soleplate surface 37 or may be offset from the centre of the leading soleplate surface 37.

A vacuum cleaner nozzle 41 of a fourth embodiment of the invention is shown in Figure 5. As with the embodiments described previously, the nozzle 41 comprises a leading edge 42 and a soleplate 43 that comprises a slot 16. A leading soleplate surface 47 is formed between the slot 16 and the leading edge 42. In this embodiment, the width of the leading soleplate surface 47 only decreases from the centre of the soleplate 43 to one of the nozzle sides 14, with the width of the leading soleplate surface 47 remaining constant from the centre of the soleplate 43 towards the other of the soleplate sides 15 to form a soleplate guide section 48. To collect the most dust and debris that have accumulated on the carpet near to an obstacle, the user must orientate the nozzle 41 so that the portion of the soleplate front 47 that is of reduced width is positioned adjacent to the obstacle.

Although in the above described embodiment the width of the soleplate front 47 decreases from the centre of the leading soleplate surface 47, in an alternate embodiment (not shown), the width of the leading soleplate surface 47 may reduce from a point offset from the centre of the leading soleplate surface 47.

5 A vacuum cleaner nozzle 51 of a fifth embodiment of the invention is shown in Figure 6. As with the embodiments described previously, the nozzle 51 comprises a leading edge 52 and a soleplate 53 having a slot 16. A leading soleplate surface 57 is formed between the slot 16 and the leading edge 52. In this embodiment, the width of the soleplate front 57 decreases from one side 15 of the soleplate to the other nozzle side 14. The side of
10 the leading soleplate surface 57 that is of increased width comprises a guide section 58, required to help the nozzle 51 glide over the carpet, and the other side of the leading soleplate surface 57 that is of decreased width may be positioned adjacent to obstacles, so that the slot 16 is positioned close to the obstacles to collect dust and debris accumulated on the carpet close to the edges of the obstacle.

15 A vacuum cleaner nozzle 61 of a sixth embodiment of the invention is shown in Figure 7. In this embodiment, the nozzle 61 comprises a soleplate 63 having a slot 16. The nozzle 61 comprises a leading edge 62 that is formed on the edge of the body 2 and the soleplate 63 does not extend up to the leading edge of the nozzle 61 but has its own leading edge 69 which is parallel with the slot 16. The area of the underside of the body 2 between
20 the nozzle leading edge 62 and the soleplate leading edge 69 comprises a body leading surface or region 67. A section of the body leading surface 67 forms a body guide section 68. The surface area and/or width of the body guide section 68 is configured to allow the nozzle 61 to glide over the carpet surface when the nozzle 61 is moved by the user and prevent the nozzle 61 from snagging or sucking itself into the carpet, which would require a user to exert
25 an unacceptably large force to move the nozzle 61 over the carpet.

The width of the body leading surface 67 decreases from the body guide section 68 towards the nozzle sides 14, 15. The reduced width of the body front portion 67 towards the nozzle sides 14, 15 allows the user to position the slot 16 closer to obstacles so that dust and debris may be collected that have accumulated on the carpet near to those
30 obstacles.

In this embodiment it is not necessary for the distance between the slot 16 and the leading edge 69 of the soleplate 63 to decrease towards the nozzle sides 14, 15, as the leading edge 69 of the soleplate 63 does not extend to or past the leading edge 62 of the body 2 and, therefore, will not come into contact with obstacles and so does not prevent the slot 16

from being positioned close to said obstacles. Therefore, the soleplate 63 may have, for example, a rectangular profile as shown in Figure 7. In an alternative embodiment however (not shown), the shape of the soleplate leading edge 69 may correspond to the shape of the leading edge of the body 62.

5 The soleplate 63 may be received in a recess in the body 2 or received on the underside surface of the body 2 and attached thereto by appropriate fastening means. Alternatively, the soleplate 63 may be integrally formed with the body 2.

10 Although in the above described embodiments the nozzle rear edge 13 extends in a straight line parallel to the longitudinal direction of the slot 16, in alternate embodiments (not shown), the distance between the nozzle rear edge 13 and the slot 16 may also decrease, or increase, from the centre to the nozzle sides 14, 15. This alternate configuration would further facilitate in the user being able to position the slot 16 close to obstacles to improve debris pick up. The nozzle rear edge 13 may be the same shape as any of the previously described leading edges 12, 22, 32, 42, 52, 62.

15 It should be appreciated that other shapes of leading edge that have not been described herein are intended to fall within the scope of the claims, providing that the distance between the leading edge and the slot varies along the length of the slot to provide the advantages described above of being able to position the slot closer to obstacles to suck up dust closer thereto.

20 Although in the above described embodiments the thread lifting strip 20a only extends over a section of the length of the soleplate front, in an alternate embodiment (not shown) the thread lifting strip 20a extends over the entire soleplate front. In yet another embodiment (not shown), the thread lifting strip may be omitted from the soleplate front. Similarly, the thread lifting strip 20b may extend across the full width of the rear of the
25 soleplate.

It will be appreciated the nozzle for a vacuum cleaner is suitable for the removal of dust, dirt, residue, debris, other solids and liquids, and is compatible for use with both ‘canister’ and ‘upright’ type vacuum cleaners, and other suction generating devices.

30 It will be appreciated that the term “comprising” does not exclude other elements or steps and that 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 an advantage. Any reference signs in the claims should not be construed as limiting the scope of the claims.

Although claims have been formulated in this application to particular combinations of features, it should be understood that the scope of the disclosure of the present invention also includes any novel features or any novel combinations of features disclosed herein either explicitly or implicitly or any generalization thereof, whether or not it
5 relates to the same invention as presently claimed in any claim and whether or not it mitigates any or all of the same technical problems as does the parent invention. The applicants hereby give notice that new claims may be formulated to such features and/or combinations of features during the prosecution of the present application or of any further application derived therefrom.

CLAIMS:

1. A nozzle for a vacuum cleaner having side edges and a front, the front being defined by a leading edge (12, 22, 32, 42, 52, 62) that extends between and protrudes beyond the side edges and a slot (16) adjacent to said leading edge and having a length that extends between the side edges and through which debris is sucked from a surface being vacuumed,
5 wherein the leading edge is shaped so that a distance between the leading edge and the slot reduces from a point between the side edges toward each side edge for the entire length, or substantially the entire length, of the slot.
2. A nozzle according to claim 1, wherein said point is midway between said side
10 edges.
3. A nozzle according to claim 1 or claim 2, wherein the rate at which the distance reduces is constant.
- 15 4. A nozzle according to any preceding claim, wherein the slot comprises at least one substantially linear section extending between the side edges.
5. A nozzle according to claim 4, wherein the or each substantially linear section extends transversely in a direction across the width of the nozzle between said side edges.
20
6. A nozzle according to claim 4 or 5, wherein the at least one substantially linear section comprises a mid-section and two end sections, each end section extending from a respective end of the mid-section.
- 25 7. A nozzle according to claim 6, wherein the mid-section and each end section extend parallel to each other.
8. A nozzle according to claim 7, wherein the mid-section is joined to each end section by an arcuate region to form a continuous slot.

9. A nozzle according to any preceding claim, wherein at least a portion of the leading edge (32) is arcuate in shape.

5 10. A nozzle according to any preceding claim, wherein the leading edge (22) is substantially V-shaped.

11. A nozzle according to any preceding claim, comprising a body (2) and a soleplate (3, 23, 33, 43, 53, 63), wherein the slot (16) is provided in the soleplate.

10

12. A nozzle according to claim 11, wherein the leading edge (12, 22, 32, 42, 52, 62) is formed on the body (2).

13. A nozzle according to claim 11 or 12, wherein the soleplate (3, 23, 33, 43, 53, 63) is received in or on the body (2).

15

14. A nozzle according to claim 11 or claim 12, wherein the soleplate (3, 23, 33, 43, 53, 63) is integrally formed with the body (2).

20 15. A vacuum cleaner comprising a nozzle (1, 21, 31, 41, 51, 61) according to any of claims 1 – 14.

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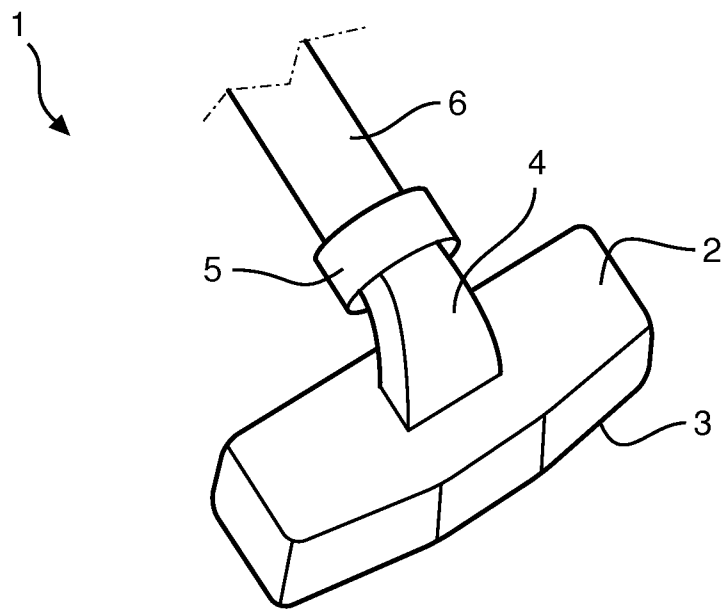


FIG. 1

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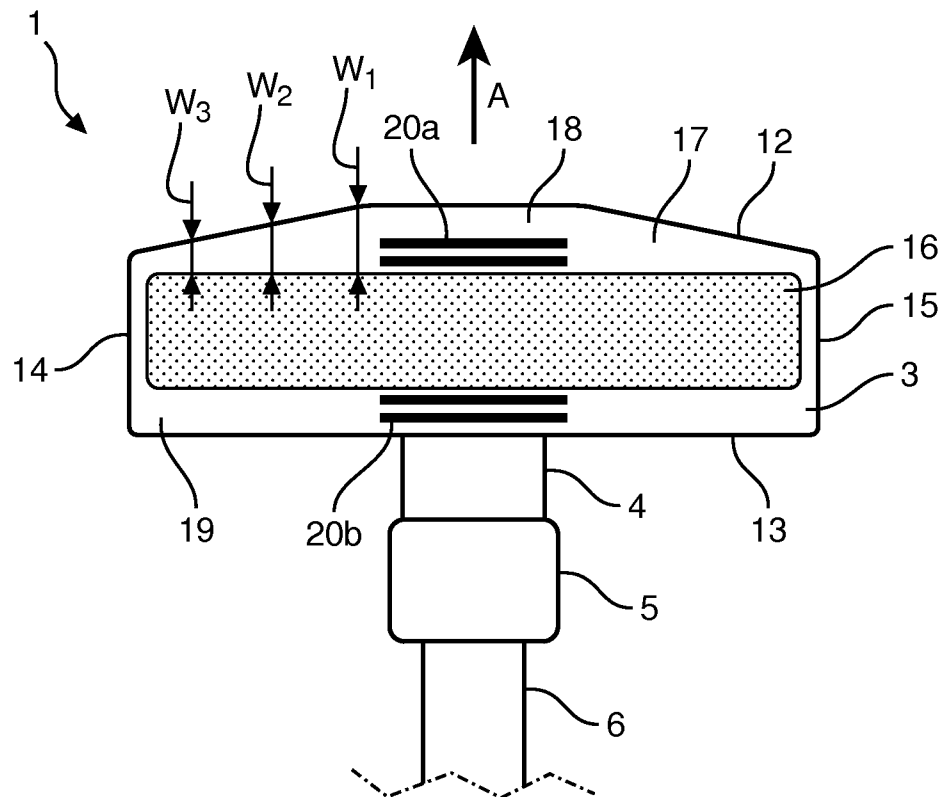


FIG. 2

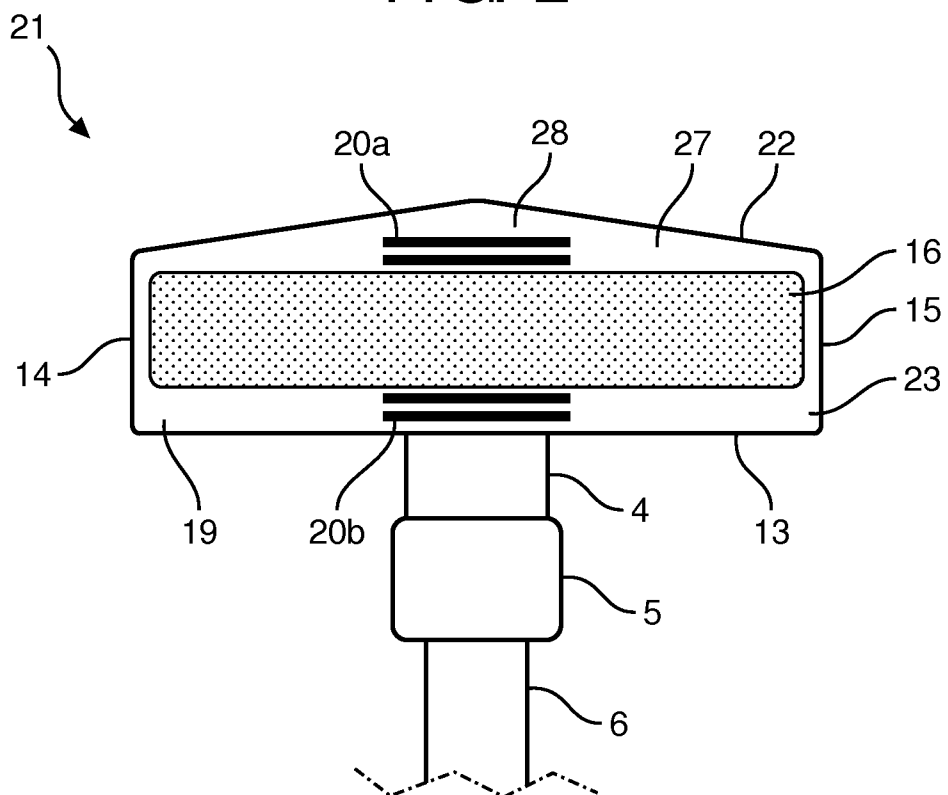


FIG. 3

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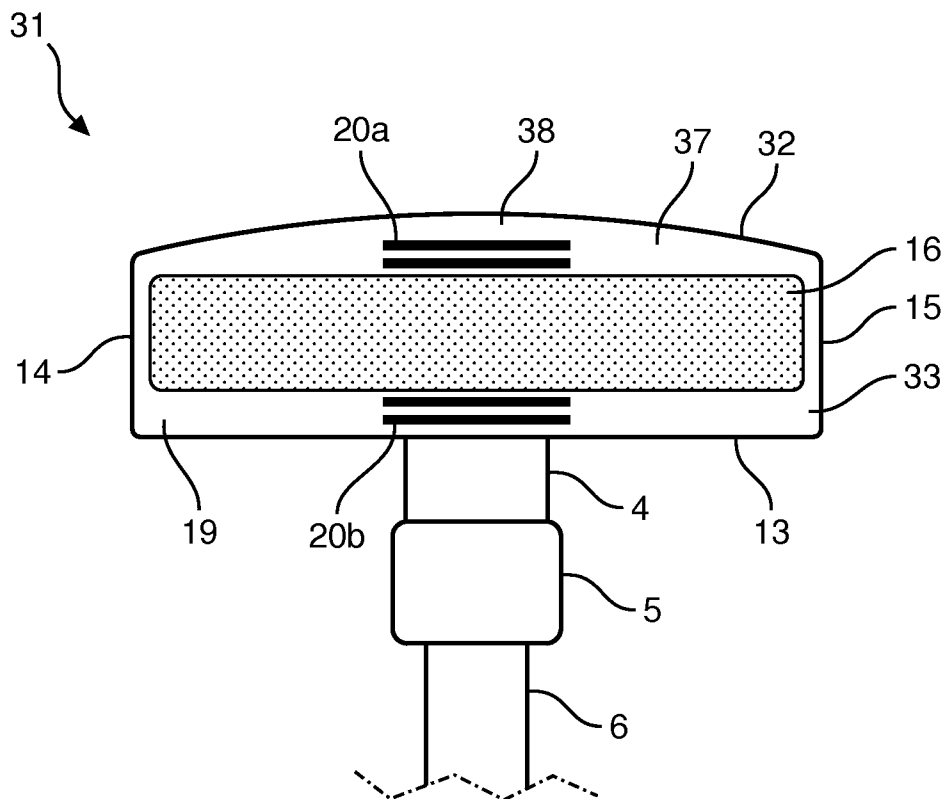


FIG. 4

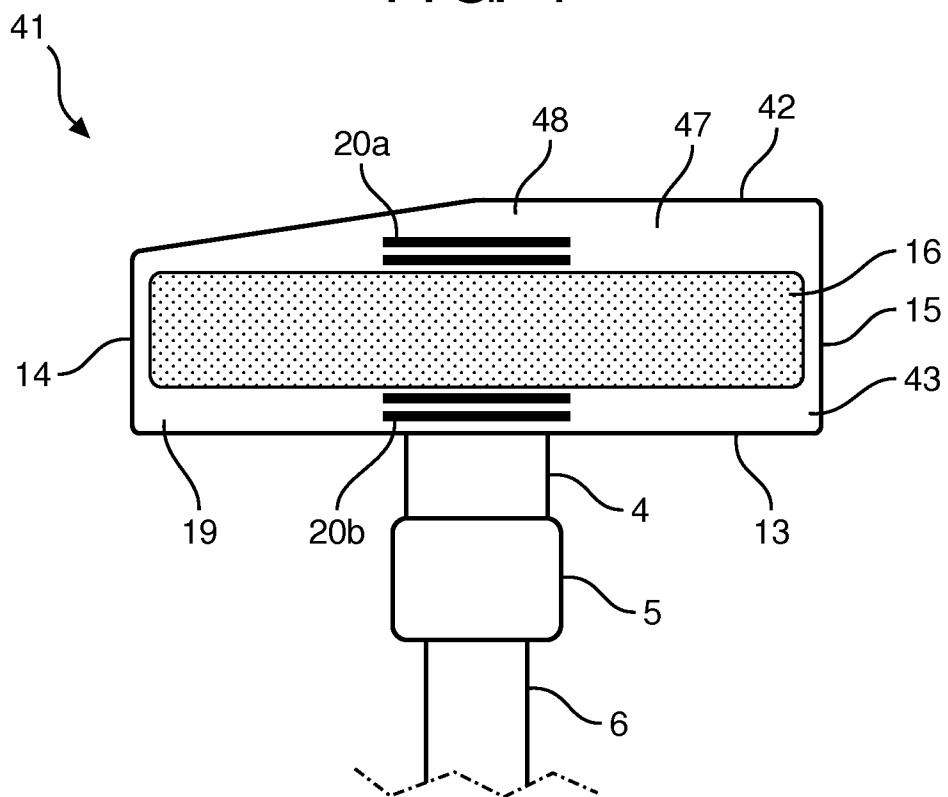


FIG. 5

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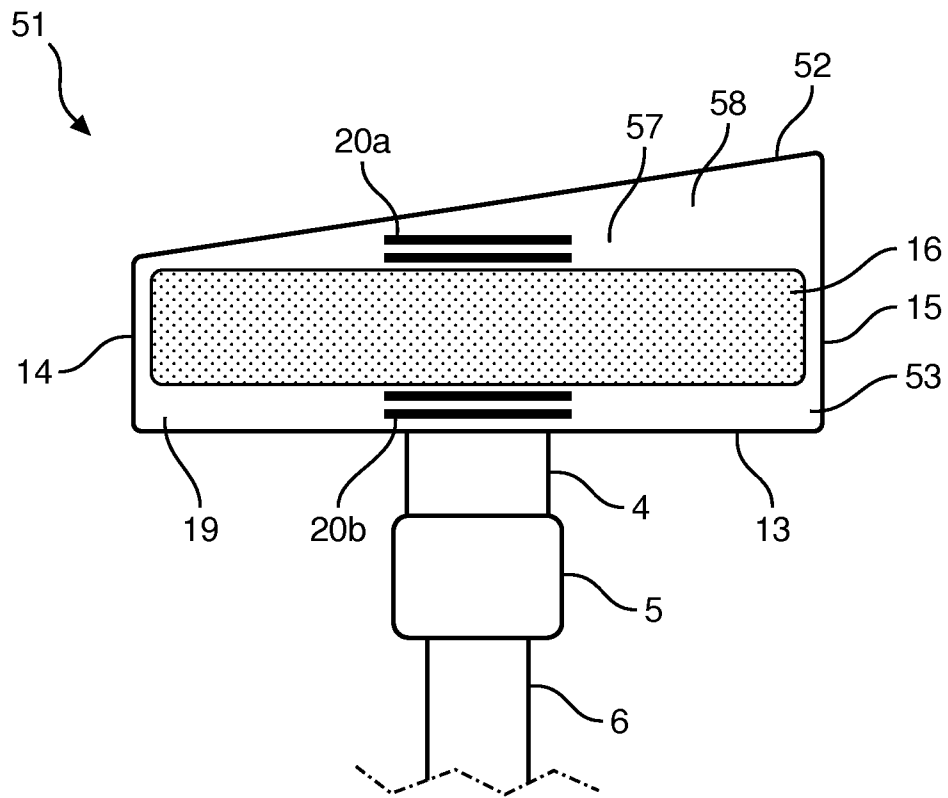


FIG. 6

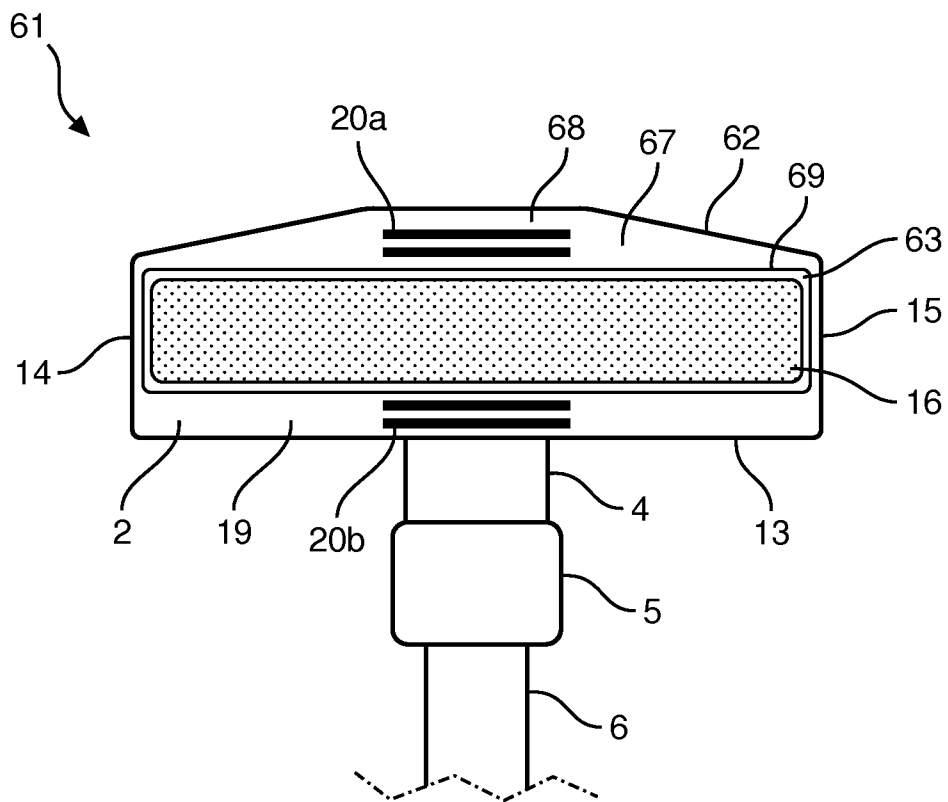


FIG. 7

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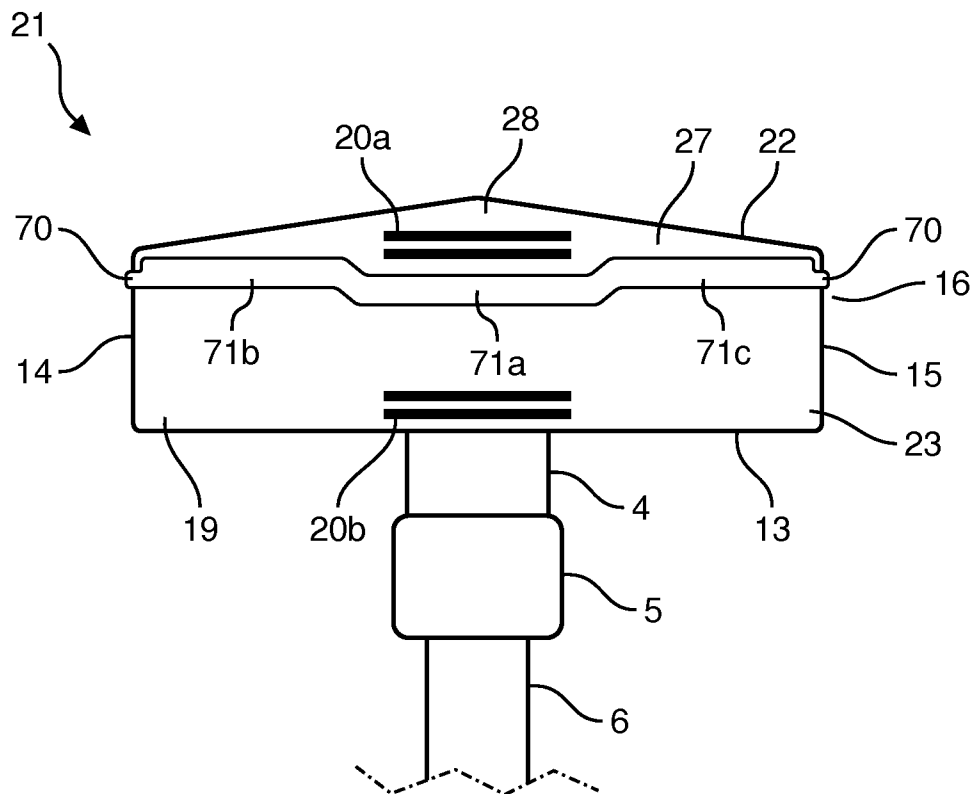


FIG. 8

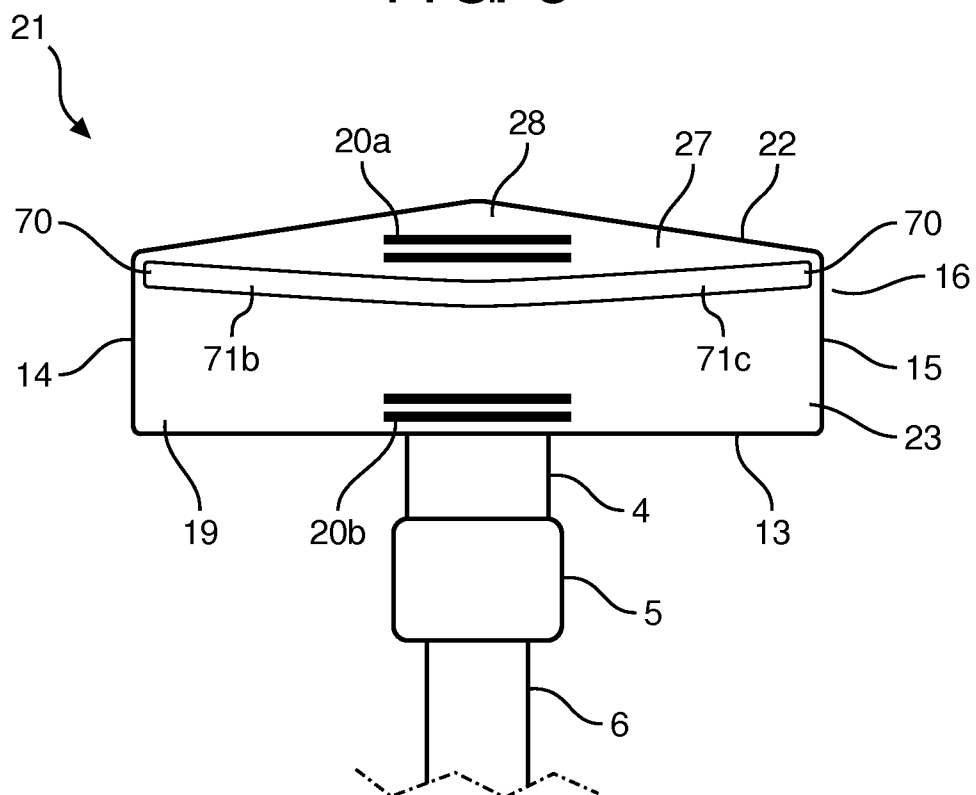


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2013/058923

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L9/06

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	DE 15 03 830 A1 (LICENTIA GMBH) 10 July 1969 (1969-07-10) page 5, last line - page 8, line first; figures 1-4 -----	1,2,4-7, 9-15
X	US 2005/066471 A1 (MILLER PAUL R [US] ET AL) 31 March 2005 (2005-03-31) paragraph [0013] - paragraph [0028]; figures 1-4 -----	1-10,15
X	DE 30 25 977 A1 (ALLSTAR VERBRAUCHSGUETER GMBH [DE]) 11 February 1982 (1982-02-11) abstract; figures 1-3 -----	1-7, 10-15
A	EP 0 397 112 A1 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 14 November 1990 (1990-11-14) abstract; figures 3,4 -----	1-15



Further documents are listed in the continuation of Box C.



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Information on patent family members

International application No

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