

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 March 2008 (06.03.2008)

PCT

(10) International Publication Number
WO 2008/025956 A1

(51) International Patent Classification:
A47L 5/28 (2006.01) A47L 9/16 (2006.01)
A47L 9/00 (2006.01)

(74) Agents: HUCKER, Nerys et al.; Dyson Technology Limited, Intellectual Property Department, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

(21) International Application Number:
PCT/GB2007/003213

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date: 23 August 2007 (23.08.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0617184.7 1 September 2006 (01.09.2006) GB
0625763.8 22 December 2006 (22.12.2006) GB

(71) Applicant (for all designated States except US): **DYSON TECHNOLOGY LIMITED** [GB/GB]; Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

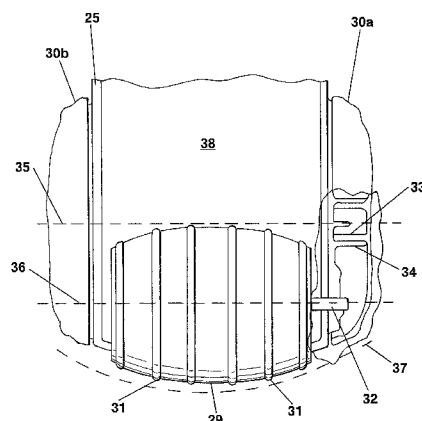
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **INGE, Douglas, Andrew** [GB/GB]; Dyson Technology Limited, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB). **COURTNEY, Stephen, Benjamin** [GB/GB]; Dyson Technology Limited, Tetbury Hill, Malmesbury, Wiltshire SN16 0RP (GB).

Published:
— with international search report

(54) Title: SUPPORT ASSEMBLY



(57) Abstract: A support assembly (13) for a surface treating appliance comprises a central roller (29) arranged to engage a surface and outer rollers (30a) and (30b) at either end of the central roller. The rollers together define a rolling support surface (37) and the outer rollers rotate about an axis (35) spaced from the rotational axis (36) of the central roller. This arrangement of rollers provides a rolling support surface over a wide range of motions, and spacing the rotational axes of the rollers permits the rollers to be arranged relative to one another to define a region (38) into which components of the appliance are mountable.

WO 2008/025956 A1

Support Assembly

This invention relates to a support assembly for a surface treating head or a surface treating appliance, such as a vacuum cleaner.

5

Surface treating appliances such as vacuum cleaners and floor polishers are well known. The majority of vacuum cleaners are either of the 'upright' type or of the 'cylinder' type, called canister or barrel cleaners in some countries. An example of an upright vacuum cleaner manufactured by Dyson Limited under the name DC15 ("DC15" is a trade mark
10 of Dyson Limited) is shown in Figure 1. The vacuum cleaner, indicated generally by the reference numeral 1, comprises a main body 2, which houses the main components of the vacuum cleaner, including separating apparatus 3 for separating dirt, dust and other debris from a dirty airflow drawn in by a motor-driven fan (not visible in this drawing). A cleaner head 4 is mounted to the lower end of the main body 2.

15

Also at the lower end of the main body 2 is a support assembly in the form of a barrel-shaped roller 5. The roller 5 permits the cleaner 1 to be easily manoeuvred. In use, a user reclines the main body 2 of the vacuum cleaner 1 and then pushes and pulls a handle 6 which is fixed to the main body of the cleaner. The vacuum cleaner 1 rolls
20 along the floor surface on the roller 5, and may be steered by the user twisting the handle 6 about its longitudinal axis 8. This cleaner 1 is much more manoeuvrable than previous cleaners employing wheels. Various components of the cleaner are mounted within the roller 5 as a space-saving measure.

25

A problem which may be encountered with this appliance is that connections have to be made between the components mounted inside the roller 5 and other components on the cleaner 1. For example, where the roller 5 houses filters and other components that act on fluid being drawn into the appliance, ducts 7a, 7b have to be provided in order to create a fluid flow path between those components inside the roller 5 and those of the
30 separating apparatus 3 on the main body 2. A good sealing connection has to be

provided between these rigid ducts 7a, 7b and the rotatable roller 5, and a special bearing has to be provided to accommodate the ducts.

The invention provides a support assembly for a surface treating appliance or a surface
5 treating head comprising a plurality of rollers defining a rolling support surface, the rollers comprising a central roller arranged to engage a floor surface and a pair of outer rollers at respective ends of the central roller, each outer roller having a rotational axis spaced from that of the central roller.

10 This arrangement of a central roller and outer rollers provides a substantially continuous symmetrical rolling support surface over a wide range of motions. Spacing the rotational axes of the rollers permits the rollers to be arranged relative to one another to define a region into which components of the appliance or head are mountable.

15 Preferably, the outer rollers have a common rotational axis to provide a symmetrical support surface. However, the outer rollers may have separate rotational axes spaced from each other.

Advantageously, when the support assembly is in an upright position, with the rotational
20 axis of its central roller parallel with a floor or other surface to be treated, the rotational axis or axes of the outer rollers is vertically higher than that of the central roller.

It is preferable that the maximum diameter of the central roller is less than the maximum diameter of each outer roller.

25

The central roller may be elongated and barrel-shaped, so that it is wider at its central portion than at the ends. This shape gives good stability.

Any or all of the rollers of the support assembly may be made up of a plurality of roller
30 members.

The invention further provides a surface treating appliance, such as a vacuum cleaner, incorporating such a rolling support assembly.

5 The invention further provides a surface treating head incorporating such a rolling support assembly.

The term "surface treating appliance" is intended to have a broad meaning, and includes a wide range of machines having a head for travelling over a surface to clean or treat the surface in some manner. It includes, inter alia, machines which apply suction to the
10 surface so as to draw material from it, such as vacuum cleaners (dry, wet and wet/dry), as well as machines which apply material to the surface, such as polishing/waxing machines, pressure washing machines, ground marking machines and shampooing machines. It also includes lawn mowers and other cutting machines.

15

Use of the term "roller" is intended to encompass wheels and rolling surfaces in general.

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

20

Figure 1 is a perspective view of a vacuum cleaner incorporating a known type of support assembly;

25

Figure 2 is a rear view of a vacuum cleaner incorporating a support assembly constructed according to the invention;

Figure 3 is a perspective view of the vacuum cleaner of Figure 2 in use;

30

Figure 4 is a schematic, partly cut-away rear view of the support assembly of Figures 2 and 3;

Figure 5 is a rear view of the support assembly in more detail;

Figure 6 is a perspective view of the support assembly in detail;

5

Figures 7 to 10 are schematic drawings of an alternative support assemblies constructed according to the invention;

Figure 11a is a perspective view from above of a surface treating head incorporating a support assembly constructed according to the invention;

10

Figure 11b is a perspective view from below of the head of Figure 11a;

Figure 11c is a side view of the head of Figures 11a and 11b; and

15

Figure 12 is a perspective view of the head of Figures 11a, b and c in use.

Like reference numerals refer to like parts throughout the specification.

20 With reference to Figures 2 and 3, a surface treating appliance is shown in the form of a vacuum cleaner and is indicated generally by the reference numeral 10. The vacuum cleaner 10 comprises a main body 11, a cleaner head 12 and a rolling support assembly 13 for rolling the cleaner along a floor surface. The main body 11 houses a motor and fan for generating a suction airflow (not visible in these drawings) as well as separating
25 apparatus 14 for separating dirt, dust and other debris from a dirty airflow drawn into the machine by the fan and motor.

In this embodiment, the separating apparatus 14 is cyclonic, in which the dirt and dust is spun from the airflow. The cyclonic separating apparatus 14 comprises two stages of
30 cyclone separation arranged in series with one another. The first stage is a cylindrically-

walled chamber 15 and the second stage comprises a set 16 of tapering, substantially frusto-conically shaped chambers arranged in parallel with one another. Airflow is directed tangentially into the upper part of the chamber 15. Larger debris and particles are removed and collected in the chamber 15. The airflow then passes through a shroud 5 17 to the set 16 of smaller frusto-conically shaped cyclonic chambers. Finer dust is separated by these chambers and the separated dust is collected in a common collecting region.

The main body 11 also houses filters (not visible in these drawings) for trapping fine 10 particles in the cleaned airflow. These filters remove any fine particles of dust which have not already been removed from the airflow by the separating apparatus. A first filter, called a pre-motor filter, is provided before the motor and fan. A second filter, called a post-motor filter, is provided after the motor and fan. Where the motor for driving the suction fan has carbon brushes, the post-motor filter also serves to trap any 15 carbon particles emitted by the brushes. Clean air is then expelled to the atmosphere.

The cleaner head 12 is pivotably mounted to the lower end of the main body 11, and serves, in use, to treat the floor surface. In this embodiment, it comprises a housing 18 with a chamber for supporting an agitator in the form of a brush bar 19. The lower, 20 floor-facing side of the chamber has an air inlet slot 20 and the brush bar 19 is rotatably mounted in the chamber such that bristles on the brush bar can protrude through the inlet slot and can agitate the floor surface over which the cleaner head passes. The brush bar 19 is rotatably driven by a dedicated motor 21 positioned on the rear of the cleaner head 12.

25

The rolling support assembly 13 permits the cleaner to be manoeuvred along a floor surface. In order to provide extra support for the cleaner when the main body 11 is in the vertical position, as in Figure 1, a stand 22 is provided.

A user-operable handle 23 extends upwardly from the rear part of the main body 11. When the cleaner 10 is in the position shown in Figures 1 and 2, it can be used in a cylinder mode, in which case the handle 23 may be released and used as a hose and wand assembly. A changeover valve on the main body 11 automatically connects the dust separating apparatus 14 to the wand and hose so that cleaner can be used in
5 cylinder mode for above the floor cleaning. Air is drawn into the cleaner through the end of the wand which can be released from the cleaner for appropriate manipulation. The inlet 20 in the cleaner head 10 is automatically shut off.

10 When the cleaner 10 is to be used in conventional upright mode, the user reclines the main body 11 whilst depressing a pedal 24 associated with the stand 22. A mechanism on the main body 9 causes the stand 22 to pivot into a position where it lies against the main body, as can be seen in Figure 3. The changeover valve automatically shuts off the air inlet at the distal end of the wand handle 23 and connects the dust separating
15 apparatus 14 to the inlet 20 in the cleaner head 12.

The cleaner head 12 is connected to the main body 11 of the vacuum cleaner 10 in such a manner that the cleaner head remains in contact with a floor surface as the main body is manoeuvred through a wide range of operating positions, e.g. when moved from side-
20 to-side or when the main body is twisted about its longitudinal axis. A linkage in the form of a yoke 25 forms a connection between the main body 9 and the cleaner head 10. The yoke 25 comprises a shell, which is moulded to incorporate two rotational axes 26, 27. The first axis 26, which extends across the sides of the shell, permits the main body 11 to pivot with respect to the yoke when it is reclined for a cleaning operation in the
25 upright mode. The second axis 27, which depends from the front of the shell, permits the housing 18 of the head 12 to turn with respect to the yoke 25 when the cleaner is being steered along a floor surface. The two axes 26, 27 are transverse to each other. This arrangement permits the cleaner 10 to be more easily manoeuvred than traditional vacuum cleaners.

Figure 3 shows the vacuum cleaner in a turning position. The user rotates the main body about its longitudinal axis 28 by means of the handle 23. This causes a longitudinal axis of the rolling support assembly 13 to tilt with respect to the floor. The pivoting connections 26, 27 associated with the yoke 25 cause the housing 18 of the cleaner head 12 to turn whilst remaining in contact with the floor. The extent to which the main body 11 is turned about its longitudinal axis 28 determines the extent to which the cleaner head 12 moves from its forward facing position towards the right or left. The stand 22 remains neatly tucked up against the rear of the main body 11 during this range of motions performed by the cleaner 10. This permits the user easily to manoeuvre the cleaner 10, even when cleaning under furniture and other low obstructions.

In accordance with the invention, the rolling support assembly 13 comprises a central roller 29 and a pair of outer rollers 30a, 30b, which are arranged relative to each other so as to provide a rolling support surface, but with rotational axes that are spaced from each other. This arrangement is shown in the partly cut-away schematic drawing of Figure 4.

The central roller 29 comprises an elongated and barrel-shaped shell, which shape provides both stability and manoeuvrability. A plurality of ridges 31 are provided around its circumference, equally spaced along its length. The ridges 31 provide extra grip as the support assembly 13 is rolled along a surface to be treated. The central roller 29 is rotatably mounted to the yoke 25 by means of an axle 32. The yoke 25 also rotatably supports the pair of outer rollers, 30a, 30b, which are mounted adjacent opposite respective ends of the central roller 29. The outer rollers 30a, 30b, are cap-shaped, having a larger diameter than the maximum diameter of the central roller 29 but a relatively narrow rolling surface. Each of the outer rollers 30a, 30b, has a collar 33 formed on its inner surface. The collar 33 fits onto a neck 34 formed in the yoke 25 such that the outer roller 30a can rotate with respect to the yoke. The outer rollers 30a, 30b, have a common rotational axis 35 that is spaced from the rotational axis 36 of the

central roller 29. In this embodiment, the axes 35, 36 are spaced so that, when the support assembly is in the upright position, with the rotational axes parallel to the floor surface, the rotational axis 35 of the outer rollers 30a, 30b, is spaced further from the floor than is the rotational axis 36 of the central roller 29. The rollers 29, 30a, 30b, together define a rolling support surface 37. This arrangement of rollers delimits a region 38 into which components of the vacuum cleaner 10 may be mounted, as is shown in Figures 5 and 6.

In these drawings, a plurality of components is mounted within the region 38. A first group 39 of components, mounted adjacent the yoke 25, together form a mechanism for urging the stand between its supporting position and its position against the main body. This mechanism includes a helical spring 41. A second group 40 of components form part of the previously-mentioned changeover valve. Another component in the form of a fluid conduit 42 is also mounted in this region, conveniently adjacent the changeover valve. This conduit 42 provides a fluid flow path between the cleaner head 12 and the main body 11. The arrangement of rollers 29, 30a, 30b, both protects and hides the components within this region 38. This provides advantages in safety and reliability, as well as being more aesthetically pleasing to the user.

In use, the rolling support assembly 13 provides support for the cleaner 10 over a wide range of movements, as the head 12 is steered over a surface to be treated. Although there is a slight discontinuity of the support surface 37 in the space between the central roller 29 and the adjacent outer roller 30a or 30b, at least one roller of the support assembly 13 provides support for the cleaner 10 in all positions, even at the extremes of movement.

The arrangement of rollers provides a rolling support assembly having a low central region and higher side regions, which together form a protective envelope for the region 38. When compared with the prior art arrangement of Figure 1, there is still a wide and supportive rolling surface that enables the cleaner to travel over a surface to be treated.

There is also still a region within the volume defined by the rolling support assembly into which components of the cleaner may be mounted. However, the region is not wholly enclosed within the envelope of the rolling support assembly, as was the case with the roller 6 of Figure 1. It is much more straightforward to connect components of the cleaner located in the region defined by the rollers with other components on the main body of the cleaner. Straightforward mechanical connections and seals may be provided.

Figures 11 (a, b and c) and 12 illustrate a surface treating head, indicated generally by the reference numeral 65, incorporating a support assembly constructed according to the invention. The head 65 comprises a housing 66 with a chamber for supporting an agitator in the form of a brush bar 67. The lower, floor-facing side of the chamber has an air inlet slot 68 and the brush bar 67 is rotatably mounted in the chamber such that bristles on the brush bar can protrude through the inlet slot and can agitate the floor surface over which the surface treating head passes. The brush bar 67 is rotatably driven by a dedicated motor 69 positioned on the rear of the housing 66.

The head 65 further comprises a rolling support assembly 70 arranged to roll with respect to the housing 66, and which permits the head to be manoeuvred along a floor surface. In accordance with the invention, the rolling support assembly 70 comprises a central roller 71 and a pair of outer rollers 72a, 72b, which are arranged relative to each other so as to provide a rolling support surface. The central roller 71 has a rotational axis 73 that is spaced from the common rotational axis 74 of the outer rollers 72a, 72b.

The axes 73, 74 are spaced so that, when the support assembly 70 is in the upright position, with the rotational axes parallel to a floor surface, the rotational axis 74 of the outer rollers 72a, 72b, is spaced further from the floor than is the rotational axis 73 of the central roller 71. This arrangement of rollers delimits a region 75 into which components of the head 65 may be mounted. In this embodiment, a fluid conduit 76 is located. The fluid conduit 76 provides a fluid flow path for air drawn into the head 65

via the air inlet slot 68, so that the air passes to an outlet 77 located on the neck 78 at the rear of the head 65. The neck 78 permits the head 65 to be connected to a wand or hose for a cleaning operation, such as is illustrated in Figure 12.

5 Figure 12 shows the head 65 in use. The neck 78 is connected to one end portion of a wand 79 which, in turn, is connected to a hose 80. The hose 80 is connectable to a surface-treating appliance, such as a cylinder vacuum cleaner 81. The wand 79 includes a handle 82, which enables the user to manipulate the wand. In use, the user rotates the neck 78 of the head 65 by rotating the wand 79 about the common longitudinal axis 83
0 of the neck and wand by means of the handle 82. This causes a longitudinal axis of the rolling support assembly 70 to tilt with respect to the floor. A rotatable joint 84 located between the housing 66 and the rolling support assembly 70 permits the housing of the head 65 to turn whilst remaining in contact with the floor. The extent to which the wand 79, and hence the neck 78 is turned about the longitudinal axis 83 determines the
5 extent to which the head 65 moves from its forward facing position towards the right or left.

Figures 7 to 10 schematically illustrate alternative forms that the invention could take. Each roller need not comprise a single rolling member, but may instead be made up of a
20 plurality of rolling members. For example, in Figure 7, the central roller 43 comprises a pair of wheels 43a, 43b, mounted on a common axle 44. A strut 45 extends upwardly from the axle 44 between the wheels 43a, 43b. Each wheel 43a, 43b, has a larger diameter at the end portion near the strut 45 than at its other end portion adjacent the outer rollers 46a, 46b, so that the overall profile of the rolling support surface of the
25 wheels 43a, 43b is approximately barrel-shaped. In this embodiment, the outer rollers 46a, 46b, comprise caps having partly spherical outer surfaces with rounded ends. Each outer roller 46a, 46b has its own axle 47a, 47b, but a common rotational axis 48. This common rotational axis 48 is spaced from the rotational axis 49 of the central roller 43. The axles 44, 47a and 47b are rotatably mounted to a frame 50, from which the strut 45
30 extends.

In the embodiment of Figure 8, the central roller comprises a single elongated rolling member 51. The outer rollers comprise two pairs of roller members. The first pair of outer roller members 52a, 52b, is provided adjacent each end of the central roller 51. Each roller member 52a, 52b of the first pair has a tapered surface, with the end portion of larger diameter being adjacent the central roller 51. The other end portions of smaller diameter are adjacent a second pair of roller members 53a, 53b, in the form of rounded caps. The first and second pairs 52, 53 have a common rotational axis 54, which simplifies assembly of this arrangement, but could, of course, be mounted so as to have separate rotational axes spaced from each other. The rotational axis 54 of the outer rollers 52, 53 is spaced vertically from the rotational axis 55 of the central roller 51 and all of the rollers are mounted on a common frame 56.

The rotational axes of the rollers need not be parallel. In the embodiment shown in Figure 9, the roller assembly comprises a central elongated roller 57 having a pair of tilted outer rollers 58a, 58b. Each outer roller 58a, 58b is approximately half-barrel shaped, with its largest diameter adjacent the central roller 57. The outer rollers 58a, 58b do not rotate about a common axis but instead have different respective axes 59a, 59b. Each axis 59a, 59b is spaced from the rotational axis 60 of the central roller 57 and tilted with respect to it. The axes 59a, 59b are tilted so that each outer roller 58a, 58b is tilted toward the central roller 57. Naturally, the outer rollers 58a, 58b could be tilted so as to be inclined away from the central roller 57. The frame or yoke onto which the rollers may be mounted is not shown in this drawing, nor in Figure 10.

Finally, in the alternative arrangement of Figure 10, the central roller comprises a pair of barrel-shaped roller members 61a, 61b. These central members 61a, 61b do not rotate about a common axis, but instead have separate rotational axes 62a, 62b, that are inclined with respect to each other. The outer rollers comprise a pair of rotatable caps 63a, 63b of relatively large diameter. The caps rotate about a common axis 64 that is

substantially parallel to a floor surface when the assembly is placed upright on a floor. This arrangement gives good stability when the assembly is steered to the left or right.

5 Although arrangements have been shown having a pair of outer rollers mounted at respective ends of the central roller, the support assembly may only have one outer roller at one end of the central roller. This solitary outer roller may itself comprise a plurality of rotatable members. This arrangement would be employed in a support assembly arranged to turn predominantly in one direction, or where more support is required at one end of the assembly than the other. In general, a symmetrical arrangement, having
10 outer rollers at both ends of the central roller, is preferred.

While the illustrated embodiment shows a vacuum cleaner in which ducts carry airflow, it will be appreciated that the invention can be applied to vacuum cleaners which carry other fluids, such as water and detergents, as well as other surface-treating appliances.

Claims

1. A support assembly for a surface treating appliance or a surface treating head comprising a plurality of rollers defining a rolling support surface, the rollers comprising a central roller arranged to engage a floor surface and a pair of outer rollers at respective ends of the central roller, each outer roller having a rotational axis spaced from that of the central roller.
- 5
2. An assembly as claimed in claim 1 wherein the outer rollers have a common rotational axis.
- 10
3. An assembly as claimed in claim 1 or 2 wherein, when the support assembly engages a surface such that the rotational axis of the central roller is substantially parallel to the surface, the rotational axis of each outer roller is further above the surface than is the rotational axis of the central roller.
- 15
4. An assembly as claimed in any preceding claim wherein the maximum diameter of the central roller is smaller than the maximum diameter of each outer roller.
- 20
5. An assembly as claimed in any preceding claim wherein the central roller has a smaller diameter at each end portion than at the central portion.
6. An assembly as claimed in any preceding claim wherein each outer roller has a smaller diameter at its end portion remote from the central roller than at its end portion adjacent the central roller.
- 25
7. An assembly as claimed in any preceding claim wherein at least one of the rollers comprises a plurality of roller members.
- 30

8. A support assembly for a surface treating appliance or a surface treating head, substantially as hereinbefore described, with reference to, or as illustrated in, the accompanying drawings.

5 9. A surface treating appliance including a support assembly as claimed in any preceding claim, the appliance comprising a main body having a longitudinal axis and a surface-treating head, the support assembly being arranged to roll with respect to the main body for allowing the appliance to be rolled along a surface.

10 10. An appliance as claimed in claim 9, wherein the rollers of the support assembly delimit a region housing a component.

11. An appliance as claimed in claim 10, wherein the component comprises a fluid flow conduit.

15 12. An appliance as claimed in claim 10 or 11, further comprising a stand moveable between a supporting position, in which it supports the main body, and a stored position, wherein the component comprises an actuating mechanism arranged to urge the stand between the supporting and stored positions.

20 13. An appliance as claimed in claim 11, further comprising a user-operable pedal arranged to communicate with the actuating mechanism such that depressing the pedal brings the stand out of the supporting position.

25 14. An appliance as claimed in any one of claims 10 to 13, wherein the component comprises a changeover mechanism arranged to allow fluid flow from the surface-treating head or from a hose located on the main body.

15. An appliance as claimed in any one of claims 9 to 14, wherein the rolling support surface lies in a direction perpendicular to the longitudinal axis of the main body.

5 16. An appliance as claimed in any one of claims 9 to 15, wherein at least one rotational axis of the support assembly is transverse to the longitudinal axis of the main body.

10 17. An appliance as claimed in any one of claims 9 to 16, further comprising a linkage between the main body and the surface treating head arranged such that rotating the main body about its longitudinal axis causes the surface treating head to turn in a new direction.

15 18. An appliance according to claim 17, wherein the linkage is arranged to allow the surface treating head to remain substantially in contact with the surface as the main body is rotated about its longitudinal axis.

19. A surface treating appliance, substantially as hereinbefore described, with reference to, or as illustrated in, the accompanying drawings.

20

20. A surface treating head including a support assembly as claimed in any one of claims 1 to 8.

25

21. A head as claimed in claim 20, wherein the rollers of the support assembly delimit a region housing a component.

22. A head as claimed in claim 21, wherein the component comprises a fluid flow conduit.

23. A head as claimed in claim 20, 21 or 22, further comprising a neck adapted to be connectable to the wand or hose of a surface treating appliance.
24. A head as claimed in claim 23, wherein the rolling support surface lies in a direction perpendicular to the longitudinal axis of the neck.
25. A head as claimed in claim 23 or 24, wherein at least one rotational axis of the support assembly is transverse to the longitudinal axis of the neck.
26. A head as claimed in claim 23, 24 or 25, further comprising a joint arranged such that rotating the neck about its longitudinal axis causes the surface treating head to turn in a new direction.
27. A head as claimed in claim 26, wherein the joint is arranged to allow the surface treating head to remain substantially in contact with the surface as the neck is rotated about its longitudinal axis.
28. A surface treating head, substantially as hereinbefore described, with reference to, or as illustrated in, the accompanying drawings.
29. A surface treating appliance incorporating a surface treating head as claimed in any one of claims 20 to 28.
30. A surface treating appliance as claimed in any one of claims 1 to 19 or claim 29 in the form of a vacuum cleaner.

1/10

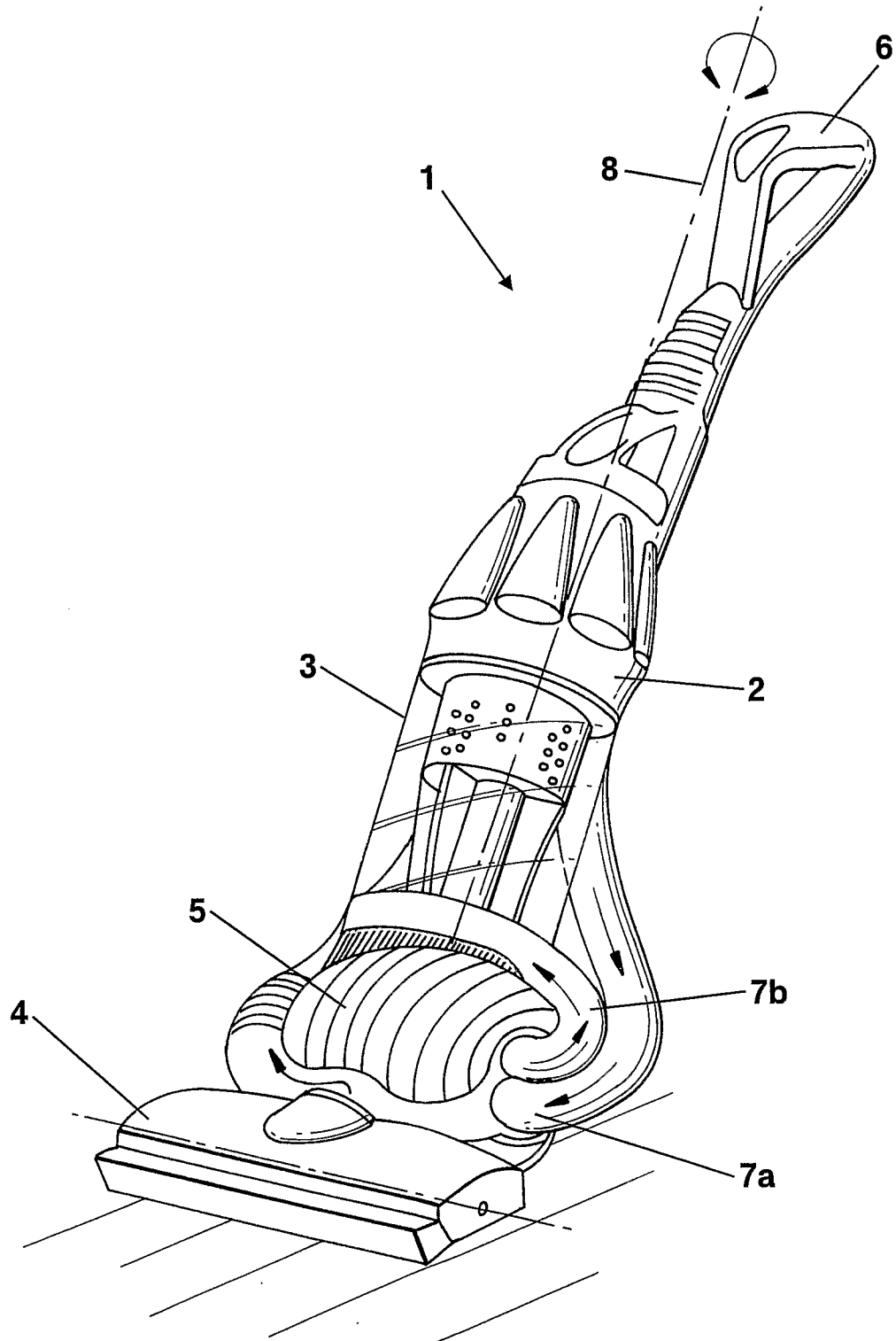
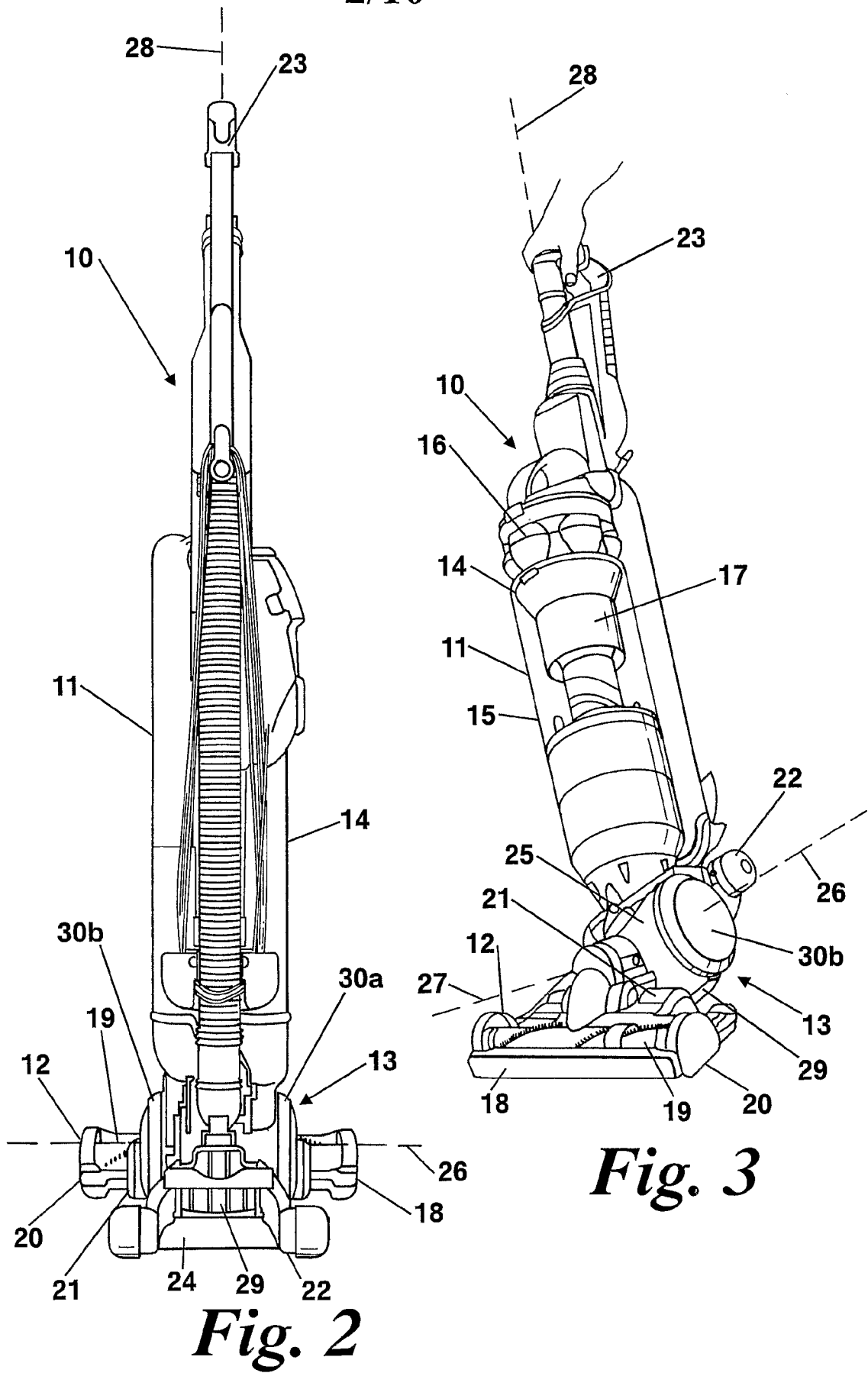


Fig. 1

2/10



3/10

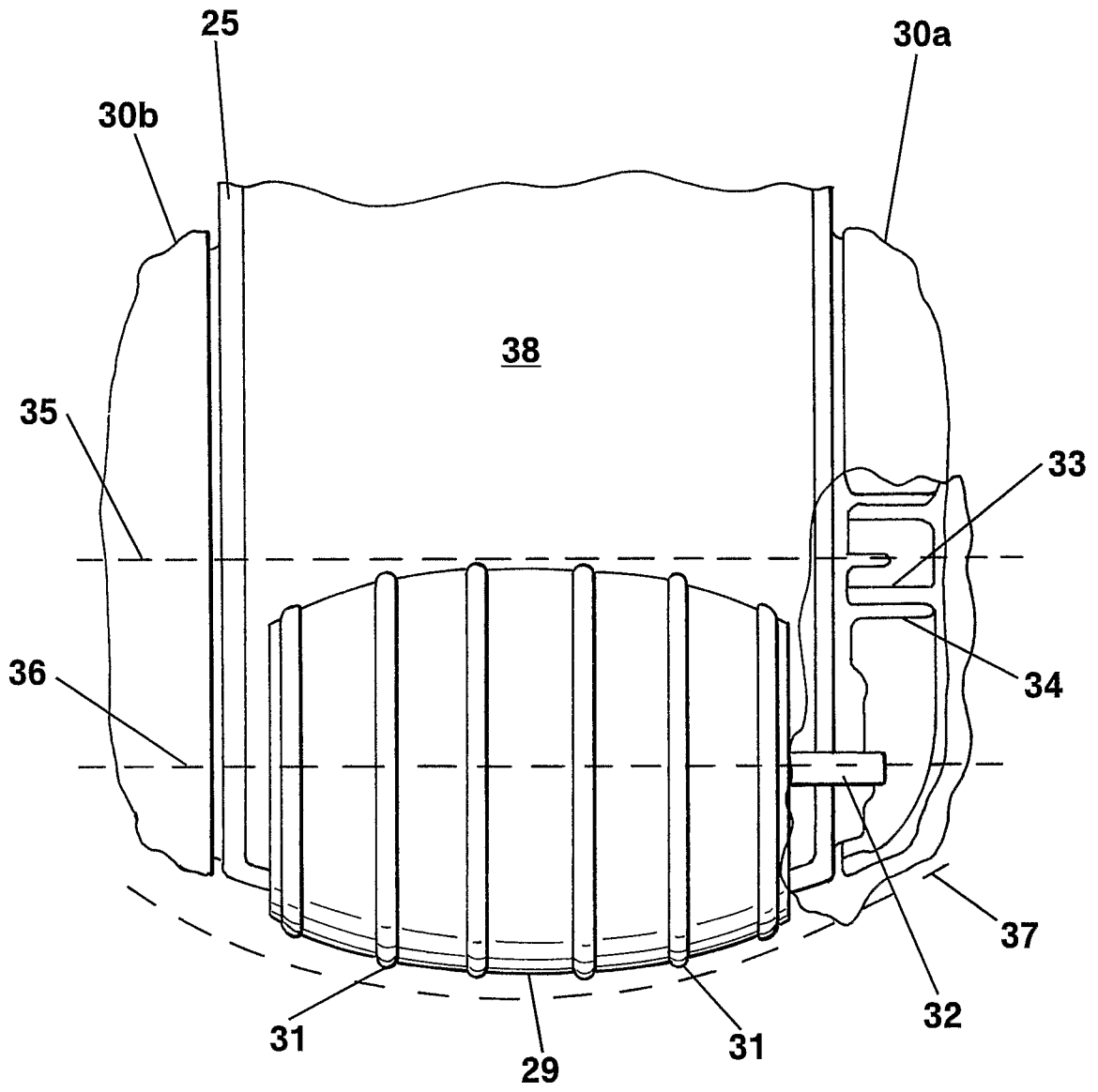


Fig. 4

4/10

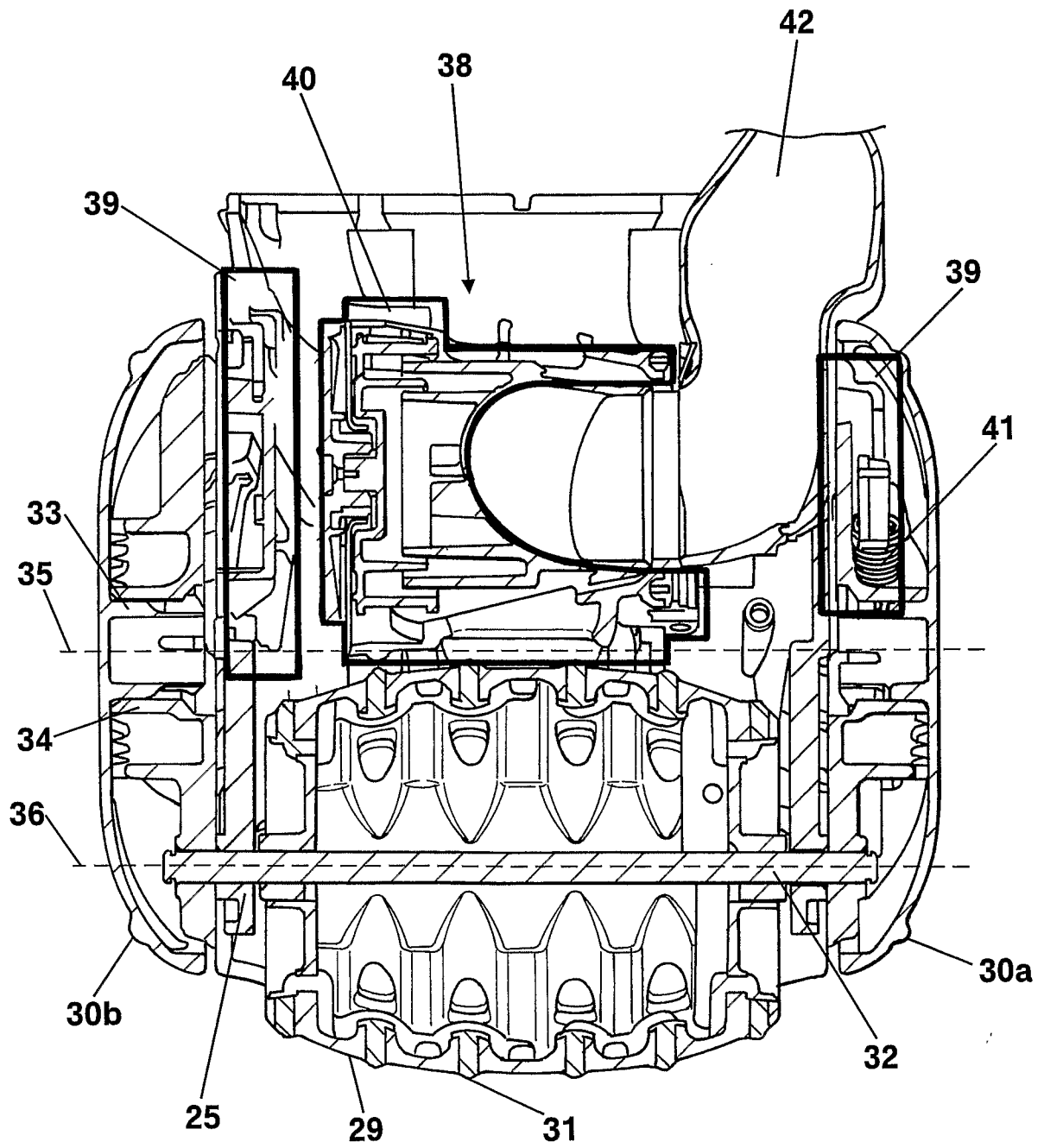


Fig. 5

5/10

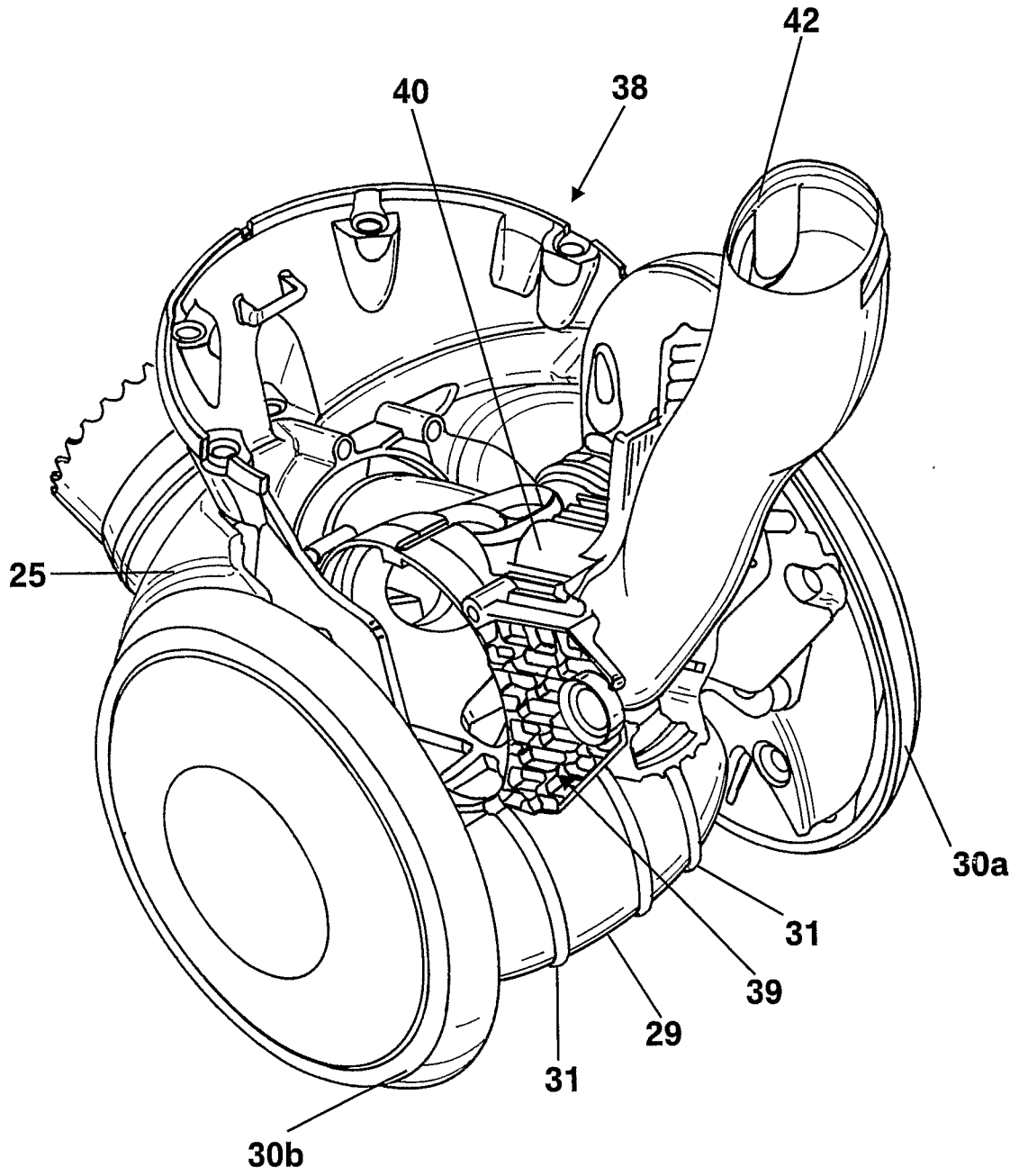


Fig. 6

6/10

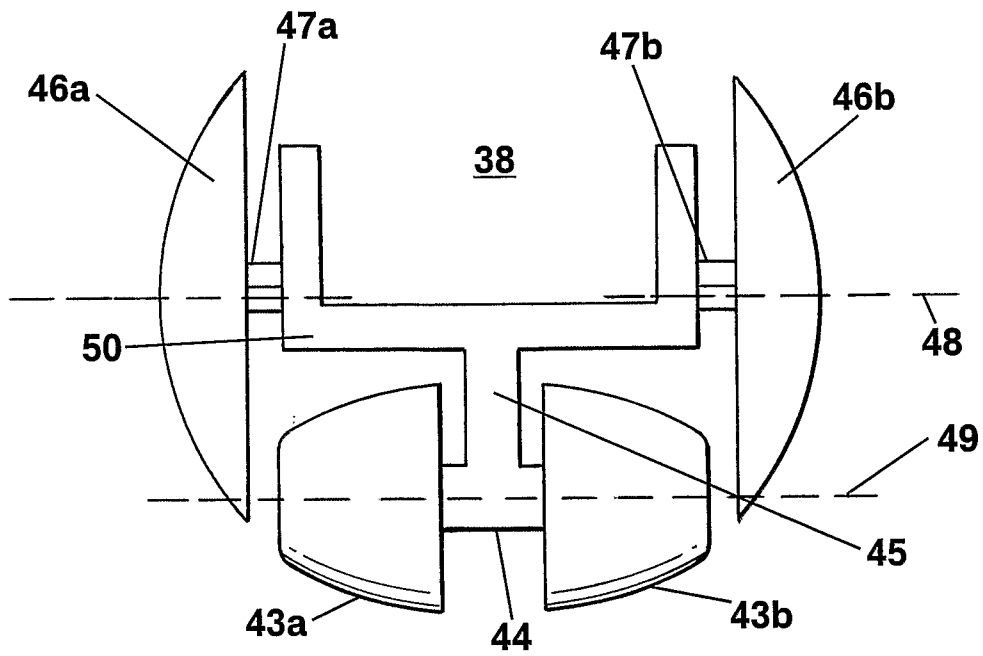


Fig. 7

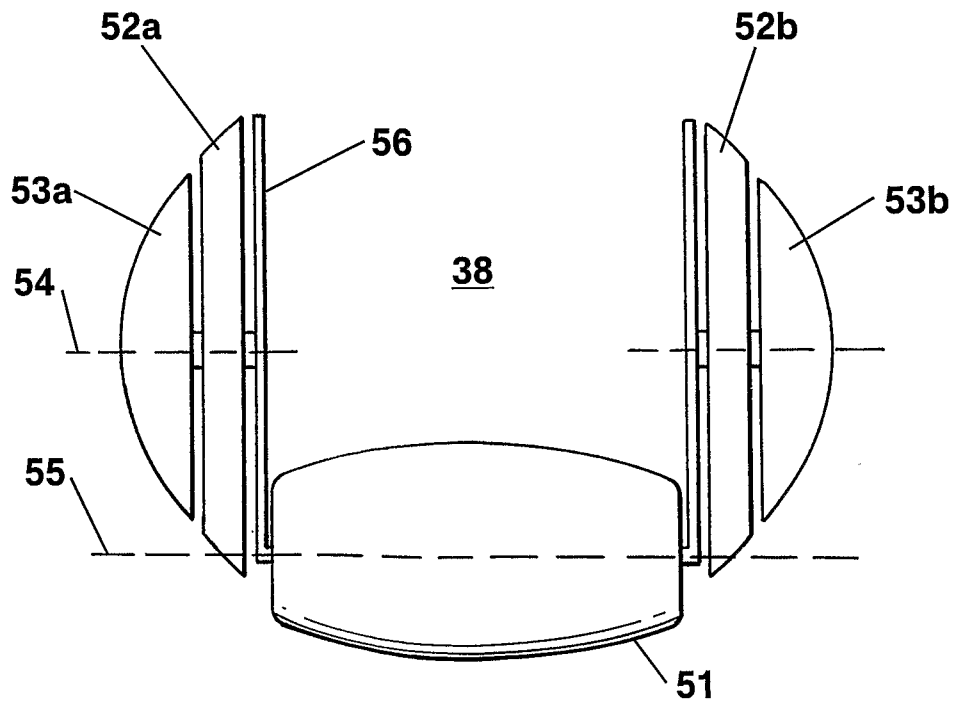


Fig. 8

7/10

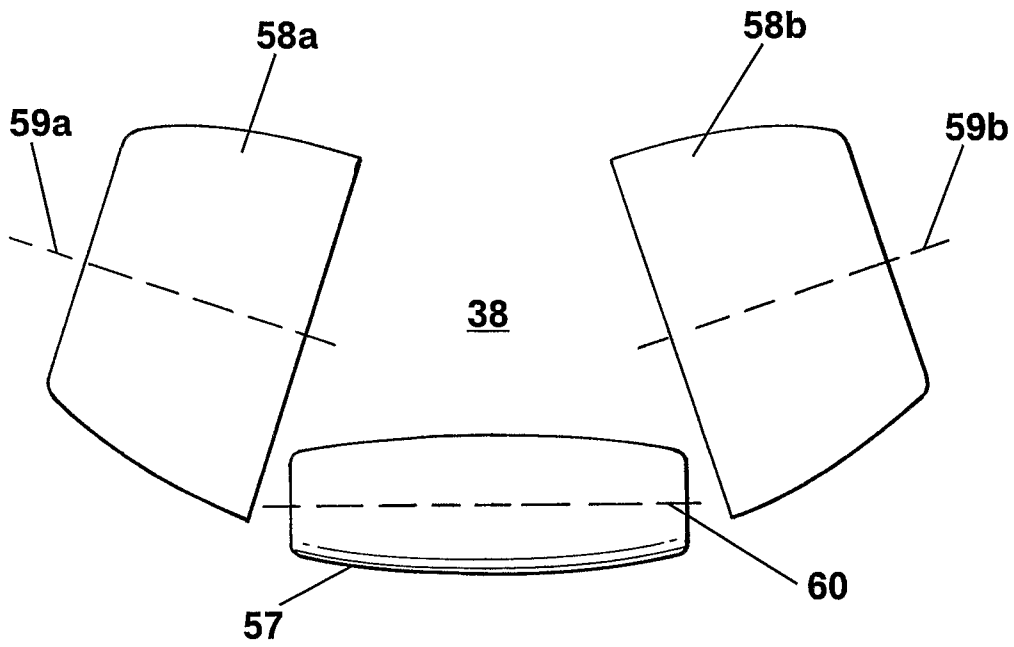


Fig. 9

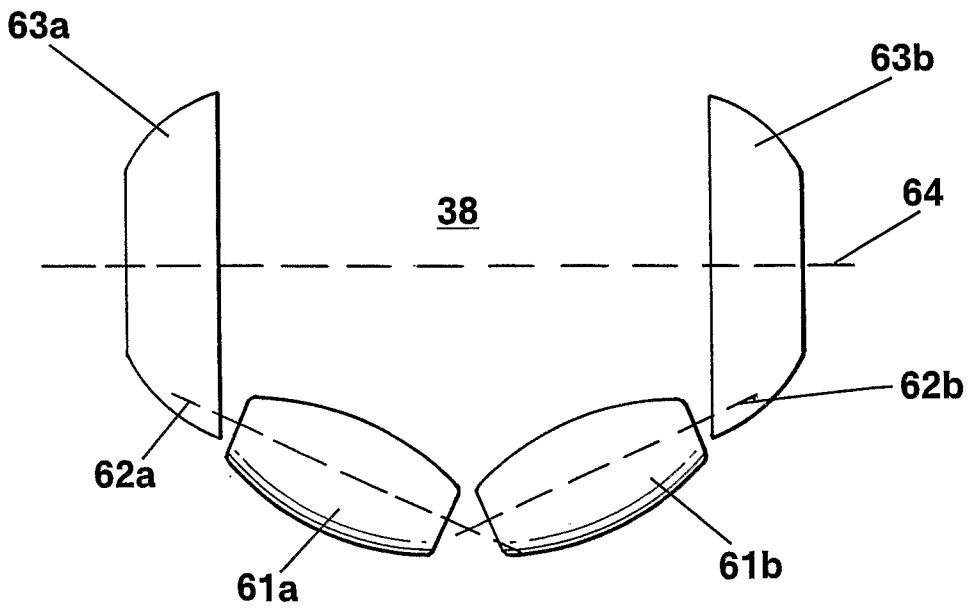


Fig. 10

8/10

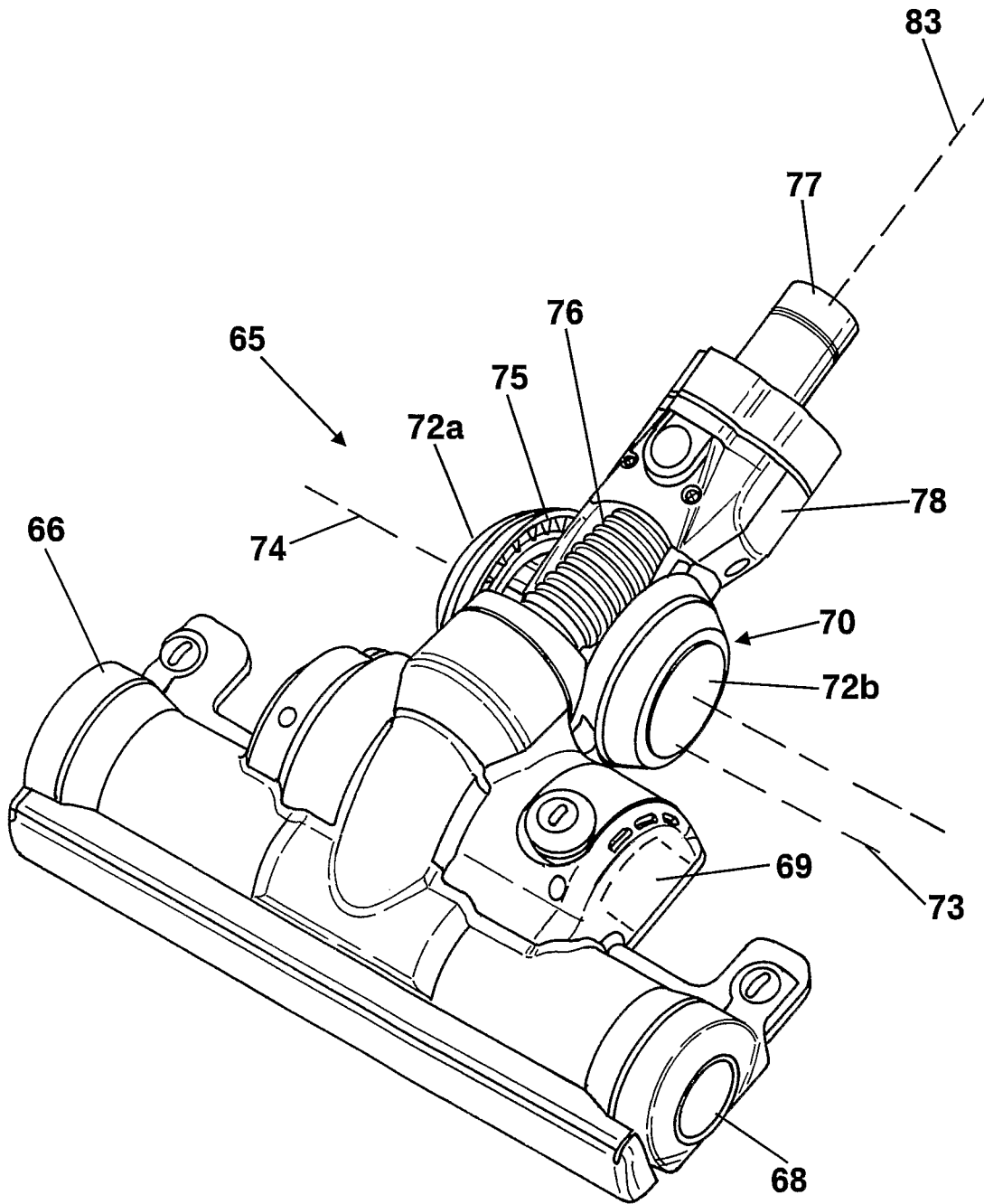


Fig. 11a

9/10

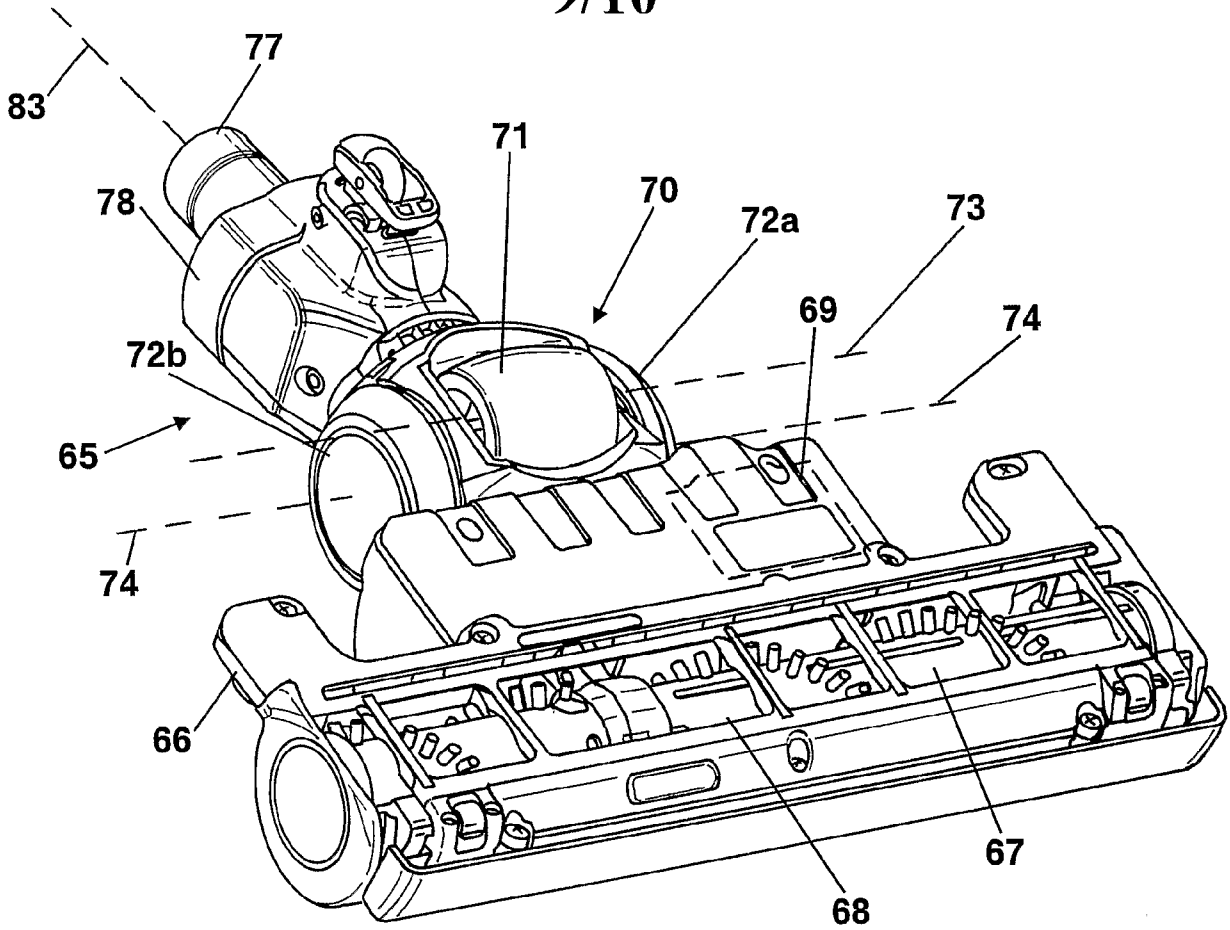


Fig. 11b

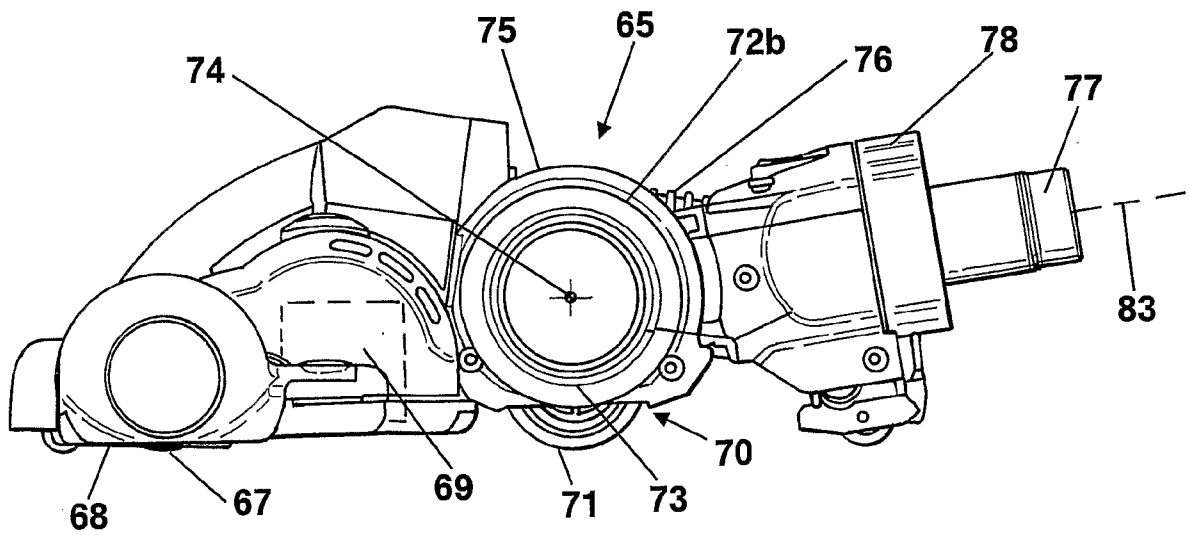


Fig. 11c

10/10

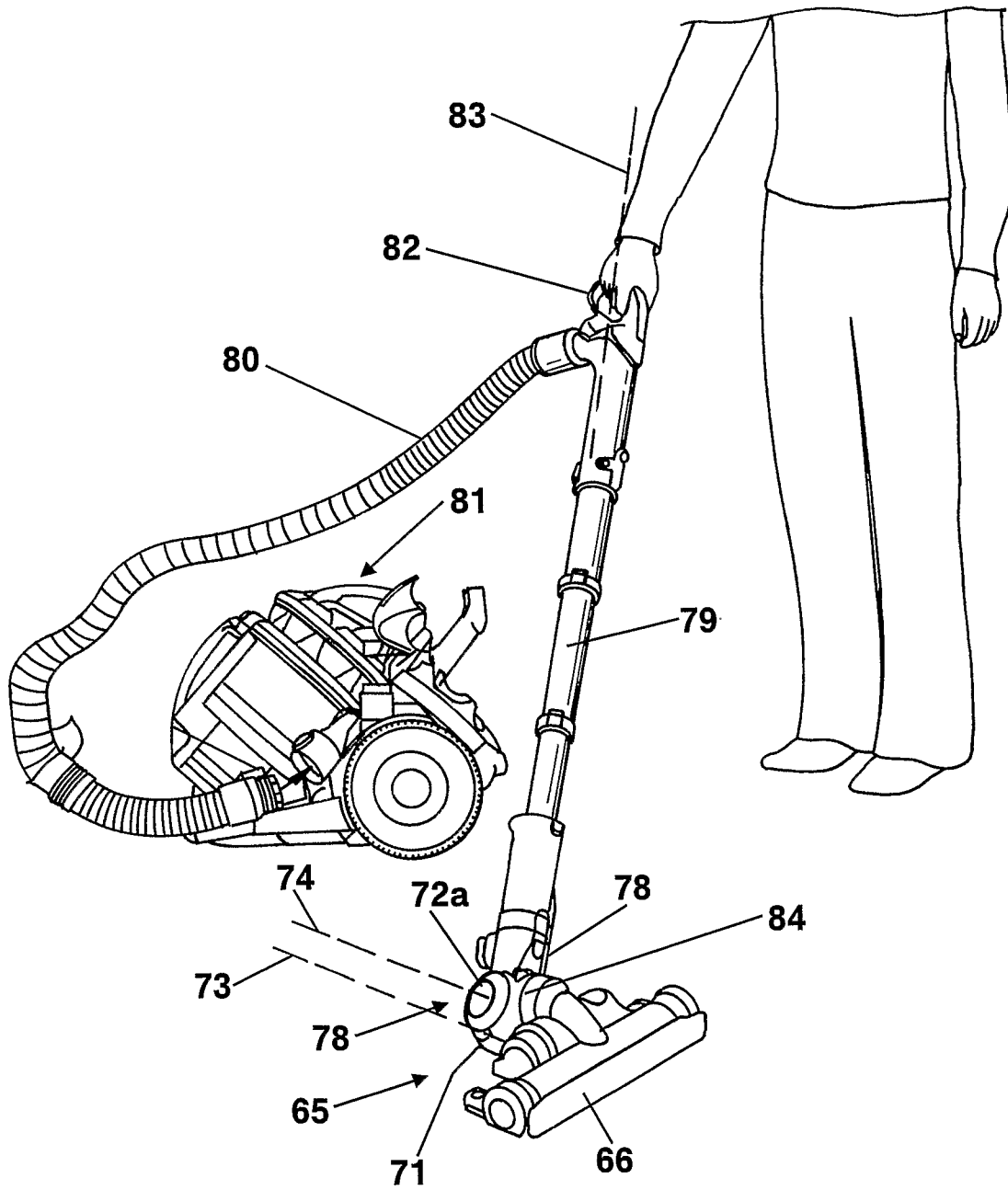


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/003213

A. CLASSIFICATION OF SUBJECT MATTER INV. A47L5/28 A47L9/00 A47L9/16		
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 practical, 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	WO 2004/014211 A (DYSON LTD [GB]; COURTNEY STEPHEN BENJAMIN [GB]) 19 February 2004 (2004-02-19) page 14, lines 12-16 page 17, line 18 - page 18, line 15 page 18, lines 17-30 claims 1,2 figure 6 figures 22,23,25,26	1, 3-7, 9, 12, 14-18, 20, 23-30
Y		2, 10, 11, 13, 21, 22
Y	EP 1 250 880 A (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 23 October 2002 (2002-10-23) paragraph [0015] figures 3,4	2, 10, 11, 21, 22
	----- -/--	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed		*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 *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family
Date of the actual completion of the international search 14 December 2007		Date of mailing of the international search report 27/12/2007
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Özsoy, Sevda

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/003213

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 422 094 A (DYSON TECHNOLOGY LTD [GB]) 19 July 2006 (2006-07-19) page 6, lines 22,23 page 7, lines 13-16 figures 1,3a	13
X	US 4 809 395 A (FLEISCHHAUER EUGENE T [US]) 7 March 1989 (1989-03-07) column 4, line 51 - column 5, line 16 figure 1	1,9
X	US 3 401 952 A (JOHANSON RALPH A W ET AL) 17 September 1968 (1968-09-17) column 1, line 49 - column 2, line 16 figures	1,9
A	GB 2 290 462 A (DAE WOO ELECTRONICS CO LTD [KR]) 3 January 1996 (1996-01-03) the whole document	1
A	EP 1 129 657 A (MATSUSHITA ELECTRIC IND CO LTD [JP]) 5 September 2001 (2001-09-05) the whole document	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2007/003213

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: 8, 19, 28
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; It is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 8,19,28

Present claims 8,19,28 lack clarity contrary to the requirements of Article 6 PCT, because the subject-matter is attempted to be defined by reference to the drawings. Reference-to-the-drawings type of definition does not allow the scope of the claim to be ascertained. For this purpose, all claims should clearly specify the technical features of the invention. Consequently, the search has been carried out for those part of the claims which appear to be clear, supported and disclosed.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following the receipt of the search report or during any Chapter II procedure.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2007/003213

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2004014211	A	19-02-2004	AU 2003283157 A1	25-02-2004
			AU 2003283159 A1	25-02-2004
			AU 2003283161 A1	25-02-2004
			-BR -0312979 A	14-06-2005
			BR 0313040 A	14-06-2005
			BR 0313223 A	12-07-2005
			CA 2495053 A1	19-02-2004
			CA 2495066 A1	19-02-2004
			CA 2495073 A1	19-02-2004
			CN 1674818 A	28-09-2005
			CN 1674819 A	28-09-2005
			CN 1674820 A	28-09-2005
			EP 1526796 A1	04-05-2005
			EP 1526797 A1	04-05-2005
			EP 1526798 A1	04-05-2005
			GB 2391459 A	11-02-2004
			WO 2004014209 A1	19-02-2004
			WO 2004014210 A1	19-02-2004
			JP 2006503607 T	02-02-2006
			JP 2005534442 T	17-11-2005
			JP 2006503608 T	02-02-2006
			KR 20060004647 A	12-01-2006
			KR 20050056196 A	14-06-2005
			KR 20050060066 A	21-06-2005
			MX PA05001610 A	19-08-2005
			MX PA05001611 A	25-04-2005
			MX PA05001612 A	25-04-2005
			NZ 537905 A	29-09-2006
NZ 537906 A	27-10-2006			
NZ 537907 A	29-09-2006			
US 2005235454 A1	27-10-2005			
US 2005223516 A1	13-10-2005			
US 2005223517 A1	13-10-2005			
ZA 200500578 A	19-10-2005			
ZA 200500579 A	22-02-2006			
ZA 200500580 A	22-02-2006			
EP 1250880	A	23-10-2002	AT 339147 T	15-10-2006
			DE 20106784 U1	19-07-2001
			ES 2271136 T3	16-04-2007
GB 2422094	A	19-07-2006	AU 2006207353 A1	27-07-2006
			CA 2594749 A1	27-07-2006
			EP 1838195 A1	03-10-2007
			WO 2006077382 A1	27-07-2006
			KR 20070100895 A	12-10-2007
US 4809395	A	07-03-1989	NONE	
US 3401952	A	17-09-1968	NONE	
GB 2290462	A	03-01-1996	CN 1118241 A	13-03-1996
			DE 19522349 A1	04-01-1996
			FR 2721495 A1	29-12-1995
			JP 8000506 A	09-01-1996
EP 1129657	A	05-09-2001	CA 2338895 A1	01-09-2001
			CN 1310979 A	05-09-2001

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2007/003213

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1129657	A	KR 20010087225 A TW 471954 B US 2001029641 A1	15-09-2001 11-01-2002 18-10-2001
