(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 541 078 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.06.2005 Bulletin 2005/24

(51) Int Cl.[7]: **A47L 11/00**, A47L 11/24, A47L 11/33

(21) Application number: **04257527.4**

(22) Date of filing: **03.12.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

(30) Priority: **09.12.2003 GB 0328561**
10.11.2004 GB 0424759

(71) Applicant: **Grey Technology Limited**
Whittington, Worcester WR5 2RQ (GB)

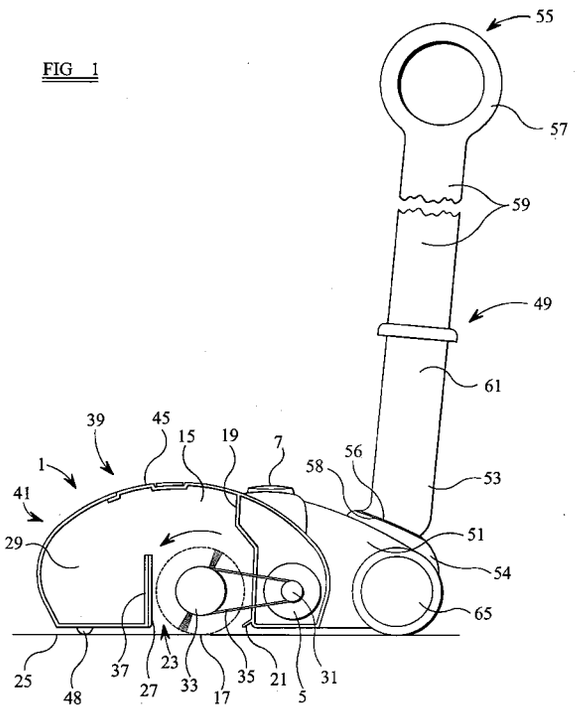
(72) Inventor: **Grey, Nicholas Gerald**
Crowle, Worcestershire WR7 4BH (GB)

(74) Representative: **Jackson, Derek Charles**
Derek Jackson Associates
The Old Yard
Lower Town
Claines Worcester WR3 7RY (GB)

(54) Motorised surface cleaning apparatus

(57) A surface cleaning apparatus comprising a cleaning body (1) and collection means (29) for accumulating debris retrieved from a surface to be cleaned. The collection means (29) is provided solely at a first end portion of the cleaning body (1) of the surface cleaning apparatus. A handle means (49) is connected by pivot means (54) to a second end portion (51) of the cleaning body (1) of the surface cleaning apparatus opposite the first end portion. The pivot means (54) is arranged to permit the first end portion of the cleaning body (1) to pivot relative to the handle means (49) from a first orientation to a second, depending orientation. A rotatable elongate brush arrangement (17) is provided between the collection means (29) and the second end portion (51) and is adapted to retrieve the debris from the surface to be cleaned and to direct the debris into the collection means (29). A motor (5) is provided between the brush arrangement (17) and the second end portion (51) of the cleaning body (1) and is arranged to rotate the brush arrangement (17).

FIG 1



EP 1 541 078 A2

Description

[0001] This invention relates to a surface cleaning apparatus.

[0002] Current sweeper type surface cleaning apparatus generally collect debris in a receptacle within the apparatus where the debris is stored until the sweeper, is emptied. In general, a sweeper containing collected debris must be transported relatively carefully to a region where the debris is to be removed in order that the collected debris is not released unintentionally from within the sweeper back onto a cleaned surface. Unintentional release of the debris can occur when the sweeper is picked up, for example when the sweeper is moved from a first surface which has been cleaned to a second surface which is to be cleaned.

[0003] It is therefore an object of the present invention to provide a surface cleaning apparatus which overcomes, or at least ameliorates, the problem of known apparatus.

[0004] According to the present invention there is provided a surface cleaning apparatus comprising:

a cleaning body;

collection means for accumulating debris retrieved from a surface to be cleaned, the collection means being provided solely at a first end portion of the cleaning body of the surface cleaning apparatus;

a handle means connected by pivot means to a second end portion of the cleaning body of the surface cleaning apparatus opposite the first end portion, the pivot means being arranged to permit the first end portion of the cleaning body of the surface cleaning apparatus to pivot relative to the handle means from a first orientation to a second, depending orientation;

a rotatable elongate brush arrangement adapted to retrieve the debris from the surface to be cleaned and to direct the debris into the collection means, the rotatable elongate brush arrangement being provided between the collection means and the second end portion; and

a motor arranged to rotate the brush arrangement, the motor being provided substantially between the brush arrangement and the second end portion of the cleaning body.

[0005] The brush arrangement, the motor and the second end portion of the cleaning body may be arranged in a substantially straight line.

[0006] A surface cleaning apparatus in accordance with the present invention substantially reduces the possibility of unintentional release of collected debris from the collection means when the apparatus is lifted by a user from the surface to be cleaned.

[0007] The first end portion of the cleaning body may be a front portion of the cleaning body and the second end portion of the cleaning body may be a rear portion of the cleaning body. That is, the apparatus may be adapted to be operated with the first end portion of the cleaning body as the front of the apparatus and the second end portion of the cleaning body as the rear of the apparatus.

[0008] The pivot means may allow the cleaning body to pivot about an axis transverse to the axial direction of the handle means.

[0009] The pivot means may enable the cleaning body to pivot through an angle of at least 95 degrees.

[0010] Swivel means may be provided between the handle means and the pivot means, for example to allow the handle means to rotate about the axis thereof relative to the cleaning body of the surface cleaning apparatus. That is, the axis of the swivel means may be transverse relative to the axis of the pivot means.

[0011] The swivel means and the pivot means may be arranged to enable the surface cleaning apparatus to be steered by a user.

[0012] The brush arrangement may extend substantially the entire width of the surface cleaning apparatus and may be provided with a helically arranged row of bristles.

[0013] The brush arrangement may be rotatable such that part of the brush arrangement adapted to be adjacent to the surface to be cleaned is adapted, in use, to sweep debris towards the second end portion of the apparatus. The apparatus may be provided with baffle means which, in combination with the brush arrangement, conveys debris around the brush arrangement and into the collection means at the first end portion of the apparatus.

[0014] The motor may be powered by batteries, for example rechargeable batteries, or by mains power.

[0015] The batteries may be provided between the brush arrangement and the second end portion of the cleaning body.

[0016] The collection means may be removable from the surface cleaning apparatus to facilitate the removal of debris therefrom.

[0017] Alternatively, the collection means may be provided with a removable closure, such as a removable wall, for the removal of debris therefrom.

[0018] The handle means may be connected by the pivot means solely to the second end portion.

[0019] The handle means may comprise at least two parts enabling the length of the handle means to be varied.

[0020] The second end portion of the cleaning body of the surface cleaning apparatus may be provided with ground-engaging wheels. The ground-engaging wheels may be formed externally in side regions of the second end portion of the cleaning body. Alternatively the ground-engaging wheel may be provided within recess-

es formed at least partly beneath the second end portion of the cleaning body.

[0021] The first end portion of the surface cleaning apparatus may be provided with ground-engaging rollers, preferably provided within recesses formed at least partly beneath the first end portion of the cleaning body.

[0022] A bottom wall of the first end portion may be maintained, in use, a distance from the surface to be cleaned.

[0023] A channel may be provided substantially centrally beneath the first end portion of the cleaning body. The channel may extend substantially the length of the first end portion from an outer edge of the first end portion towards the brush arrangement. The channel may function to allow pieces of debris to pass beneath the cleaning body, which pieces of debris are too large to be accommodated beneath the remainder of the first end of the cleaning body.

[0024] For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a side elevational view, partly in section, of a surface cleaning apparatus according to the present invention in a first configuration;

Figure 2 is a bottom view of the surface cleaning apparatus of Figure 1;

Figure 3 is a perspective view of a forward compartment of the surface cleaning apparatus of Figures 1 and 2; and

Figure 4 is a side elevational view, of the surface cleaning apparatus of Figures 1 and 2 in a second configuration.

[0025] The surface cleaning apparatus shown in Figures 1 and 2 comprises a cleaning body 1, suitably moulded of plastics material, and having effectively four compartments.

[0026] A first rear compartment 3 houses an electric motor 5. A switch means 7 is provided to permit a user to energise and de-energise the motor 5 as desired.

[0027] A second rear compartment 9 houses an array of batteries (not shown), preferably rechargeable batteries, arranged to provide power to the electric motor 5. The first rear compartment 3 and second rear compartment 9 are arranged co-linearly and are separated by a common side wall 11. The bottom wall 13 of the second rear compartment 9 is removable to enable a user to access the batteries. The batteries are removable in order that they can be replaced, or recharged by means separate to the surface cleaning apparatus.

[0028] As an alternative to removable rechargeable batteries, the surface cleaning apparatus could be mains powered. A further alternative is that a recharging unit (not shown) may be incorporated into the surface cleaning apparatus such that the batteries can be recharged whilst still in the surface cleaning apparatus by being connected to a mains power supply (not shown). The batteries may either be connected to the mains supply whenever the apparatus is not in use or at suitable times when the batteries have become depleted.

[0029] An intermediate compartment 15 houses an elongate rotatable brush arrangement 17. The brush arrangement 17 extends substantially the entire width of the intermediate compartment 15 and is provided with a helically arranged row of bristles. The bottom of the intermediate compartment is open at 23 to allow the bristles of the brush arrangement to contact the surface 25 to be cleaned, for example a floor, carpet or the like.

[0030] The front of the intermediate compartment 15 is a substantially upright wall 27. The wall 27 extends upwardly to about the same height as the top of the brush arrangement 17. A rear wall 19 of the intermediate compartment 15 forms a front wall of both the first rear compartment 3 and second rear compartment 9. A baffle means in the form of a lower region 21 of the rear wall 19 is arcuate and extends forwardly towards the periphery of the brush arrangement 17. The baffle means 21 causes debris, such as dust, dirt and the like, to be propelled up the wall 19 due to rotation of the brush arrangement 17. The debris passes around the brush arrangement, over the front wall 27 of the intermediate compartment and into a forward compartment 29 which is provided at a first or front end portion of the cleaning body 1 and will be described in more detail hereinafter.

[0031] The brush arrangement 17 is rotated by the motor 5 by way of toothed rollers 31, 33 attached to the motor 5 and to the brush 17, respectively, and by way of a toothed belt 35, for example of elastomeric material, extending around and engaging with the two rollers. The toothed belt 35 is provided in an enclosure provided between the first rear compartment and the intermediate compartment in order to prevent the ingress of debris into the first rear compartment 3. The motor and toothed belt are arranged such that the brush arrangement is rotated in the direction of the arrow 101 (shown in Figure 1) towards the front wall 27 of the intermediate compartment of the apparatus. As such, debris picked up by the brush arrangement is swept towards the rear of the apparatus and then conveyed by means of the baffle means 21 up the rear wall 19 of the intermediate compartment, around the brush arrangement and into the forward compartment.

[0032] As shown in Figures 1 and 2, the motor is provided substantially between the brush arrangement and the rear end portion of the surface cleaning apparatus. The brush arrangement, the motor and the rear end portion of the cleaning body are arranged in a substantially straight line.

[0033] The forward compartment 29 forms a collection means for the surface cleaning apparatus and is provided with a rear wall 37 which is positioned in use

against the front wall 27 of the intermediate compartment 15. The rear wall 37 of the forward compartment 29 is a substantially upright wall which extends upwardly to about the same height as the top of front wall 27 of the intermediate compartment 15. Therefore, debris propelled over the wall 27 of the intermediate compartment 15 due to rotation of the brush arrangement 17 passes over the rear wall 37 of the forward compartment 29 into the forward compartment 29. Debris therefore accumulates solely within the forward compartment 29. The forward compartment 29 has a front wall, side walls and a bottom wall which form the outer walls of the cleaning body 1. The top wall of the forward compartment is formed in part by a portion 39 of the upper surface of the cleaning body which extends a short distance past the rear wall 37 of the forward compartment 29, and in part by a complementary shaped upper portion 41 of the forward compartment 29. Portion 41 of the forward compartment 29 is arranged to overlap the portion 39 of the upper surface of the cleaning body.

[0034] The forward compartment 29, as shown in Figure 3, forms a removable member of the surface cleaning apparatus to facilitate the removal of debris from within the forward compartment.

[0035] The shaped upper portion 41 of the forward compartment 29 is removably attached to the rearwardly extending portion 39 of the upper surface of the cleaning body. Apertures 43 in the shaped upper portion 41 are positioned over complementary dimensioned protrusions 45 on the upper surface of the cleaning body to secure together the upper portion 41 of the forward compartment 29 and the extending portion 39 of the upper surface of the cleaning body.

[0036] A fastening means 47 is provided to secure a lower portion of the rear wall 37 of the forward compartment 29 to a lower portion of the front wall 27 of the intermediate compartment 15.

[0037] It should be appreciated that other arrangements of fastening means could be provided to retain the forward compartment on the cleaning body.

[0038] Ground-engaging rollers 48 are provided within recesses formed beneath the bottom wall of the forward compartment 29. The ground-engaging rollers 48 assist mobility of the surface cleaning apparatus.

[0039] The ground-engaging rollers 48 maintain, in use, the bottom wall of the forward compartment a distance from the surface to be cleaned. The distance between the lowest portion of the bottom wall of the forward compartment and the surface to be cleaned is nominally about 10mm but may, for example, be in the range from about 4mm to about 20mm.

[0040] As shown in Figure 3, a channel 50 is provided substantially centrally beneath the bottom wall of the forward compartment, extending substantially the length of the forward compartment from the front of the forward compartment to the intermediate compartment containing the brush arrangement. The channel has a flattened, inverted "V" shape.

[0041] The channel 50 allows debris, such as dust, dirt and the like, too large to pass under the lowest portion of the bottom wall to pass beneath the forward compartment, into the intermediate compartment, and be picked up by means of the brush arrangement 17. The inclined side walls of the inverted "V" shaped channel tend to direct debris towards the centre of the channel to facilitate passage of the debris beneath the forward compartment.

[0042] A handle 49 is attached solely to a second or rear end portion 51 of the cleaning body 1 provided behind the first rear compartment 3 and second rear compartment 9 and at the opposite end of the cleaning body 1 to the first or front end portion thereof.

[0043] The handle 49 comprises two parts, a first part 53 which is secured to the cleaning body 1, and a second part 55 which includes a portion 57 attached to an elongate member 59. The portion 57 is gripped by the user. The elongate member 59 can be removably engaged to the first part 53 of the handle 49. The first part of the handle 49 comprises a region 61 for gripping by the user such that the surface cleaning apparatus can be moved over difficult to reach surfaces, for example stairs and inside vehicles, by detaching the second part 55 of the handle 49 and solely using the first part 53 of the handle 49.

[0044] The first part 53 of the handle 49 is provided with pivot means 54 to allow the cleaning body 1 to pivot about an axis transverse to the axial direction of the handle 49 and with swivel means to allow the handle 49 to rotate about the axis thereof relative to the cleaning body 1. The axis of the swivel means is transverse relative to the axis of the pivot means.

[0045] The swivel means enables a substantially planar surface 56 of the first part 53 of the handle 49 to move relative to a substantially planar surface 58 provided on a portion of the pivot means 54. The substantially planar surface 56 of the first part 53 of the handle 49 and the substantially planar surface 58 of the pivot means 54 are inclined relative to the longitudinal axis of the handle 49.

[0046] The combination of the swivel means and the pivot means 54 enables the surface cleaning apparatus to be steered by the user.

[0047] As shown in Figure 2, the rear portion 51 of the cleaning body is formed with a recess 63 beneath the handle to allow the cleaning body 1 to be pivoted freely from a first orientation in which the cleaning body 1 extends forwardly relative to the handle means (as shown in Figure 1) to a second, depending position in which the front wall of the cleaning body is at a level below the pivot means of the surface cleaning apparatus (as shown in Figure 4). The angle through which the cleaning body is pivoted relative to the handle means is preferably greater than 95 degrees.

[0048] The rear portion 51 is provided with ground-engaging wheels 65 in order to assist mobility of the surface cleaning apparatus. The ground-engaging wheels

65 are formed externally in the side regions of the rear portion 51. Alternatively the ground-engaging wheel may be provided within recesses formed at least partly beneath the rear portion 51.

[0049] In use of the surface cleaning apparatus according to the invention, the apparatus is placed upon a surface 25 to be cleaned, such as a carpet, and the switch means 7 is operated to energise the motor 5. Consequently, the brush arrangement 17 is rotated (in the direction of arrow 101) to sweep debris from the surface towards the rear of the apparatus. The baffle means 21, in combination with the rotating brush arrangement, conveys debris around the brush arrangement and then propels the debris up and over the front wall 27 of the intermediate compartment 15 and the adjacent rear wall 37 of the forward compartment 29 and into the forward compartment 29 where the debris is temporarily stored. As the surface cleaning apparatus is moved over the surface with the brush arrangement 17 rotating, any further debris is similarly swept from the surface and propelled into the forward compartment 29.

[0050] The channel 50 beneath the bottom wall of the forward compartment enables the surface apparatus to pass over any portion of the debris which is too large to pass under the lowest portion of the bottom wall of the forward compartment. Once the channel has passed sufficiently over the debris such that the intermediate compartment is positioned over the larger debris, the debris is swept from the surface and propelled into the forward compartment 29.

[0051] If at any time the cleaning body 1 of the surface cleaning apparatus is lifted by means of the handle 49 from the surface being cleaned, for example during movement of the apparatus to another surface to be cleaned, the recess 63 in the rear portion 51 of the cleaning body 1 allows the cleaning body to pivot freely about an axis transverse to the axial direction of the handle 49. Therefore, on the initial raising of the cleaning body 1 from the surface, the cleaning body 1 is tilted downward such that the front wall of the forward compartment 29 becomes the lowest point of the cleaning body, as shown in Figure 4.

[0052] Further raising of the first part 53 of the handle 49 relative to the surface 25 being cleaned maintains the cleaning body in the downwardly tilted position. As such, the collected debris is moved towards the front wall of the forward compartment 29 and is retained within the forward compartment 29, thus minimising any possible unintentional release of the debris.

[0053] The collecting of the debris in the forward compartment 29 of the surface cleaning apparatus results in the debris being substantially prevented from being accidentally released from the forward compartment 29 if the cleaning body is raised from a surface being cleaned, provided the front wall of the forward compartment 29 is not raised relative to the remainder of the cleaning body 1 to such an extent that the collected debris is moved towards and over the rear wall 37 of the forward compartment 29 and the front wall 27 of the intermediate compartment 15.

[0054] When the forward compartment 29 is to be emptied, the fastening means 47 is released and the apertured portions 43 of the top wall of the forward compartment are detached from the protrusions 45 on the extending portion 39 of the upper surface of the cleaning body. The forward compartment 29 can then be removed from the cleaning body of the surface cleaning apparatus and the debris can readily be discharged. The forward compartment 29 is then replaced.

[0055] A removable forward compartment 29 has been described hereinbefore to enable the collected debris to be removed from a surface cleaning apparatus according to the present invention. It should be appreciated that a surface cleaning apparatus in accordance with the present invention may have a forward compartment which is rigidly attached to the remainder of the cleaning body of the surface cleaning apparatus but is provided with a removable enclosure, for example a removable wall, to enable the debris to be removed.

[0056] A surface cleaning apparatus has been described hereinbefore in which there is a first rear compartment 3 which houses the electric motor 5, and a second rear compartment 9 which houses batteries. It should be appreciated that the motor 5 and batteries could be provided in a common rear compartment.

Claims

1. A surface cleaning apparatus comprising:

a cleaning body (1);

collection means (29) for accumulating debris retrieved from a surface to be cleaned, the collection means (29) being provided solely at a first end portion of the cleaning body (1) of the surface cleaning apparatus;

a handle means (49) connected by pivot means (54) to a second end portion (51) of the cleaning body (1) of the surface cleaning apparatus opposite the first end portion, the pivot means (54) being arranged to permit the first end portion of the cleaning body (1) of the surface cleaning apparatus to pivot relative to the handle mean (49) from a first orientation to a second, depending orientation;

a rotatable elongate brush arrangement (17) adapted to retrieve the debris from the surface to be cleaned and to direct the debris into the collection means (29), the rotatable elongate brush arrangement (17) being provided between the collection means (29) and the second end portion (51); and

a motor (5) arranged to rotate the brush arrangement (17), the motor (5) being provided substantially between the brush arrangement (17) and the second end portion (51) of the cleaning body (1).

2. A surface cleaning apparatus as claimed in claim 1, **characterised in that** the brush arrangement (17), the motor (5) and the second end portion (51) of the cleaning body (1) are arranged in a substantially straight line.

3. A surface cleaning apparatus as claimed in claim 1 or 2, **characterised in that** the first end portion of the cleaning body (1) is a front portion of the cleaning body (1) .

4. A surface cleaning apparatus as claimed in claim 1, 2 or 3, **characterised in that** the second end portion (51) of the cleaning body (1) is a rear portion of the cleaning body (1).

5. A surface cleaning apparatus as claimed in any one of claims 1 to 4, **characterised in that** the pivot means (54) allows the cleaning body (1) to pivot about an axis transverse to the axial direction of the handle mean (49).

6. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the pivot means (54) enables the cleaning body (1) to pivot through an angle of at least 95 degrees.

7. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** swivel means is provided between the handle mean (49) and the pivot means (54) .

8. A surface cleaning apparatus as claimed in claim 7, **characterised in that** the swivel means allows the handle mean (49) to rotate about the axis thereof relative to the cleaning body (1) of the surface cleaning apparatus, for example the axis of the swivel means being transverse relative to the axis of the pivot means (54).

9. A surface cleaning apparatus as claimed in claim 7 or 8, **characterised in that** the swivel means and the pivot means (54) are arranged to enable the surface cleaning apparatus to be steered by a user.

10. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the brush arrangement (17) extends substantially the entire width of the surface cleaning apparatus.

11. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the brush arrangement (17) is provided with a helically arranged row of bristles.

12. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the brush arrangement (17) is rotatable such that part of the brush arrangement (17) adapted to be adjacent to the surface to be cleaned is adapted, in use, to sweep debris towards the second end portion (51) of the apparatus.

13. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the apparatus is provided with baffle means (21) which, in combination with the brush arrangement (17), conveys debris around the brush arrangement (17) and into the collection means (29) at the first end portion of the apparatus.

14. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the motor (5) is powered by batteries, for example rechargeable batteries.

15. A surface cleaning apparatus as claimed in claim 14, **characterised in that** the batteries are provided between the brush arrangement (17) and the second end portion (51) of the surface cleaning apparatus.

16. A surface cleaning apparatus as claimed in any one of claims 1 to 13, **characterised in that** the motor (5) is powered by mains power.

17. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the collection means (29) is removable from the surface cleaning apparatus to facilitate the removal of debris therefrom.

18. A surface cleaning apparatus as claimed in any one of claims 1 to 16, **characterised in that** the collection means (29) is provided with a removable closure, for example a removable wall, for the removal of debris therefrom.

19. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the handle mean (49) may be connected by the pivot means (54) solely to the second end portion (51).

20. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the handle mean (49) comprises at least two parts (53, 55), for example to enable the length of the handle mean (49) to be varied.

21. A surface cleaning apparatus as claimed in any pre-

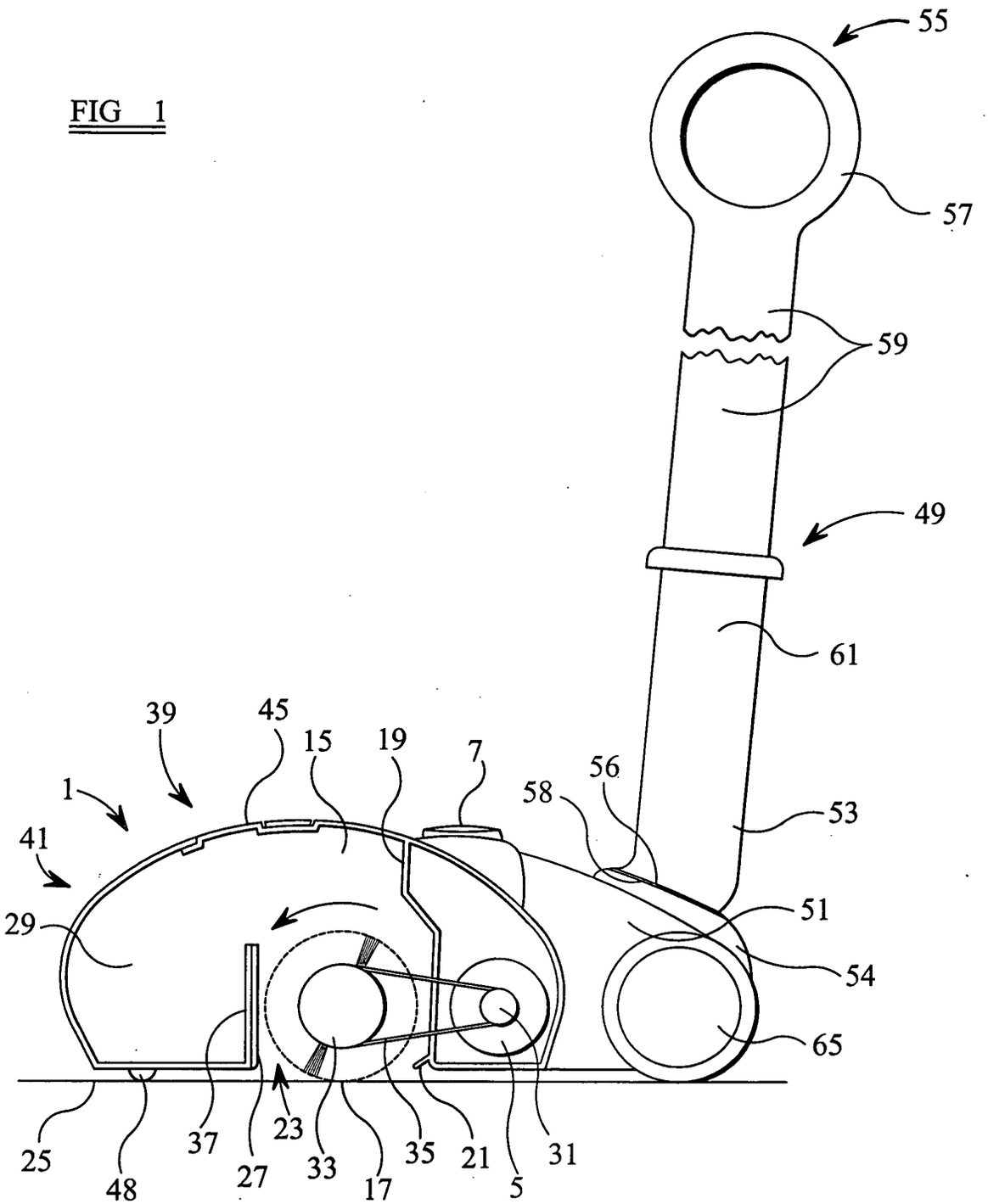
ceding claim, **characterised in that** the second end portion (51) of the cleaning body (1) of the surface cleaning apparatus is provided with ground-engaging wheels (65), for example formed externally in side regions of the second end portion (51) of the cleaning body (1) or provided within recesses formed at least partly beneath the second end portion (51) of the cleaning body (1).

22. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** the first end portion of the cleaning body (1) of the surface cleaning apparatus is provided with ground-engaging rollers (48), for example provided within recesses formed at least partly beneath the first end portion of the cleaning body (1) .

23. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** a bottom wall of the first end portion is maintained, in use, a distance from the surface to be cleaned.

24. A surface cleaning apparatus as claimed in any preceding claim, **characterised in that** a channel (50) is provided substantially centrally beneath the first end portion of the cleaning body (1), for example extending substantially the length of the first end portion from the front of the first end portion towards the brush arrangement (17).

FIG 1


55
57
59
49
61
39
45
15
19
7
56
58
53
1
41
29
51
54
65
25
48
37
27
23
33
17
35
21
5
31

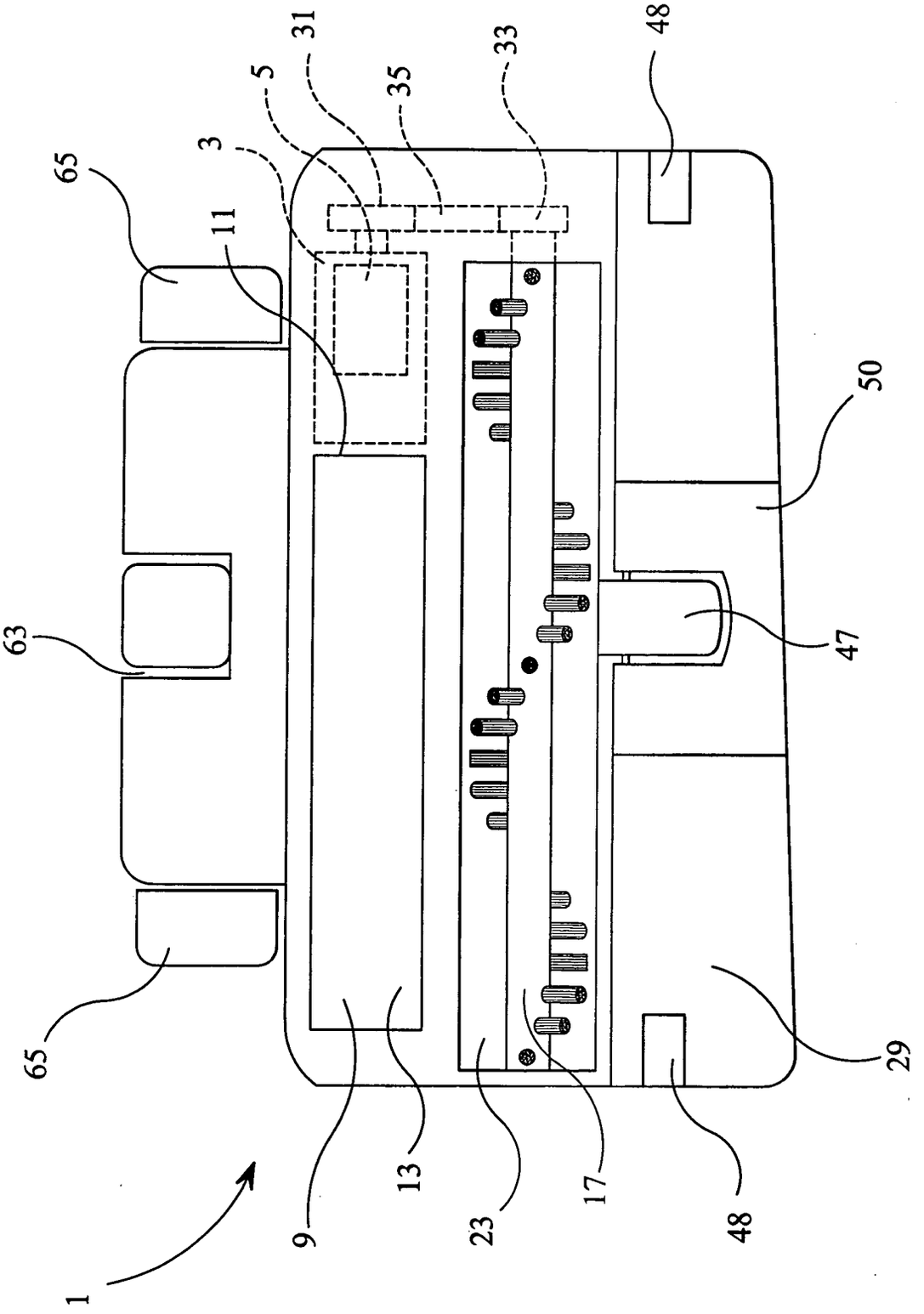
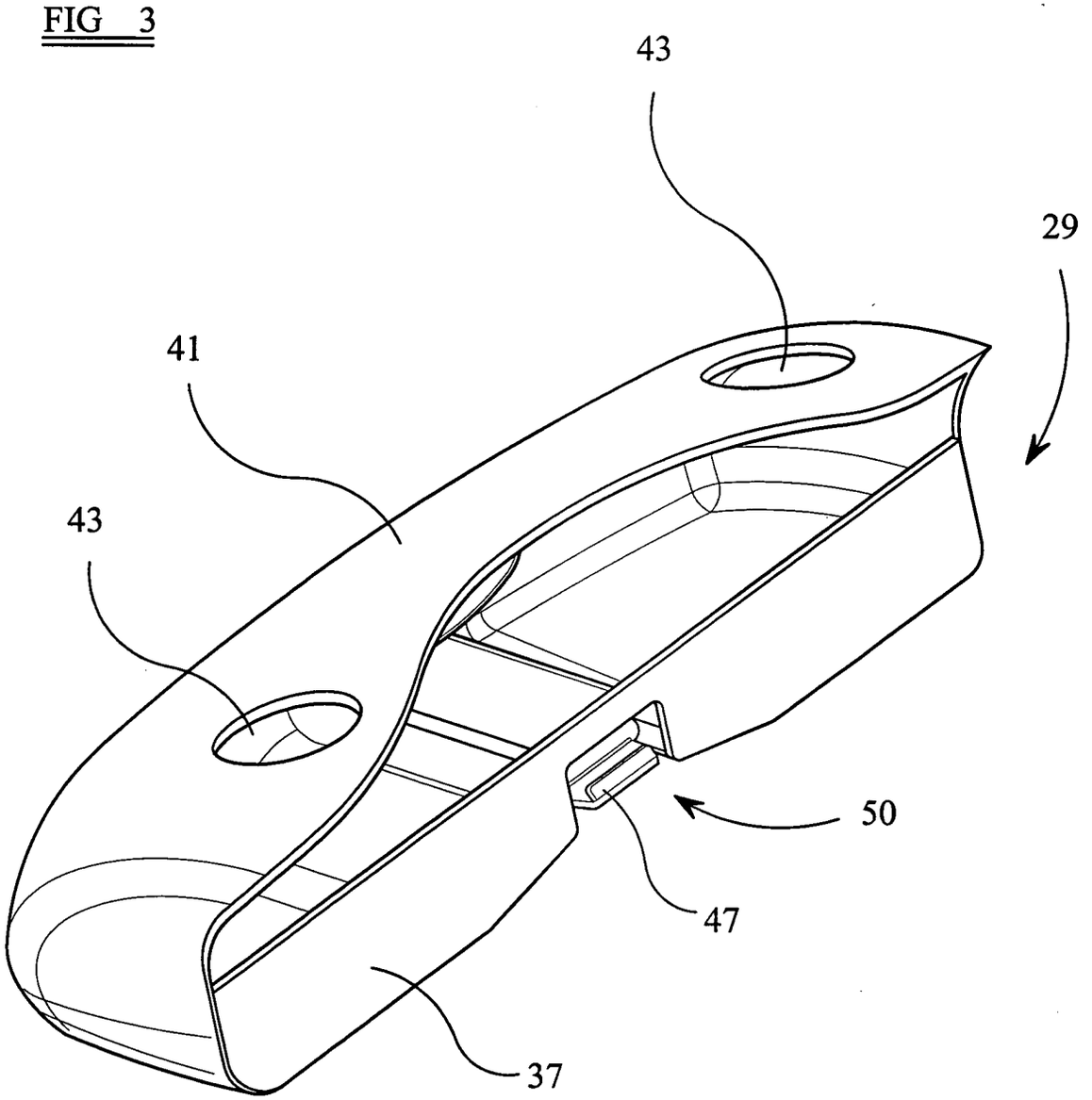


FIG 2

FIG 3



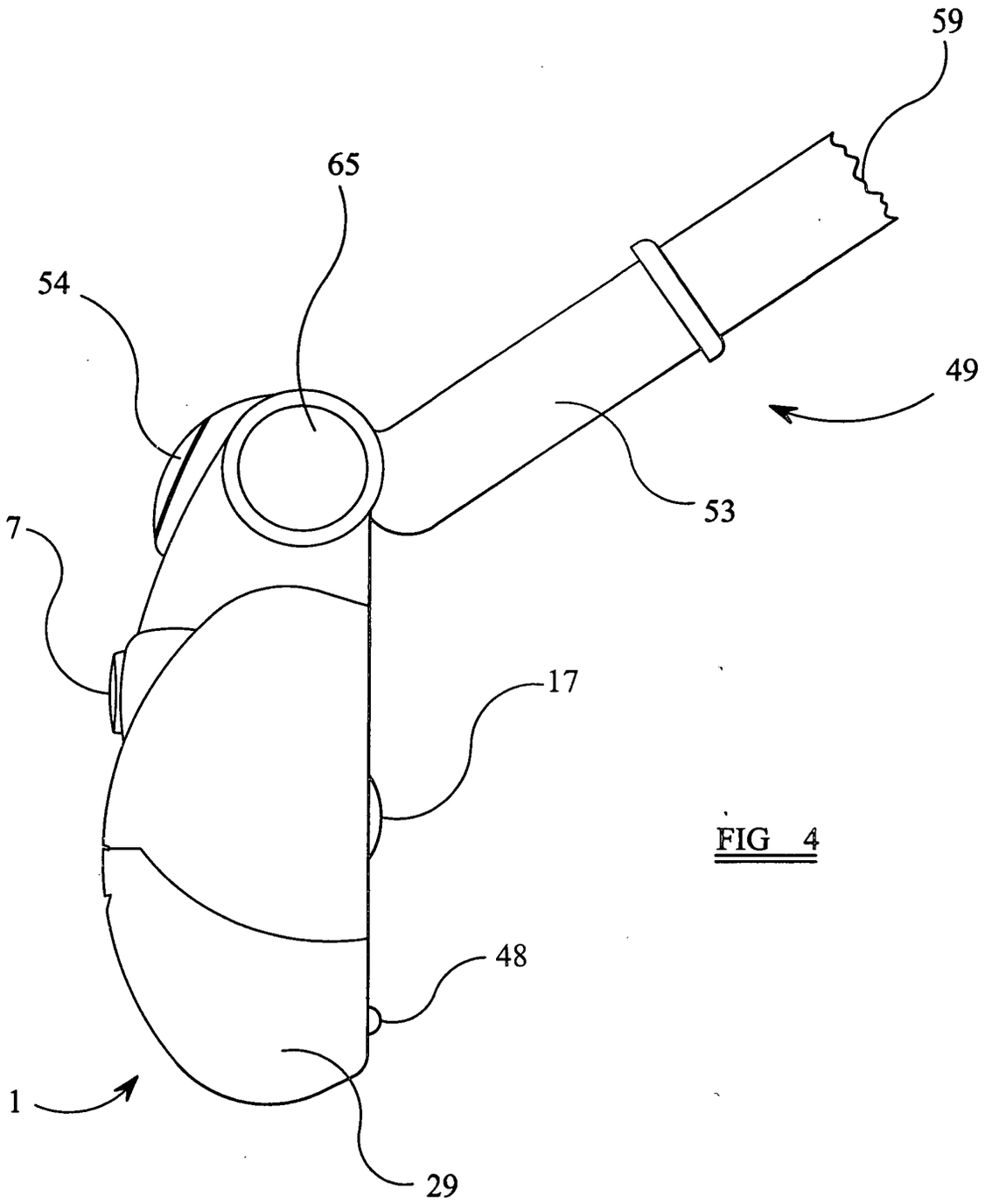


FIG 4