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Electric Broom

DESCRIPTION

Field of the invention

The present invention relates to an electric broom for
5 household use.

Prior art

Electrical apparatuses commonly denominated electric
brooms which are in practice vacuum cleaners with a
particular sucking head designed for sucking dust from
10 the floor are known. For example, apparatuses of this
kind are described by EP-A-0192624, EP-A-0611544, FR-A-
2213758, US-A-4766638, US-A-4956892. Said sucking head
normally comprises a boxed body provided with a sucking
mouth surrounded by brushes of various shapes and is
15 connected in a jointed manner to an elongated handle. In
use the head is passed over the floor so as to permit the
suction mouth to suck in the dirt spread on the floor.
The jointed connection allows that the sucking head
remains horizontal on the floor, irrespective of the
20 inclination of the handle, thereby ensuring the desired
suction effect. The actual vacuum cleaner unit can be
housed in a separate truck connected at the head by a
suction tube constituting the above mentioned elongated
handle or it can be mounted directly on the handle and
25 optionally on the sucking head itself.

These apparatuses serve certainly for cleaning the floor
but despite their name of electric broom they are not
used for sweeping. None of them is capable of performing
the typical action of a broom which is to collect, move
30 and accumulate the dirt on the floor. Consequently the
manner of using said apparatuses is significantly
different from the manner of using a broom.

CONFIRMATION COPY

Summing up, the availability of one of the apparatuses commonly called electric brooms does not allow doing without a conventional broom.

- In the following, the term "broom" will be used in strict sense, i.e. only for devices or apparatuses that include a stick handle fixed to a body provided with cleaning means such as bristles or the like, all these elements being arranged in such a manner as to allow that the broom is used for sweeping.
- 10 The only known electric broom in this sense is described in EP-A-0605280. It has a handle rigidly fixed to a broom body provided with cleaning bristles. An electric vacuum cleaner unit, housed in the broom body, is provided with a suction mouth open in an upper corner
- 15 region of the broom body. Operation of this electric broom is split into two phases: in the first phase, the broom is used to sweep as a normal broom to gather dust on a floor; in the second phase, the electric vacuum cleaner is activated, while the broom body is inclined
- 20 and used as a normal vacuum cleaner to suck the gathered dust from the floor. It is impossible to have a suction action while sweeping.

Summary of the invention

- The idea underlying the present invention is to conceive an apparatus permitting both sweeping in the conventional
- 25 manner and collection of the dirt by vacuum, successively or simultaneously at choice.

- On the basis of said idea the present invention relates to a broom comprising a handle in the form of an elongated stick, a broom body rigidly fixed below to the
- 30 handle and cleaning means born by the broom body and designed to collect dirt on a floor after dragging the broom body over said floor, and a vacuum cleaner unit

housed in the broom body and provided with a suction mouth open below in a position adjacent to the cleaning means.

An apparatus of this type is clearly a broom and as such
5 can be used for collecting the dirt on the floor without operation of the vacuum cleaner unit. Dirt collected by the broom operated when the vacuum cleaner is turned off can always be removed in the conventional manner (with a dust pan) or it can be sucked up by operating the vacuum
10 cleaner unit, only for the time strictly necessary. In addition to the obvious energy saving there is secured a drastic reduction in acoustic pollution. However, if preferred, the vacuum cleaner can be kept turned on while sweeping, thus allowing immediate and continuous suction
15 of the dirt.

In general the brushing means can be of different types either with bristles or with elastic material. Preferably however the cleaning means comprise an elastic pad provided with at least one rectilinear cleaning lip.

20 Indeed, the presence of bristles would make the sucking action less effective because of the passage of air between the bristles.

Preferably the pad has an elongated form and is provided with two parallel cleaning lips and still more preferably
25 the suction mouth is open in an intermediate position between the two lips. The presence of the two lips allows sweeping in a fully natural manner since it is possible to incline the broom on one side or the other freely. In addition, between the two lips is created a
30 compact and particularly effective suction zone.

Advantageously the two cleaning lips are defined each by two surfaces of the pad mutually inclined at an angle α and filleted with a curvature radius r , with α between

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60° and 90° and r between 2mm and 10mm. These values have proven suitable for allowing an effective cleaning action and adequate duration of the pad.

Advantageously the vacuum cleaner unit comprises an
5 electric motor housed in the broom body, a suction fan mounted in the broom body and driven by the motor, a suction path in the broom body between the suction mouth and the fan, a filtering element in the suction path and a collection tank made in the broom body beside the
10 suction path.

Such an arrangement permits handling the broom in accordance with the present invention as though it were a normal broom since the weights and space occupied are distributed in an analogous manner with a lower broom
15 body and a simple upper stick handle.

Advantageously the broom body comprises two units, one upper unit fixed to the handle and provided with the motor and fan, and a lower unit bearing the cleaning means and comprising the collection tank and the suction
20 mouth, the two units being integrated in a removable manner by peripheral groove and tongue joint between the two units and by means of a plurality of hooking means. The embodiment in two parts allows making readily accessible the collection tank for emptying the dirt
25 while the integration by means of groove and tongue joint and hooking ensures the necessary solidity for use as a broom.

The groove and tongue joint can be provided in various ways. Preferably the peripheral groove and tongue joint
30 is provided between a male portion made on the upper unit and a female portion made on the lower unit. Said groove and tongue joint is readily provided and particularly convenient in use.

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Advantageously the broom comprises a rechargeable battery housed in the broom body for supply of the electric motor. Battery supply permits the greatest freedom of use of the broom to increase its practicality.

- 5 Advantageously there can be provided a support for hanging the broom on a wall with said support including means for electrical connection of the rechargeable battery of the broom with a battery charger.

Brief description of the drawings

- 10 FIG. 1 shows a perspective view of a first broom in accordance with the present invention mounted on a support,

FIG. 2 shows a longitudinal cross section view of the broom of FIG. 1,

- 15 FIG. 3 shows a cross section view of the broom of FIG. 1,
FIG. 4 shows an exploded longitudinal cross section view of the broom of FIG. 1,

FIG. 5 shows a perspective view of the support for the broom of FIG. 1,

- 20 FIG. 6 shows a cross section view of a different variant of a detail of the broom of FIG. 3,

FIG 7 is a front side view of a second broom in accordance with the present invention,

- FIG. 8 shows a cross section view of the broom of FIG. 8,
25 and,

FIG. 9 shows a perspective view of the broom of FIG. 7.

Description of a preferred embodiment of the invention

With reference to the figures reference number 1 indicates as a whole a broom assembly, including a broom 2 and a support 3.

The broom 2 comprises a broom body 4 rigidly fixed to the lower end of a handle 5 having the form of an elongated stick.

The broom body 4 has a form flattened vertically, i.e. it has a dimension in a horizontal direction X much smaller than both the dimension in the other horizontal direction Y perpendicular to the former and the dimension in a vertical direction Z. The broom body 4 is provided below with cleaning means and specifically a pad 6 of form elongated in direction Y provided in elastic material (foamed rubber or the like) and fitted with two parallel cleaning lips 7. The cleaning lips 7 are each defined by two surfaces of the pad 6, a side surface 8 and a bottom surface 9 which are mutually inclined at an angle α and filleted with a curvature radius r. Preferably α is between 60° and 90° while r is between 2mm and 10mm.

In the broom body is housed a vacuum cleaner unit comprising an electric motor 10, a fan 11, a suction path 12, a filtering element 13 and a collection tank 14. The electric motor 10 is mounted with the vertical motor axis 15 in centred position in the broom body 4 essentially aligned with the handle 5. The fan 11 is of the centrifugal type and keyed directly on the motor axis 15.

The suction path 12 is defined in the broom body 4 between a suction mouth 16 and a plurality of vent louvers 17. The suction mouth 16 is made in the bottom of the broom body 4 in a position adjacent to the cleaning means and traverses the pad 6 in a median position thereof between the two cleaning lips 7. The vent louvers 17 are made in the top of the broom body 4

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in a position near the handle 5.

Between the suction mouth 16 and the vent louvers 17, the suction path 12 comprises a series of chambers open one on the other and closed towards the inner space of the broom body 4. A first chamber 18 defined by a first tubular wall 19 is adjacent to the suction mouth 16 and extends therefrom upward. A second tubular wall 20 surrounds coaxially the tubular wall 19. Below, said tubular wall 20 is closed by a bottom wall 21 of the broom body 4 and delimits the collection tank 14. Above, the tubular wall 20 extends vertically more than the tubular wall 19 and defines a second chamber 22 open at the top and on which opens the first chamber 18. A third chamber 23 is defined as an upward extension of the chamber 22 by a third tubular wall 24 and a fourth chamber 25 is defined as an upward extension of the chamber 23 by a fourth tubular wall 26. Between the second chamber 22 and the third chamber 23 is placed the filtering element 13 and between the third chamber 23 and the fourth chamber 25 is placed a baffle 27 having a circular central hole 28 in which is housed the fan 11. A fifth chamber 29 is defined as an upward extension of the chamber 25 from a fifth tubular wall 30 up to a top wall 31 of the broom body 4 where are made the vent louvers 17. In the chamber 29 are housed the electric motor 10 and a plurality of supply batteries 32 which are thus licked and surrounded by the air flow in the suction duct 12. All of the tubular walls 19, 20, 24, 26, 30 have a cross section which is not circular but elliptical or at least crushed in the direction of the axis X to make better use of the inner space of the broom body 4 which is flattened in the direction of the axis X.

The broom body 4 is provided in two separable superimposed units, a top unit 33 and a bottom unit 34 both having a boxed structure and provided preferably of

moulded plastic. The top unit 33 comprises the suction path 12 defined by the chambers 23, 25, 29 while the bottom unit 34 comprises the portion of suction path 12 defined by the chambers 18 and 22. The electric motor 10, the fan 11 and the batteries 32 are thus housed in the top unit 33 which also bears the handle 5. The collection tank 14 is housed in the bottom unit 34 which also bears the pad 6. The filtering element 13 comprises a micropierced fabric 35 (provided preferably with a so-called nonwoven fabric) fixed on a ledge 36 of elastomeric material which is fitted on the tubular wall 24 and provides airproofness with the tubular wall 20 when the two units 33 and 34 are assembled. A plurality of spacing teeth 37 are fixed to the baffle 27 around its central hole 28 and turned downward against the filter fabric 35 to avoid the pressure exerted by the air crushing the fabric 35 against the fan 11 and thus reducing the filtering surface area.

The top unit 33 is provided below with a peripheral step 38 while the bottom unit 34 is open above and provided with a peripheral edge 39 essentially complementary to the step 38. The step 38 and the peripheral edge 39 constitute respectively a male portion and a female portion of a peripheral groove and tongue joint between the two units 33 and 34. In addition to said groove and tongue joint the two units 33 and 34 are provided with mutual connection means indicated as a whole by reference number 40.

The connection means 40 comprise a pair of shafts 41 pivotally mounted on the top unit 33 and protruding downward and a corresponding pair of seats 42 provided in the bottom unit 34 and turned upward. Each shaft 41 is provided below with at least one eccentric tooth 43 while each seat 42 is provided with a corresponding hooking edge 44 for the tooth 43. Each shaft 41 is then provided

with a rotary drive lever 45 protruding outside the top unit 33 through a window 46 and an auxiliary lever 47 connected by a spring 48 to a fixed point 49 on the unit 33.

5 The pad 6 of elastic material is preferably mounted between two rigid supports, a lower support 50 and an upper support 51, which are mutually integral. Specifically the lower support 50 is provided with two posts 52 turned upward and which engage in corresponding
10 holes 53 formed in the upper support 51 through passages 54 in the pad 6. In addition the lower support 50 is provided in a median position of an opening filleted to a tubular wall 55 extending upward and engaging in a corresponding hole 56 in the upper support 51 through a
15 passage 57 in the pad 6. The tubular wall 55 - with pad 6 mounted - connects to the first tubular wall 19 of the suction path 12. In practice the tubular wall 55 defines the suction mouth 16. For fixing of the broom body 4 the posts 52 are provided with elastic toothed appendices 58
20 turned upward for insertion in seats 59 formed in the bottom unit 34 and snap connection with teeth 60 in said seat. In this manner to the broom body 4 is fixed the lower support 50 and therewith the pad 6 and the upper support 51. To ensure the best mutual positioning the
25 bottom unit 34 is provided around the seats 59 with respective tubular extensions 61 designed to enter the holes 53 and the passages 54 around the posts 52. In addition there are provided two rungs 62 projecting above from the upper support 51 and two corresponding holes 63
30 formed in the lower wall of the bottom unit 34 of the broom body 4.

The broom is also provided with a switch 64a housed on the top unit 33 for starting and stopping the electric motor 10.

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The support 3 for the broom 2 comprises an essentially vertical wall 64 designed for fixing to a wall and an essentially horizontal bracket 65 which can be rested on the floor or hung depending on the height at which the support 3 is placed on the wall.

On the wall 64 are provided two opposed elastically deformable arms 66 for holding the handle 5 of the broom 2. On the bracket 65 is provided a positioning projection 67 designed to be inserted in the suction mouth 16. Two other smaller projections 68 are provided on the bracket 65 for insertion in holes 69 made in the lower support 50 of the pad 6 opposite the posts 52.

Between the support 3 and the broom 2 are provided electrical contacts for recharging the batteries 32. Specifically on the wall 64 of the support 3 are provided two contacts 70a and on the top unit 33 of the broom body 4 are provided two corresponding contacts 70. The contacts 70a and/or the contacts 70 are spring-mounted to permit effective electrical coupling. The contacts 70 are connected by wiring not illustrated with batteries 32. The contacts 70a are connected by wiring not illustrated with a battery charger or external power supply of the conventional type and not illustrated.

Behind the wall 64 is provided a step 71 to facilitate installation in the presence of a baseboard.

Operation of the broom in accordance with the present invention is clear from the above description.

With the electric motor 10 off, the broom 2 can be conveniently used as a normal broom. The cleaning lips 7 permit moving and collecting the dirt on a floor by operating the broom 2 in an absolutely normal manner.

Starting of the electric motor 10 causes a sucking action

by the suction mouth 16. Said sucking action can be used either after collection of the dirt using the broom 2 manually as described above or during operation of the broom 2 to secure immediate suction of the dirt.

- 5 The air and dirt sucked in by the mouth 16 traverse the chamber 18 and enter the chamber 22 where they are intercepted by the filtering element 13. While the air can traverse said filtering element 13 the dirt is stopped and falls back into the collection tank 14. The
10 air issues from the vent louvers 17 after traversing in succession the chambers 23, 25 and 29 and contributing to cooling of the electric motor 10 and the batteries 32.

- To empty the collection tank 14 and optionally clean the filtering element 13 it is necessary to separate the two
15 units 33 and 34. For this purpose one operates the lever 45 and rotates the shafts 41 to disengage the teeth 43 from the edge 44 of the seats 42. Subsequently one can draw out the top unit 33 from the bottom unit 34. The tank 14 can be readily emptied by merely overturning the
20 bottom unit 34. The filter fabric 35 can be cleaned with a brush or the entire filtering element 13 can be removed and washed.

- Also the cleaning pad 6 can be readily removed either for better cleaning thereof or for possible replacement. For
25 this purpose it suffices to unhook the lower support 50 by means of mere traction since the coupling with the broom body 4 is by snap.

- The cleaning pad 6 of the broom 2 may be replaced by a different cleaning pad 90, having asymmetric
30 construction, according to the variant shown in figure 6. In the cleaning pad 90, there is provided a suction mouth 91 which is at an angle with respect to the vertical direction Z; more in particular, the mouth 91 has a mouth

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intake section 92 disposed according to a plane forming an angle β with the direction Z which is greater than 45° and smaller than 90° , preferably of 60° to 75° .

The mouth 91 is surrounded by two rectilinear cleaning
5 lips 93 and 94 oriented in direction Y, one different from the other. More in particular, lip 93 is enclosed between two surfaces defining an obtuse angle while lip 94 is enclosed between two surfaces defining an acute angle. With reference to the plane of the intake section
10 92 of the suction mouth 91, lip 94 lies well below that plane, while lip 93 lies right in that plane or just above (below and above are used with reference to the vertical position of the broom). Considering the operation (which will be described below), lip 93 will be
15 named idle lip and lip 94 will be named working lip.

Cleaning pad 90 is particularly suitable when the user desires to have the suction action during sweeping operation. Broom 2 equipped with cleaning pad 90 is to be operated with the idle lip 93 forwards and the working
20 lip 94 backwards, while keeping the handle 5 so inclined as to have the idle lip 93 raised just a little from the floor while the working lip 94 slides on it. Dust is collected by the working lip 94 and immediately removed by suction into the suction mouth 91; idle lip 93
25 cooperates in creating a suction volume between the cleaning pad 90 and the floor, thus facilitating suction of the dust.

Another broom in accordance with the invention is shown in figures 7 to 9, and is indicated as a whole by numeral
30 102. The broom 102 is similar to the broom 2 in many aspects; for examples, it includes a broom body 104 rigidly fixed to the lower end of a handle 103 having the form of an elongated stick. Parts and elements of the broom 102 directly corresponding to parts and elements of

the broom 2 will have reference numerals greater by 100 than those of broom 2; for parts and elements not having a direct correspondence, numerals greater than 200 will be used.

5 The broom body 104 has a form flattened vertically, and is provided below with cleaning means 106, which means include a pad 201 provided in elastic material (foamed rubber or the like) and a bundle of bristles 202. The pad 201 and the bundle of bristles 202 have both a form
10 elongated in direction Y and are placed side by side along the same direction Y. The pad 201 is fitted with a cleaning lip 107, extended in the Y direction as well.

In the broom body 104 is housed a vacuum cleaner unit comprising an electric motor 110, a fan 111, a suction
15 path 112, a filtering element 113 and a collection tank 114. The electric motor 110 is mounted with the vertical motor axis 115 in centred position in the broom body 104 essentially aligned with the handle 105. The fan 111 is of the centrifugal type and keyed directly on the motor
20 axis 115.

The suction path 112 is defined in the broom body 4 between a suction mouth 116 and a plurality of vent louvers 117. The suction mouth 116 is made in the bottom of the broom body 104 and has a mouth intake section 192
25 which is disposed according to a plane forming an angle β with the direction Z which is greater than 45° and smaller than 90° , preferably of 60° to 75° . The intake section 192 is in a position adjacent to the pad 201, on its side opposite to the bundle of bristles 202. The
30 vent louvers 117 are made in the top of the broom body 104 in a position near the handle 105.

Between the suction mouth 116 and the vent louvers 117, the suction path 112 comprises a series of chambers,

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quite similar to those of the broom 2; for this reason, these chambers will not be described in detail in the following.

5 The broom body 104 is provided in two separable superimposed units, a top unit 133 and a bottom unit 134 both having a boxed structure and provided preferably of moulded plastic. The electric motor 110, the fan 111 and batteries 132 are housed in the top unit 133 which also bears the handle 105. The collection tank 114 is housed
10 in the bottom unit 134 which also bears the cleaning means 106. The filtering element 113 is equal to filtering element 13 of the broom 2.

The top unit 133 and the bottom unit 134 are secured one another by groove and tongue joint with male-female
15 engagement. In addition to said groove and tongue joint the two units 133 and 134 are provided with mutual connection means 140, including an elastic projection 203 fixed on the bottom unit 134 and a corresponding seat 204 formed in the top unit 133; separation of the two units
20 133 and 134 can be obtained only after disengagement of the projection 203 from the seat 204.

The pad 201 has a rectangular cross section (see figure 8) and is removably secured to the broom body 104 by holding between two opposing walls 205 and 206 formed in
25 the bottom unit 134; to improve holding action, the walls 205 and 206 are provided with projections 207, which penetrate into the pad 201.

The broom 102 is also provided with a switch 164 housed on the top unit 133 for starting and stopping the
30 electric motor 110.

Similarly to the broom 2, the broom 102 is provided with a support, which is fully correspondent to support 3; such support is not shown in the drawings and will not be

described.

Operation of the broom 102 is equivalent to operation of the broom 2, particularly if the latter is provided with the cleaning pad 90. The only significant difference is
5 the possibility - when sweeping manually, i.e. without operating the vacuum cleaner - to chose to work either with the pad 201 of elastic material or with the bundle of bristles 202, to collect the dust on the floor.

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CLAIMS



1. Broom comprising a handle in the form of an elongated stick, a broom body rigidly fixed below to the handle, cleaning means born by the broom body and
5 designed to collect dirt on a floor after dragging of the broom body on said floor, and a vacuum cleaner unit housed in the broom body provided with a suction mouth open at the bottom in a position adjacent to the cleaning means.
- 10 2. Broom in accordance with claim 1 wherein the cleaning means comprise a pad of elastic material provided with at least one rectilinear cleaning lip.
3. Broom in accordance with claim 2 wherein the pad has elongated form and is provided with two parallel
15 cleaning lips.
4. Broom in accordance with claim 3 wherein the suction mouth opens in an intermediate position between the two cleaning lips.
5. Broom in accordance with claim 4 wherein the two
20 cleaning lips are each defined by two pad surfaces mutually inclined at an angle α and filleted with a curvature radius r where α is between 60° and 90° and r is between 2mm and 10mm.
6. Broom in accordance with claim 1 wherein the vacuum
25 cleaner unit comprises an electric motor housed in the broom body, a suction fan mounted in the broom body and operated by the motor, a suction path in the broom body between the suction mouth and the fan, a filtering element in the suction path and a collection tank made in
30 the broom body beside the suction path.
7. Broom in accordance with claim 6 wherein the broom

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body comprises two units, an upper unit fixed to the handle and provided with the motor and fan and a lower unit bearing the cleaning means and comprising the collection tank and the suction mouth, the two units
5 being integrated in a removable manner by means of a peripheral groove and tongue joint between the two units and by means of a plurality of hooking means.

8. Broom in accordance with claim 7 wherein the peripheral groove and tongue joint is provided between a
10 male portion made on the upper unit and a female portion made on the lower unit.

9. Broom in accordance with claim 6 comprising a rechargeable battery housed in the broom body for supply of the electric motor.

15 10. Broom assembly comprising a broom in accordance with claim 6 and a support for hanging the broom on a wall with said support including means of electrical connection of the rechargeable battery of the broom to a battery charger.

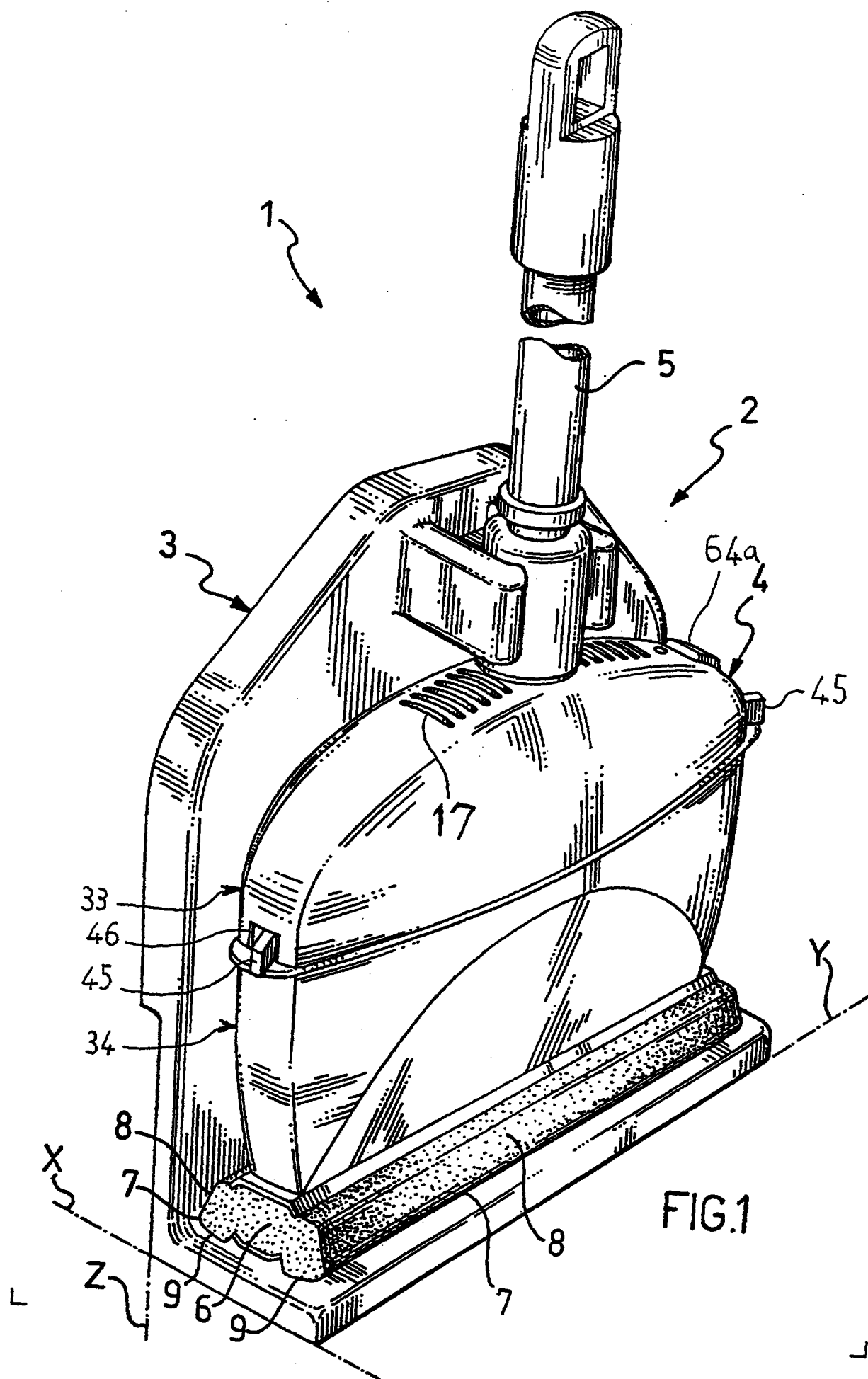
20 11. Broom in accordance with claim 3, wherein the suction mouth has an intake section disposed according to a plane forming an angle with the vertical direction, such angle being greater than 45° and smaller than 90°, the two cleaning lips being at different sides of the plane.

25 12. Broom in accordance with claim 2, wherein the cleaning means further comprise a bundle of bristles, adjacent to the pad of elastic material.

13. Broom in accordance with claim 12, wherein the pad of elastic material is between the suction mouth and the
30 bundle of bristles.

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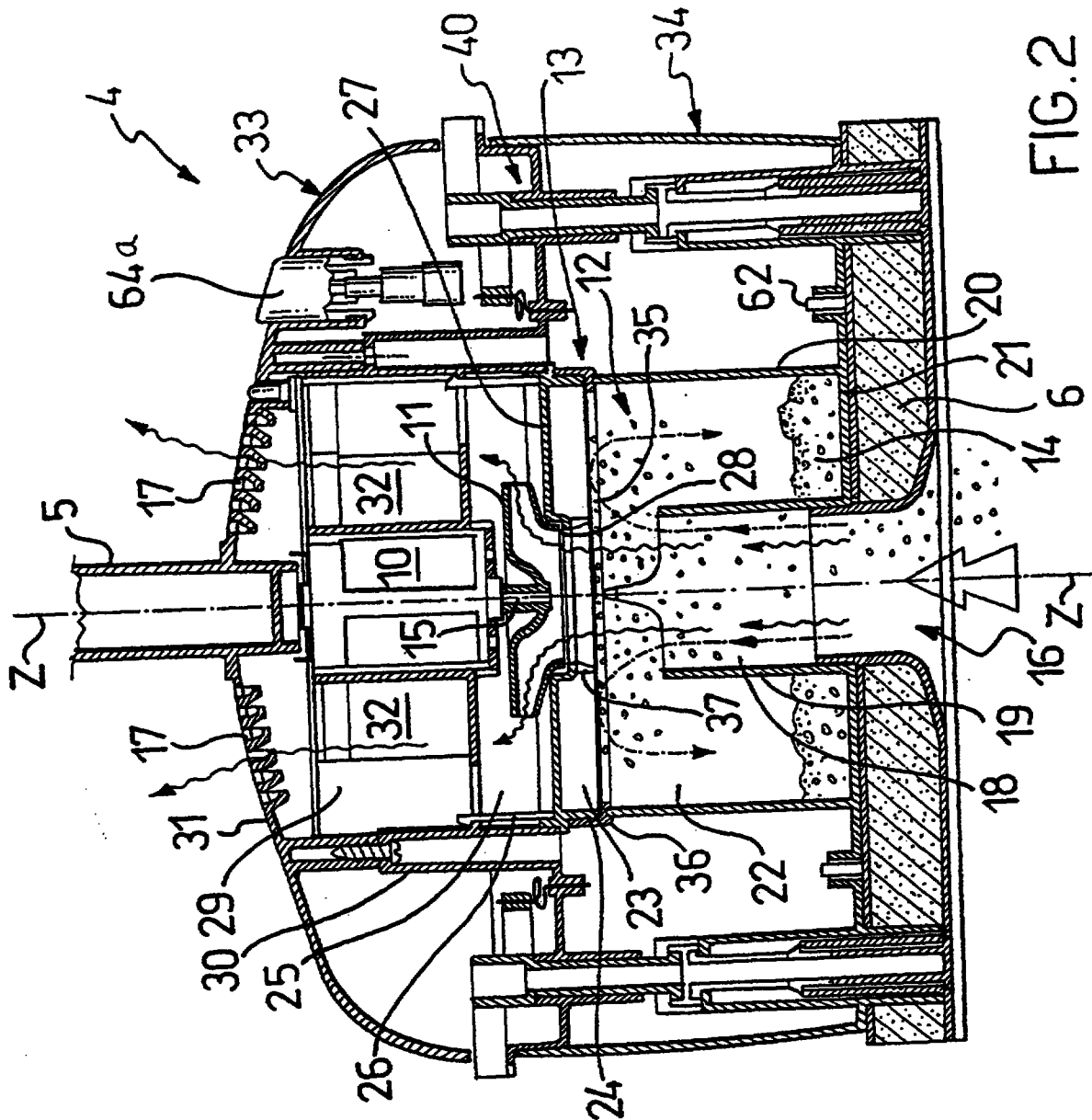


FIG. 2

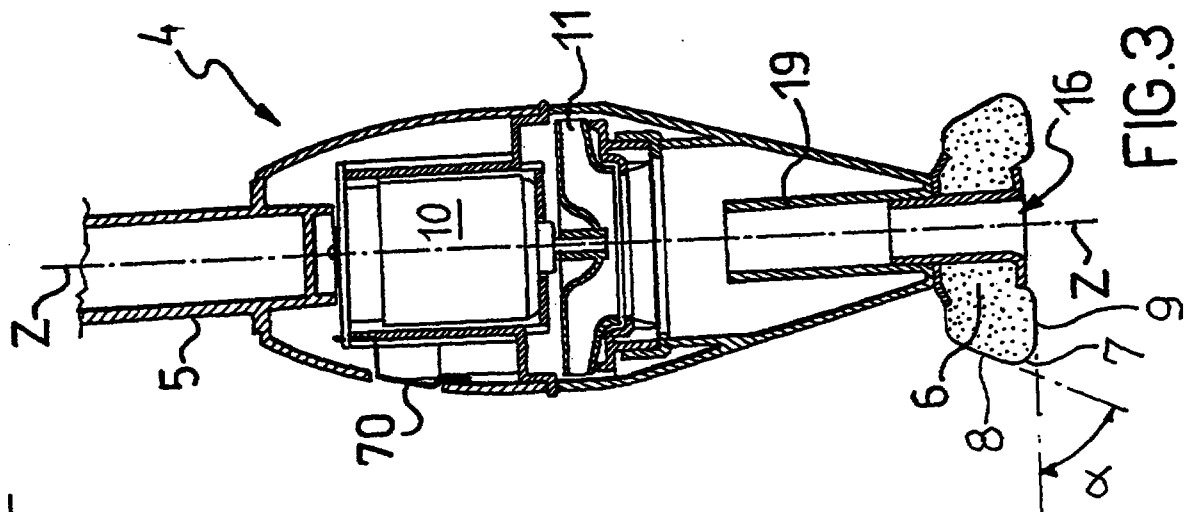


FIG. 3

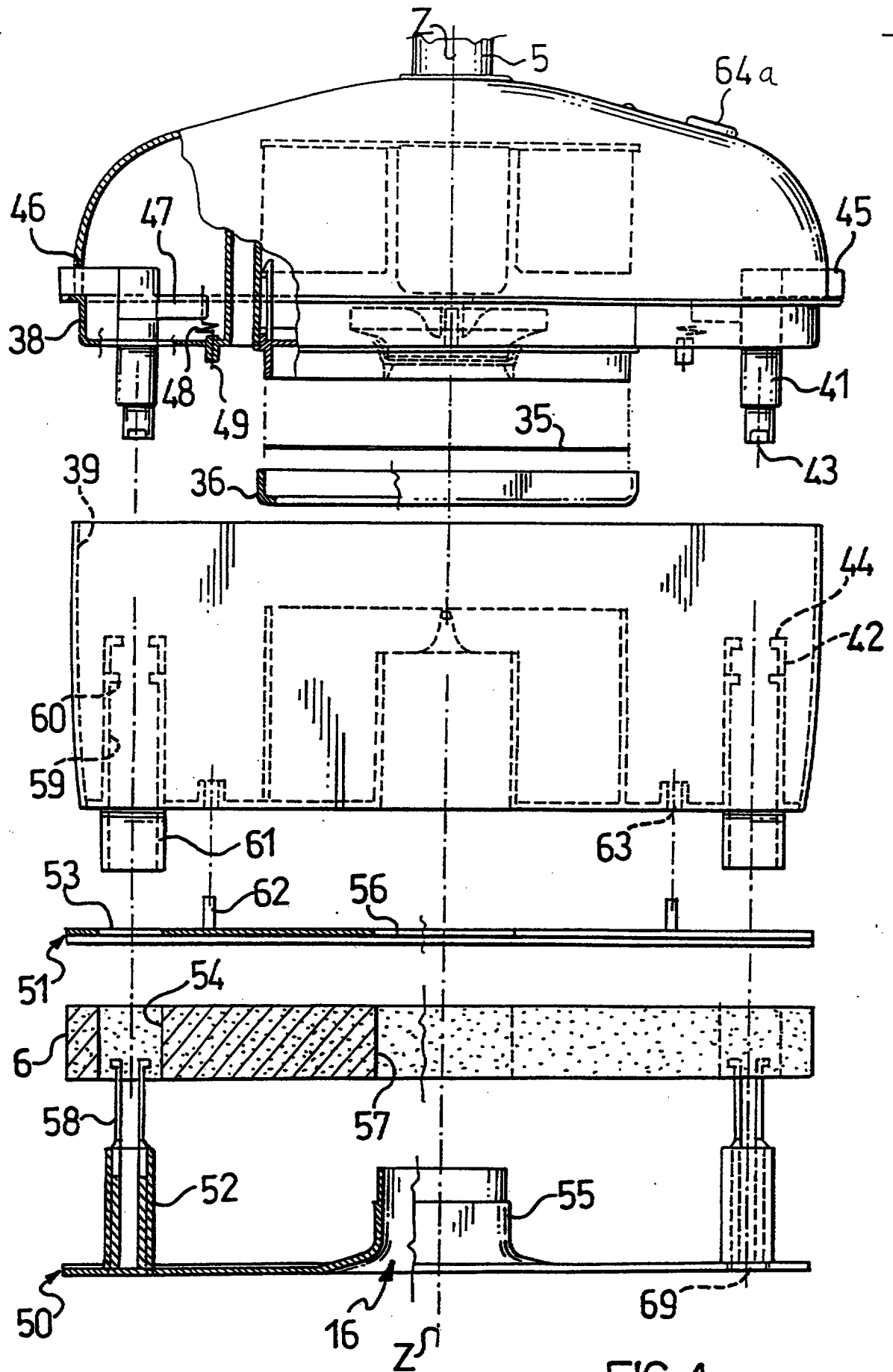


FIG. 4

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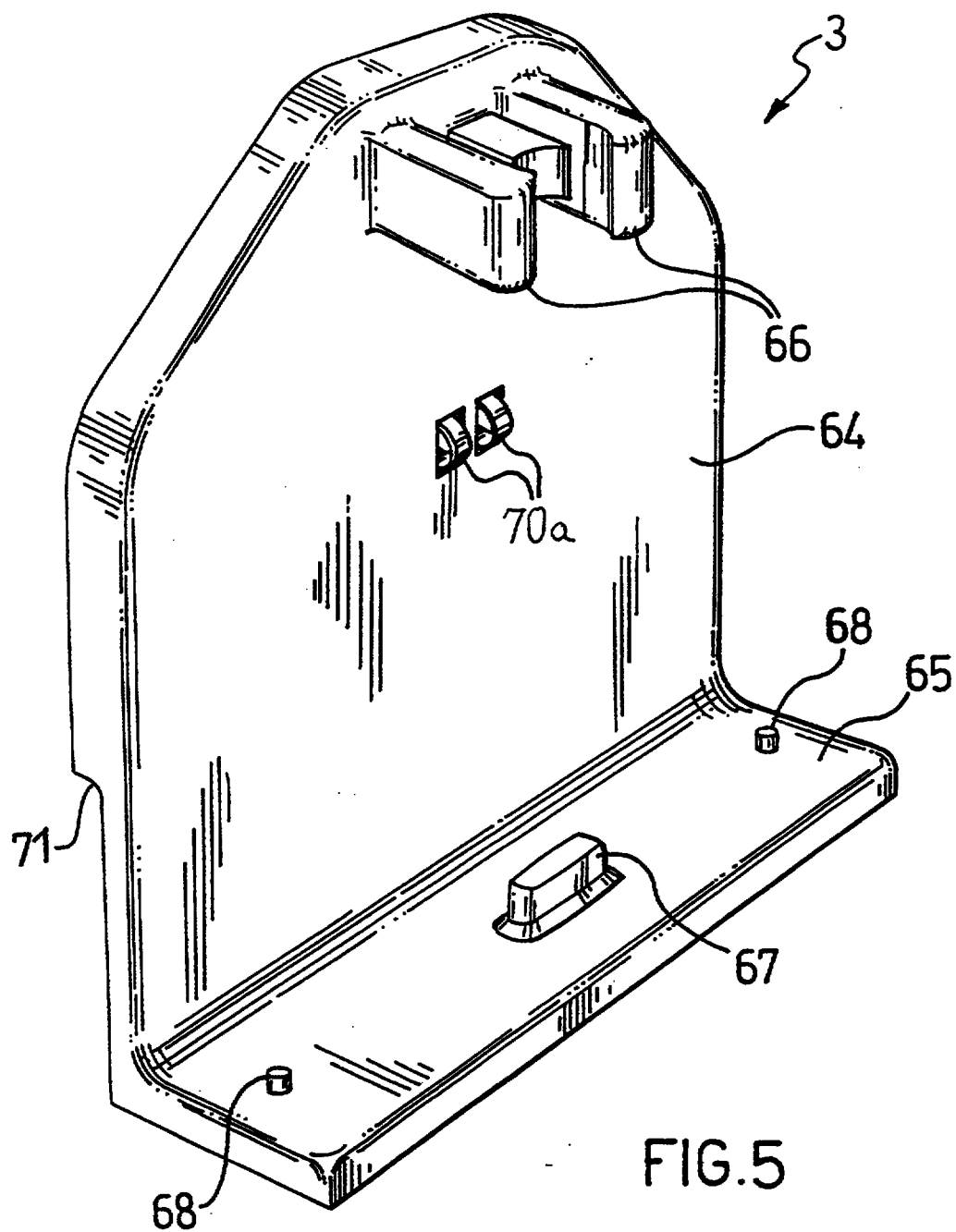


FIG. 5

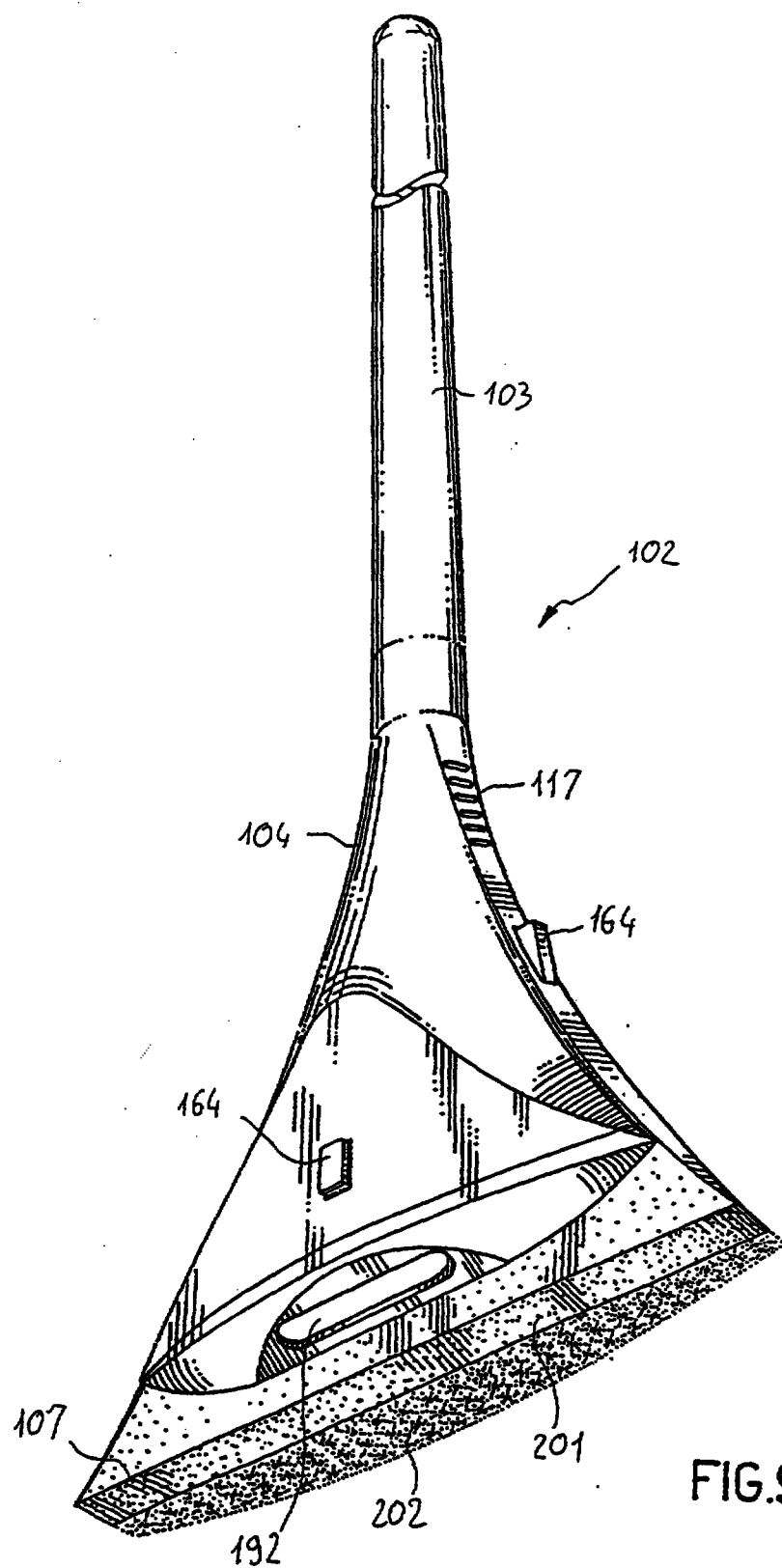
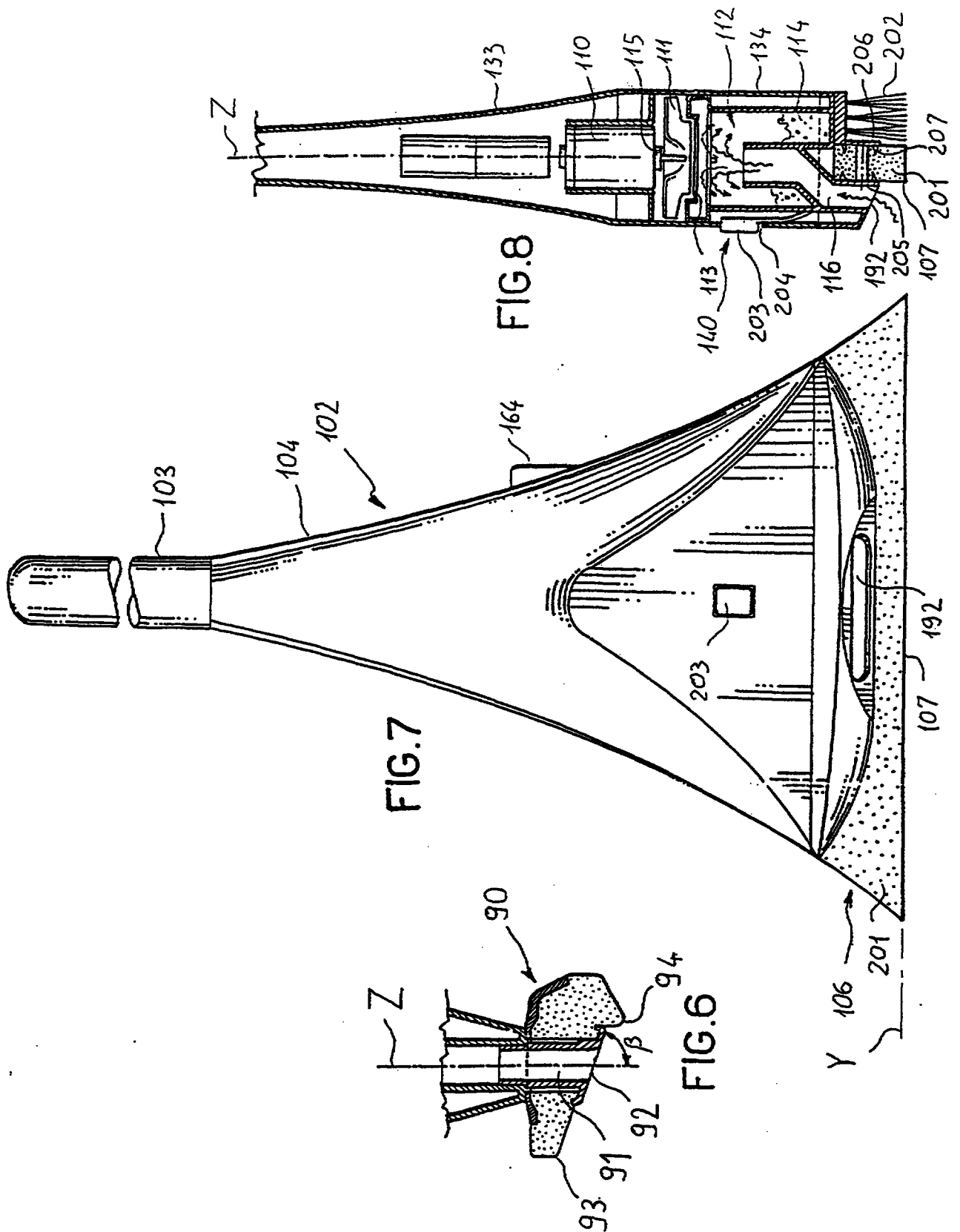


FIG.9





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(54) Title: **ELECTRIC BROOM**

(57) Abstract

The broom (1) comprises a handle (5) in the form of an elongated stick, a broom body (4) fixed below to the handle, cleaning means (6) born by the broom body and designed to collect dirt on a floor after dragging of the broom body on said floor. It is characterised in that it comprises a vacuum cleaner unit housed in the broom body provided with a suction mouth (16) open at the bottom in a position adjacent to the cleaning means.

