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Engquist

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[54] **CLEANING DEVICE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 185,079, Sept. 30, 1971, abandoned.

[52] **U.S. Cl.** **15/421,** 15/322, 15/347

[51] **Int. Cl.** **A47l 9/02**

[58] **Field of Search** 15/321, 322, 415, 420, 15/421, 347, 414; 285/7

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[57] **ABSTRACT**

A cleaning device for the removal of excrement and extraneous matter from a surface such as human skin and the like, which device includes a trough-like intake channel having a suction passage connectible to a vacuum source for effecting the passage of material from the surface being cleaned to the vacuum source. A filter element is supported in line with the suction passage to retain solid particles removed from the skin while allowing passage of fluids therethrough, and a fluid discharge passage is connectible to a source of liquid washing medium for selectively discharging the liquid onto the skin surface to loosen matter to be removed.

9 Claims, 5 Drawing Figures

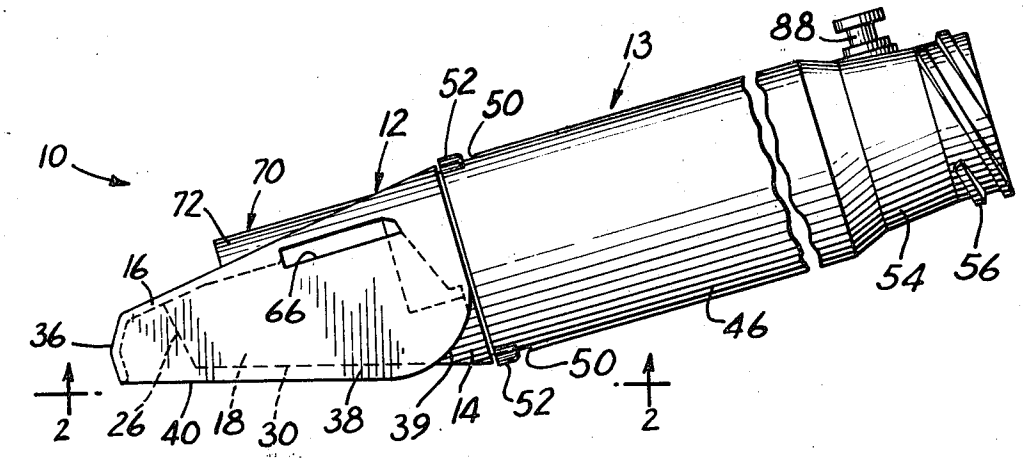


FIG. 1

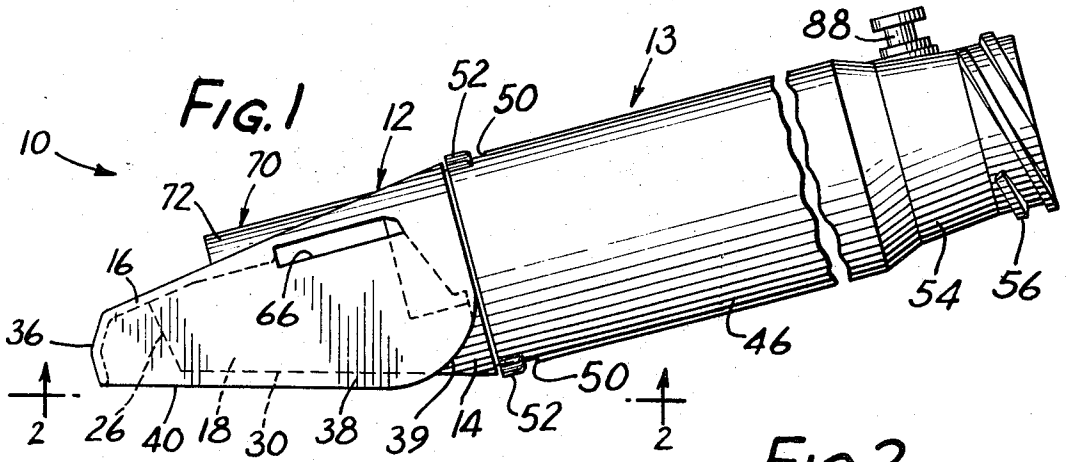


FIG. 2

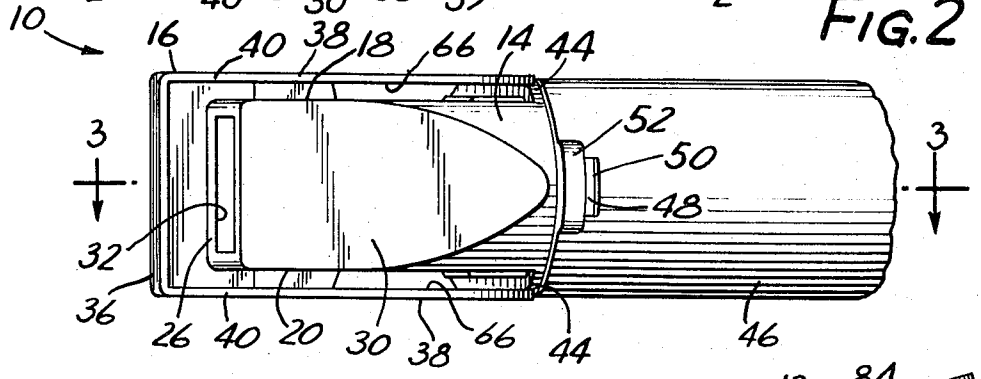


FIG. 3

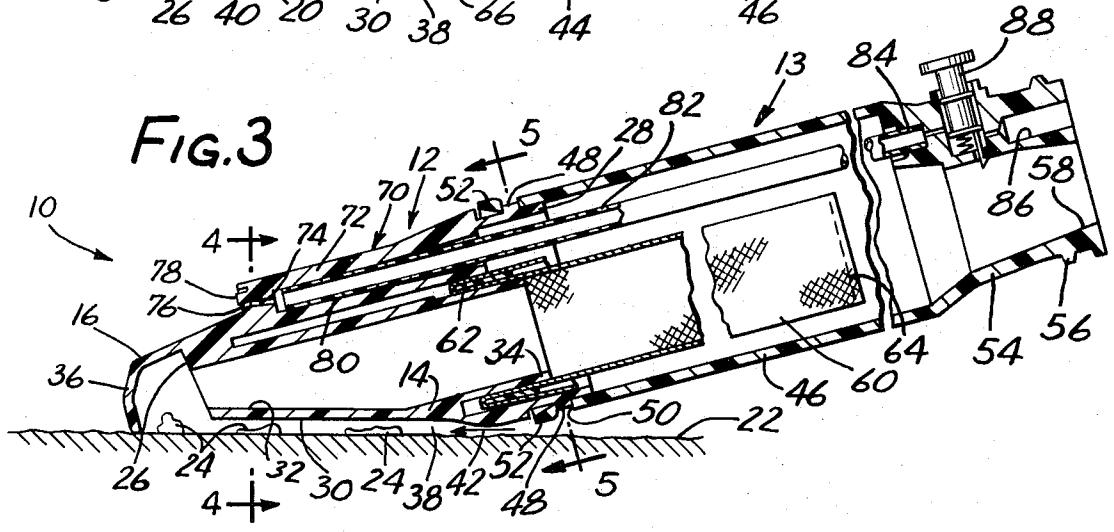


FIG. 4

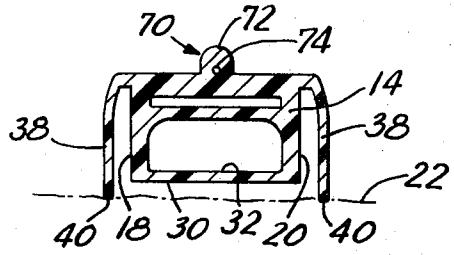
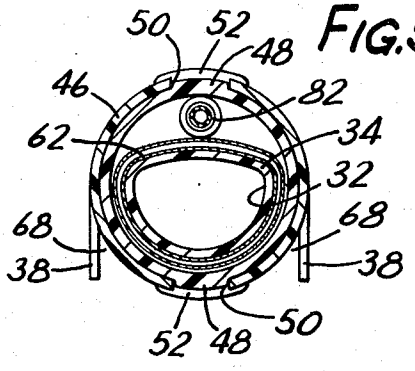


FIG. 5



CLEANING DEVICE

The present application is a continuation-in-part application from my copending application, Ser. No. 185,079, filed Sept. 30, 1971 now abandoned, and relates generally to cleaning devices, and more particularly to an aspiration-type cleaning device for cleaning a surface such as human skin and the like by the removal of excrement and extraneous matter from the surface by suction.

It is known to employ suction nozzles for cleaning surfaces such as carpeting, wall surfaces, upholstery and like items. Conventionally, a generally tubular nozzle is connected by a flexible hose to a source of vacuum and the materials being removed from the surface undergoing cleaning are drawn inwardly through the suction nozzle. Depending upon the nature of the matter to be removed and upon the nature of the underlying surface, problems are frequently encountered in moving the cleaning nozzle along the surface and moving it from area to area. Such difficulties are particularly encountered in the cleaning of textiles, soft tissues, foils, human skin and the like because such surfaces easily adhere to the edges of the nozzle defining the suction opening and make it difficult to move the nozzle over or readily remove it from the surface being cleaned.

Attempts have been made to reduce these difficulties by counteracting the suctional force through the provision of leak holes or breather openings in the suction nozzles to assist in allowing movement of the nozzle or removal from the surface being cleaned without great difficulty or damage to the surface. The present invention overcomes the disadvantages found in prior cleaning devices by providing an aspiration-type cleaning device which is particularly compatible with thin pliable surfaces such as flexible plastic or textile sheets, and with human skin and the like in removing semi-liquid or highly viscous matter such as feces or excrement deposited on the skin of bedridden patients or on the surfaces of bedding for such patients as in hospitals and the like.

One of the primary objects of the present invention is to provide a cleaning device which has a novel configuration greatly facilitating continuous movement of the nozzle over the surface being cleaned without lifting the device from the surface, but which also allows the device to be readily raised from the surface without irritating the surface, such as human skin, or damaging the surface in any manner.

Another object of the present invention is to provide an aspiration-type cleaning device having a configuration which effects an inflow of air in a direction parallel to the surface being cleaned whereby to move the material being removed from the surface to a suction passage entrance.

Another object of the present invention is to provide an aspiration-type cleaning device as described which includes air leak holes or breather openings strategically positioned to assist in maneuverability of the device over the surface being cleaned, the leak or breather air streams additionally serving to effect an air turbulance which establishes whirl and vortex formation in the incoming air to loosen the material on the surface and facilitate its removal.

A further object of the present invention is to provide an aspiration-type cleaning device as described

wherein a porous filter element is supported in-line with the suction passage in a manner to retain solid particles removed from the surface while allowing the passage therethrough of liquid material toward a vacuum source.

Still another object of the present invention is to provide an aspiration-type cleaning device which is particularly adapted for use with apparatus for the cleaning of bedridden patients hygienically, which cleaning device is highly economical to manufacture whereby to allow removal and disposal of the cleaning device after use with a single patient so as to maintain high sanitary conditions.

Further objects and advantages of the present invention, together with the organization and manner of operation thereof, will become apparent from the following detailed description of the invention when taken in conjunction with the accompanying drawing wherein like reference numerals designate like elements throughout the several views and wherein:

FIG. 1 is a foreshortened side elevational view of an aspiration-type cleaning device in accordance with the present invention;

FIG. 2 is a partial bottom view taken generally along the line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a foreshortened longitudinal sectional view taken generally along the line 3—3 of FIG. 2;

FIG. 4 is a transverse sectional view taken along the line 4—4 of FIG. 3; and

FIG. 5 is a transverse sectional view taken generally along the line 5—5 of FIG. 3.

Referring now to the drawings, a cleaning device in accordance with a preferred embodiment of the present invention is indicated generally at **10.** The cleaning device **10** may alternatively be termed an aspiration-type cleaning nozzle and is particularly suited for use in apparatus for cleaning surfaces such as human skin, flexible sheets such as textile and flexible plastic bed sheets as used in hospitals and the like, and similar surfaces which may have human excrement and semi-liquid matter disposed thereon which, for sanitary and hygiene purposes, must be frequently removed. The cleaning device **10** includes body or housing means having a nozzle portion, indicated generally at **12,** and a generally tubular handle portion, indicated generally at **13.**

The nozzle portion **12** includes an inner core **14** and an outer cup-shaped skirt portion **16.** The inner core **14** has parallel planar side wall surfaces **18** and **20** which are disposed in generally vertically upstanding relation relative to a surface being cleaned, such as indicated at **22.** The surface **22** may, for example, comprise the skin of a bedridden patient having particles of excrement or the like disposed thereon which are to be removed by the cleaning device **10.** The inner core **14** of the cleaning device **10** has a forward or front end surface **26,** a rearward tubular end **28,** and a substantially flat lower surface **30.** The inner core **14** has a suction passage **32** therein which communicates with the forward end surface **26** of the core and terminates at its rearward end in a tubular wall portion **34** disposed within the rear end **28** of the inner core. As will be described more fully below, the rearward end **28** of the core **14** is adapted to be connected to the handle portion **13** which, in turn, is adapted to be connected to a source

of vacuum employed in removing the particles 24 from the surface 22 being cleaned.

The outer cup-shaped skirt portion 16 of the nozzle portion 12 is defined by a depending skirt wall connected at its upper edge to the inner core 14. The depending skirt wall includes a forward wall portion 36 and side wall portions 38 which extend rearwardly from the forward skirt wall portion 36 to adjacent the rearward end 28 of the inner core 14. The lower rearward corners of the skirt side walls 38 are curved as indicated at 39 in FIG. 1. The forward skirt wall 36 is spaced forwardly of the end surface 26 of the inner core 14 and the skirt side walls 38 are spaced outwardly from the corresponding side wall surfaces 18 and 20 of the inner core as illustrated in FIGS. 3 and 4. The skirt wall portions 36 and 38 cooperate with the front end surface 26 and side wall surfaces 18 and 20 of the inner core 14 to define an air channel between the inner core and the skirt portion 16 of the nozzle 12. The skirt walls 38 have lower edge surfaces 40 adapted to engage the surface 22 being cleaned in a manner to maintain the lower flat surface 30 of the inner core 14 spaced above the surface 22 and establish an air intake channel having an intake opening, indicated by arrow 42, adjacent the rearward curved edges 39 of the skirt walls 38 in underlying relation to the rear end portion of the flat surface 30. The skirt side walls 38 are connected at their rearward upstanding edges to the inner core 14 of the nozzle 12 as indicated at 44 in FIG. 2. The nozzle portion 12 of the cleaning device 10 may be formed of a molded plastic material such that the skirt portion 16 is integrally connected to the inner core 14.

The tubular handle portion 13 of the cleaning device 10 comprises a generally cylindrical tubular body 46 having one end adapted to be received over the tubular end 28 of the nozzle 12. The tubular end 28 of the inner core 14 has a pair of diametrically opposed upstanding retainer tabs 48 formed integral thereon. The tabs 48 are adapted to be received through suitably positioned arcuate slots 50 in the body member 46 to retain the nozzle 12 and handle portion 13 in assembled relation. The wall of the handle body 46 is formed slightly radially outwardly at 52 forwardly of each slot 50, with the inner surface of each portion 52 being inclined to assist in entry of the tabs 48 into their associated slots 50 when the handle body 46 is moved axially over the end 28 of the nozzle 12. With the tabs 48 received in the slots 50 to retain the handle body 46 on the nozzle 12, rotation of the tubular body 46 about its longitudinal axis relative to the nozzle 12 causes the tabs 48 to be engaged and cammed inwardly by the inner peripheral surface of the tubular body 46 whereby to allow axial movement of the tubular body away from the nozzle 12 to disconnect the handle portion 13 from the nozzle. The tabs 48 and associated slots 50 in the tubular body 46 provide quick-disconnect means for connecting the nozzle 12 to the handle portion 13 of the cleaning device 10.

The end of the tubular body 46 of the handle portion 13 opposite the end connectible to the nozzle 12 has a reduced diameter neck portion 54 having a right-hand external thread 56 thereon. The external thread 56 provides means for releasably connecting the handle portion 13 to the sources of vacuum and pressurized liquid washing medium of the patient washing apparatus such as disclosed in the copending application of Tord G. Lundblad, Ser. No. 316,675, filed Dec. 20, 1972, a continuation-in-part of Ser. No. 211,457, filed Dec. 23, 1971. The handle portion 13 and nozzle 12 of the cleaning device 10 may be connected to the sources of vacuum and pressurized washing medium through a multi-channel flow conduit and connector arrangement as disclosed in the copending application of Sven Erik Kraft, Ser. No. 301,802, filed Oct. 30, 1972, a U.S. application corresponding to Swedish application, Ser. No. 14096/71, filed in Sweden on Nov. 4, 1971. The reduced diameter end 54 of the tubular body 46 has a suction passage 58 therein which, when the handle 13 is connected to the nozzle 12, communicates with the suction passage 32 in the nozzle 12.

The cleaning device 10 includes a generally tubular foraminous particle-filter element 60 one end of which is adapted to be received over the tubular wall 34 defining one end of the suction passage 32. A retainer ring 62 is snugly received over the end of the filter element 60 disposed on the tubular wall 34 to retain the filter element on the wall 34 with the interior of the filter element communicating with suction passage 32, as shown in FIG. 3. The end of the filter element 60 opposite the end secured on the tubular wall 34 is closed, as at 64, such that any solid particles passed upwardly within the suction passage 32 from the surface 22 being cleaned will be retained within the filter element 60 while any liquid matter is passed through the filter to the source of vacuum.

A pair of elongated breather air openings 66 are provided in the nozzle 12 on opposite sides of the longitudinal axis thereof adjacent the upper edges of the depending skirt walls 38, as illustrated in FIGS. 1 and 2. The openings 66 communicate with the aforedescribed air channel defined between the depending skirt walls 36 and 38 and the inner core 14 for the entry of breather air to assist in preventing suction retention of the cleaning device against the surface 22 being cleaned. In addition, air leak inlets 68 are established between the rearward edge portions of the depending skirt walls 38 and the adjacent outer surface of the inner core 14, as indicated at 68 in FIG. 5. The air leak inlets also assist in the entry of air into the air channel defined between the depending skirt walls 38 and the inner core side surfaces 18 and 20 to prevent suction adherence of the nozzle 12 to the surface 22 being cleaned, particularly when the rearward intake opening 42 has solid particle matter therein which substantially precludes the entry of air through the intake opening.

The cleaning device 10 includes fluid discharge means, indicated generally at 70, for discharging a liquid spray onto particle matter adhering to the surface 22 being cleaned to soften and loosen the matter for removal. To this end, the nozzle 12 has a raised projection 72 formed integrally thereon generally centrally between the depending skirt walls 38. A fluid flow passage 74 is provided in the raised projection 72 and intersects an annular discharge orifice 76 in an end surface 78 of the projection 72. The flow passage 74 also communicates with a larger diameter tapered passage 80 which is adapted to snugly receive an end of a flow tube 82. The flow tube 82 extends through the tubular body 46 of the handle portion 13 and has its opposite end received within a cylindrical passage 84 in the end 54 of the tubular body 46. The passage 84 is adapted for selective communication with a flow passage 86 in the end 54 of the handle portion 13 through a normally closed control valve 88. The flow passage 86 is con-

nectible to a source of pressurized liquid washing medium compatible with human skin so that manual depression of the control valve **88** effects flow of liquid washing medium through the flow tube **82** where it is discharged in the form of a spray from the annular orifice **76.** The liquid spray so discharged may be directed onto particle matter adhering to the surface **22** for loosening the matter preparatory to removing the matter by suction.

In operation, when the cleaning device **10** is connected to sources of vacuum and pressurized liquid washing medium, such as used in the patient washing apparatus disclosed in the referenced copending application of Tord G. Lundblad, the lower edge surface **40** of the depending skirt walls **36** and **38** of the nozzle **12** is placed against a surface, such as **22,** to be cleaned. The cleaning device **10** is then moved over the skin to effect passage of undesirable particle matter on the surface through the intake opening **42.** If the particle matter adheres to the surface **22,** the matter may be dampened and loosened by discharge of a liquid spray through the discharge orifice **76** under the control of valve **88.** The matter removed from the surface **22** being cleaned is drawn through the intake opening **42** and through the trough-like intake channel underlying the flat lower surface **30** of the inner core **14** into the suction passage **32** where it passes into the filter element **60.** The solid particle matter is retained in the filter element **60** while any fluid material passes outwardly through the suction passage **58** toward the vacuum source (not shown).

The breather air openings **66** and the leak openings **68** provide passage means through which air may be drawn to prevent suction adherence of the cleaning device **10** against the surface **22** and facilitate movement of the nozzle **12** along the surface. The air currents established through the leak air openings **68** also assist in the transport of matter from the surface **22** to the intake opening of the suction passage **32.** The air entering the breather openings **66** and leak inlets **68** creates an air turbulence which serves to effect vibration of the surface **22** and establish whirl and vortex formation in the incoming air stream such that any contaminant particles on the surface are more easily loosened and suctionally picked up from the surface.

While a preferred embodiment of the present invention has been illustrated and described, it will be obvious to those skilled in the art that changes and modifications may be made therein without departing from the invention and its broader aspects. Various features of the invention are defined in the accompanying claims.

I claim:

1. A cleaning device for cleaning a surface such as human skin and the like through the removal of excrement and semi-liquid matter from the surface by suction, said device comprising: body means including an inner core portion and an outer skirt portion; said inner core portion having side wall surfaces, front and rear ends, and a substantially flat lower surface; said inner core portion having a suction passage therein communicating with said front and rear ends thereof; said outer skirt portion being defined by a skirt wall which is connected at its upper edge to said inner core portion and which includes a portion spaced outwardly from said front end and side wall surfaces of said inner core portion to define an air channel between said inner core portion and said skirt wall; said skirt wall having edge surface portions adapted for engagement with the surface to be cleaned in a manner to maintain said flat surface of said inner core in spaced relation from the surface being cleaned; said skirt wall and said flat surface of said inner core portion defining an intake opening generally adjacent said rear end of said core portion for the entry of matter removed from the surface being cleaned when said device is disposed in an operating position; said skirt wall having at least one opening therein for the entry of breather air into said air channel; and means at said rear end of said inner core portion for connecting said suction passage to a source of vacuum such that material removed from the surface being cleaned is caused to pass through said suction passage toward the source of vacuum.

2. A cleaning device as defined in claim **1,** and further including leak air openings adjacent said rear end of said inner core portion and communicating with said air channel.

3. A cleaning device as defined in claim **1** wherein said air channel extends from said rear end of said inner core portion along one of said side wall surfaces of said core, along said front end of said inner core portion and along the other of said side wall surfaces of said core to the rear end of said inner core portion, said skirt wall having a lower edge surface adapted for contact with the surface to be cleaned.

4. A cleaning device as defined in claim **1** wherein said skirt wall has a pair of laterally spaced elongated openings adjacent the upper edge of said skirt wall for the entry of breather air into said air channel.

5. A cleaning device for cleaning a surface such as human skin and the like through the removal of excrement and semi-liquid matter from the surface by suction, said device comprising: body means including an inner core portion and an outer skirt portion; said inner core portion having side wall surfaces, a front end surface, and a substantially flat lower surface; said inner core portion having a suction passage therein communicating with said front end surface, said outer skirt portion being defined by a skirt wall connected at its upper edge to said side wall and front end surfaces of said inner core portion and having a lower edge surface disposed below the plane of said flat lower surface and adapted for engagement with the surface to be cleaned in a manner to maintain said flat lower surface of said inner core in spaced relation from the surface being cleaned so as to define an air channel which underlies said flat surface and has an intake opening generally adjacent said rear end of said core portion such that air entering said intake opening flows through said air channel substantially tangential to the surface being cleaned, said skirt wall having at least one opening therein to permit the entry of breather air into said air intake channel in a manner to cause increased cleaning action by air turbulence and prevent suction adherence to the surface being cleaned.

6. A cleaning device as defined in claim **5** wherein said body means includes a nozzle portion and a handle portion, said handle portion comprising a tubular member releasably connected to said nozzle portion and having means thereon for releasably connecting said handle portion to a source of vacuum.

7. A cleaning device as defined in claim **5** including a filter element supported by said means in said suction passage means, said filter element being adapted to re-

tain solid particles received therein from said suction passage means while allowing liquid to pass therethrough toward said source of vacuum.

8. A cleaning device as defined in claim **5** wherein said body means includes air leak openings allowing the entry of air into said air intake channel when said device is disposed against a surface during cleaning thereof.

9. A cleaning device as defined in claim **6** wherein said handle portion is released from said nozzle portion by effecting relative rotation between said handle portion and said nozzle portion.

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