

DISPOSABLE DUST COLLECTORS FOR USE WITH CLEANING
MACHINES

CROSS REFERENCE TO RELATED APPLICATIONS

5 **[0001]** Not applicable

STATEMENT REGARDING FEDERALLY SPONSORED
RESEARCH/DEVELOPMENT

[0002] Not applicable

BACKGROUND OF THE INVENTION

10 **[0003]** The present invention relates to disposable
dust collecting ruffles designed for use with floor care
equipment such as vacuum cleaners or the like.

15 **[0004]** Mechanical and electrical cleaning machines
such as vacuum cleaners, rotary polishing machines,
brush-driven carpet cleaners and sweepers are well known
in the art. These devices range from hand-operated
upright and canister vacuum and sweeper devices to
motorized robotic cleaning devices. The latter may
include an internal control system and associated sensors
20 for permitting the device to follow a selected path in a
room area.

25 **[0005]** A number of problems are associated with these
devices. For example, certain vacuum and sweeping
devices do not easily provide adequate cleaning in narrow
gaps, such as around the feet of furniture or in room
corners. Therefore, individual attention and a variety
of cleaning tools, attachments, and fixtures are often
required to treat these areas. Even when the device is
robotically-driven, the device may miss certain areas
30 (e.g. if a chair is moved and not replaced to its exact
expected position).

[0006] Another problem is that small particulate matter (collectively referred to as dust) is often propelled into the surrounding air by such devices, rather than being sucked into the vacuum storage bag.

5 This is particularly of concern with respect to devices that use rotating brushes. This not only can result in a requirement for more frequent dusting of room furniture, it can cause respiratory problems for those who have asthma or another respiratory condition.

10 **[0007]** In U.S. Pat. No. 5,974,626 there is disclosed plastic shield coupled to a flexible skirt that surrounds the perimeter of a polishing machine that is used to reduce dust problems. Similarly, U.S. Pat. No. 5,643,047 discloses a floor grinding machine including a rubber
15 skirt surrounding vacuum heads. Also, U.S. Pat. No. 5,454,129 discloses a vacuum cleaning device including a brush surrounding the perimeter of the machine.

[0008] These devices use the surrounding structures primarily to prevent dust and particulate matter from
20 escaping laterally from the area that the machine passes over. However, these surrounding structures are not well designed to themselves capture dust, and thus leave considerable amounts of dust able to settle back onto the carpet (e.g. permitting the dust to be kicked up again
25 when a human walks over the carpet). Moreover, these devices are of little assistance in picking up dust in areas where the device cannot reach directly over.

[0009] Also, these devices are designed to be typically permanent, or at least semi-permanent,
30 additions to the machine. They cannot be easily cleaned, and thus create their own problems for asthmatics and the

like. Furthermore, some of these devices are unduly expensive.

[0010] In separate developments, the art has created disposable cloths for use in dusting. Some of these are made of fabric that attracts dust, and thus holds dust once attracted. These cloths are intended to be disposed of when sufficiently dirty. See e.g. U.S. patent 3,877,103 and PCT application WO 02/00819. These disposable cloths can be used above, or in conjunction with a cleaning utensil such as a sweeper or mop.

[0011] Accordingly, there is still a need for a dust collecting device which can be easily added and removed from a cleaning machine, which also improves the performance of the cleaning machine around corners, gaps, and uneven or angled surfaces.

SUMMARY OF THE INVENTION

[0012] The present invention provides a dust and particulate matter collecting device which can be easily attached to and removed from a mechanical, electrical, robotic, or other cleaning machine or apparatus to prevent the spread of dust while a cleaning operation is performed, and to improve the ability of such devices to clean in corners, angled surfaces, gaps, and around the feet and legs of tables and chairs.

[0013] According to one aspect the present invention provides a dust collector (e.g. a dust ruffle) for use in conjunction with a cleaning apparatus of the type having a lower head. The dust collector has a skirt portion of electet material suitable to essentially circumscribe the perimeter of the head, the skirt having means along an upper area of the skirt for mounting the skirt on the head.

[0014] For purposes of this patent the term "electet" shall mean a dust attractant material, such as one that attracts by electrostatic charge. This is to be distinguished from merely an adhesive material which may bind dust or other materials once in contact, but does not attract dust which is not in contact.

[0015] In preferred forms the skirt may have a central through hole for receiving a portion of the head, and in an especially preferred form a central cover region for covering at least a portion (e.g. a majority or almost all or all) of the bottom of the head. The cover can have an aperture sized for permitting a wheel of the cleaning apparatus to project there through and another aperture sized for permitting a brush of the cleaning apparatus to project there through. Alternatively, the electet material can be impregnated with at least one of a cleaning fluid, a polishing fluid, an insecticide, or a fragrance (so as to act as a dispenser as well).

[0016] In another form of the invention there is a cleaning apparatus (e.g. a vacuum cleaner) that has an upper handle, a head linked to the handle at a lower portion thereof, and a dust collector mounted to the head. The collector is a skirt portion of electet material that essentially circumscribes the perimeter of the head, the skirt having means along an upper area of the skirt for mounting the skirt on the head. Preferably the electet material is ruffled along its lower edge.

[0017] In yet another form the invention provides an automated cleaning robot. It has a robot body, and a dust collector mounted to the robot body. The dust collector is an outwardly flared skirt portion of electet material that essentially circumscribes the perimeter of

the body, the skirt having means along an upper area of the skirt for mounting the skirt on the body. See e.g. U.S. patent 5,454,129 for a teaching of a self-powered vacuum.

5 **[0018]** The skirt can be slid over and retained on such cleaning machines. The skirt surrounds the outer perimeter of these machines and extends downward to contact the surface being cleaned. The skirt is preferably highly ruffled, and is wider at the bottom
10 along the cleaning surface than the top. This provides additional material which can be extended into and crammed against gaps or other oddly-shaped areas being cleaned. When used in a corner, the electet material of the skirt attracts and holds dust and small particulate
15 matter, thereby providing a fast and efficient way to clean the area. When not pressed against an obstacle, the skirt is free flowing.

[0019] Such a ruffle also has the advantage of being a bumper. It can therefore minimize damage to the legs or
20 feet of furniture, or room walls, caused by contacting such a machine with them.

[0020] The dust collecting device can comprise a dust cover, sized and dimensioned to enclose the bottom of the cleaning device with the exception of functional elements
25 such as wheels and brushes. Therefore, dust and particulate matter which is forced into the air by the rotation of the brush and wheels of a cleaning device is inhibited from entering the air.

[0021] According to still another aspect of the
30 invention, the dust and particulate matter limiting device is used in conjunction with a cleaning device which includes a floating plate mechanism for providing

pressure on the dust cover as it moves along a surface being cleaned and for picking up dust particles.

[0022] This brief summary of the invention has been provided so that the nature of the invention may be generally understood. However, this summary should not be construed to limit the invention. The foregoing and other advantages of the present invention will become apparent from the following detailed description of the preferred embodiments taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 is a bottom plan view of a dust collector device of the present invention;

[0024] FIG. 2 is a bottom plan view of a second embodiment thereof;

[0025] FIG. 3 is bottom perspective view of an autonomous cleaning machine on which has been mounted the FIG. 2 dust collector;

[0026] FIG. 4 is a side view, partially in section, of the cleaning device of FIG. 3; and

[0027] FIG. 5 is a cross-sectional view take along line 5-5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Referring now to FIG. 1, a dust collecting device 10 is shown in the form of a ring of electret material 12 comprising a woven or non-woven cleaning material. The preferred materials are those described in WO 02/00819 (PCT/US00/20074, filed June 22, 2001), which is hereby incorporated herein by reference. The cleaning material can be electrostatic, electret, treated with dust-attractants, cleaning fluids, insecticides, etc., and provide a function of removing dust, dirt, or other

particulate matter and depositing a layer of surfactant as described more fully below.

5 **[0029]** The material 12 is preferably formed into a skirt 18 that has an elasticized top edge 14 which is sized and dimensioned to be slid over a selected cleaning machine. When this is done bottom edge 16 hangs freely downward to a position wherein it contacts the surface being cleaned, typically a carpet or a hard floor surface. The bottom edge 16 of the skirt 18 is formed to be larger than the elasticized top edge 14, and the skirt 18 is preferably gathered or ruffled around the top edge, such that the skirt material extends horizontally outward from the cleaning machine.

10 **[0030]** It therefore has sufficient give to be able to be compressed to conform to a gap existing between the cleaning machine and an obstacle such as a corner, chair or table leg, or other irregular or angled surface. Thus, the skirt 18 can attract and capture dust and particulate matter during the cleaning process, even over floor areas that the main machine cannot reach. The elasticized top edge 14 comprises a length of elastic material 19 formed in a generally circular configuration and enclosed in the sheet of electet material. See generally U.S. Pat. No. 5,292,582 for the description of suitable elastics. Although an elasticized material is preferred as a means of connecting the skirt to the machine, other methods may be used such as ties, strips, snaps, or other mechanical devices apparent to those of advancing skill in the art.

15 **[0031]** Referring now to FIG. 2, a second dust collecting device 20 has a similar outer skirt section, but also has a dust cover 22 essentially closing the

central hole. It has the electet material sized and dimensioned to enclose the cleaning face 24 (FIG. 4) of a cleaning machine. As will be appreciated from FIGS. 2-5, there is an elasticized top edge 14 of the skirt 18.

5 There are also apertures 40, 42, 43 through which functional elements of the selected cleaning machine 26 can extend. Functional elements can include, for example, wheels 30 fitting through apertures 40, a brush fitting through aperture 42, and a sensor (not shown) fitting through aperture 43.

10 **[0032]** Referring now to FIG. 4, the dust collecting device 20 is shown attached to a robotic cleaning device 26. The robotic cleaning device 26 comprises a housing 28 in which a control and drive system is stored, a plurality of drive wheels 30, and a rotary brush 32. The dust collecting device 20 is positioned over the perimeter of the cleaning machine 26 and is held in place by the elastic 14, with the skirt 12 extending from the elastic 14 to a surface below, and with the dust cover 22 also extending downward and across to largely cover a bottom surface of the cleaning machine 26.

15 **[0033]** The skirt of the dust collecting device 20 extends around a lower edge of the robotic cleaning device 26, and from this edge to the cleaning surface 34 below. Because, as noted above, the skirt 18 is larger at the bottom edge than the top, the lower perimeter of the skirt is larger than that of robotic device 26.

25 Material from the skirt 18 can therefore be compressed into gaps, angled surfaces, and corners as the robotic device 26 approaches otherwise hard-to-clean obstacles.

30 **[0034]** The robotic cleaning device 26 can also include two plates or pads 31, 33 located on opposing sides of

the brush 32 to provide a downward pressure on the electet dust cover 22, forcing the cover 22 against the surface 34 being cleaned. The dust cover 22 therefore can attract dust and small particulate matter from the surface 34 by direct contact. Although the brush 32 is shown as a rotary brush, various types of brushes including stationary brushes, counter-rotating brushes, beater brushes, and other devices for use with both brush-driven and vacuum cleaning devices can be used.

[0035] Furthermore, as the brush 32 rotates and causes particles to be lifted from the surface 34, these particles are forced upward and beneath the dust cover 22. Whatever is not vacuumed up may then attach to the dust cover 22.

[0036] In operation the dust collectors of the present invention provide a number of functions. First, the skirt 18 provides a cleaning surface that is automatically configured for cleaning otherwise inaccessible surfaces. Furthermore, the skirt 18 surrounds the area of the cleaning machine in which the rotary brush 32 is located, improving the efficiency of the device by preventing dust from being sprayed outward. Moreover, dust which isn't sucked or brushed up will tend to stick on the dust collector. The dust cover 22 provides both a cleaning ana depository function, cleaning dust from the surface and/or depositing a fragrance, insecticide, insect repellant, cleaning fluid, or other material.

[0037] After a particular period of use, one such dust collector can be pulled off of the cleaning machine, disposed of, and replaced with a new, clean dust collecting device 20. This prevents the dust collector

from being used after its "saturation" point. In some applications the dust collecting device can also be cleaned and re-used.

[0038] In some applications, the dust collector can have another function. For example, it can be treated with a volatile such as an insecticide, insect repellent, deodorizer, fragrance, or fragrance beads which can be deposited on the surface and/or dispersed throughout the room being cleaned as the air passing into the machine and out helps dispense the volatile. In other applications, the material 12 can be pre-treated with polishing and cleaning fluids such as floor polishes and waxes. In this version the skirt will both act as a dust collector and a dispenser of floor treating materials. In a bathroom application, the skirt could contain antibacterial cleaning fluids useful, particularly, in cleaning tile surfaces in kitchens and bathrooms can also be used.

[0039] The dust collector can also have different sections in which the cleaning cloth is treated to provide different functions. For example, a loading section can be treated to provide a dust attracting function, while a trailing portion deposits a layer of fragrance. Furthermore, sections of the dust collector can be provided to attract different kinds or sizes of dust and particulate matter.

[0040] A wide variety of cleaning machines can advantageously be provided with the present invention. These include without limitation, electrical and mechanical cleaning devices including vacuum cleaners, carpet sweepers and mopping devices.

[0041] It should therefore be appreciated that the invention may appear in other embodiments from just those disclosed above. Hence, the claims should be looked to in order to judge the full scope of the invention.

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INDUSTRIAL APPLICABILITY

[0042] The invention provides disposable skirts mountable on cleaning machines that can be used for dust collecting and dispensing desired actives.

Claims

We claim:

1. A dust collector for use in conjunction with a cleaning machine, the cleaning machine being of the type having a lower head, the dust collector comprising: a
5 readily removable skirt portion of cleaning material suitable to essentially circumscribe the perimeter of the head, the skirt having means along an upper area of the skirt for mounting the skirt on the head.

10 2. The dust collector of claim 1, wherein the skirt has a central through hole for receiving a portion of the head.

3. The dust collector of claim 1, wherein the skirt has a central cover region for covering a majority
15 of the bottom of the head.

4. The dust collector of claim 1, wherein the cover has an aperture sized for permitting a wheel of the cleaning machine to project there through and another aperture sized for permitting a brush of the cleaning
20 machine to project there through.

5. The dust collector of claim 1, wherein the electet material is impregnated with at least one of a cleaning fluid, a polishing fluid, an insecticide, or a fragrance.

25 6. The dust collector of claim 1, wherein the skirt is outwardly flared.

7. The dust collector of claim 1, wherein the skirt comprises a ruffle.

8. The dust collector of claim 1, wherein the dust
30 collector is disposable.

9. The dust collector of claim 1, wherein the dust collector is reusable.

10. A cleaning machine, comprising:

an upper handle;

a head linked to the handle at a lower portion thereof; and

5 a dust collector mounted to the head;

wherein the dust collector is a readily removable skirt portion of cleaning material that essentially circumscribes the perimeter of the head, the skirt having means along an upper area of the skirt for mounting the skirt on the head.

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11. The cleaning machine of claim 10, wherein the cleaning material is ruffled along its lower edge.

12. The cleaning machine of claim 10, wherein the apparatus is a vacuum cleaner.

13. An automated cleaning robot, comprising:

a robot body; and

a dust collector mounted to the robot body;

wherein the dust collector is a readily removable

5 skirt portion of cleaning material that essentially
circumscribes the perimeter of the body, the skirt having
means along an upper area of the skirt for mounting the
skirt on the body.