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(54) **Manually-operated sweeper**

(57) A manually-operated sweeper, of the type constituted by a wheeled chassis (11) with a steering handlebar (12) and with which a dirt collection container (13) is associated; the rear wheels (14) of the chassis (11) actuate, by means of a first transmission, a first brush (15), which has a horizontal axis which is parallel to the axis of the rear wheels (14) and is adapted to act on the surface that lies below the chassis (11), and, by means of a second transmission, a second brush (16), which

has a vertical axis and is supported by an arm (17) which protrudes in front of the chassis (11). The sweeper (10) also has, proximate to the first brush (15), a fan (18) for aspirating fine dust raised by the action of the first and second brushes (15, 16) toward a filter (19) located inside a protective housing (20) at an opening leading externally (21) for the escape of the filtered air. The fan (18) is turned by way of transmission devices actuated by the motion of at least one of the rear wheels (14), therefore without electric motor drives.

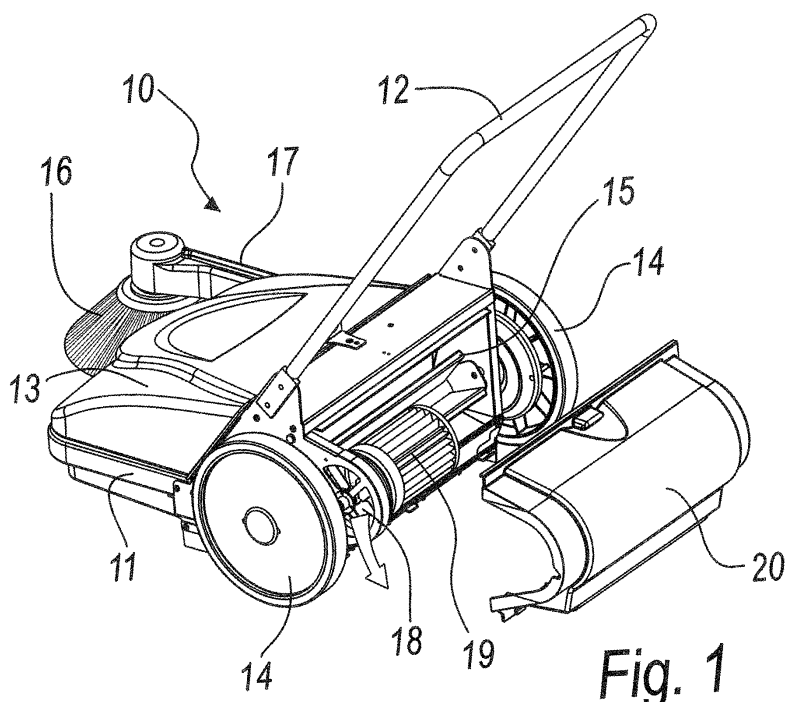


Fig. 1

Description

[0001] Manually-operated sweepers are currently known and widely appreciated.

[0002] These manually-operated sweepers allow to clean rapidly and cheaply very large surfaces, such as the indoor areas of an industrial building, sidewalks and other similar road portions, and more generally surfaces that are so extensive as to make scarcely convenient to perform manual cleaning by means of a broom or by means of an electric vacuum cleaner.

[0003] Moreover, the manually-operated sweeper is capable of removing and aspirating dust, debris and other similar dirt even from corner regions which are generally difficult to reach, such as for example the region where a sidewalk and the road surface meet.

[0004] These known sweepers are generally constituted by a wheeled chassis provided with a steering handlebar, a dirt collection container being associated with said chassis.

[0005] The rear wheels of the chassis are adapted, by virtue of their rotation, to actuate by means of a first transmission a first brush, which has a horizontal axis which is parallel to the axis of the rear wheels and is adapted to act on the surface below the chassis.

[0006] The rear wheels, by means of a second transmission, actuate a second brush, which has a vertical axis and is supported by an arm which lies in front of the chassis.

[0007] The sweeper further has, proximate to the first brush, a fan for aspirating the fine dust, lifted by the action of the brushes, toward a filter located inside a protective housing.

[0008] Such suction fan for fine dust is actuated by a motor drive (motor, gearmotor and the like) which is electric and therefore requires a power supply battery and a battery charger in order to periodically restore its full functionality.

[0009] The electric motor and the battery, in addition to being, together with the battery charger, important factors in the production costs of the sweeper, are two components which increase the weight of the sweeper.

[0010] The aim of the present invention is to provide a manually-operated sweeper which is capable of operating in a fully independent manner, without using electric power.

[0011] Within this aim, an object of the present invention is to provide a manually-operated sweeper in which the fan for aspirating fine dust is not actuated by an electric motor drive.

[0012] Another object of the present invention is to provide a sweeper whose functionality and efficiency is not lower than that of known types of sweeper.

[0013] Another object of the present invention is to provide a sweeper whose dirt loading capacity is not lower than that of known types of sweeper.

[0014] Another object of the present invention is to provide a sweeper which can be operated easily even by an

operator lacking particular prior training.

[0015] A further object of the present invention is to provide a manually-operated sweeper which can be manufactured cheaply with known systems and technologies.

[0016] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a manually-operated sweeper, of the type constituted by a wheeled chassis with a steering handlebar, a dirt collection container being associated with said chassis, the rear wheels of said chassis being adapted, by virtue of their rotation, to actuate by means of a first transmission a first brush, which has a horizontal axis which is parallel to the axis of the rear wheels and is adapted to act on the surface that lies below said chassis, and, by means of a second transmission, a second brush, which is supported by an arm which protrudes in front of the chassis, said second brush rotating with a vertical axis, said sweeper also having, proximate to said first brush, a fan for aspirating fine dust raised by the action of said first and second brushes toward a filter located inside a protective housing at an opening leading externally for the escape of the filtered air, said sweeper being characterized in that said fan is turned by way of transmission means actuated by the motion of at least one of said rear wheels.

[0017] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a partially exploded rear perspective view of a sweeper according to the invention;

Figure 2 is a schematic sectional side view of a sweeper according to the invention;

Figure 3 is a sectional top view of a detail of a sweeper according to the invention.

[0018] With reference to the figures, a manually-operated sweeper according to the invention is generally designated by the reference numeral 10.

[0019] The sweeper 10 is constituted by a wheeled chassis 11 with a steering handlebar 12; a container 13 for collecting dirt 28 is associated with said chassis.

[0020] The rear wheels 14 of the chassis 11, by virtue of their rotation, actuate by means of a first transmission a first brush 15, whose axis is horizontal and parallel to the axis of the rear wheels 14, said first brush being adapted to act on the surface below the chassis 11.

[0021] The wheels 14, by means of a second transmission, also actuate a second brush 16, which rotates with a vertical axis and is supported by an arm 17 which protrudes in front of the chassis 11.

[0022] The sweeper 10 has, proximate to the first brush 15, a fan 18 for aspirating fine dust 29, raised by the action of the brushes, toward a filter 19 located within a rear protective housing 20.

[0023] The chassis 11 has, at the fan 18, a grille which

opens onto the outside 21 for the escape of the filtered air.

[0024] The fan 18 is turned by way of transmission means which are actuated by the motion of the closest of the rear wheels 14 without the aid of any electric motor drive.

[0025] Said transmission means for the fan 18, which accordingly replace the electric motor drive provided in known types of sweeper, are constituted by a drive train of the internal-wheel type, provided by a drive wheel 22, which is rigidly coupled to the rotation shaft 23 of the fan 18 and is in contact with the internal surface 24 of the rear wheel 14, as shown clearly in Figure 3.

[0026] The wheel 14 applies to the drive wheel 22 torque by rolling friction.

[0027] The drive wheel 22 is made of a rubber-like material, and the wheel 14 and therefore its internal surface 24 are made of plastic material such as nylon or equivalents, and therefore the drive wheel 22 rotates substantially without slipping on the internal surface 24.

[0028] The transmission ratio determined by the outside diameter of the drive wheel 22 and by the inside diameter of the internal surface 24 of the rear wheel 14 is such as to move the fan 18 at a rate which generates partial vacuum within the filter 19.

[0029] The filter 19 has a cylindrical structure and is of the cartridge type.

[0030] The filter 19 is associated coaxially with the fan 18 by interposing a tube 25.

[0031] The tube 25 has a larger cross-section in the region 25a where it surrounds the fan 18 and a smaller cross-section in the region 25b for coupling to the filter 19.

[0032] The tube 25 is therefore shaped so as to obtain a Venturi effect, reducing the pressure in the filter 19 with respect to the pressure outside the fan 18.

[0033] The drive wheel 22 at the free end of the rotation shaft 23 of the fan 18 therefore allows to save on the entire electrical system with which known types of sweeper are provided, i.e., the electric motor drive, the battery and the battery charger.

[0034] The sweeper 10 according to the invention further has the advantage of being lighter than known sweepers, since it lacks said electric power supply components and is therefore more maneuverable.

[0035] The first transmission for the first brush 15 is provided by a first driving gear 26, which is keyed on a rotation shaft 27 of the rear wheel 14, against which the drive wheel 22 is pressed, and by a second driven gear 28, which meshes with the first gear 26 so as to form an external gear train and is keyed to a rotation pivot 29 of the first brush 15.

[0036] The first brush 15 therefore rotates in the opposite direction with respect to the direction of travel of the sweeper 10.

[0037] In practice it has been found that the invention thus described solves the problems noted in known types of manually-operated sweeper.

[0038] In particular, the present invention provides a manually-operated sweeper which is adapted to operate

in a fully independent manner without using electric power.

[0039] Moreover, the present invention provides a manually-operated sweeper in which the fan for aspirating fine dust is not actuated by an electric motor drive, but is actuated by mechanical means for transmitting the rotation of the rear wheels.

[0040] Further, the present invention provides a sweeper whose functionality and efficiency is not lower than that of known types of sweeper.

[0041] Moreover, the present invention provides a sweeper whose dirt loading capacity is not lower than that of known types of sweeper.

[0042] Further, the present invention provides a sweeper which can be operated easily even by an operator who does not have particular prior training.

[0043] Moreover, the present invention provides a manually-operated sweeper which can be manufactured cheaply with known systems and technologies.

[0044] In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

[0045] The disclosures in Italian Patent Application No. PD2005U000011 from which this application claims priority are incorporated herein by reference.

[0046] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A manually-operated sweeper, of the type constituted by a wheeled chassis (11) with a steering handlebar (12), a dirt collection container (13) being associated with said chassis (11), the rear wheels (14) of said chassis (11) being adapted, by virtue of their rotation, to actuate by means of a first transmission a first brush (15), which has a horizontal axis which is parallel to the axis of the rear wheels (14) and is adapted to act on the surface that lies below said chassis (11), and, by means of a second transmission, a second brush (16), which rotates with a vertical axis and is supported by an arm (17) which protrudes in front of the chassis (11), said sweeper (10) also having, proximate to said first brush (15), a fan (18) for aspirating fine dust raised by the action of said first and second brushes (15, 16) toward a filter (19) located inside a protective housing (20) at an opening leading externally (21) for the escape of the filtered air, said sweeper (10) being **characterized in that** said fan (18) is turned by way of transmission means actuated by the motion of at least one of said

rear wheels (14).

2. The sweeper according to claim 1, **characterized in that** said transmission means for said fan (18) are constituted by a drive train of the internal-wheel type, provided by a drive wheel (22) which is rigidly coupled to the rotation shaft (23) of said fan (18) and is in contact with the internal surface (24) of said at least one rear wheel (14).

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3. The sweeper according to one or more of the preceding claims, **characterized in that** said wheel (14) applies to said drive wheel (22) torque by rolling friction.

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4. The sweeper according to one or more of the preceding claims, **characterized in that** said drive wheel (22) is made of rubber-like material, said wheel (14), and therefore its internal surface (24), being made of plastic material such as nylon or equivalents.

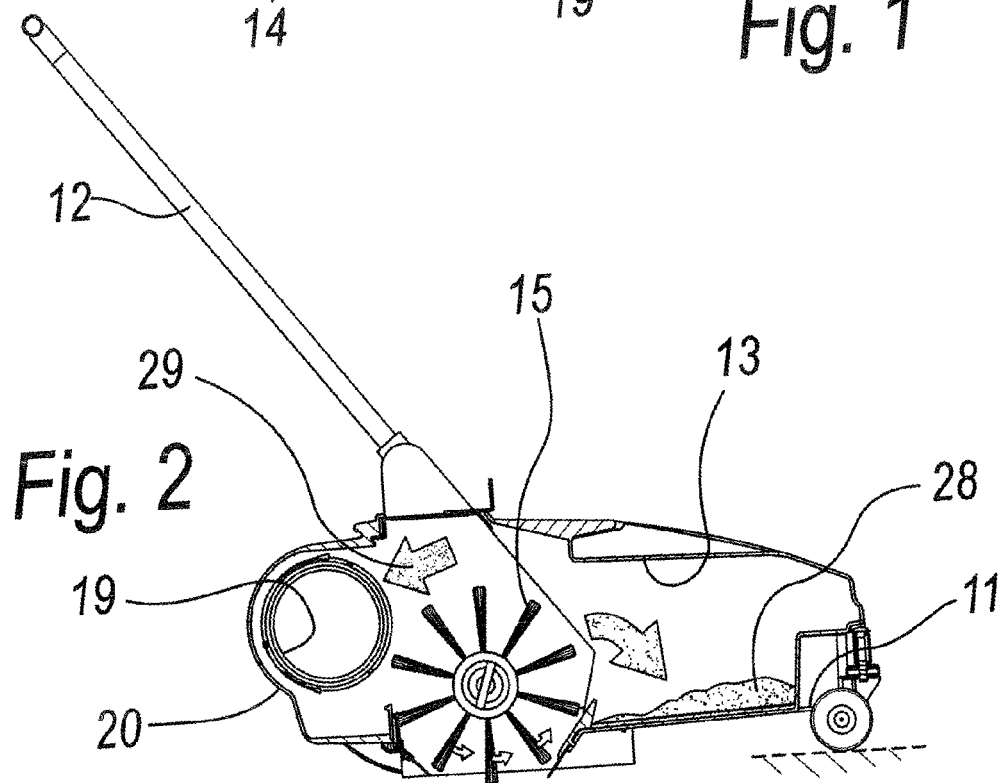
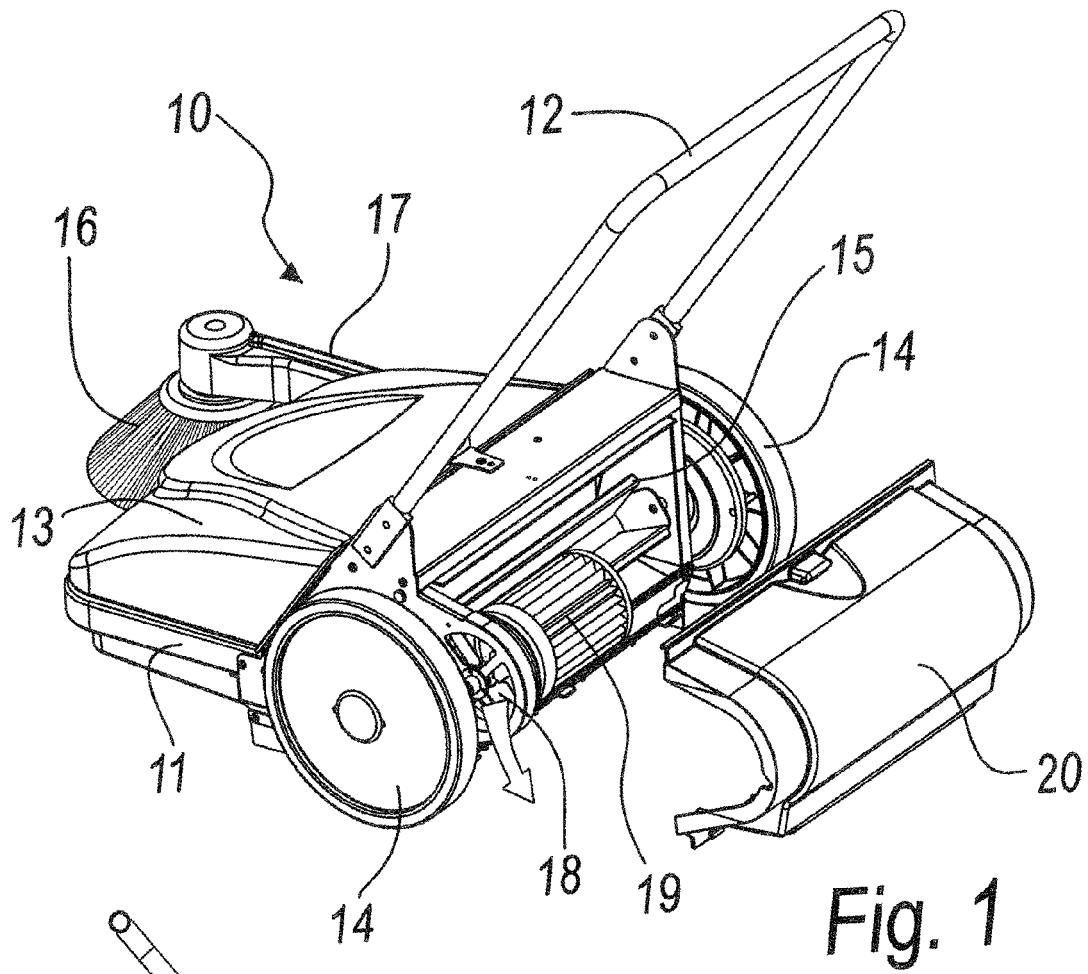
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5. The sweeper according to one or more of the preceding claims, **characterized in that** the transmission ratio determined by the outside diameter of said drive wheel (22) and by the inside diameter of said internal surface (24) of the rear wheel (14) is such as to move said fan (18) at such a rate as to generate a partial vacuum within said filter (19).

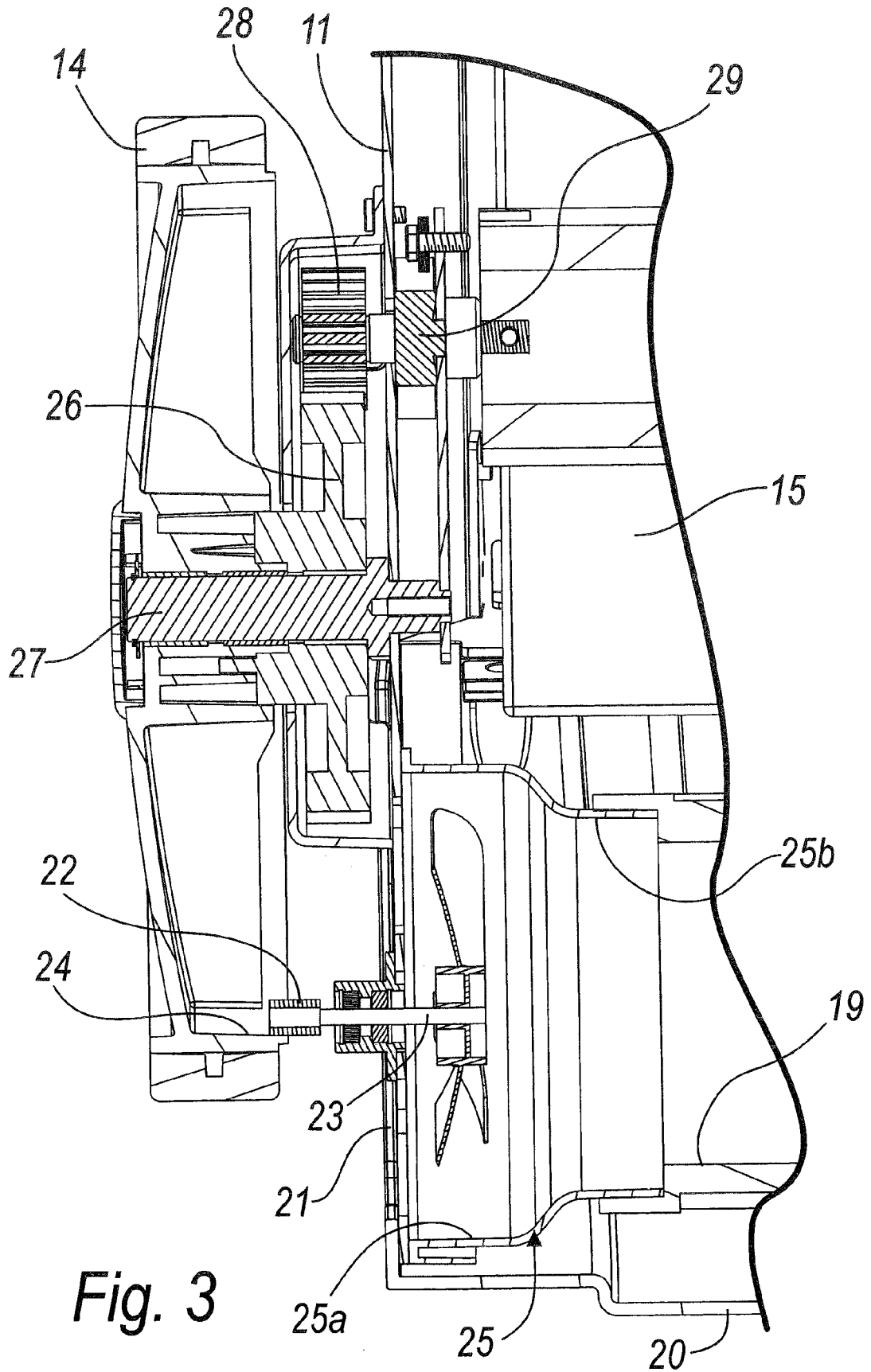
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6. The sweeper according to one or more of the preceding claims, **characterized in that** said filter (19) has a cylindrical structure and is of the cartridge type.

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7. The sweeper according to one or more of the preceding claims, **characterized in that** said filter (19) is associated coaxially with said fan (18) by interposing a tube (25) which has a larger cross-section in the region (25a) in which it surrounds said fan (18) and a smaller cross-section in the region (25b) for coupling to the filter (19), said tube (25) being shaped so as to achieve a Venturi effect of pressure reduction in the filter with respect to the pressure outside the fan (18).

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8. The sweeper according to one or more of the preceding claims, **characterized in that** said first transmission for said first brush (15) is provided by a first driving gear (26), which is keyed on the rotation shaft (27) of said at least one rear wheel (14), and by a second driven gear (28), which meshes with said first gear (26) so as to form a gear train with external gears and is keyed to the rotation pivot (29) of said first brush (15), which rotates in the opposite direction with respect to the direction of travel of the sweeper (10).

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EUROPEAN SEARCH REPORT

Application Number
EP 06 10 1238

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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