

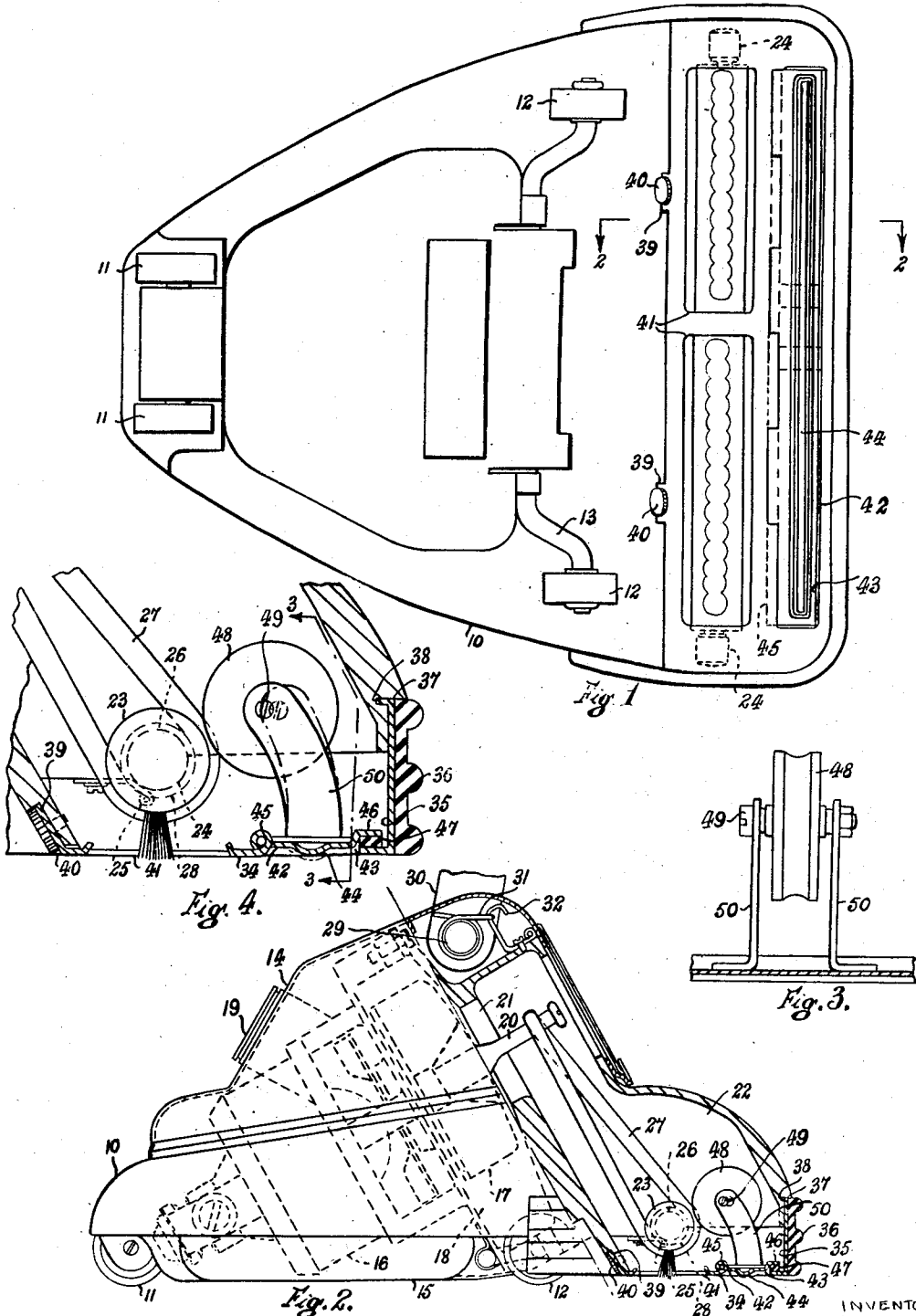
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SUCTION CLEANER WITH CARPET BEATER AND BRUSH

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SUCTION CLEANER WITH CARPET BEATER AND BRUSH

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This invention relates to vacuum cleaners of the kind provided both with a brush having a substantially cylindrical stock adapted to be rotated about a horizontal transverse axis by a motor that drives the suction fan and to engage a carpet over which the cleaner is moved, and also with a beating attachment adapted to be driven by the motor and to engage the carpet.

An object of this invention is to provide a beating attachment which is simple and effective and which will not cause undue wear of the carpet.

Another object is to employ the beating attachment as at least part of a bottom plate of a suction nozzle containing the brush.

Another object is to provide simple and effective means for causing the motor to impart oscillation to the beating attachment.

Another object is to render the brush and the driving mechanism readily accessible.

Further objects and advantages of the invention will be apparent from the following description of a preferred embodiment, as applied to a vacuum cleaner of the type having an external dust-bag, and given with reference to the accompanying drawings, in which:

Figure 1 is a plan view from below of the cleaner, the dust-bag and handle being omitted.

Figure 2 is a side-elevation of the cleaner, the front portion being shown in section on the line 2—2 in Figure 1.

Figure 3 is a view, to a larger scale, of a detail as seen from the line 3—3 in Figure 4, and

Figure 4 is an enlarged view of a part of Figure 2.

The cleaner comprises a cast metal frame 10 supported by rear wheels 11 and front wheels 12. An angularly adjustable cranked axle 13 carrying the front wheels enables the front end of the frame to be set at any desired height above the ground. The frame, which is provided with a top cover 14 and bottom cover 15 of pressed metal, carries an electric motor 16 and a fan 17, which appear in broken lines in Figure 2 and which, being generally of conventional design, need not be described in detail. The fan is of the single-stage, radial-flow type, the volute chamber 18 of which communicates with a connector 19 adapted to be coupled to a dust-bag suspended from a handle.

The motor shaft has an extension 20 projecting forwards through the eye 21 of the fan into the upper part of a nozzle chamber 22 formed in the front part of the frame 10. A rotary brush 23 of conventional design is mounted in the lower part of the nozzle chamber, being rotatable

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in bearings 24 held by clips such as 25 in notches such as 25 formed in the side lips of the nozzle mouth. A rubber belt 27 looped around the motor shaft extension 20 and a circumferential groove 28 near the middle of the cylindrical stock of the brush 23 drives the brush and constitutes the driving member for the beating attachment to be described hereinafter.

Above the nozzle chamber is a recess the side walls of which carry pins, such as 29, on which is pivotally mounted a forked lower end of the handle. A portion of this fork appears at 30. Torsion springs, such as 31, engaging the fork 30 and reacting on clips, such as 32, urge the handle to move upwards and forwards about the pins 29. The cover 14, slotted in the way of the fork 30, encloses the recess.

The mouth of the nozzle chamber 22 is partly covered by a sheet metal bottom plate having a horizontal portion 34 provided at its front and sides with a vertical wall 35 faced with a rubber fender 36. Along the top of the front portion of the wall 35 is a rearwardly directed horizontal flange 37 engaged in a horizontal transverse groove 38 in the front lip of the nozzle. The rear border of the horizontal plate portion 34 is provided with lugs 39 bent upwards and rearwards and held against a correspondingly inclined facing on the rear lip of the nozzle by milled-head screws 40, the remainder of the rear border of the portion 34 being thereby held in contact with this lip. Apertures 41 in the plate portion 34 provide the actual mouth opening and enable the brush bristles to engage a carpet.

The beating attachment includes a substantially horizontal elongated rectangular beater plate 42 closing an aperture 43 of substantially the same length as the plate 42 and somewhat narrower width formed in the plate portion 34 in front of and parallel to the apertures 41. The beater plate 42 has a pressed rib 44 protruding downwards and extending over its whole length, which is equal to the length of the brush. The rib 44 forms the beating member proper. The rear edge of the beater plate 42 is connected by a hinge 45 to the rear edge of the aperture 43, and the front border of the beater plate is joggled upwards at 46 and overlies the front border of the aperture 43, a sealing strip 47 of sponge rubber being interposed between these borders.

Means for imparting oscillation to the beater plate 42 include an eccentric pulley 48 mounted by means of an oil-impregnated porous bush on a bearing pin 49. Rigid arms 50 fixed to the beater plate 42 carry the pin 49. The relative

positions of the parts are such that the force imposed on the beater plate 42 by the compressible sealing strip 47 keeps the pulley 48 at all times in engagement with the driving belt 27 at a point where the belt embraces the stock of the brush 23.

The effective diameter of the pulley is $1\frac{1}{8}$ in. and its eccentricity is $\frac{3}{8}$ in. The amplitude of oscillation of the upper ends of the arms 50 as the pulley rotates is therefore about $\frac{1}{8}$ in., since a plane containing the axis of the hinge 45 and the point of contact of the belt and the pulley is substantially tangential to the pulley. The arms 50 and the beater plate 42 are thereby caused to oscillate about the axis of the hinge 45. Since the beater rib 44 is only a short distance below the horizontal plane containing the hinge 45 and is displaced horizontally from this hinge, the direction of motion of the lowermost part of the beater rib at the point of its maximum downward displacement is inclined to the vertical at an angle of the order of 15° ; such movement of the rib is to be regarded as substantially vertical. The amplitude of the rib oscillation is about 0.025 in. The speed of the motor 16 is 10,000 R. P. M., and the transmission ratio between motor and pulley is such that the beating frequency is of the order of 40 periods per second. A beating effect of the small amplitude and high frequency described is found to have a valuable loosening effect on dust embedded in the pile of a carpet over which the sweeper is being advanced, and to make the dust more readily removable by the brush and the suction effect without materially increasing the wear of the carpet.

The brush is rendered easily accessible for cleaning or for renewing the belt by undoing the screws 40 and hinging the bottom plate 34, 35 downwards and forwards about its flange 37 until it is free to be detached from the cleaner by being drawn bodily off the nozzle.

I claim:

1. A vacuum cleaner including a motor, a suction fan drivably connected to said motor, a suction nozzle communicating with said fan, a bottom plate partly covering the mouth of said nozzle and having an aperture, a brush mounted in said nozzle for rotation about a horizontal transverse axis and for engagement through said aperture with a carpet over which the cleaner is moved, a beating attachment mounted on the cleaner for oscillation about a horizontal axis which is parallel to the brush axis and close to the ground level, said beating attachment constituting a part of said bottom plate hinged about a horizontal axis to the remainder of the bottom plate and including a beating member displaced horizontally from the axis of oscillation so that the beating action is substantially perpendicular to the carpet, and means for causing the motor to rotate the brush and to impart oscillation to the beating attachment.

2. A vacuum cleaner including a motor, a suction fan drivably connected to said motor, a suction nozzle communicating with said fan, a brush mounted in said nozzle for rotation about a horizontal transverse axis and for engagement with a carpet over which the cleaner is moved, a beating attachment mounted in said mouth for oscillation about a horizontal transverse axis

which is close to ground level, said beating attachment having a beating member displaced horizontally from the axis of oscillation, a belt drivably connecting said motor to said brush, an eccentric roller element mounted on said beating attachment for rotation about a transverse horizontal axis at a level above the level of the axis of oscillation of the beater axis, and means urging said beating attachment resiliently upwards so as to maintain said roller element frictionally engaged with said belt at a part thereof cooperating with said brush.

3. A vacuum cleaner including a motor, a suction fan drivably connected to said motor, a suction nozzle communicating with said fan, a brush mounted in said nozzle for rotation about a horizontal transverse axis, a bottom plate normally fixed to the nozzle and provided with a first aperture through which the brush bristles engage the carpet and a second transversely elongated aperture in front of the brush aperture, a beating attachment constituted by a plate hinged to the back edge of the second aperture and substantially closing this aperture, a beating member on the under side of said plate, and means for causing the motor to rotate the brush and to impart oscillation to the beating plate.

4. A vacuum cleaner as claimed in claim 3, wherein the front border of the beating plate lies above the front border of the second aperture, and a compressible sealing strip is located between these borders.

5. A vacuum cleaner as claimed in claim 3, wherein said bottom plate has at one edge an inturned flange engaged in a horizontal groove in the outside of the nozzle, the opposite edge of the bottom plate being fixed to the nozzle by releasable fasteners.

6. A vacuum cleaner as claimed in claim 3, wherein said bottom plate has at one edge an inturned flange engaged in a horizontal groove in the outside of the nozzle, the bottom plate having at least a part of its edge opposite to said one edge inclined upwards and away from said one edge and fastened to a correspondingly inclined facing on the nozzle by screws operable by finger and thumb.

7. A vacuum cleaner as claimed in claim 3, wherein said means for causing said motor to impart oscillations to said beating attachment are arranged to produce oscillations having a frequency exceeding 20 periods per second and an amplitude, at the part thereof that engages the carpet, not exceeding $\frac{1}{4}$ inch.

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