Aug. 25, 1953 E. P. TURNER 2,649,609

DUST AGITATOR SUPPORTING MEANS FOR AMBULATORY VACUUM CLEANERS

Filed March 10, 1949 2 Sheets-Sheet 1

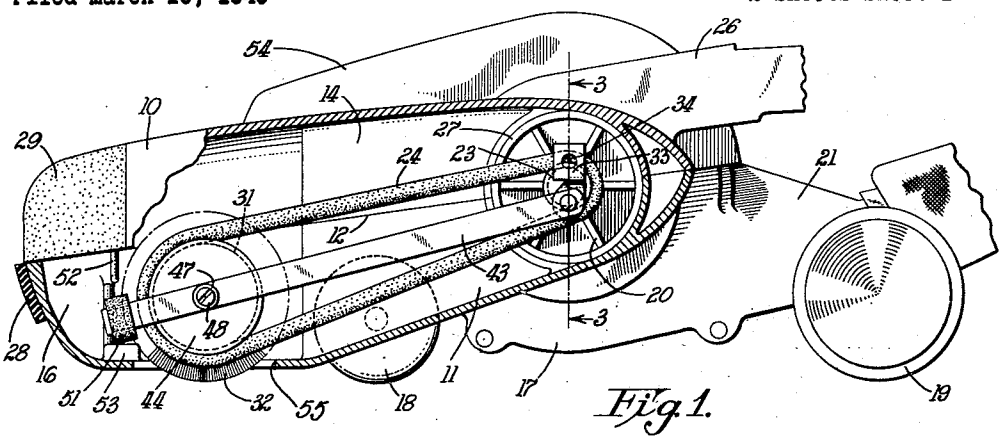


Fig. 1.

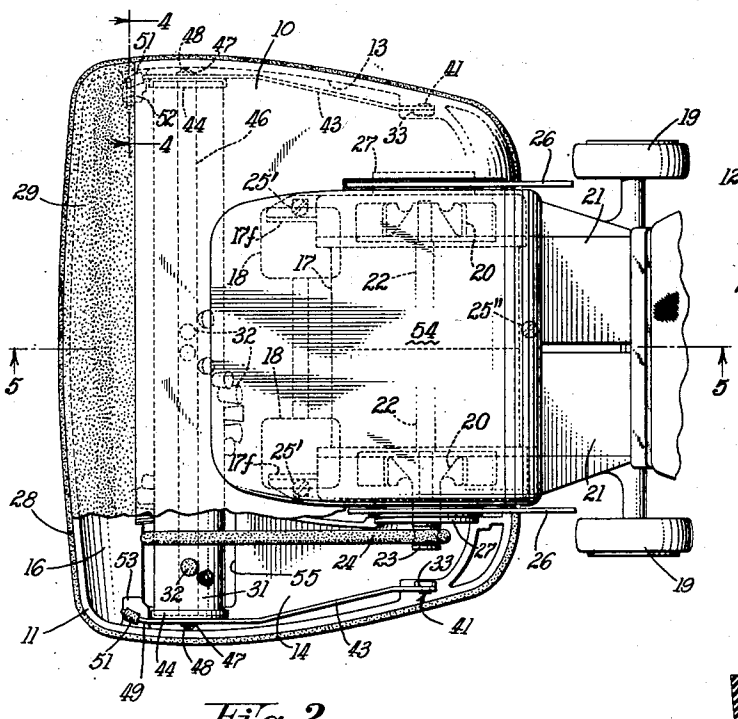


Fig. 2.

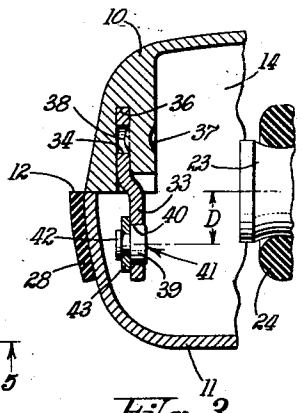


Fig. 3.

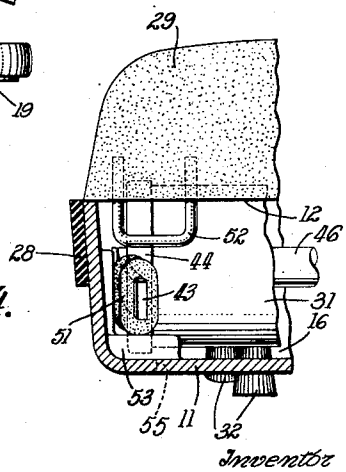


Fig. 4.

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Aug. 25, 1953 E. P. TURNER 2,649,609

DUST AGITATOR SUPPORTING MEANS FOR AMBULATORY VACUUM CLEANERS

Filed March 10, 1949 2 Sheets-Sheet 2

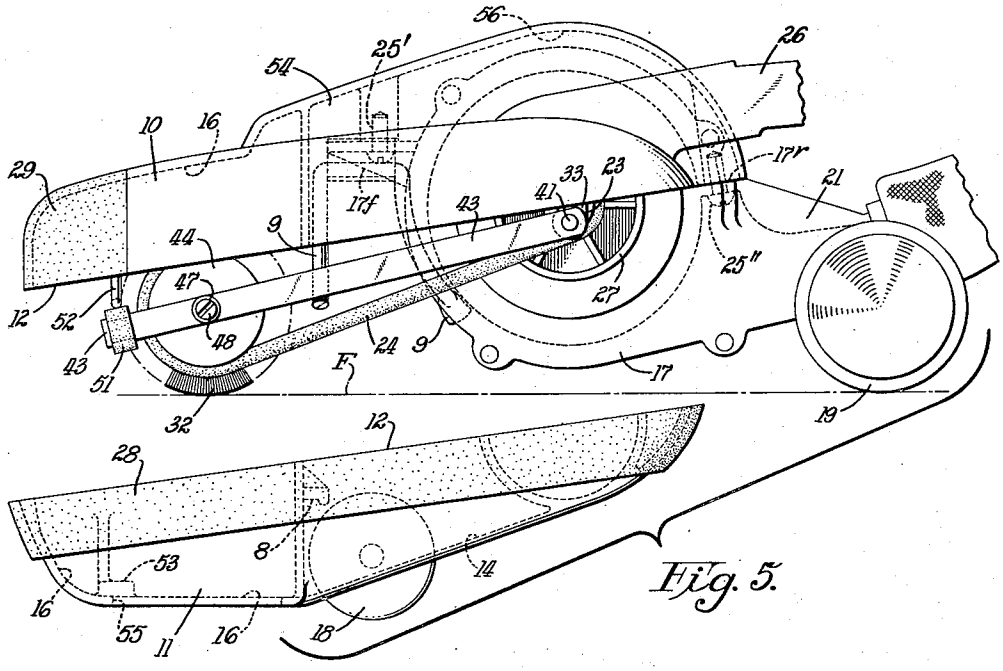


Fig. 5.

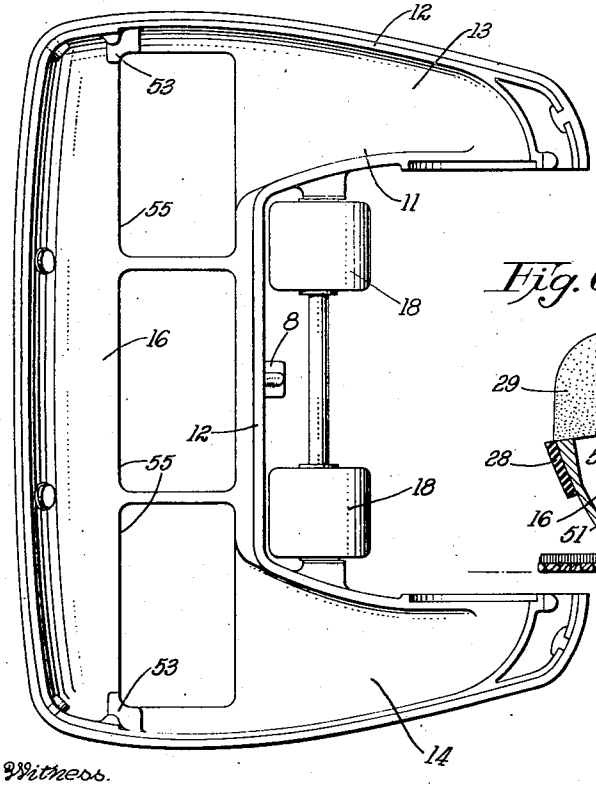


Fig. 6.

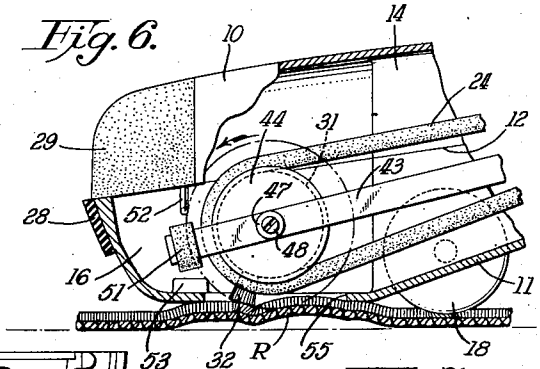


Fig. 7.

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DUST AGITATOR SUPPORTING MEANS FOR AMBULATORY VACUUM CLEANERS

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5 Claims. (Cl. 15—372)

1

This invention relates to ambulatory type vacuum cleaners and more particularly to vacuum cleaners in which both a motor shaft and a rotary dust brush extend horizontally and transversely of the vacuum cleaner and in which each end of the motor shaft carries a fan.

One of the primary objects of the present invention is to provide an improved dual-fan, horizontal motor type vacuum cleaner having advantages not heretofore attained.

Another object of the invention is to provide an improved means for housing various elements in a two-part, split casing, dual-fan, horizontal motor type vacuum cleaner.

Another object of the invention is to provide improved means for attaching various operating mechanisms to the casing of a dual-fan, horizontal motor type vacuum cleaner.

Still another object of the invention is to provide an improved two-part casing for a dual-fan, horizontal motor type vacuum cleaner.

A further object of the invention is to provide an improved means for pivotally supporting a rotary dust brush in a dual-fan, horizontal motor type vacuum cleaner.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby, will be readily understood by those skilled in the art.

In the accompanying drawings:

Fig. 1 is a side elevational view of a dual-fan, floor type vacuum cleaner embodying the present invention, portions of the vacuum cleaner casing being broken away to illustrate the internal construction;

Fig. 2 is a plan view of the vacuum cleaner illustrated in Fig. 1, portions of the vacuum cleaner casing also being broken away;

Fig. 3 is an enlarged fragmentary vertical sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmentary elevational view of a portion of the vacuum cleaner, part of the view being taken in section along the line 4—4 of Fig. 2;

Fig. 5 is a side elevational view of the vacuum cleaner showing the lower casing shell removed from contact with the upper casing shell;

Fig. 6 is a reduced scale top plan view of the lower casing shell shown in Fig. 5; and

Fig. 7 is a view showing portions of the mechanisms of Fig. 1 and specifically illustrating the rug cleaning operation.

2

The drawings, which form a part of this specification, illustrate a preferred embodiment of the present invention as applied to an ambulatory type dual-fan, horizontal motor, vacuum cleaner having an upper casing shell 10 and a lower casing shell 11, the two shells being joined on a slightly inclined plane indicated by the numeral 12. The lower casing shell 11 is removably held to the upper casing shell 10 by a releasable latch mechanism 9 and keeper 8 (Fig. 5) and more fully illustrated and described in patent application Serial No. 16,716, filed March 24, 1948, now Patent No. 2,532,432. The lower casing shell 11, as seen in Fig. 6, is substantially U-shaped in plan view and has an upfacing U-shaped cavity, comprising a pair of upfacing leg cavity portions extending along the sides of the shell and an upfacing connecting cavity portion extending along the front of the shell. The upper casing shell 10 has a downfacing U-shaped cavity which is complemental to the upfacing U-shaped cavity of the lower casing shell, the said downfacing cavity having a pair of leg cavities extending along the sides of said upper casing shell and a connecting cavity extended along the front of the upper casing shell. When the lower casing shell 11 is secured or latched to the upper casing shell 10, the complemental U-shaped cavity portions combine to form a U-shaped cavity having two leg cavity portions 13 and 14 extending along the opposite sides of the split casing and a cavity portion 16 extending transversely along the front of the split casing.

A combination electric motor and dual-fan unit 17, which is fully illustrated in patent applications Serial Nos. 784,165 (now Patent No. 2,540,178) and 784,167, filed November 5, 1947 (now Patent No. 2,633,597), has a horizontally extending armature shaft 22 that is positioned perpendicular to the direction of the to-and-fro movement of the ambulatory cleaner and each end of the shaft carries a fan 20. The combination motor-fan unit 17 is secured to the upper casing shell 10 by screws 25'—25' which pass through lugs 17f—17f formed on a forward portion of the motor-fan unit 17, and a screw 25'' which passes through a web 17r formed on a rear portion of the unit 17, the screws 25' and 25'' entering threaded holes formed in the upper casing shell 10. The vacuum cleaner as a whole is supported on a pair of front and a pair of rear wheels 18 and 19 respectively, the front wheels 18 being rotatably supported from the lower casing

shell 11, whereas the rear wheels 19 are journalled on rearwardly extending exhaust ducts 21—21 formed as part of the motor-fan unit 17. One end of the motor shaft 22 is extended to form a pulley 23 for driving a resilient belt 24 presently to be described. Reference to Figs. 1 and 3 shows that the axial center of the horizontal shaft 22 and of the pulley 23 lies in the plane 12 in which the upper and lower casing shells are joined.

A propelling handle (not shown) for the vacuum cleaner is secured to the free ends of arms 26—26, these arms being pivotally mounted on cylindrical portions 27 of the motor-fan unit 17. A more detailed disclosure of the handle mounting will be found in Patent No. 2,633,597, supra.

The lower casing shell 11 is provided with a resilient bumper 28 and the forward nose portion of the upper casing shell 10 carries a bumper element 29, the latter being fully disclosed in patent application Serial No. 64,843, filed December 11, 1948, now Patent No. 2,575,554.

A horizontally and transversely extending agitator, dust brush or brush roll 31, is rotatably and yieldingly supported in the cavity portion 16. Preferably the dust brush 31 will have a single row of bristles 32 extending in a spiral around the circumference of the brush, and preferably this spiral will reverse at a point midway between the ends of the brush. The means for supporting the dust brush comprises a pair of offset brackets 33—33. The upper end of each bracket 33 has a hole 34, and these upper ends are inserted into downwardly open rectangular recesses 36—36, provided in opposite side walls of the upper casing shell 10. Each bracket 33 is held in its respective recess 36 by a punch mark 37 which when made causes a small portion of the metal in the form of a mound 38 of the upper casing shell to flow into the hole 34, thus securely holding each bracket 33 in place. The lower end of each offset bracket 33 is apertured, as at 40, to receive the large end 39 of a pivot pin 41. Each of the pivot pins 41—41 is riveted, as at 42, to the rear end of a pair of offset or bent brush supporting arms 43—43 that are housed in the leg portions 13 and 14 of the hereinbefore described U-shaped cavity. The arms 43—43 are made of resilient material and are biased so as to hold the pins 41—41 in the apertures 40—40, thus providing a removable pivotal mount for the arms 43—43 and the brush 31. A pair of non-rotatable brush caps 44—44, together with a non-rotatable shaft 46, are held to each of the arms 43—43 by a washer 47 and a screw 48, the latter passing through the arm, the cap and into the shaft 46. Each cap 44 and the shaft 46 are restrained from rotation by non-circular ends (not shown) of the shaft 46 that enters non-circular holes (not shown) in the cap 44 and the arms 43. The brush 31 is rotatably mounted on the shaft 46.

The forward or free end of each arm 43 is bent inwardly, as at 49, and thereafter is encircled by a resilient shock absorber 51. The upper casing shell 10 carries a pair of downwardly extending U-shaped wire stop members 52—52 (Fig. 5) which are so located that, when the arms 43—43 are raised, the shock absorbers 51—51 engage the stops 52—52 and thus limit the upward movement of the arms 43—43 and the brush 31. The lower casing shell 11 is provided with a pair of integrally formed upwardly extending bosses 53—53 (Fig. 1), which are so positioned that when the arms 43—43 are lowered the shock absorbers 51—51 engage the bosses 53—53, thus limiting the downward movement of the arms and brush.

Reference to Fig. 1 and particularly to Fig. 3 shows that the center of the pivot pin 39 is a distance "D" below the plane 12 and thus is below the axis of the pulley 23. Reference to Fig. 2 shows that the pulley 23 and the pivot pin 41 lie in the same vertical plane. The above described position of the pivot pin 41 with respect to the pulley 23 is of considerable importance and assures very satisfactory and desirable performance for the pivotally mounted rotary dust brush 31. The distance from the axial center of the pulley 23 to the axial center of the dust brush 31 is substantially the same as the distance from the axial center of the pivot pin 41 to the axial center of the dust brush 31. This permits the brush 31 to oscillate up and down without an appreciable change in the length or tension of the belt 24. On the other hand, the fact that the center of the shaft 23 is located above the pivot point 41 for the arms 43, provides considerable uplift for the brush 31 and thus for the arms 43—43. Stating this in another manner, it can be said that an upwardly directed vertical component of force produced by the belt 24 acts on the brush 31 in opposition to the weight of the brush and the arms 43—43. Without the uplift, caused by the relative position of the pulley 23 and the pin 41, the weight of the brush 31 and the arms 43—43 would cause the bristles 32 to scrub against the surface being cleaned. This would result in undue wear of the bristles as well as undue wear of the surface being cleaned. By use of the disclosed arrangement it is possible to support the brush 31 in such a manner that the bristles of the brush will deliver a blow or beater action each time they contact the rug.

Suction produced by the applicant's fans 20—20 and acting through a mouth 55 formed in the lower casing shell 11 will, in a manner shown in Fig. 7, cause a rug or carpet to be picked up and held against the mouth portion of the cleaner and against the bottom of the rotary brush 31—32. Since the applicant's brush 31 and arms 43—43 are comparatively heavy, the inertia of these parts will prevent the brush from bouncing away from the carpet each time one of the bristle tufts 32 engages a portion of the carpet or rug being cleaned. Since the brush 31 does not move away when the bristles strike the rug, the rug will be given a beating by the bristles and the rug will be caused to move away from the brush. This beater action of the bristles causes the rug to oscillate in a wave motion as the spirally positioned bristles 32 progressively engage the carpet.

One advantageous use for the applicant's structure is the easy conversion of the instant vacuum cleaner to a floor polisher. The vacuum cleaner of the present invention can be converted to a floor polishing machine simply by removing the lower casing shell 11, and the front wheels 18 carried thereby. This operation is accomplished by opening the latch mechanism 9 in such a manner as to disconnect and remove the lower casing shell 11 from the upper casing shell 10 as indicated in Fig. 5. After the lower casing shell 11 and wheels 18 have been removed, the brush 31 and bristles 32 protrude below the upper casing shell 10. When the lower shell 11 has been removed, the ambulatory machine is placed on the floor (as indicated by the line F in Fig. 5) to be polished, with the rear wheels 19—19 and the bristles 32 of the brush 31 being the sole means for supporting the weight of the

machine. In this condition of operation, the shock absorbers 51—51 are pressed against the stops 52—52. While the ordinary dust brush 31 may be employed for the polishing operation, it is desirable to remove the dust brush and to substitute a brush that is especially adapted for polishing. This avoids the possibility of getting polishing wax on the dust brush and later having this wax transferred to a rug or carpet.

The dust brush 31 and the arms 43—43 are readily removed from the upper casing shell 10 by springing the two resilient arms 43—43 outwardly away from the center of the vacuum cleaner. This disengages the pivot pins 41—41 from the holes 40—40 formed in the lower ends of the bracket 33—33, and allows the belt 24 to be removed. After the dust brush, brush arms, and belt have been removed, a special polishing brush that is provided with its own set of supporting arms is installed along with the belt just removed. The polishing brush and arms have not been illustrated in the drawings, but these items may be exactly like the dust brush 31 and the arms 43—43 except that the polishing brush may have more bristles 32 than are shown for the dust brush.

Figs. 1, 2 and 5 show that the upper casing shell 10 is provided with a dome 54 which extends between the portions of the upper casing shell that form downfacing cavity portions of the cavities 13 and 14. The dome 54 provides a downfacing centrally located cavity which overlies the upper portion of the motor-fan unit 17. An air space 56 is provided between the said dome 54 and the motor portion of the motor-fan unit 17. This allows for circulation of air into and out of the usual ventilating openings (not shown) that are provided in the frame of the motor portion of the motor-fan unit 17.

From the above it will be appreciated that I have provided an improved and novel two-part casing for dual-fan, horizontal motor vacuum cleaner in which the lower casing shell 11 is removably attached to the upper casing shell 10, and in which the upper casing shell performs a plurality of functions including the following:

(*a*) The upper casing shell 10 covers the motor-fan unit 17 and provides an air space 56;

(*b*) The upper casing shell 10 acts as the unit to which the motor-fan unit 17 is secured by screws 25′—25″;

(*c*) The upper casing shell 10 carries supports 33—33 which support the pivot points 41—41 for the arms 43—43;

(*d*) The upper casing shell 10, in cooperation with the lower casing shell 11, provides the forward nozzle cavity 16 for housing the brush 31;

(*e*) The upper casing shell 10 carries the stop members 52—52 which limit the upward movement of the brush arms 43—43;

(*f*) The upper casing shell 10 in cooperation with the lower casing shell 11 provides the rearwardly extending cavities 13 and 14 which act as dust passageways leading from the cavity 16 to the fans 20—20 and at the same time act as working spaces for the brush support arms 43—43.

As indicated above, it will also be appreciated that the present invention provides a vacuum cleaner that can easily be converted to a floor polisher. The complete vacuum cleaner comprises two assemblies of parts; the upper assembly of parts, comprising, the upper casing shell 10, the motor-fan unit 17, the rotary dust brush 31 together with its supports 33—33, the pair of

rear wheels 19, and the arms 26 by which a propelling handle (not shown) may be attached to the upper assembly. The lower assembly of parts, comprises, the lower casing shell 11 and the pair of front wheels 18. When the lower assembly is attached to the upper assembly, the machine is usable as a vacuum cleaner, and when the lower assembly is removed, the machine is usable as a floor polisher.

Furthermore, it will be noted that I have provided a novel means for supporting the rotary brush or agitator 31 in the nozzle of the vacuum cleaner. The heavy brush roll 31, which preferably weighs from 13 to 15 ounces, will not bounce, but at the same time this heavy brush roll 31, due to the uplift of the belt 24, does not press downwardly on the rug with sufficient pressure to prevent the suction produced by the fans 20—20 from lifting the rug or carpet R into contact with the nozzle. Nor does the brush 31 press downwardly with enough pressure to cause appreciable wear of the rug R or the bristles 32.

Having thus set forth the nature of my invention, what I claim herein is:

1. A vacuum cleaner comprising a casing having an upper casing shell and a U-shaped lower casing shell opertured to form a suction nozzle, a motor having a shaft with a horizontal axis that extends transversely of said casing, a fan on each end of said motor shaft, a pulley on one end of said shaft and located externally of one of said fans, a rotary agitator located within said casing adjacent to said suction nozzle and the axis of said agitator being parallel to and forward of said motor shaft, a pair of agitator supporting arms extending rearwardly from said agitator, mounting means at opposite sides of said upper casing shell pivotally supporting the rear ends of said arms directly below said motor axis, and a belt for driving said agitator from said pulley.

2. In an ambulatory type vacuum cleaner, a motor-fan unit having a horizontal drive-shaft that is perpendicular to the direction of the to-and-fro movement of the ambulatory cleaner, a pair of rear supporting wheels rotatably secured to said rotor-fan unit, an upper casing shell secured to said motor-fan unit and having a downfacing U-shaped cavity extending along the two sides and front of said upper casing and having a central downfacing cavity positioned between the two side portions of the U-shaped cavity, the said central cavity being arranged to overlie said motor-fan unit, a pair of dust brush arms carried on pivotal points supported by said upper casing shell, said pivotal points and the center of said motor-shaft being in the same vertical plane, with the pivotal points below the center of said shaft, a dust brush rotatably carried by the free ends of said arms, a resilient belt driving said brush from said drive-shaft, a lower casing shell having an upfacing U-shaped cavity conforming to the outlines of the U-shaped cavity in said upper casing shell, a pair of front supporting wheels rotatably carried by said lower casing shell, and means for securing said lower casing shell to said upper casing shell.

3. A vacuum cleaner comprising a casing having an upper casing shell and a U-shaped lower casing shell apertured to form a suction nozzle, a motor having a shaft with a horizontal axis that extends transversely of said casing, a fan on each end of said motor shaft, a pulley on one end of said shaft and located externally of

one of said fans, a rotary agitator located within said casing adjacent to said suction nozzle and the axis of said agitator being parallel to and forward of said motor shaft, a pair of agitator supporting arms extending rearwardly from said agitator, mounting means at opposite sides of said upper casing shell, pins carried by said mounting means and pivotally supporting the rear ends of said arms, said pins being located directly below said motor axis, and a belt driving said agitator from said pulley.

4. A vacuum cleaner comprising a casing having an upper casing shell and a U-shaped lower casing shell apertured to form a suction nozzle, a motor having a shaft with a horizontal axis that extends transversely of said casing, a fan on each end of said motor shaft, a pulley on one end of said shaft and located externally of one of said fans, a rotary agitator located within said casing adjacent to said suction nozzle and the axis of said agitator being parallel to and forward of said motor shaft, a pair of agitator supporting arms extending rearwardly from said agitator, a pair of brackets depending from opposite sides of said upper casing shell, a pin pivotally supported by each of said brackets, the center of said pins being located directly below said motor axis, means securing one of said pins to the rear end of each of said arms, and a belt stretched over said pulley and said agitator for driving said agitator from said pulley.

5. A vacuum cleaner comprising a casing having an upper casing shell with opposite sides and a U-shaped lower casing shell apertured to form a suction nozzle, a motor having a shaft

with a horizontal axis that extends transversely of said casing, a fan on each end of said motor shaft, a pulley on one end of said shaft and located externally of one of said fans, a rotary agitator located within said casing adjacent to said suction nozzle and the axis of said agitator being parallel to and forward of said motor shaft, a pair of agitator supporting arms extending rearwardly from said agitator, a pair of brackets, one being secured to and depending from each of the opposite sides of said upper casing shell, the lower end of each of said brackets being provided with a hole of which the axis is parallel to and directly below the axis of said motor shaft, pins secured to the rear ends of said arms and pivotally entering the holes in said brackets and a belt stretched over said pulley and said agitator for driving said agitator from said pulley.

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