Nov. 23, 1948. E. W. GENT 2,454,314

VACUUM CLEANER

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FIG. 1

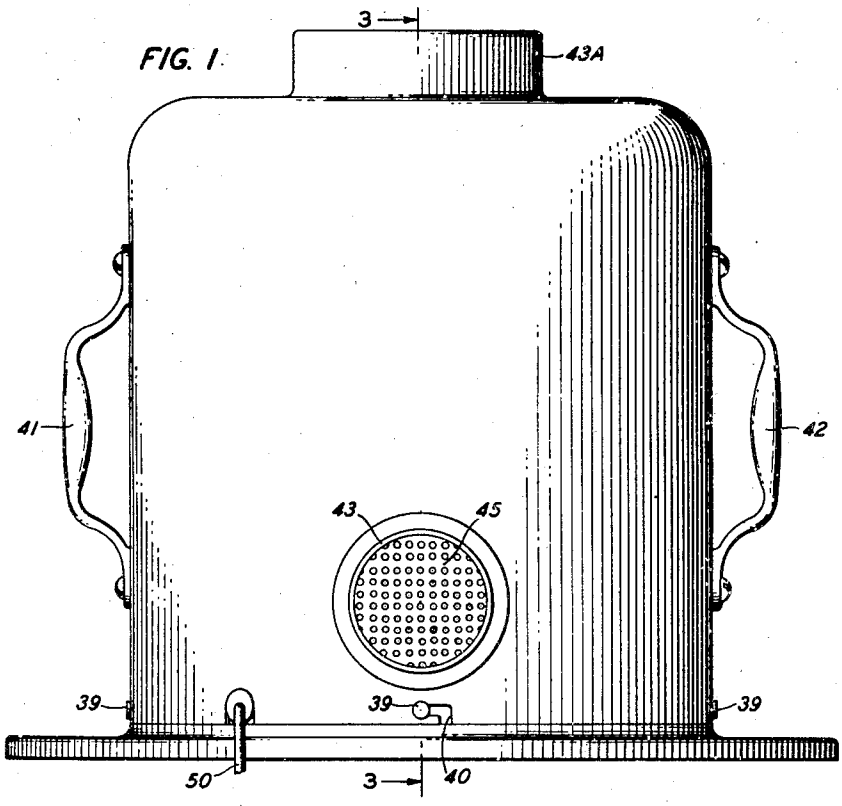

FIG. 2

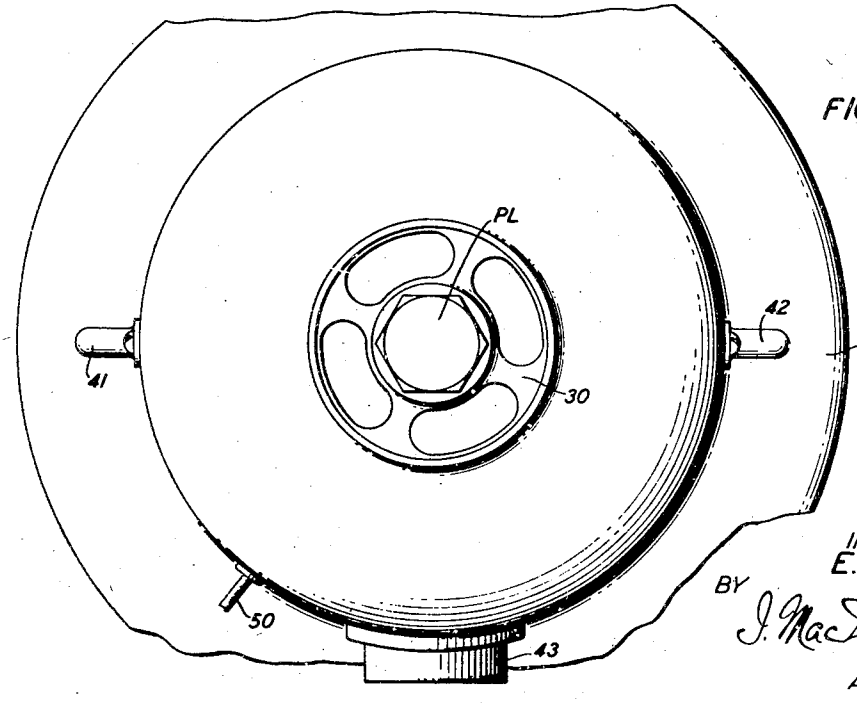

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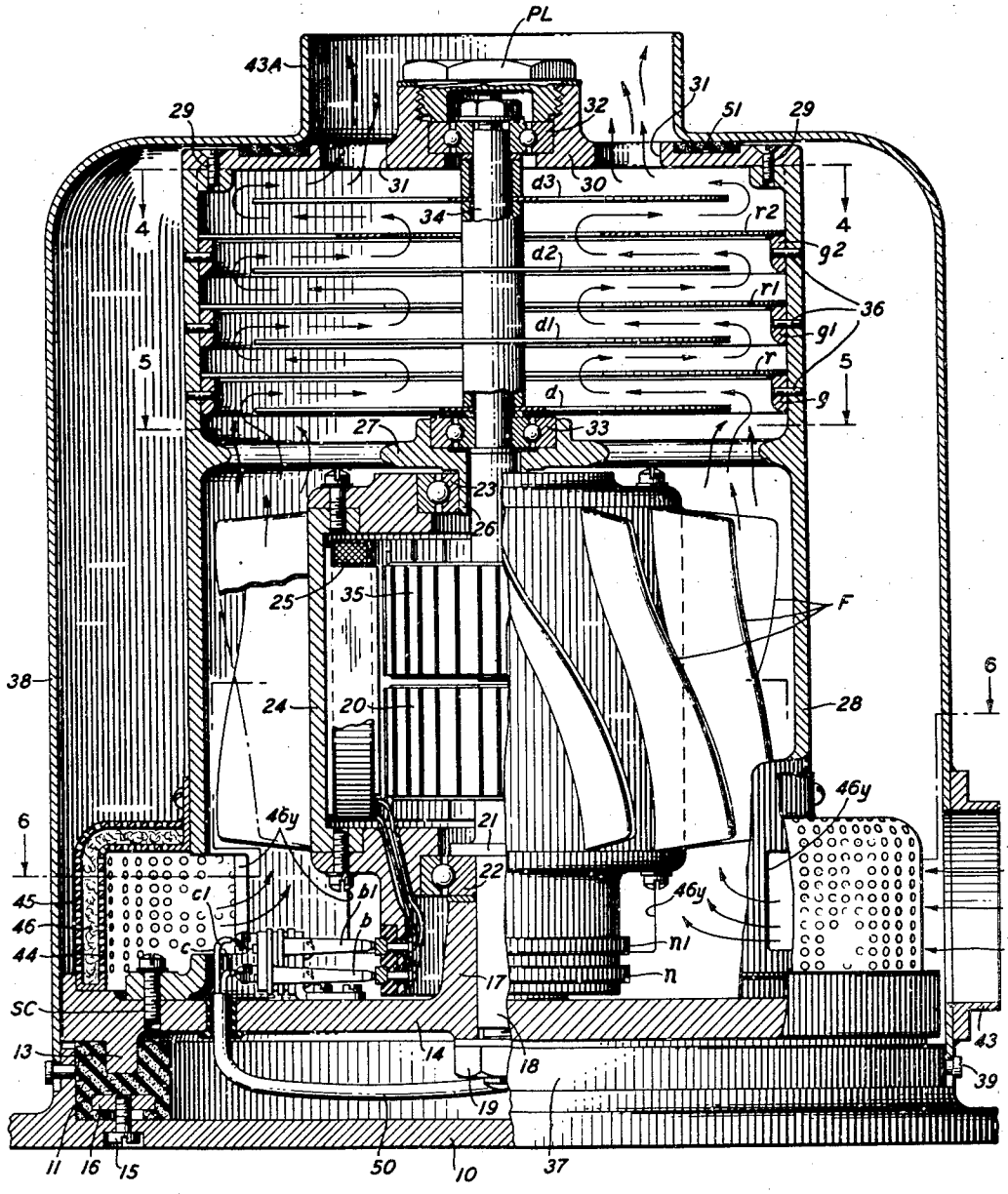
FIG. 3



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VACUUM CLEANER

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FIG. 4

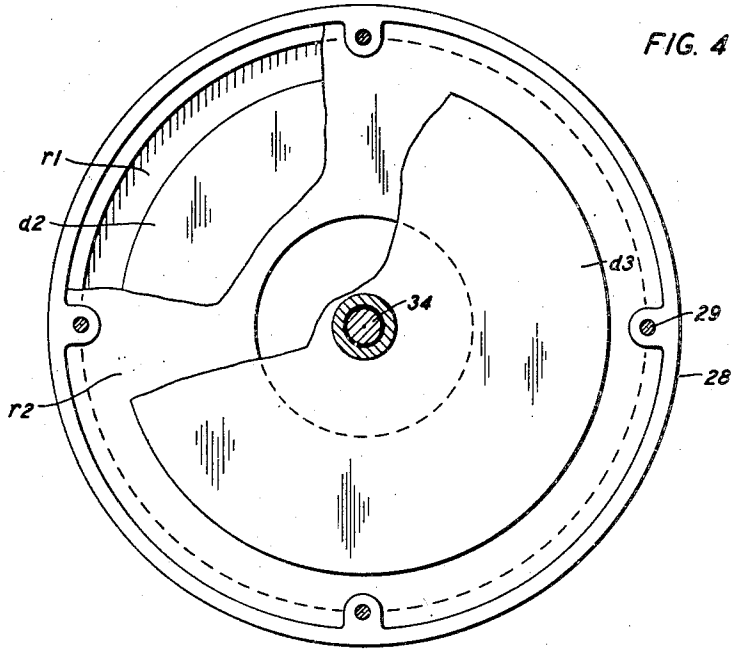

FIG. 5

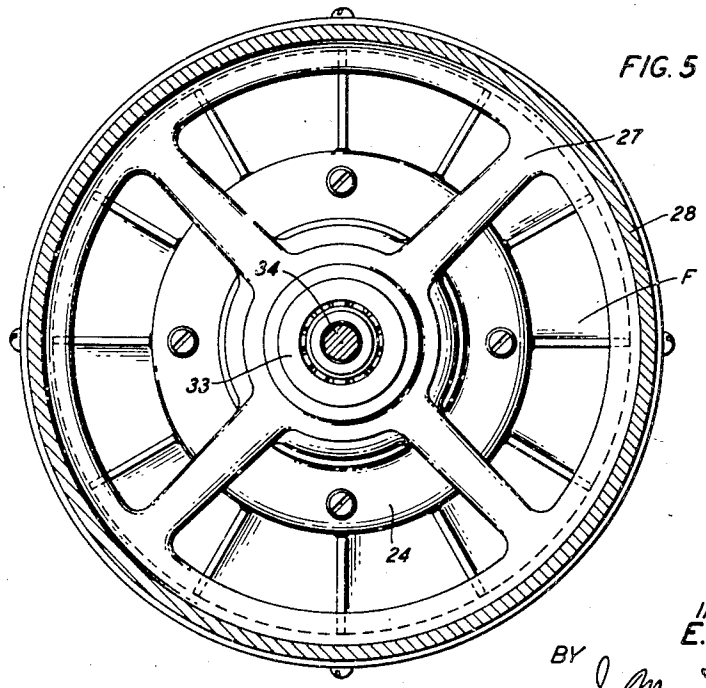

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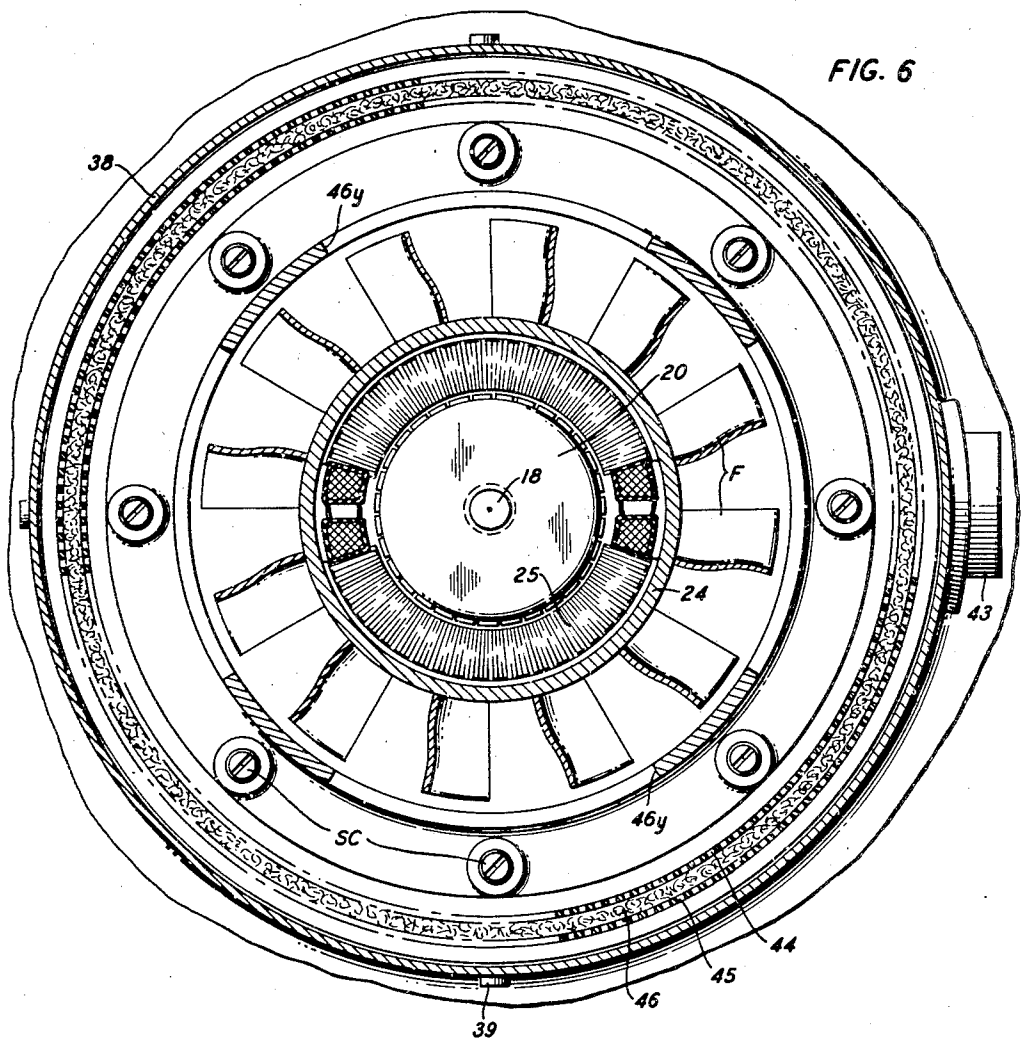
FIG. 6



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UNITED STATES PATENT OFFICE

2,454,314

VACUUM CLEANER

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Application September 20, 1946, Serial No. 698,185

4 Claims. (Cl. 230—117)

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This invention relates to vacuum cleaner devices.

In the use of vacuum cleaner devices, as is well known, ordinary fans of relatively large diameter are mounted on the armature shaft of high speed universal electric motors with the result that considerable noise is generated by the impact of the fan blades against the air and the sparking between the brushes and the collector segments of the motor and because of the frictional contact of the brushes on the collector segments and the high speed of the armature shaft, the brushes have been found to wear out in a relatively short time, requiring considerable maintenance and expense in order to maintain such a vacuum cleaner device in proper operating condition.

The object of the present invention is the provision of a vacuum cleaner which will be simple in construction, substantially noiseless and efficient in operation and in which the expense for maintenance has been reduced to a minimum.

A feature of the present invention is the provision in a vacuum cleaner device, of a new motor in which the primary member is mounted for rotation in position concentric to a stationary secondary member while a secondary member is mounted for rotation in such primary member at twice the speed imparted to the primary member, thus avoiding the wear on the brushes because of the low speed of the primary member and the collector segments carried thereby in relation to the rotatable secondary member.

Another feature is the provision in a vacuum cleaner of a novel blower making use of the combined effect of adhesion and cohesion of the air and of the frictional drag for generating a current of air through air-paths in the housing of the vacuum cleaner.

Another feature is the provision of means carried by the rotating casing of the primary member to form a second blower for generating an airflow directed toward the blower carried by the rotatable secondary member.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto, reference being had to the accompanying drawing in which:

Fig. 1 is an elevational view.

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Fig. 2 is a top view shown with portions of the base broken away.

Fig. 3 is an elevation view shown with a number of operating parts in central vertical section.

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 3, shown with a number of operating parts with portions broken away.

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 3; and

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 3.

In accordance with the construction of the vacuum cleaner device of this invention, a circular base 10 is provided with a rim portion 37 for receiving in position concentric thereto a damping ring 11 of rubber, for example, vulcanized to a circular ridge portion 13 formed at the periphery of a disc shaped member 14, the ring being held securely onto the base 10 by a plurality of screws 15 threadedly engaging a ring 16 vulcanized in the rubber ring 11.

The disc shaped member 14 is formed with a centrally disposed hub portion 17 for receiving a shaft 18 secured against rotation therein by a nut 19, while a secondary member 20 of the motor is keyed on the upward extending end of shaft 18. A collar 21 is formed with the shaft 18 to serve for clamping the inner race of a ball bearing 22 onto the top surface of hub 17, this ball bearing cooperating with a ball bearing 23 for rotatably mounting the so-called cage or casing 24 for the primary member 25 of the motor, casing 24 having a plurality of helically disposed fin members F at its periphery to serve as a low speed blower, the function of which will be hereinafter described in detail.

The ball bearing 23 is mounted in a bushing portion 26 formed centrally to a spider web-shaped partition 27 cast with a cylindrical casing 28, the lower end of which is secured onto the disc 14 by a number of screws SC best seen in Fig. 3. To the upper disposed end portion of casing 28 is secured as by a number of screws 29 a disc member 30 having a plurality of openings 31 serving as an outlet air path adjacent a high speed blower which will be hereinafter described in detail.

The partition 27 and disc-shaped member 30 serve for rotatably mounting as on ball bearings 32 and 33 a shaft 34. The outer rim of ball

bearing 32 is held against rotation by a plug PL in screw threaded engagement with the hub portion of disc member 30 and to the lower disposed end of shaft 34 is keyed a rotatable secondary member 35 provided for rotating the rotor element of the high speed blower which consists of a plurality of disc shaped plates *d*, *d1*, *d2* and *d3* disposed for rotation between flat rings *r*, *r1*, *r2*, secured at their peripheral edge as by welding to supporting rings, *g*, *g1* and *g2* which in turn are secured to the cylindrical casing 26 by a number of pins 36 best seen in Fig. 3, the rings and the discs being in any quantity desired depending upon the power rating of the motor.

A bell shaped casing 38 is removably secured to the rim portion 37 of the base 10 by a plurality of bayonet-like arrangements best seen in Fig. 1 consisting of studs 39 laterally extending from the cylindrical rim portion 37 and engaged by guiding cam portions 40 so as to cause the inner disposed top surface of the bell-shaped member 28 to engage with a predetermined pressure a rubber ring 51 fitted into a circular recess in the disc member 30 as best seen in Fig. 3 upon a small angular movement of casing 38 as effected by the handles 41 and 42 secured in diametrically opposite relation to the outer periphery of bell-shaped casing 38 as shown in Figs. 1 and 2. Casing 38 is provided with an air inlet pipe connection 43 and an air outlet pipe connection 43A. The pipe connection 43 serves as an air inlet toward the concentric space formed by the cylindrical casing 26 and the bell-shaped casing 38 from which the air is forced by the negative pressure generated by the fin members F carried by the primary member casing 24 into the cylindrical casing 28 through an air filter arrangement comprising the concentrically disposed perforated metallic rings 44 and 45 and a ring 46 of fibrous material, disposed between the rings 44 and 45, the cylindrical casing 28 being provided at its lower disposed end portion with a plurality of openings 46Y forming a part of the air path leading to the low and high speed blowers thus constructed.

Electrical connection to the primary member 25 is effected by the conductors *c* and *c1* of cord 50, the brushes *b* and *b1*, the collector segments *n* and *n1* and the wire forming the winding of primary member 25.

In the operation of the vacuum cleaner of this invention, the energization of the winding 25 connected to the segments *n* and *n1* in engagement with the brushes *b* and *b1* themselves connected to the wires *c* and *c1* of cord 50 is effective to cause the rotation of primary member casing 24 at the ordinary speed of substantially 3000 revolutions per minute, while causing the rotation of secondary member 35 relative to the primary member at a speed of 3000 revolutions per minute relative to the stationary secondary member 20 thus considerably reducing the wear and sparking between the brushes and the commutator segments *n* and *n1*.

Rotation of primary member casing 24 and the helically disposed fin members carried thereby is effective to generate a stream of air from the inlet pipe opening 43 through the filter formed by the concentrically disposed rings 44—45 and the fibrous material 46 placed therebetween, and hence through the openings 46Y in casing 28 and the annular space formed between the casing 28 and the rotatable casing 24 of the primary member winding 25. The stream of air thus generated extending through the air path formed by the spider web-shaped member 27 to be acted upon by the operation of the discs *d*, *d1*, *d2* and *d3* relative to the stationary rings *r*, *r1* and *r2*, which may be in any number desired. The high velocity of the stream of air thus generated being forced through the outlet opening 31 formed in the disc 30 and the outlet pipe 43*a* formed at the top disposed end of casing 38.

According to the object of the invention, a vacuum cleaner device is provided which is simple in construction, efficient and silent in operation and wherein the wear on the brushes because of the low velocity of the commutator segments and sparking is reduced to a minimum.

What is claimed is:

1. In a vacuum cleaner device, a pair of concentrically disposed casings, a motor mounted in the inner disposed of said casings, said motor having a plurality of unidirectional rotating elements movable at different speeds, and a blower carried by each of said elements, each of said casings having an air inlet opening and an air outlet opening forming an air path extending between one of said casings and said rotating elements.

2. In a vacuum cleaner device, a base, a shaft secured against rotation on said base, a secondary member keyed on said shaft, a cylindrical casing secured to said base having a partition formed midway of its length and interiorly thereof, a disc shaped member secured to the opposite end of said cylindrical casing, a rotatable shaft journaled in said partition and said disc-shaped member in coaxial relation with the first-mentioned shaft, a secondary member keyed to one end of said rotatable shaft in juxtaposition to the first mentioned secondary member, a rotatable primary member common to each of said secondary members, a blower comprising a set of plate disc members forming the rotor of said blower carried by said rotatable shaft interfitted between a set of flat rings carried by said casing forming the stator elements of said blower, a primary member common to said secondary members, a blower's fin members formed with said primary member, said primary member being movable at a different speed from that of said movable secondary member in the same direction.

3. A vacuum cleaner device comprising a base, a disc-shaped member, a cushioning element secured to said base and to said disc, said member having a hub portion, a shaft secured against rotation in said hub portion, a motor having a secondary member keyed to said shaft a cylindrical casing secured at one of its ends to said disc-shaped member, a partition formed interiorly of said cylindrical casing having a hub portion, a disc-shaped member secured at the opposite end of said casing having a hub portion, a shaft mounted for rotation in the hub portion of the last-mentioned partition and said disc-shaped member, a blower in said casing disposed between said partition and the last-mentioned disc-shaped member, said blower comprising a set of rings supported by said casing and a set of discs carried by said rotatable shaft forming the rotor element of said blower, said motor having a primary member common to said secondary members, and a blower carried by said primary member for rotation in said casing at a different speed from that of said rotatable shaft in the same direction.

4. In a vacuum cleaner device, an electric motor having a stationary secondary member, a rotatable secondary member, a primary rotatable member common to each of said secondary members, a blower device of one character carried by

said rotatable secondary member in one direction and a blower device of another character carried by said rotatable primary member rotatable in the direction of the first-mentioned blower at a different speed.

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