Jan. 12, 1943. F. C. DOUGHMAN 2,307,827

VACUUM CLEANER

Filed July 19, 1940

Fig. 1.

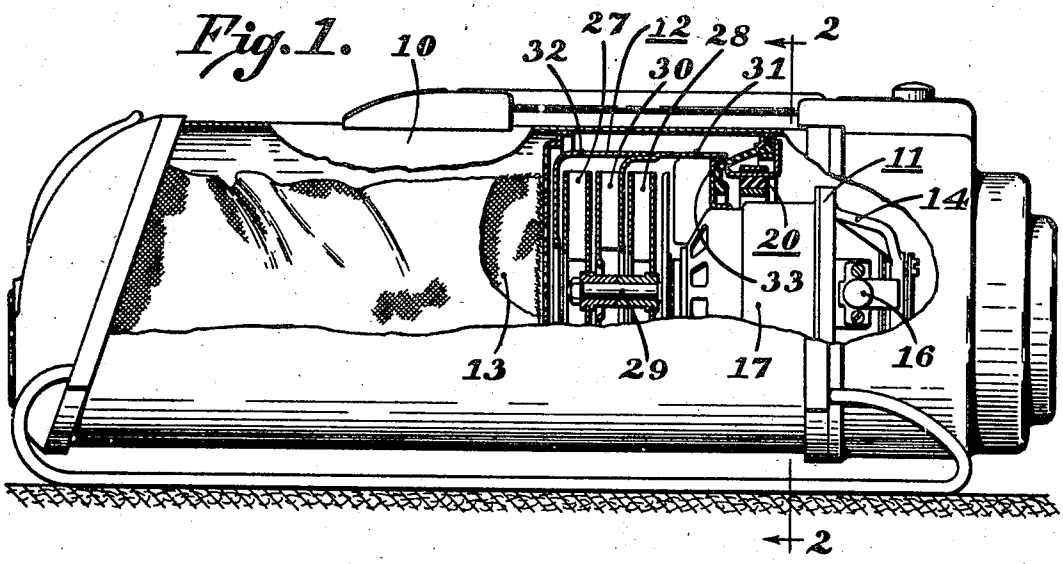


Fig. 2.

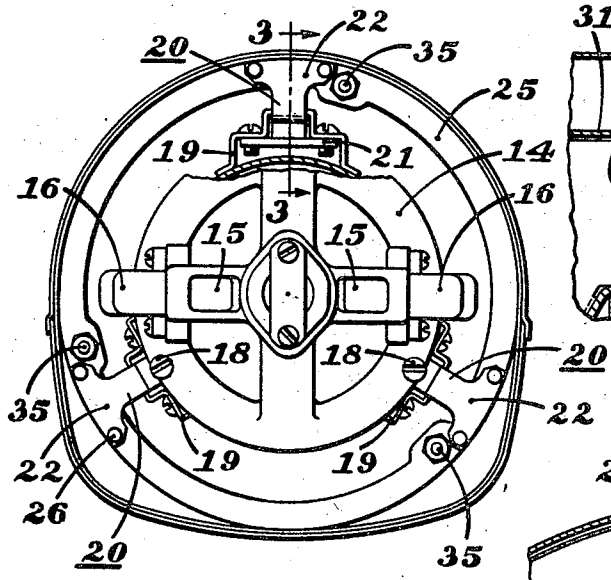


Fig. 3.

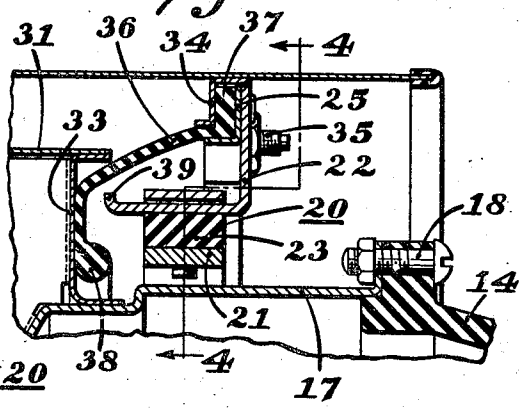


Fig. 4.

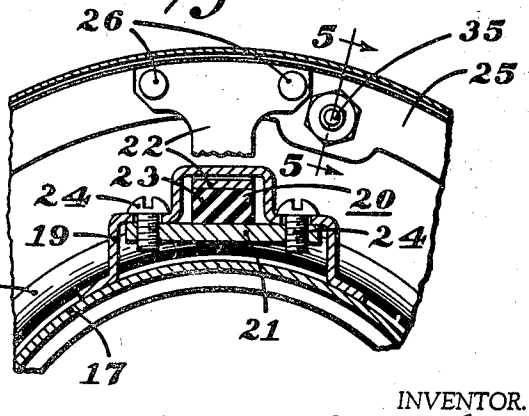
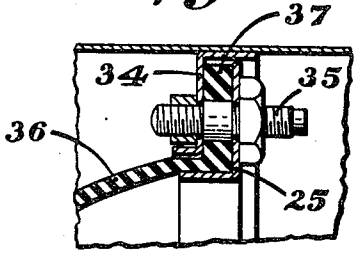


Fig. 5.



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2,307,827

VACUUM CLEANER

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Application July 19, 1940, Serial No. 346,242

6 Claims. (Cl. 230—132)

My invention relates to vacuum cleaners and more particularly to the motor-fan unit support within the vacuum cleaner casing.

In vacuum cleaners of the type having a unit which is pulled around on the floor by a flexible hose, a motor-fan unit is mounted in this unit. The motor is usually a universal type motor which operates at a relatively high speed when connected either to alternating or direct current. A motor of this type has a commutator with a number of segments engaged by two carbon brushes. High frequency electrical pulsations are created as the commutator segments pass successively under the carbon brushes. The slots in the armature also produce high frequency electrical pulsations. These electrical pulsations are converted into mechanical vibrations in the motor primarily as torque pulsations. When the motor is connected to a source of alternating current, the alternating impulses are also converted into mechanical vibrations. The variations in the load on the motor as the vacuum cleaner is operated, which produce variations in the speed of operation of the motor, are also converted into mechanical vibrations. Any mechanical unbalance in the armature will produce vibrations. The multi-stage fan which is connected to the motor with its plurality of blades produces mechanical vibrations. All of these mechanical vibrations produce noise, if not absorbed, which is magnified if transmitted to the vacuum cleaner casing. A flexible support for the motor-fan unit has been used heretofore to reduce the noise produced and transmitted to the vacuum cleaner casing.

An object of my invention is to provide an improved motor-fan unit support.

A further object of my invention is to eliminate the transmission of vibrations and noise from the motor-fan unit to the vacuum cleaner casing.

What I consider to be novel and my invention may be better understood by reference to the following specification and accompanying drawing, in which:

Fig. 1 is a side view of a vacuum cleaner unit broken away in part to show the motor-fan unit and dust bag within it;

Fig. 2 is a cross-sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged detail sectional view taken along the lines 4—4 of Fig. 3; and

Fig. 5 is an enlarged detail view taken along the line 5—5 of Fig. 4.

Referring to the drawing, 10 indicates a vacuum cleaner casing housing a motor 11, driving a multi-stage fan 12 which produces a flow of air in the casing 10 from left to right, as shown in Fig. 1. At the left end in casing 10, a dust separating member or dust bag 13 is located.

Motor 11 is provided with an end shield 14 formed of a phenolic condensation product such as "Bakelite." Formed integrally with end shield 14 are two brush holders 15 to which are secured brush holder caps 16. End shield 14 is secured to a steel motor housing shell 17 by means of bolts 18. Three brackets 19 are secured to shell 17 at radially spaced points around the periphery of the shell. Three resilient supporting members 20 consisting of a flat metal strap 21, a metal angle member 22, and a block 23 of rubber or other resilient material are provided. Block 23 is secured to strap 21 and angle member 22 by means of vulcanization. Strap 21 is secured to bracket 19 by means of two screws 24 in threaded engagement with strap 21. Angle members 22 are secured to an annular ring 25 as by means of rivets 26.

Fan 12 includes two rotating fan members 27 and 28 secured to the end of shaft extension 29 of motor 11. Between the fan members 27 and 28 is located a guide member 30, which serves to guide air discharged from fan 27 to the inlet of fan 28. Guide member 30 is secured to a housing 31 surrounding fan 28. A second fan housing 32 surrounds fan 27 and is secured to fan housing 31. Fan housing 31 is closed by an end wall 33 secured to shell 17.

A bulkhead 34 is secured within vacuum cleaner casing 10 and is provided with an opening to receive motor 11 and fan 12. Annular ring 25 is secured to bulkhead 34 by means of bolts 35 to mount the motor 11 and fan 12 within casing 10. The space between fan housings 31 and 32 and casing 10 is closed by a flexible sealing ring 36. Sealing ring 36 has a radially extending flange 37 positioned between bulkhead 34 and annular ring 25. An enlarged end 38 of sealing ring 36 remote from flange 37 abuts end wall 33.

When motor 11 and fan 12 are operated the electrical impulses tending to produce mechanical vibrations and noise appear as radial or rotary vibrations. The relatively small widths of the blocks 23 provide extreme flexibility to rotary vibrations with blocks 23, under shear, readily absorbing any such vibrations. Variations in the load on the motor tend primarily to produce axial vibrations which are of lower frequency than the rotary vibrations mentioned above. The axial

vibrations are equally well absorbed by the blocks 23, which are relatively short in length, so provide considerable flexibility when the blocks 23 are under shear in an axial direction.

The operation of motor 11 and fan 12 produces a flow of air from left to right in casing 10, as shown in Fig. 1. This operation of the motor-fan unit produces a force on the motor 11 and fan 12 moving it toward the left or in a direction opposite to the direction of air movement. The flexibility of the supporting members 20 permits considerable movement of the motor-fan unit in this direction. When the motor-fan unit is not operating, the flexible sealing ring 36 has a considerable portion of its free end in engagement with wall 33 as shown in Fig. 3. When the motor-fan unit is operated movement of the motor 11 and fan 12 to the left reduces the portion of sealing ring 36 in engagement with wall 33, but the end 38 and a small adjacent portion of ring 36 retains the seal to prevent air flow between casing 10 and the fan housings 31 and 32.

When motor 11 moves axially, bracket 19 and strap 21 move with respect to angle member 22. An upturned shoulder 39 provided on the end of angle member 22 serves as a stop to prevent undue movement of motor 11 toward the left, as shown in Fig. 3, by engagement with bracket 19. Axial movement of motor 11 in the opposite direction is stopped by engagement of bracket 19 with the radially extending portion of angle member 22. These stops are particularly useful to prevent damage to the supporting members 20 when the vacuum cleaner casing 10 is dropped on one end or the other. Such abuse does occasionally occur in the use of vacuum cleaners but it more often occurs in the transportation or shipment of them.

What I claim is:

1. A vacuum cleaner including a casing, a motor located within said casing, a plurality of brackets secured to said motor, straps secured to said brackets, angle members secured to said casing and having an axially extending portion overlying said straps, and blocks of rubber resiliently connecting said straps and said angle members together, said angle members having stops adapted to engage said brackets to limit axial movement of said motor and serving to support said motor in said casing.

2. A vacuum cleaner including a casing, a bulkhead located within said casing having an opening, a motor located in said casing extending through the opening in said bulkhead, a plurality of brackets secured to said motor, straps connected to said brackets, angle members having axially extending portions overlying said straps and radially extending portions, blocks of rubber resiliently securing said straps and said angle members together, an annular metal ring secured to the radial extending portions of said angle members, and means to secure said annular ring to said bulkhead.

3. Apparatus adapted to be used in a vacuum cleaner comprising housing means including a tank, means for producing air flow through the tank, resilient means for supporting the air flow means within the tank, and resilient sealing means for preventing circulation of air from one end of the air flow means to the other without the air going outside the tank, said sealing means comprising an annular member sealingly attached to one of the two first mentioned means and biased into sealing engagement with a radial face of the other of said two first mentioned means and adapted to remain in such sealing engagement despite axial movement of the air flow means.

4. A vacuum cleaner tank, means for producing air flow through the tank, resilient means for supporting the air flow means within the tank, and resilient sealing means for preventing circulation of air from one end of the air flow means to the other without the air going outside the tank, said sealing means comprising a resilient member sealingly attached to the tank and in sealing engagement with the air flow means, the portion of said member attached to the tank forming a part of the resilient supporting means.

5. A vacuum cleaner tank of generally tubular shape, means for producing air flow through the tank, resilient means for supporting the air flow means within the tank, said resilient means comprising a plurality of rubber sandwiches, the planes of said sandwiches being substantially parallel to the axis of the tank, and stop means formed on one of the outer layers of one of said sandwiches adapted to engage means comprising the other outer layer of the same sandwich upon axial displacement of said air flow means to prevent further axial displacement.

6. A vacuum cleaner tank of generally tubular shape adapted when in use to be placed with its axis in a substantially horizontal position, means for producing air flow through the tank, resilient means for supporting the air flow means within the tank, said resilient means comprising a plurality of rubber sandwiches, the planes of said sandwiches being substantially perpendicular to radial lines through their centers perpendicular to the axis of the tank, and stop means formed on one of the outer layers of one of said sandwiches adapted to engage means comprising the outer layer of the same sandwich upon downward displacement of said air flow means to prevent further downward displacement.

FERMAN C. DOUGHMAN.