

March 31, 1936.

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2,035,882

VACUUM CLEANER

Filed Sept. 1, 1933

3 Sheets-Sheet 2

Fig. 10.

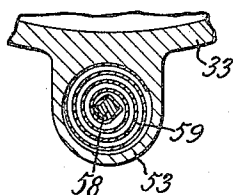


Fig. 4.

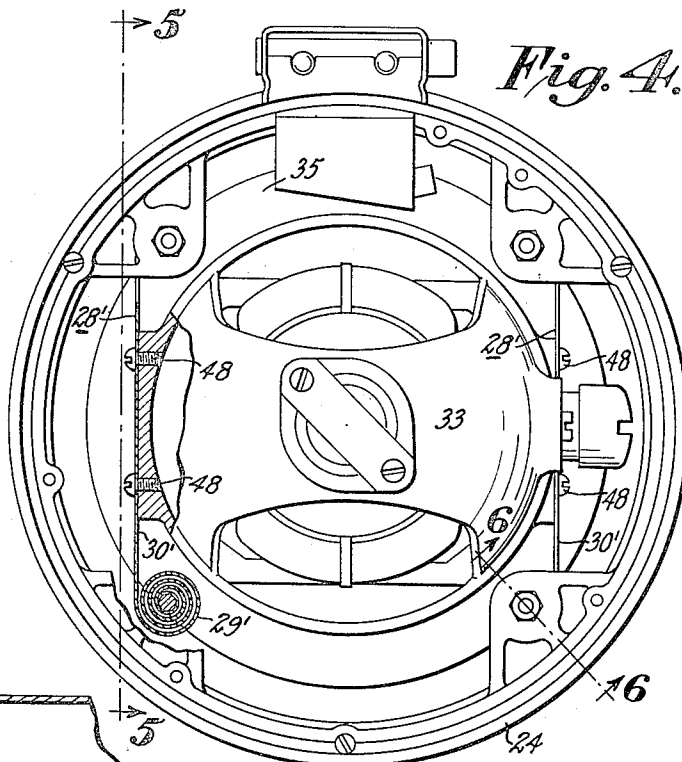
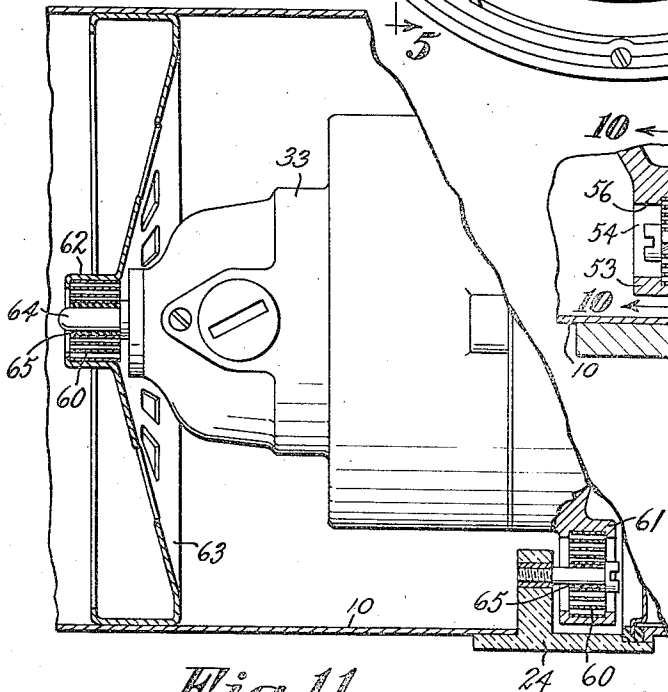


Fig. 11.

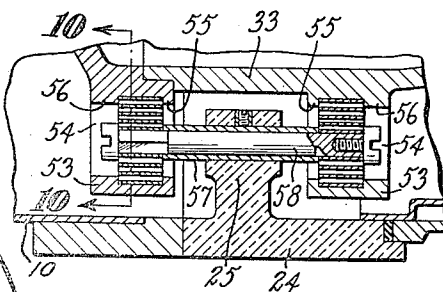


Fig. 9.

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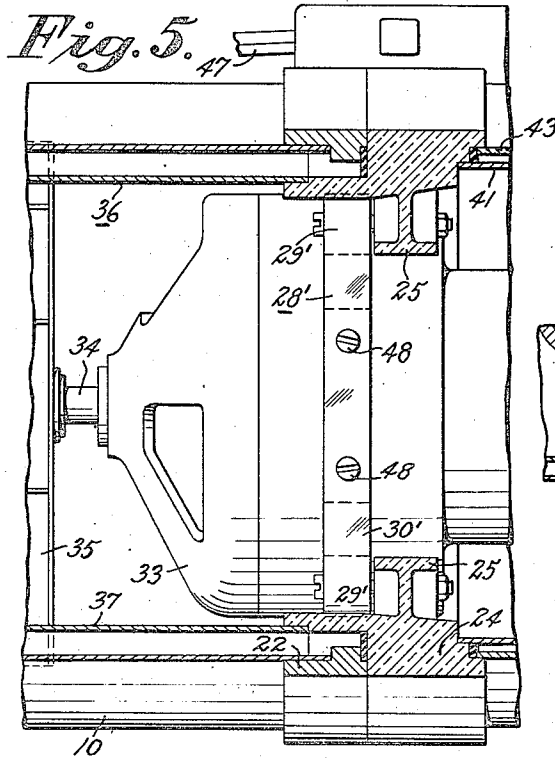
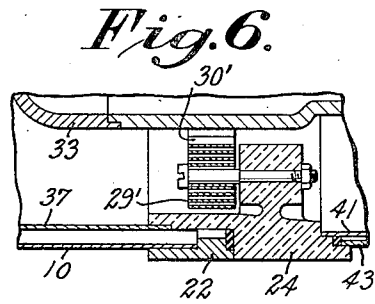
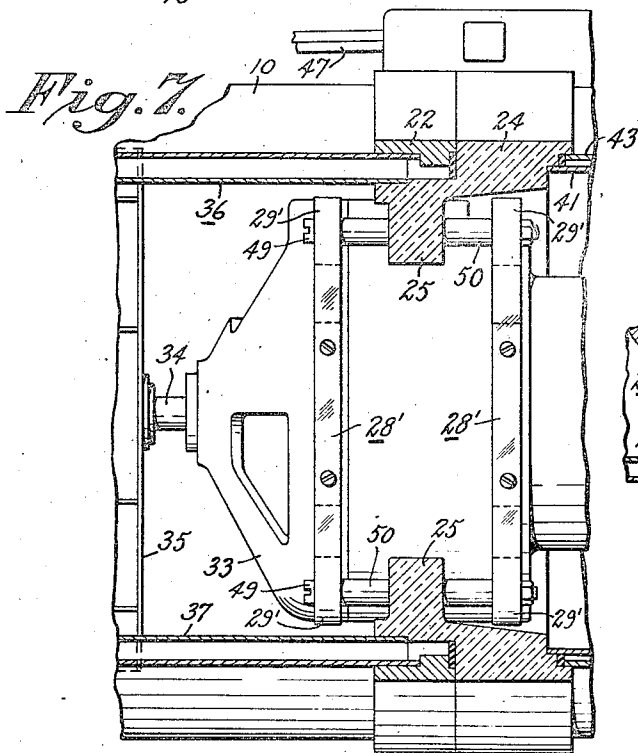
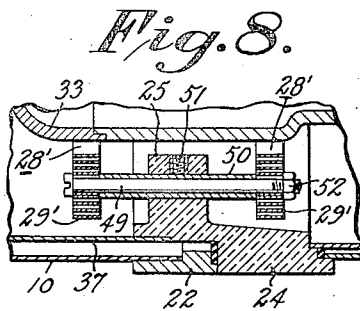
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VACUUM CLEANER

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3 Sheets-Sheet 3



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2,035,882

VACUUM CLEANER

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 In Germany December 17, 1932

3 Claims. (Cl. 248—26)

My invention relates to vacuum cleaners and particularly to means for resiliently supporting the motor-fan unit in a surrounding casing. While my invention will be described in connection with a vacuum cleaner of the enclosed-bag type, that is, one in which the dust bag and motor-fan unit are enclosed in a casing, it will be appreciated that the invention is applicable to other types of vacuum cleaners.

It is desirable to resiliently support the motor-fan unit in order to reduce the noise caused by the vibration resulting from the rotation of the motor and fan. The resilient mounting absorbs this vibration and prevents its transmission to the casing. On the other hand, too great displacement of the motor-fan unit with respect to the casing due to the resilient mounting is not desirable, for reasons which will appear. One of the objects of my invention is to provide a mounting having sufficient resiliency without too much displacement.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawings which form a part of this specification, and of which:

Fig. 1 is a side view, chiefly in cross section, of a vacuum cleaner of the enclosed-bag type embodying my invention;

Fig. 2 is an end view of the device shown in Fig. 1 with certain of the parts removed;

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is an end view, similar to Fig. 2, but showing a different embodiment of my invention;

Fig. 5 is a cross sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 4;

Fig. 7 is a view similar to Fig. 5 but showing a further embodiment of my invention;

Fig. 8 is a cross sectional view of a portion of the device shown in Fig. 7;

Fig. 9 is a cross sectional view of a still further embodiment of my invention;

Fig. 10 is a cross sectional view taken on the line 10—10 of Fig. 9; and

Fig. 11 is a cross sectional view of a portion of a vacuum cleaner illustrating another embodiment of my invention.

Referring more particularly to Figs. 1 to 3, reference character 10 designates a main cylindrical member comprising part of a casing provided with runners 11 adapted to support it horizontally above a surface. One end of casing

member 10 is provided with a ring 12 to which a bell-shaped member 14 is adapted to be clamped by means of suitable snap fasteners 13. Member 14 is formed with a central threaded opening into which may be screwed a coupling member 15. Member 15 is provided with a central opening for receiving one end of a flexible hose 16. The other end of hose 16 is adapted to be connected to the suction nozzle 17 and there may be interposed between hose 16 and nozzle 17 a hollow rigid handle 18. A ring 19 having an outwardly extending annular flange 20 is adapted to be clamped between ring 12 and member 14. Suitably secured to ring 19 is a dust bag 21 made of cloth or other material which permits the passage therethrough of air, but is impervious to dust.

The other end of casing member 10 is provided with a ring 22 to which a ring 24 is secured by means of bolts 23. Ring 24 is preferably made of electrical insulating material such as Bakelite. Ring 24 is formed with a plurality of inwardly extending lugs 25 which are equally spaced around its circumference. In the embodiment illustrated in Figs. 1 through 3, three of these lugs 25 are employed. Bolts 26 are threaded into lugs 25 and extend parallel to the axis of the casing member 10. As shown particularly in Fig. 3, sleeves 27 formed with internal threads are cast in the lugs 25, and the bolts 26 are screwed into these sleeves. Mounted on each bolt 26 is a spring member 28 which comprises a spiral portion 29 having radially overlapping turns and a straight portion 30. The spring member 28 may also be described as comprising a straight portion 30 and a spirally rolled up portion 29. The innermost turn of the spiral portion 29 closely embraces bolt 26 and is firmly held between the head of the bolt and a washer 31. The end of the straight portion 30 is secured by means of screws 32 to the housing of an electric motor 33.

The armature shaft 34 of the motor projects from one end of the housing and has mounted thereon a centrifugal fan 35, comprising one or more rotors. In the embodiment shown two rotors are employed, and they, together with the motor, comprise a motor-fan unit supported in the casing 10 by the three springs 28. The center lines of springs 28 lie in a plane perpendicular to the axis of rotation of the motor which plane intercepts all of the turns and is radial with respect to the spiral portion. Hence, the axes of the spiral portions of the springs are parallel to the axis of rotation of the motor. Preferably, this

plane passes through the center of gravity of the motor-fan unit.

A fan housing 36 is carried by ring 24 and comprises a cylindrical portion 37 and two laterally extending walls 38 and 39. Wall 38 is ahead of the first rotor, while wall 39 is between the two rotors. Each of these walls is formed with a central opening and the central opening in wall 38 is covered by a perforated plate 40.

A motor shield member 41 is suitably secured to ring 24 behind the motor. Shield 41 is formed with a plurality of openings 42. An end member 43 is adapted to be secured to ring 24 by means of spring fasteners or the like which may be similar to fasteners 13 for securing member 14 to ring 12. Member 43 is provided with a central discharge opening 44, which is threaded and adapted to receive coupling member 15 when the device is used as a blower. A plurality of inclined louvers 45 are arranged adjacent to the opening 44 and serve to direct the air discharged there-through upwardly so as not to contact the surface upon which the cleaner is supported. A filter member 46 is arranged within member 43 and serves to completely eliminate from the air stream any very fine particles of dust or bacteria which may have passed through the dust bag. A handle 47 is provided for carrying the vacuum cleaner.

The casing heretofore referred to comprises casing member 10 and members 14 and 43.

The operation of the above described device is as follows:

Upon the rotation of shaft 34 of motor 33, the rotors 35 produce flow of air through the casing in the direction of the arrows. This air is drawn in through suction nozzle 17 and passes through hollow handle 18, hose 16, coupling 15 and member 14 into dust bag 21. If the nozzle 17 is passed over a dusty surface, dust will be drawn in with this air. This dust is separated from the air stream in dust bag 21, while the air passes through the material of the dust bag to the fan. From here it is discharged around and through motor 33, thereby cooling the motor, and passes through openings 42 in shield 41 and through the filter 46 to the discharge opening 44.

Motor 33 necessarily operates at a comparatively high rate of speed in order that a comparatively small fan may produce sufficient suction. This rotation necessarily results in vibration, which, if transmitted directly to the casing, would result in a large amount of undesirable noise. In order to prevent this, the motor-fan unit is supported in the casing by means of the springs 28. I have found that by making these springs in the form of spirals, it is possible to obtain a high degree of resiliency without a too great amount of displacement of the motor with respect to the casing and other stationary parts of the device. With the resilient mountings heretofore used, if the springs were made light enough to have the necessary degree of resiliency for satisfactory absorption of vibration, they were so weak that they allowed the motor-fan unit to have considerable movement with respect to the casing and the fan housing 36. This necessitated large clearance spaces, which were a waste of space and reduced the efficiency of the fan. If the springs were made stiff enough to prevent undue displacement of the motor-fan unit they were too stiff to satisfactorily absorb the vibration, which consequently was transmitted to the casing. By the use of spiral springs, arranged substantially as shown, I have overcome these difficulties and have made it possible to use a

spring weak enough to absorb the vibration without allowing the motor-fan unit to be unduly displaced.

In the embodiment shown in Figs. 4 through 6, four spiral spring portions 29' are employed. As shown, there are only two springs 28' used, inasmuch as pairs of spiral portions 29' are connected to a common straight portion 30'. This straight portion is secured to the motor housing by means of rivets or the like 48. Obviously, four spiral springs could be used by merely having the straight portions non-continuous. I have found that better silencing results are obtained if the straight portions 30' are arranged to extend in a vertical direction than if they are arranged horizontally.

The other structural details of the cleaner shown in Figs. 4 through 6 are substantially the same as above described in connection with Figs. 1 through 3, wherefore it is not necessary to repeat the description. Like reference characters on the various figures designate like parts.

In the embodiment illustrated in Figs. 7 and 8, springs 28', which are similar to the springs shown in Figs. 4 through 6, are employed, but these springs are arranged in pairs axially spaced from each other. The spiral portions 29' of the springs of each pair are supported by bolts 49 extending through the lugs 25 formed on ring 24. A sleeve 50 may be cast in each lug, or secured therein by means of a set screw 51. Bolts 49 extend through the sleeve 50. The innermost turn of each spiral portion 29' is secured between the head of bolt 49 and one end of sleeve 50 or between the other end of sleeve 50 and a nut 52 threaded on to the bolt. Due to the fact that twice as many springs are employed in this modification as in that shown in Figs. 4 through 6, each spring may be of less width. The springs are preferably arranged equidistant on either side of a plane perpendicular to the axis of rotation of the motor and passing through the center of gravity of the motor-fan unit as a whole.

In the embodiment shown in Figs. 9 and 10, the motor housing is provided with lugs 53 having cylindrical recesses 54 therein. Each recess is formed with a pair of shoulders 55 and 56. Lugs 25 on ring 24 carry sleeves 57 through which extend bolts or pins 58. These bolts extend into the recesses 54. Secured around each end of each bolt is a spiral spring 59. The ends of the bolts may have a non-circular cross-section, for instance square, as shown in Fig. 10. The innermost turns of springs 59 engage the non-circular part of bolt 58 and are shaped to conform therewith, whereby relative turning between the springs and the bolts or pins is prevented. The outermost turns contact the cylindrical surfaces of recesses 58 between shoulders 55 and 56. These springs thus provide a resilient connection between bolts 58 and the housing of the motor, which serves to resiliently support the motor in the casing.

In the embodiment illustrated in Fig. 11, the motor is supported by three springs 60 which are similar to springs 59 shown in Figs. 9 and 10. Two of these springs are arranged in lugs 61 on opposite sides of the circumference of the motor housing. Preferably, these lugs are so located that they are vertically aligned with each other. The third spring is located within a cylindrical recess 62 formed in an intermediate wall 63. Motor 33 is provided at one end with a pin 64 which extends within the innermost turn of the spiral spring 60 within recess 62. In this em-

bodiment the innermost turns of the springs are not tightly secured to their supporting bolts or pins, but may turn with respect thereto. A sleeve 65 of felt or other soft material is preferably placed between the pins and the springs in order to eliminate the possibility of a grating noise when the parts have relative movement. There is thus provided a three-point suspension for the motor with one of the points at the center near one end, and the other two points at the circumference near the other end.

In any of the modifications illustrated, instead of having the innermost turns of the spiral springs securely fixed to the supporting member extending therethrough, they may be arranged loosely thereon with soft material therebetween, as described in connection with Fig. 11, so that the springs may turn with respect to the supporting members. Likewise, in any of the embodiments, instead of clamping the innermost turn, for instance, between the sleeve 50 and the nut 52, as shown in Fig. 8, the supporting bolt may be formed with a square, elliptical or other non-circular cross-section, and the innermost turn of the spiral may be formed with a similar shape, as illustrated in Fig. 10, so that relative turning of the two members is prevented.

In all the embodiments, the spiral springs are shown as lying in planes perpendicular to the axis of rotation of the motor. In other words, the axes of the springs are parallel to the axis of rotation of the motor. Furthermore, each spring lies in a single plane, that is, the center line of a spring lies in a single plane. This is not absolutely necessary, particularly if the motor is to be supported in a vertically extending casing, in which case it may be desirable to have the turns of the spiral in overlapping relationship.

While I have shown and described several modifications of my invention, it is to be understood that this has been done for purposes of illustration only, and that my invention is not to be limited thereby. Its scope is to be determined by the appended claims, viewed in the light of the prior art.

What I claim is:

1. In a vacuum cleaner, a casing, a motor in said casing, means for supporting said motor in said casing comprising springs disposed about said motor between the motor and casing, each spring having a portion secured to the motor and another portion secured to the casing and being formed of a substantially flat strip wound upon itself with the axis of the coil substantially parallel to the axis of the motor whereby axial thrust is resisted and torque vibrations dampened.

2. In a vacuum cleaner, a casing, a motor in said casing, means for supporting said motor in said casing comprising springs disposed about said motor between the motor and casing, each spring having a portion secured to the motor and another portion secured to the casing and being formed of a substantially flat strip wound upon itself to form a coil and a straight extension therefrom between the places where the spring is secured to the motor and the casing with the axis of the coil substantially parallel to the axis of the motor, whereby axial thrust is resisted and torque vibrations are dampened.

3. In a vacuum cleaner a casing having lugs on the interior thereof, a motor-fan unit in said casing having a shaft, said fan upon rotation developing vibration due to torque action and thrust in an axial direction, and means for resiliently supporting said motor-fan unit within said casing comprising springs, each having a straight and a roll-up portion, said straight portion being fixed to said motor-fan unit and the end of said roll-up portion being secured to one of said lugs, said springs being disposed with the straight portions transversely of the motor-fan unit, and each spring being formed of a strip of resilient material the width of which is substantially greater than its thickness, the construction being such that axial thrust is resisted and torque vibrations dampened.

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