Oct. 20, 1953 R. E. SHEAHAN 2,656,097

MOTOR MOUNT AND SEAL FOR SUCTION CLEANERS

Filed Feb. 13, 1952

Fig. 1.

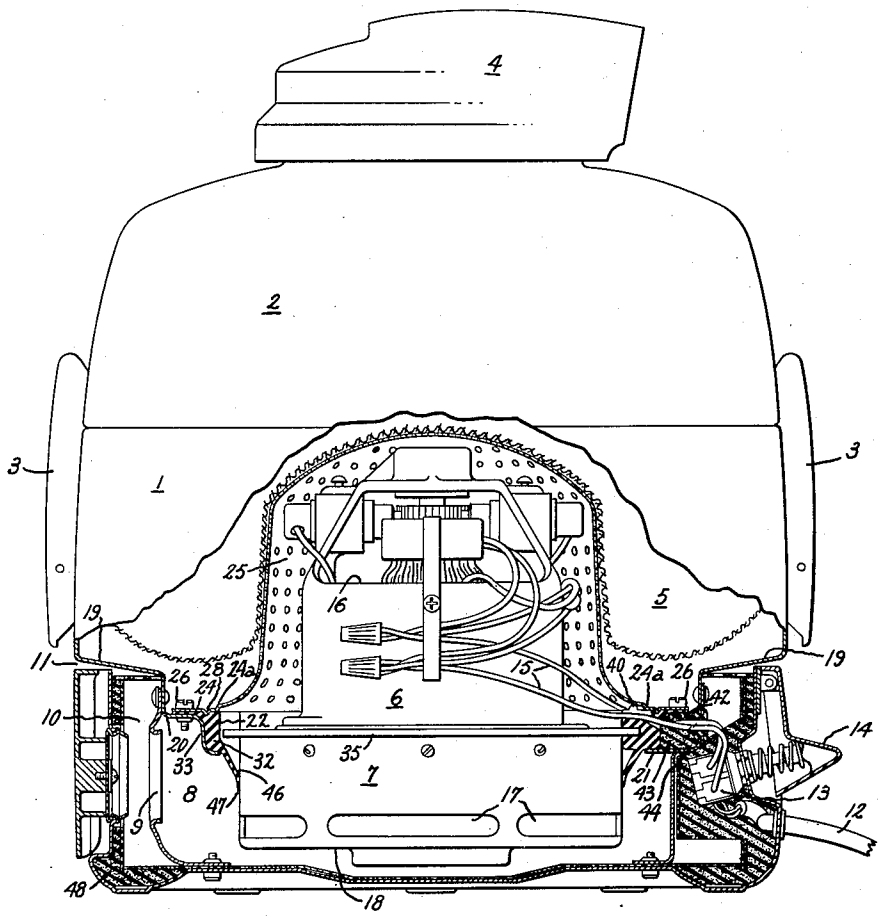


Fig. 2.

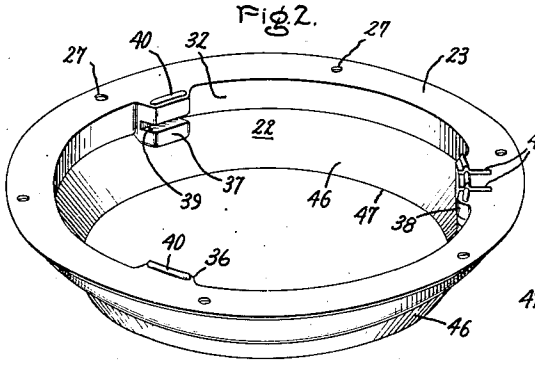


Fig. 3.

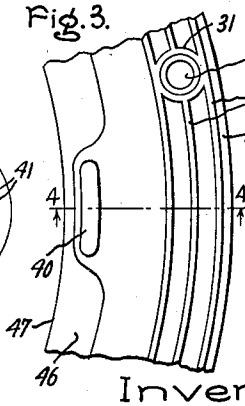
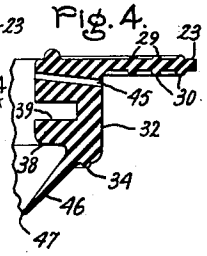


Fig. 4.



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Patented Oct. 20, 1953

2,656,097

UNITED STATES PATENT OFFICE

2,656,097

MOTOR MOUNT AND SEAL FOR SUCTION CLEANERS

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Application February 13, 1952, Serial No. 271,380

5 Claims. (Cl. 230—117)

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My invention relates to an arrangement for supporting or mounting a motor in a suction cleaner. More particularly, my arrangement includes a motor mounting element which also serves as an air seal between the high and low pressure sides of the cleaner. Although it will be shown and described in connection with a suction cleaner of the vertical tank or canister type, obviously the invention could be used in connection with cleaners of other types.

The motor and fan unit for a suction cleaner is usually mounted within a casing or housing. One object of my invention is to reduce vibration transmitted to the outer casing of the suction cleaner from the motor and fan unit of the cleaner. This produces a more quiet operating cleaner.

Another object of my invention is to produce a proper seal between the high pressure or outlet side of the cleaner and the low pressure or inlet side of the cleaner. Such a seal is necessary to obtain the maximum suction and operating efficiency from the motor and fan unit and to avoid any air recirculation and consequent reheating which lowers efficiency of the unit. A further object of my invention is to provide proper air sealing around electrical wires leading to the motor unit of the cleaner from the switch or outside power source. Other objects are to increase the ease of manufacture and assembly of suction cleaners, particularly the motor mounting and sealing.

These objects are met according to my invention by providing a motor mounting gasket of special design, preferably held in place by a ring which may be part of a motor guard member, with an annular web on the gasket sealing around the motor fan unit in a manner which will be described.

Other objects and further details of that which I believe to be novel and my invention will be clear from the following description and claims taken with the accompanying drawing, in which is illustrated a suction cleaner with two examples of gaskets embodying the present invention.

In the drawing, Fig. 1 is a side elevational view, partly in section, showing a suction cleaner with a motor mounting and sealing arrangement according to my invention; Fig. 2 is a perspective view of the motor mounting and sealing gasket shown removed from the cleaner; Fig. 3 is an enlarged plan view of a segment of a modified form of gasket; and Fig. 4 is a sectional view taken on the line and in the direction of the arrows 4—4 of Fig. 3.

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A cleaner of the character which may use my invention includes a main body portion 1 which may be of sheet metal having a removable cover 2 detachably held in place on the body as by cover clamps 3. At an appropriate location on the cleaner body, shown here on the cover, a suction inlet fitting 4 is provided for connection to the customary suction hose and attachments which are not shown.

Within the cleaner body is mounted a bag or filter 5 of appropriate character, through which air from the inlet fitting is drawn. For producing a flow of air through the cleaner and through the filter, a suction unit having a motor section 6 and a fan section 7 is provided. This unit is mounted in the cleaner body in a manner which will be described in detail at a later point. Air from the suction unit is discharged into a central chamber 8, then through an opening 9 into an outer chamber 10, and from there the air is discharged through an exhaust opening or slot 11, preferably surrounding the entire cleaner body.

Power is supplied to the suction unit within the cleaner from a suitable power source (not shown) through a usual cord set 12, one end of which is shown where it passes through one wall of the cleaner body. The wiring is connected through a switch 13 which may be actuated by a spring-pressed treadle 14. Motor lead wires 15 extend from the switch to suitable terminals on the motor so that actuation of the switch will connect or disconnect the motor from the power source in a fashion which should be obvious.

In operation of the cleaner, when the motor 6 is started, it drives the fan 7 so that air will flow into the inlet fitting 4, pass through the filter 5, into the motor 6 through openings 16 in the motor frame, through the motor 6, through the fan 7, and out of the fan discharge openings 17 shown here at the end of the fan housing sides. If desired, the fan discharge openings may be provided in the bottom or end wall 18 of the fan housing instead of or in addition to the location shown. Air flow from the chamber 8 to the exhaust slot 11 is described above.

For the purposes of the present invention, the structures described above may be regarded as conventional or known. The present invention is concerned with improvements in the mounting of the motor and fan unit and in the sealing of this unit between the high pressure and low pressure sides of the cleaner. For this purpose, the cleaner body is provided with a transverse

partition or inwardly extending annular wall portion 19 shown here as having two inwardly stepped portions 20 and 21 which receive a motor mounting and sealing gasket 22.

The form of this gasket and its dimensions relative to other parts of the cleaner is extremely important. It will be noted that at the top the gasket has a relatively thin, outwardly extending flange portion 23 with a lower face seated against the step 20 of the annular wall 19. This flange 23 provides the first seal between the suction or low pressure side of the cleaner and the discharge or high pressure side of the cleaner, and it is held and compressed against the step 20 by means of a metal sealing ring 24. This compression and sealing ring 24 may be and preferably is part of the lower end of a perforated motor guard and bag support 25, which surrounds the motor section of the suction unit and supports the filter bag 5. This motor guard and bag support with its ring 24 may be removably secured to the annular step 20 by a plurality of machine screws 26 which pass through appropriate clearance holes in the ring portion 24 and are threadedly received in corresponding tapped openings in the step 20. Of course, these screws must pass through matching openings 27 in the gasket flange and I have shown six such openings in Fig. 2, which illustrates one form of the gasket by itself. When the screws 26 are tightened, the gasket flange 23 is compressed between the ring 24 and the step 20 so that an effective air seal is provided entirely around the gasket. To improve this seal, I may provide the ring portion 24 with an annular depressed rib 28 and, in addition thereto or instead of this rib, I may provide the gasket flange with a series of annular ribs 29 on the top surface of the flange 23, and similar ribs 30 on the bottom face of the flange. These are illustrated in Figs. 3 and 4. Additionally, each one of the screw holes 27 in the gasket may be provided with a surrounding rib 31 as shown in Fig. 3. Because the entire gasket is made of rubber, neoprene, or similar resilient compressible material, the ribs 29, 30 and 31 will form effective sealing lines when the screws 26 are tightened and the ring 24 is pulled toward the step 20.

Extending downwardly from the inner edge of the flange 23 on the gasket is a main body portion 32 which is in the shape of a shallow, hollow cylinder. The outside of this main body portion of the gasket fits snugly against the inside of the riser portion 33 which extends between the step 20 and the step 21. At its bottom end, the body of the gasket is seated against the step 21, where an additional small annular sealing rib 34 (see Fig. 4) may be provided if desired.

The inner circumference of the main cylindrical body portion of the gasket surrounds, but is spaced slightly away from, a motor mounting flange 35, on the motor frame or suction unit. The motor mounting flange 35 is an imperforate rigid flat circular projection which, to all intents and purposes, is an integral part of the suction unit located between the low pressure and high pressure sides of the suction unit. This flange is carried and supported within the motor mounting gasket by means of three equally spaced and inwardly projecting lugs 36, 37 and 38 which are integral with the body 32 of the resilient gasket. Each of these inwardly extending lugs is provided with a slot 39 of such a depth that when the motor mounting flange 35 is engaged in all of the slots 39, the outer edges of the flange are spaced slightly inwardly away from the inner wall of the portion 32 of the gasket. Thus, the motor and fan unit is radially supported at only three places, which occupy but a small amount of the total inside circumference of the gasket main body portion 32. Transmission of radial vibration of the suction unit to the body of the cleaner is therefore minimized. Note also that the outer diameter of the motor flange 35 is not quite as great as the diameter of the opening formed by the inner edge of the annular step portion 21 which supports the gasket. Therefore, the motor flange, even at the three spaced places where it is supported, is being supported in shear rather than by compression of the gasket lug at that point. This arrangement supports the suction unit firmly, although resiliently, and because of the few points of suspension and the shear support, transmission of vibration from the suction unit to the cleaner casing is considerably reduced.

Equal provision is made for supporting the suction unit in shear against movement in an upward direction. Downward force against the unit is the result of gravitational force or weight of the unit when the cleaner is at rest. Upward force is the result of the atmospheric pressure difference between the low and high pressure sides of the cleaner when the suction unit is operating, acting on an area equal to the horizontal cross-sectional area of the unit at the motor mounting flange 35. Considering the normal operating "vacuum" in the low pressure side of the cleaner and the large cross-sectional area of the suction unit at the place of sealing, it will be seen that the resultant lifting force caused by the differential air pressure may be as much as and probably more than the gravitational pull on the unit, and the unit will tend to rise in its mounting. To prevent this from happening, I provide an annular step 24a on the ring portion 24 of the motor guard 25. In effect, this step 24a is the innermost diameter of the ring portion 24, is the same as the diameter of the inner edge of the supporting step 21, and is therefore larger than the diameter of the motor flange. A resilient support in shear is thereby obtained at the lugs against upward movement of the suction unit as well as against downward movement.

In order to reduce any tendency for shifting of the gasket vertically, I have provided ribs 40 on top of each of the lugs near their inner edges. These abut against but are not compressed by the underside of the motor shield 25 when the screws 26 are tightened to compress the flange 23. The ribs 40 thus limit any excess upward movement of the suction unit due to lifting force caused by high pressure differential between the high pressure and low pressure sides of the cleaner.

The inwardly extending lug 38 on the motor gasket may be provided with means for sealing the motor lead wires 15 where they pass from the switch 13 to the motor 6. For this purpose, Figs. 1 and 2 show a form in which slots 41 are provided in the top of lug 38 and through the body portion of the gasket opposite this lug. In this form, a portion of the step 20 is eliminated opposite this lug and blocks of sponge rubber 42 and 43, above and below the lead wires respectively, are seated in a partial extension 44 of the step 21. These sponge rubber blocks 42 and 43 are held in compression on either side of the lead wires 15 by the ring portion 24 of the motor shield

25. In the form shown in Figs. 3 and 4, the extension 44 of the step 21 is not required and use of the sponge rubber blocks is eliminated by the provision of holes 45 which extend through the body of the gasket and through the lug 38 from outside to inside, the holes 45 being made of such a size that the wires 15 will fit tightly therein when threaded through, without compression of the gasket from outside. Obviously, the riser portion 33 between the steps 20 and 21 is provided with suitable clearance holes for the lead wires 15 in either form shown.

In order to make a final and positive air seal between the high and low pressure sides of the cleaner, the gasket 22 is provided with a downwardly and inwardly extending tapered web 46 shown here as of inverted truncated conical shape. This is preferably made of thin cross section in order to reduce the tendency of transmitting vibration and in order to be sure that it seats completely and evenly around the suction unit even though the circumference of the suction unit should vary in manufacture. The inner opening 47 formed by the bottom edge of this web is of a diameter smaller than the smallest expected outer diameter of the fan portion 7 of the suction unit. Therefore, when the suction unit is mounted in the slots in the lugs of the gasket, the edge 47 of the web will resiliently press closely around the entire circumference of the fan housing 7 above the location of the outlets 17. Because the high pressure side of the cleaner is located below and outside this web 46, during operation of the cleaner the difference in pressure between the two sides of this gasket web will tend to push the web even more closely against the suction unit to seal the two sides of the cleaner from each other.

Although the motor mounting described above will considerably reduce the transmission of vibration from the suction unit to the outer cleaner casing, further noise suppression and sound deadening structure may be used, such as the sound deadening or absorbing materials 48 shown, arranged in the discharge passages of the cleaner.

In assembling the parts of the cleaner, the motor mounting flange 35 on the suction unit is first snapped into place within the lugs 36, 37 and 38 of the gasket 22, and the gasket is then seated on the stepped portions 20 and 21 with the holes 27 in proper position and with the motor leads 15 passing through the gasket and out through the hole in the riser portion 33 between steps 20 and 21. The motor shield and bag support 25 is then properly placed with the ring portion 24 over the flange 23 of the gasket, and the screws 26 are drawn down tightly and evenly. This completes the motor mounting and seal.

As will be evident from the foregoing description, certain aspects of my invention are not limited to the particular details of construction of the examples illustrated, and I contemplate that various and other modifications and applications of the invention will occur to those skilled in the art. It is therefore my intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a suction cleaner, a casing, a suction unit therein, air inlet and outlet ends on the unit, a mount and seal for said unit comprising an annular wall extending inwardly from said casing, a stepped seat in said wall, a resilient annular gasket fitted in said seat, means sealing said gasket against said seat, spaced lugs on said gasket extending inwardly toward the open center thereof, a mounting flange on said suction unit intermediate its ends, means supporting said mounting flange in said gasket lugs, and a web on said gasket surrounding said suction unit and extending inwardly toward and sealing against said unit between its inlet and outlet ends.

2. In a suction cleaner, a casing, a suction unit therein, air inlet and outlet ends on the unit, a mount and seal for said unit comprising an annular wall extending inwardly from said casing, a stepper seat in said wall, a resilient annular gasket fitted in said seat, a sealing flange on the inlet side of said gasket extending outwardly over said seat, means sealing said gasket flange against said seat, a plurality of equally spaced lugs on said gasket extending inwardly toward the open center thereof, a mounting flange surrounding said suction unit intermediate its ends, means supporting said mounting flange in said gasket lugs, and a web on the outlet side of said gasket surrounding said suction unit and extending inwardly toward and sealing against said unit between its inlet and outlet ends.

3. In a suction cleaner, an outer casing, a suction unit therein including a motor, a fan driven by the motor, an air inlet near one end of the unit, an air outlet near the opposite end of the unit, means mounting said unit and providing a seal between said inlet and outlet within said casing comprising an inwardly extending annular wall on said casing, a step on said wall, a resilient gasket with a hollow cylindrical body portion seated in said step, a sealing flange on one end of said gasket extending outwardly over said step, means compressing said gasket flange against said step, spaced lugs on said gasket extending inwardly from said body portion toward the open center thereof, each lug having a slot therein, a circumferential mounting flange on said suction unit seated in said lug slots, and a tapered web on the opposite end of said gasket extending inwardly toward and sealing against the circumference of said suction unit between its inlet and outlet.

4. In a suction cleaner, an outer casing, a suction unit therein including a motor, a fan driven by the motor, an air inlet near one end of the unit, an air outlet near the opposite end of the unit, means mounting said unit and providing a seal between said inlet and outlet within said casing comprising an inwardly extending annular wall on said casing, a step on said wall, a resilient annular gasket with a main body portion seated in said step, a thin sealing flange integral with that side of said gasket nearest said inlet, said flange extending outwardly over said step, a compression ring securing said gasket flange to said step, three equally spaced lugs integral with said gasket extending inwardly from said body portion toward the open center thereof, each lug having a slot therein, a circumferential mounting flange on said suction unit seated in said lug slots and spaced from the main body portion of said gasket, and a web integral with that side of said gasket nearest said outlet, said web being in the form of a truncated cone tapering inwardly toward the outlet end of said unit and sealing against the circumference of said suction unit between its inlet and outlet ends.

5. In a suction cleaner, an outer casing, a suction unit therein including a motor, a fan driven

by the motor, an air inlet near one end of the unit, an air outlet near the opposite end of the unit, motor lead wires to said motor extending through said casing and connected to said motor, means mounting said unit and providing a seal between said inlet and outlet within said casing comprising a transverse partition wall in said casing having a central opening therein, an annular step surrounding said central opening, a resilient annular gasket with a hollow cylindrical body portion seated in said step, a sealing flange integral with that side of said gasket nearest said inlet, said flange extending outwardly over said step, a motor shield having a compression ring at its edge securing said gasket flange to said step, equally spaced lugs on said gasket extending inwardly from said body portion toward the open center thereof, each lug having a slot therein, a circumferential mounting flange

on said suction unit seated in said lug slots, a passageway for said motor lead wires extending through one of said gasket lugs and through said gasket body portion, said wires being located within said passageway, and a web on that side of said gasket nearest said outlet, said web extending inwardly toward and sealing against the circumference of said suction unit between its inlet and outlet ends.

ROBERT E. SHEAHAN.

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