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SUCTION CLEANER DOME MOUNTING CONSTRUCTION

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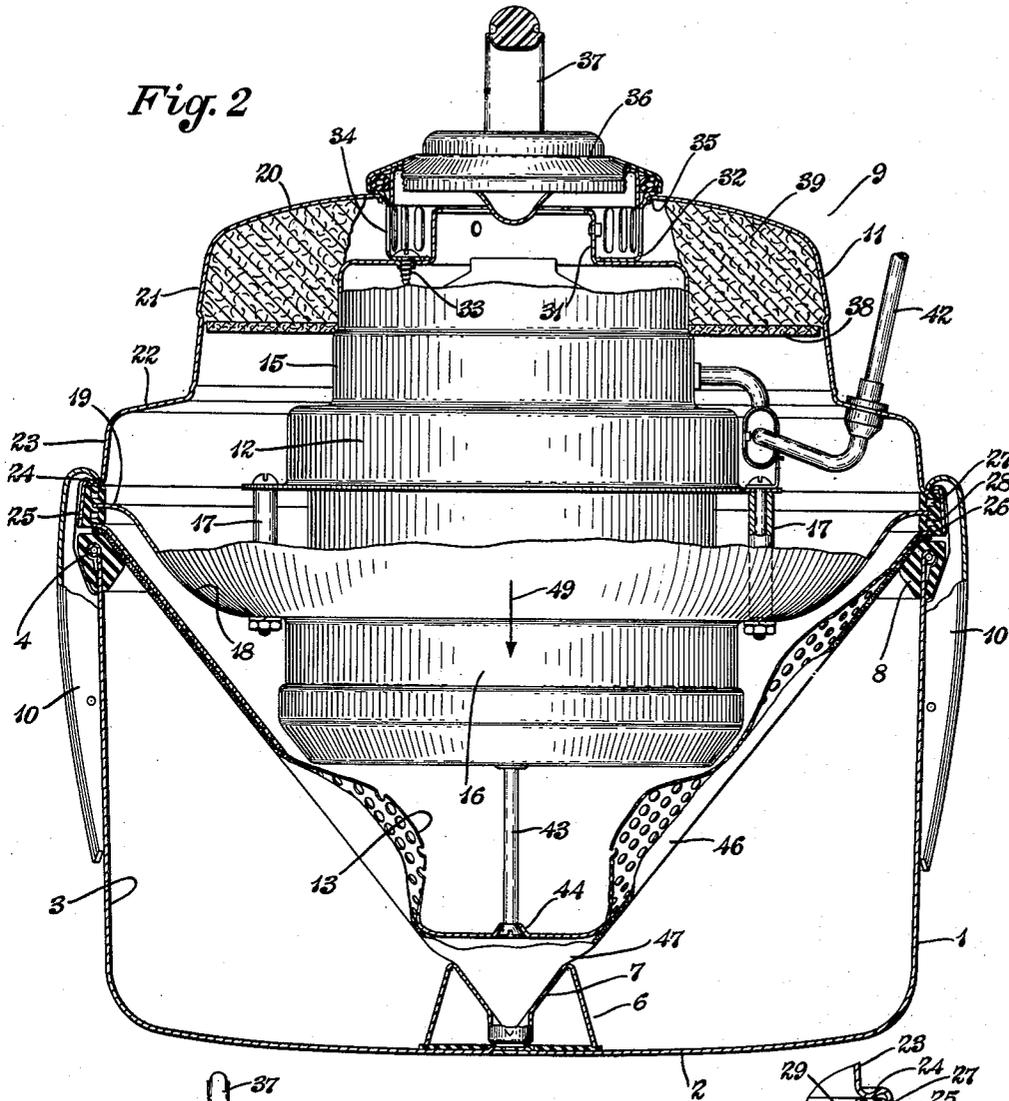


Fig. 2

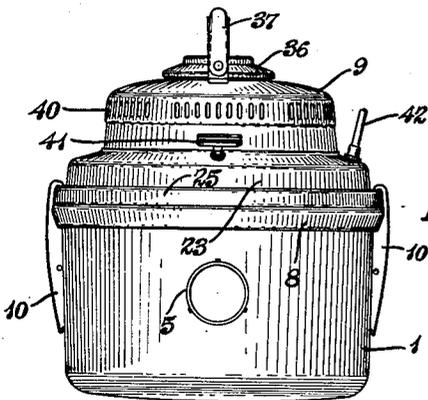


Fig. 1

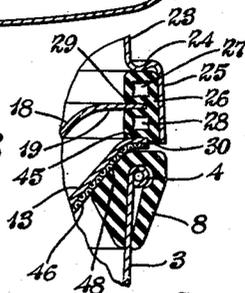


Fig. 3

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SUCTION CLEANER DOME MOUNTING CONSTRUCTION

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3 Claims. (Cl. 183—37)

1

The invention relates to suction cleaners, and more particularly to a mounting construction for mounting a dome, motor-fan unit, and filter supporting cone of a preferably vertical tank type suction cleaner so as to provide an adequate and effective seal at all times between the suction and exhaust sides of the fan, and the interior and exterior of the dome.

In the prior art construction of a vertical tank type suction cleaner the dome or cover element for the cleaner tank has been assembled mechanically with a filter supporting cone, and the motor-fan unit has been supported in some manner from the dome-cone assembly. It has been difficult in such constructions to readily position and seal the connection between the dome and the cone, and to effectively support the motor-fan unit within the assembly. Such prior constructions have involved the use of rubber gaskets, a sealing compound, and the maintenance of very close tolerances in the size and assembly of the sheet metal dome and cone parts, in spite of which air leakage which reduces the efficiency of the cleaner has been prevalent.

Accordingly, it is an object of the present invention to provide a new dome, motor-fan unit, and filter cone assembly for a vertical tank type suction cleaner which provides a positive and effective seal between the parts and between the interior and exterior of the assembled parts at all times when the cleaner is at rest or in operation.

Furthermore, it is an object of the present invention to provide a new dome mounting construction for a vertical tank type suction cleaner in which the necessity for the maintenance of close tolerances in the size and assembly of sheet metal parts is eliminated.

Moreover, it is an object of the present invention to provide a new dome mounting construction for a vertical tank type suction cleaner in which it is unnecessary to use shellac or other joint sealing compound material in the assembly of the parts in order to provide an adequate and effective seal.

Furthermore, it is an object of the present invention to provide a new dome mounting construction for a vertical tank type suction cleaner which assists in maintaining isolation of noise and vibration incident to the operation of the motor and fan.

Finally, it is an object of the present invention to satisfy the need and solve existing problems in the construction and mounting of the dome and parts assembled thereto of a vertical tank type suction cleaner, to eliminate prior art diffi-

2

culties in this field, generally to improve and simplify tank type suction cleaner construction, and to obtain the foregoing advantages and desiderata in a simple, inexpensive, and effective manner.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved, and the described difficulties overcome, by the improvements, elements, combinations, sub-combinations, arrangements, and constructions which comprise the present invention, the nature of which is set forth in the following general statement, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and shown in the drawing, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the discoveries and improvements in dome mounting construction for vertical tank type suction cleaners may be stated in general terms as preferably including in a suction cleaner, a pan-like cleaner tank member, a dome or cover member for the tank member, a motor-fan unit for the cleaner, a filter supporting cone, a hollow annular rubber mounting ring carried by the dome member, means on the motor-fan unit engaging said rubber mounting ring, means securing the motor-fan unit and dome member together thereby compressing a portion of said rubber mounting ring to provide a seal at the joint therebetween, said cone having a portion engaging said rubber mounting ring, means securing said cone and motor-fan unit together thereby compressing another portion of said rubber mounting ring to provide a seal at the joint therebetween, and means for releasably clamping said dome to the cleaner tank member with the cone and motor-fan unit assembled thereto.

By way of example, the improved suction cleaner dome mounting construction of the present invention, is shown in the accompanying drawing, forming part hereof, wherein:

Figure 1 is a side elevation of a suction cleaner embodying the improved construction;

Fig. 2 is an enlarged vertical section through the vertical tank type suction cleaner of Fig. 1 illustrating some of the parts in full lines; and

Fig. 3 is an enlarged fragmentary sectional view of a portion of Fig. 2.

Similar numerals refer to similar parts

3

throughout the various figures of the drawing.

The suction cleaner apparatus shown in the drawing is a vertical tank type suction cleaner and as illustrated includes a pan-like dust collector, receptacle, base or tank member generally indicated at 1, formed by a bottom wall 2 and an annular side wall 3 which terminates in an upper preferably beaded edge 4 so that the tank member 1 is upwardly open. The receptacle or tank member 1 is preferably provided with an inlet opening connector 5 with which the usual flexible hose of a suction cleaner may be detachably connected. The hose may be provided in the usual manner at its outer end with a suitable nozzle or other tool for cleaning any desired surface or article. The air blast induced by the cleaner is drawn through such tool and hose and through the connector 5 into the interior of the tank member 1.

A filter locating support member generally indicated at 6 is preferably centrally located within the tank member 1 at the bottom thereof, and the member 6 preferably includes a central conically formed portion 7. An annular preferably soft rubber ring 8 having a generally U-shaped cross-section, as shown, is engaged over and around the upper beaded edge 4 of the receptacle side wall 3 in the usual manner, and a dome unit, generally indicated at 9, is mounted on the tank member 1 and clamped against the rubber ring 8 by releasable clamps 10 in the usual manner.

In accordance with the present invention, the dome unit 9 generally includes a dome member 11, a motor-fan unit 12 and a foraminous conical filter support member 13. The motor-fan unit 12 includes a motor and fan, not shown, mounted within an upper housing member 15 and a lower housing member 16 secured together by bolts and spacer members 17, the housing member 16 being provided with an annular upwardly and outwardly flared portion 18 terminating in an outturned flange 19.

The dome member 11 is preferably annularly curved at its top portion 20 and then turns downward at 21 and outward at 22 and then again downward at 23. The downturned portion 23 of dome 11 terminates in a reversely curved shoulder 24 which terminates in a downturned flange 25.

A hollow rubber mounting ring 26 is seated against shoulder 24 within dome flange 25 and the annular ring 26 in accordance with the present invention is provided with an upper hollow chamber 27 and a lower hollow chamber 28 each closed from the exterior and extending completely annularly around the member 26. As best illustrated in Fig. 3, an annular groove or recess 29 extends annularly around the ring 26 on the inner surface thereof in which groove 29 the flange 19 of the lower motor housing member 16 is seated; and the lower annular surface of the ring 26 is recessed at 30 for a purpose to be later described.

The upper housing member 15 of the motor-fan unit 12 terminates in a connector member 31, and a cup-shaped member 32 surrounds connector member 31 and is secured by screws 33 to housing member 15. The side wall 34 of cup-shaped member 32 is perforated, as illustrated, and terminates at its upper end in an outturned flange 35 which engages over the dome wall 20 of the dome member 11 at the edge of the central opening therein. A removable closure 36 is provided for closing the upper open end of the cup-shaped member 32, and the dome unit 9 may be

4

provided with a supporting handle 37. When the cover member 36 is removed, the usual flexible suction cleaner hose may be attached to connector 31 for using the cleaner as a blower, the connector 31 comprising the exhaust outlet of the motor-fan unit 12.

A partition member 38 is provided within dome member 11 and surrounding upper housing member 15 for supporting within the upper end of the dome member an annular ring 39 of sound insulating and air pressure disbursing material which may be wool-like or other fibrous material through which air may pass. The portion 21 of dome member 11 is perforated as indicated at 40 at Fig. 1 for the passage of exhaust air from the cleaner in normal operation when the cover member 36 is in place. The dome unit 9 is provided with a suitable switch 41 controlling power to the motor-fan unit 12 from any suitable source, as through wires 42.

In assembling the dome unit 9, the rubber mounting ring 26 is assembled to motor-fan unit 12 with flange 19 in ring recess 29. Partition member 38 is slipped over top of top housing member 15 and sound filtering material 39 is placed thereon. Dome member 11 is then telescoped over these parts and ring 26 seats within the flange 25 of the dome member 11 against shoulder 24. The cup-shaped member 32 is then inserted in the central opening in the top wall 20 of dome member 11, and the cup-shaped member is secured by screws 33 to the upper housing member 15 of the motor-fan unit 12.

As the screws 33 are secured, the motor-fan unit 12 moves upward with respect to the dome member 11, so that the flange 19 of the lower housing member 16 compresses the upper annular portion of the rubber mounting ring 26 between flange 19 and shoulder 24, thus providing an airtight seal between the upper surface of flange 19 of member 16 and dome member 11, the space enclosed between the said members comprising the exhaust end of the motor-fan unit 12. Since the members 16 and 11 are formed of sheet metal and because of the curvature 18 of the member 16 and the curvature 20 of dome member 11 and because of the inherent slight flexibility or resilience of these sheet metal parts, these parts give somewhat as the screws 33 are tightened, thereby imparting a resilient clamping pressure between the flange 19 of the lower housing member 16 and the shoulder 24 of the dome member 11 which maintains the upper portion of the rubber mounting ring 26 tightly clamped and squeezed at all times. A slight clearance is provided between the lower end of the cup member 32 and the upper end of the upper housing member 15 before the screws 33 are secured so as to insure that this clamping pressure is established. Thus a predetermined amount of pressure or loading on the upper portion of the rubber mounting ring 26 is obtained.

The cone member 13 is then assembled to the dome member 11 and motor-fan unit 12 by placing the same over the lower end of the motor-fan unit and securing the cone member 13 to the motor-fan unit 12 by screw 43 which engages the cone 13 centrally at 44 and is screwed into the lower housing member 16 of the motor-fan unit 12. The outer or upper open end of the cone member 13 is provided with a flange 45 which is received in the annular recess 30 (Fig. 3) in the under surface of the mounting ring 26, thereby preventing any metal-to-metal contact between the cone 13 and dome member

5

11 and housing member 16 at the outer or open end of the cone. The recess 30, in addition, centers the cone as the connection between the members is effected by tightening the screw 43.

As the screw 43 is tightened, flange 45 on the cone member 13 compresses the lower annular portion of the rubber mounting ring 26 against the flange 19 of the lower housing member 16, thus providing an airtight seal between the lower surface of the flange 19 of member 16 and the flange 45 of cone 13. Since the space between the interior of cone member 13 and the lower exterior of housing member 16 communicates with the suction side of the motor-fan unit 12, any leakage at the joint between flanges 19 and 45 and rubber ring 26 would cut down the efficiency of the cleaner, if an airtight seal is not provided at such joint.

The provision of the single, central screw 43 for connecting the cone member 13 to the motor-fan unit 12 furthermore enables the flange 45 of the cone member 13 to clamp against the rubber mounting ring 26 with equalized pressure around its periphery so as to insure the attainment of the tightly sealed joint entirely around the periphery of the flange 45. Furthermore, the complete assembly of the parts of the dome unit 9 provides for compressing the rubber mounting ring 26 axially from both ends, thus tightly pinching the flange 19 on the motor-fan unit in the groove 29 so that, in effect, the motor-fan unit is supported in a floating manner between the dome 11 and cone 13.

The rubber mounting ring 26, prior to assembly, has air under atmospheric pressure trapped within chambers 27 and 28, so that this ring may be termed a "zero pressure" rubber mounting ring. The pressure exerted axially on the mounting ring 26 when the screws 33 and 43 are tightened for assembly of the parts of the dome unit 9, compresses the upper and lower portions of the mounting ring 26, thereby reducing the size of the "zero pressure" chambers 27 and 28 therein. This reduced size of the chambers results in compressing the air therein a desired predetermined amount, so that these portions of the ring thereafter exert an expanding pressure on the parts assembled therewith.

When the dome member 9 is assembled with the tank member 1, a conical paper dust-filtering member 46 is placed in the upper open end of the tank member 1 and centered by the filter locating member 6, as indicated at 47. The yielding clamp members 10 are then engaged over the shoulder 24 of the dome unit 9 to secure the dome unit 9 to the tank member 1, thus providing a sealed joint as indicated at 48 between the cone member 13 and rubber ring 8 in a band-like zone extending around the conical surface of the cone member 13. As shown at Fig. 3, when this sealed joint is made, there is still a slight clearance between the paper and cone flange 45 and the top surface of rubber ring 8. Thus, the upper rim of the tank member is sealed in airtight relation against the cone member 13 by rubber ring 8. Also cone member 13, motor-fan unit housing member 16, and dome member 11 are sealed in airtight relation by rubber mounting ring 26 so that there can be no air leakage or suction loss from the cleaner at any of the joints between the various parts described.

Accordingly, when the motor is operated to drive the fan in the motor-fan unit 12, a suction is established at the lower end of the motor-fan unit within cone member 13 which draws

6

air into the cleaner inlet opening 5 and through the paper filter member 46, and discharges the same out through the motor-fan unit exhaust outlet 31, through the perforated openings 34 of the cup member 32, through the fibrous material 39, and out to the atmosphere through openings 40 in the dome member 11.

When the motor is running and suction is produced by the fan in the motor-fan unit 12, a downward thrust reaction of unit 12 occurs, as indicated by the arrow 49 in Fig. 1. Such thrust may tend to move the motor-fan unit 12, or the entire dome unit 9, downward somewhat relative to the remaining parts, but such downward movement cannot break the air tightness of the joints previously described. If there is any relative downward movement of the flange 19, the internal pressure of the cavity 27 in rubber mounting ring 26 compensates for the same and maintains the airtightness of the joint. Downward movement of the dome unit 9, as a whole, only tends to increase the tightness of the seal at 48 between the cone and rubber ring 8. Furthermore, any tendency of downward movement of the motor-fan unit due to the thrust reaction indicated at 49, tends to increase the seal between flange 19 and cone member 13.

The releasable clamping members 10 likewise have a yielding construction, such as illustrated and described in the copending application of Martinet and Koren, Serial No. 85,975, so as to maintain the dome unit 9 and tank member 1 clamped tightly together while the motor is running despite any resulting thrust reaction 49 which may occur.

The rubber mounting ring 26 furthermore adequately isolates noise and vibration of the motor-fan unit 12 incident to motor operation, from the dome member 11 and other metal parts of the cleaner, so that such noise and vibration are not transmitted to these metal parts or amplified thereby. This noise and vibration isolation characteristic of the improved construction of the present invention results because of the so-called "floating" mounting of the motor-fan unit in the rubber ring 26 previously described, by which the flange 19 is held, in effect, between air cushions in the annular "zero pressure" chambers 27 and 28.

Because of the particular construction and arrangement of the parts utilized in assembling the various members of the dome unit 9 which have been described, it is unnecessary to maintain close tolerances in the manufacture and assembly of these parts; and furthermore, it is unnecessary to use shellac or other joint sealing means in the assembly of the rubber mounting ring 26 with the sheet metal parts of the dome unit 9.

Accordingly, the particular construction and arrangement of the rubber mounting ring 26 and related parts perform a number of functions. First, a tight dome seal is provided. Second, a tight cone seal is provided. Third, the motor-fan unit is tightly mounted with noise and vibration isolation. Fourth, the motor-fan unit is mounted in a floating manner. Fifth, close tolerances in production are eliminated. Sixth, the use of shellac or other joint sealing means is eliminated.

Accordingly, the present invention provides a new and improved construction for the assembly of the dome, cone, motor-fan unit, and tank of a vertical tank type suction cleaner and provides a construction which eliminates prior art

7

difficulties and overcomes long standing problems in the art.

In the foregoing description, certain terms have been used for brevity, clearness and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such terms are used for descriptive purposes herein and not for the purpose of limitation, and are intended to be broadly construed.

Moreover, the description of the improvements is by way of example and the scope of the present invention is not limited to the exact details illustrated, nor to the specific devices shown.

Having now described the features, discoveries, and principles of the invention, the construction and operation of a preferred embodiment thereof, and the advantageous, new, and useful results obtained thereby; the new and useful elements, combinations, sub-combinations, arrangements, and constructions, and mechanical equivalents obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. In a vertical tank type suction cleaner, a dome unit comprising a dome member having an annular shoulder adjacent its open end, a motor fan unit having an annular flange, a filter supporting cone, an annular rubber mounting ring carried by and within the dome member seated against said annular shoulder, said ring including walls forming spaced upper and lower annular cavities within the ring and an annular groove open radially inward of the ring between said upper and lower cavities, said flange being seated in said groove, means securing the motor-fan unit and dome member together thereby compressing said upper cavity between said flange and shoulder, the cone having an annular flange engaging the ring below the lower cavities portion thereof, and means axially securing said cone and motor-fan unit together thereby compressing said lower cavity between said flanges.

2. In a vertical tank type suction cleaner, a pan-like cleaner tank member, a dome member for the tank member having an annular shoulder adjacent its open end, a motor-fan unit within the tank and dome members, a filter supporting cone, a hollow annular resilient mounting ring carried by and seated within the dome member against said annular shoulder, flange means on the motor-fan unit engaging said mounting ring, means engageable between the motor-fan unit and dome member to move the motor-fan unit flange toward said shoulder and secure the motor-fan unit and dome member together thereby compressing a portion of said mounting ring between said flange means and shoulder and sealing the

8

joint therebetween, the cone having a flange portion engaging said mounting ring, means axially engageable between the cone and motor-fan unit to move the cone flange portion toward said motor-fan unit flange and secure said cone and motor-fan unit together thereby compressing another portion of said mounting ring between said cone flange portion and motor-fan unit flange and sealing the joint therebetween, and means releasably clamping said dome member to the tank member with the cone and motor-fan unit assembled thereto.

3. In a vertical tank type suction cleaner, a pan-like cleaner tank member, a dome unit for the tank member comprising a sheet metal dome member having a resilient top portion and an annular shoulder adjacent its open end, a motor-fan unit having a resilient annular sheet metal mounting flange, a filter supporting cone, a hollow annular rubber mounting ring carried by and seated within the dome member against said annular shoulder, said motor-fan unit flange engaging said mounting ring, means engageable between said dome and motor-fan units to move said flange toward said shoulder thereby compressing a portion of said mounting ring between said flange and shoulder and sealing the joint therebetween, the cone having a flange engaging said mounting ring, axially extending bolt means engageable between said cone and motor-fan units to secure the cone and motor-fan units together and to draw said cone flange toward said motor-fan unit flange thereby compressing another portion of said mounting ring between said flanges and sealing the joint therebetween, and means releasably clamping said dome unit to the tank member with the cone and motor-fan unit assembled thereto.

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