Aug. 8, 1939. D. M. DOW 2,168,899

VACUUM CLEANER

Filed April 13, 1936 2 Sheets-Sheet 1

Fig. 2

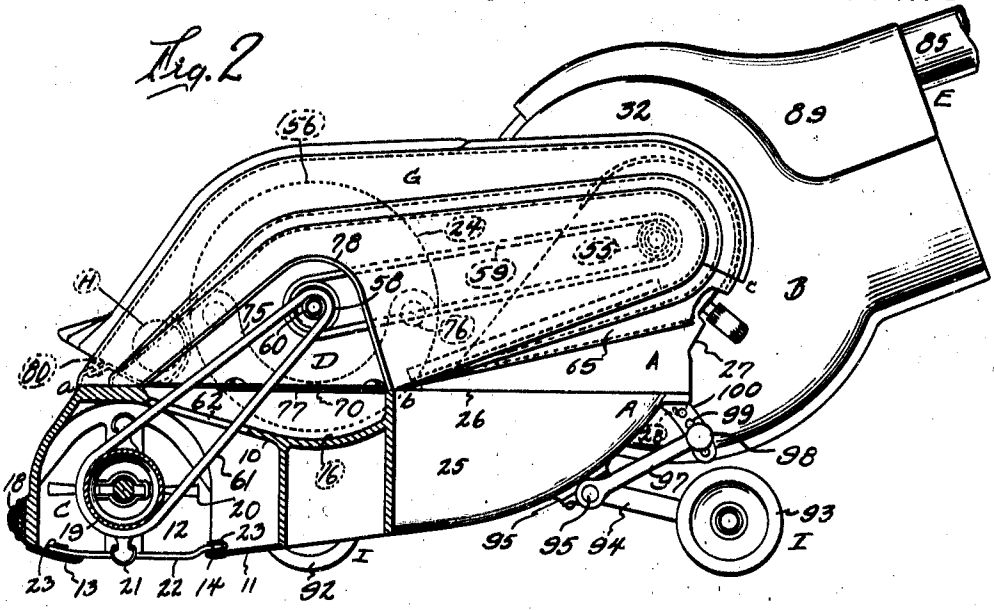
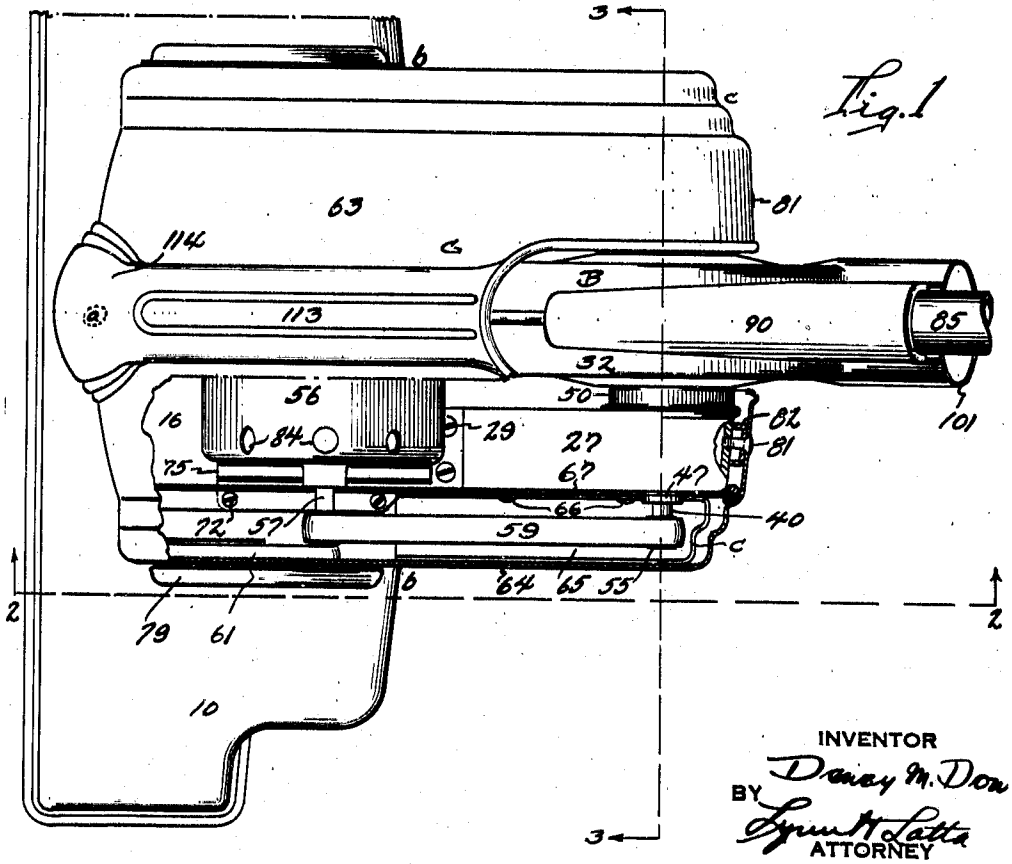


Fig. 1

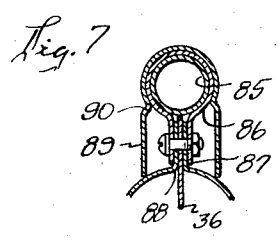


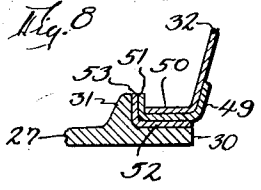
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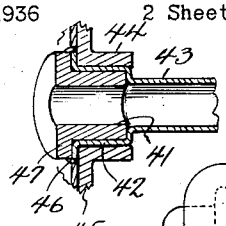
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VACUUM CLEANER

Filed April 13, 1936 2 Sheets-Sheet 2







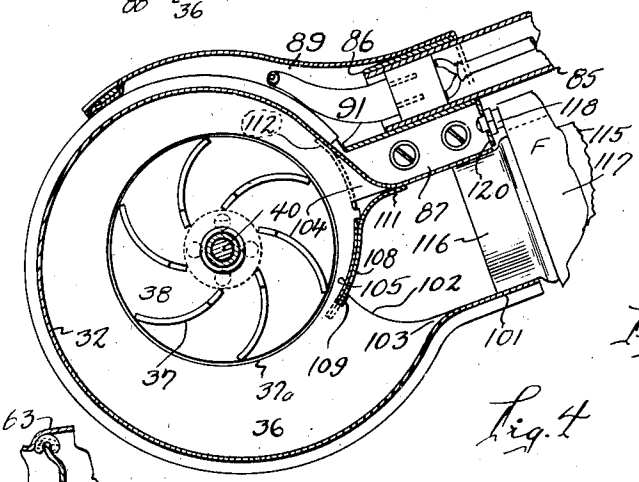


Fig. 4

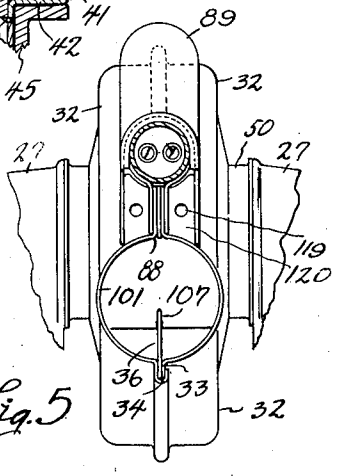


Fig. 5

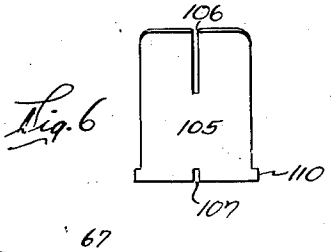


Fig. 6

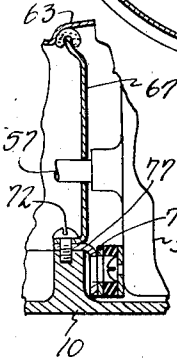


Fig. 10

Fig. 3



Fig. 11

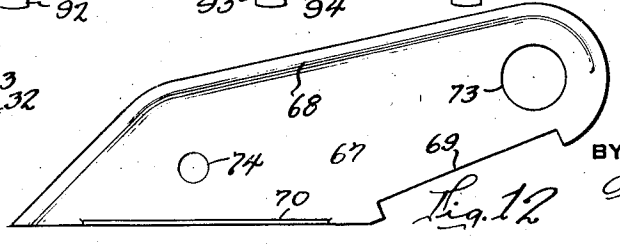


Fig. 12

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Patented Aug. 8, 1939 2,168,899

UNITED STATES PATENT OFFICE

2,168,899

VACUUM CLEANER

Dewey M. Dow, Toledo, Ohio, assignor to Air-Way Electric Appliance Corporation, Toledo, Ohio, a corporation of Delaware

Application April 13, 1936, Serial No. 74,012

15 Claims. (Cl. 15—6)

The invention relates to vacuum cleaners of the type wherein the fan casing is rigidly associated with the handle and has its inlet rotatably associated with the suction chamber, whereby the dust collecting apparatus may remain fixedly associated with the fan casing outlet at all times, irrespective of the position of the handle. The object of the present invention, generally is to provide a practical and successful construction and arrangement of the rotatable connection between fan housing and suction chamber, the fan driving mechanism and the housing means therefor.

Specifically, it is aimed to provide a solution for the problem of securing a dust tight rotatable connection between fan casing and suction chamber, which will remain in proper functioning condition over an extended period of time without attention; i. e., can not get out of order.

The invention further contemplates achievement of the foregoing objects in an arrangement wherein the parts can be readily and easily assembled and disassembled.

It is also aimed to achieve these objects in an arrangement wherein greatly increased suction is obtained by making the fan casing double with two inlets, and two rotatable connections which of necessity must be opposed to each other.

Where the double fan feature is employed, the fan shaft must necessarily pass through the suction passages of the suction chamber, and the invention provides an arrangement for mounting the shaft in bearings and sheathing it in the regions of passage of dust laden air so that threads, etc., will have no opportunity to wind around it. The bearings cooperate with the sheathing sleeves to secure them in the walls of the suction chamber through which the shaft must pass in order to have connection to the driving motor. The problems are more complex in such an organization than in the case of a single fan housing. At the same time, the sleeves serve as holders for the bearings, so that sleeve and bearing may be inserted or removed as a unit.

Another object is to provide a raisable cover for covering most of the mechanism on top of the suction chamber, which cover serves also as part of the means for housing the fan driving and agitator driving means.

Another object is to provide a practical arrangement of the foregoing features, in which the agitator driving belt is completely sealed against passage of air through it into the subatmospheric region at the opening where the belt passes from the belt housing into the suction chamber, so as to avoid loss of suction.

Another object is to provide a sheet metal double fan casing of unique and extremely simple construction wherein two fan chambers are produced. It is also aimed to provide, in such a casing, a scientifically correct air discharge cut-off.

Fig. 1 is a plan view of a cleaner embodying the invention, parts being broken away to better illustrate the construction.

Fig. 2 is a sectional view of the same taken on the line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view of the same taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view through the fan casing.

Fig. 5 is a rear elevation of the fan casing.

Fig. 6 is a detailed view of the fan casing cut-off.

Fig. 7 is a detailed sectional view showing the handle connection to the fan casing.

Fig. 8 is a detailed sectional view showing the rotatable connection between the fan casing and the suction chamber.

Fig. 9 is a detailed perspective sectional view of the fan shaft bearing assembly.

Fig. 10 is a detailed sectional view of the motor mounting and the drive housing partition, and

Fig. 11 is a detailed sectional view through the periphery of the fan casing.

Fig. 12 is a detail view of the belt compartment partition wall.

The invention deals with the type of vacuum cleaner construction illustrated in my pending application, Serial Number 66,882, filed March 3, 1936, and the present application constitutes a continuation in part of that application.

The cleaner comprises generally a suction chamber A, a suction unit B, a rotary agitator unit C mounted in the suction chamber A, an electric motor and power transmitting mechanism D for driving the fan and rotary agitator, a handle assembly E rigidly attached to the suction unit B, an air filtering and dust collecting unit F (Fig. 4), a removable cover unit G for covering the motor and superstructure of the suction chamber A, a headlight assembly H, and floor wheel mechanism I for supporting the cleaner for travel over the surface to be cleaned.

The suction chamber A comprises a body casting 10 and two elbows 27 detachably secured thereto. The forward region of the body member 10 comprises a roughly semi-cylindrical agitator chamber 12 opening downwardly. The bottom of the chamber 12 is open, forming the

inlet mouth which is defined between stainless steel lips 13 and 14, the latter secured to the forward edge of the suction chamber bottom plate 11, as described in the aforesaid prior application. The bumper 18, agitator spindle 19, with brush elements 20 and flexible beater elements 21 thereon, the guard 22 secured to buttons 23, the depression 16 in the top wall of the body casting 10, receiving the motor housing 24, the bifurcated tubular portions 25 of the body casting 10 opening upwardly and communicating with the lower ends of the elbows 27, and the horizontal plane 26 on which the upper extremities of the body portion 10 are finished, are all as described in the prior application.

Elbows 27 are secured to the body portion 10 by machine screws 28 (Fig. 3) and 29 (Fig. 1). The upper ends terminate in outlets 30 (Fig. 3 and Fig. 8) which are defined by radially extending peripheral shoulders 31. The suction mechanism B includes a fan casing comprising complementary drawn sheet metal members 32 joined on a central plane perpendicular to their common axis by means of out-turned flanges 33 and 34 respectively, the latter being bent up on the flange 33 as at 35. A dividing wall 36 is secured between the flanges 33 and 34, and divides the fan casing into complementary fan chambers. The dividing wall 36 has a circular opening 37*a*, coaxial with the axis of rotation of the fan, which opening is filled by the fan impeller 37. The impeller 37 is double, comprising two identical impellers each having a skirt 38, the two skirts being secured together upon a hub 39.

The hub 39 in turn is secured upon a fan shaft 40 which is mounted in bearing bushings 41 each of which in turn is mounted in the expanded region 42 of a sheath sleeve 43. The expanded region 42 of the sleeve is mounted in a boss 44 formed integrally with the outer wall 45 of the elbows 27.

The sleeve is positioned by a flange 46 outturned at the end of the expanded portion 42 and the bushing 41 has a corresponding flange 47 which positions the bushing in the sleeve.

The sleeve 43 extends through the outlet 30 coaxial therewith, and into the fan housing 32 and is telescoped within an axial flange 48 formed on the hub 39. The function of the sleeve 43 is to enclose the shaft 40 so that threads, lint, etc., carried by the dust laden air stream flowing around the shaft will not wind upon the shaft. Being mounted between the boss 44 and the bushing 41, the sleeve is rigidly secured in its proper position, the bushing serving to reenforce it from within so that objects carried by the air stream striking the sleeve will not tend to collapse the expanded portion 42 and loosen the sleeve in its mounting.

The fan casing 32 has oppositely projecting inlet necks 49 pressed into engagement with the axial flanges 50 forming the termination of the side walls of the fan casing. The necks 49 have out-turning flanges 51 pressed against the edges of the flanges 50 to provide secure retention of the necks and also to provide fitting engagement with the linings of the shoulders 31 of the elbows 27. The necks 49 rotate upon bearing bushings 52 which are pressed onto the outlets 30 and the lining flanges 53 against which the end flanges 51 of the collars 49 engage are formed integrally with the bushings 52.

The collars 49 are adapted to rotate against the bushings 52 thus allowing the fan casing to swing in unison with the movement of the handle of the cleaner. The fit between the collar 49 and the bushings 52 is made as snug as is consistent with free rotation of the fan casing under handle movement.

Should long extended usage of the cleaner cause the bushing 52 to wear, the elbows 27 may be detached from the body portion 10 of the suction chamber, the fan casing disassembled from the elbows and the bushings 52 may then be replaced by new bushings pressed onto the outlets 30. It may be noted at this point that by forming the suction chamber in several sections, the elbows being detachably mounted on the remainder of the suction chamber, the fan casing may be assembled or disassembled without difficulty.

The drive mechanism D comprises pulleys 55 on the ends of the fan shaft 40 projecting beyond the elbows 27, a motor 56 having a shaft 57, pulleys 58 on the respective ends of the shaft 57, belts 59 connecting the pulleys 55 to the pulleys 58, a smaller pulley 60 formed integrally with one of the pulleys 58, and a belt 61 connecting the pulley 60 to the spindle of the agitator 19. The belt 61 passes through an opening 62 in the top wall of the body 10.

The belts are covered by the side regions of the cover G. The latter includes the peripheral wall 63 and side walls 64, the lower edges of the latter being fitted against the top of the body 10 at its forward end, from the point *a* to the points *b*—*b* in Fig. 1, and thence projecting upwardly and rearwardly to meet the rear extremities of the peripheral wall 63 at *c*—*c*. The line *a*—*b*—*b* lies entirely in the plane 26.

The spaces between the points *b*—*b* and *c*—*c* are closed by plate 65, secured at 66 to the elbows 27 and extending into engagement with the inner faces of the walls 64.

Coacting with the side regions of the cover G and the plates 65 to form belt compartments, are partition walls 67 (Fig. 12) their upper edges shaped at 68 to fit the peripheral wall 63, their lower edges shaped at 69 to fit the plates 65, and at 70 to fit upon the ledges 71 (Fig. 2) defining the end extremities of the depression 16. 70 is a flange that is secured upon ledge 71 by screws 72. The shafts 40 and 57 project through openings 73 and 74 respectively in the partition wall 67.

The motor 56 is mounted upon crescent shaped rubber sandwich mounting 75 secured at 76 to the ends of the motor, each having an angle bracket 77 resting upon the ledge 71 and secured thereon by the screw 72.

One side wall 64 of the cover G has an opening defined by an outwardly projecting flange 78 (Fig. 2), which opening is closed by a removable cover plate 79 (Fig. 1). This allows access to the belt 61 without removing the motor cover G. The latter is secured in place by a screw 80 (Fig. 2) extended through the center of the lower forward extremity of wall 63 into the bracket of the headlight H, and by screws 81 (Fig. 1) extended through spacer brackets 82 into the elbows 27.

The belt housing opposite the removable cover plate 79 has in its plate 65 a series of openings 83 (Fig. 3) through which air enters the belt housing. The air thence passes through partition 67 and into the motor compartment, thence through suitable openings into the housing of the motor 56 at one end, thence through the housing to the other end, where it is blown out of the housing through openings 84 by means of a conventional motor ventilating fan (not shown). Thence the air escapes from beneath the cover

G through space between the cover and the fan housing 32.

The handle assembly E includes a handle shaft 85 mounted in a sleeve 86 having ears 87 secured to projecting web portions 88 of the fan housing 32. An apron 89 is snapped onto the sleeve 86 and retained by indented regions 90. The current conductor mechanism 91 is received within the apron 90 and extends into the handle shaft 85.

The fan case has an outlet 101 formed of half sections made integrally with the body 32 of the fan case. The partition wall 36 is cut away at 102 to allow the exhaust air streams to unite in the outlet 101, leaving extensions 103 and 104 projecting between the flanges 33 and 34 respectively of the lower side of the outlet 101, and between the ears 88, respectively.

The fan casing cut off comprises a rectangular sheet of metal 105, slotted at 106 to receive the extension 104, and slotted at 107 at its opposite end to receive a portion of the partition wall 36 at the inner terminus of the cut away line 102. A second sheet of metal 108 is welded to the sheet 105, and its lower end is likewise slotted. The wall 36 also is slotted at 109 and receives the regions of the members 105 and 108 just above the slot 107. Tongues 110 formed on the sides of the members 105 and 108 are extended through perforations in the fan case 32 and may be bent over. The upper end of the member 108 is bent rearwardly at 111 and welded to the upper wall of the discharge outlet 101 to form a brace. The upper ends of the member 105 are curved forwardly and welded to the peripheral wall of the fan case at 112.

The cover G is provided with a rubber bumper 113 the lower forward end of which forms a light reflector 114.

The dust collector mechanism F comprises an inner bag 115 of porous paper, having a neck attached to the coupler 116 which is secured in the outlet 101, and an outer bag 117 the upper edges of which are hung upon rods 118. The ends of the rods 118 are socketed in openings 119 in brackets 120 formed integrally with ears 87 and bent laterally from the rear ends thereof.

The wheel mounting mechanism I comprises front wheels 92 and rear wheels 93, the latter mounted in the end of a sheet metal bracket 94. The other end of the bracket 94 is mounted on a shaft 95 journalled in bearings 96 on the throat members 25. To one end of the shaft 95 is secured an adjusting lever 97. A spring operated bolt 98 is slidably mounted in the lever 97 and engages openings 99 in a bracket 100 secured to one of the throats 25 by the screws 28.

I claim as my invention:

1. In a vacuum cleaner, a suction chamber beginning with a carpet engaging mouth and terminating in a pair of spaced opposed axially aligned outlets, a fan casing having a pair of oppositely facing inlets associated with said outlets and enclosing a shaft for a fan, a pair of sleeves carried respectively by remote wall regions of the chamber and projecting toward each other through said outletts and inlets into the fan casing, their inner ends spaced apart, portions of the shaft being sheathed in said sleeves in the regions of passage of dust laden air streams, and a fan impeller mouted on said shaft between said spaced ends of the sleeves.

2. In a vacuum chamber, a suction chamber, a fan casing having a pair of oppositely facing inlets and enclosing a shaft for a fan, said inlets communicating with said chamber, a pair of sleeves carried respectively by remote wall regions of the chamber and projecting toward each other through said inlets into the fan casing, their inner ends spaced apart, portions of the shaft being sheathed in said sleeves in the regions of passage of dust laden air streams, a fan impeller mounted on said shaft between said spaced ends of the sleeves, at least one end of said shaft projecting through and beyond one of said wall regions, a motor mounted on the body of said cleaner ahead of the fan casing, the axes of said motor and said shaft being transverse to the direction of cleaner travel, horizontal, and parallel to each other, and driving means connecting said shaft and the shaft of the motor.

3. In a vacuum cleaner, a suction chamber, a fan casing having a pair of oppositely facing inlets and enclosing a shaft for a fan, said inlets communicating with said chamber, a pair of sleeves carried respectively by remote wall regions of the chamber and projecting toward each other through said inlets into the fan casing, their inner ends spaced apart, portions of the shaft being sheathed in said sleeves in the regions of passage of dust laden air streams, a fan impeller mounted on said shaft between said spaced ends of the sleeves, at least one end of said shaft projecting through and beyond one of said wall regions, a motor mounted on the body of said cleaner ahead of the fan casing, the axes of said motor and said shaft being transverse to the direction of cleaner travel, horizontal, and parallel to each other, driving means connecting said shaft and the shaft of the motor, a rotary agitator mounted in the suction chamber below said motor, its axis parallel to the axes of motor and fan, and driving means connecting the motor to said agitator.

4. In a vacuum cleaner, a suction chamber beginning with a carpet engaging mouth and terminating in an outlet, a fan casing having an inlet rotatably associated with said outlet, a sleeve carried by a wall region of said chamber and projecting through said outlet and inlet into the fan casing, a shaft projecting through said sleeve and sheathed thereby against the dust laden air stream, and an impeller mounted on the shaft adjacent the inner end of the said sleeve.

5. In a vacuum cleaner, a suction chamber beginning with a carpet engaging mouth and terminating in an outlet, a sleeve carried by a wall region of said chamber and projecting through said outlet, a bearing mounted in said sleeve, a fan casing having an inlet rotatably associated with said outlet, a fan impeller in said casing, disposed adjacent the inner end of said sleeve, and a shaft journalled in said bearing, sheathed in said sleeve in the region of passage of the dust laden air stream, and carrying said impeller.

6. In a vacuum cleaner, a suction chamber beginning with a carpet engaging mouth and terminating in an outlet,a fan casing having an inlet rotatably associated with said outlet, a sleeve carried by a wall region of the chamber and projecting through said outlet and inlet into the fan casing, a fan impeller in the fan casing, including a hub having its end region telescopically arranged with reference to the end of said sleeve, and a shaft sheathed in said sleeve in the region of passage of dust laden air stream, and carrying said hub.

7. In a vacuum cleaner, a suction chamber including a body portion and an elbow projecting

from the body portion and terminating in a lateral outlet, a sleeve carried by the outer wall of the elbow, coaxial with said outlet, a fan casing having an inlet rotatably associated with said outlet, a fan impeller in said casing, disposed adjacent the inner end of the sleeve, and a shaft sheathed in said sleeve in the region of passage of the dust laden air stream, and carrying said impeller.

8. In a vacuum cleaner, a suction chamber including a body portion and a suction elbow, said elbow terminating in a lateral outlet and having a boss in its outer wall, a sleeve having an enlarged outer end region mounted in the boss, said sleeve projecting through said outlet, a bearing bushing mounted in said enlarged region of the sleeve, a fan casing having an inlet neck rotatably mounted on said outlet, a fan impeller in said casing, disposed adjacent the inner end of said sleeve, and a shaft journalled in said bearing, projecting through said sleeve and carrying said impeller.

9. In a vacuum cleaner, a suction chamber, including a body portion and an elbow communicating with and projecting upwardly from said body portion and having a lateral outlet, a fan casing having an inlet associated with said outlet, an impeller in said casing, a shaft on which said impeller is mounted, projecting through said outlet and through the outer wall of said elbow, a motor disposed forwardly of said fan casing and having a shaft parallel to the fan shaft, a partition secured to the suction chamber in engagement with the outer face of said outer wall of the elbow and projecting forwardly beyond said motor shaft, both of said shafts projecting through said partition, a cover covering the motor and said elbow, a bottom plate secured to the suction chamber and projecting laterally from said partition below the mean level of said shafts, said cover having a side wall the lower region of which meets the outer edge region of said bottom plate to form a drive housing, and drive mechanism connecting said fan and motor shafts and housed within said housing, said cover being raisable while the bottom plate remains stationary.

10. In a vacuum cleaner, a suction chamber including a body portion and an elbow communicating with and projecting upwardly from said body portion and having a lateral outlet, a fan casing having an inlet associated with said outlet, an impeller in said casing, a shaft on which said impeller is mounted, projecting through said outlet and through the outer wall of said elbow, a motor disposed forwardly of said fan casing and having a shaft parallel to the fan shaft, a partition secured to the suction chamber in engagement with the outer face of said outer wall of the elbow and projecting forwardly beyond said motor shaft, both of said shafts projecting through said partition, a cover covering the motor and said elbow, a bottom plate secured to the suction chamber and projecting laterally from said partition below the mean level of said shafts, said cover having a side wall the lower region of which meets the outer edge region of said bottom plate to form a drive housing, and drive mechanism connecting said shafts and housed within said housing, said bottom plate being inclined downwardly and forwardly to meet the top wall of said body portion, and said top wall forming the bottom of the belt housing from the forward end of said bottom plate to the forward extremity of the belt housing.

11. In a vacuum cleaner, a suction chamber, including a body portion and an elbow communicating with and projecting upwardly from said body portion and having a lateral outlet, a fan casing having an inlet associated with said outlet, an impeller in said casing, a shaft on which said impeller is mounted, projecting through said outlet and through the outer wall of said elbow, a motor disposed forwardly of said fan casing and having a shaft parallel to the fan shaft, a partition secured to the suction chamber in engagement with the outer face of said outer wall of the elbow and projecting forwardly beyond said motor shaft, both of said shafts projecting through said partition, a cover covering the motor and said elbow, a bottom plate secured to the suction chamber and projecting laterally from said partition below the mean level of said shafts, said cover having a side wall the lower region of which meets the outer edge region of said bottom plate to form a drive housing, and drive mechanism connecting said shafts and housed within said housing, said cover being raisable while the bottom plate remains stationary, and an edging of packing material along the upper edge of said partition, against which said cover is sealed.

12. In a vacuum cleaner, a fan casing, a suction chamber including a portion communicating with the inlet of said fan casing, a boss formed in the wall of said portion opposite the inlet of said fan casing, a sleeve having an enlarged outer end region mounted in said boss, said sleeve projecting through said inlet, a bearing bushing mounted in the said enlarged region of the sleeve, a fan impeller in the fan casing, and a shaft journalled in said bearing, sheathed in said sleeve in the region of passage of the dust laden air stream, and carrying said impeller.

13. In a vacuum cleaner, a suction chamber, a motor mounted thereon, its shaft horizontal and transverse to the direction of cleaner movement, a fan positioned rearwardly of said motor, its shaft being parallel to the motor shaft, a casing for said fan, an air duct connecting the fan casing to the suction chamber, a drive connecting said shafts, a bottom plate secured to the suction chamber and projecting laterally below said drive, and a cover covering the motor, said duct, and said drive, said cover having a side wall the lower region of which meets the outer region of said bottom plate to form a drive housing, said cover being raisable while the bottom plate remains stationary.

14. In a vacuum cleaner, a suction chamber including a bottom plate secured to the top outer portion thereof, a motor mounted thereon, its shaft horizontal and transverse to the direction of cleaner movement, a fan positioned rearwardly of said motor, its shaft being parallel to the motor shaft, a casing for said fan, an air duct connecting the fan casing to the suction chamber, a drive connecting said shafts, and a cover covering the motor, said duct, and said drive, said cover having a side wall the lower region of which meets the outer region of said bottom plate to form a drive housing.

15. In a vacuum cleaner, a suction chamber, a motor mounted on said chamber and having its shaft horizontal and extending transversely of the normal direction of cleaner movement, a fan positioned rearwardly of said motor and having its shaft parallel to said motor shaft, said fan including a casing provided with oppositely disposed suction inlets, said fan shaft carrying op-

positely disposed impeller means positioned between said suction inlets, oppositely disposed air ducts providing suction communication between said suction inlets and said suction chamber, said fan shaft extending outwardly through said suction inlets and having its opposite end portions extending through the opposite outer walls of said air ducts, driving means connecting the corresponding ends of said motor shaft and said fan shaft, oppositely disposed plates positioned under said driving means and carried at each side of said cleaner by said suction chamber and said air ducts, and a cover for said motor, said air ducts and said driving means, said cover having oppositely disposed side walls, the lower portions of which normally engage said plates, said cover having its top portion bifurcated so as to form two rearwardly extending branches which normally cover said driving means and said air ducts at opposite sides of said fan casing.

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