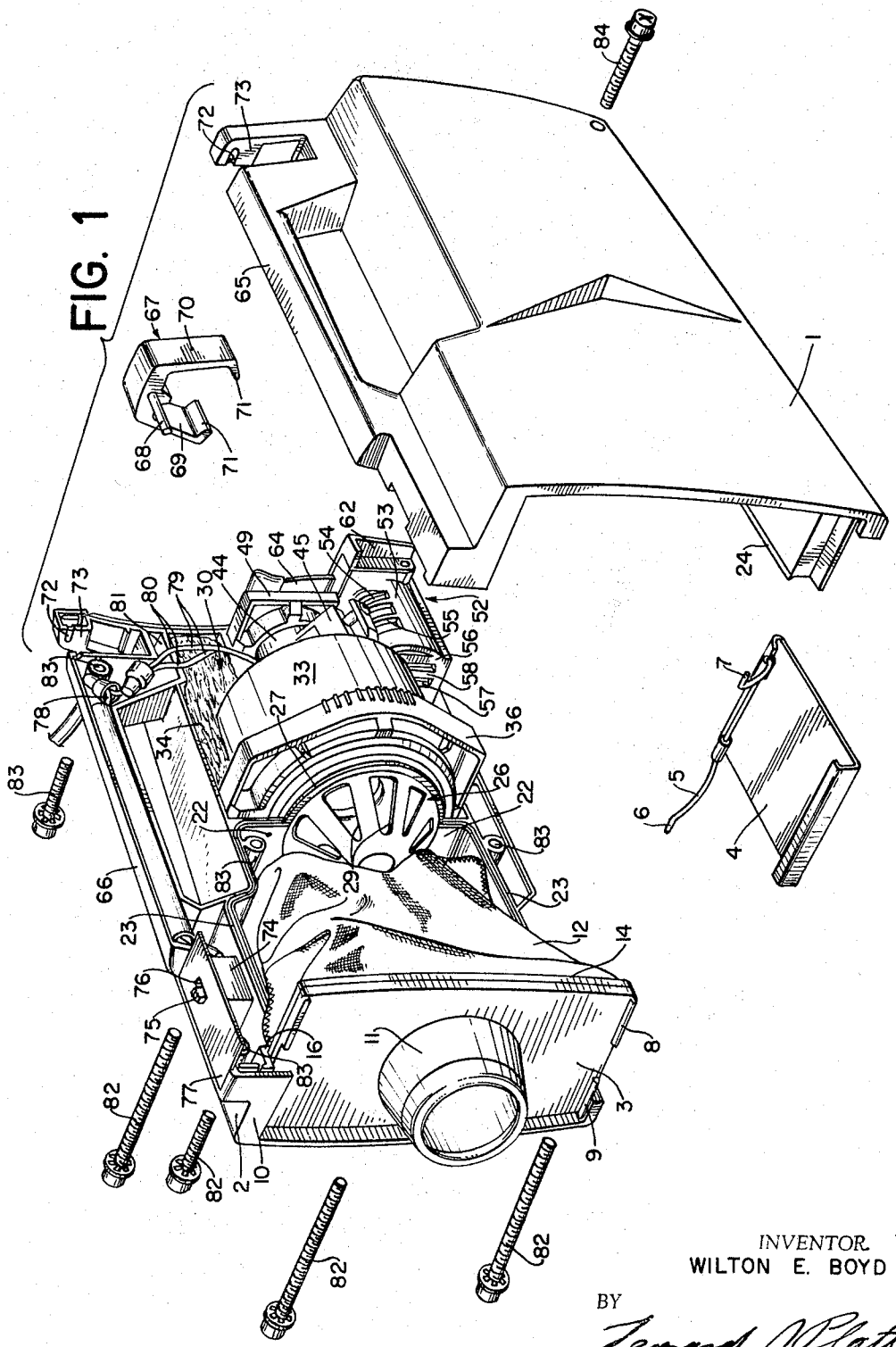
Aug. 8, 1967 W. E. BOYD 3,334,370

LIGHTWEIGHT PORTABLE VACUUM CLEANER

Filed Nov. 17, 1964 3 Sheets-Sheet 1

FIG. 1



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LIGHTWEIGHT PORTABLE VACUUM CLEANER

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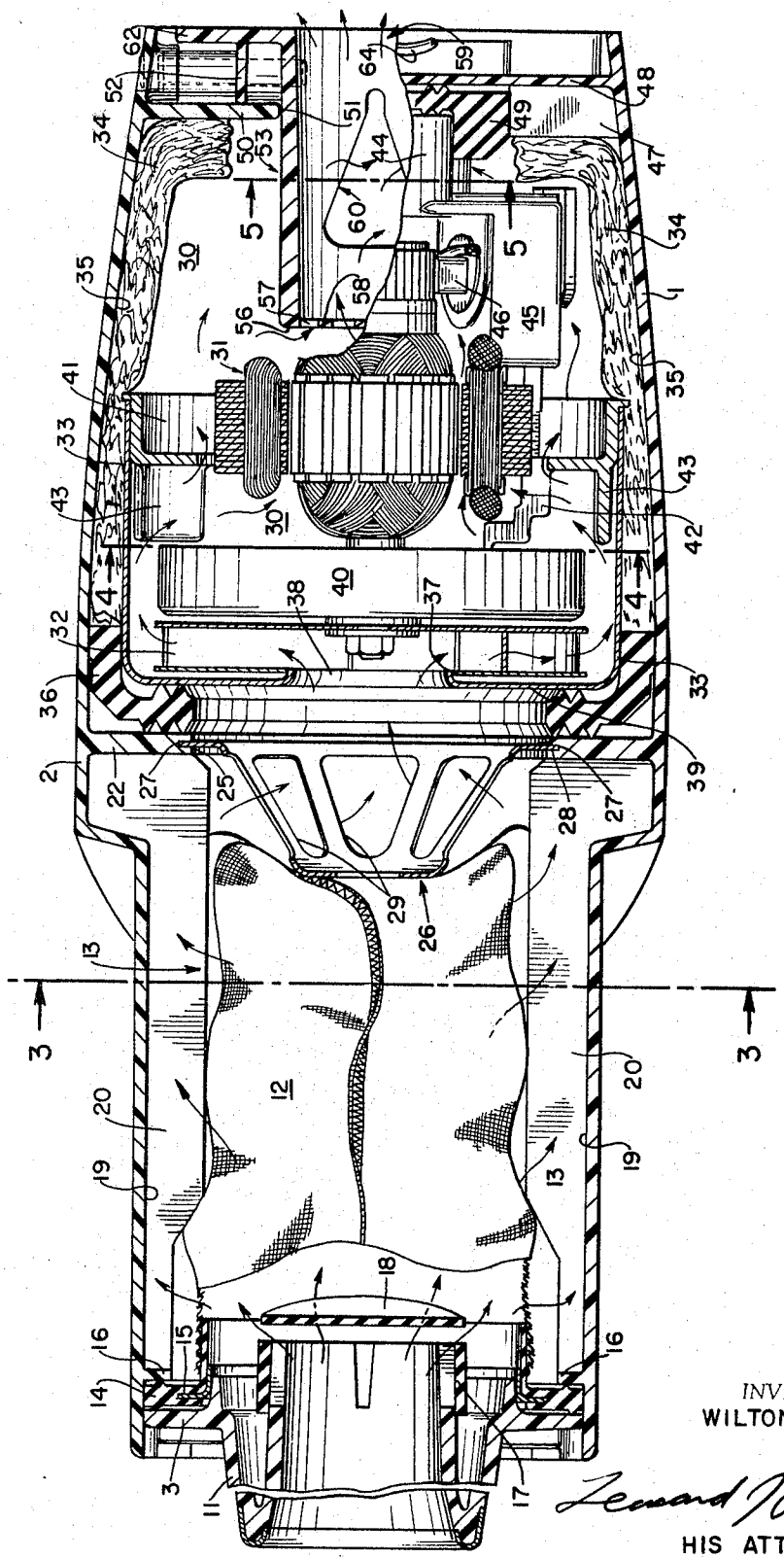
FIG. 2



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Filed Nov. 17, 1964 3 Sheets-Sheet 3

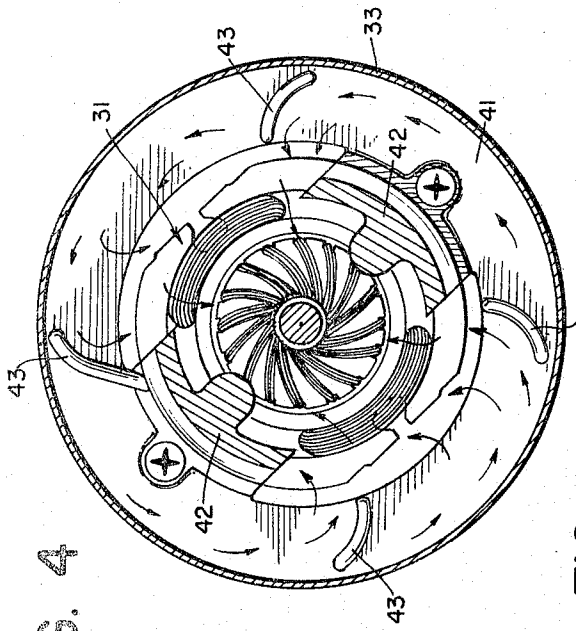

FIG. 4

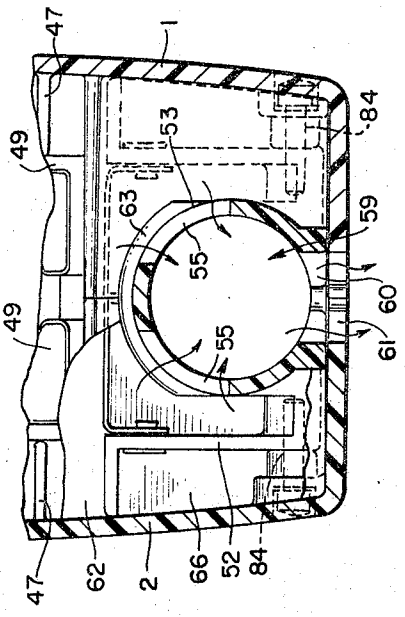

FIG. 5

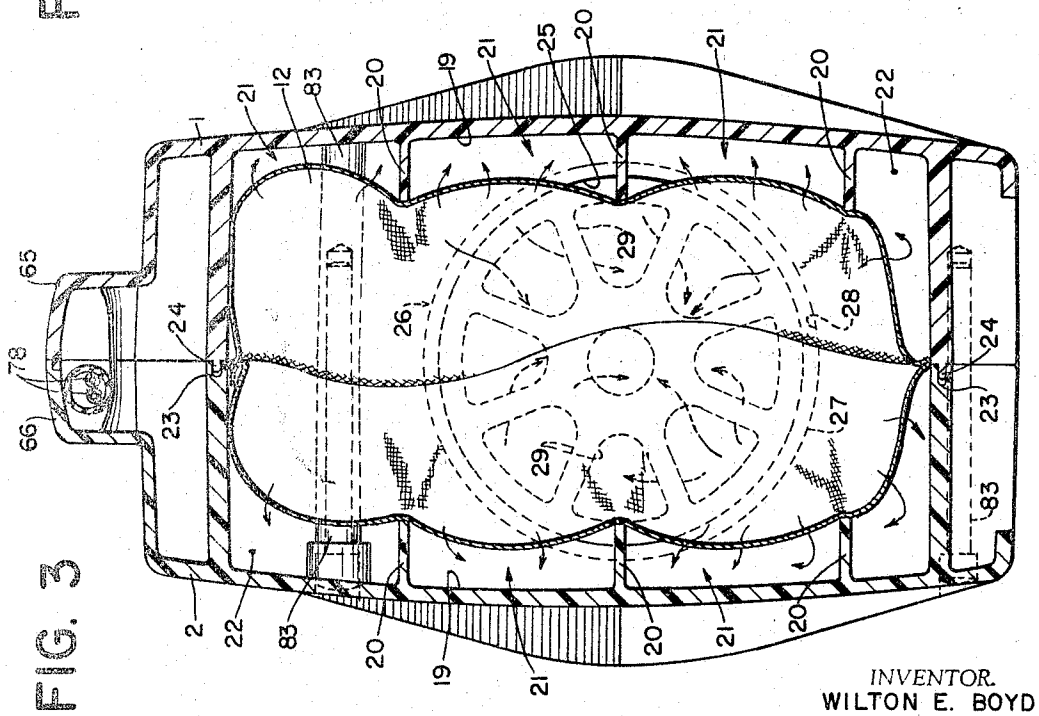

FIG. 3

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United States Patent Office 3,334,370
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3,334,370

LIGHTWEIGHT PORTABLE VACUUM CLEANER

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Filed Nov. 17, 1964, Ser. No. 411,760
6 Claims. (Cl. 15—327)

My invention relates to vacuum cleaners, and more particularly to lightweight portable cleaners of the type which are carried and manipulated by hand.

In recent years manufacturers of vacuum cleaners have recognized the existance of a consumer market for a lightweight portable vacuum cleaner which could be carried by hand and used for such odd jobs as cleaning car interiors, draperies, and numerous other jobs for which a floor or canister-type cleaner would be too heavy or too cumbersome. One of the lightweight cleaners introduced on the market comprises a one-piece cylindrical housing for the motor and a long tapered snout attached to the housing, the snout having the suction inlet for the cleaner at its tip and a filter bag within the body of the snout. A cleaner of this type has certain disadvantages: (1) the working element of the cleaner forms a part of the cleaner housing and hence is bulky and noninterchangeable; (2) the mouth of the filter bag surrounds the suction inlet in the barely accessible forward end of the snout interior and, thus, is difficult to remove and replace; (3) the one-piece cylindrical housing for the motor may necessitate involved and expensive procedures for assembling the internal components of the cleaner within the housing.

Another cleaner has an external filter bag sealed around the blower outlet of the cleaner. With this filter arrangement a secondary outer bag is required to minimize the unattractive appearance presented by the filter bag. This secondary outer bag increases the cost of the filter components of the cleaner and is also an added inconvenience to the user when it is desired to replace or empty the filter bag. Perhaps even more important, this arrangement filters the air only *after* it has been drawn through the motor for cooling purposes. Thus, dirt is deposited around the motor brushes and in other undesirable locations within the motor, this deposition having an eventual deleterious effect on motor operation.

A third type of lightweight portable vacuum cleaner which has appeared on the market comprises a cast metal motor housing and a one-piece cast fan housing and nozzle. The fan in this type of cleaner is of the centrifugal type, drawing air into the axial inlet in the rearward direction through the cleaner suction inlet and in the forward direction through the motor housing to provide a flow of cooling air over the motor. It is manifest that with this type of cleaner high suction losses will be incurred at the suction inlet due to the fact that a part of the fan's output is employed solely to cool the motor. Also, machines of this type utilizing cast metal housing parts are apt to be excessively heavy.

At least one prior art patent in this field shows a portable vacuum cleaner having an airflow which is forced to travel twice the full axial length of the cleaner, once in traversing the filter bag, and a second time in passing through the fan-filter-motor unit. Such a lengthened airflow will generate excessively high friction losses within the cleaner, with resultant diminished suction available at suction inlet of the cleaner.

It is an object of my invention to provide a lightweight portable vacuum cleaner having a rigid, compact, and highly maneuverable construction.

It is another object of my invention to provide a lightweight portable vacuum cleaner having a housing consrtuction which facilitates assembly therein of the internal components of the cleaner.

It is a further object of my invention to provide a lightweight portable vacuum cleaner having a construction which provides an airflow through the cleaner of minimum length and maximum motor cooling efficiency.

It is still another object of my invention to provide a lightweight portable vacuum cleaner which is quiet in operation and inexpensive to produce.

Further objects and advantages of my invention will become apparent as the following description proceeds. The subject matter which constitutes my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly, in carrying out the objects of my invention, in one form thereof, I provide a lightweight portable vacuum cleaner having a slender, compact, box-like construction. The internal components of my cleaner are ensconced within a lightweight molded plastic housing comprising a pair of mating shell halves. The housing has integral, inwardly projecting portions defining various pockets, grooves and compartments which receive the motor and fan unit, the filter bag, the switch assembly, a blower coupling assembly, and an orifice cone which is disposed between the fan intake and the filter bag to prevent the bag from being drawn into the intake of the fan. The split shell construction of the cleaner housing provides a means by which the internal components can be assembled and inexpensively within the housing. A highly efficient airflow for cooling the motor is provided by disposing the motor and centrifugal fan assemblies within a cylindrical can. The can and a dished diffuser disposed concentrically therein guide the airflow from the fan axially rearwardly. Located around the motor and within the can is an annular member having radially inwardly curved blades which direct the rearwardly flowing air inwardly over and through the motor assembly.

For a better understanding of my invention, reference may be made to the accompanying drawings in which:

FIG. 1 is a partially exploded view of my cleaner showing the internal components in place within the cleaner.

FIG. 2 is a partial section view of the assembled cleaner taken on a horizontal plane through the center of the cleaner, with a part of the motor assembly broken away to show the blower coupling assembly.

FIG. 3 is a section view taken on lines 3—3 in FIG. 2.

FIG. 4 is a section view taken on lines 4—4 in FIG. 2.

FIG. 5 is the lower portion of a section view taken on lines 5—5 in FIG. 2, with an area broken away.

Referring to the drawings, and especially to FIG. 1, it will be seen that I provide a lightweight portable vacuum cleaner having a slender, compact, box-like construction. A detailed description of the construction of my cleaner follows, each component of the cleaner being described roughly in the order in which the air flowing through the cleaner touches that component.

The housing for my cleaner comprises a pair of mating shell halves, a right half **1** and a left half **2** (when viewed from the top and front of the cleaner). The housing is open at its forward end, a cover **3** being provided to close the open end. The cover **3** is easily removed from or assembled upon the housing by means of a toggle clamp **4**. The clamp **4** is biased into the closed position by a U-shaped overcenter spring **5**. The outturned legs **6, 7** of the spring **5** are rotatably mounted in eyes (not shown), one of which is held in each of the shell halves **1, 2**. When the toggle clamp **4** has been freed from its engagement with a pair of lugs **8, 9** integral with the edge of the cover **3**, the cover **3** can be pivoted free of the housing from its position beneath an overhanging lip **10** integral with the forward end of the housing. A mouth or air inlet **11** is formed integrally with the cover **3** and serves to receive the male end of a tubular wand or hose attached to the cleaner during use.

In order to cool the motor with filtered, rather than unfiltered, air, I provide a filter means at the forward end of the cleaner upstream of the motor. Viewing FIGS. 1–3 of the drawings, and especially FIG. 2, it will be seen that my filter means is a filter bag **12** located in an enclosure **13** formed in the forward end of the housing. The mouth of the bag **12** is sealed around the air inlet **11** in the cover **3**. A rubber gasket **14** on a rectangular frame **15** disposed in the mouth of the bag **12** is supported upon a ledge **16** integral with the inner periphery of the open end of the housing. When the cover **3** is drawn in place on the housing by the toggle clamp **4**, the gasket **14** is deformed into sealing engagement with the ledge **16** and the cover. Thus, no air can be drawn into the cleaner housing without passing through the filter bag **12**. A rubber one-way valve **17** comprising essentially a resilient flap **18**, serves to close an inner end of the air inlet **11** when the cleaner is not operating, thus preventing dirt trapped in the bag **12** from escaping from the housing.

When the cleaner is operating and the filter bag **12** is fully inflated, the bag **12** might come into contact with the walls **19** of the enclosure **13**, thus, smothering the bag **12**. To preclude this possibility, a number of integral spaced ribs **20** are provided, projecting from the enclosure walls **19** into the enclosure **13** (see FIG. 3). These ribs **20** hold the bag **12** away from the walls **19** of the enclosure **13** and form channels **21** through which the influent air may leave the filter bag enclosure **13**. The ribs **20** additionally function to give structural support to the walls **19** of the enclosure **13**.

It will be evident from the drawings that the filter bag enclosure **13** is formed by the walls **19**, the cover **3**, and an integral partition **22** extending transversely across the interior of the housing. It is desirable that the enclosure **13** be sealed off from the outside in order that no air may leak into the enclosure during operation of the cleaner. To effect such a seal, a groove **23** is formed in the left shell half **2** and a flange **24** on the right shell half **1** along the junction line between the shell halves which define the enclosure **13** for the filter bag **12**. When the mating shell halves **1**, **2** are joined, the groove **23** receives the flange **24** in a slight interfering fit; the joint thus formed is effective to preclude entry of outside air into the enclosure **13**.

The filtered air is then drawn through an aperture in the partition **22**, the edge of which is indicated at **25**. A truncated conical grating **26** is disposed in the aperture to extend the filtering surface of the bag **12** and also to prevent the bag **12** from being drawn therethrough. The grating **26** has an annular flange **27** which is held between the shell halves **1**, **2** in an annular groove **28** formed in the edge **25** of the aperture. The grating **26** is provided with angularly spaced holes **29** which admit the filtered air from the enclosure **13** into the aperture in the partition **22**. By the fact of the truncated conical shape of the grating **26**, the bag **12**, when inflated, will not block the holes **29** in the grating **26** and prevent the filtered air from passing through the aperture.

In the interior of the rear section of the housing on the opposite side of the partition **22** from the filter bag enclosure **13**, a motor-fan compartment **30** is formed. Referring especially to FIG. 2, the motor assembly will be seen at **31** and a centrifugal fan at **32** mounted on the forward end of the motor shaft. It is evident from FIGS. 1 and 2 that the motor assembly **31** and the fan **32** are positioned within a cylindrical air deflecting can **33**. Vibration and noise generated within the can **33** are isolated from the cleaner housing by means of a lining of insulation **34** covering the inner surfaces of the side walls **35** of the compartment **30**, and by an annular molded rubber gasket **36** embracing the forward end of the can **33**. The insulation **34** completely covers all exposed surfaces of compartment **30** to flameproof the plastic body shells **1** and **2** in case of fire in the motor.

As shown by the arrows in FIG. 2, the filtered air exits from the filter bag enclosure **13** through the aperture in the partition **22** and enters the axial inlet **37** of the fan **32** through an opening **38** in the forward end **39** of the can **33**. A portion of the gasket **36** is compressed between the rear surface of the partition **22** and the forward end **39** of the can **33**, forming a seal which insures that all air flowing through the aperture in the partition **22** enters the inlet **37** of the fan **32**.

Tracing further the airflow diagram illustrated in FIG. 2, it will be seen that the filtered air entering the axial inlet **37** of the fan **32** is thrown radially outwardly against the inner surface of the can **33**. The airflow is guided axially rearwardly by air deflecting means comprising the inner surface of the can **33** and the outer surface of a dished diffuser **40**. The diffuser **40** is supported upon a forward portion (not shown) of a cast metal bearing retainer having an annular body **41** fitting within the open end of the can **33**. The forward portion of the bearing retainer which supports the diffuser **40** also retains the bearings for the forward end of the motor shaft. This forward portion is integral with and supported by a pair of diametrically opposed arms, one of which is shown at **42**, extending forwardly and radially inwardly from the annular body **41** of the bearing retainer.

For the purpose of deflecting the airflow from the fan **32** inwardly over and through the motor assembly **31** to cool heated motor components, the annular body **41** of the bearing retainer is provided with a series of angularly spaced, radially inwardly curved blades **43**. The airflow whirling rearwardly between the diffuser **40** and the inner surface of the can **33** is caught by the blades **43** and directed radially inwardly over and through the motor assembly **31** (see FIG. 4). It is evident from the drawing and the above description that the can **33**, diffuser **40** and the blades **43** on the retainer combine to create a highly effective and efficient means for guiding the airflow for maximum cooling of the motor components.

Bolted to the annular body **41** of the bearing retainer is a cast support member having a rear portion **44** which serves to hold the rear bearings for the motor shaft and side portions **45** which support the motor brushes **46** and associated assemblies.

A series of projections integral with the cleaner housing, one of which is shown at **47**, extend from the rear wall **48**, surrounding and defining an unobstructed rectangular area on the wall **48**. Supported in this area by the projections **47** is a rectangular rubber gasket **49**. The gasket **49** receives in a circular recess the rear portion **44** of the support member, functioning to isolate within the housing some of the vibration and noise generated by the motor.

In order to provide exhaust outlet means for exhausting the airflow from the motor compartment **30**, an offset portion **50** of the rear wall **48** has a circular exhaust outlet aperture **51** formed therein (see FIGS. 2 and 5). A molded blower coupling member **52** is held in the aperture **51** between the mating shell halves **1**, **2** of the housing. The blower coupling member **52** comprises a tubular body **53** having openings **54** which admit air into the coupling member **52**. Each of the openings **54** is divided by spaced bars **55** which prevent objects from being inserted through the coupling member **52** and into the interior of the cleaner. The inner end **56** of the tubular body **53** of the coupling member **52** likewise has an opening **57** divided by bars **58** for admitting air into the coupling member **52**. The air passing into the coupling member **52** through openings **54** and **57** is exhausted for the most part through the axial exhaust outlet **59** at the rear most end of the tubular body **53**. A portion of the air exhausts through aligned, generally triangular holes in the bottom of the tubular body **53** and the housing, designated **60** and **61**, respectively. From the location of the holes **60**, **61** and the axial exhaust outlet **59**, it will be evident that air may exhaust from the cleaner no matter what

position the cleaner might be placed in upon a flat surface. When the cleaner is not in use, the holes **60**, **61** function as a means by which the cleaner can be hung on a wall projection.

A backplate **62**, integral with the rear of the tubular body **53** of the coupling member **52**, assists in locating and stabilizing the coupling member **52** in the exhaust outlet aperture **51**. For the purpose of holding the coupling member **52** in the exhaust outlet aperture **51**, an arcuate lug **63** is formed projecting from the tubular body **53** of the coupling member **52** in spaced relationship with respect to the backplate **62**. The lug **63** and the backplate **62** form a channel which receives a portion of the perimeter of the outlet aperture **51**. Thus, when the mating shell halves **1**, **2** are brought together, the blower coupling member **52** is retained securely in the aperture **51**.

A spring finger tool holder **64** is riveted upon the backplate **62** and is positioned parallel to the outer surface of the rear wall **48** of the housing in order to receive an auxiliary tool forced over the tool holder.

A hollow handle is formed integrally with the cleaner housing across the top of the housing, right and left half shells of which are shown at **65** and **66**, respectively, (see particularly FIGS. 1 and 3). A recess is formed in the rear of the handle to receive a C-shaped clip **67** which serves to store a wand or hose section along the top of the handle. The clip **67** is rotatable upon a pin **68** to an operative position in which resilient arms **69**, **70** of the clip **67** extend from the top of the handle, or to an inoperative position in which the outer surfaces of the arms **69**, **70**, lie flush with the outer surface of the handle. When in the operative position inturned hands **71** on the arms **70** of the clip **67** grasp and hold the wand or hose section after it has been snapped between the arms **70**. A groove **72** formed in the rearmost interior wall **73** of the recess receives projections on the clip **67** (not shown) to form a detent which serves to retain the clip **67** in either the operative or inoperative position.

Adjacent the forward end of the handle a pocket is formed between the mating shell halves **1**, **2** the pocket receiving a switch assembly **74** (see FIG. 1). A switch operator **75** projects through an opening **76** in an escutcheon plate **77** on the housing.

Electrical leads **78** running to the switch assembly **74** from a point where the supply cord enters the housing and from the motor are ensconced in the left half shell **66** of the handle, as shown in FIG. 3.

Electrical leads **79** running from the motor to the switch assembly **74** and the supply cord fit into slots **80** molded into wall **81** of left half shell **2**.

The mating shell halves **1**, **2** of the housing are secured together by a plurality of screws **82** which pass through guide lugs **83** integral with the left shell half **2** and screw into threads molded into corresponding lugs in the right shell half **1**. The blower coupling member is anchored more firmly in the exhaust outlet aperture **51** by means of a single screw **84** entering the backplate **62** of the blower coupling member **52** through the right shell half **1** of the housing.

My invention is not limited to the particular details of the construction of the embodiment illustrated and I contemplate that variosu and other modifications and applications 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. A lightweight portable vacuum cleaner comprising:
(a) an elongated plastic housing formed from a pair of complementary mating casing halves;
(b) each of said casing halves forming a side wall, one-half of a bottom wall, and one-half of a top wall;
(c) a relatively thin centrally located half partition extending a substantial distance inwardly from and integrally formed on each of said casing halves;
(d) each of said inwardly extending half partitions including a front surface, a rear surface, and a narrow inwardly facing surface;
(e) a groove formed in each of said narrow inwardly facing surfaces;
(f) a sheet metal grill having a plurality of apertures formed therein;
(g) said grill having wall portions disposed in said recesses for securely holding said grill within said casing between said half partitions;
(h) a plurality of longitudinal inwardly directed parallel plastic ribs integrally formed on each of said casing halves, said ribs being integrally connected to the front surface of one of said half partitions and one of said casing side walls to securely brace said centrally located half partitions;
(i) an air inlet opening formed in said casing in front of said ribs;
(j) an electric motor and suction fan unit disposed within said housing behind said partition; means disposed against said partition and said motor fan unit so that said partition partially supports said motor fan unit;
(k) a filter bag having a closed end, side walls and an open end portion; and
(l) said filter bag side walls being arranged for engagement with said inwardly directed ribs, and said filter bag end wall being arranged for engagement with said grill so that air may enter said air inlet, pass through the side walls of said filter bag adjacent to said ribs and also pass through the end wall of said filter bag adjacent to said grill, said ribs, partition and grill providing a rigid, compact construction and also forming a construction for achieving efficient filter bag use.

2. A lightweight portable vacuum cleaner comprising;
(a) an elongated plastic housing formed from a pair of complementary mating casing halves;
(b) each of said casing halves forming a side wall, one-half of a bottom wall, and one-half of a top wall;
(c) a relatively thin centrally located half partition extending a substantial distance inwardly from and integrally formed on each of said casing halves;
(d) each of said inwardly extending half partitions including a front surface, a rear surface, and a narrow inwardly facing surface;
(e) a plurality of inwardly directed plastic ribs integrally formed on each of said casing halves, said ribs being integrally connected to the front surface of one of said half partitions and one of said casing side walls to securely brace said centrally located half partitions;
(f) an air inlet opening formed in said casing in front of said ribs;
(g) a generally cylindrical electric motor and suction fan assembly; and
(h) a resilient gasket, said gasket having a generally cylindrical inner wall for receiving said generally cylindrical motor and fan assembly, a resilient front wall for abutting said partition, and top, bottom and side surfaces formed to tightly fit the top, side and bottom walls of said casing halves, so that said gasket in combination with said partition partially supports said motor fan assembly.

3. A lightweight portable vacuum cleaner comprising:
(a) an elongated plastic housing formed from a pair of complementary mating casing halves;
(b) each of said casing halves forming a side wall, one-half of a bottom wall, and one-half of a top wall;
(c) a relatively thin centrally located half partition

extending a substantial distance inwardly from and integrally formed on each of said casing halves;

(d) each of said inwardly extending half partitions including a front surface, a rear surface, and a narrow inwardly facing surface;

(e) a plurality of inwardly directed plastic ribs integrally formed on each of said casing halves, said ribs being integrally connected to the front surface of said one of said half partitions and one of said casing side walls to securely brace said centrally located half partitions;

(f) an air inlet opening formed in said casing in front of said ribs;

(g) a generally cylindrical electric motor and suction fan assembly;

(h) a resilient gasket, said gasket having a generally cylindrical inner wall for receiving said generally cylindrical motor and fan assembly, a resilient front wall for abutting said partition, and top, bottom and side surfaces formed to tightly fit the top, side and bottom walls of said casing halves, so that said gasket in combination with said partition partially supports said motor fan assembly;

(i) inwardly extending screw-receiving lugs integrally formed in said casing halves, said lugs being arranged generally parallel to each other and integrally connected to said half bottom walls and top walls; and

(j) a plurality of screws extending through said screw-receiving lugs for connecting said casing halves to each other and for compressing said resiilent gasket between said motor and fan assembly and the inside walls of the casing in order to securely and resiliently hold said motor and fan assembly within said casing.

4. A lightweight portable vacuum cleaner comprising:

(a) a plastic housing formed from a pair of complementary mating casing halves;

(b) each of said casing halves forming a side-wall, one-half of a bottom wall, and one-half of a top wall;

(c) a relatively thin centrally located half partition extending a substantial distance inwardly from and integrally formed on each of said casing halves;

(d) each of said inwardly extending half partitions including a front surface, a rear surface, and a narrow inwardly facing surface;

(e) a groove formed in each of said narrow inwardly facing surfaces;

(f) a sheet metal grill having a plurality of apertures formed therein;

(g) said grill having wall portions disposed in said recesses for securely holding said grill within said casing between said half partitions;

(h) a plurality of inwardly directed plastic ribs integrally formed on each of said casing halves, said ribs being integrally connected to the front surface of one of said half partitions and one of said casing side walls to securely brace said centrally located half partitions;

(i) an air inlet opening formed in said casing in front of said ribs;

(j) a generally cylindrical electric motor and suction fan assembly;

(k) a resilient gasket, said gasket having a generally cylindrical inner wall for receiving said generally cylindrical motor and fan assembly, a resilient front wall for abutting said partition, and top, bottom and side surfaces formed to tightly fit the top, side and bottom walls of said casing halves so that said gasket in combination with said partition partially supports said motor fan assembly;

(l) inwardly extending screw-receiving lugs integrally formed in said casing halves, said lugs being arranged generally parallel to each other and integrally connected to said half bottom walls and top walls;

(m) a plurality of screws extending through said screw-receiving lugs for connecting said casing halves to each other and for compressing said resilient gasket between said motor and fan assembly and the inside walls of the casing in order to securely and resiliently hold said motor and fan assembly within said casing;

(n) an inwardly directed half rear wall integrally formed on each of said casing halves, said rear wall including a rear surface and an inner front surface;

(o) a plurality of ribs integrally connected to the front inner surface of said rear wall and the side wall of one of said casing halves; and

(p) a second resilient gasket positioned between said rear wall ribs and the rear portion of said fan and motor assembly for securely holding the rear portion of said fan and motor assembly within said casing.

5. A lightweight portable vacuum cleaner comprising:

(a) a plastic housing formed from a pair of complementary mating casing halves;

(b) each of said casing halves forming a side wall, one-half of a bottom wall, and one-half of a top wall;

(c) a large centrally located inwardly extending half partition integrally formed on each of said casing halves;

(d) an electric motor and suction fan disposed within said housing behind said parition;

(e) an inwardly directed half rear wall integrally formed on each of said casing halves, said rear wall including a rear surface and an inner front surface;

(f) an integrally molded plastic blower coupling, said coupling including a generally cylindrical wall, a generally flat bottom wall integrally connected to and tangent to said generally cylindrical wall, a generally flat rear wall integrally connected to and perpendicular to said bottom wall and said cylindrical wall, a front wall integrally connected to said generally cylindrical wall arranged perpendicular to said bottom wall, a land extending upwardly from said generally cylindrical wall, a plurality of openings formed in said cylindrical wall, a plurality of openings formed in said front wall, and a hole formed in said bottom wall;

(g) each of said half rear walls including a narrow inwardly facing semi-cylindrical surface; and

(h) said molded plastic blower coupling being sandwiched between said casing halves with said semi-cylindrical inwardly facing surfaces of said rear wall positioned between the rear wall of said blower coupling and the upwardly extending land.

6. A lightweight portable vacuum cleaner comprising:

(a) a plastic housing formed from a pair of complementary mating casing halves;

(b) each of said casing halves forming a side wall, one-half of a bottom wall, and one-half of a top wall;

(c) a large centrally located inwardly extending half partition integrally formed on each of said casing halves;

(d) an electric motor and suction fan disposed within said housing behind said partition;

(e) an inwardly directed half rear wall integrally formed on each of said casing halves, said rear wall including a rear surface and an inner front surface;

(f) a plurality of ribs integrally connected to the front inner surface of said rear wall and the side wall of one of said casing halves;

(g) a second resilient gasket positioned between said rear wall ribs and the rear portion of said fan and motor assembly for securely holding the rear portion of said fan and motor assembly within said casing;

(h) an integrally molded plastic blower coupling, said coupling including a generally cylindrical wall, a

generally flat bottom wall integrally connected to and tangent to said generally cylindrical wall, a generally flat rear wall integrally connected to and perpendicular to said bottom wall and said cylindrical wall, a front wall integrally connected to said generally cylindrical wall arranged perpendicular to said bottom wall, a land extending upwardly from said generally cylindrical wall, a plurality of openings formed in said cylindrical wall, a plurality of openings formed in said front wall, and a hole formed in said bottom wall;

(i) each of said half rear walls including a narrow inwardly facing semi-cylindrical surface; and

(j) said molded plastic blower coupling being sandwiched between said casing halves with said semi-cylindrical inwardly facing surfaces of said rear wall positioned between the rear wall of said blower coupling and the upwardly extending land.

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