March 9, 1971 J. C. HAMRICK 3,568,240

FLOOR INSTALLABLE VACUUM CLEANER

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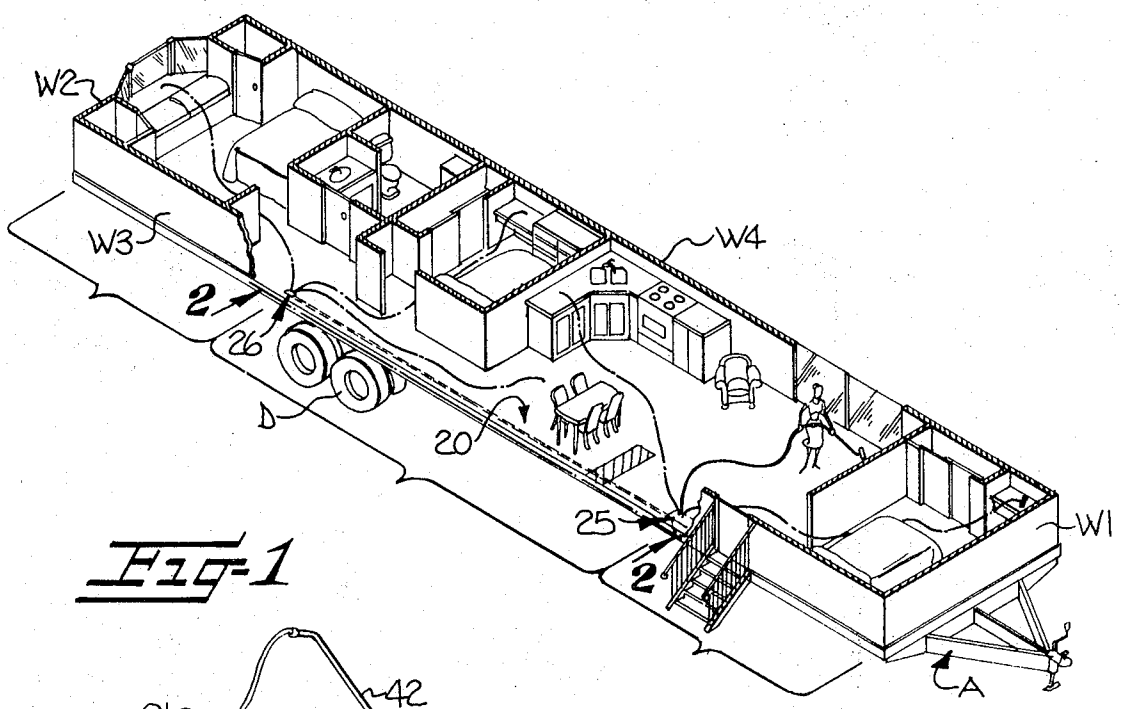


Fig-1

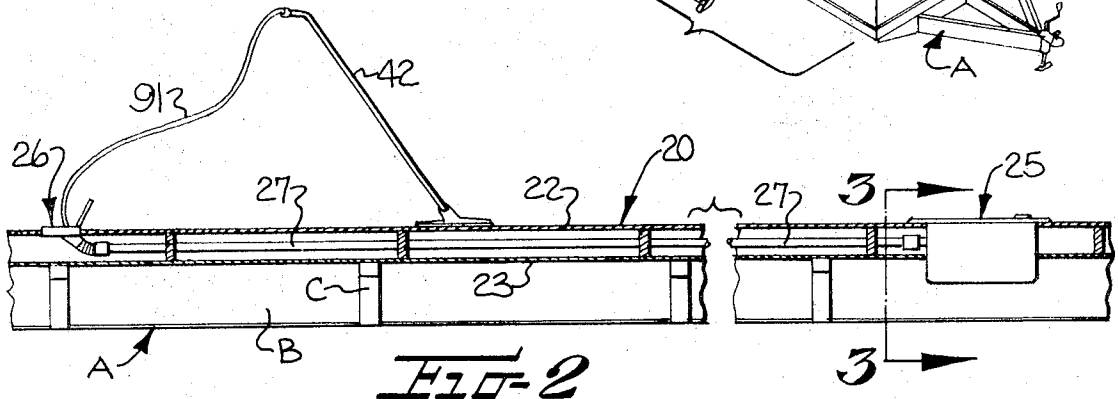


Fig-2

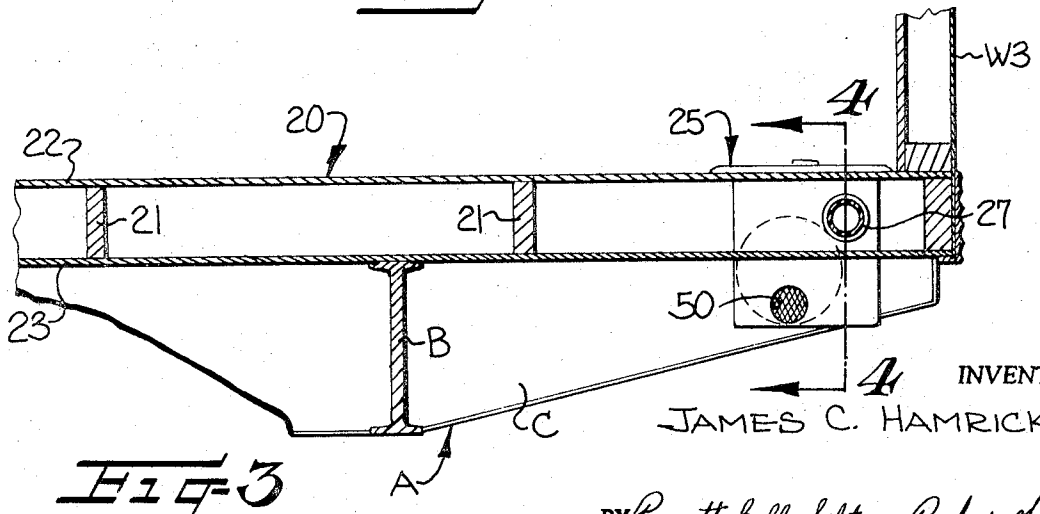


Fig-3

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FLOOR INSTALLABLE VACUUM CLEANER

Filed Jan. 2, 1969 7 Sheets-Sheet 2

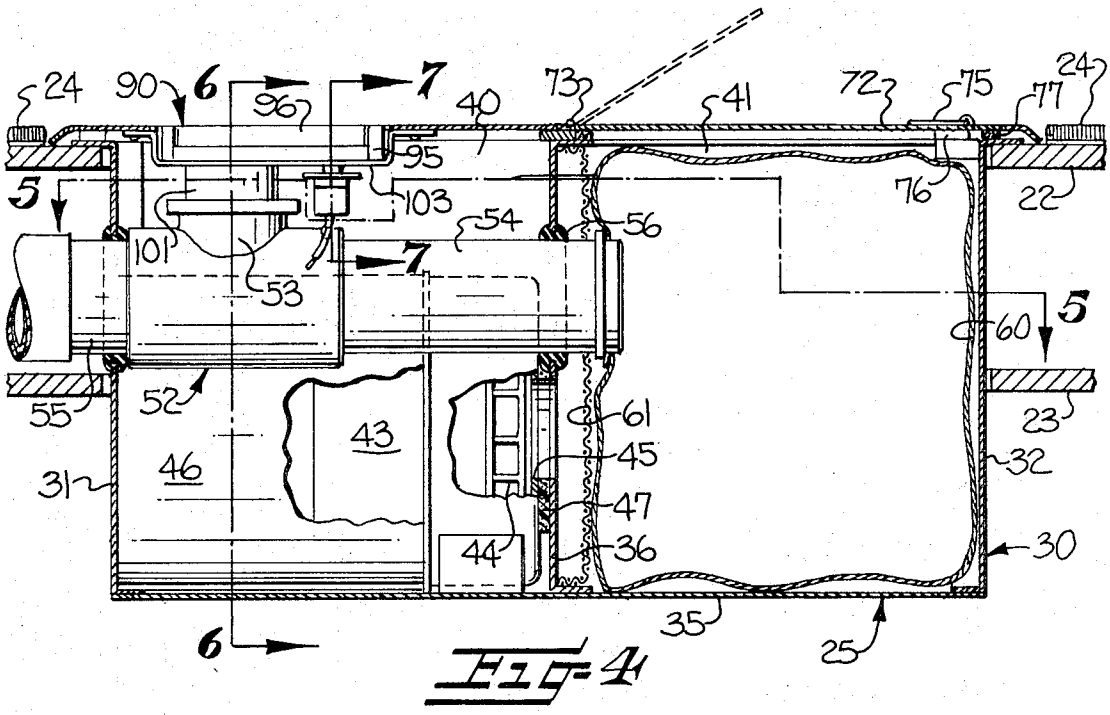


Fig-4

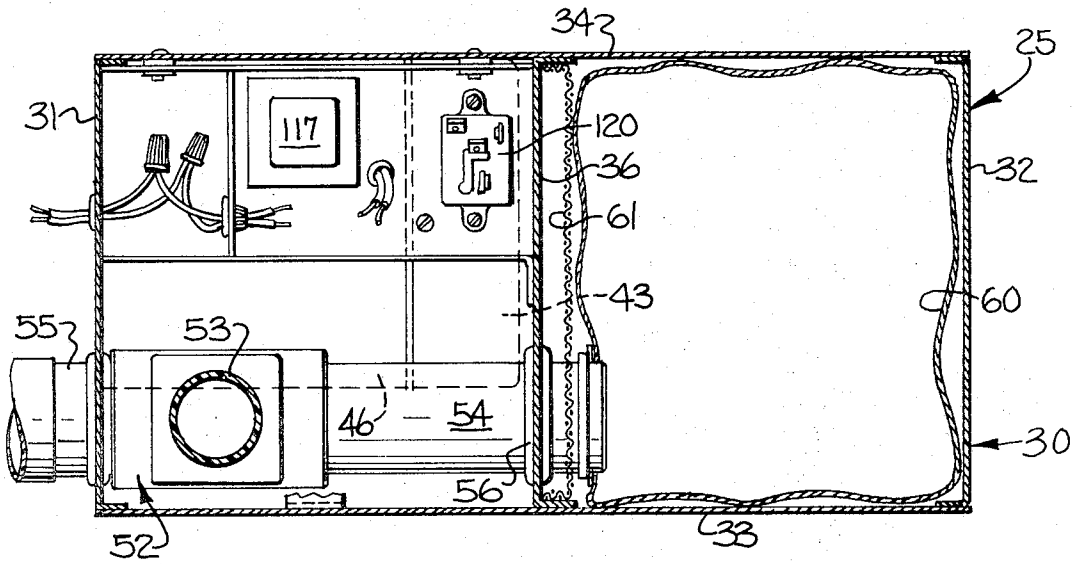


Fig-5

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FLOOR INSTALLABLE VACUUM CLEANER

Filed Jan. 2, 1969 7 Sheets-Sheet 5

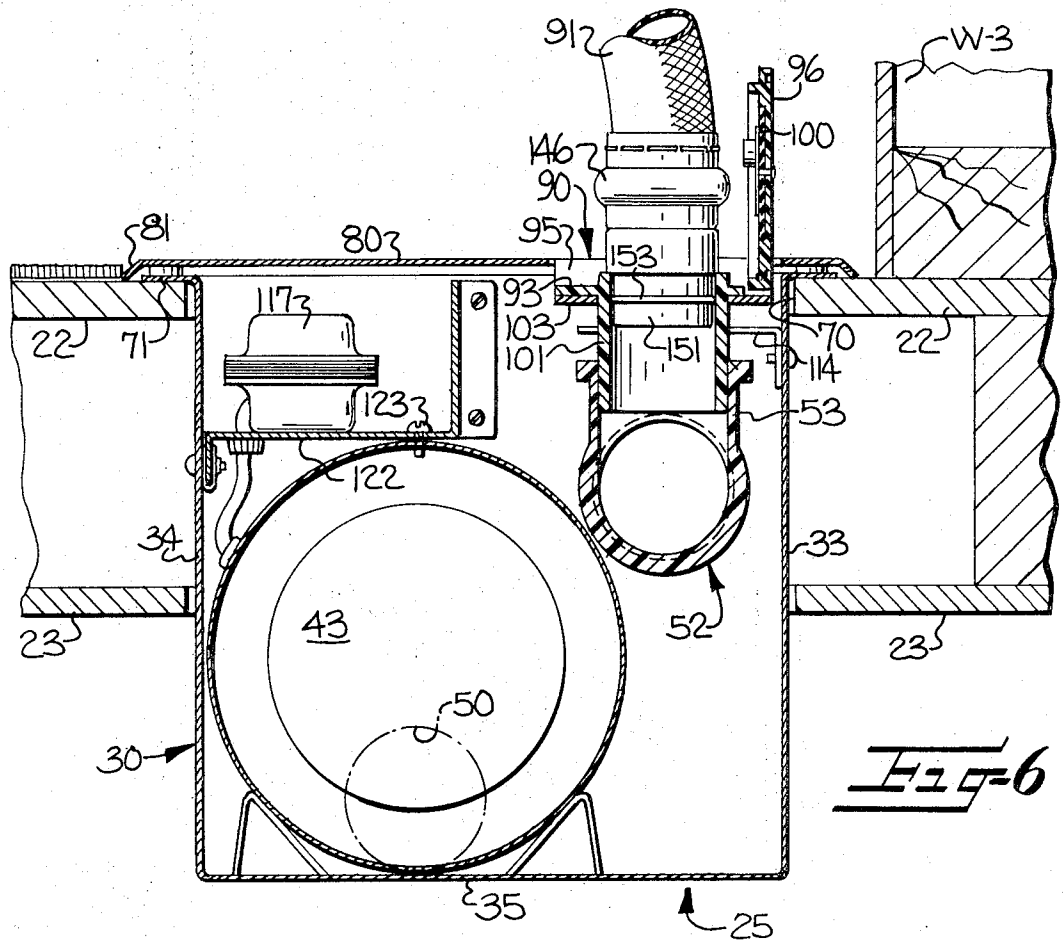


Fig-6

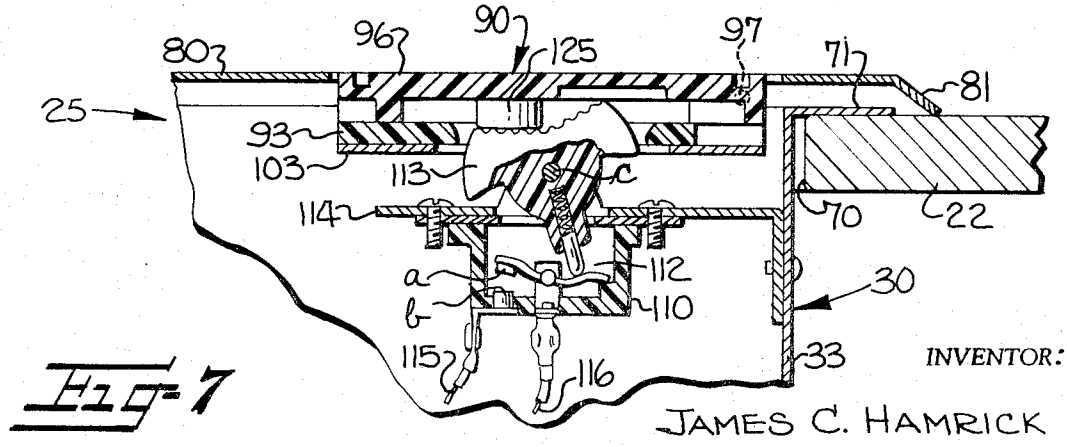


Fig-7

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FLOOR INSTALLABLE VACUUM CLEANER

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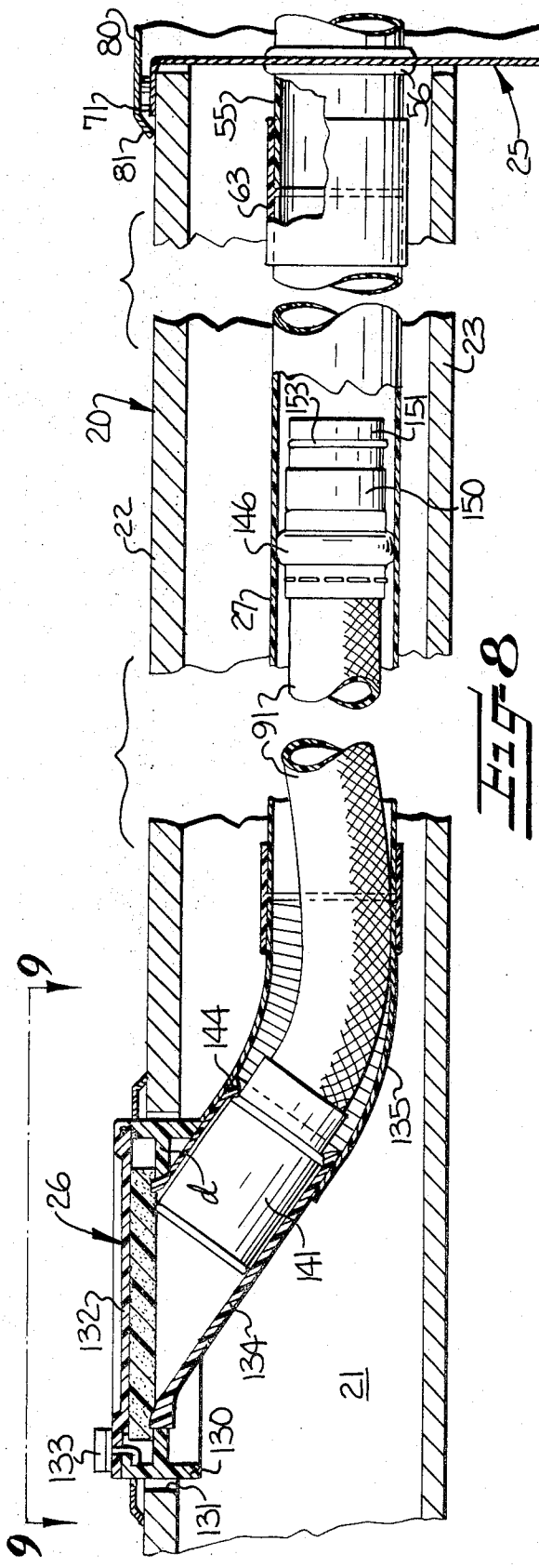


Fig. 8

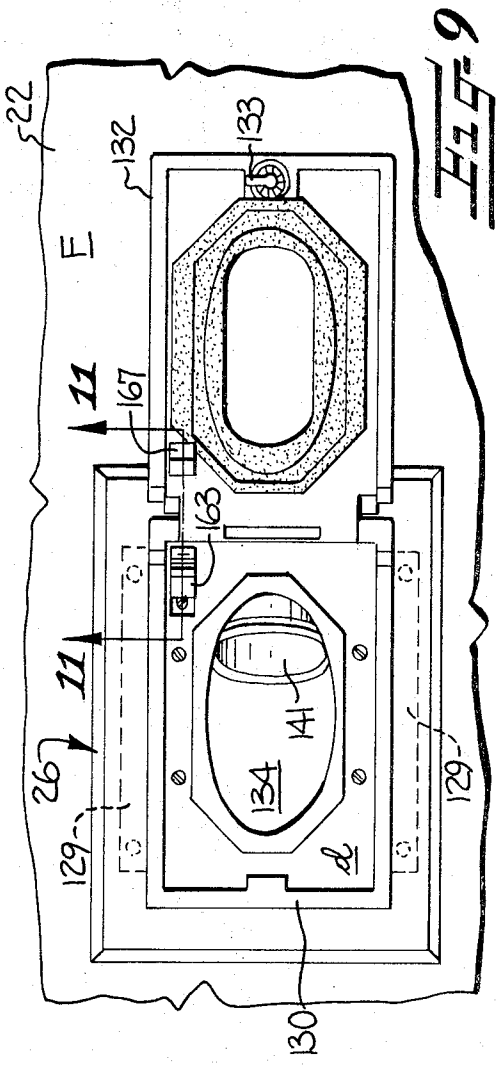


Fig. 9

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FLOOR INSTALLABLE VACUUM CLEANER

Filed Jan. 2, 1969 7 Sheets-Sheet 6

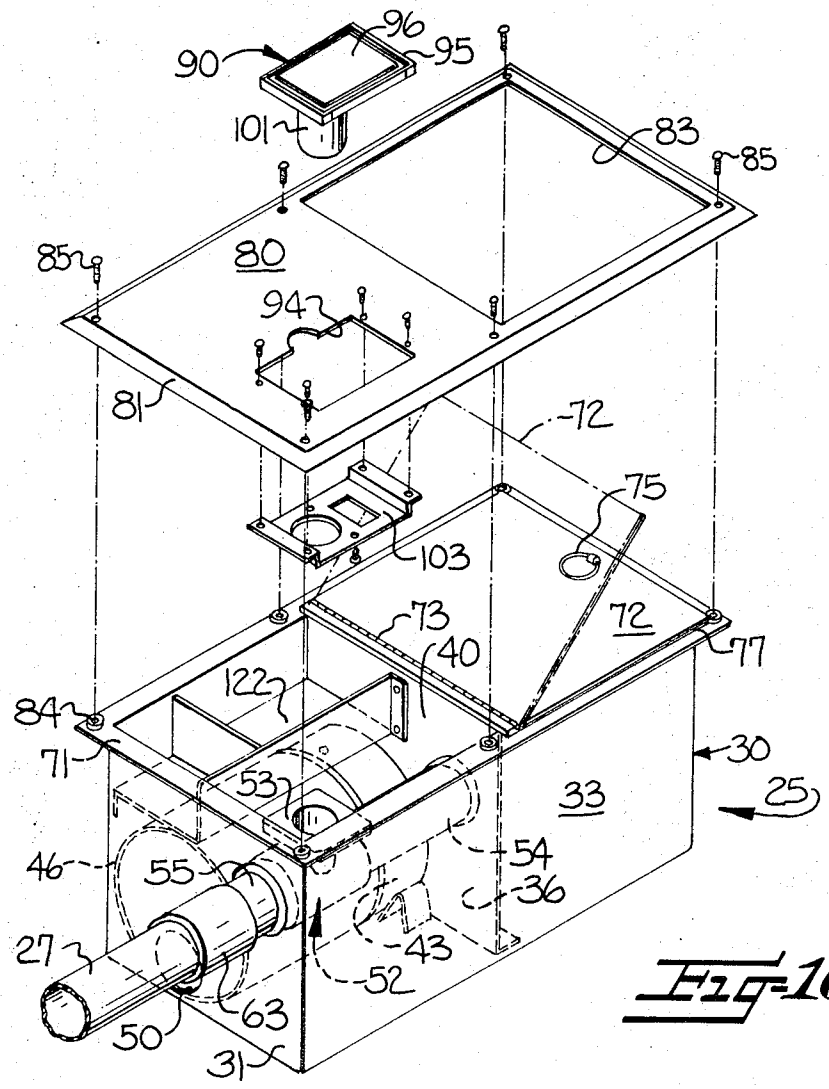


Fig-10

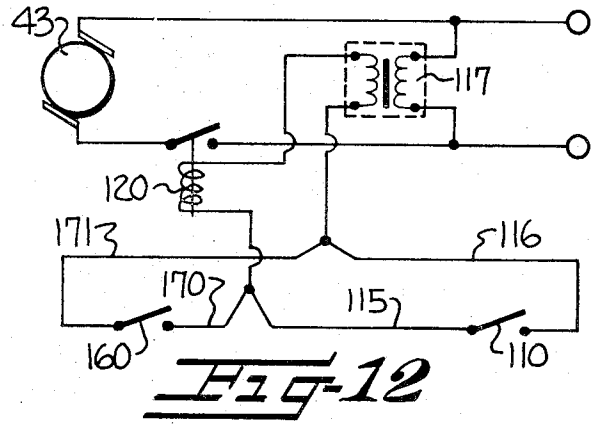


Fig-12

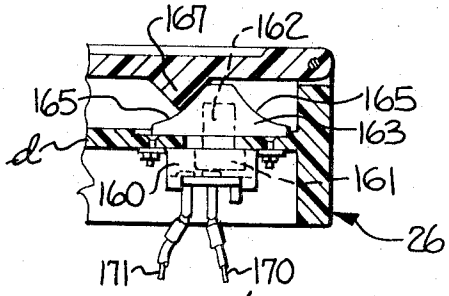


Fig-11

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March 9, 1971 J. C. HAMRICK 3,568,240

FLOOR INSTALLABLE VACUUM CLEANER

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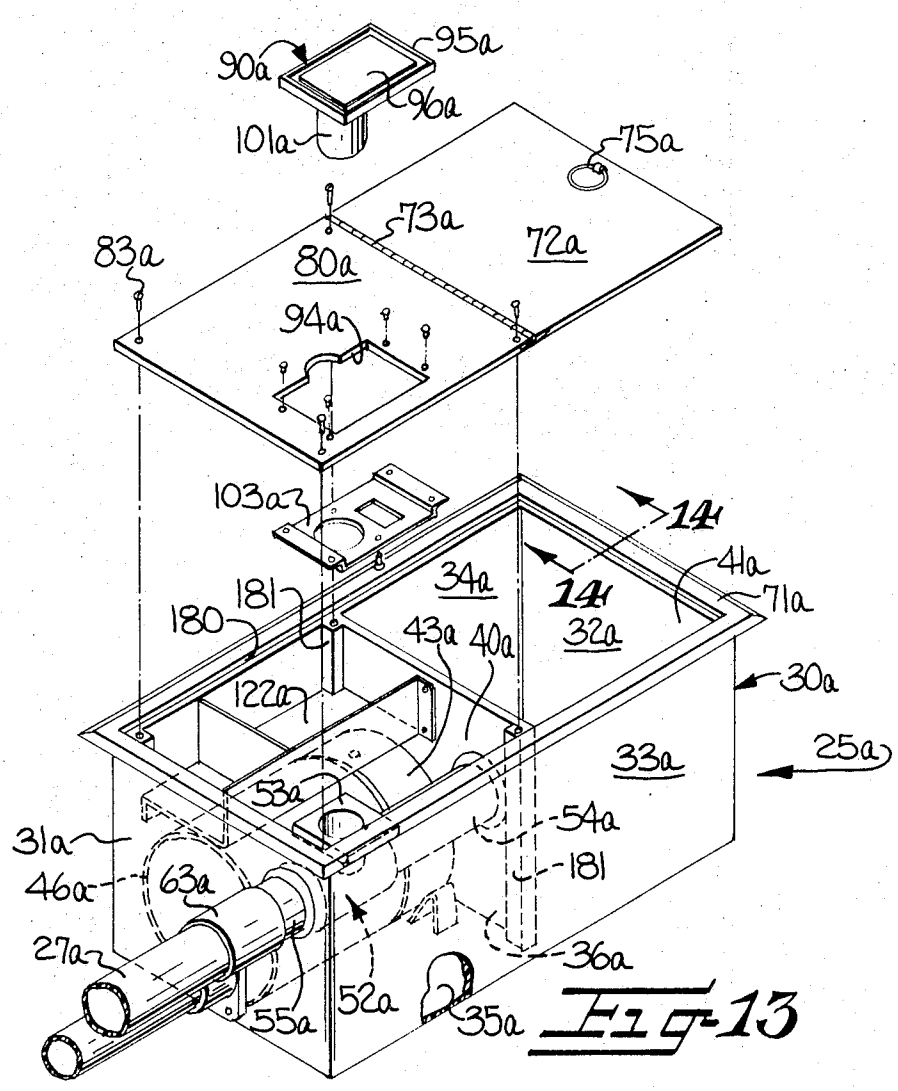


Fig-13

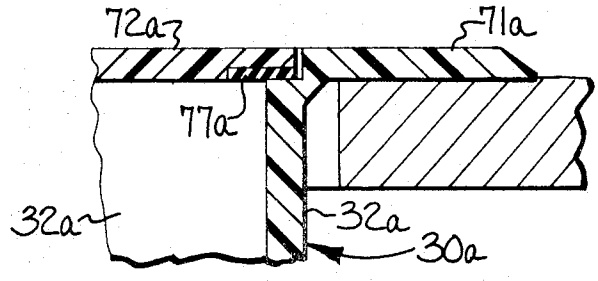


Fig-14

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March 9, 1971 J. C. HAMRICK 3,568,240

FLOOR INSTALLABLE VACUUM CLEANER

Filed Jan. 2, 1969 7 Sheets-Sheet 7

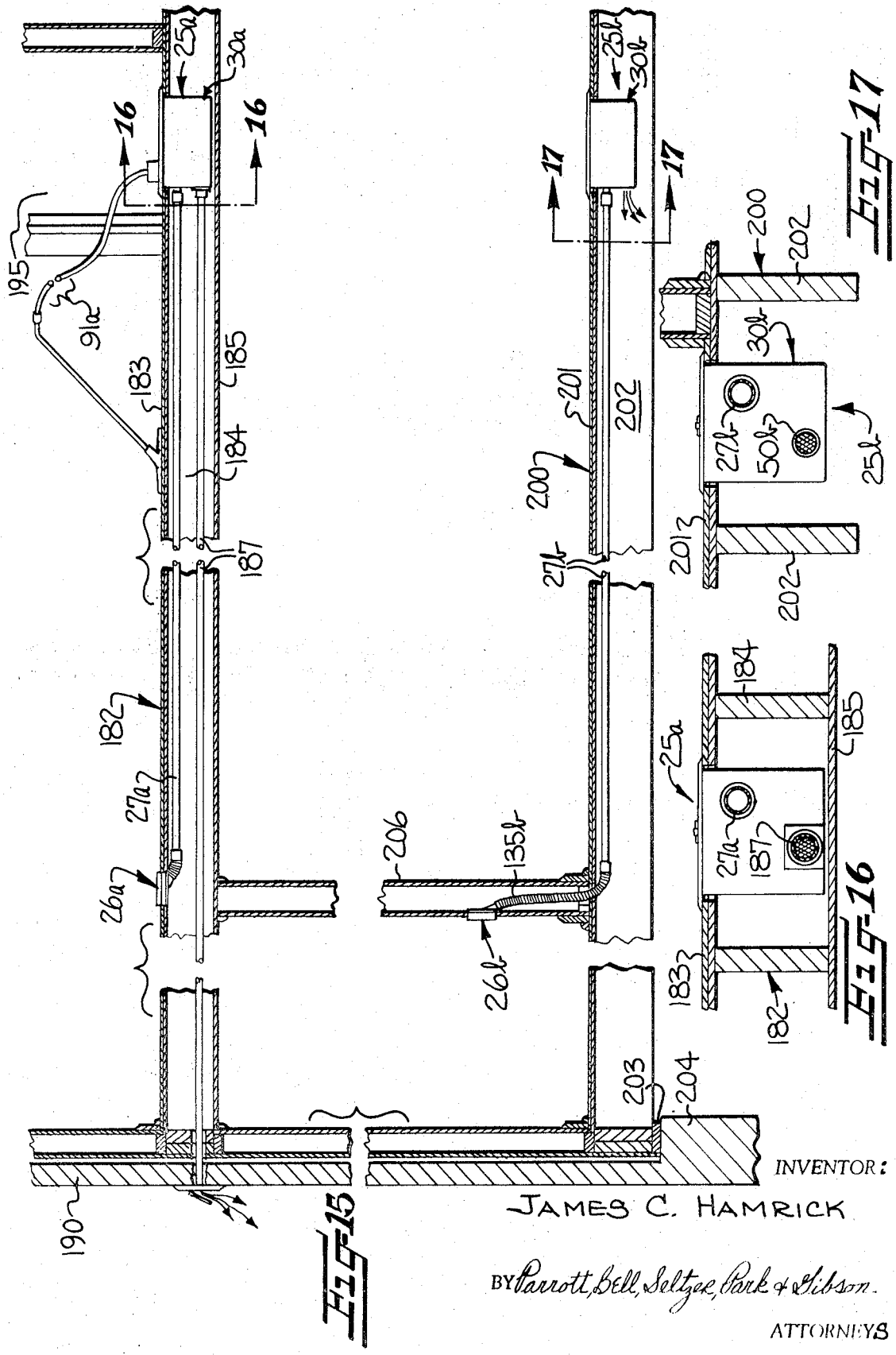


FIG-15

FIG-16

FIG-17

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United States Patent Office 3,568,240
Patented Mar. 9, 1971

3,568,240

FLOOR INSTALLABLE VACUUM CLEANER

James C. Hamrick, Matthews, N.C., assignor to JL Products Incorporated, Matthews, N.C.

Continuation-in-part of application Ser. No. 567,615, July 25, 1966. This application Jan. 2, 1969, Ser. No. 788,395
The portion of the term of the patent subsequent to Jan. 21, 1986, has been disclaimed
Int. Cl. A47l 5/38, 9/10; B60s 1/64
U.S. Cl. 15—314 17 Claims

ABSTRACT OF THE DISCLOSURE

A compact self-contained vacuum cleaner unit especially designed for installation in the floor structure of mobile homes and apartment buildings and having an inlet fitting in one vertical wall thereof for connection thereto of a suction conduit extending beneath the flooring of, and within, the floor structure to an auxiliary hose-receiving receptacle remote from the vacuum cleaner. A hand-operated flexible suction hose is connectable to both the auxiliary receptacle and a main receptacle of the cleaner unit communicating with the inlet fitting and, when not in use, the suction hose is stored within the auxiliary receptacle and the suction conduit thereof.

This application is a continuation-in-part of my copending application Ser. No. 567,615, now Pat. No. 3,422,482, filed July 25, 1966, and entitled Wall-Mounted Vacuum Cleaner Unit.

To my knowledge, only vacuum cleaners of the portable type have been used heretofore for cleaning mobile homes. However, due to storage problems, such portable vacuum cleaners are not entirely satisfactory. Despite an apparently long-felt need for an economical permanently installed vacuum cleaning system suitable for mobile homes, which system would not present objectionable obstructions and would not take up valuable space in a mobile home, up to this time, such a system has never been available to my knowledge.

It is therefore the primary object of this invention to provide a compact, self-contained vacuum cleaner unit installable in the floor of a mobile home, and which is also equally useful as a low-cost floor-mounted unit in conventional homes or apartment buildings.

Another object of this invention is to provide, in combination with a self-contained floor-installable vacuum cleaner unit having its own plug-in receptacle, at least one auxiliary outlet receptacle connected, by elongate suction conduit means, to the air inlet of the self-contained vacuum cleaner unit, and wherein the air inlet of the vacuum cleaner unit is so located that it may be entirely within the confines of the floor joists of a mobile home, and the suction conduit means, or at least the portion of the suction conduit means adjacent the air inlet, also may be positioned within the confines of the floor joists of the mobile home. In this regard, the floor structures of many mobile homes are made up of so-called 2" x 4" floor joists which are actually about 1⅝" x 3⅝", and upon which suitable flooring is secured. In some instances, the vertical width of the floor-supporting joists may be substantially greater; i.e. the depth of the floor structures of different mobile homes may be in the range of about 3⅝" to 5⅝" or more from the bottom surface of the flooring. Conventionally, a suitable closure paneling is secured to the lower edges of the floor joists of a mobile home and defines, with the flooring, what is generally known as a "basement area" to accommodate therein heating ducts, plumbing pipes, electrical wires, insulation materials, etc.

Thus, it is a more specific object of this invention to provide a vacuum cleaning system in which a floor-installed vacuum cleaner unit is provided with an upwardly facing plug-in outlet receptacle for connection of a suction hose thereto, and wherein the casing of the cleaner unit also has an air inlet in one side thereof located entirely within about 3¾ to 4 inches of the upper extremity of the cleaner unit casing so that the suction conduit may extend within the aforementioned "basement area" of a mobile home. Further, the vacuum cleaner unit is provided with an exhaust opening located below the air inlet passage to facilitate exhausting air from a suction device, located within the power compartment, to an area beneath the "basement area" of a mobile home.

Still another object of this invention is to provide a floor-installable vacuum cleaner unit of the character described above wherein the height of the casing from the bottom to the top thereof is no more than about 8 inches so that it also may be readily installed in a floor opening of an upper floor apartment, whose flooring may be supported on so-called 2" x 8" floor joists, without the lower portion of the casing projecting below the lower edges of the floor joists or otherwise obstructing the ceiling of a room therebelow.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIG. 1 is a perspective view of a representative installation of the vacuum cleaning system of the present invention in a typical mobile home;

FIG. 2 is an enlarged fragmentary longitudinal vertical sectional view through the floor structure of the mobile home taken substantially along line **2—2** in FIG. 1 and showing the vacuum cleaner unit with an auxiliary hose-retracting suction outlet receptacle spaced therefrom and connected to the vacuum cleaner unit by means of a suction conduit extending longitudinally within the confines of the floor joists;

FIG. 3 is a further enlarged fragmentary transverse vertical sectional view taken substantially along line **3—3** in FIG. 2;

FIG. 4 is an enlarged vertical sectional view through a first form of the vacuum cleaner unit taken substantially along line **4—4** in FIG. 3;

FIG. 5 is a sectional plan view taken substantially along line **5—5** in FIG. 4;

FIG. 6 is an enlarged transverse vertical sectional view through the vacuum cleaner unit taken substantially along line **6—6** in FIG. 4;

FIG. 7 is an enlarged fragmentary vertical sectional view taken substantially along line **7—7** in FIG. 4 and showing an electrical switch adjacent the hose-receiving plug-in suction outlet receptacle of the vacuum cleaner unit;

FIG. 8 is an enlarged vertical sectional view similar to FIG. 2, with parts broken away to show a flexible suction hose stored in the suction conduit extending to the auxiliary hose-retracting outlet receptacle from the vacuum cleaner unit;

FIG. 9 is a plan view of the auxiliary outlet receptacle taken substantially along the line **9—9** in FIG. 8, but showing the door thereof in open position;

FIG. 10 is a partially exploded perspective view of the first form of the vacuum cleaner unit;

FIG. 11 is an enlarged vertical sectional view taken substantially along line **11—11** in FIG. 9, showing a switch for the suction device of the vacuum cleaner unit, and showing how its actuator is moved to an open position whenever the door of the auxiliary outlet receptacle is moved to closed position;

FIG. 12 is a schematic diagram of an electrical circuit for controlling the suction device of the vacuum cleaning unit;

FIG. 13 is a view similar to FIG. 10 but showing a second embodiment of the vacuum cleaner unit;

FIG. 14 is an enlarged fragmentary vertical sectional view taken substantially along line **14—14** in FIG. 13 with the door to the corresponding vacuum compartment occupying closed position;

FIG. 15 is a fragmentary vertical sectional view through a portion of a multi-story building showing vacuum cleaning systems of the instant invention as they are installed in the first floor structure and an upper floor structure of such building; and

FIGS. 16 and 17 are enlarged fragmentary vertical and sectional views taken along the respective lines **16—16** and **17—17** in FIG. 15.

Referring more specifically to the drawings, a typical installation of one embodiment of the suction cleaning system of the present invention is shown in FIG. 1 in association with a mobile home. Generally, mobile homes are about twelve feet wide and about forty to sixty feet long and include opposing front and rear end walls W1, W2, opposing side walls W3, W4, a floor structure **20** and suitably arranged interior walls or partitions dividing the mobile home into rooms. Conventionally, the floor structure **20** includes a framework of floor joists **21** upon which suitable flooring **22**, about ½ to ¾ inch thick, is secured.

Suitable closure underpaneling **23**, about ¼ to ½ inch thick, is usually secured to the lower edges of joists **21**, thus defining a so-called "basement area" between the flooring **22** and the underpaneling to accommodate heating ducts, plumbing pipes, electrical wires, insulation materials, etc. The floor structure **20** is usually secured upon a metal chassis A of longitudinal beams B and transverse outriggers C supported on ground wheels D. In many instances, a floor covering **24**, such as carpeting (FIG. 6) is positioned upon flooring **22**.

The floor joists of mobile homes are usually in the range of about 3⅝ to 5⅝ inches wide from the top to the bottom edges thereof, and the vacuum clean unit of this invention is particularly adapted for installation in mobile home floor structures whose basement areas are within about 3⅝ inches to 5⅝ inches deep. As will be later described with respect to FIGS. 15–17, the vacuum cleaner unit of this invention also is particularly adapted for installation within the floor structure of conventional buildings; especially upper stories of apartment buildings, having floor joists of a vertical width of no less than about 7⅝ inches.

As best shown in FIGS. 1, 2 and 3, the suction cleaning system comprises a compact, self-contained, floor installed vacuum cleaner unit **25** and a floor installed, hose-retracting type of auxiliary hose-receiving outlet receptacle **26** which is spaced a substantial distance from, and is communicatively connected to, the cleaner unit **25** by means of an elongate suction conduit **27**, as will be more fully described hereinafter. Suction conduit **27** is permanently installed in the basement area, within the confines or horizontal plane of floor joists **21**.

FIRST EMBODIMENT OF VACUUM CLEANER UNIT

The first embodiment of the vacuum cleaner unit **25** is shown in detail in FIGS. 4–7, 10 and 12 and comprises a substantially rectangular, open-topped casing, broadly designated at **30**, which is designed to be fabricated from rigid sheet material such as sheet metal. Casing **30** includes opposing substantially vertical end walls **31, 32**, opposing substantially vertical side walls **33, 34** and a substantially horizontal bottom wall **35**. In order that the vacuum cleaner unit **25** may be efficiently installed in the floor structures of apartment buildings or other multi-story buildings as well as in the floor structures of mobile homes without taking up an undesirably large amount of floor space, it is preferred that the casing is about 8" square at its ends and about 16" long.

Located aproximately half-way between the opposing end walls **31, 32** is a substantially vertically disposed partition **36** of substantially the same height as the end and side walls **31–34** and which divides casing **30** into a power compartment **40** and a vacuum or collection compartment **41**. An electrically operable power unit, embodied in a suction device or blower motor **43**, and including a rotary fan **44**, is supported upon bottom wall **35** within power compartment **40** and has a suction inlet **45** communicating, by way of an opening in a lower portion of partition **36**, with the vacuum compartment **41**.

The housing of suction device **43** is of circular cross-section with its axis extending substantially horizontally, and the exhaust side thereof has a duct **46** fitting thereover and engaging casing end wall **31**. Duct **46** is about the same external diameter as the housing of suction device **43**. A resilient annular gasket **47** (FIG. 4), between suction device **43** and partition **36**, is held under compression by suction device **43** so as to bias duct **46** against casing end wall **31**. The lower portion of end wall **31** has an exhaust opening **50** therethrough (FIGS. 3 and 11) communicating with the exhaust side of suction device **43** through duct **46**.

The diameter of suction device **43** is substantially less than the height and width of casing **30**. However, for the sake of compactness of the vacuum cleaner unit **25**, the width of casing **30** is only sufficiently greater than the diameter of suction device **43** to readily accommodate a plug-in type of hose-receiving suction outlet receptacle **90** (FIG. 6) and the lower substantially horizontal portion of an inverted substantially T-shaped suction inlet fitting **52** located between casing sidewall **33** and the adjacent arcuate upper portion of suction device **43**, including its duct **46**. Since the lower portion of suction inlet fitting **52** is spaced substantially above the axis of suction device **43**, this facilitates providing a lesser displacement between casing sidewall **33** and suction device **43** than the width of the lower portion of T-shaped suction inlet fitting **52**.

The tubular suction inlet fitting **52** comprises a tubular substantially vertically disposed portion **53** and a pair of substantially horizontal, aligned, lateral, tubular legs **54, 55**. Tubular leg **54** communicates with the upper portion of vacuum compartment **41** through an opening **56** (FIG. 4) formed in the upper portion of partition **36**. The free end of tubular leg **54** of inlet fitting **52**, within vacuum compartment **41**, has the upper portion of a removable pliable filter bag **60** communicatively connected thereto, the filter bag constituting separator means and being positioned entirely within vacuum compartment **41** to entrap dust and the like sucked into vacuum compartment **41** through tubular fitting **52** by suction device **43**. A substantially rigid foraminate shield or screen **61** may be positioned in vacuum compartment **41** between partition **36** and filter bag **60**, with the screen **61** preferably being spaced away from partition **36**, so as to prevent the pliable filter bag **60** from being sucked into or against the inlet opening of suction device **43**.

The outer lateral tubular leg **55** of the substantially T-shaped suction inlet fitting **52** extends outwardly through a corresponding inlet passage in the exterior end wall **31** of casing **30** and serves as an inlet for connection of the corresponding end of the suction conduit **27** (FIGS. 2 and 8) thereto. The suction conduit **27**, which is preferably of about the same internal and external diameters as those of the lateral leg **55** of inlet fitting **52**, may be coupled to leg **55** by a suitable coupling sleeve **63**, as best shown in FIG. 8. It should be noted that the inlet tubular leg **55** is spaced above and to one side of exhaust opening **50** and is entirely within about 3¾ to 4 inches of the upper edges of vertical walls **31–34** so that suction conduit **27** is readily positioned within the confines of the floor struc-

ture 20 and in the horizontal plane of floor joists 21 of FIGS. 2 and 3.

In order to support casing 30 in a suitable floor opening 70 (FIG. 6) in floor structure 20, the upper peripheral edge of casing 30 is provided with flange means 71 integral with vertical walls 31–34 and which overlies and rests upon flooring 22 about the perimeter of opening 70. A movable cover or door means 72 is hingedly connected to casing 30 and normally overlies and closes the vacuum compartment access opening defined between the upper edges of vertical walls 32, 33, 34 and partition 36 (FIGS. 4 and 10). In this instance, movable cover 72 is hingedly connected to casing 30 by means of a hinge 73 (FIG. 10) secured to the flanged upper edge of partition 36. Opposing ends of hinge 73 extend over opposing side portions of flange means 71, and the two side edges and one end edge of movable cover 72 partially overlap flange means 71. A pivoted loop 75 is provided on cover 72 for opening and closing the same, and a permanent magnet 76 (FIG. 4) carried by cover 72 or casing end wall 32 may be used for releasably maintaining cover 72 in closed position.

To enclose casing 30 in the floor opening 70 in which it is positioned, a planar top closure member 80 is provided. Closure member 80 is formed with downwardly and outwardly beveled or inclined flanged edge portions 81 adapted to engage the upper surface of flooring 22 about the peripheries of the floor opening 70 and the flange means 71 of casing 30 when closure member 80 is placed over casing 30. Closure member 80 has a substantially rectangular opening 83 therethrough which overlies vacuum compartment 41 and within which movable cover 72 is positioned when it occupies closed position.

In order that the upper surface of closure member 80 may be substantially flush with the upper surface of movable cover 72; allowing for the thickness of the resilient seal 77 and also assuming that movable cover 72 and closure member 80 are made of sheet material of about the same thickness, suitable spacer means or washers 84 are positioned on flange means 71 and are penetrated by screws 85 (FIG. 10) which serve to secure closure member 80 to casing 30. The screws 85 may be threaded into suitable holes in the flange means 71 or, if desired, some or all of the screws 85 may extend through flange means 71 and be embedded in flooring 22 for securing casing 30 in the desired position in floor opening 70.

Flange means 71 may be about 1/16" thick, so that the upper surface of casing 30 is substantially flush with the upper surface of flooring 22. To accommodate movable cover 72 and spacer means 84 (FIG. 10) the upper surface of closure member 80 need only project about 3/16" to 1/4" above the upper surface of flooring 22. Thus, if carpeting 24 surrounds the closure member 80 (see FIG. 6), the upper surfaces of the carpeting 24 and closure member 80 may be substantially flush with each other.

Vacuum cleaner unit 30 is provided with a main hose-receiving outlet receptacle of the "plug-in" type broadly designated at 90 and which is adapted to receive therein the foot end of a flexible suction hose 91 to be later described. When not in use, the main outlet receptacle 90 is substantially flush with the upper surface of closure member 80 while being telescopically communicatively connected to the substantially vertical tubular portion 53 of suction inlet fitting 52 (FIGS. 4, 5, 6 and 10). Accordingly, main outlet receptacle 90 comprises a substantially rectangular base or plate 93 which fits in a substantially rectangular opening 94 (FIG. 10) in closure member 80 and is provided with upwardly projecting ribs or end flanges 95 along opposing edges thereof. The upper surfaces of flanges 95 are substantially flush with the upper surface of closure member 80 as best shown in FIGS. 4, 6 and 7. A substantially rectangular receptacle closing door 96 is positioned between end flanges 95 and is pivotally connected, as by pivot pins 97, to end flanges 95. Door 96 may be provided with a suitable resilient sealing member or gasket 100 (FIG. 6) for sealingly engaging the upper or hose-receiving end of a tubular member 101 preferably molded integral with and projecting upwardly a relatively short distance from plate 93.

A substantial portion of tubular member 101 extends downwardly from plate 93 and is telescopically positioned in the upwardly projecting portion 53 of inlet fitting 52 when closure member 80 is secured to the upper end of casing 30. In order to secure main outlet receptacle 90 in the opening 94 (FIG. 10) of closure member 80, plate 93 rests upon and is secured to a bracket 103 suitably secured to the lower surface of closure member 80, and through which the lower portion of tubular member 101 loosely extends.

Suction device 43 preferably is electrically operated by a rocker switch 110 which, as best shown in FIG. 7, comprises a movable switch arm 111 having an electrical contact *a* thereon and which may be pivoted intermediate its ends and is moved between open and closed positions relative to a fixed contact *b* by a detent or spring-loaded plunger 112 carried by a rockable switch actuator member 113. Actuator member 113 is pivoted intermediate its ends, at *c*, on the housing of switch 110 and is held in the desired relationship to the upper portion of casing 30 by means of a bracket 114 carried by side wall 33 of casing 30. Conductors 115, 116 of switch 110 establish a low voltage circuit (see FIG. 12) between the secondary winding of a transformer 117 and the coil of an electromagnet relay 120 whenever the contacts *a*, *b* of switch 110 are closed, thus completing a high voltage circuit to suction device 43.

It should be noted that the depth of casing 30 (FIG. 6) is such as to provide sufficient space above motor 43 and its duct 46 to accommodate transformer 117 and relay 120. Transformer 117 and relay 120 are suitably secured upon the horizontal portion of a substantially L-shaped bracket 122 which extends between exterior end wall 31 and partition 36 and is suitably secured to side wall 34 and partition 36. The horizontal portion of L-shaped bracket 122 preferably is positioned immediately above suction device 43 and may have a screw 123 extending therethrough and embedded in the housing of suction device to prevent the same from rotating due to the torque generated thereby during operation.

To ensure that flow of electrical energy to suction device 43 is interrupted when the receptacle door 96 is closed, it will be observed in FIG. 7 that door 96 is provided with a projecting abutment 125 thereon adapted to engage and move the left-hand portion of switch actuator member 113 downwardly as door 96 is moved to closed position. In so doing, if switch 110 is then closed, switch actuator member 113 is pivoted about its axis *c*, thus moving switch arm 111 from closed to open position. When door 96 is opened, the operator then simply moves the right-hand portion of switch actuator member 113 downwardly, pivoting the same in the clockwise direction in FIG. 7 to move switch arm 111 to the closed position and energize suction device 43. Preferably, the upper portion of switch actuator member 113 is of substantially V-shaped configuration so that, when switch 110 is open as in FIG. 7, the left-hand portion of the outer face of actuator member 113 is substantially parallel with the upper surface of closure member 80 and receptacle plate 93. The detent 112 cooperates with switch arm 111 in urging actuator member 113 to either side of dead center with respect to the pivotal axes of switch arm 111 and actuator 113.

It is to be noted that the relationship between the lower surfaces of abutment 125 and sealing member 110 (FIGS. 6 and 7) is such, relative to the protruding upper end of receptacle sleeve or tubular member 101 and the left-hand portion of the upper surface of switch actuator member 113, that gasket 100 may tightly engage the upper end of sleeve 101 when door 96 is closed. Abutment 125 does not have to engage actuator member 113 in order to maintain the same in open position, since it is only necessary for abutment 125 to engage and rock switch actuator member

113 from closed position to beyond dead center position when door 96 is being closed. Detent 112 then will urge switch arm 111 and switch actuator member 113 the remaining distance to ensure that switch 110 is open.

It is important to note that, with the vacuum cleaner unit 25 installed in the floor structure 20 in the manner described and as shown in FIGS. 2, 3, 4, 7 and 8, the lateral tubular inlet leg 55 of inlet fitting 52 is positioned entirely within a distance from the upper surface of casing 30 which is no greater than about the thickness of flooring 22 combined with the vertical width of the floor joists 21 of the floor structure 20 of a mobile home so that the suction conduit 27 for the auxiliary outlet receptacle 26 may be positioned entirely within the confines of the floor joists when auxiliary outlet receptacle 26 is mounted in floor structure 20, as is preferred, and as is shown in FIGS. 1, 2, 8 and 9.

By way of example, it is contemplated that the distance from the bottom of the casing flange means 71 to the lower surface of suction inlet leg 55 may be within about 3¾" to 4", assuming that the outside diameter of lateral inlet leg 55 is about two inches, as is usual. Thus, since the usual thickness of the flooring 22 of a mobile home is at least about ½" to¾", and the standard vertical width of the floor joists of a mobile home is at least about 3⅝" and may be up to 5⅝" or more, it can be appreciated that this provides ample space (about 4⅛" or more) within the confines of the floor joists of a mobile home to accommodate lateral inlet leg 55 and suction conduit 27 therewithin. Although the outside diameter of coupling 63 (FIGS. 8 and 10) may be up to 2¼", its lower surface would not protrude below the level of the lower edges of the floor joists 21.

As indicated earlier herein, it is preferred that the height of the casing end and side walls 31–34 is no more than about 8" so that a vacuum cleaner unit as described may be installed in upper floor structures of conventional home buildings or apartment buildings, which upper floor structures are formed of floor joists having a vertical width, in many instances, of about 7⅝".

Assuming that the floor joists 21 (FIGS. 2 and 3) of the mobile home have a vertical width of about 3⅝", that the flooring 22 is about ½" to ¾" thick, that the underpaneling 23 is about ⅜" thick, and that the exhaust opening 50 in casing end wall 31 is about 2" diameter, such exhaust opening 50 would be positioned entirely below the underpaneling 23 when the vacuum cleaner unit 25 is installed in such floor structure 20, as shown in FIG. 3.

In instances in which vacuum cleaner unit 25 is installed in a mobile home floor structure 20 whose joists 21 have a vertical width such that exhaust opening 50 is located partially or entirely within the confines of the floor joists, suitable means, such as a pipe elbow, not shown, may be connected to casing end wall 31 to divert the exhaust air from opening 50 downwardly beneath underpaneling 23.

AUXILIARY HOSE-RECEIVING SUCTION OUTLET RECEPTACLE

As preferred, the auxiliary hose-receiving outlet receptacle 26 (FIGS. 2, 8 and 9) is shown as being a type similar to that disclosed in my copending application Ser. No. 573,707, now Pat. No. 3,464,859, filed Aug. 19, 1966, and entitled Method and Apparatus for Vacuum Cleaning. Since auxiliary outlet receptacle 26 is designed to facilitate storage of hose 91 in suction conduit 27 when the hose is not in use, it may be termed as a hose-retracting outlet receptacle to distinguish the same from the plug-in type of outlet receptacle embodied in main receptacle 90 of cleaner unit 25. More specifically, the term "plug-in outlet receptacle" is used in this specification and appending claims to mean that the receptacle is adapted for the connection of the foot end of a flexible suction hose thereto, but that the hose would not be stored normally within the conduit or other tubular member to which the receptacle is connected and/or the internal diameter or configuration of the hose-receiving tubular portion of the receptacle is such that only a relatively short length of the foot end of the hose, or the reduced portion of a foot-end adapter thereon, can be accommodated by the receptacle. On the other hand, the term "hose-retracting outlet receptacle" is used in the specification and appending claims to mean that the hose-receiving tubular portion of the receptacle is adapted for passage of substantially the entire length of the suction hose therethrough, with exception of the head-end adapter thereon, and that the associated suction conduit is of such internal cross-sectional configuration and length as to receive and store therein substantially the entire length of the hose.

Auxiliary outlet receptacle 26 comprises a substantially rectangular frame 130 (FIGS. 8 and 9) defining a web or face plate *d* which fits in a substantially rectangular opening 131 in the flooring 22. Frame 130 has a pair of outwardly extending tabs 132 on the lower portion thereof which engage and are suitably secured to the lower surface of flooring 22. A receptacle door 132 hingedly connected to frame 130 has a manually releasable latch 133 thereon engageable with a suitable projection on the inner surface of the upper portion of frame 130 for releasably locking the door in closed position.

Also secured to web *d* is a short tubular hose-receiving member 134 which extends downwardly at a relatively steep angle and terminates beneath the flooring 22 within the basement area defined by the joists 21 of the mobile home. Tubular member 134 may be connected to suction conduit 27 by a flexible sleeve 135 having an internal diameter about the same of that of suction conduit 27. A gasket 136, preferably in the form of a sponge rubber plate or the like, is adhesively or otherwise secured on door 132 so as to engage the open upper end of tubular member 134 and seal the same against the passage of air therethrough when door 132 occupies closed position and auxiliary receptacle 26 is not in use.

A hand-operated flexible suction hose 91 is shown occupying stored position within suction conduit 27 in FIG. 8. The operating or head end of the body of suction hose 91 is provided with an enlarged tubular head-end adapter 141 thereon adapted to receive various cleaning implements, such as the floor sweeper generally designated at 142 in FIG. 2. The lower end of tubular member 134 is provided with an internal annular abutment 144 thereon whose internal diameter is less than the external diameter of head-end adapter 141 but greater than the external diameter of the body of flexible hose 91 so that, when the head-end adapted 141 is loosely positioned within tubular member 134 of receptacle 26 as shown in FIG. 8, the head-end adapter 141 will engage and be restrained from further inward movement by annular abutment 144 when the flexible hose occupies fully retracted or stored position within suction conduit 27.

The foot end of the body of flexible hose 91 is provided with an annular resilient seal or piston 146 thereon which is adapted to engage the inner peripheral surface of suction conduit 27 so that, by closing the tubular head-end adapter 141 with the suction device in operation, suction hose 91 may be drawn into suction conduit 27 by suction. Also, when receptacle cover 132 is opened and the suction hose 91 is partially withdrawn from suction conduit 27 and sleeve 135 as shown in FIG. 2, piston 146 prevents passage of air between hose 91 and the inner surface of suction conduit 27 and/or flexible sleeve 135. Further, the abutment 144 may serve to inhibit retraction of hose 91 by suction when hose 91 is being used as a consequence of engagement of piston 146 with annular abutment 144. In order that hose 91 may be stored in conduit 27 and also may be used at the main outlet receptacle 90 of vacuum cleaner unit 25, the piston 146 is collapsible or

sufficiently yieldable so that the operator may readily force the same past annular abutment **144**.

From the foregoing description, it is apparent that the external diameter of the body of flexible hose **91** is necessarily substantially less than the external diameter of the head-end adapter **141** thereof. Thus, since main outlet receptacle **90** is of the plug-in type, tubular member **101** is of lesser internal diameter than the internal diameter of the tubular member **134** of auxiliary receptacle **26** and the internal diameter of suction conduit **27**. Therefore, the foot end of the body of suction hose **91** has a tubular plug-in foot-end adapter **150** adhesively or otherwise secured thereon, made from rigid material such as plastic, and which is provided with a reduced free end portion **151** thereon adapted to fit in the tubular member **101** of main outlet receptacle **90** as shown in FIG. 6. The body of tubular adapter **150** is of lesser external diameter than the internal diameter of the annular abutment **144** in the tubular member **134** of auxiliary receptacle **26** so that it may readily pass through the annular abutment **140**. Additionally, the shoulder, formed at the juncture of the body of foot-end adapter **150** with its reduced portion **151**, engages the free upper end of the tubular member **101** of main receptacle **90**, as shown in FIG. 6, to limit the extent to which the reduced portion **151** of foot-end adapter **150** may be inserted into tubular member **101** of main receptacle **90**. A resilient sealing ring **152** may be provided around the reduced portion **151** of foot-end adapter **150** so as to frictionally hold the adapter **150** in engagement with tubular member **101** of main outlet receptacle **90** and to also provide an air seal between tubular member **101** and the reduced portion **151** of foot-end adapter **150**. If so desired, piston **146** may be secured about the periphery of the body of foot-end adapter **150** as shown in FIG. 8.

The auxiliary outlet receptacle **26** is also provided with a switch which may be operated manually for controlling suction device **43**, and which switch will be opened automatically whenever the cover **132** of auxiliary receptacle **26** is moved from open to closed position. As best shown in FIGS. 9 and 11, the switch associated with auxiliary receptacle **26** is indicated at **160** and the housing thereof is suitably secured to the lower surface of web *d*. The housing of switch **160** contains a movable switch arm **161** having an upwardly projection portion **162** thereon which loosely penetrates web *d* and has an actuator **163** suitably secured thereto. Actuator **163** is provided with opposing downwardly diverging surfaces **165** which may be grasped by an operator for moving switch actuator **163** between the open position shown in FIG. 11 and a closed position to the right of the position in which it is shown in FIG. 11. Additionally, the lower or inner surface of cover **132** is provided with a downwardly projecting substantially V-shaped cam **167** which may be formed integral with cover **132**.

Cam **167** is so positioned that, in the event that switch actuator **163** occupies closed position when the cover **132** is being moved from open to closed position, cam **167** engages the left-hand angularly disposed surface **165** of actuator **163** in FIG. 11 and thus cams the actuator **163** to open position to interrupt the flow of electrical energy to electric suction device **43**. It will be observed in FIG. 12 that opposed sides of switch **160** have conductors or electric wires **170**, **171** extending therefrom which are arranged in the circuit of FIG. 12 so as to energize the coil of relay **120** whenever switch **160** is moved to closed position and to interrupt the flow of electrical energy to the coil of relay **120** whenever switch **160** is moved to open position. Switches **110**, **160** are arranged in parallel circuit so that, when either of these switches occupies an open position, the other switch, if closed, will complete a circuit to electric motor **43**. Since the doors **100**, **132** of the outlet receptacles **90**, **26** must be closed whenever the corresponding receptacles are not being used, in order to ensure efficient flow of air into either of the receptacles which may subsequently be placed into use, it is unlikely that both of the switches **110**, **160** would be closed at the same time.

By locating the main and auxiliary outlet receptacles **90**, **26** a distance inwardly from the respective end walls of a mobile home which is about equal to ¼ of the total length of the mobile home, is thus seen that a single suction hose **91** which may have a length of about ⅓ of the total length of the mobile home, may be used to clean the entire interior of the mobile home by utilizing the single hose interchangeably at the two receptacles **90**, **26**. For example, in a standard mobile home having a length of about 60 feet and a width of about 12 feet, by positioning the receptacles **26**, **90** approximately 15 feet inwardly from the respective end walls W2, W1 of the mobile home as shown in FIG. 1, the distance between receptacles **26**, **90** then would be approximately 30 feet. It follows that a standard length hose **91** about 20 feet long would serve to clean the entire interior of the mobile home and may be readily stored within the suction conduit **27**, as shown in FIG. 8, when the suction hose is not being used.

SECOND EMBODIMENT OF VACUUM CLEANER UNIT

The first embodiment of the vacuum cleaner unit **25** shown in FIGS. 1–12 embodies a substantially rectangular casing **30** which is designed to be fabricated from sheet metal or other rigid sheet material without the necessity of utilizing special forming dies not used in many sheet metal fabricating plants. The second form of vacuum cleaner unit, broadly designated at **25***a*, is shown in FIGS. 13–17 to illustrate a preferred embodiment of a substantially rectangular casing **30***a* of molded plastic construction with its upper closure member **80***a* and its vacuum compartment door **72***a* recessed into the casing so that they may be substantially flush with the upper surface of the flange means **81***a* of the casing, instead of having the upper closure member and vacuum compartment door overlie the casing as in the first embodiment of the vacuum cleaner unit.

With the exception of the molded construction of the casing **30***a* of FIGS. 13 and 14, the second embodiment of the vacuum cleaner unit may be substantially the same as the first embodiment shown in FIGS. 1–12. Accordingly, many of the elements shown in FIGS. 1–12 are omitted from the embodiment of FIGS. 13 and 14, for purposes of clarity only and to avoid unnecessary duplication of the drawings. Further, those parts of the second embodiment of the vacuum cleaner unit **25***a* shown in FIGS. 13 and 14 which are similar to parts of the first embodiment shown in FIGS. 1–13 will bear the same reference characters with the letter *a* added thereto, where applicable, to avoid repetitive description.

It will be observed in FIGS. 13 and 14 that the vertical walls **31***a*–**34***a* of casing **30***a* are molded integral with each other and the peripheral flange means **71***a* is molded integral with the vertical walls **31***a*–**34***a*. The upper surface of flange means **71***a* has a substantially rectangular recess **180** formed in the inner portion thereof for receiving therein the closure member **80***a* and the movable cover **72***a*. The depth of recess **180** is such that the upper surfaces of closure member **80***a* and cover **72***a* are substantially flush with the upper surface of flange means **71***a* when the movable cover **72***a* occupies closed position.

It will be noted that the hinge **73***a* of FIG. 13 serves to pivotally connect movable cover **72***a* directly to closure member **80***a*, and the sealing member **77***a* (FIG. 14) is preferably recessed into the cover **72***a* so as to sealingly engage the bottom of recess **180** with the upper surface of cover **72***a* substantially flush with the upper surface of flange means **71***a* when cover **72***a* occupies closed position as shown in FIG. 14. The four inside corners of power compartment **40***a* of casing **30***a*, may be provided with vertically extending reinforcing ribs or corner posts

181 molded integral therewith, with the upper ends thereof terminating substantially in the same horizontal plane as the bottom of recess 180, for receiving the screws 83*a* to secure upper closure member 80*a* to the upper portion of casing 30*a* in overlying relationship to power compartment 40*a*.

Referring to FIGS. 15 and 16, the second embodiment of the vacuum cleaner unit 25*a* is shown mounted in a second or upper floor structure 182 of a typical multi-story building such as, for example, an apartment building, and wherein the exhaust air stream from the power unit or suction device 43*a* of FIG. 13 is exhausted into the atmosphere exteriorly of the building. It should be noted that the compact construction of vacuum cleaner unit 25*a* (which is also the case with respect to vacuum cleaner unit 25) is such that the vertical depth of casing 30*a* need not exceed about eight inch so that, with the exception of flange means 71*a*, casing 30*a* is positioned entirely within the confines of the floor structure 182; including the flooring 183, the floor joists 184 and the underpaneling 185, even though the floor joists 184 may be in the form of so-called 2" x 8" timbers having an actual vertical width of about 7⅝ inches. Since it is unlikely that the flooring 183 of a typical building would ever be less than ½ inch thick, and such flooring usually includes a rough flooring or sub-flooring about ½ to ¾ inch thick as well as a finished flooring of about ½ to ¾ inch thick, it follows that the lower surface of casing 30*a* does not protrude below the level of the bottom edges of floor joists 184 and therefore, does not interrupt the underpaneling 185 forming the ceiling of the room therebelow.

The second form of vacuum cleaner unit 25*a* differs also from vacuum cleaner unit 25 in that an exhaust conduit 187 is connected to the lower portion of end wall 31*a* (FIG. 13) for communication with the exhaust side of suction device 43*a*. As shown in FIG. 15, exhaust conduit 187 extends between floor joists 184 and through one exterior wall 190 of a typical multi-story building in FIG. 15, thus exhausting the air from the exhaust side of vacuum cleaner unit 26*a* exteriorly of the building of FIG. 15.

FIG. 15 illustrates that the vacuum cleaner unit 25*a* may be conveniently mounted in the upper floor structure 182 within a clothes closet 195, and the flexible suction hose 91*a*, when connected to cleaner unit 25*a*, may be extended through a doorway of the closet for cleaning adjacent areas. FIG. 15 also illustrates that an auxiliary hose-receiving outlet receptacle 26*a* may be mounted in the flooring 183 of floor structure 182 a substantial distance away from vacuum cleaner unit 25*a*, with a suction conduit 27*a* extending between the flooring 183 and the underpaneling 185 of floor structure 182 from the auxiliary hose-receiving receptacle 26*a* to the inlet side of vacuum cleaner unit 25*a*. Auxiliary outlet receptacle 26*a* may be constructed and mounted in the flooring 183 of floor structure 182 in substantially the same manner as that described with respect to auxiliary receptacle 26 (FIGS. 1, 8 and 9), accordingly, a further description thereof is deemed unnecessary.

The building shown in FIG. 15 also includes a first floor structure broadly designated at 200, including flooring 201 secured upon floor joists 202, which are supported on a sill structure 203 mounted on a foundation wall 204 defining a crawl space or basement area beneath first floor joists 202. Floor joists 202 are shown as being of greater vertical width than the upper-floor structure joists 184, as is usual. A vacuum cleaner unit 26*b* which may be of substantially the same structure as either of the vacuum cleaner units 25 or 25*a*, is mounted in a suitable opening in the flooring 201 and has a suction conduit 27*b* leading from the inlet side thereof between adjacent first floor joists 202. The end of suction conduit 27*b* remote from vacuum cleaner unit 25*b* includes a flexible conduit section 135*b* which extends upwardly through flooring 201 and within a partition 206 spaced a substantial distance from vacuum cleaner unit 25*b*. One wall of partition 206 has an auxiliary hose-receiving outlet receptacle 26*b* mounted therein in substantially the same manner as that in which receptacles 26, 26*a* are mounted in the flooring, and the flexible conduit section 135*b* serves to connect the auxiliary receptacle 26*b* to the corresponding end of suction conduit 27*b*. FIGS. 15 and 17 particularly illustrate how the exhaust air from the vacuum cleaner unit 25*b* may be exhausted through the opening 50*b* in the casing 30*b* of unit 25*b* directly between the joists 202 and into the crawl space or basement area therebeneath. Since the vacuum cleaner unit 25*b* may be mounted, constructed, and operated in the same manner as that described with respect to either of the vacuum cleaner units 25 or 25*a*, a further detailed description thereof is deemed unnecessary.

It is thus seen that I have provided an improved economical vacuum cleaning system which may be readily permanently installed in mobile homes and conventional residential buildings and wherein the self-contained vacuum cleaner unit is so constructed as to present very little obstruction above the flooring surface when installed in a floor opening of a mobile home or conventional building. Also, each air inlet fitting 52, 52*a* is so positioned in the respective casing that the air inlet defined thereby is entirely within the confines of the joists of the floor structure of a mobile home or a conventional home, so that stationary suction conduits connected thereto also may be largely if not entirely positioned within the confines of such joists.

As shown in FIG. 8, the flexible suction hose 91 is normally stored within suction conduit 27 with the head-end adapter 141 within auxiliary receptacle 26. In use of the vacuum cleaning system, with particular references to the first embodiment thereof in FIGS. 1–12, the operator opens the door 132 of receptacle 26 and then grasps the head-end adapter 141 and withdraws the desired length of flexible suction hose 91 from suction conduit 27. The operator then manually closes switch 163 (FIGS. 9, 11 and 12) to energize suction device 43 (FIGS. 4, 5, 6 and 10) of vacuum cleaner unit 25 and, after connecting the desired implement 142 (FIG. 2) to head-end adapter 141, the operator then cleans the desired area adjacent auxiliary receptacle 26.

As heretofore stated, the location of auxiliary receptacle 26 and the length of suction hose 91 are such that areas of the mobile home may be cleaned from its rear end wall W2 to about the center of the mobile home. Thereafter, the suction hose 91 may again be stored within the suction conduit 27. Alternatively, the suction hose 91 then may be fully withdrawn from suction conduit 27 through receptacle 26, after which the door 132 of auxiliary receptacle 26 is closed to seal the tubular member 134 of receptacle 26 against the flow of air therethrough and to thereby move the switch actuator 163 of switch 160 to open position, in the manner heretofore described.

The operator then opens the door 96 of main outlet receptacle 90 and plugs the reduced end 151 of the foot-end adapter 150 on hose 91 into tubular member 101 of main receptacle 90 as shown in FIG. 6. Thereupon, switch actuator 113 is moved manually to closed position to again energize suction device 43, whereupon areas of the mobile home from its front end wall W1 to about the center of the mobile home may be cleaned. Upon completion of cleaning, suction hose 91 is disconnected from main receptacle 90 and the door 96 thereof is then closed to seal the open upper end of the tubular member 101 of receptacle 90 against the passage of air therethrough. At the same time, abutment 125 on door 96 engages and moves switch actuator 113 to open position, thus de-energizing suction device 43. The implement 142 is then removed from the suction hose 91 and the suction hose 91 is inserted in the suction conduit 27 through the auxiliary receptacle 26. If so desired, suction device 43 may be energized by the manual operation of switch actuator

163 of receptacle 26 so that the suction current generated thereby may aid in retracting suction hose 91 into stored position within suction conduit 27 as shown in FIG. 8. Thereupon, door 132 of auxiliary receptacle 26 is closed to de-energize suction device 43 and to seal the tubular member 134 against passage of air therethrough to complete the operation.

If desired, a separate suction hose may be provided for connection to the main outlet receptacle 90, in addition to suction hose 91, in which instance suction hose 91 may be used only at the auxiliary receptacle 26. While this is not desirable in view of the necessity for storage of the additional hose, it is within the scope of the instant invention. Also, the foot-end adapter 150 may be removably secured to the corresponding end of hose 91, in which case it need not be of such dimensions as to fit within auxiliary receptacle 26 and suction conduit 27, just so long as it is capable of being attached to the main outlet receptacle and serves to connect the suction hose to the main outlet receptacle 90. As disclosed in my copending application Ser. No. 788,376, filed of even date, and entitled Vacuum Cleaning System With Hose Plug-In and Hose Retracting Outlets, either or both the piston and the plug-in adapter may be detachably connected to the foot end of the suction hose, as desired.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A vacuum cleaner unit adapted to be mounted in a substantially horizontal position in a floor opening in a building, said unit comprising a substantially rectangular casing having a bottom wall, opposing side walls and opposing end walls, said side and end walls being adapted to occupy substantially vertical positions, a substantially vertical partition extending between said opposing side walls and dividing said casing into a vacuum compartment and a power compartment, a suction device mounted in said power compartment closely adjacent said bottom wall thereof, one of said walls having an air exhaust opening therethrough communicating with the exhaust side of said suction device and with said power compartment, said suction device having a suction inlet communicating with said vacuum compartment through an opening in a lower portion of said partition, flange means on the upper portions of said side and end walls adapted to overlie the floor to support said casing in the floor opening, closure means overlying said power compartment, a tubular hose-receiving receptacle mounted in said closure means and extending into said power compartment, tubular fitting means within said power compartment and communicatively connected to said receptacle, said tubular fitting means being connected to said partition for communication with said vacuum compartment at a location spaced substantially above the opening through which said suction inlet of said suction device communicates with said vacuum compartment, and separator means in said vacuum compartment operable to entrap dust and the like sucked thereinto through said tubular fitting means by said suction device.

2. A vacuum cleaner unit according to claim 1, wherein that end wall of said casing defining said power compartment is provided with a passage therethrough spaced substantially above said exhaust opening and substantially aligned with the location at which said tubular fitting means is connected to said partition, and conduit means communicating with said tubular fitting means through said passage.

3. A vacuum cleaner unit according to claim 1 wherein said suction device is of arcuate convex external configuration at least along the upper portion thereof, said tubular fitting means including an elongate substantially horizontally disposed tube extending from said partition and having means connecting the same to said receptacle, and there being a substantial lower portion of said tube positioned within the space between the convex external configuration of said suction device and one adjacent side wall of said casing.

4. A vacuum cleaner unit according to claim 1 in which said hose-receiving receptacle comprises a substantially vertical tubular hose-receiving member having its lower end connected to said tubular fitting means, a receptacle plate secured to an upper portion of said tubular hose-receiving member, a door carried by and adapted to overlie and close said tubular hose-receiving member, said closure means having a recess therein accommodating said receptacle plate, and means supporting said receptacle plate in said recess with said door substantially flush with the upper surface of said closure means when said door is closed.

5. A vacuum cleaner unit installable in a floor structure opening in a building and comprising a substantially rectangular casing having a vacuum compartment and a power compartment position in side-by-side relationship and both being open at their upper ends, a suction device within said power compartment and having a suction side and an exhaust side and wherein said suction side communicates with said vacuum compartment, said casing having an exhaust opening in a lower portion thereof communicating with the exhaust side of said suction device, a movable cover overlying said vacuum compartment, closure means having a hose-receiving receptacle therein and overlying said power compartment, a tubular fitting means in an upper portion of said power compartment communicatively connecting said receptacle to said vacuum compartment, said fitting means being spaced above said exhaust opening in said casing, separator means in said vacuum compartment operable to entrap dust and the like sucked into said vacuum compartment through said tubular fitting means by said suction device, said casing being adapted to occupy a substantially horizontal position in the floor opening, and said tubular fitting means having a substantially horizontal tubular portion extending outwardly from said casing and located entirely within a distance of about 4 inches from the upper surface of said casing so that the tubular portion may be positioned within the confines of flooring and floor joists having a combined vertical width of about 4 inches with the upper surfaces of the casing and flooring substantially flush with each other.

6. A vacuum cleaner unit installable in a floor structure opening in a building and comprising a substantially rectangular casing having a vacuum compartment and a power compartment positioned in side-by-side relationship and both being open at their upper ends, a suction device within said power compartment and having a suction side and an exhaust side and wherein said suction side communicates with said vacuum compartment, said casing having an exhaust opening in a lower portion thereof communicating with the exhaust side of said suction device, a movable cover overlying said vacuum compartment, closure means having a hose-receiving receptacle therein and overlying said power compartment, a tubular fitting means in an upper portion of said power compartment communicatively connecting said receptacle to said vacuum compartment, said fitting means being spaced above said exhaust opening in said casing, and separator means in said vacuum compartment operable to entrap dust and the like sucked into said vacuum compartment through said tubular fitting means by said suction device.

7. A vacuum cleaner unit positioned largely within a floor structure of a building, wherein the floor structure includes spaced joists and flooring secured upon said joists and having an opening therethrough accommodating said cleaner unit, said cleaner unit comprising a sub-

stantially rectangular casing having a bottom wall and substantially vertical opposing side walls and opposing end walls extending through said floor opening, flange means on upper portions of said vertical walls overlying said flooring about the perimeter of said floor opening for supporting said casing in said floor opening, a substantially vertical partition extending between said opposing side walls and dividing said casing into a vacuum compartment and a power compartment, a suction device mounted in said power compartment closely adjacent said bottom wall thereof, one of said walls having an air exhaust opening therethrough communicating with the exhaust side of said suction device and with said power compartment, said suction device having a suction inlet communicating with said vacuum compartment, closure means overlying said compartments, a hose-receiving outlet receptacle mounted in said closure means and extending into said power compartment, a substantially T-shaped hollow connecting means having a pair of laterally substantially horizontal legs and a substantially vertical leg positioned within said power compartment substantially above the level of said air exhaust opening, one of said horizontal legs being connected to said partition and communicating with said vacuum compartment, said hose-receiving outlet receptacle including a tube communicatively connected to said vertical leg of said hollow connecting means, that end wall of said casing defining said power compartment having a passage therethrough aligned with the other horizontal leg of said T-shaped connecting means for connection of one end of a suction conduit thereto above the level of said exhaust opening, and separator means in said vacuum compartment operable to entrap dust and the like sucked thereinto through said tubular fitting means by said suction device.

8. A vacuum cleaning system installed in a building wherein the building includes a floor structure comprising flooring and joists supporting said flooring, and said flooring being provided with a floor opening therein, a vacuum cleaner unit mounted in said floor opening and including a casing whose upper surface is positioned substantially flush with the upper surface of the flooring, said casing having a power compartment and a vacuum compartment disposed in side-by-side relationship, a suction device mounted in a lower portion of said power compartment and having a suction inlet communicating with said vacuum compartment and an exhaust outlet communicating with an exhaust opening in an exterior wall of said casing, a tubular fitting means mounted in an upper portion of said power compartment and communicating with said vacuum compartment, said tubular fitting means also communictaing with an air inlet opening in an exterior wall of said casing, closure means defining an upper wall of said casing, a tubular hose-receiving outlet receptacle carried by said casing and communicating with the atmosphere above said closure means and also communicating with a medial portion of said tubular fitting means, said air inlet opening being located above the level of said exhaust opening and within the horizontal plane of said joists, an auxiliary tubular hose-receiving outlet receptacle mounted in said building at a location remote from said vacuum cleaner unit, and a suction conduit largely extending within the horizontal plane of said joists and having one of its ends communicatively connected to said auxiliary outlet receptacle and its other end communicatively connected to said tubular fitting means through said inlet opening.

9. A vacuum cleaning system according to claim **8** wherein said exhaust opening is located below the level of said joists.

10. A vacuum cleaning system according to claim **8** wherein the lower extremity of said vacuum cleaner unit is positioned in a horizontal plane no lower than that of the lower surfaces of said joists, and an exhaust conduit connected to said exhaust opening and extending entirely within the horizontal plane of said joists and through an exterior wall of said building for exhausting air from said vacuum cleaner unit into the atmosphere exteriorly of the building.

11. A vacuum cleaning system according to claim **8** wherein the building is of predetermined length and is provided with exterior opposing end walls, said vacuum cleaner unit being positioned inwardly from one of said exterior end walls of the building a predetermined distance about one-fourth of that distance between the said exterior end walls, said auxiliary tubular hose-receiving outlet receptacle being positioned approximately the same distance from the other of said exterior end walls as said predetermined distance, a flexible suction hose connectable selectively to each of said tubular hose-receiving outlet receptacles and being of a length at least equal to the distance from each hose-receiving receptacle to the adjacent exterior end wall of said building whereby the entire floor space between the two hose-receiving receptacles and between each receptacle and the adjacent exterior end wall may readily be cleaned.

12. A vacuum cleaning system according to claim **11** wherein the relative sizes of said suction hose and said suction conduit are such that said suction hose may be telescopically received in and substantially entirely stored within said suction conduit when the vacuum cleaning system is not in use.

13. A vacuum cleaning system according to claim **11** wherein said hose-receiving outlet receptacles are of substantially circular internal cross-section with said auxiliary tubular hose-receiving receptacle having a greater internal diameter than the external diameter of said suction hose and also wherein the internal diameter of said first-named tubular hose-receiving outlet receptacle is substantially less than the internal diameter of said auxiliary receptacle, a resilient sealing member fixed to and encircling said hose adjacent one end thereof and being engageable with the inner peripheral surface of said auxiliary outlet receptacle and also being engageable with the inner surface of said suction conduit when the corresponding end of the hose is positioned within said suction conduit, and a substantially rigid tubular adapter fixed to and projecting from the latter end of said suction hose and having a portion thereon of reduced external diameter which fits within said first-named tubular hose-receiving outlet receptacle during use of said suction hose for cleaning areas adjacent said vacuum cleaner unit.

14. A vacuum cleaning system according to claim **8**, wherein said air inlet opening and at least said other end of said suction conduit are positioned entirely within about 4 inches of the upper surface of said casing facilitating said location of said air inlet opening within the horizontal plane of said joists.

15. A vacuum cleaning system according to claim **8**, wherein said casing has a vertical depth of no more than about 8 inches and wherein the vertical width of said joists is at least about 7⅝ inches and the flooring is at least about ½ inch thick whereby the lower extremity of said casing does not project below the lower extremities of said joists.

16. A vacuum cleaner unit installable in a floor structure opening in a building and comprising a substantially rectangular casing having a vacuum compartment and a power compartment positioned in side-by-side relationship and both being open at their upper ends, a suction device within said power compartment and having a suction side and an exhaust side and wherein said suction side communicates with said vacuum compartment, said casing having an exhaust opening in a lower portion thereof communicating with the exhaust side of said suction device, a movable cover overlying said vacuum compartment, closure means having a hose-receiving receptacle therein and overlying said power compartment, a tubular fitting means in an upper portion of said power compartment communicatively connecting said receptacle to said vacuum compartment, said tubular fitting means including

an inlet leg extending through an opening in the casing adjacent said exhaust opening, and separator means in said vacuum compartment operable to entrap dust and the like sucked into said vacuum compartment through said tubular fitting means by said suction device.

17. A vacuum cleaner unit adapted to be removably mounted in an opening in a building wall and comprising a casing divided into a vacuum compartment and a power compartment, a suction device mounted in said power compartment and having a suction side communicating with said vacuum compartment and an exhaust discharging exteriorly of the casing, a suction inlet fitting in said power compartment communicating with said vacuum compartment, said suction inlet fitting having an inlet leg, said inlet leg and said exhaust positioned in a common end of said casing remote from the vacuum compartment, and a hose-receiving receptacle on said vacuum cleaner unit and communicatively connected to said inlet fitting intermediate the ends thereof.

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PETER FELDMAN, Primary Examiner

U.S. Cl. X.R.

15—327

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,568,240 Dated March 9, 1971

Inventor(s) J. C. Hamrick

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, Line 4, change "JL Products Incorporated" to --Jet Line Products Incorporated--. Column 11, Line 17, change "inch" to --inches--. CLAIM 8, Column 15, Line 51, change "communictaing" to --communicating--

Signed and sealed this 2nd day of November 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents