United States Patent [19]

Williams

[11] **3,824,771**

[45] **July 23, 1974**

[54] **GAS AND PARTICULATE SOLID MATERIAL SEPARATING AND SOLID MATERIAL DISCHARGING APPARATUS**

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[73] Assignee: **Central Texas Iron Works, Inc.**, Waco, Tex.

[22] Filed: **May 22, 1973**

[21] Appl. No.: **362,685**

Related U.S. Application Data

[62] Division of Ser. No. 193,514, Oct. 28, 1971, Pat. No. 3,755,851.

[52] **U.S. Cl.** **55/429**, 15/340, 55/447

[51] **Int. Cl.** **B01d 50/00**

[58] **Field of Search** 55/337, 429, 432, 459, 55/447; 15/340

[56] **References Cited**

UNITED STATES PATENTS

3,541,631	11/1970	Kluge et al	55/432
3,545,181	12/1970	Young	55/432
3,755,851	9/1973	Williams	55/429

FOREIGN PATENTS OR APPLICATIONS

232,087	1/1961	Australia	15/340
474,627	8/1969	Switzerland	15/340

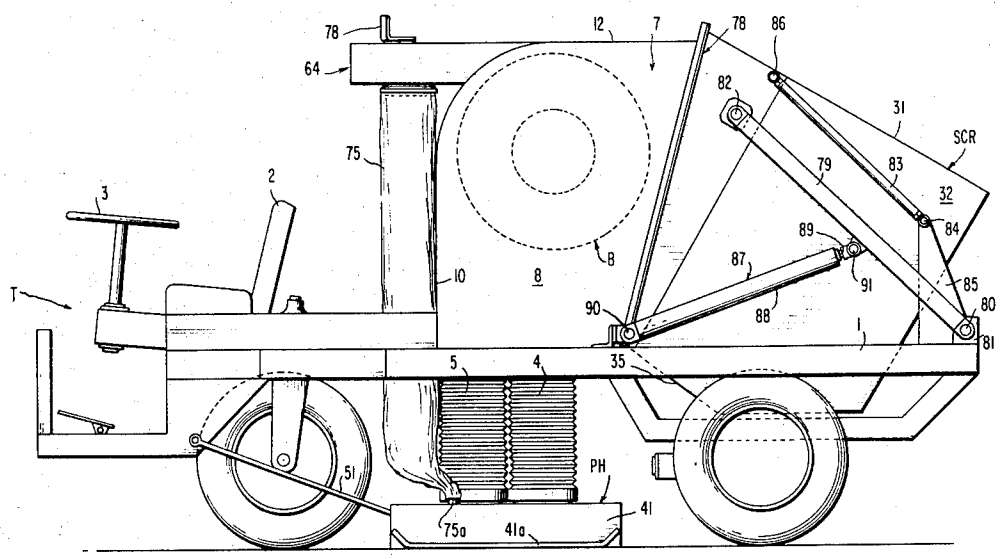
Primary Examiner—Bernard Nozick

Attorney, Agent, or Firm—Baldwin, Wight & Brown

[57] **ABSTRACT**

Apparatus for separating particulate solid material from a stream of gas, such as air, entraining such material includes a blower, a solids collection receptacle, ducting connected to the blower and to the receptacle and communicating with a source of gas with entrained particulate solid material, the blower, receptacle and ducting providing a substantially closed system in which gas is recirculated, the solid material being separated from the circulating gas and deposited in the collection receptacle. A portion of the circulating gas, usually not exceeding 30 percent by volume, is bled from the circulatory system and discharged to maintain the average pressure in the circulating system at a desired low value so as to prevent leakage blow-out of gas and entrained dust or fine solids. Means for bleeding gas off from the system is situated within structure housing the blower and a separation chamber. The solids collecting receptacle is mounted so as to be bodily movable away from the blower and ducting housing structure and so as to respond to such bodily movement by tipping to dump accumulated solids. The gas cleaning apparatus is disclosed in connection with mobile surface sweeping equipment including a pick-up head having means for regulating the flow of air from a pressure chamber against the surface being cleaned and into a suction chamber in the pick-up head.

8 Claims, 15 Drawing Figures



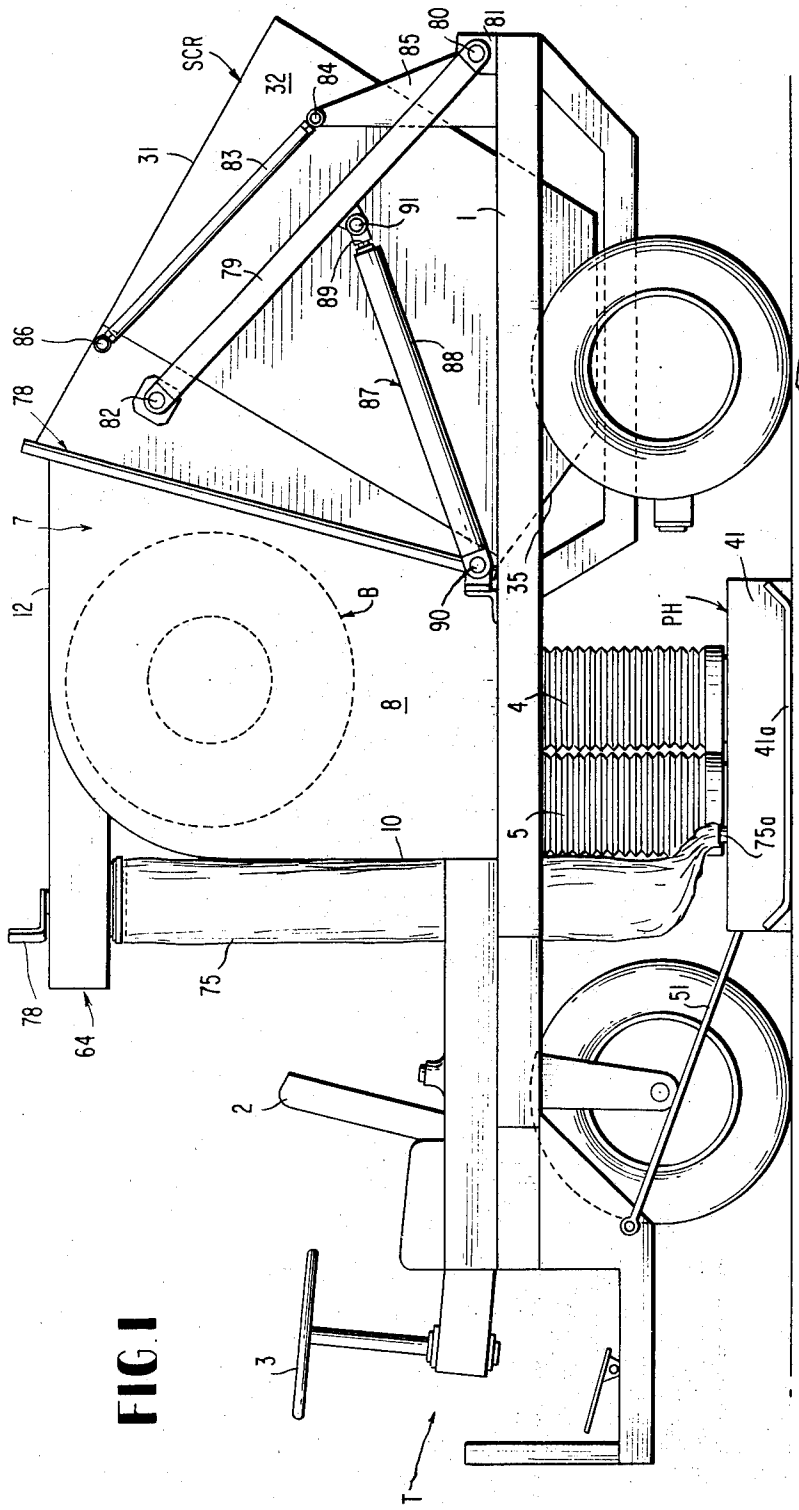


FIG. 1

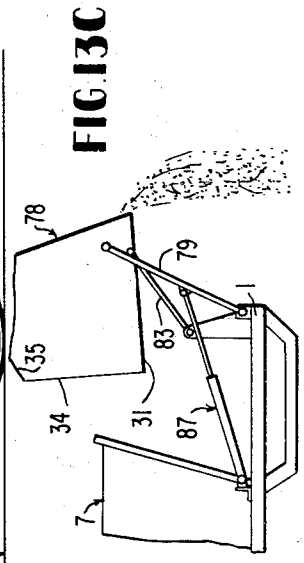


FIG. 13C

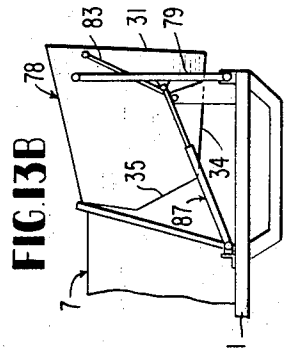


FIG. 13B

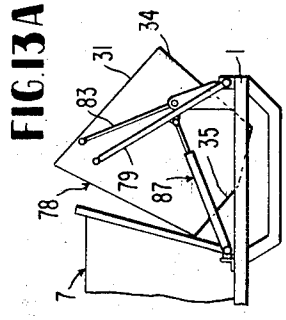


FIG. 13A

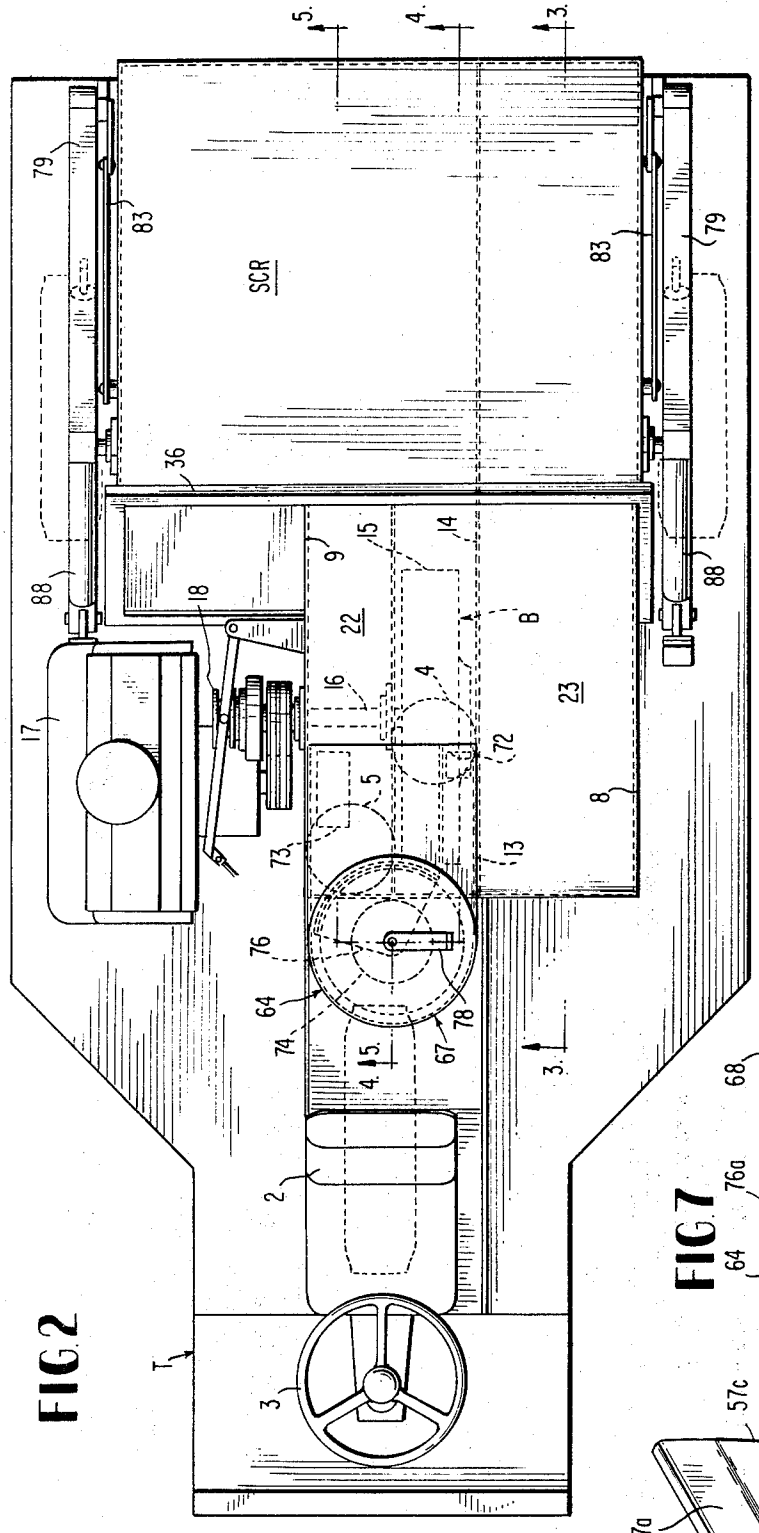


FIG 2

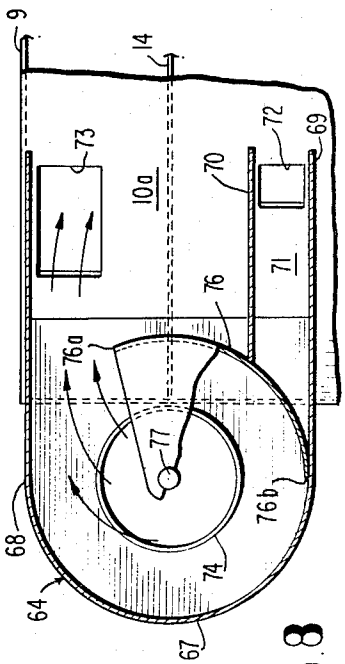


FIG 8

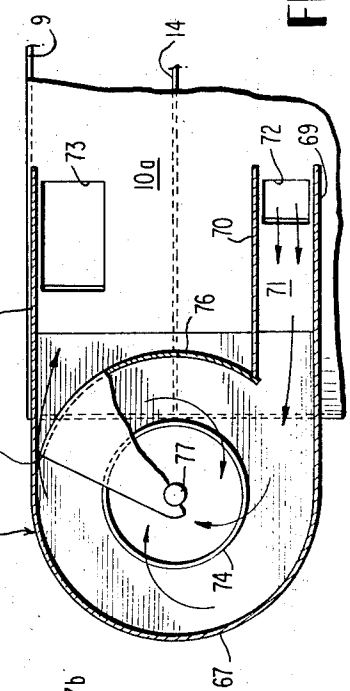


FIG 7

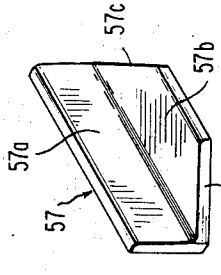


FIG 12

FIG. 3

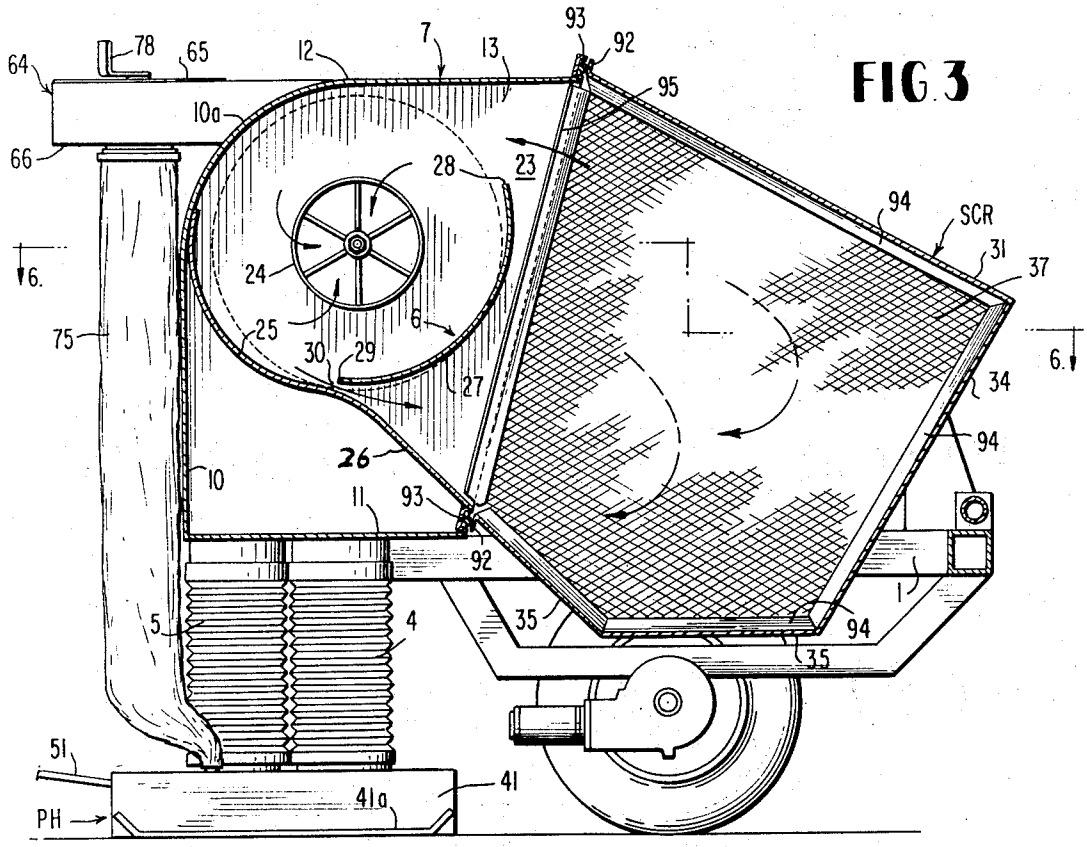
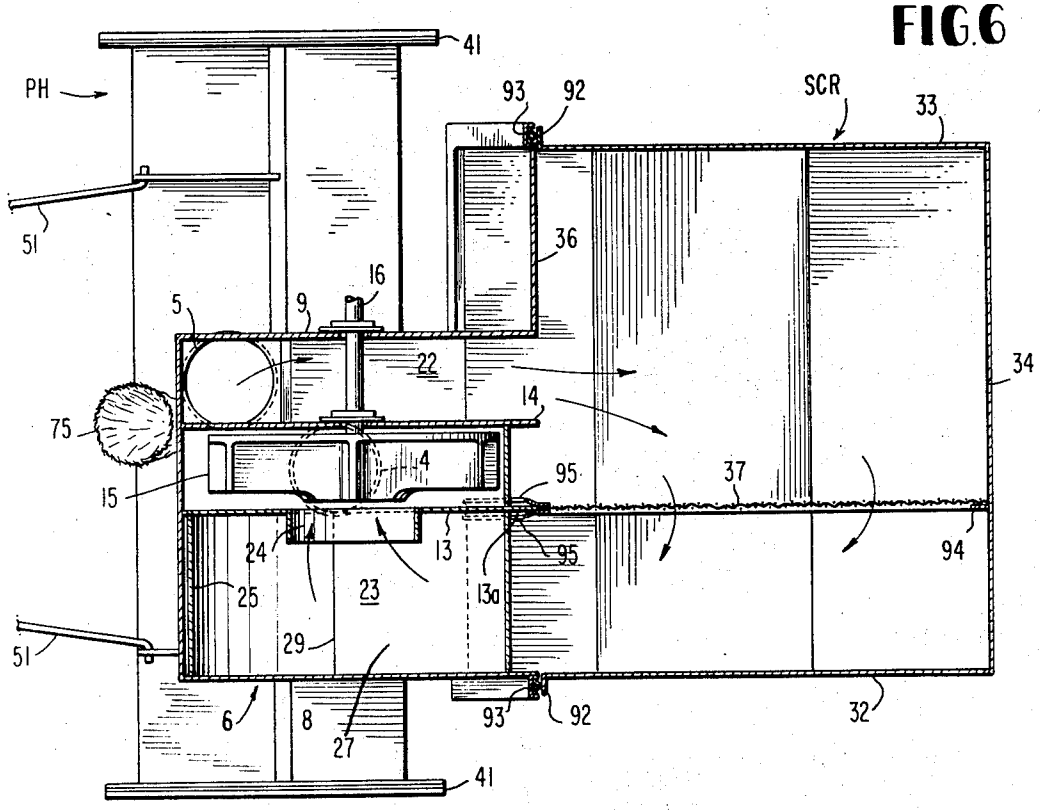

64
78
65
12
7
13
93
92
95
10a
66
28
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94
SCR
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37
6.
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75
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30
29
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6.
34
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92
1
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4
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94
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51
41
41a
PH

FIG. 6


41
PH
93
92
SCR
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51
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16
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9
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75
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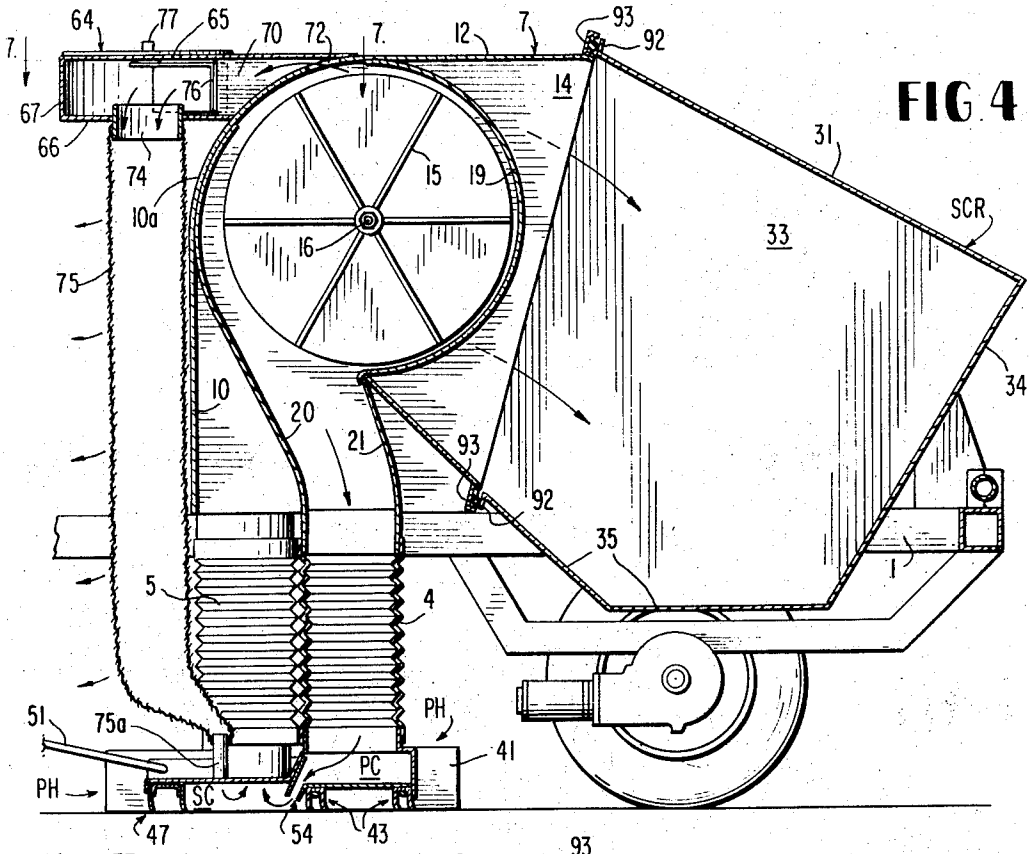

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SCR
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4
51
75a
PH
41
PC
PH
SC
47
54
43

FIG. 4

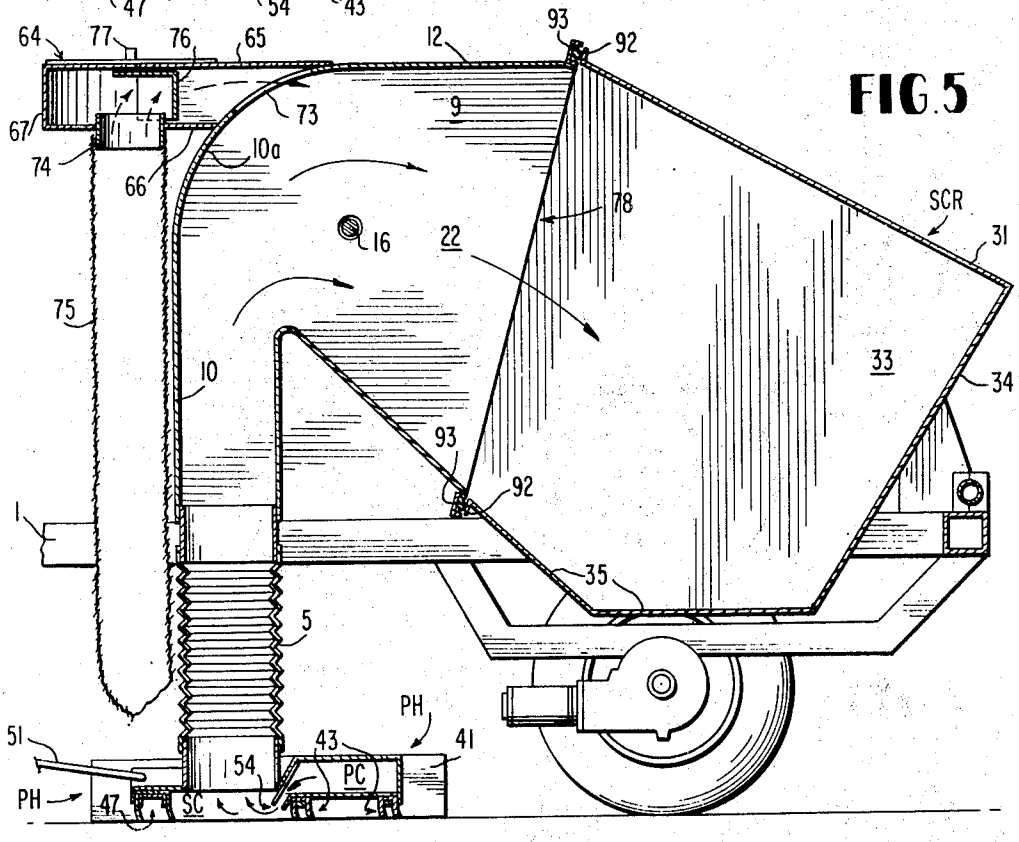

64
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41
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PC
PH
47
SC

FIG. 5

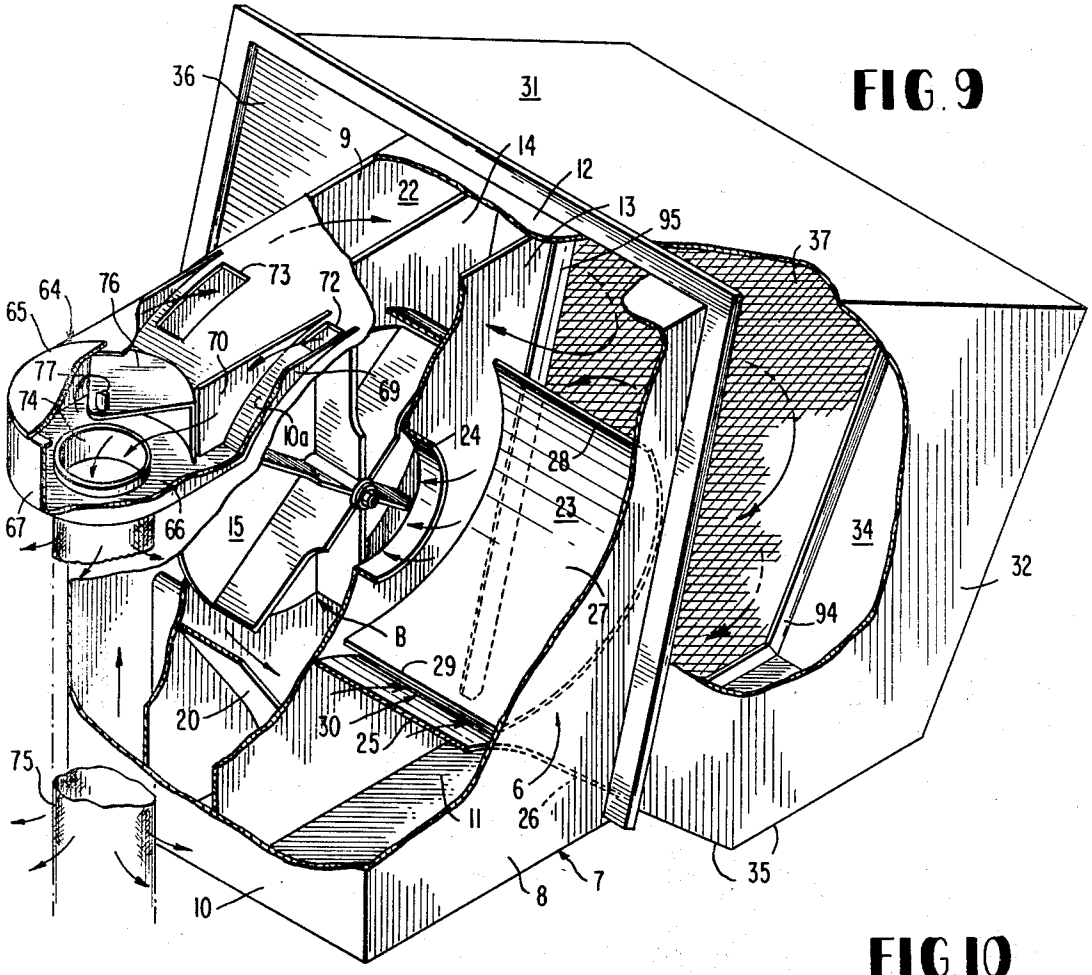


FIG. 9

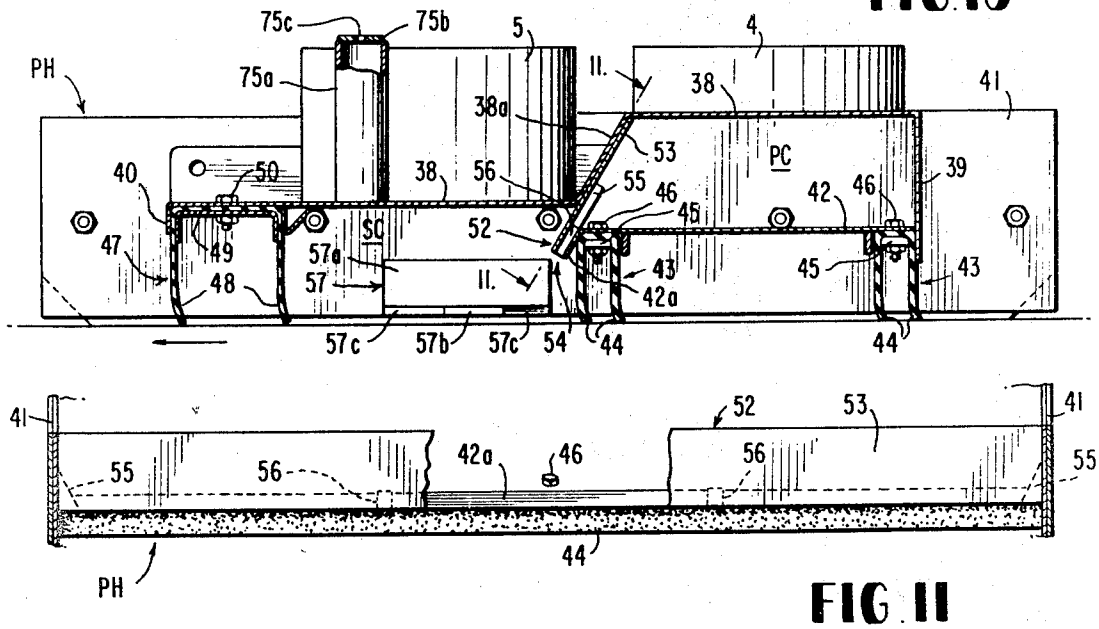


FIG. 10

FIG. 11

GAS AND PARTICULATE SOLID MATERIAL SEPARATING AND SOLID MATERIAL DISCHARGING APPARATUS

This is a division of application Ser. No. 193,514 filed Oct. 28, 1971 now U.S. Pat. No. 3,755,851 issued Sept. 4, 1973.

This invention is illustrated in connection with apparatus for separating gas from particulate solid matter entrained in a stream of the gas. This apparatus provides improvements in previously known separation apparatus in which particulate solid matter is picked up in a stream of gas, e.g., air, and conducted in a substantially closed recirculating air stream system to separating means including a receptacle into which solid matter separated from the air stream is deposited. Such recirculating systems are used, for example, in connection with street or other surface cleaning equipments in which the cleaning action is performed mainly if not entirely by air stream action, as distinguished from by brushing the surface mechanically. While such recirculating systems are intended to be, and in practice essentially are, closed, it is inevitable that some, although relatively very little, air is drawn from outside the system into the suction side of the system which thereby increases the total amount of air in the system. Since the system is essentially of fixed volume, the drawing in of additional air tends to increase the average pressure throughout the system. This increase in pressure will cause some air with entrained dust to be discharged from the high pressure side of the circulation system through leaks in the ducting or collection receptacle or from the pressure chamber of the pick-up head. Air leaking under pressure carries with it entrained dust or other particles, discharging of which to the atmosphere is naturally undesirable, in fact in many situations, intolerable.

Gas and particulate solid matter separating apparatus as outlined above is claimed in my co-pending parent application Ser. No. 193,514, now U.S. Pat. No. 3,755,851 dated Sept. 4, 1973.

An object of the invention is to provide means for mounting the solids collection receptacle of a gas and particulate solids material separation apparatus in such manner that the receptacle may be moved bodily away from a blower and ducting housing included in such apparatus and, as an incident to such bodily movement, will be tipped to discharge collected solids.

Other objects of the invention will become apparent from a reading of the following description of a preferred embodiment, the appended claims, and the accompanying drawings, in which:

FIG. 1 is a somewhat schematic side elevational view of mobile surface sweeping equipment comprising a truck and apparatus for separating entrained solids from air supported thereon;

FIG. 2 is a top plan view of the equipment shown in FIG. 1;

FIG. 3 is a longitudinal vertical section on the line 3—3 of FIG. 2;

FIG. 4 is a vertical section on the line 4—4 of FIG. 2;

FIG. 5 is a vertical section on the line 5—5 of FIG. 2;

FIG. 6 is a horizontal section on the line 6—6 of FIG. 3;

FIG. 7 is an enlarged scale horizontal section on the line 7—7 of FIG. 4, an air bleed-off valve being shown in position for bleeding air from a main air circulatory system;

FIG. 8 is a view similar to FIG. 7, but showing the valve in a different position, for reverse flow cleaning of a filter;

FIG. 9 is a perspective view, with parts broken away, showing the inside of a housing with a blower and ducts and separator chamber being illustrated;

FIG. 10 is an enlarged scale cross section of a pick-up head;

FIG. 11 is a fragmentary longitudinal section of the pick-up head on the line 11—11 in FIG. 10, with parts broken away, and drawn on a smaller scale than FIG. 10;

FIG. 12 is a perspective view of an angle plate member included in the pick-up head construction; and

FIGS. 13A, 13B and 13C are diagrammatic elevational views showing successive positions of a solids collection receptacle during a dumping operation.

A representative embodiment of the invention is shown as being mounted on a mobile truck or the like permitting the equipment to be moved over a street or other surface to be cleaned. In general, surface cleaning is effected by directing a blast of air against the surface to entrain particulate solid matter in an airstream which is then delivered to equipment for separating the solid particulate matter from the airstream and for then returning the air under pressure so as to recirculate continuously in the cleaning of the surface. The equipment is shown as being mounted on a wheeled truck T having a frame 1 for supporting the equipment for picking up solid particles in the airstream and separating the particles from the air. An operator's seat 2 and steering wheel 3 are shown conventionally. The truck T may be driven by any conventional means.

Considering the surface cleaning and air and solids separating equipment generally, a blower B receives its intake of air from a solids collection receptacle SCR, thereby reducing the pressure in the receptacle to a relatively negative pressure. The blower delivers air under pressure through a duct 4 to a pressure chamber PC in a hollow pick-up head structure PH, the construction of which is described more particularly hereinafter. An air blast is delivered from the pressure chamber PC downwardly against the surface to be cleaned and thence to a suction chamber SC in the pick-up head. Air with entrained particulate matter flows from the suction chamber SC to the solids collection receptacle SCR through a suction duct 5 and further ducting means to be described later. The air with entrained solid matter entering the collection chamber SCR is reversed in its flow in the receptacle so that some of the solid matter drops out of the airstream into the bottom of the receptacle. Air thus at least partially cleaned flows to the blower intake via supplemental separating structure generally designated 6 in FIGS. 3, 6 and 9 and which will be further described hereinafter. Air flows from the supplemental separating structure 6 to the blower intake, thus completing the circulation which is repeated continuously over the same system route.

Considering the illustrative construction more particularly, a housing generally designated 7 encloses the blower B and provides ducting required for the air to flow over the recirculating path generally described above. The housing 7, which is mounted on the support

1, includes side walls 8 and 9, a front wall 10, a bottom wall 11, and a top wall 12. The rear face of the housing 7 is open, that is unwalled.

Mounted in the housing 7 are two vertical partitions 13 and 14 extending fore-and-aft between the front wall 10 and the open rear face of the housing. Rotatably mounted in the space between the partitions 13 and 14 is the blower impeller 15 driven through a shaft 16 by an engine 17 and clutch 18 generally indicated in FIG. 2. As shown in FIGS. 4 and 9, a curved shroud 19 is mounted between the partitions 13 and 14 so as partially to surround the impeller 15. Also, as shown in FIG. 4, are transition members 20 and 21 mounted between the partitions 13 and 14 and extending downwardly from the shroud 19 to the pressure duct 4 leading to the pressure chamber PC of the pick-up head PH. Air discharged peripherally by the impeller 15 is thus delivered downwardly through the pressure duct 4 to the pressure chamber PC.

The space 22 in the housing 7 between the housing side wall 9 and the partition 14 serves as part of duct means communicating with the suction duct 5 and suction chamber SC of the pick-up head PH, the space 22 being open at the rear face of the housing 7.

As shown in FIGS. 2, 3, 6 and 9, the space between the partition 13 and the housing side wall 8 serves as a separation chamber 23 which is useful for removing from air flowing to the blower any entrained solid matter which was not deposited in the collection receptacle SCR.

The chamber 23 is open at its rear to the receptacle SCR and communicates with the blower intake through an inlet opening 24 in the partition 13. Mounted in the separation chamber 23 is a curved partition 25 with a rearward-downward extension 26 projecting to the rear of the housing 7 as clearly shown in FIG. 3. The curved partition 25 follows generally the curvature of a curved part 10*a* of the housing front wall 10.

Mounted in the separation chamber 23 is a curved baffle 27 generally following the curvature of the partition 25. The upper edge 28 of the baffle 27 is spaced substantially below the top 12 of the housing 7, whereas the lower or opposite edge 29 of the baffle 27 is spaced from but is relatively very close to the mergence of the curved partition 25 with its extension 26. The relatively large spacing of the baffle edge 28 from the top 12 of the housing provides for free flow of air from the collection receptacle SCR tangentially into the separation chamber 23 so as to create a swirling or vortex action which centrifugally concentrates any remaining solid particles out against the wall 10*a*, 25 of the separation chamber 23. The concentrated solids are skimmed out through a skimmer slit 30 defined by the lower edge 29 of the curved baffle 27 and the adjacent part of the partition 25.

The solids collection receptacle SCR is mounted on the support 1 by means permitting it to be raised and dumped as later to be described. At this point it is sufficient to explain the construction of the collection receptacle SCR as it is related to its functioning as part of the circulating system for separating solids from air. The receptacle includes a top wall 31, side walls 32 and 33, a rear wall 34, and an obtusely angled bottom wall 35. The front face of the receptacle is open, that is unwalled. When the receptacle is in operative position, its open front face permits free communication between the receptacle and the duct space 22 in the housing 7 between the side wall 9 and the partition 14 of the housing. The open front face of the receptacle also places the receptacle into communication with the separator space 23 included between the housing partition 13 and housing side wall 8 as described above. As shown in FIG. 6, the housing 7 is provided with a laterally offset wall extension 36 which closes the open front face of the collection receptacle SCR beyond the housing wall 9.

As shown in FIGS. 3, 6 and 9, the collection receptacle SCR is fitted with a screen partition 37 extending fore-and-aft and generally in alignment with the housing partition 13 and dividing the receptacle into two sections. Air with entrained solid matter enters the receptacle SCR from the duct space 22 and flows through the screen 37 before being returned to the blower intake 24 by way of the supplemental separation chamber 23. The screen 37 is useful for intercepting a considerable portion of the entrained solid matter before the circulating air is returned to the blower.

One form of pick-up head suitable for use in connection with an air cleaning apparatus of the kind described above is shown in FIGS. 10 and 11, although other pick-up head constructions may be used. The pick-up head PH as shown in FIGS. 10 and 11 includes a stepped top plate wall 38 provided with longitudinal flanges 39 and 40, and end panels 41. A horizontal wall 42 is welded or otherwise secured to the inside of the flange 39 spaced below the top wall 38 and extends toward the longitudinal center of the pick-up head PH. The horizontal wall 42 mounts two flexible or yieldable U-shaped members 43 formed with spaced downwardly extending aprons or curtains 44. The members 43 are secured to the wall 42 by clamping strips 45 and bolts 46.

Underneath the opposite edge of the pick-up head PH, that is adjacent to the flange 40, is mounted another flexible member 47 generally U-shaped in cross section and comprising aprons or curtains 48. A channel-shaped strip 49 and bolts 50 clamp the member 47 to the bottom face of the top wall 38.

The end panels 41 are provided with skids 41*a* which rest upon the surface being cleaned and support the pick-up head PH. The curtains 44 and 48 and the end panels 41 together enclose a working air space including both the pressure chamber PC and the suction chamber SC. The curtains assist in supporting the pick-up head, but the curtains 48 are flexible enough to yield upwardly and admit cans and other objects into the pick-up head working space. As shown in FIGS. 1 and 6, the pick-up head PH is towed along in the direction of cleaning movement progress by draw bars 51 connected at their rear ends to the pick-up head PH and connected at their front ends to the truck frame 1.

Extending generally centrally and longitudinally inside the pick-up head and transversely to the direction of cleaning movement progress is an inclined partition generally designated 52 which separates the suction chamber SC from the pressure chamber PC. The partition comprises a plate 53 secured to the inner face of the step-down part 38*a* of the top plate wall 38, and an inclined flange 42*a* extending along the front edge of the horizontal plate 42. The flange 42*a* is parallel to and spaced from the lower portion of the plate 53 so as to provide an elongated orifice slit 54 for discharging blast air from the pressure chamber PC against the surface being cleaned at a downward-forward inclination

and thence into the suction chamber SC. The spacing of the lower part of the plate **53** from the flange **42***a* and hence the width of the slit **54** are fixed by two spacers **55** at the respective ends of the orifice slit between the plate **53** and the flange **42***a*, and two intermediate spacers **56** between the plate **53** and the flange **42***a*. The end spacers **55** have downwardly-inwardly sloping edges as shown in FIG. **11.** These edges direct blast air emerging from the slit orifice inwardly and away from the respectively adjacent ends of the suction chamber toward the longitudinal center of the latter.

At each end of the suction chamber SC is an angle plate member **57** secured to the inside of the adjacent end panel **41.** One angle plate member **57** is shown in FIG. **12** as having its vertical web **57***a* secured to the inner face of the one end panel **41** and having its horizontal web **57***b* extending inwardly from that panel into the suction chamber. The other angle plate member **57** (not shown) is similarly mounted on the other end panel **41.** The horizontal webs **57***b* of the members **57** are chamfered 45° at **57***c* as shown also in FIG. **12.** The plate members **57** divert blast air from ends of the suction chamber toward its center and thus prevent blow-out of blast air at the ends of the suction chamber.

In operation, air delivered under pressure by the blower B flows downwardly through the pressure duct **4** into the pressure chamber PC of the pick-up head. Air under pressure in the pressure chamber flows at high velocity in the manner of a blast through the slit orifice **54** to impinge upon the surface being cleaned at an angle so as to dislodge particles from the surface and disperse them in the suction chamber SC. Air with entrained particulate solid material is then drawn from the suction chamber up through the suction duct **5** into the duct space **22** in the housing **7** and thence into the collection receptacle SCR between the receptacle side wall **33** and the screen **37,** a considerable portion of the entrained solid material descending to the bottom of that part of the receptacle by gravity. The screen **37** intercepts non-descended solid particles from the airstream as it passes into the part of the collection receptacle between the screen **37** and the side wall **32** of the receptacle. The airstream flows from the latter part of the receptacle into the supplemental separation chamber **23** and thence through the blower intake **24,** thus completing the recirculation flow path. Very fine solid particles remaining in the airstream flowing from the receptacle SCR into the supplemental separation chamber **23** are largely removed by the centrifugal action resulting in skimming off of fine solid particles through the skimmer slit **30** and returning of those particles downwardly along the partition extension **26** to the collection receptacle.

Although the recirculation system described above is essentially a closed system, as a practical matter some air in addition to that being circulated inevitably is drawn into the system where under suction conditions, principally at the ground/curtain interface. Air may also be drawn in in lesser degree through any leaks in imperfectly sealed joints in the housing **7** defining the suction duct space **22,** and where the collection receptacle SCR fits against the housing **7** without perfect sealing. Whatever additional air is drawn into the closed system tends to raise the average system pressure above atmospheric pressure. This means that there must be some discharge of air from the system to compensate for that drawn in. Emitting air through leakage or say under the curtains **44** adjoining the pressure chamber PC would result in blowing dirty air into the atmosphere which would obviously be undesirable and which would result in sacrificing advantages otherwise obtainable by the use of the closed circulating system.

The construction illustrated and described above has provision for discharging or bleeding off air in an amount approximately equal to that drawn in incidentally so as to maintain the average system pressure at a desired low level. The air discharged or bled off is delivered to the atmosphere without discharging significant amounts of dust or other particles freely to the atmosphere. This is accomplished by by-passing or bleeding some of the circulating air, which may contain some entrained solid particles, through a filter by means of equipment now to be described.

A by-pass or pressure relief plenum structure generally designated **64** is mounted on the housing **7** adjacent the top of the curved part **10***a* of the housing front wall **10.** The plenum structure **64** includes a top wall **65,** a bottom wall **66,** a curved end wall **67,** an outer side wall **68,** and an inner side wall **69.** The plenum bottom wall **66** abuts the curved part **10***a* of the housing front wall **10** as shown in FIGS. **4, 5** and **9.** The side walls **68** and **69** conform at their rear ends to the curvature of and they abut the curved wall part **10***a* of the housing front wall. The plenum structure **64** includes an additional wall **70** which is spaced inwardly from the wall **69** as shown in FIGS. **7** and **8** so as to provide a flow passage **71** leading tangentially into the round part of the plenum.

A pressure relief or by-pass opening **72** is formed in the blower casing adjacent the juncture of the housing front wall **10** and the top wall **12** as shown in FIGS. **2, 4** and **9.** The pressure relief opening **72** communicates with the flow passage **71** of the plenum **64.**

A suction port **73** is formed in the housing **7** adjacent the convergence of the front wall **10***a* with the housing top wall **12** so as to communicate with the ducting space **22** previously described as being between the housing wall **9** and the partition **14.** The port **73** is also adapted to communicate with the plenum **64** at a zone spaced circumferentially from the tangential reception of air entering the plenum from the passage **71.**

At the center of the plenum **64** is a gas bleed outlet extending through a spigot **74** on which is mounted the open end part of a filter bag **75** of foraminous material.

A segment-shaped by-pass control valve **76** is pivoted at **77** at the center of curvature of the plenum wall **67** and is operable by a handle **78** located above the plenum **64** as shown in FIGS. **2** and **3** so as to be movable to two positions as shown respectively in FIGS. **7** and **8.**

Normally, that is during most periods of operation, the valve **76** will be positioned as shown in FIG. **7** so that there is free opening for air with entrained dust to move from the relief opening **72** and passage **71** into the plenum circular part tangentially. In this position of the valve **76,** an edge **76***a* of the valve is closely adjacent to the plenum wall **68** so as to prevent free communication between the plenum and the port **73,** but leaves a narrow skimmer slit between the valve edge **76***a* and the plenum wall **68.** The slit provides for controlled restricted communication of the port **73** with the plenum **64** at a zone spaced circumferentially ap-

proximately 180° from the tangential reception of bypassed air by the plenum. Some of the dirt laden air flowing circularly in the plenum will be relieved of its dust by centrifugal force concentrating the dust particles in the outer part of the plenum from which they are passed through the skimmer slit at the valve edge **76***a* with a small amount of air. The air and dust passing through the skimmer slit are returned to the system through the port **73**, suction duct space **22**, and collection receptacle SCR. However, the major part of the air received in the plenum **64** from the relief opening **72** flows to the plenum center and out through the bleed outlet **74** into the filter bag **75**. The bag traps and retains practically all of the entrained dust while the bled-off air passes out through the bag to the atmosphere without harmful and unpleasant results.

After operating for some time with the valve **76** in the position shown in FIG. **7** with bleeding off of surplus air as described above, the filter bag **75** normally will accumulate a considerable amount of dust or other pqrticles which, if not removed, would reduce the efficiency of the filter. Accordingly, it is desirable to provide for cleaning the filter. Of course, this could be done by removing the bag **76** and replacing it with a clean bag, but this would involve additional trouble and expense and extra equipment. The present construction provides for cleaning the filter bag **75** by the simple expedient of moving the valve **76** to the position shown in FIG. **8** in which the valve edge part **76***b* opposite the edge **76***a* blocks off the passage **71** and the valve edge part **76***a* is widely spaced from the plenum wall **68** so as to place the curved part of the plenum and also the interior of the filter bag **75** in substantially unrestricted communication with the port **73** and hence with the suction duct space **22** and receptacle SCR. The inside of the bag **75** is thereby subjected to suction which causes the bag to give up dust or other particles residing in the bag. Removal of the particles from the bag is enhanced by flexing of the bag resulting from reversal of flow of air into the bag from the atmosphere, as distinguished from the normal flow outwardly through the bag into the atmosphere. The air drawn into the bag **75** from the atmosphere entrains the dust dislodged from the bag walls and carries it by suction flow through the port **73** and duct space **22** into the receptacle SCR.

The setting of the valve **76** in the FIG. **8** position for cleaning the filter bag is used only periodically and for relatively short periods as compared to the operation under the normal conditions when the valve is positioned as shown in FIG. **7**. The frequency of reverse cleaning the filter by positioning the valve as shown in FIG. **8** may be reduced by connecting the bottom of the filter bag to the suction side of the recirculatory system. In the form shown, the bottom of the bag **75** is connected to a tube **75***a* communicating with the suction chamber SC in the pick-up head PH. Dust or solids in the filter bag which do not adhere to the bag side walls but drop to the bottom of the bag are thus returned directly to the suction side of the system while the valve **76** is in its normal position as shown in FIG. **7**. Suction removal of solid particles from the bottom of the bag **75** is improved by provision of a disk cover **75***b* on the tube **75***a* formed with a restricted air passage hole **75***c*. Air drawn by suction from the bag **75** into the suction chamber SC must flow at a high velocity through the hole **75***c* so as efficiently to entrain particles and carry them into the tube **75***a* and thence to the suction chamber SC.

The solids collection receptacle SCR is mounted so as to be supported on the truck frame **1** and to be moved from its normal position shown in FIG. **1** bodily away from the housing **7** and simultaneously to be tipped so as to discharge material collected in the receptacle to the rear and through the open face **78** of the receptacle. In the normal position of the receptacle, its open front face **78** communicates directly with the suction duct space **22** and with the separation chamber **23** in the housing **7**. When the receptacle is moved bodily away from the housing **7** and is tipped, the housing contents are dumped or discharged through the open face **78** of the receptacle, thus dispensing with the necessity of providing a separate clean-out door or gate.

As shown in FIG. **1**, control means for tipping the receptacle when it is moved away from the housing includes a relatively long link **79** pivoted at **80** to a bracket **81** on the support **1**, and pivoted at **82** to the receptacle SCR relatively close to the receptacle open face **78** and near the top of the receptacle.

A relatively short link **83** extending above the link **79** is pivoted at **86** to the receptacle side wall **32** close to the receptacle top wall **31**. The links **79** and **83** together with the support **1** and the receptacle SCR constitute a four-bar linkage.

Means for operating the control linkage includes a power operable extensible assembly generally designated **87** and in the present instance illustrated as an assembly of a cylinder **88** and piston rod **89** operable under fluid pressure from a source, not shown. The cylinder **88** is pivoted at **90** on the support **1**, and the piston rod is pivoted at **91** to an intermediate part of the link **79**. Fluid pressure extension of the piston rod **89** operates through the links **79** and **83** and other components of the four-bar linkage to move the receptacle SCR from the normal position shown in FIG. **1** successively through the positions shown in FIGS. **13A**, **13B** and **13C**, thus moving the receptacle SCR bodily away from the housing **7**. As illustrated in FIGS. **13A**, **13B** and **13C**, the control linkage responds to movement of the receptacle away from the housing by bodily elevating the receptacle relatively to the housing **7** and to the support **1** to a position spaced above the support, and by also tipping the receptacle so far as to dump the contents through the same open face **78** as was positioned against the open face of the housing **7** during normal operation. The linkage and operating means located adjacent the side **32** of the collection receptacle SCR have been described. For balancing forces, a similar mechanism is provided at the side **33** of the receptacle.

When the receptacle SCR is in its normal position with its open front face adjacent the generally vertically extending open rear face of the housing **7**, flanges **92** surrounding the front face of the receptacle abut sealing gaskets **93** which surround the rear face of the housing **7**. This provides a sufficiently good seal to prevent inward leakage of more air than can be compensated for by the bleeding off of air through the filter **75**. The screen **37** is secured to the receptacle SCR walls **31**, **34** and **35** by strips **94**. As shown in FIGS. **3** and **6**, two flanged strips **95** extend along the front edge of the screen **37**. When the receptacle is in its normal position as shown in FIGS. **1**, **3** and **6**, the flanges of the strips **95** fit over and embrace a rearward extension **13***a* of

the housing partition 13. In this manner, the front edge of the screen 37 is supported against lateral deflection, for example in the event of piling of dust and even heavier particles against one side of the screen.

Although the invention has been described in its application to air blast surface cleaning, it will be understood that apparatus according to the invention may be used for separating particulate solid material from air or other gas generally, and not only in connection with street or other surface cleaning operations. The construction illustrated and described embodies the invention in a preferred form, but it is intended that the disclosure be illustrative rather than definitive, the invention being defined in the claims.

I claim:

1. In apparatus for separating gas from particulate solid material entrained therein, a support; a housing mounted on said support and having one face thereof extending generally vertically; a blower in said housing; first duct means in said housing extending through said one housing face and to the blower intake; second duct means in said housing extending through said one housing face and to a source of gas with particulate solid material entrained therein; means comprising a solids collection receptacle for separating gas from particulate solid material entrained therein, said solids collection receptacle having an open face; means mounting said receptacle on said support normally with said open face thereof covering said one face of said housing with both of said duct means communicating through said one housing face with the interior of said receptacle, whereby gas in said receptacle is withdrawn therefrom through said first duct means and through said blower intake with resultant drawing of gas and entrained solid material through said second duct means into said receptacle to pass therethrough with separation of solids from gas and passage of gas out through said first duct means into said blower intake; and operating means for moving said receptacle away from said one face of said housing, said receptacle mounting means including position control means responsive to movement of said receptacle away from said one face of said housing for bodily elevating said receptacle relatively to said housing and to said support to a position spaced above said support, and for also tipping said receptacle to discharge solid material from the elevated receptacle through said receptacle open face.

2. Apparatus according to claim 1 in which said means mounting said receptacle on said support comprises a relatively long link pivoted at one end to said support at a point relatively remote from said one face of said housing and at a relatively low level and pivoted at its other end to said receptacle at a point relatively close to said receptacle open face and at a relatively high level; and a relatively short link extending above said relatively long link when said receptacle is positioned, as normally, with its open face covering said one face of said housing, said relatively short link being pivoted at one end to said support remote from said one face of said housing and being pivoted at its other end to said receptacle close to said open face thereof.

3. Apparatus according to claim 1 in which said receptacle mounting and position control means comprises two links both connected at opposite ends to said support and to said receptacle respectively.

4. Apparatus according to claim 3 in which said two links, said support, and said receptacle together constitute a four bar linkage.

5. Apparatus according to claim 3 in which said operating means comprises a power operated extensible assembly pivoted at its opposite ends respectively to said support and to an intermediate point of one of said links.

6. In apparatus for separating gas from particulate solid material entrained therein, a support; a housing mounted on said support and having one face thereof extending generally vertically; a blower in said housing; first duct means in said housing extending through said one housing face and to the blower intake; second duct means in said housing extending through said one housing face and to a source of gas with particulate solid material entrained therein; means comprising a solids collection receptacle for separating gas from particulate solid material entrained therein, said solids collection receptacle having an open face; means mounting said receptacle on said support for bodily movement from a normal position to a discharging position, said receptacle open face facing towards and covering said one face of said housing with both of said duct means communicating through said one housing face with the interior of said receptacle when said receptacle is in its normal position, whereby gas in said receptacle is withdrawn therefrom through said first duct means and through said blower intake with resultant drawing of gas and entrained solid material through said second duct means into said receptacle to pass therethrough with separation of solids from gas and passage of gas out through said first duct means into said blower intake, said receptacle open face being displaced from said one face of said housing and facing away from said one face of said housing when said receptacle is in its discharging position; and operating means for moving said receptacle from said normal position thereof to said discharging position thereof, said receptacle mounting means including position control means responsive to movement of said receptacle from said normal position thereof to said discharging position thereof for tipping said receptacle to discharge solid material therein through said receptacle open face.

7. Apparatus according to claim 6 in which said receptacle mounting and position control means comprises a four bar linkage, itself comprising said receptacle, said support, and two links each connected to said receptacle and to said support respectively.

8. Apparatus according to claim 6 in which said means mounting said receptacle on said support comprises a relatively long link pivoted at one end to said support at a point relatively remote from said one face of said housing and at a relatively low level and pivoted at its other end to said receptacle at a point relatively close to said receptacle open face and at a relatively high level; and a relatively short link extending above said relatively long link when said receptacle is positioned, as normally, with its open face covering said one face of said housing, said relatively short link being pivoted at one end to said support remote from said one face of said housing and being pivoted at its other end to said receptacle close to said open face thereof.

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