PORTABLE VACUUM CLEANER AND METHOD

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ABSTRACT

An upright frame (A) carries a hopper (B) having a centrifugal fan (D) for creating a partial vacuum in the hopper. A discharge chute (E) on a lower end of the hopper is normally closed by a gate (F). The method contemplates use of the receptacles (I) to receive the forks of a lift truck for lifting the vacuum cleaner to facilitate discharge of trash collected in the hopper through the discharge chute.
Fig. 4
PORTABLE VACUUM CLEANER AND METHOD

BACKGROUND OF THE INVENTION

[0001] This invention relates to a portable vacuum cleaner and method for wet and dry pickup especially suitable for industrial uses employing high vacuums, portability and maneuverability facilitating discharging of material collected during vacuuming.

[0002] Vacuum cleaners for industrial use have a common problem in that it is difficult to exert a high suction and at the same time provides adequate discharge apparatus for expelling waste material received within the vacuum chamber. For example, U.S. Pat. Nos. 3,496,592 and 3,619,849 illustrate the use of free standing hoppers or vacuum chambers carried on wheeled platforms for wet pickup in carpet cleaning. It is necessary in such vacuum cleaners to provide suitable pumps within the bottom of the tanks to forcefully expel waste water through a line provided for that purpose. Additional discharge problems are illustrated in U.S. Pat. No. 4,467,494 where lint collection bags are utilized. The use of collection bags is impractical for industrial use where pressure drops are increased as well as costs, together with limited air flow.

[0003] The invention of U.S. Pat. No. 4,934,017 concerns itself with removing liquid waste material by utilizing a dump valve located on a lower front side of a vacuum chamber collection tank.

[0004] The disclosure of U.S. Pat. No. 5,090,083 relates to eliminating the task of manually removing and emptying collection bags through the use of filter tubes.

SUMMARY OF THE INVENTION

[0005] The invention contemplates an industrial vacuum cleaner having an upright hopper mounted in a portable frame provided with a discharge chute having a pivoted gate operated by external linkage.

[0006] Accordingly, it is an important object of the invention to provide a discharge chute as a bottom for upright vacuum cleaners to facilitate removal of liquid or solid waste collected therein.

[0007] Another object of the invention is the provision of an upright wheeled frame within which is positioned a hopper having a centrifugal fan at the top with discharge apparatus at the bottom of the hopper.

[0008] Another object of the invention is the provision of a method for emptying trash by the use of a lift truck to raise the vacuum cleaner for convenient discharge through a chute at the bottom of the vacuum cleaner.

[0009] It has been found that by utilizing linkage positioned on an upright vacuum hopper and including a toggle mechanism, constant force may be provided to urge a gate into sealing engagement at a discharge end of a waste chute preparatory to opening of the chute for convenient discharge of industrial trash collected in the hopper.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

[0011] The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein;

[0012] FIG. 1 is a right front perspective view illustrating hopper and vacuum hose connections for a portable industrial vacuum cleaner constructed in accordance with the invention;

[0013] FIG. 2 is a right side elevation of a vacuum hopper and frame mounting illustrating a bottom discharge chute for convenient waste disposal;

[0014] FIG. 3 is a front elevation illustrating an upright hopper with vacuum hose connections fixedly mounted in an upright frame having receptacle apparatus for reception of a lift operator such as the forks of a lift truck;

[0015] FIG. 4 is an enlarged side elevation illustrating external linkage including a toggle joint for operating a pivotal gate for opening and closing the discharge chute;

[0016] FIG. 5 is a right side elevation illustrating operating linkage, wheels such as casters, and lift receptacles for a vacuum cleaner constructed in accordance with the invention;

[0017] FIG. 6 is a front elevation further illustrating operating mechanism for the gate together with wheel and lift devices for the vacuum cleaner; and

[0018] FIG. 7 is a right front perspective view illustrating a method including the step of raising the vacuum cleaner for convenient discharge of waste.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0019] The drawings illustrate a portable vacuum cleaner having an upright frame A. An upright hopper B having an open top is carried within the frame. A closure cover C is provided for closing the open top of the hopper. Mechanical apparatus D evacuating air from the hopper creating a partial vacuum is preferably carried on the cover for collecting waste material collected within the hopper. A discharge chute E is carried adjacent a lower end of the hopper. A gate F normally closes the discharge chute for retaining material collected in the hopper, and linkage G is carried adjacent to and externally of the hopper opening the gate discharging the material from the hopper. Wheels H are carried by the frame for transporting the vacuum cleaner. At least one receptacle I is carried by the frame for receiving a lift truck operator.

[0020] The linkage G includes a toggle apparatus J that in post center position exerts a continuous force urging the gate to closed position locking the gate in sealing relation against unwanted movement. When on center the toggle joint acts as a single link for exerting pivotal movement opening the gate allowing waste collected in the chute to be expelled therefrom by gravity.

[0021] Referring more particularly to the drawings an upright generally rectangular frame A includes four corner posts each having a fixed mounting on a lower platform that includes a horizontal frame member 10 carrying the receptacles I as well as the wheels H as is best seen in FIGS. 4-7. An upright hopper B has a generally rectangular configura-
tion to fit within the upright frame in which it is fixedly mounted as by welding, not shown.

[0022] A closed cover C is provided for maintaining the open top of the hopper B in a closed configuration supporting centrifugal fans D for creating a partial vacuum within the hopper B. The centrifugal fans have a lower housing 11 containing the fan blade, not shown. A suitable motor is carried above the fan in the housing 12.

[0023] The discharge chute E includes a bottom 13 disposed at an angle of approximately 45 degrees. The discharge chute includes a member 14 opposite the bottom member 13 defining a chute of progressively reduced or inwardly tapering cross section. A terminal chute section 15 extending is a continuation of the bottom 13 has a vertical longitudinal opening 16 therein.

[0024] The vertical opening 16 of the discharge chute E is closed by a gate F on a pivoted shaft as illustrated at 17 in FIG. 4. The gate has a suitable link 18 welded thereto for urging the gate into sealing engagement with a deformable gasket 19. The link 18 has pivot connection as at 20 with the lower end of the toggle joint J. The upper end of the toggle joint is pivotally connected at 21 with a link 22 that has fixed connection with a rotatable shaft 23 which in turn has fixed connection with a handle 24 for manual manipulation of the linkage.

[0025] FIG. 1 best illustrates connections 25 for each of the suction hoses 26, 27 and 28 that may be used separately or all at one time. The hose 28 is provided with a wand take up as at 29. The hoses 26 and 27 are provided with more conventional flat pickup collection attachments 30. FIG. 7 illustrates the method including the use of a fork lift truck 31 to raise the vacuum cleaner to facilitate the discharge of waste through the chute E and the opening 16 at a desired location.

[0026] Vacuums cleaners constructed in accordance with the invention have proved in trials to be useful in cleaning up in a concrete block factory. For example, by utilizing a two inch hose, 110 inches water left, and 500 CFM of air flow, a successful clean up was achieved. It is believed that vacuum cleaners may be constructed in accordance with the invention for clean ups for most metal working and machining operations as well as a myriad of other industrial cleansing applications.

[0027] While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations in the hopper and discharge chute as well as related components and method may be made without departing from the spirit or scope of the following claims.

What is claimed is:
1. A portable vacuum cleaner comprising:
   an upright frame;
   an upright hopper having an open top carried within the frame;
   a closure cover for the open top of said hopper;
   mechanical apparatus evacuating air from the hopper creating a partial vacuum in said hopper carried adjacent to the cover for collecting material within the hopper;
   a discharge chute carried adjacent to the lower end of said hopper;
   a gate normally closing said discharge chute for retaining material collected in the hopper, and
   linkage carried adjacent to and externally of the hopper opening said gate discharging said material from the hopper;
2. A portable vacuum cleaner set forth in claim 1 including a hose carried collection apparatus communicating with said hopper.
3. A portable vacuum cleaner set forth in claim 1 including wheels carried by said frame for transporting said vacuum cleaner.
4. A portable vacuum cleaner set forth in claim 1 including at least one receptacle carried by said frame for receiving a lift truck operator.
5. A portable vacuum cleaner set forth in claim 1 wherein said linkage includes a manually actuated operator for moving said gate to open and closed positions.
6. A portable vacuum cleaner set forth in claim 1 wherein said linkage includes a toggle linkage.
7. A portable vacuum cleaner set forth in claim 1 wherein said upright hopper has a fixed mounting in said frame and said linkage is carried by said hopper.
8. A method of vacuum cleaning comprising the steps of:
   providing an upright frame;
   mounting an upright hopper having an open top within the frame;
   positioning a closure cover over the open top of the hopper;
   evacuating air from the hopper creating a partial vacuum in said hopper for collecting material within the hopper;
   providing a discharge chute adjacent to the lower end of the hopper;
   closing a gate carried by the discharge chute for retaining material collected in the hopper; and
   opening the gate discharging the material from the hopper.
9. A method of vacuum cleaning set forth in claim 8 including the step of actuating linkage carried adjacent to and externally of the hopper opening the gate.
10. A method of vacuum cleaning set forth in claim 8 including the step of attaching wheels to the frame for transporting the frame and hopper.
11. A method of vacuum cleaning set forth in claim 8 including the step providing at least one receptacle carried by the frame for receiving a lift truck operator.
12. A method of vacuum cleaning set forth in claim 9 including the step of pivoting said gate to open and closed positions by manually actuating an operator for positioning the linkage and the gate operated thereby.
thereby by action of the lift truck operator positioning the hopper for discharging material collected in the hopper.

15. A portable vacuum cleaner comprising:
   - an upright frame;
   - an upright hopper carried within the frame;
   - a closure at a top of said hopper creating a partial vacuum in said hopper for collecting material within the hopper;
   - normally closed discharge apparatus carried adjacent a lower end of said hopper for retaining material collected in the hopper including an operator positioned adjacent to and externally of the hopper for discharging said material from the hopper.

16. A portable vacuum cleaner set forth in claim 15 including a hose carried collection apparatus communicating with said hopper.

17. A portable vacuum cleaner set forth in claim 15 including wheels carried by said frame for transporting said vacuum cleaner.

18. A portable vacuum cleaner set forth in claim 15 including at least one receptacle carried by said frame for receiving a lift truck operator.

19. A portable vacuum cleaner set forth in claim 15 wherein said operator includes a toggle linkage.

20. A portable vacuum cleaner set forth in claim 15 wherein said upright hopper has a fixed mounting in said frame and said normally closed discharge apparatus is carried by said hopper.

21. A portable vacuum cleaner set forth in claim 15 wherein said normally closed discharge apparatus includes a discharge chute and a normally closed gate for discharging material from said hopper.

22. A discharge chute for a vacuum cleaner comprising:
   - an upright hopper having an open lower end and a centrifugal blower at a top thereof collecting material through vacuum hoses into the hopper;
   - a downwardly inclined surface extending at least partially across the open lower end of the hopper forming a downwardly extending passageway of diminishing cross section;
   - an outlet opening in the passageway; and
   - a pivoted gate in normally closed position containing material collected in the hopper.

23. The discharge chute set forth in claim 22 including linkage external to the hopper and the chute forcefully biasing the gate toward closed position.

24. The discharge chute set forth in claim 23 wherein the linkage includes a toggle joint exerting the forceful biasing of the gate.

25. The discharge chute set forth in claim 24 wherein the gate is carried by manually rotatable operator having connection to the gate through the toggle joint.

26. The discharge chute set forth in claim 25 including a gasket carried between the gate and the chute for facilitating retention of liquid and solid material in the hopper.

27. The discharge chute set forth in claim 25 wherein the rotatable operator extends at right angles to the linkage in alignment with the gate across a front of the hopper.

28. The discharge chute set forth in claim 27 including a pivotal mounting for the gate extending in parallel spaced relation to the rotatable operator.

29. The method of discharging material collected through vacuum hoses into an upright hopper comprising the steps of:
   - positioning a downward extending discharge chute at an open bottom of the hopper narrowing to form a discharge opening;
   - utilizing a normally closed pivoted gate for retaining the material collected in the hopper; and
   - actuating linkage for moving the gate to open position discharging the material collected in the hopper.

30. The method set forth in claim 29 including the step of exerting a force maintaining the gate in closed position through the action of a toggle apparatus.

31. The method set forth in claim 30 including the step of actuating a link connected to pivot and to the gate for opening and closing the gate.

32. The method set forth in claim 31 including the step of manually actuating a toggle apparatus for fixing linkage for pivotally moving the gate.

33. The method set forth in claim 29 including the step of pivoting a rod rotatably carried at a front of the hopper above the chute for opening and closing the gate.

34. The method set forth in claim 30 including the step of providing a deformable gasket sealing the gate in respect to the chute against leakage of solid and liquid waste.

35. The method set forth in claim 30 including the step of manually actuating a lever for rotating the rod for actuating linkage opening and closing the gate.

36. A portable industrial vacuum cleaner comprising:
   - an exterior frame including a base;
   - a hopper fixedly mounted on the frame;
   - a fan mounted at a top of the hopper inducing a partial vacuum therein; and
   - transversely spaced receptacles carried within the base for receiving the forks of a fork lift truck transporting the vacuum cleaner.

37. The portable industrial vacuum cleaner set forth in claim 36 including:
   - spaced wheels transporting the vacuum cleaner independently of the spaced receptacles.

38. The portable industrial vacuum cleaner set forth in claim 37 including a downwardly extending chute at a bottom of the hopper for discharging waste collected in the hopper.

39. The portable industrial vacuum cleaner set forth in claim 38 a pivoted gate and manually actuated linkage for opening the gate for discharging waste material.

40. A method of transporting an industrial vacuum cleaner having a hopper mounted within a vertical frame comprising the steps of:
   - inducing a partial vacuum within the hopper for collecting waste material therein;
   - positioning spaced receptacles for receiving the forks of a forklift truck extending in alignment with respective sides of said frame;
   - providing a discharge apparatus for removal of waste material collected in the hopper at a lower end of the hopper; and
as an alternative to transporting the vacuum cleaner on the wheels and to facilitating discharge of the waste material elevating the vacuum cleaner.

41. The method set forth in claim 40 including the steps of:

positioning wheels on the frame adjacent to marginal portions of the frame externally of the receptacles carrying the vacuum the vacuum cleaner for transport;

as an alternative to transporting the vacuum cleaner on the wheels and to facilitate discharge of the waste material elevating the vacuum cleaner.

42. The method set forth in claim 41 including the step of mounting casters on the frame above the receptacles supporting the frame including the receptacles for transport on the casters.

43. The method set forth in claim 41 including the step of providing a chute for discharging the waste material from the hopper; and

manipulating a pivoted gate for opening and closing the chute.