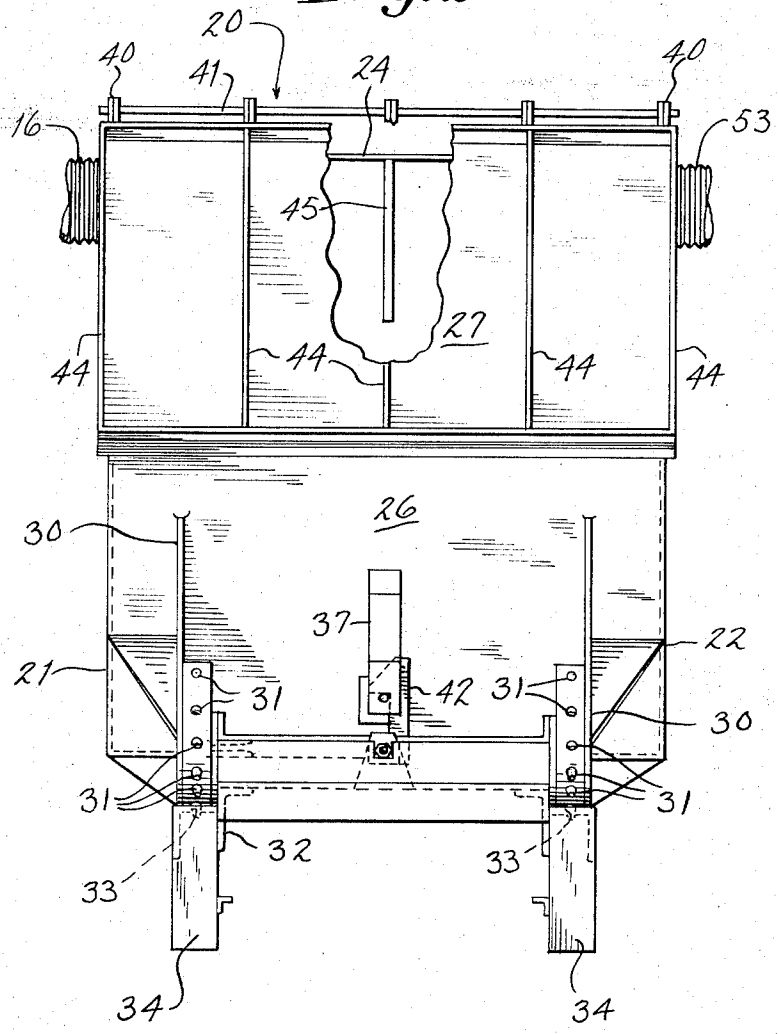
Feb. 27, 1973 D. JOHNSTONE 3,717,901

REFUSE HOPPERS

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Fig. 2



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Feb. 27, 1973 D. JOHNSTONE 3,717,901

REFUSE HOPPERS

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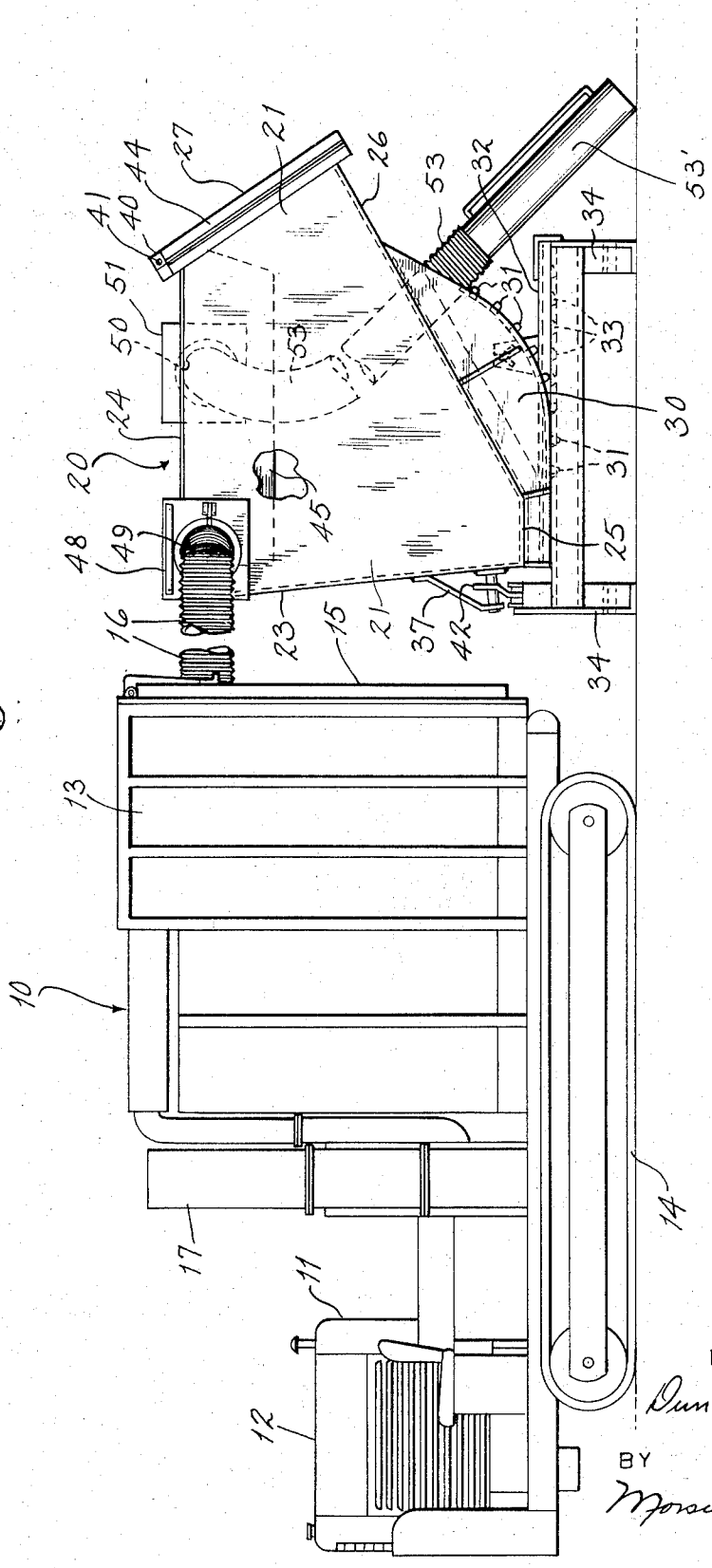


Fig. 1

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3,717,901

REFUSE HOPPERS

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U.S. Cl. 15—314 6 Claims

ABSTRACT OF THE DISCLOSURE

A refuse hopper that can be positioned at a convenient location in a foundry or factory and separably sealingly connected to a mobile vacuum cleaning machine, said hopper being designed to have refuse drawn into and deposited therein instead of said refuse being sucked directly into the cleaning machine. Thus when said hopper is filled it can be detached and hauled away to a remote dumping area while said cleaning machine is connected to another strategically placed hopper, thereby permitting the continuous utilization of said vacuum cleaning machine without requiring frequent interruptions in order to transport said machine to a remote location for dumping.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to refuse containers of the type used in factories and foundries and the like, and more particularly to a refuse container or hopper especially designed for use with industrial vacuum cleaning and refuse loading machines.

Description of the prior art

The novel refuse hopper comprising the present invention is designed particularly for use with an industrial vacuum-type refuse loader and cleaner of the type disclosed in U.S. Pat. No. 3,541,631, which patent is also owned by the assignee of the present application.

In said U.S. Pat. No. 3,541,631, there is disclosed a mobile, self-propelled suction-type cleaning machine for industry which can be maneuvered around a factory or foundry to collect refuse and debris from the floor, thereby eleminating the necessity for performing that task manually, which is slower, less efficient, and more costly than the use of a machine for the same purpose.

While the machine disclosed in said U.S. Pat. No. 3,541,631 has proven highly beneficial, and has met with considerable commercial success, it has one shortcoming. With said vacuum cleaning machine the debris and refuse are sucked directly into a compartment therefor within the machine itself and when said compartment is filled it is necessary to drive the machine to a location where said refuse can be dumped and the compartment emptied. Unfortunately it frequently occurs that the dumping site is located some distance from the foundry or factory with the result that during the time the debris-filled machine is being transporated to and from the dump site said machine cannot be used for cleaning purposes, of course. This greatly reduces the efficiency of the cleaning operation.

The object of the present invention is to provide a removable intermediate receptacle or hopper into which the collected debris and refuse can be deposited, thereby

permitting the continuous, uninterrupted use of said vacuum cleaning machine for cleaning purposes.

To the best of applicant's knowledge there are no comparable hopper units presently available, nor are there any U.S. or foreign patents disclosing such a unit.

SUMMARY OF THE INVENTION

As hereinabove described, the present invention provides a debris or refuse hopper which can be removably connected in airtight relationship to a mobile, industrial vacuum cleaning machine in a manner whereby debris and refuse sucked up from the floor of a foundary or factory by said cleaning machine is deposited in said hopper, rather than being collected in the cleaning machine itself. Thus when said hopper is full it can be disconnected from the cleaning machine and transported to a remote dumping location while the cleaning machine is connected to another conveniently-located hopper and the cleaning operation continued practically without interruption.

A further object of the invention is to provide a hopper for use with an industrial vacuum cleaning machine, as described which is especially designed so that it can be quickly and easily connected to and disconnected from said cleaning machine without requiring any special tools or equipment, and wherein an airtight seal is provided when said hopper is interconnected to the vacuum cleaning machine.

A further object is to provide a novel refuse hopper as described which is especially designed so that it can be readily picked up by a conventional fork lift truck or the like and conveyed to the dumping site, or which hopper can be mounted on wheels for towing to and from the dumping area by a suitable vehicle.

A further object of the invention is to provide a novel refuse hopper as described which is designed for quick and easy dumping.

A further object is to provide a novel intermediate receptacle or hopper for use with an industrial-type vacuum cleaning machine which hopper is so designed that while the bulk of the debris and refuse sucked up by said cleaning machine is deposited therein, as described, the finer foreign particles and dust and the like entrapped in the air stream are directed into the cleaning machine where they can be filtered out before said air stream is exhausted from the machine, thereby preventing said impurities from polluting the surrounding atmosphere.

A further object of the invention is to provide a novel mechanical cleaning operation utilizing intermediate refuse collecting hoppers, as described, which cleaning system is not only substantially less costly than manual cleaning procedures, but which results in a cleaner and safer foundry or factory.

A further object is to provide a novel intermediate refuse collecting receptacle or hopper for use with vacuum-type industrial loaders and cleaners, as described, which hopper is designed to receive and retain wet or moisture-laden refuse and to thereby eliminate the possibility of such wet debris being sucked into the cleaning machine and damaging the filters therein.

Still further objects of the present invention are to provide a novel refuse hopper for the purposes described, which hopper is simple in design and operation, relatively inexpensive to manufacture, rugged and durable in construction, and which is otherwise particularly well adapted for its intended purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, wherein the same reference numerals designate the same parts in both of the views:

FIG. 1 is a side elevational view showing the hopper comprising the present invention operatively connected to an industrial vacuum cleaning machine; and

FIG. 2 is a rear view of said hopper.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to FIG. 1 of the drawings, the hopper **20** comprising the present invention is shown operatively connected to a mobile, self-propelled industrial vacuum cleaning machine **10** of the type disclosed in the aforementioned U.S. Pat. No. 3,541,631. As is described in detail in said prior patent, said vacuum cleaning machine **10** includes a cab **11**, a diesel or other engine **12**, and a refuse compartment **13** located rearwardly of said cab. Said cleaning machine is preferably mounted on endless crawler tracks **14** for maximum maneuverability within the close confines of a foundry or factory.

In the illustrated cleaning machine **10** the rearward, refuse compartment **13** is provided with a normally closed and sealed tailgate **15**, and projecting from an opening in the upper portion thereof is an elongated flexible hose **16**. A high-vacuum blower (not shown) is carried by said machine and in the form of cleaner disclosed in said prior application said blower is adapted to suck debris and refuse, etc. from the floor of an industrial plant through said hose **16**, and into the compartment **13**. Filter means are provided in said compartment **13** for removing the larger, heavier impurities from the air stream, and the forward portion of said cleaner compartment has additional, novel filter elements therein for removing the finer dust and dirt particles from the air stream before said air is discharged through the exhaust stack **17** to the atmosphere, thereby minimizing pollution.

With the form of industrial vacuum cleaning machine **10** disclosed in said U.S. Pat. No. 3,541,631, when the compartment **13** becomes filled with refuse material it is necessary to drive the machine to a suitable site where the contents of said compartment can be emptied. Unfortunately it often occurs that said dumping area is located some distance from the factory or foundry where the cleaning machine is used, with the result that frequent time-consuming delays in the cleaning operation are required. It is to overcome this objectionable feature that the intermediate receptacle or hopper unit comprising the present invention has been designed, which hopper structure will now be described.

As is shown in the drawings, the novel hopper **20** includes a pair of side walls **21, 22**, an upright forward wall **23** (FIG. 1), a flat top **24**, a relatively short bottom wall **25**, an upwardly and rearwardly-inclined rear wall portion **26**, and an upwardly and forwardly-angled rear gate **27**. Said gate **27** is swingable from a closed position to an open, dumping position, as will be described in greater detail, and is provided with a rubber gasket **28** or the like (FIG. 1) extending therearound to provide an air-tight seal when said gate is in its closed condition.

The rearward, inclined wall portion **26** of the hopper has a pair of spaced, bottom supports in the form of curved runner plates **30**, and the entire hopper is mounted on a base unit including a pair of spaced horizontal rail members **32** elevated substantially above the ground, there being vertical, ground-engaging supporting legs **34** at the ends thereof. Said curved support elements **30** are designed to ride on said base rail elements **32** in a manner permitting the rocking of said hopper from its normal upright position to a tilted dumping position. A plurality of protruding studs **31** provided on the periphery of said

curved support members **30** are designed to removably progressively fit into corresponding openings **33** on said rail elements **32** during said tilting movement. When said hopper is in its normal, refuse-receiving position a locking latch **37** on the hopper front wall is releasably engaged with a coacting latch member **42** on the base portion to prevent the inadvertent tilting of said unit.

Due to the elevation of said horizontal base members **32** above the level of the ground in the illustrated form of the present invention, and the spacing between the supporting legs **34**, a conventional fork-type lift truck or similar lifting vehicle can be easily maneuvered into position with its forks inserted beneath said frame and the hopper raised thereby and conveyed to a desired dumping area. It is contemplated, however, that in lieu of said hopper base design, which is intended particularly for use with a fork lift truck, said hopper could also be mounted on wheels, thereby permitting it to be towed to the dumping area by any suitable vehicle, as well as permitting the hopper to be pulled along behind the self-propelled vacuum machine **10** during the cleaning operation if desired.

With reference again to the gate **27** forming a part of the rear wall of the illustrated hopper, it will be noted in the drawings that said gate is pivotally secured to a rod **41** on the top of and extending transversely across the back of said hopper (FIG. 2). Said tailgate **27** normally assumes the closed position illustrated in the drawings, and during the dumping operation the gate automatically swings to an open position permitting the discharge of the hopper contents. When it is in its closed position said gate **27** is of sufficient weight that an air-tight seal is provided, the rubber gasket **28** functioning to enhance said seal.

As illustrated in FIG. 1, formed in the upper, forward portion of the side wall **21** of the hopper is a plate **48** having an opening **49** therein which is adapted to removably sealingly receive the outer end of the hose **16** extending from the vacuum cleaning machine, there being suitable resilient gasket sealing means therefor, as is well known in the art. Formed in the opposite hopper wall **22** rearwardly of said first hose connection is a second plate **50** and opening **51** to which there is removably sealingly attached an elongated hose **53** (FIG. 1) hereinafter referred to as the intake hose. The latter hose may be of any desired length, depending upon the requirements and physical layout of the particular plant or foundry for which the cleaning machine is intended, and the outer, free end **53'** thereof is designed to be held and manipulated by a workman during the suction cleaning operation. It is to be understood that said hose-connecting plates **48, 50** are provided with coacting resilient sealing gaskets, as mentioned, which are designed to ensure a leakproof connection whereby a vacuum is created within said hopper **20** during the cleaning operation, as will be described. Moreover, the connection and separation of said hoses can be accomplished quickly and easily, and without requiring any special tools or equipment.

Within the interior of the present hopper is a baffle plate **45** which is a novel and important element of the invention. Said plate is welded or otherwise rigidly affixed to the hopper top wall **24** in substantial alignment with the longitudinal center line thereof and extends from a point adjacent the hopper forward wall **23** to the rear of said hopper, the rearward end of said plate being angled forwardly and downwardly as shown in FIG. 1. Said elongated baffle plate projects downwardly to a point below the aforementioned hose openings **49, 51**, and functions to intercept the debris carried by the incoming air stream and deflects the same downwardly to the bottom of the hopper.

In the use of the present invention a plurality of hoppers **20** are preferably positioned at convenient locations

around the factory or foundry, and when a particular area of the building is to be cleaned the mobile cleaning machine **10** is maneuvered to a position adjacent the nearest hopper and the hose **16** extending from the rearward portion of said mobile cleaning machine is sealingly engaged within the opening **49** in said hopper. The elongated hose **53** projecting from the hopper is then manually handled by a workman, the airtight sealing engagement of said hoses with the hopper body together with the sealed engagement of the tailgate **27** when said gate is in its closed position permitting the suction created by the blower in said cleaning machine to be transmitted through said hopper and through the elongated intake hose **53**. The result is that debris and refuse is sucked into the outer end of said intake hose **53** and is drawn into the hopper. Said flexible intake hose **53** can be 150 feet or more in length, if desired, and is adapted to reach into pits, under conveyors or machinery, as well as other places which are exceedingly hard to get at with shovels or other conventional manual cleaning tools, thereby permitting much more effective and thorough cleaning than is possible with manual cleaning procedures, as well as being substantially less costly.

As hereinbefore mentioned, the bulk of the refuse material is intercepted by the baffle plate **45** and falls to the bottom of the hopper **20**. However, a portion of the fine dust particles and minute impurities are retained in the air stream and are drawn completely through said hopper and into the cleaning machine **10** through the connecting hose **16**. The latter machine is provided with special filtering elements designed to separate and remove said foreign particles from the air stream before it is discharged through the stack **17**, as is fully described in said U.S. Pat. No. 3,541,631, thereby minimizing pollution of the surrounding atmosphere.

When the hopper **20** becomes filled with refuse it is a simple matter to disconnect the hoses **16, 53** therefrom, and a conventional fork lift truck or the like can be utilized to pick up said hopper and convey it to a remote dumping site, or if said hopper is mounted on wheels it can be towed to the dumping area by any suitable vehicle. In the meantime the mobile cleaning machine **10** can be immediately connected to another strategically-placed hopper and the cleaning operation continued. The result is that with the use of a plurality of said hoppers **20** the cleaning machine does not become filled with refuse, and it is unnecessary to frequently halt the cleaning operation in order to drive said machine to the dumping area, as was the former practice and which results in considerable "down time" and efficiency loss. With the illustrated cleaner and hopper assembly, in fact, it has been found that as much as eight tons of dry or wet refuse material can be collected and disposed of in an hour, although the size and capacity of the machine can be varied to suit particular plant requirements, of course.

When the hopper reaches the dumping area and the latch assembly **37, 42** is disengaged, said hopper is designed to automatically tilt to its dumping position and then right itself when its contents have been evacuated, as is well known in the art. As hereinabove described, the tailgate **27** in the present invention swings open during said dumping operation and then automatically closes again in sealed relationship when the hopper is righted. The hopper may then be returned to the plant for further use.

From the foregoing detailed description it will be seen that the present invention provides a novel refuse hopper which is particularly well adapted for use with vacuum-type industrial cleaning machines and the like. More specifically, the present hopper is so designed that it can be removably connected in air tight relationship to a cleaning machine in a manner whereby debris and refuse sucked up by said machine is deposited in said hopper, rather than being collected in the cleaning machine itself. Thus when said hopper is full it can be disengaged from the cleaning machine and transported to a remote dumping location while the cleaning machine is connected to another hopper and the cleaning operation continued practically without interruption.

Further advantages of the novel hopper unit comprising the present invention are that said hopper is designed for quick and easy dumping to empty the contents thereof, said hopper is simple in design and operation, it is relatively inexpensive to manufacture, and it is rugged and durable in construction.

It is to be understood that while one preferred form of the novel hopper comprising the present invention has been illustrated and described herein, numerous variations and modifications in the design of said hopper will undoubtedly occur to those skilled in this art. What is intended to be covered herein, therefore, is not only the illustrated embodiment of the invention but also any and all variations or modifications thereof as may come within the spirit of said invention.

What I claim is:

1. A refuse hopper for use with a vacuum-type industrial cleaning machine, comprising: a forward wall; a pair of side walls; a top; a bottom; a rear wall; a dumping opening in one of said hopper walls; a closure member movably positionable in sealed, covering relation to said dumping opening, said closure member being swingable between an open and closed position; mounting means for said hopper permitting the same to be rocked from an upright non-dumping position to a tilted dumping position where refuse collected in said hopper is discharged through said dumping opening when said closure member is in its open condition; locking means retaining said hopper in its upright position and being releasable to allow the rockng movement of said hopper to its dumping position; a first hose opening in one of said hopper walls; means for releasably sealingly securing the end of a hose projecting from said cleaning machine in registration with said hopper hose opening; a second hose opening in one of said hopper walls; an elongated flexible intake hose sealingly mounted in registration with said second opening, the sealing engagement of said hoses and closure member with the hopper permitting a vacuum to be created in said hopper; and suction means adapted to create a vacuum in the hopper during the cleaning operation whereby refuse is sucked into the outer end of said intake hose and drawn into and collected within said hopper.

2. The refuse hopper recited in claim **1** wherein said hopper is mounted on a base unit adapted to have the forks of a fork-type lift truck projected thereunder and said hopper raised and conveyed to a dumping area by said fork lift truck.

3. The refuse hopper recited in claim **1** wherein said hopper has a baffle plate depending from its top wall intermediate said side walls, said baffle plate projecting downwardly below said second hose opening and being adapted to intercept the debris carried by the incoming air stream and deflect the same downwardly to the bottom of the hopper.

4. The refuse hopper recited in claim **3** wherein a portion of the fine foreign particles entrapped in the air stream are drawn completely through said hopper.

5. The refuse hopper recited in claim **1** wherein said hopper mounting means include a pair of spaced, curved supporting members on the underside of the hopper and a base unit including a pair of spaced horizontal rail elements, said curved supporting members being ridable on said rail elements in a manner permitting rocking movement of said hopper relative to said base unit.

6. The refuse hopper recited in claim **5** wherein each of said base unit rail elements is provided with a longitudinally-spaced line of openings therein, and wherein said curved supporting members are provided with a plurality

of studs protruding therefrom sequentially insertable in said line of rail openings during the rocking movement of said hopper.

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