

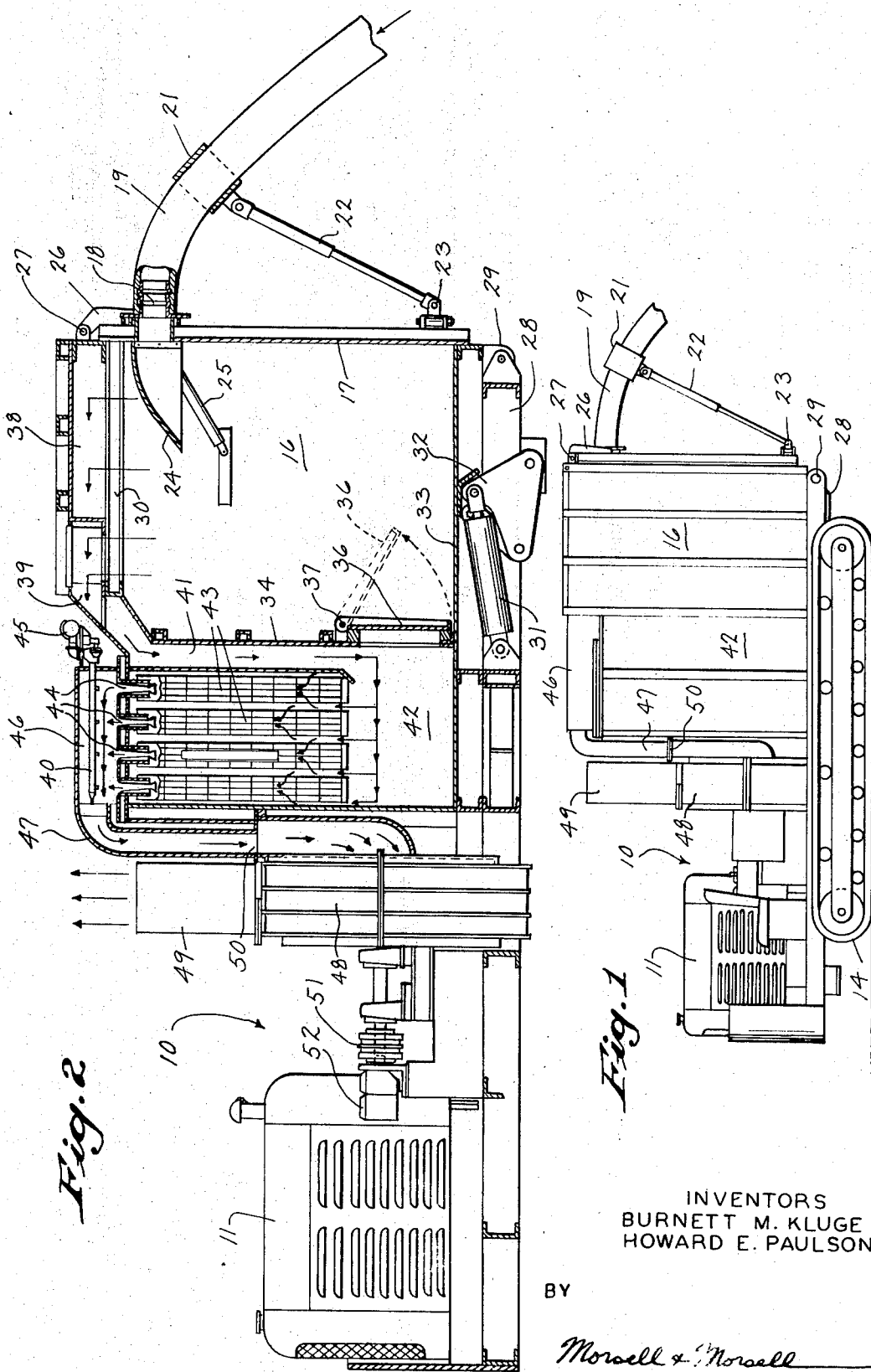
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B. M. KLUGE ET AL

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INDUSTRIAL VACUUM LOADER AND CLEANER

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INVENTORS
BURNETT M. KLUGE
HOWARD E. PAULSON

BY

Morsell & Morsell
ATTORNEYS

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INDUSTRIAL VACUUM LOADER AND CLEANER
Burnett M. Kluge, Brookfield, and Howard E. Paulson,
Waukesha, Wis., assignors to D P Way Corporation,
Milwaukee, Wis., a corporation of Wisconsin
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1 Claim

ABSTRACT OF THE DISCLOSURE

A self-propelled unit provides suction pickup and collection of refuse materials and debris from factories and foundries, said unit including a high-powered blower and elongated flexible hose for picking up materials remote from said unit, and including self-cleaning filtration means adapted to thoroughly cleanse the collected dirt particles and foreign matter from the air stream before said air is discharged to the atmosphere, said self-propelled unit being of the crawler track type for maximum maneuverability and load-carrying capacity.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to the art of pneumatic, vacuum-type cleaning, and more particularly to an improved mobile pneumatic cleaning apparatus for industrial use.

Description of the prior art

Heretofore a number of mobile vacuum-type cleaning devices have been designed for industrial cleaning purposes, as well as for cleaning streets and highways. Most of said prior mobile cleaners have been pulled behind a towing vehicle, however, and have not been self-propelled units like the present invention. Moreover, said prior mobile cleaning devices have not included filtration means designed to effectively and thoroughly purge the air stream of the collected impurities before discharging said air to the surrounding atmosphere.

Examples of prior pneumatic cleaners of the general type described are disclosed in the following U.S. patents: Daneman No. 3,193,867; Daneman No. 3,052,908; Dickson No. 3,221,358; Lison et al., No. 2,678,462; Rydberg No. 2,932,845; Steele No. 3,008,542; Hanson No. 2,887,714; Sedgwick et al., No. 2,878,508; and Luksch et al., No. 2,701,377.

SUMMARY OF THE INVENTION

The present invention provides a power-driven suction-type cleaning unit for industry which is designed to replace manual labor in the removal of debris and refuse materials in factories and foundries, thereby greatly increasing the speed, efficiency, and economy of said operation.

A further object of the present invention is to provide a cleaning unit of the type described which is mobile to permit the unit to be driven to a suitable dumping site when filled, and which unit is highly maneuverable to permit the collection of debris from inaccessible and remote locations in a plant or foundry that prior mechanical cleaning units cannot reach.

A further object of the present invention is to provide an improved vacuum-type industrial cleaner having suction capabilities permitting refuse materials to be picked up at substantial distances from said unit.

A further object is to provide an improved mobile industrial cleaning unit featuring a novel filtration system which prevents impurities including fine dust from polluting the surrounding atmosphere, and which filter system

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is automatically self cleaning and requires no shutdown for cleaning.

A further object is to provide an improved industrial cleaner wherein all dirt particles and other solids are filtered from the entraining air stream before said air stream passes through the blower, thereby minimizing damage to the blower from said abrasive materials and reducing maintenance and repair costs.

A further object is to provide a novel and improved industrial vacuum-type cleaner featuring a blower exhaust silencer adapted to maintain a low noise level.

Still further objects of the present invention are to provide a new and improved industrial vacuum-type cleaning unit which is rugged and durable in construction, which is economical to operate, and which is otherwise particularly well adapted for its intended purposes.

BRIEF DESCRIPTION OF THE DRAWING

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

FIG. 1 is a side elevational view of the complete mobile cleaning unit; and

FIG. 2 is an enlarged fragmentary side elevational and vertical sectional view of the unit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to FIG. 1 of the drawing, the self-contained mobile cleaning unit illustrated therein includes an open cab or platform 10 having a gas or diesel power unit 11, and rearwardly of said cab is the body portion of the unit housing the refuse hopper and cleaning equipment, as will be hereinafter described. The entire unit is mounted on a pair of spaced, parallel endless crawler tracks 14 having heavy-duty steel or rubber shoes. As is well known, such crawler tracks permit maximum load-carrying capacity and maneuverability. It is intended, in fact, that the novel cleaning unit comprising the present invention can turn 360° within its own length dimension, thereby greatly facilitating the pickup of debris or refuse in hard-to-reach areas in a factory or foundry. Unlike many prior mobile cleaning apparatuses the present invention is entirely self-contained and does not require a separate pulling vehicle.

Referring now more particularly to FIG. 2 of the drawing, the body portion of the present unit is of all-steel construction and includes an enlarged, rearward hopper 16 having a rear wall or tailgate 17, bottom 33, and forward wall 34. An opening is provided in the upper portion of said tailgate 17, and projecting therefrom is a connecting member 18 to which there is coupled an elongated flexible intake hose 19. Said hose is adapted to be quickly and easily disconnected from said coupling member 18 during the load-dumping operation, as will be described hereinafter, and can be of any desired length. It has been found, in fact, that with the high vacuum blower utilized in the preferred form of the present invention an extremely long intake hose 19 can be utilized to pick up refuse at distances as great as 150 feet from the vehicle. In addition to variation in length, the diameter of the hose can also be modified as desired, depending upon the intended use of the particular cleaning unit.

A hood-like deflector element 24 within the hopper 16 is designed to direct the dirt and refuse-entraining air stream introduced into said hopper through the hose 19 downwardly so that the heavier dirt particles and refuse therein will be deposited on the hopper floor. Supporting said hose exteriorly of the hopper body is a surrounding collar 21 carried on the outer end of an adjustable supporting arm 22, said arm being pivotally attached to the lower portion of the hopper tailgate, as at 23. Said tail-

gate 17 is swingable upwardly and rearwardly about a top hinge connection 27 and is adapted to be opened and closed by a hydraulic cylinder 25 and piston controlled by the driver. In addition, the entire hopper body can be tilted upwardly and rearwardly about a pivot mounting 29 by means of a hydraulic cylinder 31 and link assembly 32 in order to dump debris accumulated therein, as will be described.

The upper portion of the hopper 16 is in the form of a horizontal passageway 38, there being a removable apertured screen 30 therebetween, and communicating therewith are connected passageways 39 and 41 leading to the chamber 42 on the opposite side of the hopper forward wall 34. Said area or chamber forwardly of the hopper wall 34 includes a lower dust bin, and suspended thereabove are a plurality of filter elements 43.

The filter elements 43 employed in the present invention comprise a plurality of aligned rows or banks of elongated fabric bags having internal wire support frames. In one preferred embodiment of the invention there are four rows of ten of said tubular filter elements but the number and arrangement of said filters can be varied as desired, and the invention is not to be limited in this respect. Mounted above said multiple filter elements 43 are manifold pipes 40 connected to a source of compressed air and associated therewith are solenoid valves and an adjustable timer 45 which function to automatically cause blasts of compressed air to be discharged from said manifold pipes downwardly through said tubular filter elements 43. The high pressure backwash created by said air blast functions to knock the accumulated dirt and sediment off the filter bags and onto the floor of the dust bin 42 therebelow. Through the action of said solenoid valves and timer 45 an air blast is directed through one row of filters at a time, proceeding progressively down the line of filter tubes in sequence and then automatically starting again with the first row. Thus there is provided a continuous cleaning action which maintains the filters clean at all times and which makes it unnecessary to shut down the machine for periodic cleaning, as in conventional vacuum-type cleaners.

A further feature of the novel filter assembly incorporated in the present invention is that said filter tubes 43 are removable as a unit when it is desired to pick up unusually wet refuse materials or liquid. Such wet or sloppy materials might be injurious to the fabric in the filter bags and, in addition, the liquid functions to entrain and remove the dirt particles and the like from the air stream, thus making said fabric filter bags unnecessary when handling extremely wet materials or liquid.

The tops 44 of the filter elements 43 open into a passageway 46 communicating with a vertical conduit 47, and the latter is joined at its lower end to the high vacuum blower 48 featured in the present invention. Said blower is operatively associated with a suitable hydraulic pump 51 and hydraulic drive motor 52 which powers a hydrostatic transmission for operation of said blower, as well as the crawler tracks, body dump hoist, and tailgate. Projecting upwardly from said blower 48 is a discharge stack 49 equipped with a blower discharge silencer.

In the use of the novel vacuum-type cleaner comprising the present invention when the blower 48 is actuated a high-powered suction is created throughout the system which forcibly draws refuse and debris through the flexible intake hose 19 and into the interior of the hopper 16. As described, when the dirt and refuse-entraining air stream enters said hopper it loses a substantial portion of its velocity, and the heavier refuse and dirt particles therein fall by gravity to the bottom of the hopper. Said air stream is then drawn upwardly, together with the fine foreign material and dirt particles therein, through the perforated screening 30 and into the top passageway 38, said screening 30 functioning to filter out additional relatively large dirt particles and foreign matter which is collected on the bottom 33 of the hopper.

The air stream is next drawn by the force of the blower

through the passageways 39, 41 into the adjacent chamber 42 and enters the tubular filter elements 43. As described, said filter elements are designed to screen out even the finest dust particles and impurities, and said filter members are continuously automatically cleaned in sequence by air blasts from manifold pipes 40. The dirt and sediment separated from the air stream by said filter members 43 is collected on the floor of the dust bin therebelow.

The thoroughly cleansed air stream is then drawn through the passageway 46 and conduit 47 to the blower 48, where it is forced upwardly through the discharge stack 49. One of the principal advantages of the present invention, as hereinabove mentioned, is that in the present unit the air stream is thoroughly cleaned before it passes through the blower. Thus the blower is not damaged by the abrasive dirt particles and foreign matter, as in many prior industrial cleaners, and blower repair and maintenance costs are minimized.

In accordance with the preferred form of the present invention the exhaust stack 49 is provided with a silencer which functions to ensure that the air stream is discharged at a relatively low noise level.

When the cleaning operation has been completed, or when the hopper has been loaded with refuse the mobile unit comprising the present invention can be driven to a suitable dumping location. To discharge the contents thereof the elongated hose 19 is first disconnected from the coupling element 18 on the tailgate, as described, and the entire body may then be pivoted rearwardly and upwardly about the pivot mounting 29 by means of the hydraulic cylinder 31 and piston.

The tailgate 17 is conjointly swung outwardly about its top hinge connection 27 through the actuation of the hydraulic cylinder 25, thus permitting refuse in the hopper 16 to be dumped, and simultaneously a door 36 in the wall 34 swings open to permit the evacuation of the dust and sediment accumulated in the dust bin 42. Said hydraulic dumping can be controlled from the driver's cab, as mentioned, and the tilting of said body relative to the cab is permitted by a separable seal assembly 50 in the conduit 47, as is well known in the art.

The body of the present mobile cleaning apparatus is preferably of a size to carry up to 3½ cubic yards of refuse, which has been found to be adequate for most industrial cleaning jobs, but it is to be understood that the size and capacity of said unit can be varied, depending upon the intended use of the cleaner. Similarly, the unit is preferably designed to handle bulk densities up to 220 pounds per cubic foot, depending upon the size and shape of the particles, but neither is the invention to be limited in this respect.

From the foregoing detailed description it will be seen that the present invention provides a new and improved self-propelled cleaning unit for modern industry. The suction-type cleaner comprising the invention is designed to effectively pick up and collect a wide variety of debris and refuse materials, including foundry sand, flue dust, ash, mill scale, graphite, grain products and waste, metal chips, ores, chemicals, and, in fact, virtually all solid or liquid materials which may be encountered in a factory or foundry.

Further advantages of the improved mobile cleaning device comprising the present invention are that it is very maneuverable to permit the collection of refuse from inaccessible and remote locations in a factory or foundry, and said improved unit features a novel continuous self-cleaning filtration system which effectively prevents pollution of the surrounding atmosphere. Moreover, by filtering the dirt particles and foreign matter therefrom before the air stream passes through the blower there is no possibility of said abrasive matter damaging the blower.

Still further features of the present invention are that it is relatively quiet, it is inexpensive to operate, and it is rugged and durable in construction.

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It is to be understood that while a preferred embodiment of the present invention has been illustrated and described herein, numerous variations or modifications thereof will undoubtedly occur to those skilled in the art. What is intended to be covered herein is not only the illustrated form of the invention but also any and all modified forms thereof as may come within the spirit of said invention, and within the scope of the following claim.

What we claim is:

1. In a mobile, self-propelled vacuum-type cleaner including a cab, a body pivotally mounted rearwardly of said cab, a power-operated suction-type blower, a hopper in the rearward portion of said body, an elongated flexible intake hose communicating with said hopper interior, means in said hopper for causing the heavier dirt particles and refuse drawn therein through said intake hose to be separated from the air stream and deposited on the bottom of the hopper, a chamber between said hopper and said blower, an airstream passageway communicating with and extending between the upper portion of said chamber and said blower, and an exhaust stack communicating with said blower, the improved filter means adapted to filter fine dirt particles from the airstream before said air stream is drawn into said blower, comprising:
 a plurality of spaced, aligned rows of tubular fabric filter bags removably suspended from the upper portion of said chamber and positioned to intercept the fine dirt-entraining air stream drawn from said hopper toward said blower, said filter bags being closed whereby said air stream is caused to flow through said bag walls to the interior of said bags and upwardly through the open tops of said bags into the airstream passageway communicating with

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said blower, the fine dirt particles in said airstream being filtered out by said fabric bags and collected on the exterior surfaces thereof;
 manifold pipe means mounted above the open tops of said filter bags; and
 means for directing blasts of air under pressure from said manifold pipes downwardly into and through said filter bags to knock the dirt accumulated on the outer surfaces thereof onto the chamber floor therebelow, said air blasts being directed sequentially through one row of filter bags at a time, proceeding progressively down the line of bags in sequence and then automatically starting again with the first row, so that said bag-cleaning action is continuous and does not require the stopping of said filtering operation.

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ROBERT W. MICHELL, Primary Examiner

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15—352; 55—273, 276, 341, 342, 432