

April 27, 1965

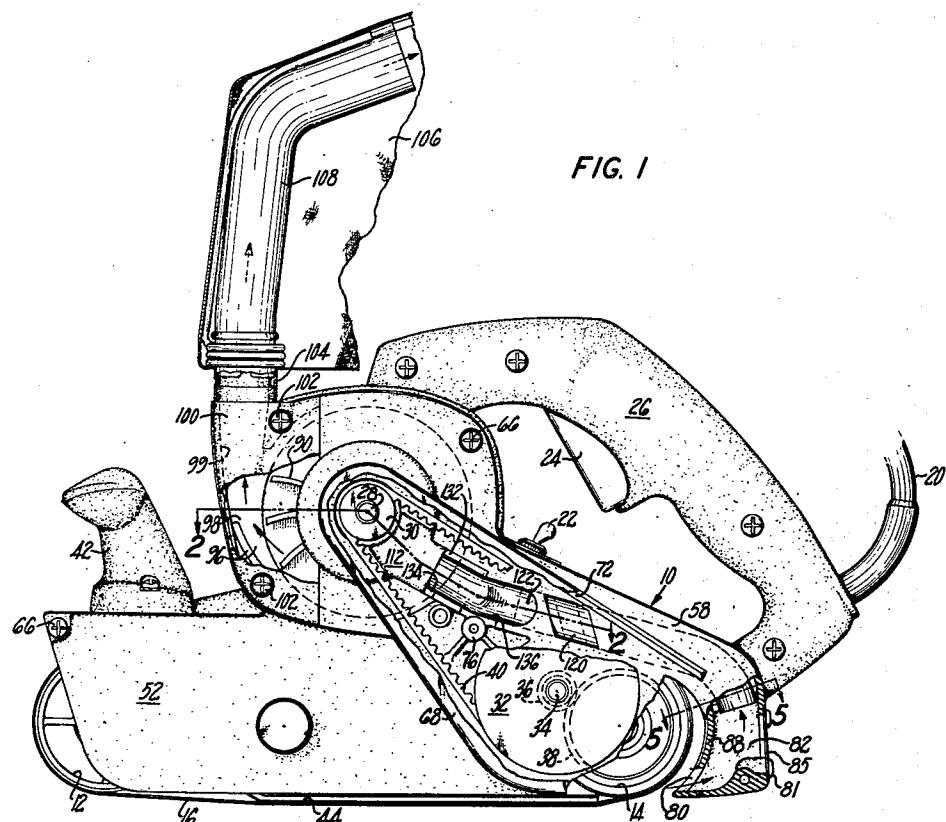
M. D. BURROWS ET AL

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VACUUM CLEANING SYSTEM FOR PORTABLE ABRADING MACHINE

Filed March 29, 1963

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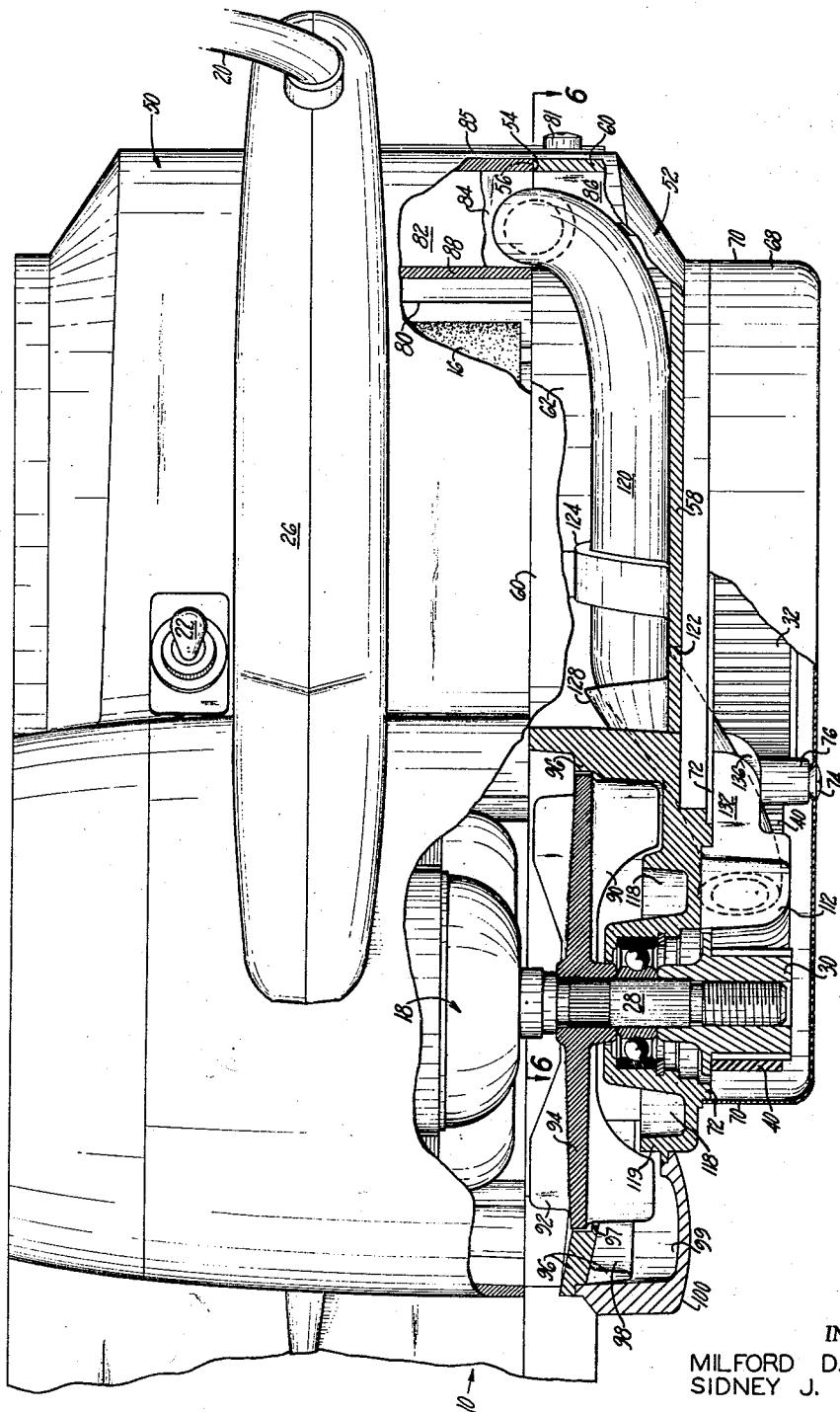
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FIG. 4

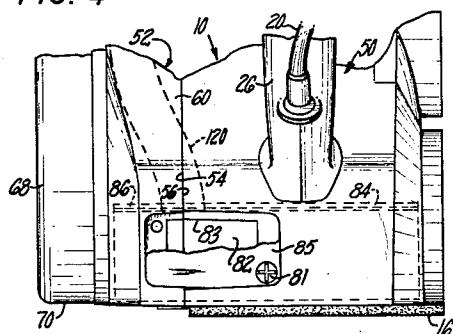
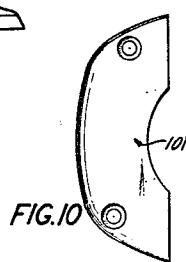
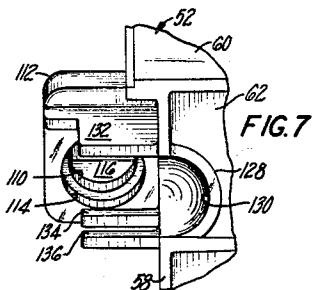
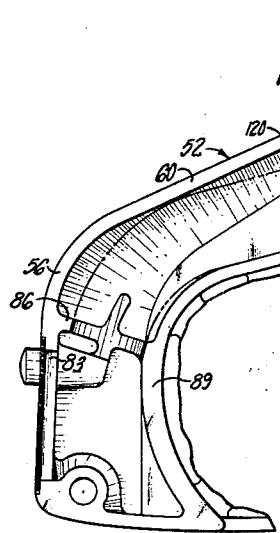
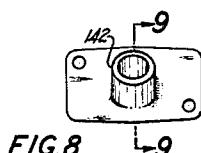
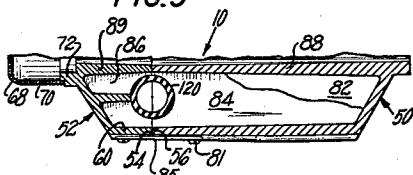


FIG. 5



INVENTORS

MILFORD D. BURROWS
SIDNEY J. GOODMAN

BY *Lindsey, Prutzman and Hayes*
ATTORNEYS

United States Patent Office

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VACUUM CLEANING SYSTEM FOR PORTABLE ABRADING MACHINE

Milford D. Burrows, Avon, and Sidney J. Goodman, Newington, Conn., assignors to The Stanley Works, New Britain, Conn., a corporation of Connecticut

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11 Claims. (Cl. 51—170)

This invention relates to improvements in portable power operated abrading machines and, more particularly, to a vacuum cleaning system adapted for removing the waste products resulting from the operation of the abrading machine.

A principal aim of the present invention is to provide a new and improved vacuum cleaning system of the type described that is capable of being compactly associated with a portable abrading machine of the type having an endless abrading belt without hindering the effectiveness and operability of the machine and with complete harmonization with the general design and styling of the machine for benefiting rather than distracting from its appearance.

Another aim of the present invention is to provide a vacuum cleaning system of the type described which is adapted for efficient and effective removal of the waste products resulting from the operation of the abrading machine, which operates with little noise to convey the waste products from the work area to a collecting receptacle without clogging of the vacuum system or of the machine and which is nevertheless adapted for convenient and facile cleaning.

A further aim of the present invention is to provide a new and improved vacuum cleaning system of the type described having an economical construction with a minimum number of light parts in compact association with the abrading machine so as not to affect its balance or shape in a manner harmful to the operation of the machine.

Another aim of the present invention is to provide a new and improved vacuum cleaning system usable as an attachment for a standard abrading machine and which is adapted for facile installation without substantial conversion of the machine. For flexibility in merchandising and for economy of manufacture, it is desirable to produce a standard abrading machine that can be sold with or without a vacuum cleaning system. Therefore, it is an aim of this invention to provide an abrading machine which is adapted for conversion for use with or without a vacuum cleaning system and which may be marketed with the vacuum cleaning system installed, with the vacuum cleaning system as a conveniently installed accessory or as a standard unit without the vacuum cleaning system.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a side elevation view, partly broken away and partly in section, of an abrading machine of the type having an endless abrading belt and provided with a preferred embodiment of the vacuum cleaning system of the present invention;

FIG. 2 is an enlarged partial section view, partly in phantom, taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged top plan view, partly broken away and partly in section, of the abrading machine;

FIG. 4 is a rear elevation view partly broken away of the abrading machine;

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FIG. 5 is a section view, partly broken away, taken along line 5—5 of FIG. 1;

FIG. 6 is a section view, partly broken away and partly in phantom, taken along line 6—6 of FIG. 3;

FIG. 7 is a partial section view taken along line 7—7 of FIG. 6;

FIG. 8 is a front elevation view of a modified cover plate for an alternative vacuum cleaning system;

FIG. 9 is a sectional view taken along line 9—9 of FIG. 8; and

FIG. 10 is a front elevation view of an alternative impeller cap.

Referring now in more particularity to the drawings, a preferred embodiment of the vacuum cleaning system of the present invention is shown associated with a portable power operated abrading or sanding machine of the type having an endless abrading belt adapted primarily for sanding or polishing flat wood or metal surfaces. An elongated housing or frame, generally denoted by the numeral 10, supports a pair of revolvable drums or pulleys 12, 14 adjacent the opposite longitudinal ends thereof, and an endless flexible abrading belt 16 is trained or looped about the drums. The drum 12, mounted adjacent the forward end of the housing, is the idler drum; while the drum 14, adjacent the after end of the housing, is the driving drum; the latter being operatively connected to and driven by an electrical motor 18 mounted within the housing 10 above and intermediate the drums 12, 14. The motor 18 is equipped with an electrical supply cable 20 and is electrically controlled by a high-low switch 22 and by an on-off trigger switch 24 mounted in an upright spade handle 26 mounted on the housing.

The drive motor 18 has a laterally extending drive shaft 28 with an axis parallel to the axes of the drums 12, 14. For operatively connecting the drive shaft 28 to the driving drum 14 there are provided a pair of pulleys 30 and 32 fixed for rotation with the drive shaft 28 and a stub shaft 34, respectively, a pair of meshing gears 36 and 38 fixed for rotation with the stub shaft 34 and the drum 14, and an endless belt 40 wound upon the pulleys 30 and 32. As seen in FIG. 1, the drive shaft 28 rotates in the clockwise direction to drive the drum 14 in the counterclockwise direction thereby moving the lower portion of the abrasive belt 16 rearwardly along the base of the housing. In the usual manner, an axial face of the drums 12, 14 and an edge of the abrasive belt 16 are substantially flush with the side of the housing 10 removed from the drive mechanism so that the abrading machine is usable for sanding a workpiece surface flush to a second surface projecting therefrom. A forward upright handle 42 and the spade handle 26 provide for operator manipulation of the machine tool, and in the usual manner a bed plate 44 provides a backing support for the lower lap of the abrading belt as the outer abrading surface thereof is pressed against the surface of the workpiece.

The housing or frame 10 comprises in assembly a housing body casting 50 and a housing cover casting 52 having (as best seen in FIG. 3) shoulders 54, 56, respectively, which abut in a longitudinally extending plane. The housing cover 52 has a longitudinal sidewall 58 and a laterally extending flange 60 terminating with the abutting shoulder 56 and forming with the sidewall 58 a housing cover chamber 62. The meshing gears 36 and 38 are mounted on the housing cover and the drive belt 40 and pulleys 30, 32 are located externally of the sidewall 58. The housing cover 52 is secured to the housing body 50 by means of screw fasteners 66 (FIG. 1) and a sheet metal drive belt cover 68 is secured to the housing cover 52 by an interfitting engagement of the peripheral edge 70 of the drive belt cover with a laterally projecting flange 72 on the sidewall 58 (FIG. 3) and by a screw fastener 74

threaded into a boss 76 extending laterally of the sidewall 58.

In accordance with the vacuum cleaning system of the present invention, wood, dust or other waste products resulting from the operation of the sander pass tangentially from the belt as it moves about the drum 14 through a lateral forwardly facing slot opening 80 located to the rear of the drum 14 adjacent the base of the machine. The slot inlet opening 80 communicates with a pickup chamber 82 defined by integral wall portions of the housing including an upper lateral web having web portions 84 and 86 and a lateral sidewall having wall portions 88 and 89 conforming to the curvature of the driving drum 14. A cover plate 85 removably secured to the rear of the housing 10 by screw fasteners 81 encloses a rearwardly facing housing opening 83 providing access to the pickup chamber.

Vacuum pumping for the vacuum cleaning system is provided by a rotary centrifugal impeller 90 press-fit upon the drive shaft 28 for rotation therewith and formed integrally with a motor cooling fan 92 and an intermediate disc 94. As seen in FIGS. 1, 2 and 3, the outside diameter of the impeller 90 is greater than that of the cooling fan 92 and less than that of the disc 94. For forming a closely fitting shroud about the impeller 90 and disc 94, the housing cover 52 is cast with a lateral flange 96 having an inward projection 97 defining with the disc 94 (as best seen in FIG. 6) a labyrinth air seal. As seen in FIG. 1, the shroud 96 diverges from the impeller forwardly of the drive shaft 28 to provide a pump outlet opening 98.

A pump discharge conduit 99 is provided by a removable cap 100 fixed to the housing cover by a pair of screw fasteners 102. The discharge conduit extends upwardly from the impeller outlet to an outlet nozzle 104 formed on the cap and removably mounting an inlet conduit 108 of an air collector bag 106. As seen in FIG. 1, the discharge conduit has an outwardly increasing cross-sectional area providing a diffuser section adapted for diminishing the velocity of the upwardly moving fluid before it is discharged through the outlet opening of the pump provided by the outlet nozzle 104 into the collector bag and for thereby improving the flow to the collector bag for increasing the efficiency of the pump.

An inlet opening 110 of the pump is cast in a projection 112 extending outwardly from the sidewall 58 within the confines of the drive belt 40 intermediate the pulleys 30, 32. The inlet opening communicates with an enlarged opening 114 in the projection and a lateral extending passage 116 communicating with a pump intake annulus 118 defined by the contoured sidewall 58. Referring to FIGS. 2 and 3, the intake annulus 118 is of less diameter than the impeller chamber and is peripherally defined by an annular flange 119 which extends axially into the impeller chamber intermediate the axial extremities or faces of the impeller. Radially inwardly of the annulus 118, the sidewall 58 is contoured for receiving a frictionless bearing mounting the drive shaft, and radially outwardly of the annulus 118 the sidewall 58 is contoured for contiguous association with the outer face of the impeller 90.

A flexible tubular conduit or hose 120 connects the pump inlet with the pickup chamber 82, with the forward end of the hose snugly received within the opening 114 of the projection 112 and, as seen in FIG. 5, its rear end received by an opening formed by semicircular shoulders in the web portions 84 and 86. Consequently, the ends of the hose are effectively sealed. The hose extends upwardly and forwardly from the web portions 84, 86; first within the chamber 62 internally of the sidewall 58 and above the gears 36, 38 and then, after extension through an opening 122 in the sidewall, externally of the sidewall into connection with the projection 112. As the opening 122 is located intermediate the pulleys 30, 32 and between the laps of the endless belt 40, the hose is threaded between the pickup chamber and the impeller inlet opening without interference with the drive mecha-

nism of the abrading machine. For rigidly maintaining the hose in its noninterfering location, a web or strap 124 is integrally cast with the housing cover for holding the hose along the inside face of the sidewall 58. An inwardly extending guide 128 integrally cast with the sidewall 58 has an outwardly concave face 130 adapted for directing the hose outwardly, and upper and lower outwardly extending shelf guides 132 and 134 and 136 provide for directing the hose upwardly to the opening 114. As seen in FIG. 1, the guide shelf 136 is slightly concave and the rear edge of the slot opening 122 is arcuately contoured to ensure that the hose 120 will extend through the sidewall opening and between the shelf guides into connection with the pump inlet without collapsing or overstressing the hose wall.

In operation, the centrifugal impeller revolves with the operation of the abrading belt 16 to create a partial vacuum in the hose 120 and pickup chamber 82 for automatic removal of dust and other waste particles resulting from the operation of the sanding machine. The waste particles are carried in a stream of air upwardly and forwardly through the hose to the intake annulus 118 of the pump and thence through the impeller chamber and discharge conduit to the collector bag 106. As the intake annulus 118 communicates with the impeller chamber inwardly of the periphery thereof and since the hose 120 extends upwardly to the opening 110, there is little or no clogging of the impeller upon shut down due to the left over particles in the system.

As the vacuum cleaning system of the present invention is confined within the lateral dimensions of the abrading machine and the collector bag 106 is positioned for noninterference with the machine operation, the sander is capable of performing all of its usual functions, including the sanding of a workpiece surface flush to a second surface projecting therefrom. Additionally, as the cap 100 on the housing cover may be readily replaced with a cap 101 (FIG. 10) not having the discharge conduit and outlet nozzle, the abrading machine can be conveniently converted to the conventional type not incorporating a vacuum cleaning system. Therefore, the sander may be sold with or without the vacuum cleaning system installed or with the vacuum system as a conveniently installed accessory. Further, though internal cleaning of the vacuum cleaning system is seldom necessary, such internal cleaning may be readily accomplished by removal of the pickup chamber cover for access to the pickup chamber and to the intake end of the hose and by removal of the drive belt cover 68 and withdrawal of the hose from the opening 114 for access to the impeller inlet opening and the upper end of the hose. For access to the impeller chamber or for replacement or removal of the hose 120, the housing cover can be dismantled from the housing body.

As a modification to the present invention, an alternative pickup chamber cover 140 (seen in FIGS. 8 and 9) can be provided with an outwardly and upwardly extending outlet nozzle 142 adapted for attachment to a hose of an external vacuum cleaning system; as, for example, the conventional home tank-type vacuum cleaner. When using such a system, the opening to the pickup chamber provided in the web portions 84, 86 could be conveniently plugged to provide better waste removal through the slot opening 80.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

We claim:

1. In combination with a portable abrading machine of the type having an elongated frame, a pair of longitudinally spaced laterally extending drums revolvably mounted on the frame for supporting an endless abrading belt thereon, a motor mounted on the frame having a

laterally extending drive shaft; and a driving connection between the motor and one of the drums including a drive pulley mounted on the drive shaft, a driven pulley and an endless driving belt mounted on the pulleys; a vacuum cleaning system comprising a pump having a rotary impeller mounted on the drive shaft and a pump inlet opening spaced intermediate the drive and driven pulleys and within the confines of the endless driving belt; means providing a pickup chamber within the housing adjacent one of the drums, and conduit means providing a passage communicating with the pickup chamber and with the pump inlet opening and located in part within the confines of the belt.

2. In combination with a portable abrading machine of the type having an elongated housing with a body portion and a cover portion providing a housing sidewall, a pair of longitudinally spaced laterally extending drums revolvably mounted within the housing for supporting an endless abrading belt thereon, a motor mounted within the housing having a laterally extending drive shaft; and a driving connection between the motor and one of the drums including a drive pulley mounted on the drive shaft, a driven pulley and an endless driving belt mounted on the pulleys and extending adjacent the sidewall externally of the housing; a vacuum cleaning system comprising a pump having a rotary impeller mounted on the drive shaft and a pump inlet opening spaced intermediate the drive and driven pulleys within the confines of the endless driving belt; means providing a pickup chamber within the housing adjacent one of the drums, and a tubular conduit providing a passage communicating with the pickup chamber and with the pump inlet opening and with a first part located within the confines of the endless driving belt externally of the housing and with a second part located internally of the housing.

3. The vacuum cleaning system of claim 2 wherein the housing sidewall has an opening through which the tubular conduit extends and further comprising means affixing said second part of the tubular conduit to the housing and guiding said first part of the tubular conduit for connection to the pump inlet opening.

4. The vacuum cleaning system of claim 2 wherein the means providing a pickup chamber includes a laterally extending web having web portions integral with the housing body and cover together defining an opening to the pickup chamber receiving the tubular conduit.

5. In combination with a portable abrading machine of the type having a frame, a pair of longitudinally spaced laterally extending drums revolvably mounted on the frame for supporting an endless abrading belt thereon, a motor mounted on the frame; and a driving connection between the motor and one of said drums including a rotary drive member, a rotary driven member and an endless driving element mounted on the drive and driven members; a vacuum cleaning system for the removal of waste resulting from the operation of the abrading machine comprising a rotary pump mounted coaxially with the rotary drive member and operatively connected to the motor for drive thereby, said pump having a pump inlet opening intermediate the drive and driven members within the confines of the endless driving element and a pump outlet opening, means providing a pickup chamber adjacent one of the drums, conduit means providing a passage communicating with the pickup chamber and with the pump inlet opening and extending in part within the confines of the endless driving element, and a removable waste-receiving bag mounted above the abrading machine and connected to the pump outlet opening.

6. In combination with a portable abrading machine of the type having an elongated housing with a sidewall on one side thereof, a pair of longitudinally spaced laterally extending drums revolvably mounted within the housing for supporting an endless abrading belt thereon, a motor mounted within the housing having a laterally extending drive shaft; and a driving connection between

the motor and one of the drums including a drive pulley mounted on the drive shaft, a drive pulley and an endless driving belt mounted on the pulleys and extending adjacent the side wall externally of the housing; a vacuum cleaning system comprising a pump having a rotary impeller mounted on the drive shaft inwardly of the drive pulley, a pump casing defining an intake annulus between the impeller and drive pulley and a pump inlet opening communicating with the intake annulus and spaced intermediate the drive and driven pulleys within the confines of the endless driving belt, means providing a pickup chamber adjacent one of the drums, and conduit means providing a passage communicating with the pickup chamber and with the pump inlet opening and located in part within the confines of the endless driving belt externally of the housing and in part internally of the housing.

7. In combination with a portable abrading machine of the type having an elongated housing with a sidewall on one side thereof, a pair of longitudinally spaced laterally extending drums revolvably mounted within the housing for supporting an endless abrading belt thereon, a motor mounted within the housing having a laterally extending drive shaft; and a driving connection between the motor and one of the drums including a drive pulley on the drive shaft, a driven pulley and an endless driving belt mounted on the pulleys and extending adjacent the sidewall externally of the housing; a vacuum cleaning system comprising, a pump having a rotary impeller mounted on the drive shaft inwardly of the drive pulley, a pump casing defining an impeller chamber receiving the impeller and pump inlet and discharge openings in communication therewith, means providing a waste-receiving chamber above the abrading machine and in communication with the pump discharge opening, means providing a pickup chamber adjacent one of the drums, and conduit means providing a passage communicating with the pickup chamber and with the pump inlet opening and extending adjacent the sidewall of the housing and located in part externally of the housing within the confines of the endless driving belt.

8. A portable abrading machine comprising an elongated housing with a sidewall on one side thereof, a pair of longitudinally spaced laterally extending drums revolvably mounted within the housing for supporting an endless abrading belt thereon, a motor mounted within the housing having a laterally extending drive shaft, means providing a driving connection between the motor and one of the drums including a drive pulley mounted on the drive shaft, a driven pulley and an endless driving belt mounted on the pulleys and extending adjacent the sidewall externally of the housing, a pump including a rotary impeller mounted on the drive shaft inwardly of the drive pulley, said housing providing a pump casing defining an impeller chamber receiving the impeller and a pump inlet opening communicating therewith and located intermediate the drive and driven pulleys within the confines of the endless driving belt, said pump casing including a removable cap replaceable by a modified cap having a pump discharge opening, said housing further providing a pickup chamber adjacent one of the drums and defining a pickup chamber outlet opening within the housing, said sidewall having an opening intermediate the drive and driven pulleys adapted for receiving a conduit connecting the pickup chamber outlet opening and the pump inlet opening whereby the abrading machine is adapted for conversion to one having a vacuum cleaning system by the addition of a conduit connecting the outlet opening of the pickup chamber with the pump inlet opening and by the replacement of the removable cap with one having a discharge opening.

9. In combination with a portable abrading machine of the type having a frame, a pair of longitudinally spaced laterally extending drums revolvably mounted on the frame for supporting an endless abrading belt thereon, a motor mounted on the frame having a laterally extend-

ing drive shaft, and a driving connection between the motor and one of the drums including a rotary drive member on the drive shaft, a rotary driven member and an endless driving element mounted on the drive and driven members; a vacuum cleaning system comprising a pump having an impeller mounted on the drive shaft inwardly of the drive member, a pump casing defining an impeller chamber receiving the impeller and an inlet opening communicating with the impeller chamber and located intermediate the drive and driven members within the confines of the endless driving element, said pump casing further defining an outlet conduit communicating with the impeller chamber and having an outwardly increasing cross-sectional area providing a diffuser section adapted for diminishing the velocity of the fluid discharged from the impeller chamber, means providing a pickup chamber adjacent one of the drums, and conduit means connecting the pickup chamber with the pump inlet opening and extending in part within the confines of the endless driving element.

10. In combination with a portable abrading machine of the type having a frame, a pair of longitudinally spaced laterally extending drums revolvably mounted on the frame for supporting an endless abrading belt thereon, a motor mounted on the frame having a drive shaft, and a driving connection between the motor drive shaft and one of the drums; a vacuum cleaning system comprising a pump having a rotary impeller mounted on the drive shaft, said pump further having a casing defining an impeller chamber receiving the impeller and an intake annulus communicating with the impeller chamber, said intake annulus being coaxial with and of less diameter than said impeller and being peripherally defined by an annular flange extending axially into the impeller chamber, intermediate the axial extremities and radially inwardly of the periphery of the impeller chamber, said pump casing further defining a pump inlet opening communicating with the intake annulus and a pump outlet opening

communicating with the impeller chamber, means providing a pickup chamber adjacent one of the drums, and conduit means connecting the pickup chamber with the pump inlet opening.

5 11. A portable abrading machine comprising a forwardly extending elongated housing, front and rear longitudinally spaced laterally extending drums revolvably mounted within the housing for supporting an endless abrading belt thereon, a motor mounted within the housing, means providing a driving connection between the motor and one of the drums, said housing having integral wall means forming a laterally extending pickup chamber located rearwardly of the rear drum, said wall means defining a laterally extending forwardly facing pickup chamber inlet opening for and in communication with the pickup chamber, said wall means further defining a rearwardly facing cover plate opening for and in communication with the pickup chamber, and a removable cover plate for the cover plate opening having 10 a rearwardly extending nozzle adapted for connection to 15 a hose conduit of an external vacuum source.

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LESTER M. SWINGLE, Primary Examiner.

J. SPENCER OVERHOLSER, Examiner.