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Wemmer

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[54] **COMBINED STEAM AND ABRASIVE MATERIAL CLEANING DEVICE**

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[52] **U.S. Cl.** **51/12**

[51] **Int. Cl.**[2] **B24C 7/00**; B24C 3/06

[58] **Field of Search** ..... 51/8 R, 11, 12

[56] **References Cited**

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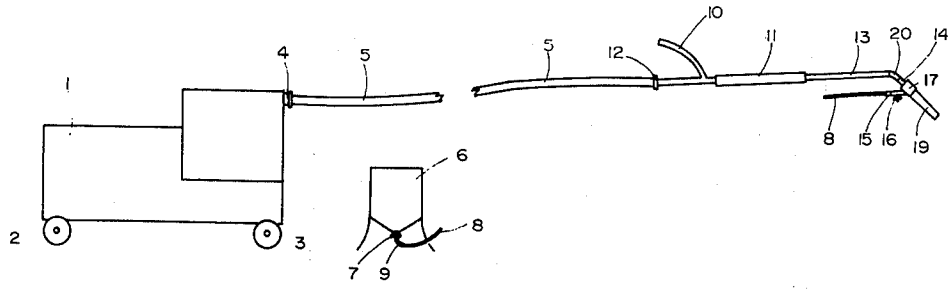
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[57] **ABSTRACT**

A cleaning device is disclosed for removing various substances from various surfaces comprising a steam cleaner comprising a water system, a heating system, and a discharge system, a unique nozzle and a source of abrasive material.

17 Claims, 2 Drawing Figures



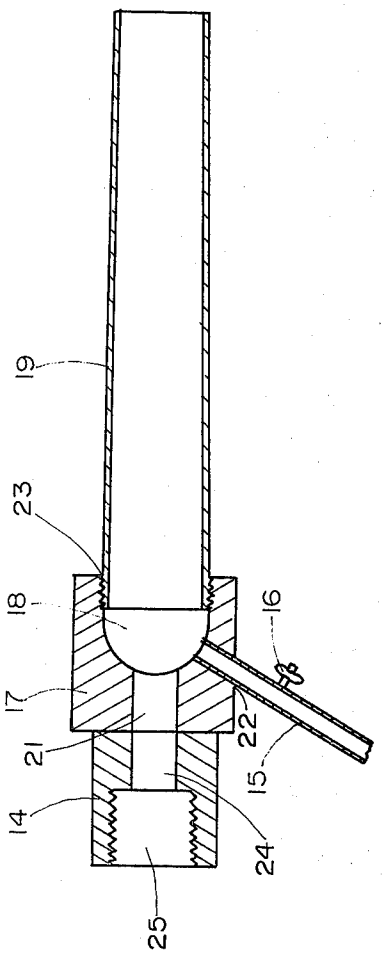

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FIG. 2

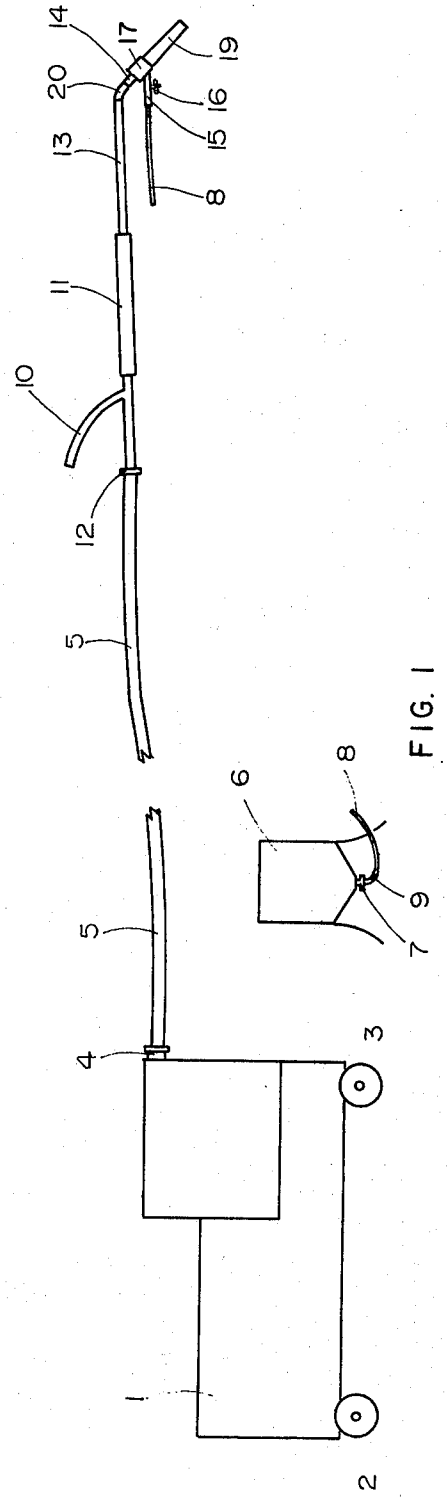

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FIG. 1

COMBINED STEAM AND ABRASIVE MATERIAL CLEANING DEVICE

This invention relates to cleaning and more particularly to cleaning by the use of a combination of abrasive materials and steam.

Many walls of brick and other materials require cleaning to remove rust, films, various forms of graffiti, and other substances. New brick walls also need to have excess mortar and other substances removed. These substances may be removed by a sandblaster which requires an expensive high capacity air compressor in order to have continuous volume of air. Sand blasting also causes a great quantity of dust to be blasted into the atmosphere surrounding the work site.

Due to an apparent increase in the drawing of graffiti on the walls of schools and other buildings and due to a growing public sentiment aimed at cleaning up the environment, a need has arisen for an inexpensive, efficient and mobile cleaning device which, upon use, emits a minimum amount of dust into the atmosphere.

An object of the present invention is to provide a cleaning device using steam and an abrasive material, such as sand, which is mobile.

A further object of the present invention is to provide a cleaning device using steam and an abrasive material, such as sand, which is inexpensive.

Another object of the present invention is to provide a cleaning device using steam and an abrasive material, such as sand, which can efficiently clean various substances from various surfaces.

Another object of the present invention is to provide a cleaning device using steam and an abrasive material, such as sand, which is effective to speedily clean new brick walls.

Still another object of the present invention is to provide a cleaning device using steam and an abrasive material, such as sand, which upon use emits a minimum of dust into the air.

These and other objects and features of the invention will be apparent from the following description and appended claims.

Briefly, the invention is a cleaning device for removing various substances from various surfaces. The cleaning device comprises a steam cleaner, which comprises a water system, a heating system, and a discharge system, including an outlet steam hose; a nozzle to which an outlet steam hose is connected; and a source of abrasive material including an abrasive material supply hose which is connected to the nozzle. The steam is passed through the nozzle under high pressure by the steam cleaner, drawing the abrasive material into the nozzle, wherefrom a combination of the steam and the abrasive material is blasted onto the surfaces to remove various substances. The nozzle comprises a nozzle base; a suction chamber within the nozzle base; first and second openings within the nozzle base, both extending from the outside of the nozzle base to the suction chamber; a steam supply fitting connected into the first opening connecting the outlet steam hose to the nozzle base allowing steam to flow through the steam supply fitting into the suction chamber; an abrasive material supply fitting connected into the second opening connecting the abrasive material supply hose to the nozzle base, allowing the abrasive material to flow through the abrasive material supply fittings into the suction chamber; and a blast tube connected to the nozzle base through which the combination of the steam and abrasive material within the suction chamber may be blasted from the nozzle. The source of abrasive material may comprise a container. The abrasive material supply hose may contain an opening through which air may enter. The abrasive material may be sand. The source of abrasive material further comprises a connector connecting the abrasive material supply hose to the container. The steam cleaner may further comprise wheels supporting the steam cleaner and providing mobility. The outlet steam hose may be attached to the steam cleaner by a connector. An air supply valve may be affixed to the abrasive material supply fitting, whereby air flow may be varied through the air supply valve to control the amount of abrasive material drawn into the nozzle by the steam. The cleaning device may further comprise a steam hose connector attached to the outlet steam hose and a steam shaft connected to the steam hose connector, whereby steam passing through the outlet steam hose will pass through the steam shaft. A handle may be on the steam shaft. The steam shaft may have an insulated grip. An elbow fitting may be attached to the steam shaft. The elbow fitting may screw into the steam supply fitting. The abrasive material supply hose may be attached to the abrasive material supply fitting.

The invention will be more fully understood from the following detailed description and appended claims when taken with the drawings in which:

FIG. **1** is an overall view of the cleaning device.

FIG. **2** is a cross-sectional view of the nozzle assembly.

Referring now to the drawings, FIG. **1** shows an overall view of the cleaning device. Steam cleaner **1** develops steam under high pressure. Basically, steam cleaner **1** comprises a water system, a heating system, and a discharge system. Several models of steam cleaners are available on the market such as the various steam cleaner models marketed by Electro-Magic Division, Dura Corp., P.O. Box 516, Vermillion, S.D. 57069. Included among those steam cleaners is Model 100, which is an efficient unit that is completely portable, fully automatic and delivers operating pressure in a few minutes.

Steam cleaner **1** is mounted on wheels **2** and **3** and is thereby mobile.

Steam cleaner connector **4** is attached to steam cleaner **1.** Outlet steam hose **5** is connected to steam cleaner **4.** Outlet steam hose **5** is attached to steam hose connector **12.** Steam shaft **13** is attached to steam hose connector **12.** Handle **10** is mounted on steam shaft **13.** Steam shaft **13** has an insulated grip **11.** Elbow fitting **20** is connected to steam shaft **13.** Elbow fitting **20** screws into steam supply fitting **14.** Steam supply fitting **14** fits into nozzle base **17.** Blast tube **19** extends from nozzle base **17.**

Sand hopper or container **6** comprise a source of abrasive material, which may be sand. Container connector **7** connects abrasive material supply hose **8** to the container **6.** Opening **9** is an air hole in abrasive material supply hose **8.**

FIG. **2** shows a cross-section of the nozzle assembly. Steam supply fitting **14** connects to nozzle base **17.** First opening **21** in nozzle **17** abutting fitting opening **24** provides a path for the steam entering from elbow fitting **20** to threaded fitting opening **25,** which connects to fitting opening **24.** Abrasive material supply fitting **15** fits into second opening **22** and connects to

nozzle base **17.** Suction chamber **18** is within nozzle base **17.** First opening **21** and second opening **22,** within nozzle base **17,** both extend from the outside of nozzle base **17** to suction chamber **18.** Blast tube **19** connects into nozzle base **17** and extends into an opening **23** in nozzle base **17** and into the area of suction chamber **18.** First supply valve **16** is affixed to the abrasive material supply fitting **15.**

Steam cleaner **1** is capable of delivering large quantities of steam at high pressure. Steam cleaner **1** contains controls within the unit that control the velocity and temperature of the steam that is desired. After setting the desired velocity and temperature, the operator of the present invention would then hold the device by the use of insulated grip **11** and handle **10,** and point blast tube **19** at the various surfaces in order to remove the desired substances on said surfaces.

Steam passes through steam cleaner connector **4** into outlet steam hose **5.** Steam passes through steam hose connector **12** into steam shaft **13.** The steam would then pass through elbow fitting **20** into steam supply fitting **14.** The steam would then pass from steam supply fitting **14** into suction chamber **18** within nozzle base **17.**

The abrasive material, such as sand, would be contained in container **6.** Opening **9** in abrasive supply hose **8** serves as an air hole. The sand would fall through container connector **7** by gravity into the abrasive supply hose **8.** Opening **9** allows air to flow into the abrasive supply hose **8,** and establishes the pressure at that point as the atmospheric pressure of the work site. The sand, when flowing, will flow through the abrasive material supply hose **8** into abrasive supply hose **15,** and then into suction chamber **18** which is within nozzle base **17.**

Steam flowing into suction chamber **18,** at high pressure, will cause a partial vacuum at the entrance of abrasive material supply fitting **15** in suction chamber **18.** With opening **9** establishing atmospheric pressure just below container **6** and a partial vacuum at the end of abrasive material supply fitting **15,** the pressure differential will cause sand to be drawn into suction chamber **18,** where it will be combined with the steam and forced out of blast tube **19** by the steam pressure established by steam cleaner **1.**

Air supply valve **16** which is mounted on fitting **15** may be any type of adjustable opening which would allow air into fitting **15.** By adjusting air supply valve **16,** the amount of flow of abrasive material, or sand, drawn from container **6** may be controlled. For example, if air supply valve **16** established an atmospheric pressure the same as that at hole **9** there would be effectively no flow of sand into suction chamber **18.**

This cleaning device has many advantages over a sandblaster. For example, in sandblasting a large amount of dust is expended into the atmosphere. Due to the wet steam and high pressure, very little rebound of dust emanates into the air when using this invention. The operator of this cleaning device requires far less protective equipment than the operator of a sandblaster. Surfaces may be safely cleaned, even in high population density areas, because of the lack of dust in the air. This invention provides an inexpensive, efficient, and mobile cleaning device which upon use emits a minimum amount of dust into the air.

While the invention has been described with reference to specific embodiments, the description is illustrative and is not to be construed as limiting the scope of the invention. Various modifications and changes may occur to those skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A cleaning device for removing various substances from various surfaces comprising:

a. a mobile steam cleaner comprising a water system, a heating system, and a discharge system including an outlet steam hose;

b. a nozzle to which said outlet steam hose is connected;

c. a source of abrasive material including an abrasive material supply hose which is also connected to said nozzle;

d. a manually-adjustable air supply valve operative to vary the flow of said abrasive material through said abrasive material supply hose;

whereby steam is passed through said nozzle, under high pressure, by said steam cleaner, drawing said abrasive material into said nozzle, wherefrom a combination of said steam and said abrasive material is blasted onto said various surfaces to remove said various substances.

2. A cleaning device according to claim **1** wherein said nozzle comprises:

a. a nozzle base;

b. a suction chamber within said nozzle base;

c. first and second openings within said nozzle base both extending from the outside of said nozzle base to said suction chamber;

d. a steam supply fitting connected into said first opening, connecting said outlet steam hose to said nozzle base, allowing steam to flow through said steam supply fitting into said suction chamber;

e. an abrasive material supply fitting connected into said second opening, connecting said abrasive material supply hose to said nozzle base allowing said abrasive material to flow through said abrasive material supply fitting into said suction chamber;

f. a blast tube, connected to said nozzle base, through which said combination of said steam and said abrasive material, within said suction chamber, may be blasted from said nozzle.

3. A cleaning device according to claim **1** wherein said source of abrasive material comprises a container.

4. A cleaning device according to claim **3** wherein said abrasive material supply hose contains an opening through which air may enter.

5. A cleaning device according to claim **4** wherein said abrasive material is sand.

6. A cleaning device according to claim **4** wherein said source of abrasive material further comprises a connector, connecting said abrasive material supply hose to said container.

7. A cleaning device according to claim **4** wherein said nozzle comprises:

a. a nozzle base;

b. a suction chamber within said nozzle base;

c. first and second openings within said nozzle base both extending from the outside of said nozzle base to said suction chamber;

d. a steam supply fitting connected into said first opening, connecting said outlet steam hose to said nozzle base, allowing steam to flow through said steam supply fitting into said suction chamber;

e. an abrasive material supply fitting connected into said second opening, connecting said abrasive ma-

terial supply hose to said nozzle base allowing said abrasive material to flow through said abrasive material supply fitting into said suction chamber;

f. a blast tube, connected to said nozzle base, through which said combination of said steam and said abrasive material, within said suction chamber, may be blasted from said nozzle.

8. A cleaning device according to claim **1** wherein said steam cleaner further comprises wheels supporting said steam cleaner and providing mobility for said steam cleaner.

9. A cleaning device according to claim **8** wherein said outlet steam hose is attached to said steam cleaner by a connector.

10. A cleaning device according to claim **7** wherein an air supply valve is affixed to said abrasive material supply fitting, whereby air flow may be varied through said air supply valve to control the amount of abrasive material drawn into said nozzle by said steam.

11. A cleaning device according to claim **10** further comprising:

a. a steam hose connector attached to said outlet steam hose;

b. a steam shaft connected to said steam hose connector whereby steam passing through said outlet steam hose will pass into said steam shaft.

12. A cleaning device according to claim **11** further comprising a handle on said steam shaft.

13. A cleaning device according to claim **12** further comprising an insulated grip on said steam shaft.

14. A cleaning device according to claim **13** further comprising an elbow fitting attached to said steam shaft.

15. A cleaning device according to claim **13** wherein said elbow fitting screws into said steam supply fitting.

16. A cleaning device according to claim **14** wherein said abrasive material supply hose is attached to said abrasive material supply fitting.

17. A cleaning device according to claim **16** wherein said abrasive material is sand.

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