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Ricklefs

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[54] **ABRADING SYSTEM**

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[21] Appl. No.: **501,026**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 452,950, March 20, 1974, abandoned.

[52] **U.S. Cl.** ..... **51/8 HD;** 51/8 BR; 51/9 M

[51] **Int. Cl.²** **B24C 3/06;** B24C 3/32; B24C 7/00

[58] **Field of Search** ..... 51/8 R, 9 M, 310–312, 51/319–321, 8 HD, 8 BR, 11; 4/185 F, 173, 177

[56] **References Cited**

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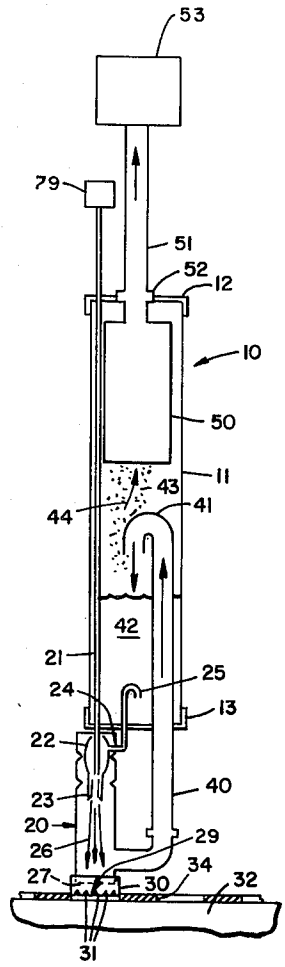
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Primary Examiner—Donald G. Kelly

[57] **ABSTRACT**

A recirculative system for abrading a predetermined portion of a surface with a high velocity stream of abrasive granules is provided in which the granules are aspirated from a supply against the surface to be abraded within a substantially enclosed abrading zone and spent granules are exhausted from the abrading zone and recycled to the supply filtered from any fines.

3 Claims, 2 Drawing Figures



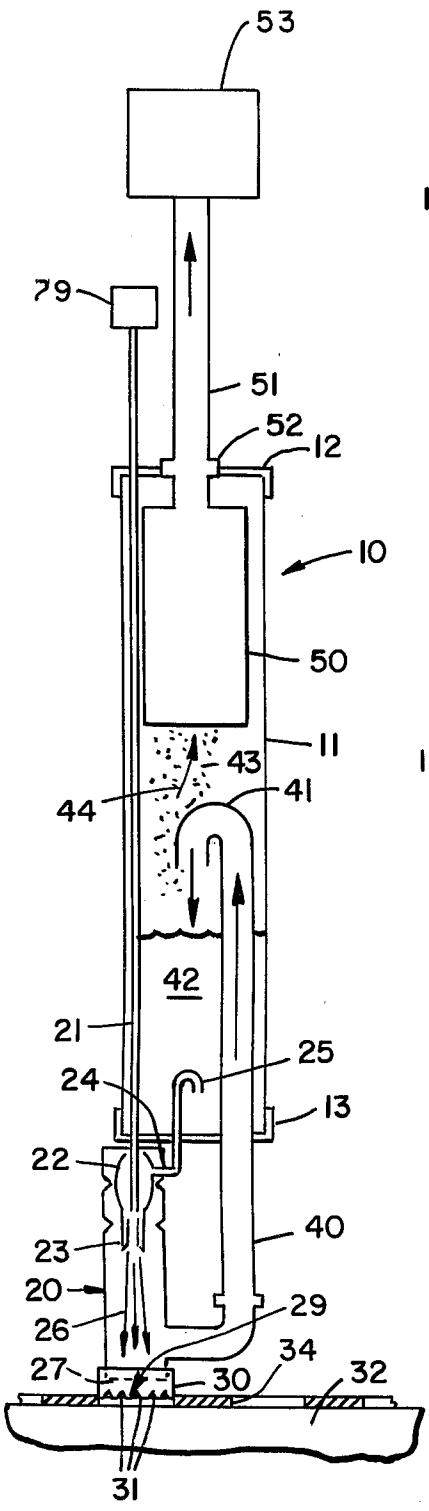

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FIG_1

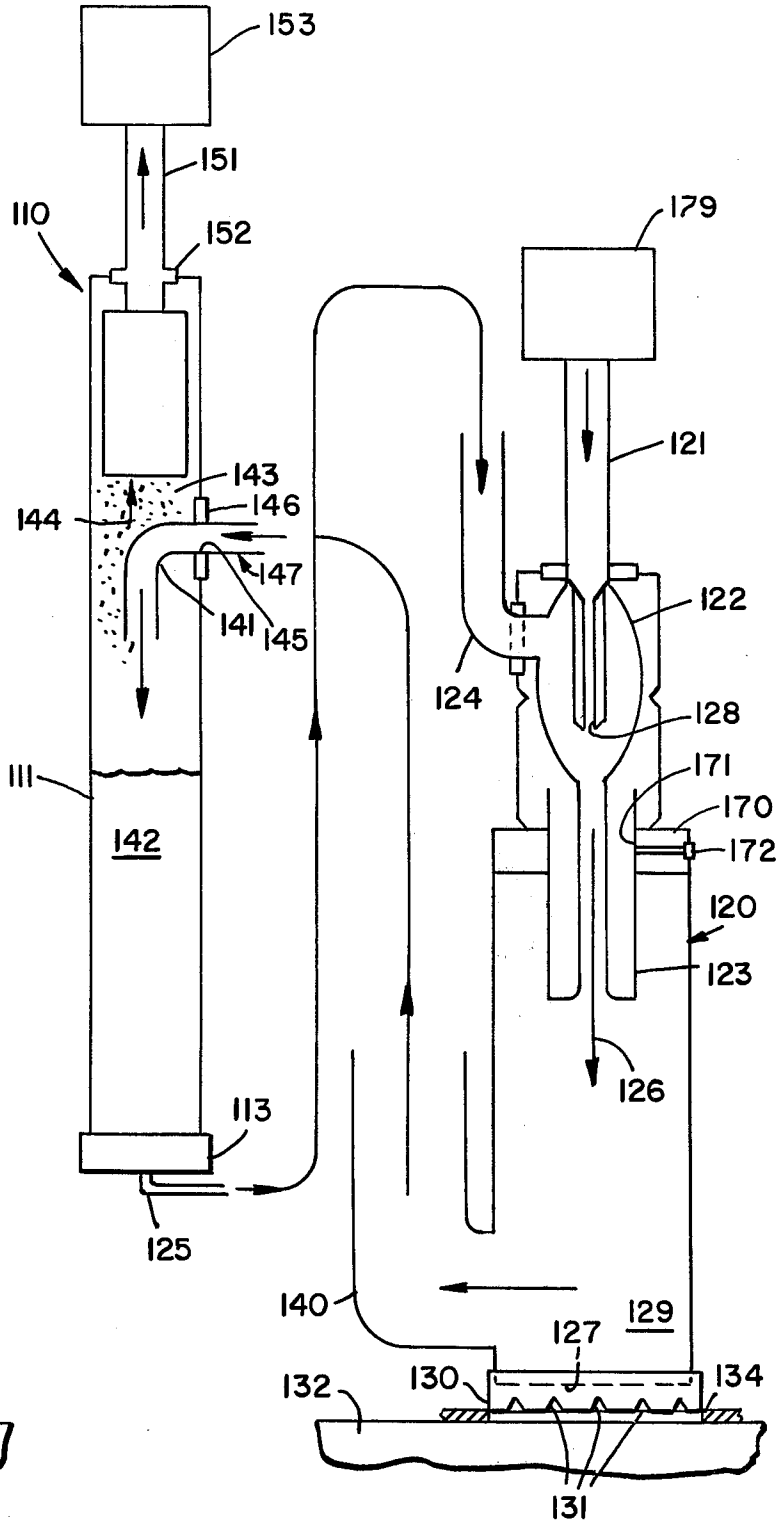

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FIG_2

ABRADING SYSTEM

This is a continuation in part of application Ser. No. 452,950 filed Mar. 20, 1974, now abandoned, entitled "Sani-Safe".

This invention relates generally to systems for abrading surfaces such as sand blasting systems and the like. The invention is more specifically related to systems for abrading a predetermined portion of a hard surface. A specific use for the invention is rendering the bottoms of bathtubs slip-resistant by forming a pattern of abraded circular areas on the slippery surface of the porcelain tub.

The prior art includes abrasive systems for rendering bathtub bottoms slip resistant by covering the bottom of the tub with a stencil, draping a cover over the tub, and directing a stream of abrasive granules through a hole in the cover at the stencil on the bottom of the tub and thereby abrading predetermined portions of the tub bottom. Portable sand blasters are also known in the prior art for various purposes.

A primary object of the present invention is to provide a portable and lightweight abrading system in which the abrasive granules are continuously recycled and reused.

A further object of this invention is to provide a portable abrading system which is capable of abrading a predetermined portion of a surface of a variety of possible designs.

Another object of this invention is to provide an abrading system in which the abrasive granules are recycled and in which the fines produced at the processed surface are separated from the recycling granules.

An object of this invention also is to provide an abrading system in which the abrasive granules are aspirated against a surface and then continuously withdrawn immediately after they impinge upon the surface.

One important object of the invention is a practical procedure for rendering slip-resistant the bottoms of bathtubs already in place by etching a pattern in the slippery surface of the porcelain.

Further objects and advantages of the invention will become apparent from the following description of preferred embodiments and the drawings, wherein:

FIG. **1** is a schematic sectional view of the invention; and

FIG. **2** is a schematic sectional view of an alternate form of the invention.

In describing the systems shown in the drawings, reference is made to the use of the system on the bottom of a bathtub although it should be understood that the system may be used in processing other surfaces.

The bottom **32** of the tub is made slip-resistant by removing the shiny surface (the epidermis- approximately 1/32nd of the entire thickness of the baked enamel coating) from the tub bottom in a pattern that is composed of one inch circles spaced three quarters of an inch apart.

This is accomplished by a "sand-blasting" technique wherein an abrasive comprising abrasive granules (No. 30 silicon carbide) is directed, under **125** psi pressure at the pattern in a rubber stencil mat **34** placed on the tub bottom. The rubber stencil mat **34** defines the pattern to be etched on the bottom but, if no pattern is desired, a stencil mat is not necessary.

Since the processing usually is done in bathtubs already installed in hotels, motels, apartments and homes, it is essential to have equipment that is compact, lightweight, and portable in order that it can be easily moved from location to location. At the same time it must be effective, efficient, safe, and clean.

The system of this invention involves a recirculative process wherein abrasive granules in supply **42** of FIG. **1**, for example, are aspirated by aspirating means **22** at high velocity against the tub bottom **32** within a substantially enclosed abrading zone **29** overlying that portion of the bottom **32** exposed by the stencil mat **34.** Spent granules and fines are continuously and simultaneously withdrawn from the abrading zone by vacuum developed by vacuum source **53** and applied through exhaust line **40** to the abrading zone **29.** The spent granules **44** return to the supply **42** for recycle and the fines are drawn through filter **50** for disposal in a waste bag, not shown.

In the embodiment of FIG. **1** compressor **79** is a source of compressed air powered by a 1.5 horsepower electric motor (17 amperes), which provides 6 cubic feet of free air per minute at 125 psi. It is equipped with safety valves, pressure regulator, and belt guard.

Exhaust means for withdrawing spent granules and fines from the abrading zone **29** includes a vacuum recovery system powered by a vacuum source **53** which is No. 860-01 Hang-Up Vac manufactured by Shop-Vac Corporation, Willimsport, Pennsylvania. It has a 1 HP by-pass motor (9 amperes), a 2½ gallon tank, and is rated at 90 CFM. The vacuum source **53** is equipped with filter **50** and a disposable waste bag, not shown.

The rubber stencil mat **34** is made from pure gum rubber sheeting, ⅛ inch in thickness, and the over-all measurement is 16 inches by 32 inches—a rectangle. The pattern covers an area measuring 14 inches by 30 inches, leaving a 1 inch margin on each edge. The pattern consists of 124 1-inch circular holes or circles spaced three-fourths of an inch apart. The circles are punched out of the rubber sheeting, and the abrasive action takes place on the tub surface in the cut out areas.

Cannister means **11** forms an enclosed supply **42** of abrasive granules **44** for the abrading or etching process. Cannister means **11** is a fiberglass tube capped at the bottom, with a cap **13** through which a rubber hose **25** leads to the aspirating means or etching gun **22.** This rubber hose **25** conducts abrasive granules from supply **42** to the aspirating means or etching gun **22.** Cannister means **11** is capped at the top by top cap **12,** and has a flexible tubing or vacuum line **51** extending through top cap **12** to vacuum source **53.** A filter means or screen assembly **50** is attached to the vacuum line **51.** The filter means **50** separates the whole, spent abrasive granules **44** from the dust and fines abraded from tub surface **32.** The spent granules drop back into the lower interior of cannister means **11** as shown at **43** and add to the abrasive granule supply **42** available for recycle. The dust particles and fines abraded from surface **32** pass through filter means **50** through line **51** and into a disposable waste bag (not shown) connected to vacuum source **53.** Filter means **50** maybe a cylindrical 3 inches in diameter and 6 inches long number **40** mesh brass screen. Such a screen performs the separation function effectively and without clogging.

The alternate embodiment shown in FIG. **2** is similar to the embodiment shown in FIG. **1,** except that the abrading apparatus shown generally as **110** in FIG. **2**

comprises a cannister means **111** which is physically separated from casing means **120** that is described hereafter. In the embodiment shown in FIG. **2** flexible rubber hoses **125** and **147** connect the cannister and casing means together. The system shown in FIG. **1** is a unitary structure shown generally as **10** which incorporates into one structure the cannister means **11** and casing means **20.** The reference numerals used in FIG. **2** in the **100** series correspond to similar components shown in FIG. **1.**

Referring to FIG. **2,** there is a hole **145** in the side of cannister means **111** 24 inches from the bottom of cannister means **111** to which is affixed, with a coupling **146** and an elbow **141,** a flexible rubber hose shown generally as **147,** which is one inch in diameter and which leads to exhaust line **140** connected to casing means **120** that defines the abrading zone **129.**

Cannister means **111** contains an enclosed supply **142** of abrasive granules which is continually replenished. The abrasive granules are drawn from the bottom of cannister means **111** through abrasive supply hose **125** by aspirating means **122** described hereafter. Granules aspirated into abrading zone **129** formed within casing means **120** abrade the predetermined pattern on bottom **132** of the tub that is defined by stencil **134.** Spent granules are drawn back into cannister means **111** by the action of vacuum source **153,** are cleaned of dust and fines by the filter means or screen filter **150,** and drop back into abrasive supply **142** in the bottom section of cannister means **111.** The cannister means **111** and the vacuum source **153** may be mounted on a hand truck for ease in handling.

An etching gun assembly including aspirating means **122** and casing means **120** aspirates abrasive granules from supply **142** into the abrading zone **129** defined by the casing means **120** overlying the surface to be abraded. The aspirating means or etching gun **122** is the same as aspirating means **22** shown in FIG. **1.** A useful one is a model GT **12** (Clemco) gun with a 0.063 inch air aperture **128** and a 3/16 inch nozzle **123.** This model GT **12** is modified by the addition of a 24 inch pipe extension placed between the gun proper and the orifice assembly in order that the etching or abrading can be done from a standing position.

Casing means **120** is a vacuum casing which encloses the etching nozzle or abrading nozzle **123.** Casing means **120** effectively contains the abrasive granules and dust or fines during the abrading process and disposes of the spent granules and dust through vacuum action into cannister means **111.** Casing means **120** is made of 1¾ inch stainless steel tubing, is 5 inches in length, and has a cap **170** at its upper end with a 1 inch hole **171** to accommodate the nozzle **123** of the aspirating means or etching gun **122** which is held snugly in place by a set screw **172.** A one inch stainless steel elbow **140** is welded to an opening in the casing one-half inch from the bottom, and this elbow is fitted to flexible rubber hose **147** leading to abrasive cannister means **111.**

The bottom edge **127** of casing means **120** is covered with or coupled to a rubber welting **130** to provide better contact with the gum rubber stencil mat **134.** Welting **130** is notched at ⅜ inch intervals with passageways **131** to allow free passage of ambient air therethrough for the suction action in which the ambient air drawn through passageways **131** carries the spent abrasive granules and dust through elbow **140** and line **147** into cannister means **111.**

Casing means **120** defines a substantially enclosed abrading zone **129** overlying a predetermined portion of surface **132,** said predetermined portion comprising the area circumscribed by the bottom edge **127** of casing means **120.** Abrasive granules are aspirated through aspirating means **122** from the enclosed supply **142** of abrasive granules into abrading zone **129** and against the predetermined portion of surface **132.** Simultaneously, the spent granules are withdrawn from abrading zone **129** by the action of exhaust means which comprises vacuum source **153,** vacuum line **151** and hose **147** connected to elbow or exhaust line **140.**

Cannister means **111** contains **15** pounds of abrasive, such as No. 30 silicon carbide granules, sufficient to process 100 or more bathtubs before refilling. The compressor **179** is plugged into a 20 ampere circuit, and it runs continuously during the processing. The cannister means **111** and vacuum source **153** which together form a vacuum-cannister assembly is wheeled to the edge of the bathtub to be processed, and the rubber mat **134** is placed in the bottom of the tub and secured by adhesive strips at each corner. The vacuum is turned on and runs continuously during the processing. The operator places casing means **120** directly over a hole in the rubber mat stencil **134** perpendicular to the bottom **132** of the tub, and squeezes the trigger of the gun which opens a valve, not shown, in air supply line **121** and holds it open for 3 seconds. He releases the trigger, moves the gun to the next hole, and continues this process until the entire pattern is etched or abraded. Three seconds of etching or abrading time is sufficient to cut the porcelain glaze to the desired depth, but there is no disaster if, for some reason, the etching or abrading continues for as long as ten seconds. The enamel on a standard bathtub will etch or abrade through to the "brown coat" in about 40 seconds.

The dust accumulated in the disposable waste bag connected to vacuum source **153** is changed after each 50 bathtubs. It takes approximately 8 minutes to process a bathtub, from start to finish, and one operator with one system can process 30 to 40 bathtubs in one working day.

The embodiment shown in FIG. **1** combines the cannister means **11** with the casing means **20** housing aspirating means **22.** This embodiment enables the use of one hand truck which can be placed at any convenient distance from the bathtub. The assembly **10** shown in FIG. **1** is connected to vacuum source **53** and the source of compressed air or compressor **29** by vacuum line **51** and compressed air supply line **21,** respectively.

The cannister means **11** shown in FIG. **1** is 18 inches long and holds five pounds of abrasive granules in supply **42** which is sufficient to process 40 to 50 bathtubs without refilling.

The casing means **20** and aspirating means **22** shown in the embodiment of FIG. **1** are the same as the casing means **120** and aspirating means **122** shown in FIG. **2.** The abrasive supply hose **25** shown in FIG. **1** passes directly to aspirating means **22** through cap **13** from cannister means **11.**

The compressed air supply line **21** extends from compressor **29** to aspirating means **22** through the interior of cannister means **11.** The aspirating means **22** is mounted upon the bottom cap **13** of cannister means **11.** The exhaust line **40** extends through the bottom cap **13** of cannister means **11** to a point 4 inches above the top level of the abrasive supply **42** and has an elbow at the top to direct the flow downward. This exhaust

line **40** is made of 1 inch plastic pipe. The exhaust means of the embodiment shown in FIG. **1** comprises exhaust line **40,** vacuum line **51** and vacuum source **53** with interposed filter **50.**

I claim:

1. Apparatus for continuously rendering the floors of bathtubs slip-resistant by abrading a predetermined portion of the floor with a stream of recycling, abrasive granules and recovering spent granules comprising:

an elongated, cylindrical cannister means forming an enclosed supply of abrasive granules,

casing means forming an abrading zone positionable adjacent to said predetermined portion of the surface,

aspirating means adjacent to said cannister means for drawing abrasive granules from said cannister means and propelling them against said predetermined portion of said surface in the abrading zone;

exhaust means comprising an exhaust line extending from said casing means to the interior of said cannister means and a vacuum source connected by a vacuum line to the interior of said cannister means for applying a vacuum to said exhaust line;

filter means in the interior of said cannister means; and

said cannister means, casing means, exhaust means, filter means and aspirating means being combined into a single, elongated and generally cylindrical unitary structure whereby the device may be used near the walls of said bathtub.

2. The apparatus of claim **1** further comprising welting means coupled with said casing means,

said welting means being positionable on the periphery of said predetermined portion of said surface and forming a boundary of said abrading zone,

said welting means having passageways to permit the flow of ambient air therethrough to carry spent granules away from said abrading zone.

3. The apparatus of claim **2** wherein said aspirating means comprises nozzle means mounted in said casing means and connected to a source of compressed air, and an abrasive supply conduit extending from said cannister means to said nozzle means whereby abrasive granules are drawn through said abrasive supply conduit and propelled through said nozzle means into said casing means.

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