United States Patent [19]

Fleisher

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[54] **APPARATUS FOR PREPARING A PAINTED METAL SURFACE FOR REPAINTING**

[76] Inventor: **Henry Fleisher,** 18 Notch Park Rd., Little Falls, N.J. 07424

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[52] **U.S. Cl.** **51/5,** 51/8, 51/11, 51/12

[51] **Int. Cl.** **B24c 3/06**

[58] **Field of Search** ..... 51/8, 9, 11, 12; 15/316 R, 15/321, 345, 102, 134; 239/336, 421, 137, 138

[56] **References Cited**

UNITED STATES PATENTS

3,401,060	9/1968	Watts	134/102 X
2,409,722	10/1946	Stark	51/11 X
3,256,642	6/1966	Fonti	51/11

Primary Examiner—Othell M. Simpson
Assistant Examiner—Marc R. Davidson

[57] **ABSTRACT**

An apparatus is provided for preparing an object having a painted metal surface for repainting which apparatus is a combination sand-blasting, degreasing and steam generating and spraying unit. Separate means for directing a stream of abrasive and air, with or without volatile chemical solvent and/or water, on to the metal surface, and separate steam spray means are employed. Compressed air is employed to propel the abrasive, blow away any abrasive dirt and grease build-up on the metal surface and to drive water into the steam generating unit thereby eliminating the need for expensive motors and pumps.

13 Claims, 10 Drawing Figures

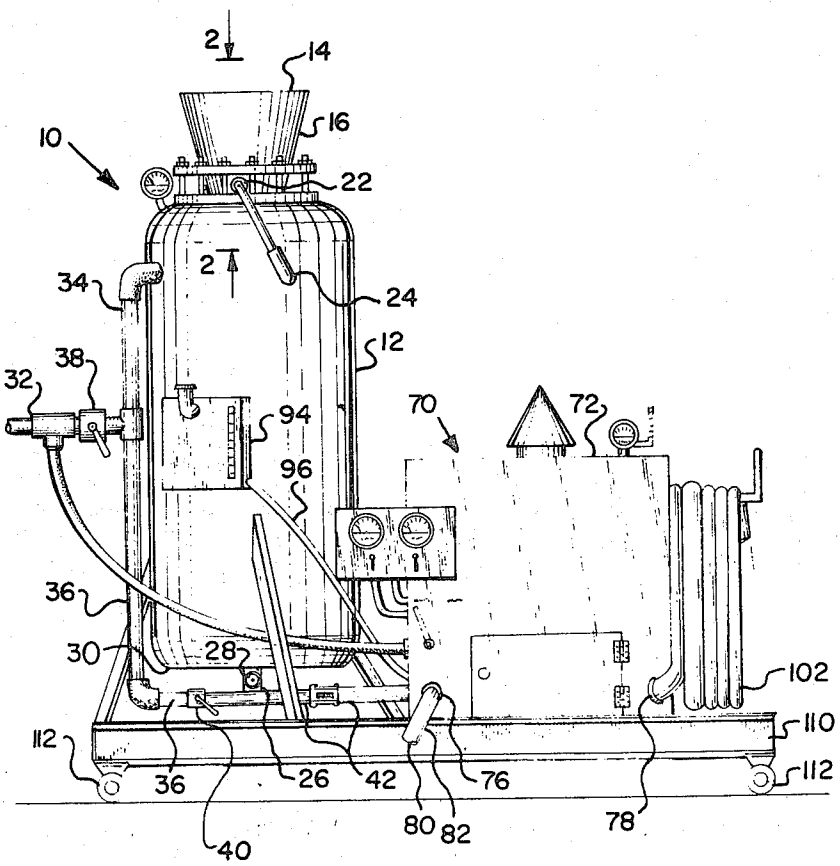
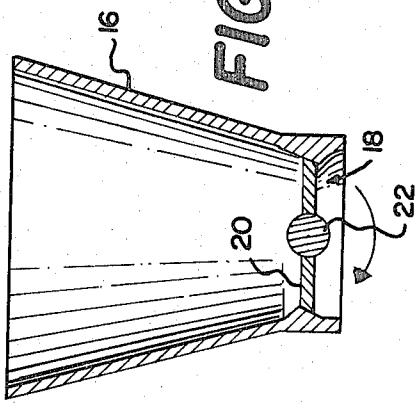


FIG. 2



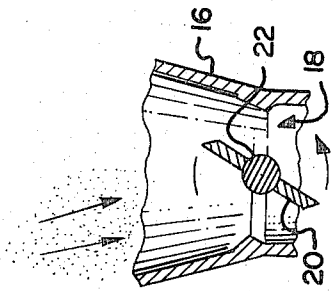
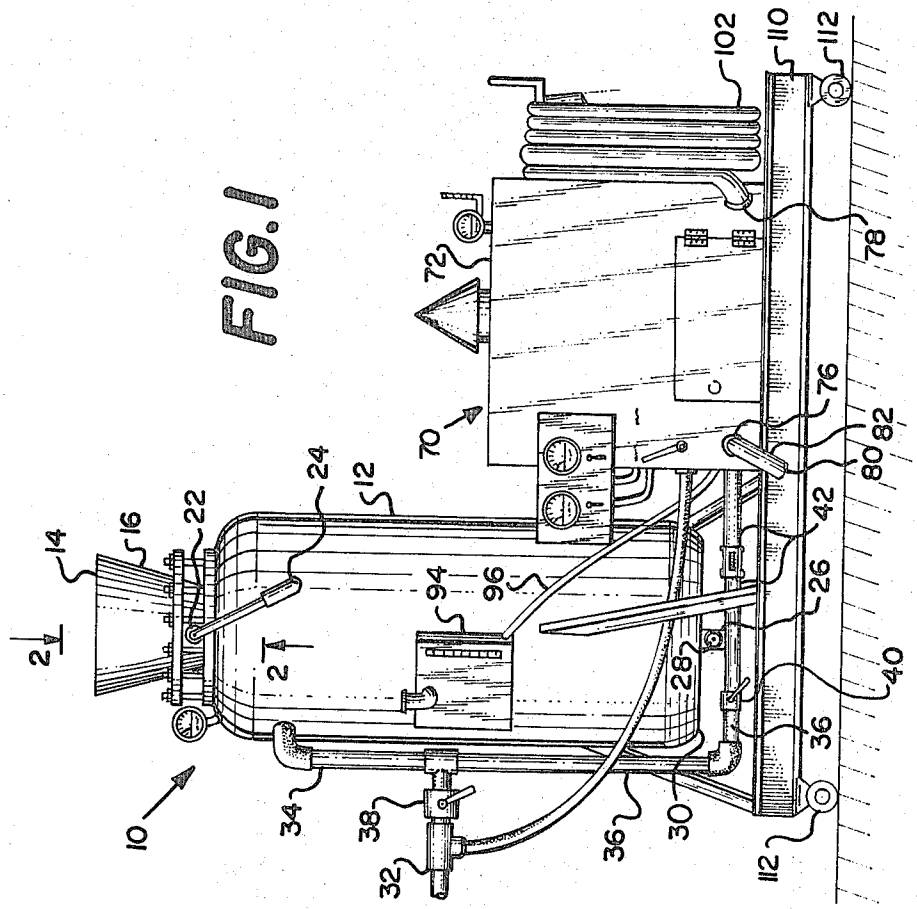


FIG. 3

FIG. 1



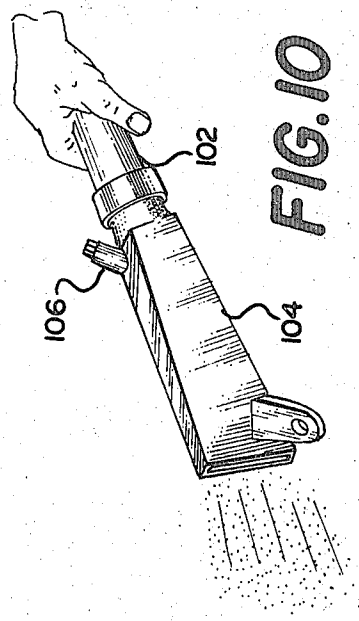


FIG. 10

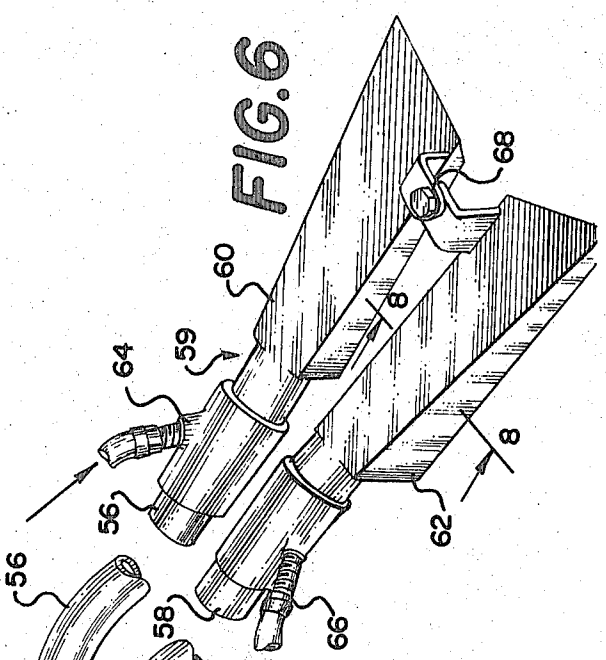


FIG. 6

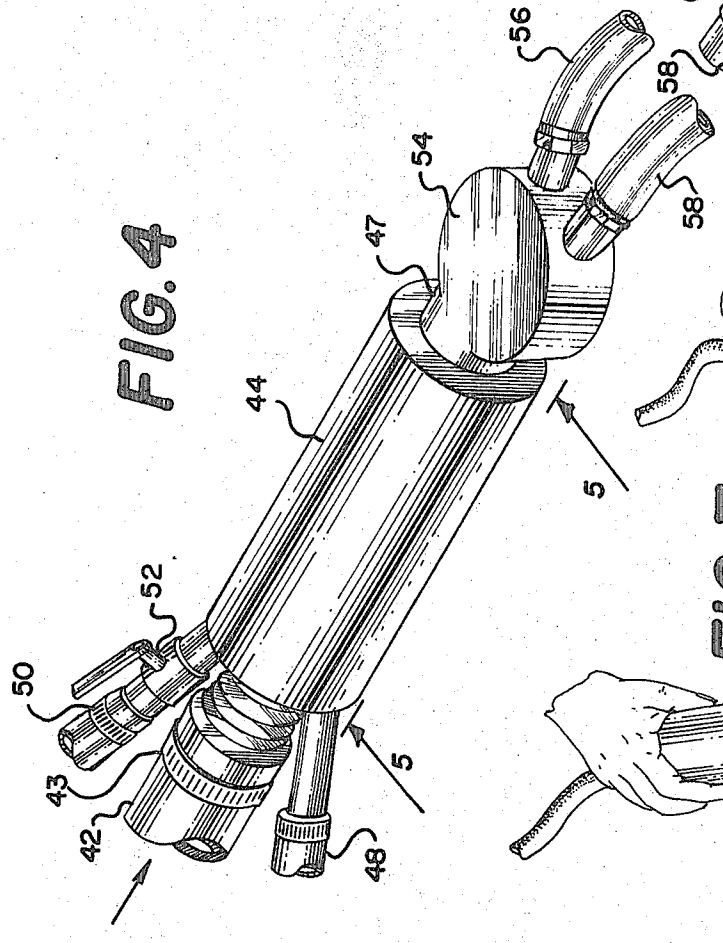


FIG. 4

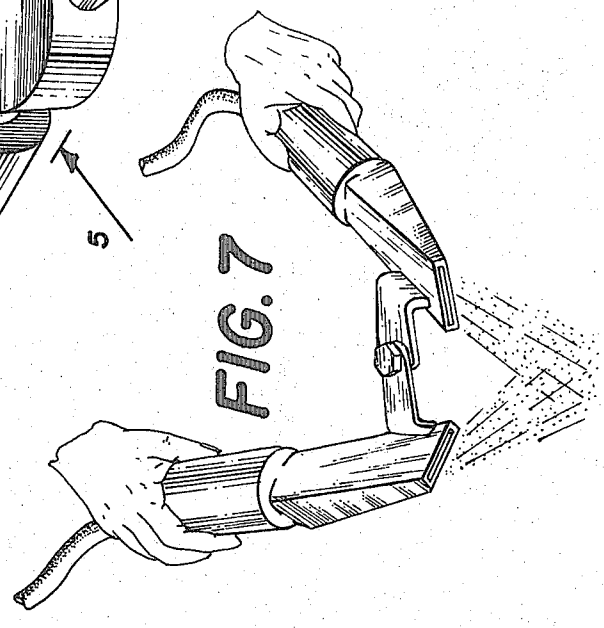


FIG. 7

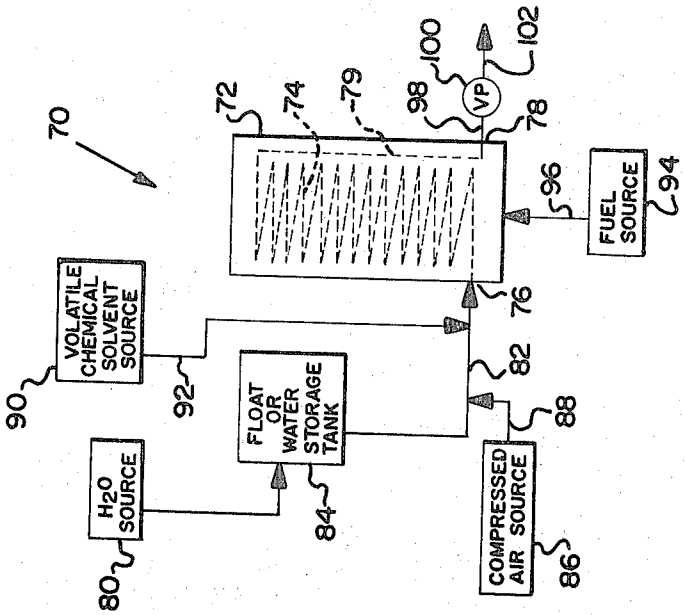


FIG. 9

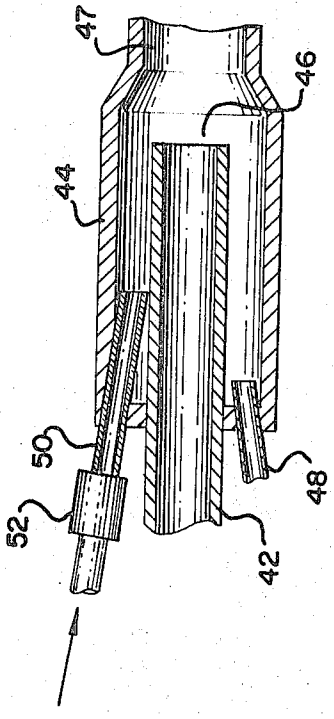


FIG. 5

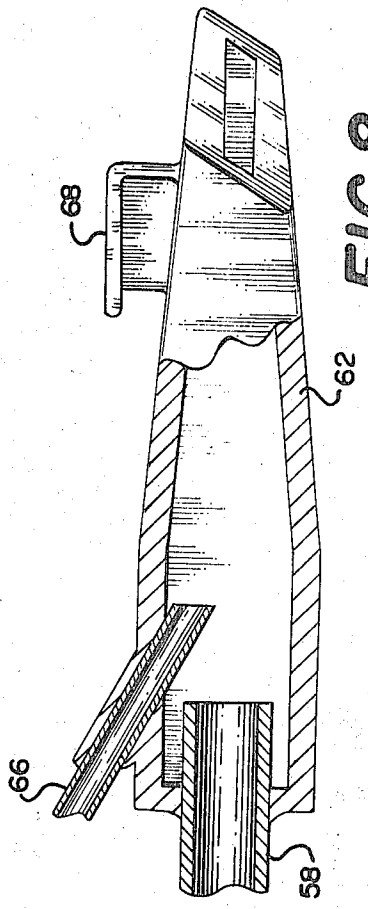


FIG. 8

APPARATUS FOR PREPARING A PAINTED METAL SURFACE FOR REPAINTING

FIELD OF THE INVENTION

This invention relates to an apparatus useful in preparing a previously painted surface for repainting and particularly in preparing automobiles for repainting.

BACKGROUND OF THE INVENTION

Many automobiles which are discarded as junk have nothing more wrong with them than a rusted-out body. In many cases this can be prevented by a timely repainting of the body of the car. As with many things a decision to repaint or not to repaint is determined to a large extent on cost.

Before a car, truck, or other similar items can be repainted, the old paint must be removed and the metallic surface thereunder properly cleaned and prepared to receive a fresh coat of paint. Proper cleansing and preparation also includes removal of grease from the painted surfaces. This problem is particularly acute in the case of trucks, such as trailor trucks, which after many years on the road accumulate thick layers of grease especially around the areas of the fifth wheel, that is the area where the trailer joins the truck, where heavy grease deposits are required. Oil delivery trucks also tend to have heavy grease accumulations and thus present unusually difficult problems in preparing their bodies for repainting.

Almost all paint removal and surface preparation of cars is done by hand by unskilled workers. Therefore, as the minimum cost of labor increases, the cost of repainting cars is directly affected.

In recent years, it has been exceedingly difficult to obtain workers to prepare cars for repainting even at increased wages. As a result, it is not only more expensive than before to have a car painted, but it is also more difficult to get the job done.

Therefore, it is an object of this invention to provide a machine for automatically removing paint and dirt from the surface of an automobile and simultaneously preparing the surface for repainting.

It is another object of this invention to provide a machine for automatically preparing a car for repainting which removes the paint without chipping or gouging the automobile trim.

It is still another object of this invention to provide a machine for automatically preparing a car for repainting which does not necessitate a drying operating after use of the machine.

It is a further object of this invention to provide a machine which may be constructed to accommodate a small automobile repainting facility which repaints large numbers of cars and trucks.

BRIEF DESCRIPTION OF THE INVENTION

With these and other objects in view, the present invention contemplates an apparatus for removing paint from a surface of an automobile and preparing the surface to receive a new coat of paint.

The apparatus of the invention comprises, in combination, a sand or other abrasive supplying unit, comprising means for storing abrasive including abrasive inlet means and abrasive outlet means; air supply means; first conduit means in communication with the air supply means, the abrasive storage means, as well as the abrasive outlet means, for supplying compressed air to the storage means to pressurize the same, and to the abrasive outlet to aid in propelling the abrasive; second conduit means communicating with the first conduit means and the abrasive outlet for carrying mixtures of abrasive and air; and means for directing a stream of abrasive and air onto the metal surface, in communication with the second conduit means. Employed with the abrasive supplying apparatus is a steam generating means including a water inlet, an air inlet, third conduit means communicating with the air inlet, air supply means and the water inlet; heating coils; and fuel means for heating the coils; and means for directing steam onto the metal surface, in communication with the steam outlet. The steam generating means makes use of compressed air for driving water into the heating coils to produce steam. In a preferred embodiment, the third conduit means of the steam generating means, is in communication with the air supply means employed with the abrasive storage means and/or the first conduit means.

The abrasive supplying means and/or the steam generating means may be employed in combination with a source of volatile chemical solvent and/or water. Thus, the means for directing a stream of abrasive and air may be employed in communication with means for mixing abrasive-air mixtures with volatile chemical solvent and/or water which is in turn in communication with a source of volatile chemical solvent and/or water, and in addition, optionally, in communication with a source of compressed air to aid in mixing of the various materials in said mixing means.

The steam generating means may be in communication with a source of volatile chemical solvent so that a mixture of steam and volatile chemical solvent may be delivered to the metal surface.

The means for directing a stream of abrasive and air will include nozzle means, preferably in the form of a pair of flat nozzles pivotally connected together to form a variable V-shape. In addition, each of the flat nozzles may be connected via conduit means to air supply means and/or volatile chemical solvent and/or water. Thus, it is possible to regulate air pressure at the nozzles and close off delivery of abrasive, so that the operator can by high pressure blasts blow away any abrasive build-up on the metal surface instantly so that the operator has constant vision of the working surface without obstruction from abrasive. In addition, use of the high pressure air blast alone or in connection with steam cleaning allows large build-ups of dirt and grease in and around hard to get at areas to be cleaned up, thereby eliminating the need for expensive chemical solvents and time consuming cleaning operation.

In addition, the steam generating means can include a negative or vacuum air pressure at the outlet side of the heating coils and a positive air pressure at the inlet side of the heating coils so that steam may be delivered under sufficient pressure to pry loose and blow away dirt and grease deposits on the working surface.

DESCRIPTION OF THE DRAWINGS

FIG. 1 shows one embodiment of the apparatus of the invention.

FIG. 2 shows a cross-section of the abrasive inlet means in the closed position taken along lines 2—2 of FIG. 1.

FIG. 3 is a view of the abrasive inlet means shown in FIG. 2 in an open position.

FIG. 4 is a perspective view of mixing means for mixing abrasive, air, volatile chemical solvent and/or water.

FIG. 5 is a section of the mixing means of FIG. 4 taken along lines 5—5.

FIG. 6 is a perspective view of a hand instrument including nozzle means used with the present invention.

FIG. 7 is another view of the hand instrument of FIG. 6.

FIG. 8 is section of the hand instrument of FIG. 6 taken along lines 8—8.

FIG. 9 is a schematic representation of the steam generating means employed in the apparatus of the invention.

FIG. 10 is a perspective view of a hand instrument employed to deliver steam with or without chemical solvents in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the Figures, wherein like parts are represented by like numerals, in FIG. 1 the numeral **10** generally represents a sand blasting unit which includes a chamber **12** into which sand (or other abrasive) from a reservoir (not shown) is fed through abrasive inlet means **14.**

As seen in FIGS. 1 to 3, the abrasive inlet means **14** includes a chute **16** and abrasive control means **18** which may take the form of a closure member **20** which completely closes off the chute **16** in its closed position and is pivoted on pivot or shaft **22.** The closure member **20** is opened by moving handle **24** (shown in FIG. 1) in a counter-clockwise motion as shown in FIG. 3.

Abrasive outlet means **26,** which includes abrasive control means **28,** which can take the form of a valve, communicates with a bottom portion **30** of chamber **12.**

Air conduit means **32,** which communicates with a source of compressed air (not shown), is in communication with chamber **12** via conduit **34** and with abrasive outlet means **26** via conduit **36.** Air conduit means **32** includes flow control means (such as a valve) **38** for controlling the flow of air into chamber **12,** and conduit **36** includes flow control means **40** (such as a valve) which in combination with flow control means **38** can regulate the flow of compressed air passed the abrasive outlet means **28.**

Conduit means **42** communicates with conduit means **36** and abrasive outlet means **26,** and carries a mixture of sand (or other abrasive) and air from chamber **12** and propelled by compressed air flowing through conduit **36.**

Referring to FIGS. **1, 4** and **5,** conduit means **42,** which includes flow control means **43,** extends into and terminates in mixing means **44** (not shown in FIG. **1**), which includes mixing chamber **46** and mixing outlet **47.**

Air conduit means **48** leading from the compressed air source (not shown) extends into mixing chamber **46** as shown in FIG. **5.** In addition, conduit means **50** which can be connected to a source of volatile chemical solvent and/or water (not shown) extends into and terminates in mixing chamber **46** as shown in FIG. **5.** Conduit means **50** is equipped with flow control means **52** such as a valve, for regulting the flow of volatile chemical solvent and/or water into the mixing chamber **46.** Air flow through conduit **48** is regulated by valve control means not shown. Flow of sand and air into the mixing chamber is regulated by control means **43** which can take the form of a conventional cut off valve.

As shown in FIG. **5,** in a preferred embodiment, the conduit **42** for abrasive and air mixture extends deepest into mixing chamber **46,** air conduit **48** extends the least amount into chamber **46** and conduit **50** for chemicals and/or water extends into and terminates in mixing chamber **46** intermediate conduits **42** and **48.** It has been found that with such an arrangement, abrasive and chemical and/or water are propelled out of the mixing chamber **46** with the aid of the compressed air flowing into conduit **48** and mixing chamber **46.** The compressed air further substantially eliminates clogging or blockage as the abrasive, chemical, etc. flow out of the mixing chamber **46.** Chamber **54** connects mixing outlet **47** and conduits **56** and **58** as shown in FIG. **4.** Conduits **56** and **58** will generally take the form of flexible hoses, and terminate in hand instrument **59** which includes nozzles **60** and **62,** respectively, as shown in FIGS. **6** and **8.** Conduit **56** includes inlet means **64,** connected to a source of chemical and/or water, for introducing chemicals and/or water into nozzle **60,** and conduit **58** includes inlet means **66,** connected to a compressed air source, for introducing compressed air into nozzle **62.**

The nozzles **60** and **62** are preferably of a flat configuration hinged at **68** and controlled by adjusting or pivoting the nozzles about hinge **68** to widen or narrow the area covered by the nozzle. The nozzles **60** and **62** provide a V-shaped pattern as shown in FIG. **7.** The nozzles **60** and **62** may be separated and employed independently of each other.

The instrument **59** is intended to be used to correct scratches and other flaws not cleaned by the steam spray portion of the apparatus shown in the Figures. Thus, the nozzles **60** and **62** interact and are tapered against one another causing the outflowing mixture to abrade the surfaces and to taper the painted surfaces gradually to form a gradual concave or shallow V-shape. This permits sratches, chips, and nicks to be painted over without any further sanding which now has to be done manually through the use of machines. No other slurry streams or combination of chemical abrasive and air will provide this tapered effect upon a painted surface. The presently known slurry and sand blast patterns produce a non-tapered effect.

This effect requires manual treatment by sanding machines to make a gradual taper over which fillers and paint can be applied; otherwise a deep grove or scratch effect will be visible upon the completion of the paint job.

The interaction of the nozzles **60** and **62** makes a double taper multi-angle abrading action upon the treated surfaces. The instrument **59** is preferably operated at an angle less than 45° to the surface being cleansed.

Referring to FIGS. **1** and **9,** there is shown a steam generating and spraying unit generally referred to by the numeral **70** which includes heating coils **74** (shown in FIG. **9**), steam chamber **72,** water inlet **76** which communicates with heating coils **74,** steam outlet **78** connected to heating coils **74** via conduit **79,** and water

source 80 connected to water inlet 76 via conduit 82 which includes a float or water storage tank 84. The float tank can include a conventional float valve which will cause flow of water from the water source into the tank to cease when the water level in the float tank reaches a predetermined level.

Compresed air source 86 communicates with water conduit 82 or water inlet 76 via conduit 88.

Volatile chemical solvent source 90 communicates with water conduit 82 or water inlet 76 via conduit 92.

Fuel source 94 communicates via conduit 96 with heating jets (not shown) which heat up the heating coil 74.

Conduit 98 extends from steam outlet 78 and is connected to a vacuum pump 100 or other means for reducing pressure and preferably applying a vacuum to conduit 98 thereby facilitating flow of steam from the heating coils 74, through conduit 79 and steam outlet 78.

Conduit 102, which can take the form of a flexible hose, is connected to a nozzle 104 as shown in FIG. 10. Nozzle 104 is equipped with additional inlet means 106, which is closed off in FIG. 10, for regulating the steam flowing or introducing other fluid such as volatile chemical solvent into the nozzle 104.

The entire assembly as described above is preferably positioned on a transportable base 110 provided with wheels 112, and is anchored and supported by the base as shown in FIG. 1.

The apparatus as shown in the Figures can be employed as follows:

Closure member 20 is opened (as shown in FIG. 3) by moving handle 24 in a counter-clockwise direction. Sand is fed from a reservoir, for example, by gravity feeding into abrasive inlet 14, the mouth of which, as shown, is quite wide to aid in the free flow of the sand into chute 16 and chamber 12.

Thereafter, closure member 20 is returned to the closed position, flow control means 38 is opened and compressed air is passed through conduits 32, 34 into the chamber 12.

As the chamber 12 is pressurized by the compressed air, abrasive flow control means 28 in abrasive outlet 26 is opened and pressurized sand falls into conduit 42. At the same time compressed air is passed via conduit 32, through control means 38, conduit 36 and control means 40 into conduit 42 and thus across the path of the sand as it falls into conduit 42. The flow of air across the path of the sand is preferably slightly downward so as not to push the sand back up into the abrasive outlet 26 blocking its downward flow. The mixture of sand and air is propelled by the compressed air and directed into the mixing means 44 (shown in FIG. 4).

Compressed air is passed through conduit 48 into the mixing means 44 under sufficient pressure to prevent a back-up of sand, air and other fluid which may be present.

If desired, control means 52 may be opened and water and/or volatile chemical solvent passed from a reservoir (not shown) via conduit 50 into mixing means 44.

By having a separate air supply and fluid supply (chemical solvent and/or water) leading into the mixing means 44, the volume of air and pressure of flow out of the mixing means 44 can be separately regulated by proper adjustment of the air supply source and fluid source.

The mixture of sand, air, water and/or chemical solvent is fed through chamber 54 into conduits 56 and 58 and into nozzles 60 and 62.

Compressed air may separately be fed via conduit 66 into nozzle 62 to further accelerate flow of sand, air and fluid from nozzle 62. Furthermore, flow of sand and air into the mixing means 44 can be regulated and even stopped by closing off regulating means 43. Thus, if desired, it is possible to deliver a stream of compressed air without sand or fluid and thus the operator can blow away any abrasive build-up instantly. In this manner the operator will have constant vision of the working surface. In a similar manner, water and/or volatile chemical solvent may be fed via conduit 64 into nozzle 60; by closing off valve 43 and the control means of the compressed air supply, it is possible to deliver a stream of water and/or volatile chemical solvent alone via nozzle 60.

Furthermore, the nozzles 60 and 62 can be employed in conjunction with each other or alone to deliver a high pressure air blast and/or fluid blast, by manipulating the aforementioned control means or valves as would be apparent to one skilled in the art, to pry loose build-up of dirt and/or grease on hard-to-get at or trouble areas.

In addition, the nozzles 60 and 62 may be separated into two independent units so that two different operators may carry out sandblasting, air blasting or water and/or chemical solvent application.

The nozzles 60 and 62 are quickly coupled on and off permitting various types of nozzles to be used for specific purposes.

It will also be understood that conventional pumps or gravity feeding techniques may be employed to feed the sand and fluids to the various conduits connecting with the chamber 12, the mixing means 44 and the nozzles 60 and 62.

As indicated, the nozzles 60 and 62 when used in conjunction with each other can be angularly adjusted with respect to each other so that the angle of incidence of the mixtur of sand, air and fluid upon a surface to be cleaned can be adjusted so that abrasion rather than chipping occurs.

The steam generating means operates by feeding water from source 80 and compressed air from source 86 to the heating coils 76 which are heated by heating jets fueled from fuel source 94. If desired, volatile chemical solvent from source 90 may also be fed to the heating coils. The heating coils heat up the water and in combination with the negative pressure (pump 100) at the exit end of the coils, cause steam to flow out of outlet 78 into conduits 98 and 102 to nozzle 104. In this manner steam can be delivered under predetermined pressures without the need for expensive pumps, motors and the like usually employed in steam spraying equipment.

Furthermore, a common source of compressed air is preferably employed for supplying compressed air to the chamber 12 and associated conduits as well as to the steam generating means for driving water into the heating coils.

As indicated, the nozzles 60 and 62 spray the preparing mixture of sand, air, the highly volatile solvent and/or water under pressure onto the working surface of a vehicle.

As the preparing mixture strikes the surface of the vehicle at an oblique angle (i.e., less than 45°), the solvent removes film and dirt from the surface thereof. The abrasive striking at an oblique angle removes the paint without chipping. Glass and trim are masked so that the impact of the abrasive will not chip or scrape them. It should be noted that if the angle of the mixture strikes the surface is greater than 45°, there would be a sand blasting effect on the surface, injuring the same.

The chemical solvent carries away the abrasive and bits of material removed from the surface of the vehicle to a suitable drain. The solvent which does not run off of the surface of the vehicle will evaporate quickly, as it is highly volatile so that relatively little further work must be done on the surface of the vehicle before repainting is accomplished. The sand carried by the air and chemical solvent may be brought through the drain to rest on the surface of a conveyor belt which will bring the abrasive back to the supply source thereof. The solvent will quickly evaporate and can then be collected by a fumehood (not shown) and then condensed to retain the solvent.

Where it is necessary to remove heavy grease build-up, for example, on trailer trucks or oil delivery trucks, the apparatus of the invention can be employed to simultaneously sand blast, steam spray and deliver chemical solvent to the trouble areas. Where it is desired to remove heavy grease deposits present on the working surface, the angle that the abrasive, solvent or steam strikes the surface is not important until substantially all of the grease is removed. It will be apparent that the grease deposit itself will act as a barrier to prevent injury to the working surface.

The entire unit mounted on the movable base described above may be easily maneuvered around the vehicle and/or the conduits or hoses connecting up with the nozzles may be of sufficient length to reach any surface of the vehicle.

It will also be understood that the steam generating means in conjunction with related conduits and nozzles may be used as a steam cleaner, as a hot water pressure washer, or both. Further, the sand blasting unit **10** may be employed as a standard sand blaster when required, as will be apparent to one skilled in the art.

Although this invention has been described with respect to its preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred, therefore, that the scope of the invention be limited, not by the specific disclosure herein, only by the appended claims.

I claim:

1. An apparatus for preparing an object having a painted metal surface for repainting comprising, in combination:

means for storing abrasive including inlet means for abrasive and outlet means for abrasive;

air supply means;

first conduit means in communication with the air supply means, the means for storing abrasive and the outlet means for abrasive;

second conduit means for carrying mixtures of abrasive and air, in communication with said first conduit means and said outlet for abrasive;

means for directing a stream of abrasive and air onto said metal surface, in communication with said second conduit means,

steam generating means including a water inlet, a steam outlet, an air inlet in communication with said water inlet, and a third conduit means in communication with said air supply means and said air inlet; and

means for directing steam onto said metal surface, in communication with said steam outlet.

2. The apparatus as defined in claim **1** including, in addition,

a source of volatile chemical solvent;

a source of water;

means for mixing abrasive-air mixture with volatile chemical solvent and/or water, in communication with said second conduit means, said sources of volatile chemical solvent and/or source of water and said means for directing a stream of abrasive and air onto said metal surface.

3. The apparatus as defined in claim **2** wherein said means for mixing abrasive-air mixtures with volatile chemical solvent and/or water includes fourth conduit means in communication with said air supply means.

4. The apparatus as defined in claim **1** wherein said means for directing a stream of abrasive and air includes nozzle means.

5. The apparatus as defined in claim **4** wherein said nozzle means comprises a pair of flat nozzles pivotally connected together to form a variable V-shape.

6. The apparatus as defined in claim **5** wherein one of said flat nozzles include fifth conduit means in communication with said air supply and the other of said flat nozzles includes sixth conduit means in communication with said source of volatile chemical solvent and/or water.

7. The apparatus as defined in claim **1** wherein said steam generating means includes in addition, heating coils, including a water intake and steam outlet sides, in communication with said water and air inlets and a fuel source for heating said coils.

8. The apparatus as defined in claim **6** including means for regulating the flow of air into said nozzles.

9. The apparatus as defined in claim **1** including means for regulating the amount of abrasive flowing from said abrasive storage means into said second conduit means.

10. The apparatus as defined in claim **1** wherein means for regulating the amount of air entering the abrasive storage means and the second conduit means.

11. The apparatus as defined in claim **1** including means for regulating the amount of air entering the steam generating means.

12. The apparatus as defined in claim **7** including means for reducing pressure of steam flowing out of the steam outlet and into the means for directing steam onto the metal surface.

13. The apparatus as defined in claim **1** including a transportable base upon which the steam generating means and the means for storing abrasive and relates conduits and components can be carried, to make said apparatus portable.

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