PORTABLE POWER WASHING APPARATUS

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ABSTRACT OF THE DISCLOSURE

A method and apparatus for cleaning surfaces by spraying heated water through an airless spray nozzle onto the surfaces to be cleaned under substantial pressures.

Disclosure

The present invention relates generally, as indicated, to a portable power washing apparatus and, more particularly, to a washing apparatus which is especially adapted to clean vehicles of all sizes and even buildings in a minimum amount of time using a minimum amount of water and detergent; and a novel method of doing the same.

There are many known techniques which are being used commercially for cleaning a large number of vehicles in a relatively short period of time, ranging from substantially fully automated washing apparatus to hand operated spray units. While most of these systems are effective in removing relatively loose dirt and in most cases baked on mud, generally they will not remove grease, hand prints, or road film, at least not without using a very strong detergent. Besides, that the available equipment is quite expensive, thus requiring a rather large initial investment to enter the field, and the water requirements for washing is substantial, which is of special concern for those who have portable washing apparatus and carry their water supply with them, or for those who operate in areas where there is a limited supply of water available.

Various methods are also being followed to clean incrustation from buildings, including the use of steam or water at elevated temperatures and/or pressures, with or without an abrasive or detergent admixed therewith. However, none of these methods has proven to be entirely satisfactory for one reason or another. Moreover, none has been found to be equally suited for cleaning vehicles merely by making minor adjustments, which is a principal object of this invention.

Another object is to provide a vehicle washing apparatus which is capable of removing such things as road film, grease, and finger prints from vehicle bodies in addition to ordinary dirt without the use of special, strong soap solutions.

Still another object is to provide a power washing apparatus of the type described which is capable of cleaning more vehicles per hour and using less water than similar type prior art washing apparatus.

A further object is to provide such a power washing apparatus which is capable of producing an airless spray of water at relatively high temperatures and under extremely high pressures, from 1600 to 1800 p.s.i. for cleaning vehicles such as cars and trucks, and up to 4200 p.s.i. for cleaning buildings.

Another object is to provide such a washing apparatus with a minimum number of operating parts, thereby making the apparatus especially suited to be mounted on a truck for transporting to various jobs.

Still another object is to provide such an apparatus which is relatively inexpensive as compared to similar type cleaning apparatus. Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

FIG. 1 is a perspective view of a preferred form of power washing apparatus in accordance with the present invention shown mounted on a truck of conventional type;

FIG. 2 is a diagrammatic view in perspective showing the various parts of the power washing apparatus;

FIG. 3 is an enlarged front elevation view of the nozzle for the apparatus, and

FIG. 4 is a vertical section taken on the plane of the line 4—4 of FIG. 3.

Turning now to the details of the preferred form of power washing apparatus illustrated in the drawing, and first of all to FIG. 1, such power washing apparatus is generally indicated at 1 and is shown mounted on a truck 2 for ready transportation to wherever it might be needed for cleaning purposes. However, it should be understood that the apparatus 1 could just as easily be a permanent installation if desired.

As perhaps best seen in FIG. 2, the power washing apparatus 1desirably consists of eight main parts; a large tank 3 for storage of a water-detergent solution; a hot water heater 4 for heating the water-detergent solution; a spray nozzle 5; a high pressure pump 6 for pumping the heated water-detergent solution from the heater 4 to the nozzle 5; a smaller tank 7 for storage of rinse water; a second pump 8 for pumping the rinse water to the nozzle 5; and a compressor 9 driven by a motor 10 for supplying compressed air to operate the pumps 6 and 8.

In the preferred form shown, the large tank 3 is located adjacent the top of the enclosed portion 15 of the truck 2 above the heater 4, whereby the water-detergent solution within the tank 3 may be fed by gravity to the heater 4 through a vertical pipe 16. Alternatively, the tank 3 may be mounted on the bed 17 of the truck 2 adjacent the heater 4, but in that case an additional pump would be required to pump the water-detergent solution from the tank 3 to the heater 4, and the truck length would have to be somewhat increased to accommodate the additional parts on the truck bed 17. While not absolutely necessary, it is desirable that there be provided a shutoff valve 18 in the vertical pipe 16 between the tank 3 and heater 4.

The tank 3 may be filled with water and detergent in the proper proportions through a removable cap 19 located in the top of the enclosed portion 15, or at some other suitable place. While it has been found convenient to mix the detergent directly with the water in the storage tank 3, it should be apparent that a separate detergent tank could be provided and the mixing done either in the heater 4, or as the heated water leaves the heater. In that case, the tank 3 could be used for supplying both the wash water and rinse water, and the rinse water tank 7 could be eliminated. Soft water is not generally used and is not necessary.

The hot water heater 4 is illustrated of the gas fired type, has a capacity of 37 gallons, and is capable of heating 120 gallons per hour at a 100°F. temperature rise. However, in actual practice it has been found that this is much larger than is necessary, since only about 40 gallons per hour of hot water is needed while cleaning with the power washing apparatus 1. The temperature of the water as it leaves the heater 4 is preferably between 160 and 180°F., this being thermostatically controlled.
The heated water-detergent solution is withdrawn from the heater 4 when needed by the pump 6 through a suction pipe 20 and discharged from the pump under extremely high pressure to the nozzle 5 through a suitable flexible hose 21. The pump 6 is of a piston type which is commercially available, being capable of delivering an airless water spray at a maximum of 4200 p.s.i. pressure and a flow rate of 14.5 gallons per minute. The pump 6 is driven by compressed air entering through a supply hose 22 from the compressor 9, such compressor preferably having a capacity of about 25 cubic feet per minute. Of course, such a high pressure hot water-detergent solution would ruin the paint on an automobile. However, it has been found that when supplied under extremely high pressure approaching 4200 p.s.i. through the nozzle 5 having a .068 inch orifice 23 and an 11 inch fan (see FIGS. 3 and 4), the resulting airless water spray is very effective in removing incrustations from the surfaces of floors and both interior and exterior walls of buildings. The temperature of the solution, while approximately 160 to 180° F. when it leaves the heater 4, is about 100° F. when it hits the work after leaving the nozzle 5. For turning the spray on and off, the nozzle 5 is provided with a shut-off valve 24.

For the cleaning of vehicles, excellent results are obtained when using such water-detergent solutions pumped at a pressure of 1600 to 1800 p.s.i. at a rate of 1 gallon per minute through the .068 inch orifice and 11 inch fan of the nozzle 5 to create an airless spray. Not only will such a spray remove normal dirt and caked on mud from vehicles such as automobiles and trucks, but it will also remove such hard to get off things as grease, road film, and hand prints without any apparent damage to the paint finish and without the use of high strength detergents which could by themselves damage the paint. No preliminary preparation of the surface to be cleaned is required. While spraying the vehicle, it is preferred that the tip of the nozzle 5 be held approximately 4 to 12 inches from the surface being cleaned, with the spray being directed substantially perpendicular to the surface. Here again, the temperature of the spray as it hits the surface is much cooler, i.e., about 100° F.

In addition to being able to remove grease and road film by using the above described method and apparatus, which was heretofore not possible with high pressure spraying equipment previously available, the amount of time necessary to clean a vehicle has been substantially reduced. Cleaning with similar type prior art apparatus takes about the same time as doing cleaning with the apparatus of the present invention. As an example, the apparatus disclosed herein is able to clean an average of 3 tractors and 30 thirty foot trailers per hour; or 10 retail milk trucks per hour, while the prior art apparatus can clean only about half as many vehicles in the same length of time.

There is also a substantial savings in the amount of water required for washing. The apparatus of the present invention uses approximately one gallon per minute while actually spraying the water-detergent solution. Competitor's apparatus, on the other hand, uses more than 3 gallons per minute. This means that while the present apparatus needs a supply of only about 350 gallons of water-detergent solution for an eight to ten hour day, competitors' apparatus needs a supply of 1200 gallons. These improved results are believed to be due to the temperature and pressure of the water-detergent spray, and the fact that the spray is airless.

Because of the relatively small amount of water required for washing purposes, the apparatus can be mounted on a much smaller and therefore less expensive truck than can the comparable prior art apparatus. Moreover, the heater for the apparatus can be made smaller and less expensive. These two factors permit a substantial reduction in the cost of the present apparatus as compared to apparatus of the prior art. Further, because less water is used during washing, there is less of a mess to clean up.

Upon completion of the washing operation, the surface is then rinsed. The rinse water is stored in a separate tank 7 as aforesaid, and is pumped in an unheated condition at a rate of about one-half g.p.m. by the pump 8 through a suction pipe 25 and hose 26 to the nozzle 5, there being provided a conventional type switching valve 27 at the nozzle 5 for switching from one hose 21 to the other 26, and vice versa. The pump 8 is driven by compressed air entering through a supply hose 22 from the compressor 9, such compressor preferably having a capacity of about 25 cubic feet per minute. Of course, such a high pressure hot water-detergent solution would ruin the paint on an automobile. However, it has been found that when supplied under extremely high pressure approaching 4200 p.s.i. through the nozzle 5 having a .068 inch orifice 23 and an 11 inch fan (see FIGS. 3 and 4), the resulting airless water spray is very effective in removing incrustations from the surfaces of floors and both interior and exterior walls of buildings. The temperature of the solution, while approximately 160 to 180° F. when it leaves the heater 4, is about 100° F. when it hits the work after leaving the nozzle 5. For turning the spray on and off, the nozzle 5 is provided with a shut-off valve 24.

For the cleaning of vehicles, excellent results are obtained when using such water-detergent solutions pumped at a pressure of 1600 to 1800 p.s.i. at a rate of 1 gallon per minute through the .068 inch orifice and 11 inch fan of the nozzle 5 to create an airless spray. Not only will such a spray remove normal dirt and caked on mud from vehicles such as automobiles and trucks, but it will also remove such hard to get off things as grease, road film, and hand prints without any apparent damage to the paint finish and without the use of high strength detergents which could by themselves damage the paint. No preliminary preparation of the surface to be cleaned is required. While spraying the vehicle, it is preferred that the tip of the nozzle 5 be held approximately 4 to 12 inches from the surface being cleaned, with the spray being directed substantially perpendicular to the surface. Here again, the temperature of the spray as it hits the surface is much cooler, i.e., about 100° F.

In addition to being able to remove grease and road film by using the above described method and apparatus, which was heretofore not possible with high pressure spraying equipment previously available, the amount of time necessary to clean a vehicle has been substantially reduced. Cleaning with similar type prior art apparatus takes about the same time as doing cleaning with the apparatus of the present invention. As an example, the apparatus disclosed herein is able to clean an average of 3 tractors and 30 thirty foot trailers per hour; or 10 retail milk trucks per hour, while the prior art apparatus can clean only about half as many vehicles in the same length of time.

There is also a substantial savings in the amount of water required for washing. The apparatus of the present invention uses approximately one gallon per minute while actually spraying the water-detergent solution. Competitor's apparatus, on the other hand, uses more than 3 gallons per minute. This means that while the present apparatus needs a supply of only about 350 gallons of water-detergent solution for an eight to ten hour day, competitors' apparatus needs a supply of 1200 gallons. These improved results are believed to be due to the temperature and pressure of the water-detergent spray, and the fact that the spray is airless.

Because of the relatively small amount of water required for washing purposes, the apparatus can be mounted on a much smaller and therefore less expensive truck than can the comparable prior art apparatus. Moreover, the heater for the apparatus can be made smaller and less expensive. These two factors permit a substantial reduction in the cost of the present apparatus as compared to apparatus of the prior art. Further, because less water is used during washing, there is less of a mess to clean up.

Upon completion of the washing operation, the surface is then rinsed. The rinse water is stored in a separate tank 7 as aforesaid, and is pumped in an unheated condition at a rate of about one-half g.p.m. by the pump 8 through a suction pipe 25 and hose 26 to the nozzle 5, there being provided a conventional type switching valve 27 at the nozzle 5 for switching from one hose 21 to the other 26, and vice versa. The pump 8 is driven by compressed air entering through a supply hose 22 from the compressor 9, such compressor preferably having a capacity of about 25 cubic feet per minute. Of course, such a high pressure hot water-detergent solution would ruin the paint on an automobile. However, it has been found that when supplied under extremely high pressure approaching 4200 p.s.i. through the nozzle 5 having a .068 inch orifice 23 and an 11 inch fan (see FIGS. 3 and 4), the resulting airless water spray is very effective in removing incrustations from the surfaces of floors and both interior and exterior walls of buildings. The temperature of the solution, while approximately 160 to 180° F. when it leaves the heater 4, is about 100° F. when it hits the work after leaving the nozzle 5. For turning the spray on and off, the nozzle 5 is provided with a shut-off valve 24.

For the cleaning of vehicles, excellent results are obtained when using such water-detergent solutions pumped at a pressure of 1600 to 1800 p.s.i. at a rate of 1 gallon per minute through the .068 inch orifice and 11 inch fan of the nozzle 5 to create an airless spray. Not only will such a spray remove normal dirt and caked on mud from vehicles such as automobiles and trucks, but it will also remove such hard to get off things as grease, road film, and hand prints without any apparent damage to the paint finish and without the use of high strength detergents which could by themselves damage the paint. No preliminary preparation of the surface to be cleaned is required. While spraying the vehicle, it is preferred that the tip of the nozzle 5 be held approximately 4 to 12 inches from the surface being cleaned, with the spray being directed substantially perpendicular to the surface. Here again, the temperature of the spray as it hits the surface is much cooler, i.e., about 100° F.

In addition to being able to remove grease and road film by using the above described method and apparatus, which was heretofore not possible with high pressure spraying equipment previously available, the amount of time necessary to clean a vehicle has been substantially reduced. Cleaning with similar type prior art apparatus takes about the same time as doing cleaning with the apparatus of the present invention. As an example, the apparatus disclosed herein is able to clean an average of 3 tractors and 30 thirty foot trailers per hour; or 10 retail milk trucks per hour, while the prior art apparatus can clean only about half as many vehicles in the same length of time.

There is also a substantial savings in the amount of water required for washing. The apparatus of the present invention uses approximately one gallon per minute while actually spraying the water-detergent solution. Competitor's apparatus, on the other hand, uses more than 3 gallons per minute. This means that while the present apparatus needs a supply of only about 350 gallons of water-detergent solution for an eight to ten hour day, competitors' apparatus needs a supply of 1200 gallons. These improved results are believed to be due to the temperature and pressure of the water-detergent spray, and the fact that the spray is airless.

Because of the relatively small amount of water required for washing purposes, the apparatus can be mounted on a much smaller and therefore less expensive truck than can the comparable prior art apparatus. Moreover, the heater for the apparatus can be made smaller and less expensive. These two factors permit a substantial reduction in the cost of the present apparatus as compared to apparatus of the prior art. Further, because less water is used during washing, there is less of a mess to clean up.
6. The power washing apparatus of claim 5 further comprising a second water storage tank on said truck for said rinse water supply, a second pump means for pumping the rinse water to said nozzle, and a switching valve means on said nozzle for selectively switching between the heated water supply and rinse water supply, said first-mentioned water storage tank having a capacity of approximately 330 gallons, and said second water storage tank having a capacity of approximately 200 gallons.

7. A power washing apparatus comprising a water-detergent solution storage tank, heater means for receiving and heating such water-detergent solution from said storage tank to a temperature from 160° F. to 180° F., an airless spray nozzle having a .068 inch orifice and an 11 inch fan, a first high pressure pump means for delivering such heated water-detergent solution to said nozzle at a pressure of from 1600 p.s.i. to 1800 p.s.i. and at a rate of approximately 1 gallon per minute to create an airless spray from said nozzle, a second storage tank for containing rinse water, a second pump for delivering such rinse water to said nozzle, and a switching valve means on said nozzle for selectively switching said nozzle between such heated water-detergent solution and rinse water.

8. A power washing apparatus comprising a water-detergent solution storage tank, heater means for receiving and heating such water-detergent solution from said storage tank to a temperature from 160° F. to 180° F., an airless spray nozzle having a .068 inch orifice and an 11 inch fan, a first high pressure pump means for delivering such heated water-detergent solution to said nozzle at pressures up to 4200 p.s.i. and at a rate of approximately 1 gallon per minute to create an airless spray from said nozzle, a second storage tank for containing rinse water, a second pump for delivering such rinse water to said nozzle, and a switching valve means on said nozzle for selectively switching said nozzle between such heated water-detergent solution and rinse water.

9. A process for cleaning surfaces comprising the steps of heating water to a temperature of from 160° F. to 180° F., pumping such heated water through an airless spray nozzle under a pressure greater than 1600 p.s.i. and at a rate of from 40-60 gallons per hour to create an airless spray, and directing the spray at the surface to be cleaned.

10. The process of claim 9 wherein a mild detergent is added to the water prior to spraying.

11. The apparatus of claim 10 wherein the water-detergent solution is sprayed through an nozzle having a .068 inch orifice and 11 inch fan, and such nozzle is moved back and forth across the surface during spraying until the surface is clean, after which the surface is rinsed with rinse water.

12. The method of claim 9 wherein the surface to be cleaned is a vehicle, and the heated water-detergent solution is pumped through the nozzle at a pressure of from 1600 p.s.i. to 1800 p.s.i.

13. The process of claim 9 wherein the surface to be cleaned is a building, and the heated water-detergent solution is pumped through the nozzle at a pressure approaching 4200 p.s.i.

14. The process of claim 12 wherein the nozzle is held at a distance of from 4 to 12 inches from the surface being cleaned and the spray is moved back and forth across the surface until all the dirt, grease, road film, and finger prints are removed therefrom.

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