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LE BARON B. JOHNSON

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DEVICE FOR CLEANING SURFACES

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FIG. 1.

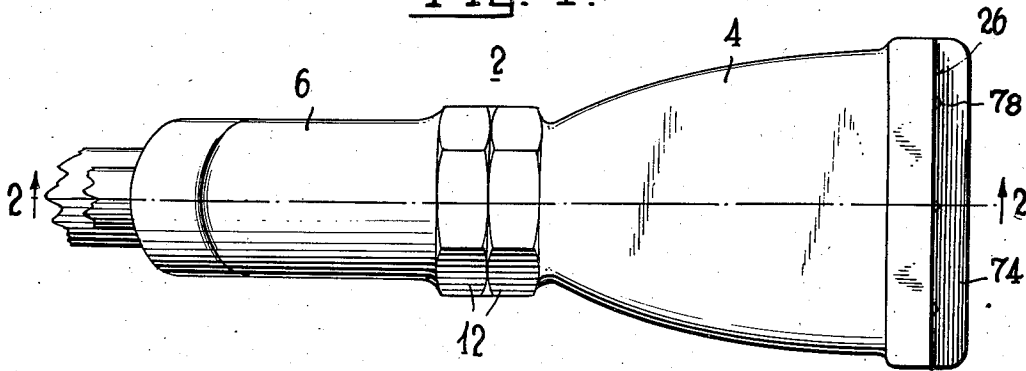


FIG. 2.

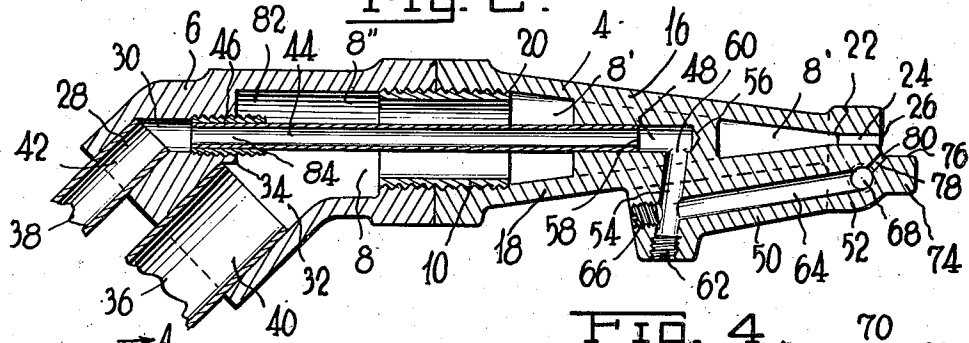


FIG. 4.

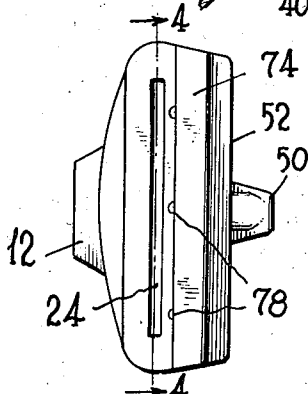
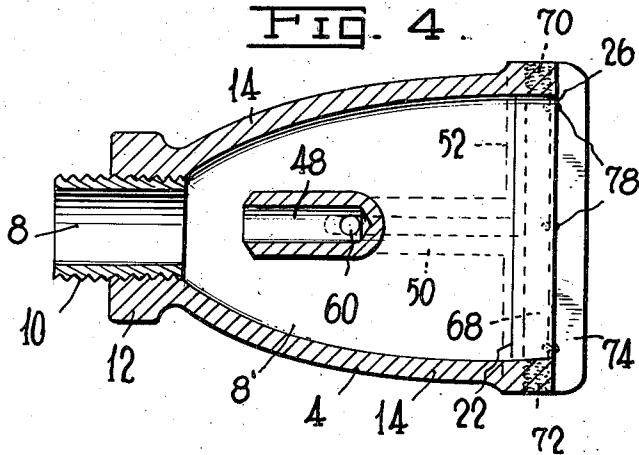


FIG. 3

Inventor  
LeBaron B. Johnson,

By *Barley Carson*  
Attorney

## UNITED STATES PATENT OFFICE

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## DEVICE FOR CLEANING SURFACES

Le Baron B. Johnson, Bronxville, N. Y., assignor  
to Oakite Products, Inc., a corporation of New  
York

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## 1 Claim. (Cl. 299—142)

The present invention relates to devices for cleaning surfaces. More particularly, the invention is concerned with devices for the removal of paints, enamels, lacquers and similar coatings from various surfaces, and with devices for the removal of heavy deposits of grease, oil and similar substances.

It is the primary object of the present invention to construct a device by which coatings of paint, enamels, lacquers or the like can be removed from surfaces and which is also adapted for removing other types of coatings, such as heavy deposits of oil, grease or similar materials, which usually require for their removal a mechanism different from that used for the removal of the first-mentioned substances.

Another object resides in constructing a nozzle or the like which can be modified by a simple adjustment for removing different types of substances.

More specifically, it is an object of the invention to construct a nozzle which automatically and accurately controls the supply of steam, hot water or the like and the supply of cleaning solution or solvent, and the proper mixture of these fluids for a given purpose.

The invention includes for another object the construction of a nozzle whereby an intimate mixture of steam and cleaning solution or solvent is obtained and ejected therefrom upon a surface in the form of a uniform spray which simultaneously covers large areas of said surface.

Another object of the invention resides in designing a nozzle or the like in such a manner that an excess supply of one fluid automatically cuts off the supply of the other fluid.

A further object of the invention consists in the construction of a nozzle or the like which automatically prevents an undesired atomization of the cleaning solution or solvent when the supply of steam admitted to the nozzle and normally ejected therefrom together with the cleaning solution or solvent exceeds a certain pressure.

Still another object consists in designing a nozzle or the like in which the flow of one liquid through the nozzle is not affected by the flow of the other liquid whereby the two liquids are discharged separately from the nozzle into the atmosphere and whereby one of the liquids is ejected from the nozzle at a high velocity, meets the stream of the other liquid immediately after both liquids have been discharged into the atmosphere and carries said other liquid along without gasifying or unduly atomizing the same.

Another important feature of the invention re-

sides in arranging the fluid passages within the nozzle or the like in heat exchange relation whereby the temperature of the cleaning solution or solvent is considerably increased by the heat of the steam while both fluids are travelling through their respective passages within the nozzle.

Still further objects and advantages of the present invention will appear from the following detailed description and the drawing, in which

Fig. 1 is a plan view of the nozzle according to the invention;

Fig. 2 is a cross-section taken along line 2—2 of Fig. 1;

Fig. 3 is a front view of the nozzle;

Fig. 4 is a cross-section taken along line 4—4 of Fig. 3.

The hollow body 2 of the nozzle comprises a nozzle portion 4 which preferably is made of one piece, for example by casting, and a rear or gun-head portion 6. A steam passage 8 extends through both the nozzle and gun-head portions 4 and 6 which are secured to each other by a sleeve 10 threaded into the adjacent ends of passage 8' of nozzle portion 4 and passage 8'' of rear portion 6. The adjacent ends of portions 4 and 6 are provided at their outer periphery with gripping surfaces 12 for tightening portions 4 and 6 relative to each other. Steam passage 8' of nozzle portion 4 is enclosed by lateral walls 14, a top wall 16 and a bottom wall 18. Lateral walls 14 diverge gradually from the forward end 20 of sleeve 10 toward the rear edge 22 of the ejecting passage or slot 24, while the top and bottom walls 16 and 18 converge from forward end 20 of sleeve 10 toward rear edge 22. Therefore, ejecting passage 24 is of small height but considerable width and of rectangular cross section. It is made of such length in the axial direction of passage 8' so as to guide the steam which is ejected from the forward end 26 in a sharply defined jet of considerable width and high pressure.

Steam passage 8'' of the rear or gun-head portion 6 is substantially cylindrical in longitudinal cross-section and terminates at its forward end in sleeve 10 and at its rear end in a solution passage 28, at least the forward end of which is disposed coaxially with passages 8', 8'' and which is of considerably smaller diameter than passage 8''. A steam inlet passage 32 of a diameter substantially equal to that of passage 8'' terminates at one end in passage 8'', its longitudinal axis is disposed at an angle of approximately 45° to the axis of passages 8', 8'' and its opening into passage 8'' is located closely adjacent the opening

of solution passage 28 as shown at 34 in Fig. 2. Steam and solution supply pipes 36, 38 of a steam gun (not shown) are secured to the outer ends 40 and 42 respectively of passages 32 and 28 in a fluid-tight manner.

A solution tube 44 is disposed within steam passage 8 coaxially therewith and is removably secured at its rear end to solution passage 28, for example by screw threads 46, while its front end fits slidably into a socket 48 secured within passage 8' to top and bottom walls 16 and 18 thereof.

Bottom wall 18 of nozzle portion 4 is provided with a ridge-like projection 50 extending in a vertical plane coaxially with passage 8' from a point adjacent but at the rear of the longitudinal center of nozzle portion 4 toward the front end thereof where it terminates in a cross piece 52 projecting from the lower wall of steam ejecting passage 24.

Projection 50 is provided with a channel 54 passing through bottom wall 18 and terminating in socket 48 at a point adjacent the bottom 56 thereof and extending at substantially a right angle to the axis of socket 48. Solution tube 44 is made of such a length that, when it is tightly screwed into passage 28, its forward end 58 extends into socket 48 but is spaced a certain distance from the bottom 56 thereof so as to leave free the opening 60 into channel 54. A plug 62 is screwed into the lower end of channel 54 for closing the same. A second channel 64 intersects channel 54 near the lower end thereof and is closed at its rear end by a screwplug 66. Channel 64 extends within projection 50 and terminates in a cross-channel 68 within cross-piece 52, the two outer ends of which are closed by screw plugs 70, 72. A lip 74 projects from the forward end 26 of the nozzle portion 4 extending over the entire width thereof and forms a cross-piece 52. Its upper surface 76 is disposed a short distance below the opening of ejection passage 24 and parallel with the plane of the upper and lower walls thereof. A plurality of solution discharge passages 78 of small diameter extend from cross-channel 68 at an angle of approximately 40° to 45° relative to the vertical plane of front end 26, and terminate within the apex of the corner 80 formed by the front end 26 and surface 76.

For the removal or stripping of paints, enamels, lacquers and similar coatings from various surfaces, the best results are obtained by ejecting an intimate mixture of steam and cleaning solution or solvent under low pressure against the surfaces to be cleaned. On the other hand, for the removal of heavy deposits of grease, oil and similar residues, the best results are obtained by adding the cleaning solution or solvent to the steam in such a manner that the solution is not intermixed with the steam but projected bodily, that is in the form of more or less undiluted drops of solvent against the surface to be cleaned. The difference in the requirements of a nozzle for steam cleaning and for paint stripping ordinarily requires a different type of nozzle for each type of cleaning. The nozzle according to the invention combines the functions of these two different nozzle constructions in a single convertible construction.

For removing oily or similar deposits from surfaces, the nozzle is used in the form shown in Fig. 2, that is, with solution tube 44 screwed into solution passage 28 and extending into socket 48, so that the cleaning solution or solvent supplied through pipe 38 of the steam gun passes through solution tube 44, socket 48, channels 54 and 64

into cross-channel 68 from which it is sucked up by aspirator action through inclined discharge passages 78 into the current of steam which passes from pipe 36 of the steam gun through passage 8, which includes passages 8' and 8'', and is ejected through the ejecting passage 24. The inclination of approximately 40° to 45° of discharge passages 78 relative to the axis of the steam passage 8 serves to prevent gasifying or undue atomization of the cleaning solution or solvent inasmuch as the solvent is discharged in the general direction of the jet of the steam and the steam acts as the carrier of liquid drops of solvent.

By arranging the relatively long passage of cleaning solution or solvent within the steam passage and in heat exchange relation therewith, the solvent is automatically raised to a very high temperature before it is intermixed with the steam whereby the cleaning efficiency is considerably increased.

If the nozzle according to the present invention is intended to be used for removing coatings of paints, enamels, lacquers or similar substances, from various types of surfaces, all that has to be done is shutting off the supply of steam and solution, unscrewing the nozzle portion 4 from the rear or gun-head portion 6, removing the solution tube 44 from the structure and screwing together again portions 4 and 6. Now, if the supply of steam and solution is again turned on, the cleaning solution or solvent is intimately mixed with the steam within passage 8' and both together are ejected through ejecting passage 24 in the form of a flat wide jet of boiling solution of considerable pressure.

In order to avoid a condition in which the steam pressure exceeds a certain limit whereby the cleaning fluid or solvent is gasified or finely atomized and disagreeable or even dangerous fumes result, and in which condition the cleaning or stripping results become poor, the nozzle according to the invention has been so designed that an excess of steam pressure above a certain limit automatically cuts off the flow of cleaning solution or solvent. By positioning the solution inlet passages 30 in axial direction of the main steam passage 8 and nozzle opening 24, and the steam inlet passage 32 at an oblique angle thereto, the solution or solvent is intimately mixed with the steam but retains its liquid form. If, however, the pressure of the steam exceeds a certain limit, a back pressure is built up in passage 8'', and particularly within the portion 82 thereof which is not directly hit by the current of steam and which includes the forward opening 84 of solution inlet passage 28. If this back pressure reaches a certain limit equal or greater than the pressure of the inflowing solution or solvent, it automatically cuts off such inflow. The operator of the nozzle will then notice immediately the absence of solution or solvent from the steam ejected from the nozzle and regulate the supply of steam to the nozzle accordingly.

If, on the other hand, a variance in the steam pressure should not affect the rate of flow of the cleaning solution or solvent to the nozzle or from the nozzle into the atmosphere, it is only necessary to screw solution tube 44 into the nozzle as described above, since in that case the steam and the solution flow through separate passages and cannot affect each other within the nozzle except that the solution is automatically heated by the steam.

For cleaning the solution passages of any sediments which may cling to their walls and gradually restrict or even prevent the flow of solution therethrough, it is only necessary to unscrew plugs 62, 66, 70 and 72, and clean the respective passages with a suitable tool. Since the nozzle and gun-head portions 4 and 6 can be separated and solution tube 44 be removed, the interior surfaces of these parts can be easily cleaned also.

While I have described herein one embodiment of my invention, I wish it to be understood that I do not intend to limit myself thereby except within the scope of the appended claim.

I claim:

An apparatus for removing different types of coatings from surfaces, comprising a nozzle having a passage therein, said passage having inlet openings at one end thereof for conducting at least two different currents of liquid into said passage, and an outlet opening at the other end of said passage for ejecting at least one of said

liquids into the atmosphere, a channel separate from said passage and terminating at its rear end into said passage, a tubular member removably secured at one end to one of said inlet openings and at the other end to the rear end of said channel, the forward end of said channel being spaced from said outlet opening and being inclined relative to the axis of said passage so that the axes of said forward end and said passage intersect at a point spaced forwardly of said outlet opening, whereby said liquids are conducted separately through said nozzle and are intermixed after they have been discharged from said nozzle into the atmosphere when said tubular member is secured within said nozzle, and said liquids are injected through said inlet openings into said passage and intermixed within said passage and ejected together through said outlet opening when said tubular member is removed from said nozzle.

LE BARON B. JOHNSON.