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Vondracek et al.

[15] **3,694,942**

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[54] **STEAM CHAMBER COATINGS**

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Related U.S. Application Data

[62] Division of Ser. No. 677,643, Oct. 24, 1967, Pat. No. 3,551,183.

[52] **U.S. Cl.** **38/77.83**

[51] **Int. Cl.** **D06f 75/06**

[58] **Field of Search** 38/77.83; 117/129, 135.1

[56] **References Cited**

UNITED STATES PATENTS

3,499,237	3/1970	Piper	38/77.83
3,184,320	5/1965	Michael	117/129
2,683,320	7/1954	Morton	38/77.83
3,551,183	12/1970	Vondracek et al.	117/49

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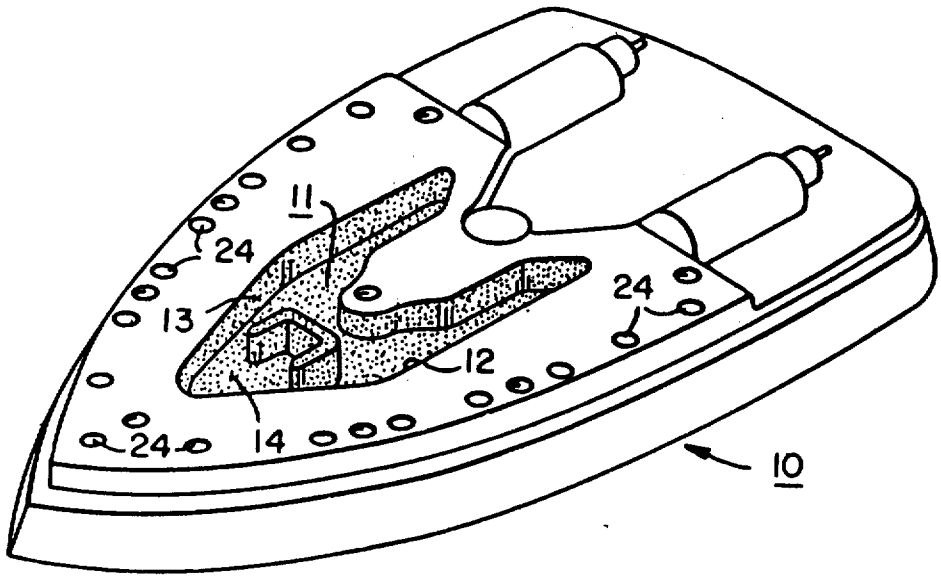
[57] **ABSTRACT**

A coating composition containing sodium silicate and hydrated alumina is deposited on a surface of the flash evaporation chamber in a steam ironing device. The coating is heated, most conveniently by application to an already heated surface and preferably heated to at least about 375° F, to convert it to a more insoluble form.

7 Claims, 2 Drawing Figures



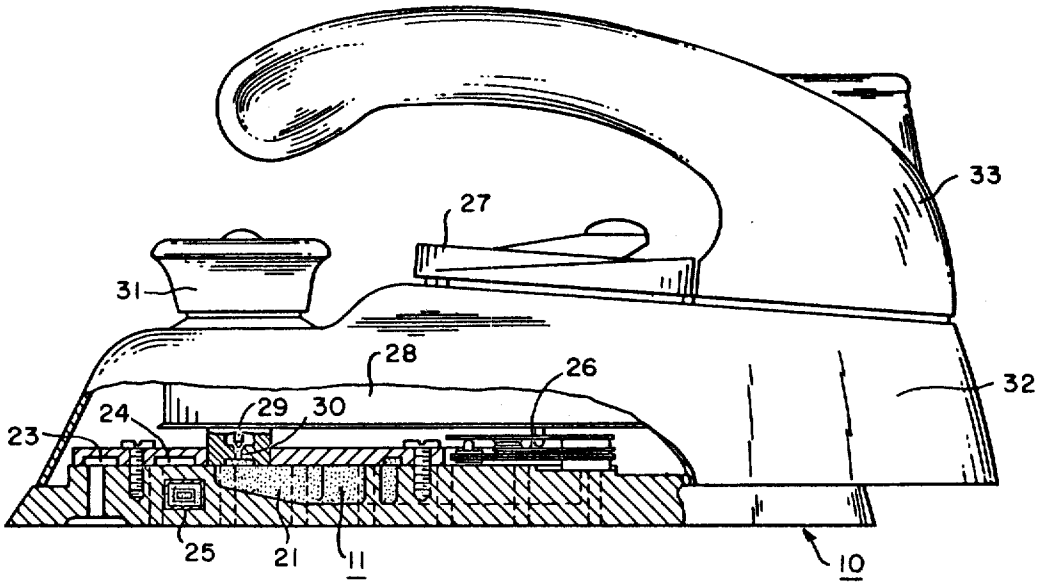
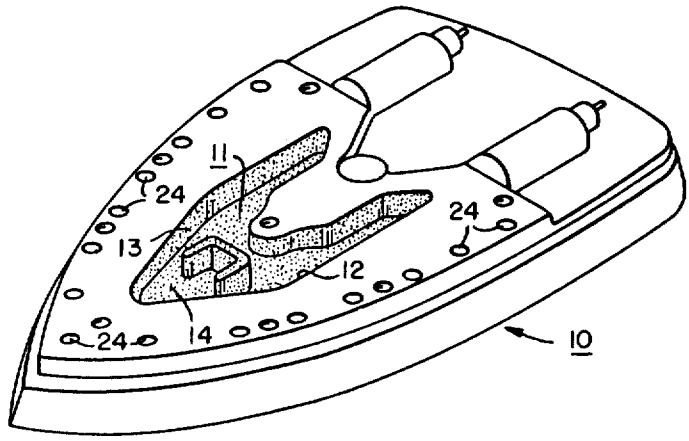


FIG. 2.

FIG. 1.



STEAM CHAMBER COATINGS

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a division of application Ser. No. 677,643, filed Oct. 24, 1967, and assigned to the assignee of this application. The prior application issued as U.S. Pat. No. 3,551,183 on Dec. 29, 1970.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to steam ironing devices and, more specifically, to coatings for the flash evaporation chambers of such devices.

2. Description of the Prior Art

Steam irons and other steam pressing or ironing devices have steam generating chambers wherein water droplets are released onto a hot surface and vaporized to form steam. The steam is emitted through ports in an ironing surface and onto the fabric material being pressed or ironed. When the water droplet strikes the hot surface, there is a pronounced tendency for the droplet to "ball" and bounce around the chamber. Portions of the droplet may be entrained by the steam, be directed through the ports and be deposited onto the fabric material. This undesirable consequence is described as "spitting" or "sputtering." To overcome this problem, the heated surfaces of the steam generating chamber which receive the water droplets have been coated with materials which will induce the water droplet to spread over the heated surface instead of forming the ball which results in spitting or sputtering. Water droplets which spread over the heated surface are rapidly and uniformly vaporized and the steam is emitted from the ports without spitting or sputtering.

To be acceptable, the coating must have other properties. It must be resistant to the water and steam in the evaporation chamber. Coatings which are soluble in water deteriorate rapidly and may even clog the steam ports of the device. It must resist the abrading force of innumerable droplets of water falling thereon. The coating must also adhere to the heated surface, must not flake off and should be adaptable to convenient application, free of blisters or other discontinuities. The difficulty of meeting the foregoing requirements is compounded when pressing devices are designed to generate steam in higher ironing or pressing temperature ranges. A higher temperature range is desirable because of the advantages of the more rapid vaporization at elevated temperatures and to more effectively cover the iron temperature requirements for all types of fabrics.

Numerous coatings for the vaporizing chamber have been proposed by the prior art, including coatings of alkali metal silicates, silica particles, mica flakes and certain metal oxides. One suitable coating that has been extensively employed is described in U.S. Pat. No. 2,683,320, assigned to the assignee of this invention. The sodium silicate coating described in the aforesaid patent has been suitable in the heretofore employed temperature range, i.e., up to about 340° F. At elevated temperatures, particularly above about 400° F, such coatings appear to either lose the ability to spread the water droplets or are too rapidly washed away in repeated vaporizing cycles to be satisfactory.

SUMMARY OF THE INVENTION

It is the general object of this invention to provide a coating for the vaporization chamber of a steam pressing device that will permit the employment of a wider, higher steam temperature range without spitting or sputtering.

It is another object of this invention to provide a chamber coating that has a low solubility, superior adherence and may be conveniently deposited in a single application.

Yet another object of this invention is to provide hydrophilic coatings containing sodium silicates, the coatings having a reduced water solubility.

Briefly, the foregoing and other objects of this invention are obtained by applying a composition containing particulated hydrated alumina, preferably a finely divided hydrated alumina, and a sodium silicate to a surface of the vaporization chamber. The coating is heated either as a consequence of being applied to a hot surface or by a separate heating step to form a coating that is more insoluble than the heretofore employed silicates. Heating or curing the coating composition containing the hydrated alumina and sodium silicate provides a coating that is effective in eliminating spitting and sputtering during steaming at temperatures at least as high as 475° F. A single spray application will provide a satisfactory coating that has a thickness in the order of 1 to 2 mils. Such coatings are adherent and will not flake or spall even under steaming conditions.

BRIEF DESCRIPTION OF THE DRAWING

For a better understanding of the invention, reference may be made to the accompanying drawing in which:

FIG. 1 is an exploded perspective view of a soleplate forming a part of the iron illustrated in FIG. 2; and

FIG. 2 is a side elevational view, partly broken away, of a steam iron.

DESCRIPTION OF THE PREFERRED EMBODIMENT

It has now been discovered that sodium silicate coatings for the flash vaporization chambers of steam pressing devices such as steam irons may be improved by adding hydrated alumina to the sodium silicate solution that is sprayed or otherwise deposited onto the surface of the chamber. The sodium silicates and solutions or suspensions thereof may be described by the weight ratio of Na_2O to SiO_2. For the purposes of this invention, it is preferred for the weight ratio of Na_2O to SiO_2 to be at least about 1:3.5 and optimally about 1:3.75. Increasing the proportion of SiO_2, decreases the water solubility of the silicate coating. It should, of course, be understood that silicates with high proportions of SiO_2 are not, per se, suitable for use as chamber coatings at the high steaming temperatures that may be employed with the coatings of this invention.

Hydrated alumina, also known as aluminum hydroxide, the hydrate of aluminum oxide or alumina trihydrate and described by either the formula $Al_2O_3 \cdot 3H_2O$ or $Al(OH)_3$ as an approximate composition is added to the heretofore described sodium silicate solution. Although applicants do not wish to be bound by any particular theory, it is believed that a reaction oc-

curs between the sodium silicate and hydrated alumina and that the reaction produces less soluble compounds. Irrespective of the validity of the reaction theory, we have discovered that a less soluble coating may be produced form admixtures of sodium silicate and hydrated alumina. The admixture of coating solution should contain from about 10 to about 25 percent of the hydrated alumina on a solids weight basis for spray application. Larger amounts of hydrated alumina may be employed for other application methods such as brushing, spreading with a spatula, etc. Compositions containing less than 10 percent of hydrated alumina have a tendency to flake. The vehicle or solvent for the admixture may be water and the hydrated alumina may, for example, be added to commercially available sodium silicate solutions. It should be understood that the term hydrated alumina is intended to cover the various soluble forms of alumina.

The admixture is sprayed or otherwise deposited onto the chamber surface and then heated to more completely react and dehydrate the coating. Some improvement over the durability of an unmodified silicate coating will be noted even with moderate heating to dry the deposit. Heating or curing at about 375° F and preferably at 400° F, however, provides a coating that will permit steaming over the entire fabric ironing temperature range including the 400°–450° F range and even up to and about 475° F with no balling of the water dropping thereon. It should be noted that the unmodified silicate coatings were serviceable for steaming temperatures up to 340° F.

The addition of hydrated alumina also improves the physical strength of the coating. Thicker coatings may be deposited without the flaking problem that is encountered in attempts to deposit the thicker deposits of the unmodified sodium silicate. Satisfactory coatings having thicknesses several orders of magnitude greater than the sodium silicate coatings may be obtained with the compositions of this invention. Coatings up to about 10 mils thick may be deposited by successive applications. Coatings in the thickness order of 1 to 2 mils that will not flake may be obtained in a single application, which is a particularly attractive advantage. It is advantageous to use a hydrated alumina having a relatively specific particle size to prevent any tendency of bubbling or blistering during the cure of thick coatings that are deposited in a single operation. A finely divided hydrated alumina powder, having an average particle diameter of about 35 microns, is sufficiently coarse to prevent bubbling or blistering. That particle size also appears to facilitate drying during application of the coating.

Referring now to FIG. **1**, we have illustrated an aluminum soleplate **10**, having a cavity **11** defined by the upstanding walls **12**, **13** and a bottom surface **14**. The surfaces of the cavity may be prepared by degreasing, washing and/or etching according to well-known procedures for cleaning metal surfaces. The soleplate is heated in an oven until it reaches a temperature of 400° F. At a station equipped with appropriate spray equipment, the heated cavity is sprayed with a solution containing sodium silicate and hydrated alumina to provide the hydrophilic coating on the cavity surfaces illustrated by the stippling in FIG. 1. Because the heated soleplate has a substantial mass and heat content, no additional heating is required to dry and cure the coating. The cured coating has a thickness in the order of 1 to 2 mils.

A specific example of an aqueous spray solution or suspension for coatings in accordance with this invention and in the process described hereinabove is made by mixing together 92.6 percent of a sodium silicate solution and 7.4 percent of hydrated alumina having an average particle diameter of about 35 microns. The sodium silicate solution contains 32.1 percent solids of which 6.8 percent is Na_2O and 25.3 percent is SiO_2. This corresponds to a Na_2O:Sio_2 ratio of 1:3.75. The sodium silicate constitutes **80** percent of the total solids and the hydrated alumina constitutes 20 percent of the total solids in the spray solution. The ratio of sodium silicate to hydrated alumina is 4:1.

It should be understood that the spray solution may contain minor amounts of other ingredients, although they are not necessary for the obtention of the advantages of this invention. Suspending agents such as silica aerogel, colloidal silica and/or colloidal clays such as bentonite may be included in amounts in the order of 2 percent of the weight of the described solids in the spray solution. Small amounts of dispersing agents or surfactants, such as those based on alkaryl polyether alcohols, sulfonates and sulfates, may be added to improve dispersing action. It should also be understood that the foregoing percentages and ratios are based on weight.

Referring now to FIG. **2**, reference character **20** designates a steam iron comprising the soleplate structure **10** described hereinabove. The steam chamber **21** is defined by the cavity **11** and a cover **22** that is mounted over the soleplate **10**. A plurality of channels **23** permit communication between the chamber **21** and the outlet ports **24**. A heating element **25** is embedded in or otherwise attached to the soleplate **10** and controlled by a conventional thermostat **26** to maintain the soleplate at predetermined operating temperatures determined by the setting of a knob **27**. The iron further comprises a water reservoir **28**, and an adjustable valve having an orifice **29** adapted to be opened and closed by valve stem **30** connected to a control knob **31**. The adjustable valve controls the delivery of water droplets from the reservoir to the steam generating chamber. An outer shell **32** extends down to the soleplate, encloses the reservoir and supports a handle **33**.

In the described steam iron, the water droplets fall to a heated surface of the chamber **21** coated with the heretofore described hydrophilic deposit. The water droplet spreads on the coated surface and is rapidly vaporized to steam. The surface may be at temperatures as high as 475° F so that vaporization may occur rapidly. The iron may be operated at this temperature without sputtering or spitting and the steam will be emitted from the ports without entrained water. It should be understood that the described coating may be employed in the vaporization chambers of other steam pressing devices with the advantages described.

Since numerous changes may be made in the above description and different embodiments may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A steam ironing device having a flash vaporization chamber adapted to convert water droplets deposited on a surface thereof into steam, a coating on said surface, the coating comprising the product of an admixture of sodium silicate and hydrated alumina.

2. The device of claim 1 wherein the $Na_2O:SiO_2$ ratio of the sodium silicate is at least about 1:3.5.

3. The device of claim 2 wherein the coating admixture contains from about 10 to about 25 percent hydrated alumina.

4. The device of claim 1 wherein the $Na_2O:SiO_2$ ratio of the sodium silicate is about 1:3.75.

5. The device of claim 4 wherein the weight ratio of sodium silicate to hydrated alumina is about 4:1.

6. The device of claim 5 wherein said coating has been heated to a temperature of at least about 400° F.

7. The device of claim 1 wherein said surface is an aluminum surface.

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