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POLISHING WHEEL AND METHOD OF TREATMENT

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This invention relates to polishing and buffing wheels and the like and a method of treatment thereof. Polishing wheels used for polishing metal are generally in practice made of cotton fabric, several sheets of which in circular form are joined together to provide a lamination and a plurality of said laminations are placed side by side and secured and held together to provide the requisite face of the polishing wheel. The outer curved cylindrical face of the polishing wheel which comes in direct contact with the metal which is polished is treated to give it a polishing "head."

When this "head" is nearly worn away so that the fabric within comes at any part of it in contact with the metal polished the very high temperatures which are induced in the polishing operation frequently cause the fabric to ignite. And if it does not ignite it is charred and thus destroyed so far as its utility may be concerned to the depth of the burned or charred material. The polishing wheel thereupon necessarily must be cut away and reduced in diameter to the extent of the greatest distance of charring of its fabric material before the new outer curved surface may be given the treatment which provides a new "head" therefor.

Polishing wheels are relatively expensive and after being either worn away at their outer curved surface or both worn and cut away because of burning, a minimum diameter is eventually reached below which the wheel is no longer useful. For example, if a new wheel should be 18" in diameter when it has been reduced to approximately 9" or 10" in diameter it has to be thrown away. Burning, charring or other destruction of the fabric of the wheel at its outer surface to the extent of ¾", not around the whole wheel but at a spot or spots on its surface will necessitate removal from the body of the wheel an amount to reduce by at least 1½" the diameter of the wheel.

The treatment to which the wheels are put which I have devised is to provide a polishing "head" for the outer curved surface or face of the wheel which will render the fabric of the wheel adjacent and a short distance within from the "head" very resistant to ignition, burning and charring. The first step of this treatment is to prepare a sizing cement, a preferred composition of which is silicate of soda, approximately 68%, hydrated aluminum silicate 7%, water 14% and Tricresyl phosphate 11%. This in liquid form is applied to the face of the polishing wheel with a brush. The penetration will be $\frac{3}{16}$" or slightly more.

After such application the wheel is placed in a baking oven and subjected to temperatures which may vary between 90° and 180° F. for periods of time varying between 1¾ hours to 3 hours, it being understood that the higher the temperature the less the time required. After the baking and after the wheel has cooled a polishing wheel cement is applied with a brush to the curved cylindrical face of the wheel. The polishing wheel cement provides a wet surface and the wheel is rolled in a finely ground fused aluminum oxide which is an abrasive having the quality of great hardness which is forced into the face of the wheel. Such operation is known as rolling and graining. After this first treatment with polishing wheel cement and the rolling and graining of the abrasive of which fused aluminum oxide is one abrasive which may be used, the wheel is allowed to dry at room temperatures for approximately 30 minutes. Then comes a second application of polishing wheel cement and a second rolling and graining identical with those first described. The final step is to again bake the wheel at temperatures which may vary between 90° and 185° F. for times between 1¾ hours and 3 hours, the higher the temperature the less the time.

The treatment which prevents ignition or burning and charring of the cotton after the polishing head provided by the fused aluminum oxide abrasive or other abrasive which may be used has been worn through comes from the initial step or the application of the sizing cement which preferably includes a solution of silicate of soda, hydrated aluminum silicate, water and tricresyl phosphate. The action of the tricresyl phosphate upon the cotton material causes such material to be rendered difficult to ignite and burn. As it is an ingredient first applied to the wheel it penetrates the cylindrical face of the wheel below the polishing "head," later applied at the outer surface of the wheel and includes the hard and resistant abrasive material mentioned, which is rolled and pressed into the surface of the wheel making a polishing face which has a depth of approximately $\frac{1}{16}$" to ⅛". The first sizing cement has penetrated a greater distance usually $\frac{3}{16}$" or more and the fabric at the outer curved surface portions of the wheel and within the polishing "head" is thus rendered very resistant to high temperatures at which it would otherwise quickly burn when the polishing "head," having been worn through, the fabric body of the wheel

comes against the work and is subjected to high temperatures. For example, temperatures of 900° F. are developed in polishing steel sufficient to cause the steel to markedly change its color. Such temperatures, in fact temperatures as low as 300° F. acting upon the fabric body of a polishing wheel which has not been treated in accordance with my invention set the wheel afire or destructively burn and char the exposed fabric, destroying so far as any polishing utility is concerned, to a depth which may reach 1" or more at one or several places around the face of the wheel. With my invention when the polishing "head" is worn through to the fabric body of the wheel such burning does not take place; and in the subsequent reconditioning of the wheel for its polishing functions it is necessary merely to subject the surface of the wheel to grinding against a grinding wheel to remove such parts of the polishing head as have not been worn away in polishing operations thereby placing the polishing wheel in substantially the same condition as it was when new, being only approximately ⅛" less in radius than when new.

The wheel may then be given the same treatment as before, namely, an application of the fireproofing sizing cement, baking, cooling, an application of the polishing wheel cement followed by rolling and graining it, a 30 minutes drying, a second application of polishing wheel cement, a second rolling and graining and a final baking.

Tricresyl phosphate, the chemical formula of which is $(CH_3C_6H_4O)3PO$ is a white or straw colored liquid having a boiling point of substantially 550° F., and no flash point. It is compatible with silicate of soda and resists hydrolysis indefinitely in 10% caustic soda solutions. There is no jelling or precipitation in long standing and in the sizing cement the sodium silicate is used as a diluent or carrier of the tricresyl phosphate. However, it is to be understood that silicate of soda is not the only diluent which can be used as other solvents such as mineral spirits may be substituted for silicate of soda.

It is desirable that the application of the tricresyl phosphate be with the initial sizing cement. In general the tricresyl phosphate should not be used in the polishing cement as its transfer to the work which is being polished in many cases is undesirable. The fact that when a polishing head has practically been worn through the work will come in contact with the material which is directly carrying tricresyl phosphate is not detrimental as in practice the fire-proofed wheels treated in accordance with my invention are used chiefly on roughing wheels in which pressure and the heat generated are greatest in their operations; and if there is transfer of some of the tricresyl phosphate ingredient to the work it will be removed in the succeeding polishing operations. Of course on work which is not to be plated or where a chemically clean surface is not necessary immediately after the polishing operation, so that a transfer of the tricresyl phosphate to the work is not harmful, it might be possible to use tricresyl phosphate in the polishing cement also. However, it is preferred that it be applied as an ingredient of the "sizing cement" which is the first step in the treatment which changes a fabric material wheel to a practical heat resistant metal polishing wheel.

Tricresyl phosphate once incorporated in a wheel face remains in the fabric until the phosphate is cut or dressed away. It will not volatilize under repeated heating.

I have also found that an equivalent of tricresyl phosphate is diphenyl phosphate and may be substituted therefor. It renders the fabric proof against burning and charring when a polishing "head" is worn through at any place, but it is not quite so good because there is a liability of hydrolysis in connection with silicate of soda upon long standing. If a wheel was used immediately after the treatment it would operate substantially as well in all respects as the tricresyl phosphate so far as protecting the body material of the wheel against danger by burning. However, between manufacture and use of the polishing wheels, a considerable time may elapse and what is of equal or more serious moment, time may and frequently does elapse between the making up and the use of the sizing cement.

The invention has been described in connection with what I have found to be the best place of use, namely, on polishing wheels. However the fireproofing of buffing wheel fabric may also be desirable to save it from the damage of charring or burning at its outer curved face upon the generation of temperatures through the friction of the revolving buffing wheel against the work which is being polished. In such case the application of the tricresyl phosphate in a suitable solvent or solution as described is applied to the buffing wheel fabric to impregnate it and render it resistant to high temperatures which normally would produce burning even to the extent of ignition, and in other cases a charring and practical destruction of the fabric at the places where charred. Therefore, the invention which I have described is not to be limited solely to use on polishing wheels but may be used in many other relations.

Having thus described my invention what I desire to claim and secure as Letters Patent is:

1. The treatment of fabric polishing wheels which consists, in applying a silicate of soda solution carrying in suspension a fabric fireproofing material, said solution penetrating the face of the wheel approximately ¼", subjecting said wheel thus treated to heat at temperatures between substantially 90° and 185° F., thereafter applying a polishing cement to the face of the wheel and then rolling and graining the wheel to work a polishing abrasive into its face a distance approximating ⅛", as specified.

2. The treatment of a fabric polishing wheel which consists, in applying a sizing cement which comprises a solution of Tricresyl phosphate and silicate of soda diluted with water around the entire face of the wheel, subjecting said wheel thereafter to temperatures between 90° and 185° F. for approximately 1½ hours and 3 hours, the lesser period of time being with the higher temperature applications of the heat, and thereafter applying and cementing abrasive material at the face of the wheel to penetrate the same a less distance than the penetration of said sizing cement solution.

3. The treatment of fabric polishing wheels which consists, in applying a sizing cement solution to the curved face of the wheel, said solution comprising silicate of soda approximately 68%, hydrated aluminum silicate approximately 7%, water approximately 14% and tricresyl phosphate approximately 11% until said solution has penetrated at the face of the wheel a distance approaching ¼", thereafter applying

heat to the wheel to bake the same and drive off the water in said sizing cement solution, and then finishing the wheel to provide a polishing head by the application of polishing wheel cement and abrasive material forced and worked into the face of the wheel to a depth approximating one-half of the penetration of the sizing cement.

4. The method of treating a fabric polishing wheel which consists in impregnating the said wheel at its curved face with a wet solution of silicate of soda in which is suspended fabric fireproofing material, baking said wheel, and thereafter applying polishing cement and a polishing abrasive and forcing the abrasive into the wheel at its face a distance less than the impregnation penetration of the fireproofing material.

5. The method of treating a fabric wheel which consists in impregnating the fabric of said wheel with a sizing cement solution comprising silicate of soda in which in suspension is tricresyl phosphate in proportions of approximately 5 to 1 until said solution is penetrated at the face of the wheel a distance approaching ¼" and thereafter applying heat to the wheel and baking it to dry off the water in said sizing cement solution.

6. A fabric polishing wheel having a polishing head at its curved surface including abrasive material, penetrating the said surface approximately ⅛", the fabric of said wheel inside of the polishing head for a short distance being impregnated with tricresyl phosphate and silicate of soda from which the water solution of silicate of soda has been removed.

7. The method of treating a fabric wheel which consists in impregnating the fabric of said wheel with tricresyl phosphate carried suspended in a water solution of silicate of soda and thereafter baking said wheel at a temperature and for a time sufficient to expel the water.

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