United States Patent [19]

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[54] **METHOD OF COATING WIRE SCREEN CLOTH**

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[51] **Int. Cl.** **C23c 1/10**

[58] **Field of Search** 148/6.16, 31.5, 6.2; 117/99; 162/348, 199

[56] **References Cited**

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[57] **ABSTRACT**

Wire cloth screen is coated with an abrasive and corrosive resistant material by immersing the wire cloth into a chromic acid solution and then heating to form a hard chromic oxide coating. The coating process may be repeated to obtain the desired coating thickness. The coating serves to bond the wires together at the points of intersection and the heating stress relieves the wire.

4 Claims, No Drawings

METHOD OF COATING WIRE SCREEN CLOTH

BACKGROUND OF THE INVENTION

Wire screen cloth is used for many purposes and is often subjected to abrasion, impact and corrosive conditions. For example, wire screen cloth is used in classifying equipment to separate materials according to particle size and abrasion can be a serious problem. The screens are usually vibrated or moved in some manner to produce relative motion between the screen and the particles. The material moving on the screen abrades the screen and the most serious wear occurs at the intersections of the wires. At these intersections fine particles become lodged between the two wires and the abrasive action of the particles causes rapid destruction of the wire.

During the formation of wire screen cloth, the wires are straightened, crimped, or formed into special shapes and woven into the desired pattern on the weaving machine. This processing of the wire work hardens the metal. The work hardened wire resists abrasive action but it is also subject to more rapid failure by fatigue. It would therefore be desirable to anneal the wire to increase its elastic limit.

SUMMARY OF THE INVENTION

An object of the present invention is to treat wire screen cloth so as to provide a coating thereon which will also bond the wires together at the intersection. Another object of the invention is to bond the wires together to prevent the abrasive action at the point of contact of the wires and to increase the load bearing properties. A further object of the invention is to provide such a coating on the wire screen cloth which will be abrasive and corrosive resistant. These and other objects of the present invention are obtained by treating the wire screen cloth to form a hard chromic oxide coating thereon which also bonds together the wires at the intersections. The formation of the chromic oxide coating involves a heating process which has the additional advantage of annealing the wire screen cloth.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Wire screen cloth to be treated in accordance with the present invention is first cleaned to remove any grease or oil from the surface. Also, if the wire is excessively oxidized, the oxide is removed such as by an acid treatment and then slightly re-oxidized by rapidly heating and then cooling. This re-oxidation step forms a porous oxidizing layer. The wire is then immersed in a chromic acid solution which penetrates the oxide layer on the wire surface. The wire screen cloth is then removed from the solution and heated to convert the chromic acid to chromic oxide according to the following reaction:

$$4CrO_3 \rightarrow 2Cr_2O_3 + 3O_2$$

This heat treating process produces a strong oxide bond between the porous oxidized layer and the base metal of the wire. The immersion-heating cycle is repeated as many times as desired to produce the desired coating thickness and to densify the porous oxide surface. Since chromic oxide is a very hard material having a hardness of 9.3 on the Moh scale, this densified coating on the metal makes it resistant to abrasion.

Examples of three different types of chromic acid solutions for coating the wire screen cloth are as follows:

SOLUTION A

Chromium trioxide—Technical grade
Water to produce a solution with a specific gravity of 1.7

SOLUTION B

	Typical	Range
Chromium Trioxide-Technical grade	266 lbs.	—
Water to produce a solution with a specific gravity of 1.7		
Activated charcoal	10 lbs.	1–20 lbs.

This Solution B is prepared by dissolving the chromium trioxide in the water, bringing the solution to a slow boil, and very slowly adding the activated charcoal while stirring. Although the exact reaction which takes place is not known, it is believed that the heating of the solution with the activated charcoal removes some of the oxygen which leaves the solution as carbon dioxide with the CrO_2 radicals linking to form a chain. The compounds which are formed are thought to contain CrO_2 radicals and hexavalent chromium which are referred to as chromyl compounds. Slow boiling is continued until no noticeable chemical reaction is taking place. The resulting solution has an increased viscosity.

SOLUTION C

	Typical	Range
Chromium Trioxide, Technical Grade	100.00 lbs.	—
Zinc Oxide, Technical Grade	16.3 lbs.	10–20 lbs.
Water to produce a solution with a specific gravity of 1.7		

Then add a mixture of:

	Typical	Range
Alumina (Alcoa T-61 minus 325 mesh)	61 lbs.	40–80 lbs.
Silica (minus 140 mesh)	39 lbs.	20–60 lbs.

The effect of the addition of zinc oxide is to increase the viscosity of the solution so that thicker coatings are applied in each treatment step. The alumina and silica are also added to produce a suitable consistency for coating the wire. The amount of each is balanced to produce a coating in which the thermal expansion and elasticity of the coating is very similar to that of the base material.

It has been found that the wires can initially be coated with either Solution A or Solution B. However, the preferred procedure is to first coat with Solution A and then to increase the thickness of the coating by using Solution B until the desired thickness has been obtained. For screens coarser than 6 mesh, the coating thickness can be increased more rapidly by using Solution C, preferably after three initial coatings with Solutions A and/or B. Solution C would not normally be suitable for fine mesh screens since it builds up a thick coating rapidly and would greatly reduce the opening size of the smaller screen. Although a specific gravity of 1.7 has been referred to in the above examples, these specific gravities can be adjusted anywhere from 1.66

to 1.75. However the specific gravity of 1.70 is the most ideal value for impregnation.

The wire screen cloth with the coating of chromic acid thereon is then heated to about 650° to 1,200°F such as by induction or radiant heat which converts the chromic acid to chromic oxide. The specific curing temperature would depend upon the base metal of the screen and the effect of the temperature on the heat treatment of that metal. The wire screen cloth is then cooled to 350°F or below and immersed in the desired chromic acid solution again. The wire screen cloth is then heated to form another layer of chromic oxide. Since the chromic acid solution readily wets the wire screen cloth and penetrates the porous oxide layer on the wire, a strong bond is formed between the chromic oxide, the oxide layer on the wire and the base metal.

The chromic oxide layer which is formed on the wire is very dense, smooth and abrasion resistant. The oxide coating bonds the wires together which strengthens and reinforces the wire screen cloth thereby increasing the load bearing capacity. The heating of the wire screen cloth to convert the chromic acid to chromic oxide also relieves the stresses induced into the wire structure during drawing, straightening, crimping and weaving of the wire cloth. This greatly increases the fatigue resistance of the wire. For example, it has been found that a wire screen cloth treated in accordance with the present invention and installed on electrically vibrating screening machine will last 25 percent longer than the same untreated wire screen cloth. This test was run with a fixed load on the wire screen cloth so that only the fatigue resistant factor could be evaluated.

While preferred embodiments of the present invention have been described, it will be understood that these are merely illustrative and that changes may be made without departing from the invention as claimed.

What is claimed is:

1. A method of treating wire screen cloth so as to form a coating thereon containing chromic oxide and to bond the wires together at the points of intersection comprising the steps of:

a. providing a wire screen cloth, the wires of said wire screen cloth having a thin porous oxide layer thereon;

b. coating said wire screen cloth with a chromic acid solution; and

c. heating said wire screen cloth to a temperature sufficient to convert said chromic acid solution to chromic oxide and to heat treat said wire whereby a coating of chromic oxide is formed on said wires and said wires at the points of intersection are bonded together with chromic oxide.

2. A method of treating wire screen cloth as recited in claim **1** and further including the steps of repeating said coating step (b) and said heating step (c) at least one additional time to form additional coatings of chromic oxide thereon.

3. A method as recited in claim **1** wherein said chromic acid solution has a specific gravity of from 1.66 to 1.75.

4. A method of treating wire screen cloth as recited in claim **1** wherein said chromic acid solution is a solution prepared by the process of disolving chromium trioxide in water, slowly boiling said solution, adding activated charcoal to said solution in the ratio of 1 to 20 pounds activated charcoal to 266 pounds chromium trioxide, and continuing said slow boiling until no noticeable reaction is taking place.

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