ABSTRACT: The present invention relates to wire bristles for brooms and brushes in which the improvement lies in providing a wear resistant metal coating of substantial thickness at the end portion of the wire only thereby increasing the life of the bristle while avoiding undue stiffening of the bristle.
WIRE BRISTLE FOR USE IN MAKING BRUSHES AND BROOMS

The present invention relates to the art of brushes and brooms and particularly to an improvement in the metal bristles which are used in the production of industrial wire brushes and brooms.

The object of the invention is primarily to improve the durability of wire brushes and brooms.

The improved wire bristle of the present invention is particularly intended for use in heavy duty rotary wire brushes and brooms such as, for instance, the rotary brushes used in pavement-sweeping and snow-clearing equipment.

It is generally known to make rotary brushes having metal bristles such as bristles of steel or other relatively wear resistant metals. The large diameter cylindrical rotary brooms used for the clearing of snow from the runways of airports are almost invariably made of steel bristles; steel and particularly stainless steel being among the best suited materials for use in such equipment on account of their desirable elastic properties. However, as good as steel rotary brooms may be, they will

and do wear out quite rapidly under the extreme working conditions to which they are subjected in runway sweepers and the like which operate at speeds of 50 miles per hour.

The metal bristles used in heavy duty sweepers and the like must necessarily exhibit good elastic properties and be wear resistant. It is known that various attempts have been made to improve the wear resistance of brooms such as by applying a wear resistant coating on the surface of the bristles thereof, for instance, plating with chrome nickel or the like wear resistant metals; it is found, however, that, whereas the presence of such coating would impart greater resistance to frictional wear to the bristles, it also imparts an objectionable degree of stiffness to the bristles and to the broom generally.

It can be appreciated therefore that, the absence of a wear resistant coating on the steel bristles results in a brush or broom that wears out too rapidly, whereas the presence of a uniformly thick wear resistant coating on the steel bristles results in an exceedingly stiff brush or broom.

The improved bristle of the present invention is intended to exhibit and retain all the advantages of the uniformly coated and uncoated types of bristles and avoid their respective disadvantages.

The bristle of the present invention exhibits improved wear characteristics while retaining excellent flexural characteristics.

In accordance with the present invention, these characteristics are obtained in a bristle which may only be partially coated, a relatively thick wear resistant coating being located at the working end of the bristle and extending toward the root portion for a length approximately equal to the maximum tolerable loss in radial measurement of the brush through wear in normal use.

A better understanding of the invention will be derived from the following disclosure of an embodiment thereof, reference being had throughout to the accompanying drawing wherein:

FIG. 1 is a front elevation view of a bristle in accordance with the present invention;

FIG. 2 is a front elevation view of an aggregation or bunch of bristles in accordance with the present invention.

FIG. 3 is a view similar to that of Fig. 1 showing a further embodiment of the invention.

In FIG. 1, there is shown a metal bristle 2 of steel or the like having an end portion 3, a root portion 4 and an intermediate or shank portion 5; the end portion 3 being that which normally comes in contact with the surface being swept. The lengthwise measurement of the end portion 3 may be defined as the length of that portion of the bristle which is adhered away and disappears until the time that the broom must be considered as fully worn out and unsuitable for further use.

The root portion 4 is that which in the construction of the broom will be anchored in or attached to the body or core of the broom.

In accordance with the invention, there is provided over the end portion 3 a coating of a wear resistant metal such as chromium, which extends longitudinally from the tip for a distance approximately as great as the tolerable maximum reduction in length that the bristle can normally suffer before being considered worn down and unsuitable for further use.

In practice, rotary brushes or brooms are never completely worn down because the reduction in length of the bristle is invariably accompanied by a corresponding increase in the stiffness thereof. Brooms having unduly stiff portioned bristles are necessarily more damaging for the surfaces on which they are used; for this reason, brooms are generally not allowed to wear down radically for a distance of more than approximately one-third of the exposed length of the bristles.

Considering that the bending forces to which the bristles are subjected are applied at the tip thereof, the resulting bending moment increases gradually from the root portion to the point of maximum value at the root portion; it is to be understood that the softness of the sweeping action is attributable to the ability of the bristles to yield in bending and that the portion of each bristle that provides the overwhelming bulk of the yielding is the intermediate portion 5 which is located between the end portion 3 and the root portion 4; this being precisely the portion of the bristle over which, once, the coating of an abrasion-resistant coating is avoided in order to leave the elastic properties thereof unaltered.

It is a characteristic of the present invention that the coating 6 does not have uniform thickness throughout and that there is no abrupt change in the said thickness thereof anywhere. The invention therefore provides for a coating the thickness of which gradually increases from an initial molecular thickness at the boundary between the intermediate portion 5 and the end portion 3 toward the tip of the said end portion 3, reaching a maximum at or a short distance from the said tip.

The purpose of the gradual increase in the thickness of the coating 6 is to avoid sudden changes in the cross-sectional area of the wire and in the mechanical properties thereof, such changes being liable to give rise to stress concentrations which in time might occasion premature fatigue failure of the bristle.

The wear resistant coating 6 is preferably applied by electrolydeposition in a plating bath, the plating process being known per se in the art and the gradual decrease in the thickness thereof being realized by properly proportioning the duration of exposure to the electrolydeposition, such as by complete immersion of the bristle portion 3, intermediate, slow and gradual withdrawal thereof for a time sufficient further withdrawal once the desired maximum thickness has been reached, or by shielding the immersed portion in appropriate manner to direct and concentrate the throw of the plating.

The steel wires which are used to make rotary brooms are usually given an undulated form such as may be observed in FIG. 1 and may be grouped in bunches 8 which are bound together at their root portions 4 such as by means of a crimped ring 9; the undulated form of the individual bristles is intended as a way of ensuring a proper degree of divergence between them away from the root portions thereof as well as to ensure proper spacing and random distribution of the tips of the bristles. A complete rotary broom or brush would normally be made up of a large number of bunches 8 or the like appropriately disposed and collectively secured to a cylindrical core.

The deposition of the wear resistant coating can be realized by electrolytic treatment of the individual bristles or by treatment of an aggregated form of a large number thereof such as, for instance, bunches 8.

The present invention does not exclude the possibility of its application to produce a wire which has other metals coated or under the thicker end portion wear resistant and stiffening metal coating which is characteristic of the invention. The improvement of the invention can apply for instance to a metal clad wire, such as shown in FIG. 3, wherein the metal cladding 2" is used to provide corrosion resistance and/or to raise the mechanical properties of an initially deficient metal core 2.
It would not depart from the scope of the present invention to produce a wire bristle the whole length of which would be uniformly clad of the same wear resistant metal except for the end portion where the thickness of the metal would be characteristically greater.

I claim:

1. Metallic wire broom and brush bristle having a wear resistant metal coating at the free end thereof and extending back longitudinally for a distance essentially equal to the tolerable reduction of one-third in the length of the freely projecting portion of said bristle, the metal of said coating having greater wear resistance than that of the bristle proper.

2. Metallic wire broom and brush bristle as claimed in claim 1, wherein a portion of said wear resistant metal coating including the end thereof and extending back therefrom has uniform thickness and the remaining length of said coating has gradually decreasing thickness.

3. Metallic wire broom and brush bristle as claimed in claim 1, wherein the thickness of said wear resistant metal is gradually decreasing.

4. Metallic wire broom and brush bristle as claimed in claim 1, wherein said metallic wire is made of a resiliently flexible steel and said wear resistant metal coating consists of chromium.

5. Metallic wire broom and brush bristle as claimed in claim 1, wherein the metallic bristle being made of stainless steel and the wear resistant metal coating thereof consisting of electrolytically deposited chromium.

6. Metallic wire broom and brush bristle having a uniformly metal coated surface and presenting a further substantial coating of a wear resistant metal disposed at one end thereof and extending longitudinally for a distance equivalent to a maximum tolerable wear of essentially one-third the freely projecting length of said bristle.