Abstract: A bristle brush has a head (10) with a multiplicity of closely spaced recesses (26) in one surface thereof and in which are disposed bristle tufts (14) of U-shaped configuration which extend outwardly thereof. The tufts (14) are comprised of multiple bristles (16) and have a bight portion (30) disposed adjacent the bottom of the recesses (26) and vertically extending leg portions (28). Staples (18) are disposed between the leg portions (28) of the tufts (14) and pressing the bight portions (30) downwardly in the recesses (26). The staples (18) have a body portion (22) of generally rectangular cross section and of greater length than the diameter of the recesses (26). A multiplicity of ribs (24) are provided on at least one side surface and extend transversely thereof. The ribs (24) are spaced apart in the vertical direction a distance at least three times the width of the ribs (24), and the ribs (24) are of substantially lesser height than the thickness of the body portion (22). At least some of the ribs (24) are embedded in the material of the head (10) about the recesses.
BRUSH WITH STAPLED TUFTS

BACKGROUND OF THE INVENTION

The present invention relates to brushes and, more particularly, to brushes using an improved staple to secure the bristle tufts in recesses in the head of the brush.

Brushes are used in many applications for seemingly countless tasks. In some cases, brushes are designed for specific applications, such as toothbrushes for dental hygiene. Other brushes have more generic uses, such as a typical scrub brush. Brushes typically utilize a multiplicity of bristles bunched together to form a tuft. The tufts are anchored in tuft holes located in the brush head. Typically, numerous tufts/tuft holes are located on the brush head and the number and locations vary depending upon the design. In many cases, a staple is used to anchor the tuft into the tuft holes on the brush head.

A common practice is to use a flat or rectangular piece of wire cut to a specified length as the staple. The tuft is wrapped around the staple in a U-shape, and then the staple and tuft are driven into the tuft hole. They are held in place by the mechanical resistance between the staple and brush head and the staples are typically made slightly longer than the tuft hole to ensure that the staple can be anchored in the brush head securely. The flat or rectangular wire used to produce these staples is typically provided in long lengths, packaged on spools, and cut to the desired lengths during the manufacture of the brushes. Exemplary of such staples are those illustrated in Leigh U.S. Patent No. 3,871,048, Klee U.S. Patent No. 5,724,697 and Fassler U.S. Patent No. 5,740,579.

Generally, the staples have a relatively large surface area and thereby cost because of the amount of metal employed.
It is an object of the present invention to provide a brush with a novel staple having a cross section of relatively small cross area and which exhibits good holding power.

It is also an object to provide a method for making brushes using staples with the novel cross section.

Another object is to provide such a brush and method in which the staple is of relatively lower cost and easy to fabricate.

SUMMARY OF THE INVENTION

It has now been found that the foregoing and related objects may be readily attained in a bristle brush comprising a head having a multiplicity of closely spaced recesses in one surface thereof, and bristle tufts of U-shaped configuration disposed in the recesses and extending outwardly thereof. Each of the tufts is comprised of multiple bristles and has a bight portion disposed adjacent the bottom of the recesses and vertically extending leg portions. Staples are disposed between the leg portions of the tufts and press the bight portions downwardly in the recesses. The staples have a body portion of generally rectangular cross section and of greater length than the diameter of the recesses and a multiplicity of ribs on at least one side surface. The ribs extend transversely of the side surface and are spaced apart in the vertical direction a distance at least three times the width of the ribs. The ribs are of substantially lesser height than the thickness of the body portion and at least some of the ribs are embedded in the material of the head about the recesses.

Preferably, the ribs are provided on both side surfaces of the staples, the ribs are of generally arcuate cross section, and desirably semicylindrical. The recesses in the brush head are of generally circular cross section.
In making the bristle brush, a brush head is formed with a multiplicity of closely spaced recesses, in one surface thereof, and bristle tufts of a U-shaped configuration are inserted into the recesses, the tufts are comprised of multiple bristles and having a bight portion and vertically extending leg portions. Staples are disposed between the tuft leg portions and driven against the bight portions to press the bight portions of the tufts against the bottom of the recesses. The staples have a body portion of generally rectangular cross section and of greater length than the diameter of the recesses, and a multiplicity of ribs extend transversely thereof. The ribs are spaced apart in the vertical direction a distance at least three times the width of the ribs, and the ribs are of substantially lesser height than the thickness of the body portion. At least some of the ribs are embedded in the material of the head about the recesses.

Desirably the tufts and staples are assembled prior to insertion into the recesses.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a perspective view of a brush embodying the present invention;

Figure 2 is a perspective view of a coil of staple wire employed in the present invention with the free end projecting therefrom to an enlarged size;

Figure 3 is an enlarged plan view of the staple used in the brushes of the present invention;

Figure 4 is a schematic view of the staple being inserted into the folded tuft of bristles;

Figure 5 is a schematic view of the staple and bristle tufts being pushed into the circular recesses in the brush head to lock the tufts in the recesses; and

Figure 6 is a cross sectional view of the staple drawn to an enlarged scale.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning first to Figure 1, therein shown is a tooth brush employing the present invention and comprising a head 10 and a handle or grip 12. Seated in recesses (seen in Figures 4 and 5) in the head 10 are tufts generally designated by the numeral 14 and comprised of a multiplicity of bristles 16.

Turning next to Figures 2-4, therein illustrated is a staple embodying the present invention and generally designated by the numeral 18. The coil 20 of staple wire is cut into short segments to provide the staple 18 which has a body portion 22 of generally rectangular cross section with semi-cylindrical ribs 24 on both side surfaces thereof. The semi-cylindrical ribs 24 are spaced apart on centers a distance X and have a diameter Y at their base which is less than the thickness Z of the body portion as best seen in Figure 6.

Figures 4 and 5 illustrate diagrammatically the method of assembling the tufts and staple into the brush head 10 which has a multiplicity of cylindrical recesses 26 formed therein with a diameter A. A staple 18 having a length B (dimension shown in Figure 6) which is slightly greater than the diameter A of the recess 26 is inserted into a bundle or tuft 14 to fold the tuft into a generally U-shaped configuration with a pair of leg portions 28 and a bight portion 30. The assembly of tuft 14 and staple 18 is moved by a mandrel (not shown) into the recess 26 to press the bight portion 30 of the tufts towards the base of the recess 26. Because the staple 18 has a length greater than the diameter of the recess 26, the staple 18 is pressed into the material of the head 10, and the tuft 14 and staple 18 are thus firmly secured in the recess 26.

As will be readily appreciated, the staple may have ribs on one or both side surfaces and the ribs may have a cross section other than semi-cylindrical such as triangular or
rectangular. At least two ribs, and preferably four, are provided on each side surface, and they are spaced apart a distance much greater (than at least three times) the thickness of the body portion of the staple so as to add only a small amount to the cross sectional area of the body portion. Although the recesses in the head may have a cross section other than circular, generally cylindrical recesses are easy to form and firmly seat the tufts and staples.

The brush heads are typically made of synthetic resin and the recesses can be formed in the molding operation or in a subsequent drilling operation. Although wood may also be employed, synthetic resin provides more secure retention of the tufts.

A staple of approximately 0.010” x 0.060” is typical for most toothbrush applications. The ribbed wire design shown in Figures 2-4 has an overall thickness (including the ridges) of 0.0100”, and a width of 0.060”. There are four ribs extending longitudinally on each side surface of the body portion of the wire. Each rib has a height (Z) of 0.001” and a width (Y) of 0.002” -- essentially a half round shape with a radius of 0.001”.

In the ribbed staple shown in Figures 2-6, there is a 17.9% decrease in cross sectional area as compared to the standard rectangular flat wire staple with dimensions of 0.010” x 0.060” as seen from the following calculations:

Standard 0.010” x 0.060” flat staple area: 0.010” x 0.060” = 0.0006 sq in.

Ribbed staple example base dimensions: 0.008” x 0.060” = 0.00048 sq in.

Rib area: 4x (3.14159 x ((0.001")^2)) = 0.0000126 sq in.

Total area: 0.00048 sq in + 0.0000126 sq in = 0.0004926 sq in.

% reduction in area: ((0.0006 sq in) – (0.0004926 sq. in))/0.0006 sq in = 0.179 sq in.

17.9%
For any individual brush application, the same length of wire staple would be needed when producing staples from both the standard flat wire and the ribbed wire. The advantage lies in the ribbed wire having a smaller cross sectional area. Based on the example 0.010” x 0.060” wire listed above, using ribbed wire would yield a savings in staple wire cross sectional area of 17.9%.

The staples of the present invention are easily formed from round wire stock which is flattened and then drawn through roller dies which form the ribs. The formed staple wire is then cut to the desired length in a tufting machine and automatically assembled with the bristle tufts and driven into the tuft holes in the brush by an anvil or platen.

The metal utilized for the staples will depend upon factors such as cost, use of fabrication, corrosion resistance, etc. Widely employed alloys are those of copper, nickel and zinc.

Thus, it can be seen from the foregoing detailed specification and attached drawings that brushes can be readily fabricated with bristle tufts being firmly secured in holes in the brush head by relatively low cost staples which can be readily fabricated.
CLAIMS

Having thus described the invention, what is claimed is:

1. A bristle brush comprising:
   
   (a) a head having a multiplicity of closely spaced recesses in one surface thereof;
   
   (b) bristle tufts of U-shaped configuration disposed in said recesses and extending outwardly thereof, each of said tufts being comprised of multiple bristles having a bight portion disposed adjacent the bottom of the recesses and vertically extending leg portions; and
   
   (c) staples disposed between the leg portions of the tufts and pressing said bight portions downwardly in said recesses, said staples having a body portion of generally rectangular cross section of greater length than the diameter of said recesses and having a multiplicity of ribs on at least one side surface which extend transversely thereof, said ribs being spaced apart in the vertical direction a distance at least three times the width of said ribs, said ribs being of substantially lesser height than the thickness of said body portion, at least some of said ribs being embedded in the material of said head about said recesses.

2. The bristle brush in accordance with Claim 1 wherein said ribs are provided on both side surfaces of said staples.

3. The bristle brush in accordance with Claim 1 wherein said ribs are of generally arcuate cross section.

4. The bristle brush in accordance with Claim 3 wherein said arcuate cross section of said ribs is semicylindrical.
5. The bristle brush in accordance with Claim 1 wherein said recesses are of circular cross section.

6. A bristle brush comprising:
   
   (a) a head having a multiplicity of closely spaced circular recesses in one surface thereof;
   
   (b) bristle tufts of U-shaped configuration disposed in said recesses and extending outwardly thereof, each of said tufts being comprised of multiple bristles having a bight portion disposed adjacent the bottom of the recesses and vertically extending leg portions; and
   
   (c) staples disposed between the leg portions of the tufts and pressing said bight portions downwardly in said recesses, said staples having a body portion of generally rectangular cross section and of greater length than the diameter of said recesses and having a multiplicity of ribs of generally arcuate cross section which extend transversely thereof on both side surfaces thereof, said ribs being spaced apart in the vertical direction a distance at least three times the width of said ribs, said ribs being of substantially lesser height than the thickness of said body portion, at least some of said ribs being embedded in the material of said head about said recesses.

7. In a method for making a bristle brush, the steps comprising:
   
   (a) forming a brush head with a multiplicity of closely spaced recesses in one surface thereof;
   
   (b) inserting bristle tufts of a U-shaped configuration into said recesses, said tufts each being comprised of multiple bristles having a bight portion and vertically extending leg portions; and
(c) driving staples between said tuft leg portions against said bight portions to press said bight portions of said tufts against the bottom of said recesses, said staples having a body portion of generally rectangular cross section and of greater length than the diameter of said recesses and having a multiplicity of ribs extending transversely of at least one side surface thereof, said ribs being spaced apart in the vertical direction a distance at least three times the width of said ribs, said ribs being of substantially lesser height than the thickness of said body portion, at least some of said ribs being embedded in the material of said head about said recesses.

8. The method for making bristle brushes in accordance with Claim 7 wherein said tufts and staples are assembled prior to insertion into said recesses.

9. The method for making bristle brushes in accordance with Claim 7 wherein said ribs are provided on both side surfaces of said staples.

10. The method for making bristle brushes in accordance with Claim 7 wherein said ribs are of generally arcuate cross section.

11. The method for making bristle brushes in accordance with Claim 10 wherein said arcuate cross section of said ribs is semicylindrical.

12. The method for making bristle brushes in accordance with Claim 7 wherein said recesses are of circular cross section.