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MINORU HOSOYA ET AL

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APPARATUS FOR ROUNDING END OF FLEXIBLE PLASTIC WIRE

Filed Jan. 7, 1970

2 Sheets-Sheet 1

FIG - 1

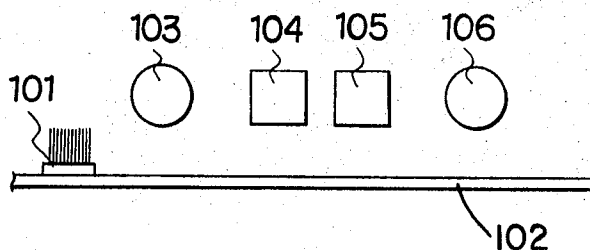
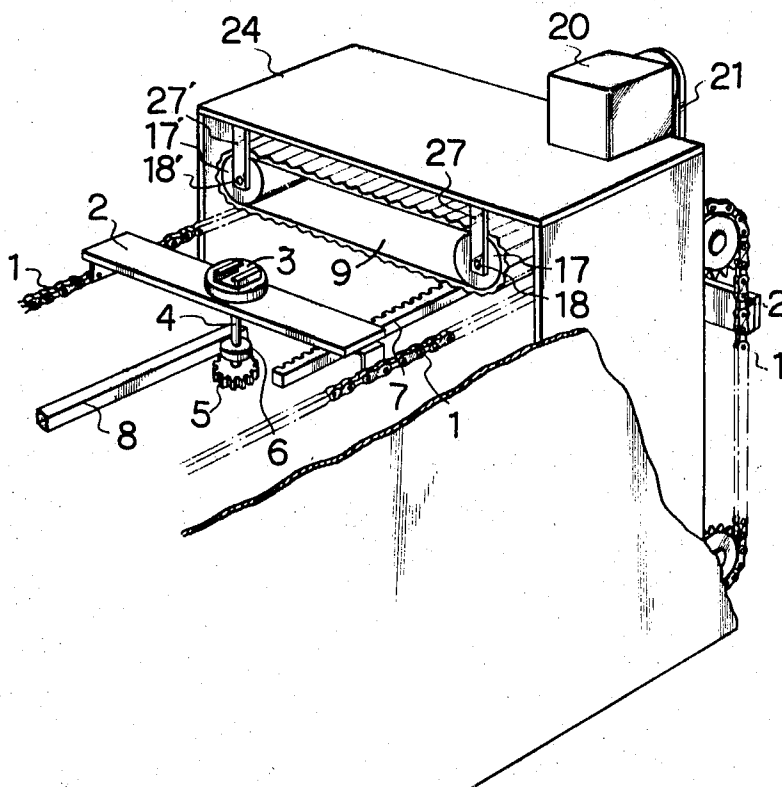


FIG - 2



INVENTORS

MINORU HOSOYA
MASAAKI HAYASHI

BY *Woodhams, Blanchard and Filynn*

ATTORNEYS

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FIG - 3

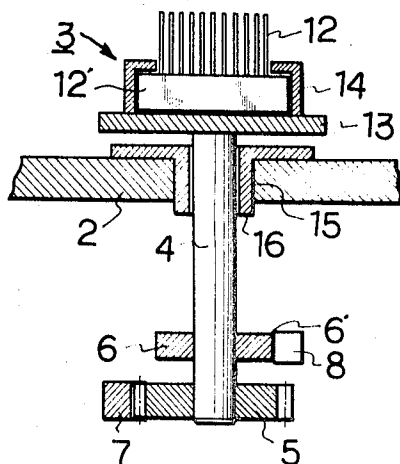


FIG - 4

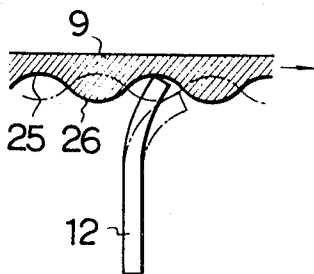
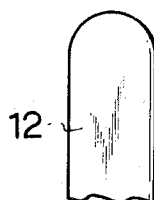


FIG - 5



INVENTORS
MINORU HOSOYA
MASAAKI HAYASHI

BY
Woodhams, Blanchard and Flynn
ATTORNEYS

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3,619,953

APPARATUS FOR ROUNDING END OF FLEXIBLE PLASTIC WIRE

Minoru Hosoya, Tokyo, and Masaaki Hayashi, Funabashi-shi, Japan, assignors to KAO Soap Co., Ltd., Tokyo, Japan

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5 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for rounding ends of flexible wire elements or brush hair elements, including a continuously traveling transfer chain and a wire holder means attached to the transfer means for movement therewith. The wire holder means is mounted for rotation about an axis perpendicular to the advancing direction of the transfer chain. An endless grinding means having a wave-like grinding surface thereon is disposed above the transfer chain and is moved in a direction transverse to the advancing direction of the transfer chain, whereby the tip ends of the wire elements contact the grinding surface and are continuously ground and polished.

The present invention relates to an apparatus for continuously grinding and polishing tip ends of flexible plastic wire elements to be used as brush hairs so as to have their tip ends rounded in a smooth semi-circular or semi-oval shaped contour.

In the drawings:

FIG. 1 is a diagrammatic view illustrative of a conventional device for rounding the end of a plastic wire;

FIG. 2 is a fragmentary perspective view showing of an embodiment of the apparatus according to the present invention;

FIG. 3 is a vertically sectioned view showing holder means of the apparatus according to the present invention;

FIG. 4 is a diagrammatic view for explaining the process for rounding a tip end of a flexible plastic wire by using the apparatus according to the present invention; and

FIG. 5 is a diagrammatic view of a tip end of a wire material finished by using the apparatus of the present invention.

As shown in FIG. 1, an apparatus for continuously grinding and polishing tip ends of flexible plastic wire elements for use as brush hairs has conventionally comprised a transfer conveyer 102 mounting a brush 101 thereon and rotary disk grinders 103, 104, 105 and 106 arranged adjacent the transfer conveyer 102 and respectively suspended in suitable directions with respect to the conveyer, said brush 101 being mounted on the conveyer 102 with its brush hair elements or wire elements held uprightly and vertically in the direction of the grinders, wherein the wire elements of the brush are moved below the suspended rotary disk grinders 103, 104, 105 and 106, and the forward and backward as well as the left- and right-hand side surfaces of the wire elements are successively pressed and ground so that the tip ends of the wire elements are shaped.

However, in the known apparatus as hereinbefore described, the rotary disk grinders are arranged in the forward and backward as well as the left- and right-hand side positions, that is to say, only in four directions, and, therefore, the tip end of a wire element will be ground only in a rectangular or square shaped contour and it will not be able to be ground in a rounded shape so as

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to have a semi-spherical or semi-oval shaped contour. In order to grind a tip end of a wire in a rounded shape it is necessary to provide a large number of rotary disk grinders. Further, in case wires of the brush are too numerous, the wires placed in the center portion of the brush will not be able to be sufficiently ground so that the obtained products will not be uniform in quality. The increase of the number of grinding devices as mentioned above will involve great disadvantages in constructing the apparatus and in the economical operation of the overall apparatus.

The present invention eliminates the above drawbacks of the conventional apparatus and provides a novel and useful apparatus for rounding tip ends of flexible plastic wire elements, which apparatus includes a rotatable holder, carrying a brush having thereon wire elements to be treated, the holder being mounted rotatably on a transfer chain and an endless grinding cloth having a wave-like grinding surface being suspended in rotation above the transfer chain, in substitution for the conventional rotary disk grinders, by which the tip end of the wire material will be desirably ground and polished in such a manner that the configuration of said tip end will have a quite smoothly curved outer contour such as a semi-sphere or semi-ellipsoid.

According to the present invention, there is provided an apparatus for rounding tip ends of flexible plastic wire elements or brush hair elements, which apparatus comprises a continuously travelling transfer chain means, a plurality of wire holder means attached to said transfer chain means and respectively carried by said chain means rotatably about an axis perpendicular to the advancing direction of said chain means and a rotary endless grinding means having a wave-like grinding surface and held in suspension above said transfer chain means, said transfer chain means, said holder and said grinding means being arranged in such a manner that the tip ends of the wire elements supported on said holder means carried and transferred by said transfer chain means will be continuously ground by said wave-like grinding surface of said endless grinding means.

An embodiment of the apparatus according to the present invention now be described with reference to the accompanying drawings.

In FIG. 2, a pair of continuously rotatable horizontal transfer chains 1 is provided and a plurality of spaced, parallel supports 2 are transversely attached between said pair of chains 1. A holder 3 for securing and carrying a brush having wire elements or brush hair elements is provided on each support 2. As shown in FIG. 3, the holder 3 is comprised of a support member 14 for supporting wire elements 12 or the base brush plate 12' of the wire elements 12 on a board 13. The upper end portion of a vertical rotary shaft 4 is secured to said board 13. This shaft 4 is held by being inserted in a hole 15 which is provided in the support 2. There is provided a bushing member 16 between the hole 15 and the rotary shaft 4 to make the rotation of the rotary shaft 4 smooth. Attached at the other end of the rotary shaft 4 is a pinion 5 which meshes with a rack 7 to turn the rotary shaft 4 to thereby turn the holder 3 about the vertical axis.

A grinding cloth 9 is provided so as to travel horizontally above the transfer chain 1 and in a direction perpendicular to the advancing direction of the transfer chain 1. The grinding cloth rotates endlessly around a pair of rollers 17 and 17'. The shaft 18' of the roller 17' of said endless grinding cloth 9 is rotatably carried by two arms 27' (only one arm is shown) secured to a shelf 24. The shaft 18 of other roller 17 is rotatably supported in a similar manner as the shaft 18' by two arms 27 (only one of the arms is shown). The other end of the

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shaft 18 is provided with a pulley (not shown) which is operatively connected to a driving motor 20 through a belt 21. Thus, by driving the motor the endless grinding cloth 9 travels rotating in an endless manner.

The rack 7 which can mesh with the pinion 5 provided on the lower part of the rotary shaft 4 of the holder 3 is suitably supported in parallel with the transfer chain 1 below the endless grinding cloth, which rack 7 meshes with the pinion 5 of the holder 3 transferred by said transfer chain 1 and thereby the advancing holder 3 is rotated with the rotation of the pinion 5 by the rack 7. The disk 6 provided on the rotary shaft 4 of the holder 3 has a notched flat portion 6' and said notched portion 6' is in contact with the side flat surface of an elongated guide board 8 which extends in parallel with the transfer chain 1 so as to move the disk 6 slidingly along said guide board 8 while preventing the holder 3 from making rotation over a distance to a position below the endless grinding cloth to which the guide board 8 is extended. Although the whole of the guide board 8 is not shown, the guide board 8 extends from the one end position where the wire elements or brush are attached on the holder to the other end position below the endless grinding cloth where the pinion 5 initially meshes with the rack 7.

The operation of the above apparatus according to the present invention will now be explained. During the time that the notched flat portion 6' of the disk 6 slideably contacts the guide board 8 and moves therealong the holder 3 will not rotate, the wire elements 12 being stationary relative to the support member 14 of the holder 3 (FIG. 3). The wire elements 12 on the holder 3 will rotate while advancing forwardly under the endless grinding cloth 9 after the disk 6 of the rotary shaft 4 is disengaged from the guide board 8 and simultaneously said pinion 5 and the rack 7 are brought into mesh with each other to rotate the holder 3. Since the grinding cloth 9 has alternating concave 25 and convex portions 26 as shown in FIG. 4, the grinding angle will vary continuously within a predetermined range while it grinds the tip ends of the wire elements 12. Further, since these wire elements 12 rotate due to the rotation of the holder 3, the tip ends of the wire elements 12 will be ground and polished into a smooth rounded shape such as a semi-spherical or semi-ellipsoid shape, as shown in FIG. 5. Thereafter, the finished wire elements, though not shown, will be removed from the holder automatically. The grinding cloth having a wave-like grinding surface may consist of a belt having an outer wave-like surface and made of rubber, synthetic resin and the like, on which surface grinding powders will be attached securely by adhesion or it may be made of an ordinary belt having its outer surface adhered with a plastic and a sand paper and molded in a wave-like shape. The dimensions of concave and convex portions of the wave-like grinding surface of the endless grinding cloth may be varied appropriately in accordance with the length, thickness and resilient force

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of the wire element so as to conduct continuously the operation for rounding tip ends of wire elements in a very ideal manner.

We claim:

1. Apparatus for rounding tip ends of flexible plastic wire elements or brush hair elements, which comprises a continuously travelling transfer chain means, a plurality of wire holder means attached to said transfer chain means and respectively carried by said chain means rotatably about an axis perpendicular to the advancing direction of said transfer chain means, and an elongated grinding means disposed above said transfer chain means and having a wave-like grinding surface, said transfer chain means, said holder means and said grinding means being arranged in such a manner that the tip ends of said wire elements supported on said holder means carried and transferred by said transfer chain means will be continuously ground and polished by said wave-like grinding surface of said elongated grinding means.

2. An apparatus according to claim 1, further including means coacting with said wire holder means for causing rotation thereof about said axis when said wire holder means is disposed below said grinding means and is moved along said grinding surface by said transfer chain means.

3. An apparatus according to claim 2, further including means movably supporting said grinding means above said transfer chain means and for causing movement of said grinding surface in a direction substantially transverse to both said axis and said advancing direction.

4. An apparatus according to claim 2, wherein said means coacting with said holder means for causing rotation thereof includes an elongated rack stationarily mounted to said apparatus and extending in the longitudinal direction thereof substantially parallel to the advancing direction of said chain means, and a gear non-rotatably interconnected to said holder means and disposed for meshing engagement with said rack for causing rotation of said holding means as said holding means is moved longitudinally in said advancing direction by said chain means.

5. An apparatus according to claim 2, further including means coacting with said holder means for preventing rotation thereof prior to said holder means being moved under said grinding means.

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WILLIAM R. ARMSTRONG, Primary Examiner

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