April 11, 1967 B. E. NELSON 3,312,993

BRUSH CONSTRUCTION

Filed Jan. 11, 1965 2 Sheets-Sheet 1

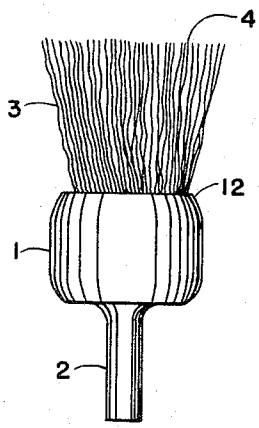


Fig. 1

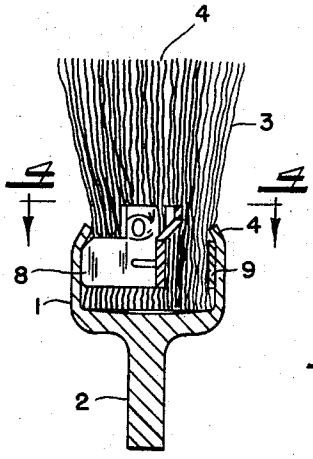


Fig. 3

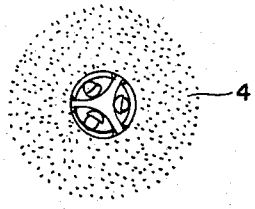


Fig. 2

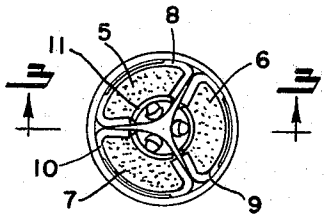


Fig. 4

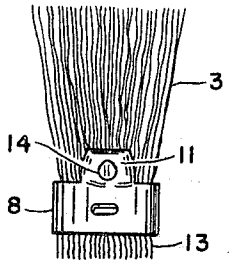


Fig. 5

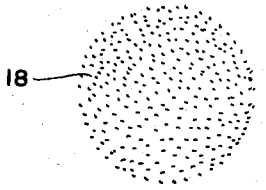


Fig. 8

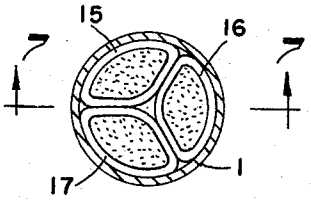


Fig. 9

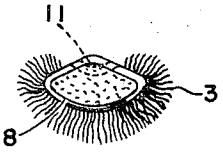


Fig. 6

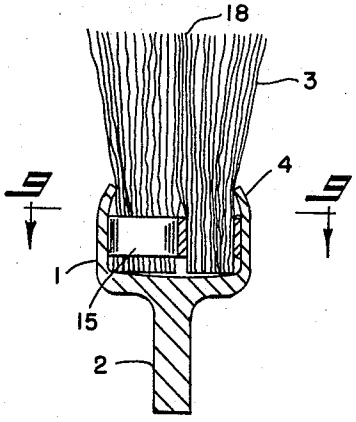


Fig. 7

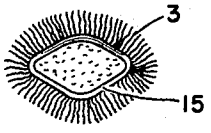


Fig. 11

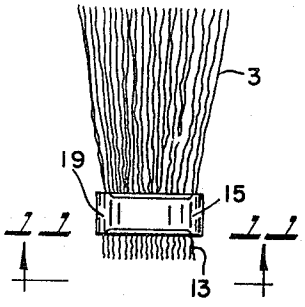


Fig. 10

INVENTOR
BROOKS E. NELSON

BY Oberlin, Maky & Donnelly
ATTORNEYS

April 11, 1967 B. E. NELSON 3,312,993

BRUSH CONSTRUCTION

Filed Jan. 11, 1965 2 Sheets-Sheet 2

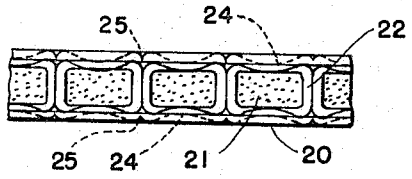


Fig. 14

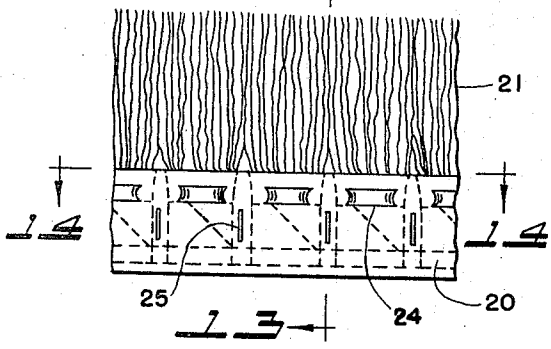


Fig. 12

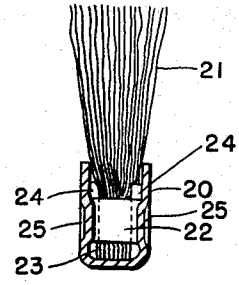


Fig. 13

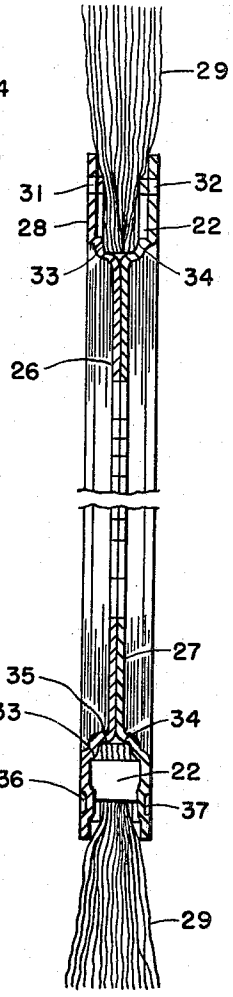


Fig. 16

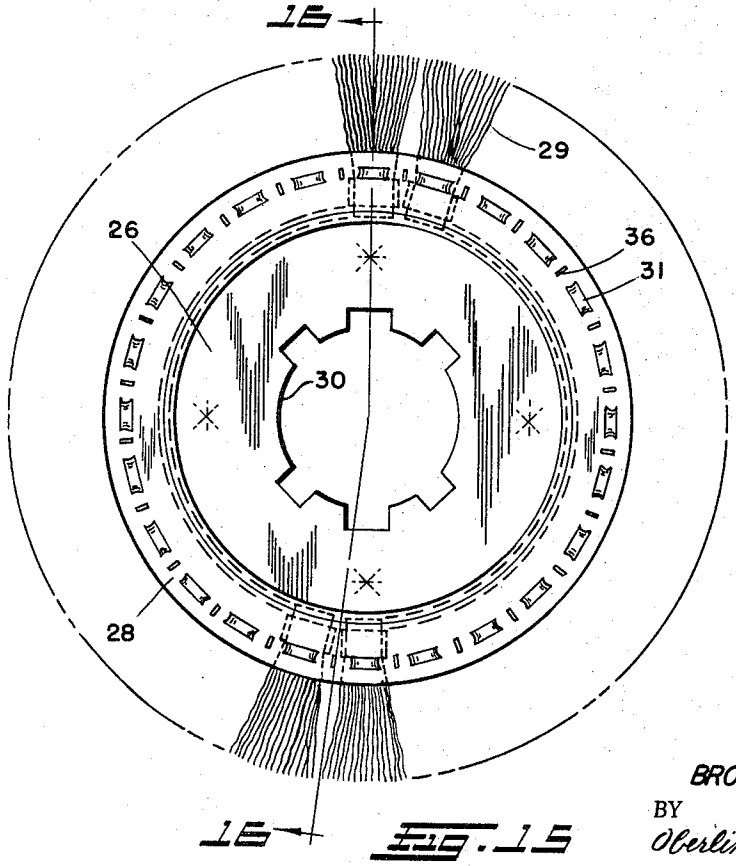


Fig. 15

INVENTOR.
BROOKS E. NELSON
BY
Oberlin, Maky & Donnelly
ATTORNEYS

United States Patent Office 3,312,993 Patented Apr. 11, 1967

3,312,993

BRUSH CONSTRUCTION

Brooks E. Nelson, Chagrin Falls, Ohio, assignor to The Osborn Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Filed Jan. 11, 1965. Ser. No. 424,542
5 Claims. (Cl. 15—180)

This invention relates as indicated to a novel brush construction, and more particularly to power driven rotary brushes in which the brush bristle material is assembled or grouped into a plurality of bundles or tufts. Certain subject matter disclosed but not claimed herein is disclosed and claimed in my copending application Serial No. 585,842, filed October 11, 1966, and in my copending application Serial. No. 494,688, filed October 11, 1965, now Patent No. 3,289,235.

It is, of course, quite old preliminarily to secure bristles into separate tufts of various sizes and shapes prior to mounting or inserting such assembled tufts into different types of brush backs or holders. When exceptionally stiff or brittle brush fill material is employed which may fracture when sharply bent about a retaining member there are obvious advantages in securing such brush fill material in other ways which do not involve sharp flexing of the same. Particularly in the case of small end brushes, the manufacturer encounters the problems of uneven fill distribution, the difficulty and expense of trimming the brush to a true flat face, and the excessive stresses placed upon the retaining members when heavy wire brush bristle fill material is employed and bent to U-shape for retention within the usual cup shaped holder.

It is accordingly an important object of my invention to provide a novel brush construction wherein a plurality of brush bristle tufts are preliminarily assembled and secured by means of encircling bands or clips, without excessive flexing of the bristles, and the tufts thus produced are then inserted and retained within an appropriate holder or brush back.

Another object is to provide such tufts, the shapes of which may be modified through corresponding modifications of the shapes of the retaining bands or clips to produce brush faces having desired characteristics.

A further object is to provide novel means for securing such brush tufts within the backs or holders through interengagement of the sides of such backs or holders with the bands or clips which thus directly encircle and grip the individual tufts of brush fill material.

Still another object is to provide power driven rotary brushes in which the brush material is in the form of a plurality of closely assembled tufts which afford an even distribution of the brush bristle fill as well as an even, true brush face.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

FIG. 1 is a side elevational vew of a power driven rotary brush produced in accordance with the present invention;

FIG. 2 is an end view of the brush of FIG. 1;

FIG. 3 is a longitudinal section through the brush of FIG. 1 taken on the line 3—3 on FIG. 4;

FIG. 4 is a transverse section taken on the line 4—4 on

FIG. 3, but before turning in the lip of the cup shaped holder;

FIG. 5 is a side view of an individual brush tuft adapted to be assembled into the brush construction of FIGS. 1–4 inclusive;

FIG. 6 is a butt end view of the brush bristle tuft assembly of FIG. 5;

FIG. 7 is a longitudinal section through a power driven rotary end brush similar to that of FIG. 3 but comprising a plurality of assembled tufts forming a solid or closed end face rather than the circular or open end face of FIG. 2, such section being taken on the line 7—7 on FIG. 9;

FIG. 8 is a view of the end face of the brush of FIG. 7;

FIG. 9 is a transverse cross-section taken on the line 9—9 on FIG. 7;

FIG. 10 is a side view of a brush bristle tuft used in the assembly of the FIG. 7 embodiment of the invention;

FIG. 11 is a butt end view of the tuft of FIG. 10;

FIG. 12 is a side elevational view of a length of brush strip comprising a plurality of tuft assemblies secured within an appropriate elongated channelform back;

FIG. 13 is a transverse section taken on the line 13—13;

FIG. 14 is a longitudinal section taken on the line 14—14 on FIG. 12;

FIG. 15 is an end view of a wheel type power driven rotary brush wherein a plurality of brush tuft assemblies are secured in generally radially outwardly extending positions; and

FIG. 16 is a generally diametral section taken on the line 16—16 on FIG. 15.

Referring now more particularly to said drawing and especially FIGS. 1–6 inclusive thereof, the embodiment of the invention there illustrated comprises an end brush having a metal holder in the form of a cup portion 1 with an axially extending stem or spindle 2 adapted to be received and gripped by the chuck of an appropriate power driven tool. Crimped wire brush fill material 3 is retained within such cup portion and extends outwardly therefrom to provide a generally flat circular brush face 4 composed of the outer tip ends of such wires. In the form thus illustrated, the brush fill material is actually in the form of three separate tufts or bundles 5, 6 and 7 individually clipped together by sheet metal clips or bands 8, 9 and 10 encircling the basal portions of the respective bundles. As best shown in FIG. 5, each such band may be provided with an upstanding portion 11 which is deformed locally to compress the corresponding region of the tuft or bundle. It will thus be seen that the basal portion of each of the three tufts is of general arcuate segmental or pie shape form, with the inner tip compressed or indented by means of such upstanding portion 11. The bristles of each bundle are carefully cut to length so that a true normally flat end face is afforded. Three of such clipped together bundles are assembled within the cup shaped holder 1 as shown in FIG. 4 to form the circular brush face 4 (FIG. 2), and the lip 12 of the cup is turned in to overlie and secure the upper edges of the several bands 8, 9, 10 as shown in FIG. 3, the relatively short protruding inner end portions 13 of the bristles engaging the inner bottom of the cup. In this manner, the bundles of brush material are firmly secured and held within the cup shape holder. An adhesive such as an epoxy resin cement may also be provided in the bottom of the cup if desired. The upstanding portions 11 may be apertured as at 14 to assist in handling the individual tufts during the die forming and assembling operations.

End brushes produced in the manner described above have several practical advantages. In the first place, by

banding the individual bundles of brush material, the handling of such brush material during manufacture is much simplified, crimped wire bristle material being notoriously difficult to manage when handled loose. The individual bands also permit shaping of the component bundles or tufts to desired contour, in the example illustrated and described such tufts presenting an arcuate outer contour, radial sides and an arcuate inner contour, thereby, when assembled within the holder, producing the circular hollow end face desired. Since the individual tufts are formed of bristles of the proper length and such bristles are clamped against shifting, the final brush assembly requires little or no trimming or grinding in order to obtain the desired flat end face. Hollow face end brushes are frequently preferred because the central bristles of rotary end brushes perform relatively little active brushing on the work surface and most of the wear is accordingly on the outer bristles. It will be appreciated that the number of bundles thus assembled within a single cup shape holder is to some extent a matter of choice, but it has been found that three such bundles are ordinarily preferred in the usual size end brush.

New referring to FIGS. 7–11 inclusive, a generally similar end brush is shown in which, however, the individual bundles of brush material **3** are secured by bands or clips **15**, **16** and **17** which are not provided with the upstanding portions **11**; in consequence, the brush fill material produces a solid flat circular end face **18** as indicated in FIGS. 8 and 9. The ends of each band or clip may desirably be diagonally offset as at **19** and the upper and lower edges of the clip may be slightly inwardly crimped by the forming dies. Such diagonally overlapping ends of the individual bands or clips are preferably located at the outer arcuate sides of the latter, and the several tufts or bundles are received and retained within the cup shape holder in the same manner as that described above. End brushes of this type may be assembled with great rapidity and yet achieve strong construction which stands up well in use. These is no opportunity for the fill to shift during manufacture and the resultant brush has excellent balance, uniform fill distribution and proper trim.

Referring now to FIGS. 12, 13 and 14, a length of brush strip is there illustrated comprising a sheet metal channelform brush back **20** having tufts or bundles of brush material **21** secured therein. Each such bundle of brush material is preliminarily secured adjacent its basal end by means of an encircling clip or band **22** which may be compressed or formed to general elongated rectangular shape as best shown in FIG. 14 for reception within channel back **20**. Ordinarily such clip or band **22** will be slightly spaced from the extreme inner end of the tuft so that a short basal portion **23** of the latter will project therebeyond and engage the inner bottom surface of the channel back. An appropriate adhesive such as an epoxy resin may be applied to such inner end portions **23** if desired to assist in securing the same to the brush back. While the channel lips may be slightly turned in to secure the clips and thus the tufts within the channel, it is normally preferred instead to indent the channel sides at **24** to overlie the outer edges of the clips **22** to secure the tufts against removal from the brush back, such indentations extending parallel to the channel lips. Additional indentations **25** may be provided in the channel sides normal to the lips of the latter and spaced inwardly therefrom to produce slight projections between the clips of adjacent tufts to ensure against any possible shifting of the latter longitudinally of the channel back in use. Brush strip of this nature will ordinarily be utilized in straight or long lead helical lengths for mounting on rotatable hubs generally parallel to the axis of rotation thereof. Such brush strip is adapted to automatic manufacture in continuous lengths and normally requires little or no trimming in view of the accurately dimensioned tufts of which it is composed.

FIGS. 15 and 16 show a wheel brush of generally similar construction in that two disc-like sheet metal face plates **26** and **27** are formed with outwardly offset circumferential edge portions to produce a radially outwardly opening channel portion **28** adapted to receive a large number of radially outwardly protruding tufts or bundles of brush material **29** therein. Such plates may be spot welded together and the assembly provided with a central aperture **30** for mounting upon an appropriate spindle or arbor. The tufts of brush material are assembled in the same manner described above in connection with the FIGS. 12–14 embodiment and are held against outward withdrawal by indentations **31** and **32** which overlie the outer edges of the clips **22**. The inner edges of such clips may be seated against shoulders **33** and **34** of the circular channel back with the basal portions of the tufts fitting within a narrower inner bottom portion **35** of the channel. Narrow radial indentations **36** and **37** are provided intermediate the clips of adjacent tufts to prevent circumferential shifting of the tufts in use and so to keep the brush in proper balance.

While crimped wire brush fill material is suitable for employment in the brushes of the present invention as above described, it will nevertheless be appreciated that a wide variety of different brush fill materials may be utilized including hard straight plastic beaded wire (see Patent No. 3,090,061), plastic coated wire, tampico fiber, plastic monofilaments such as nylon and the like. In certain instances, particularly when utilizing relatively hard brittle brush bristle material, it may also be advantageous to impregnate the butt portions of the tufts which are encircled by the clamping bands or clips with a suitable elastomeric material such as foamed polyurethane, for example.

It will be seen from the foregoing that a novel form of brush construction has been provided which is not only adapted to high speed assembly and manufacture, with consequent reduction in cost, but which is also superior in uniformity of fill, balance, and brush face trim.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. An end brush comprising a circular holder and a plurality of parallel bundles of brush material secured therein, each said bundle comprising a quantity of parallel bristles wiht the basal portion of each bundle tightly encircled by a band around the same, the basal portions of said bundles substantially entirely filling said holder, and centrally located means acting to deflect adjacent bristles outwardly of said holder to form an annular brush face of enhanced bristle density.

2. The end brush of claim **1**, wherein said centrally located means comprise upstanding portions on said bands deformed toward the outer periphery of said holder.

3. The end brush of claim **1**, wherein said bands each define a sector of such circle.

4. A power driven rotary end brush comprising a circular cup shaped holder and a plurality of individual parallel bundles of brush material secured closely together therein and extending therefrom to provide a composite brush face, each said bundle being encircled and held tightly compacted adjacent its inner end by a rigid band around the same defining a sector of such circle, thereby filling said holder and providing a circular brush face, the inner apex of each said sector shaped band being deformed to afford a central region in said holder devoid of brush material, whereby said circular brush face has a hollow center.

5. The end brush of claim 4 wherein the inner apex of each said sector shaped band is provided with an upstanding portion which is deformed toward the outer arcuate part of said band thereby locally to compress the respective bundle of brush material into generally arcuate cross-section.

References Cited by the Examiner

UNITED STATES PATENTS

527,251	10/1894	Stauder	15—190 X
1,359,104	11/1920	Rheinberger	15—168
1,928,990	10/1933	Barnett et al.	15—190
1,949,665	3/1934	Sturgis	15—179
1,998,562	4/1935	Sturgis	15—180

2,325,629	8/1943	Peterson	15—180
2,449,158	9/1948	Benyak	15—179 X
2,771,922	11/1956	Gyllenberg	15—180
2,844,835	7/1958	Benyak	15—181 X

FOREIGN PATENTS

456,984	3/1928	Germany.
267,015	8/1929	Italy.
352,737	7/1931	Great Britain.
584,164	1/1947	Great Britain.

CHARLES A. WILLMUTH, *Primary Examiner.*

P. FELDMAN, *Assistant Examiner.*