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3,072,945

BRUSH ELEMENT AND BELT BRUSH CONSTRUCTION

Filed Feb. 18, 1957

2 Sheets-Sheet 1

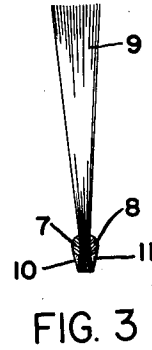
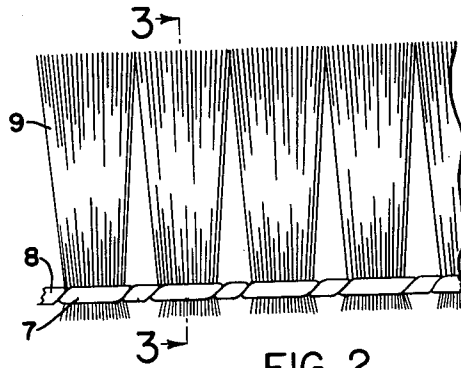
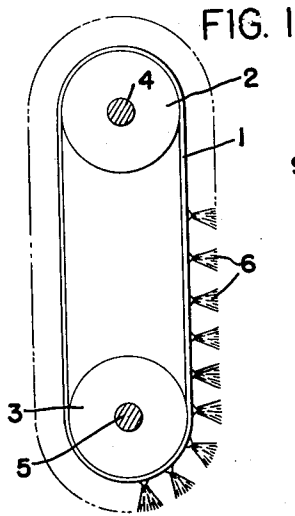


FIG. 2

FIG. 3

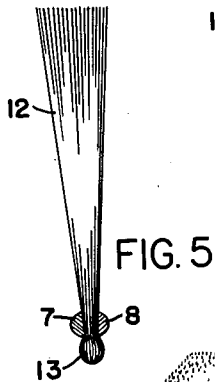
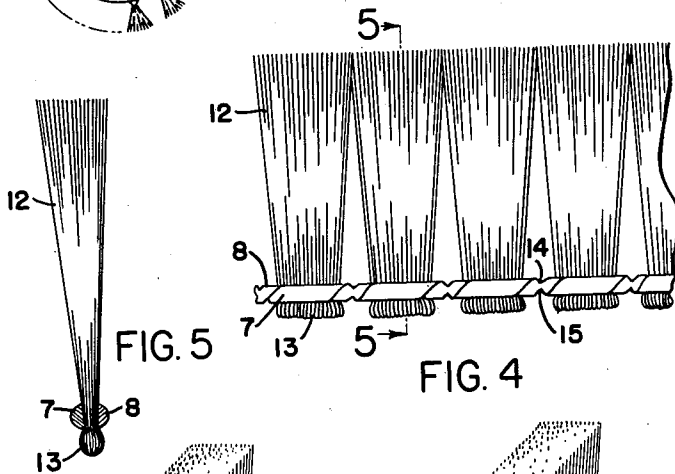


FIG. 4

FIG. 5

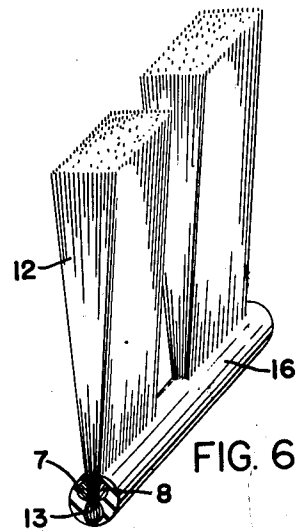


FIG. 6

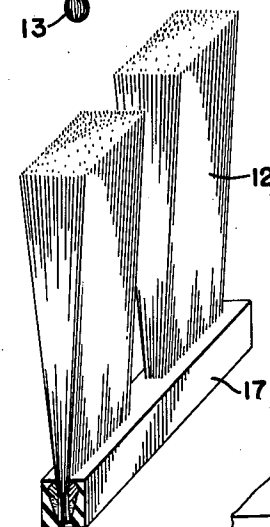


FIG. 7

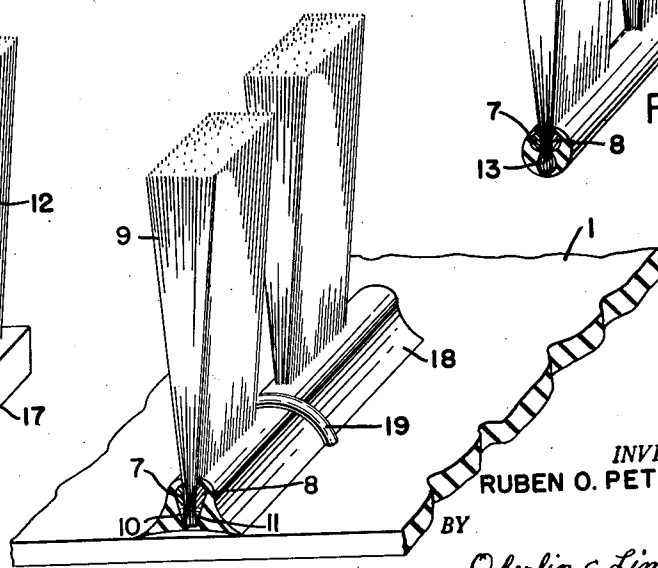


FIG. 8

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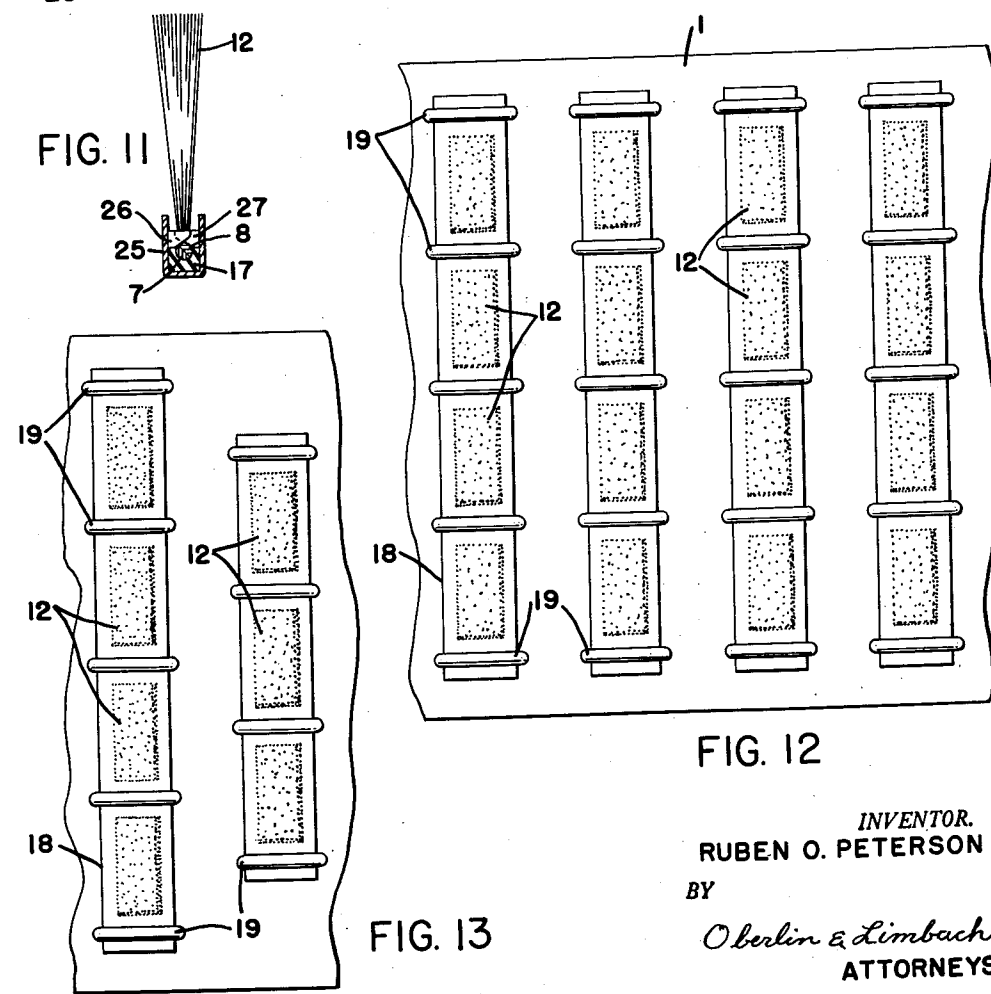
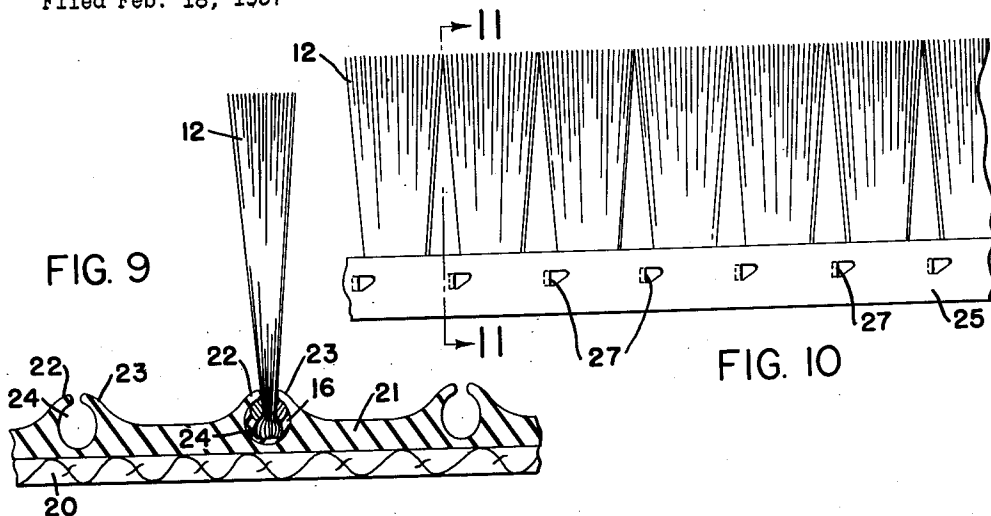
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2 Sheets-Sheet 2



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3,072,945  
**BRUSH ELEMENT AND BELT BRUSH  
 CONSTRUCTION**

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 a corporation of Ohio  
 Filed Feb. 13, 1957, Ser. No. 640,652  
 13 Claims. (Cl. 15—202)

This invention relates as indicated to a novel brush element and brush assembly, and more particularly to an improved belt brush construction comprising a plurality of such brush elements mounted on or in an elongated flexible belt.

While not a common type of brush, belt brushes have nevertheless been employed for various purposes in the past, examples being shown in U.S. Patents 2,448,931 and 2,565,894. Such brushes, however, have generally been rather expensive of construction and when assembled have not always afforded the desired flexibility and desired brushing characteristics in use.

It is accordingly an important object of my invention to provide an improved brush element suitable for continuous manufacture and particularly adapted to be mounted on or in flexible belts and particularly flexible endless belts.

Another object is to provide a novel and improved belt brush, and more particularly an endless belt brush, in which the brush material is mounted and arranged for maximum effectiveness in use.

Still another object is to provide a relatively inexpensive form of brush element which is nevertheless particularly suitable for mounting on flexible belts.

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 diagrammatic showing of an endless belt brush mounted on and passing around two spaced rollers or drums having parallel axes of rotation;

FIG. 2 shows a novel tufted brush element suitable for employment in accordance with my invention;

FIG. 3 is a transverse section taken on the line 3—3 on FIG. 2;

FIG. 4 shows a modified form of brush element;

FIG. 5 is a transverse section taken on the line 5—5 on FIG. 4;

FIG. 6 is a perspective view showing the brush element of FIG. 4 stabilized and reinforced by elastomeric material molded to the base portion thereof;

FIG. 7 is a perspective view showing a modification similar to FIG. 6;

FIG. 8 is a fragmentary perspective view illustrating one manner of mounting the brush element of FIG. 3 or FIG. 4 on a flexible belt;

FIG. 9 is a cross-section longitudinally of a portion of a flexible belt illustrating a mode of mounting the FIG. 6 brush element thereon;

FIG. 10 shows a length of brush strip of a type somewhat similar to that disclosed in my prior Patent 2,303,386 but modified in certain respects;

FIG. 11 is a transverse section taken on the line 11—11 on FIG. 10;

FIG. 12 is a fragmentary top plan view of a length of

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flexible belt showing brush elements mounted thereon in the general manner indicated in perspective in FIG. 8; and

FIG. 13 is a top plan view generally similar to FIG. 12 but with the brush elements mounted in a manner to offset the tufts of alternate adjacent elements.

Referring now more particularly to said drawing and especially FIG. 1 thereof, the belt brush of my invention may be of the general type there illustrated comprising an endless belt 1 passing around and supported on two spaced drums or rollers 2 and 3 having parallel axes of rotation 4 and 5. Brush elements are mounted on such belt with brush material 6 extending outwardly therefrom. One of such drums may be driven by an electric motor through appropriate drive means (not shown) and belt brush units of this general nature may also be incorporated in appropriate machines as desired. An endless belt brush of this type may also be employed simply as a closely fitting sleeve upon a single drum or hub, thereby providing a rotary brush, the working elements of which may conveniently be removed and replaced as a unit.

Referring now more particularly to FIGS. 2 and 3 of the drawing, the brush element there illustrated comprises two half round wires 7 and 8 twisted together with their flat faces opposed and gripping and clamping therebetween generally flat layers of brush bristle material 9. As shown, such layer of bristles may project a considerable distance in one direction to form the tufts which will later comprise the working face of the brush while the other ends of the bristles project only a short distance beyond the clamping wires. It will be seen that in a sense such tufts are secured in a manner generally comparable to those of Peterson and Charvat Patent 2,465,396. Of course, a variety of different types of brush material may thus be secured. It will be noted that the wires 7 and 8 are twisted together intermediate successive tufts, thereby both spacing and clamping the same. As indicated in FIG. 3, at 10 and 11 an appropriate adhesive or bonding agent such as the well-known epoxy adhesives (resins) may be applied to the short projecting end portions of the bristles 9 further to stabilize the same and to bond them together as a unit to the stem wires. Such short projecting end portions of the bristle tufts will desirably be spread somewhat by the application of pressure so that such epoxy resin adhesive may be intruded between the short projecting brush material strands.

A modified but generally similar element is shown in FIGS. 4 and 5 where the tufts of brush material 12, however, are formed by folding or doubling the brush material so that both end portions of each filament or bristle extend side by side in the same direction. The stem wires 7 and 8 grip and clamp the brush material adjacent the region of folding or doubling 13 so that such region projects therebeyond but a short distance. An adhesive may be applied to such projecting portion 13 as in the case described above. If desired, the stem wire may be nicked or notched as at 14 and 15 intermediate adjacent tufts 12 so that while such tufts are interconnected during manufacture of the finished brush, they will nevertheless separate from one another due to fracture of the stem wires where thus notched when the brush assembly in which they are incorporated is subsequently flexed in use.

The brush elements of either FIG. 2 or FIG. 4 may now have an elongated elastomeric base portion molded there-to enclosing the short projecting portions of the tufts as well as the clamping stem wires, three different modifications being shown in FIGS. 6, 7 and 8 respectively. Thus, in FIG. 6, such as elastomeric base 16 incorporating such portions of the FIG. 4 element is of cylindrical shape; the elastomeric base portion 17 of FIG. 7 is of square cross-section and the elastomeric base portion 18 of FIG. 8 is of rounded contour feathered at the side edges for mount-

ing upon flexible belt 1 as by means of staples 19. Such base portion 18 will desirably be adhesively joined to the surface of the belt as well as being secured thereto by means of such staples. As shown in FIG. 12, the brush elements with their elastomeric bases 18 may be arranged directly transversely of the belt 1 with successive tufts 12 aligned not only transversely of the belt but also in the direction of travel of the same. On occasion, however, as shown in FIG. 13, it may be preferred to arrange adjacent elements so that the tufts 12 of successive elements are offset or staggered in the direction of travel of the brush to ensure uniform brushing of the work without streaking, particularly if such work is not itself reciprocated in a direction transversely of the traveling belt. It will be appreciated that in the arrangements illustrated there is ample opportunity for the belt to flex intermediate the transversely extending brush elements, such flexing ordinarily being necessary when the belt passes about drums 2 and 3 and also often being desirable to permit the brush to yield somewhat where engaging the work. It is, however, also possible to mount my brush elements extending longitudinally of the direction of travel of the belt if such elements are relatively short or if the stem wires are notched as at 14 and 15 so that they will fracture upon flexing. When thus modified, the brush elements may also be arranged diagonally of the belt, the notching of the stem wires being desirable if arranged at any substantial angle to a position directly transverse of the belt. Of course, if the belt is to be employed as a tight fitting sleeve on a single drum, such notching of the stem wires is not ordinarily required even if the wires are to extend circumferentially of the drum since they will be flexed but once rather than repeatedly as in the case of the FIG. 1 embodiment. The generally triangular cross-section of the base portion 18 strongly supports the brush elements in use.

The belt may alternatively be of a form illustrated in FIG. 9 comprising a continuous foundation portion 20 of fabric, for example, and an outer surface layer 21 of an appropriate elastomer such as rubber or Neoprene, for example, bonded thereto. Such outer layer 21 is molded with transversely extending ridges comprising parallel upstanding opposed ribs or lips 22 and 23 with a groove 24 defined therebetween adapted to receive the base portion of any of my novel brush elements. Thus, as shown, such groove may be of generally circular cross-section to receive and closely embrace the elastomeric base portion 16 of the element illustrated in FIG. 6, such base portion being coated with an appropriate adhesive such as an epoxy resin cement firmly to bond the same in place. The lips 22 and 23 will desirably contact the brush material emerging from the groove and will resiliently support the same tending to reduce concentrations of stress when such brush material is flexed in use. This tends much to prolong the life of the brush material, especially wire brush material, preventing long fracture of the outer wires where they emerge from between the stem elements 7 and 8. Of course, the grooves 24 may be of other shapes to receive and fit the elastomeric base portions such as 17 and 18 of FIGS. 7 and 8 respectively. Likewise, such grooves may be shaped and proportioned to receive brush strip of the type disclosed in my prior Patent 2,303,386 or a modified form of the same shown in FIG. 10 and described below. Indeed, the brush elements of FIGS. 2 and 4 may be directly received in such grooves of appropriate dimensions, without provision of the molded base portions such as 17 and 18, and secured therein by means of sufficient epoxy resin cement.

Referring now more particularly to FIGS. 10 and 11 of the drawing, the brush element of FIG. 7 with its elastomeric base portion 17 of square or rectangular cross-section may be fitted within an outer sheet metal channel-form back 25 having teeth such as 26 and 27 punched in from the respective sides thereof to overlie the twisted retaining elements 7 and 8. Such teeth 27 will preferably

thus project inwardly from the sides of the channel back intermediate the successive tufts 12. The teeth 26 and 27 will preferably be of the form taught in my prior Patent 2,303,386. Moreover, the sides and bottom of the elastomeric base portion 17 will preferably be coated with an appropriate adhesive such as an epoxy resin to bond the same to the metal channel. Brush elements of the type shown in FIGS. 10 and 11 may then be mounted on the belt 1 in the manner illustrated in any of FIGS. 8, 9, 12 and 13. The belt 1 may be of any flexible material conventionally employed for such purpose, including canvas, rubber and Neoprene, but will usually comprise a fabric base having a layer of a resiliently deformable elastomer bonded to one or both surfaces thereof. Such layer may be cured after mounting the brush elements in the manner described while at the same time curing the base portions molded to the twisted wire brush elements and setting the cement bonding such base portions to the belt. Rubber or latex cements may be used as the bonding agent. The brush elements may similarly be mounted on a plurality of parallel belts, bridging the gaps therebetween, or on a plurality of parallel chains.

Any brush materials may be utilized depending on the brushing operation to be performed, including crimped wire, plastic coated wire, plastic coated glass fibers, horsehair, tampico fiber, nylon bristles, plastic sheet material, and textile fabric buff material such as cotton cloth. Granular abrasive such as emery, pumice, and the like may be bonded to any of such brush materials or otherwise applied.

The wire retaining elements 7 and 8 may be flat face (half round) or the opposed faces may be somewhat concave in the manner shown and described in my co-pending application Serial No. 553,317, filed December 15, 1955, now Patent No. 2,895,155. Such elements are placed on opposite sides of a continuous layer or band of the selected brush material and heavy pressure is applied thereto to compact such layer therebetween. At a suitable time in the process of manufacture of the brush element, such layer or band of brush material is severed at the desired distance from the stem wires to produce a tuft of proper size and the stem wires are twisted 360° or some multiple thereof, the tuft rotating during such operation. The pressure compacted tuft is thus tightly confined. At a suitable time in the process of manufacture, the brush material layer or band end which has been severed in forming a previous tuft is advanced and positioned between wires 7 and 8 adjacent previously positioned and clamped brush material and the layer is again severed prior to twisting the wires with rotation of all previously severed tufts together. Repetition of these operations produces an elongated brush element comprising an alignment of spaced parallel tufts secured to a twisted wire stem or base. Rather than thus twisting the wires together, they may be spot welded intermediate the tufts.

The short projecting end portions of the brush material (opposite to the tufts proper) may be spread to expose an open V along the base wires and this V filled with an appropriate adhesive, preferably an epoxy resin. A continuous elongated element may be bonded into such V's, if desired. As noted above, the brush material may instead be doubled to leave the short projecting doubled portion 13 bulging closely adjacent the stem wires to which it may be bonded with epoxy resin adhesive.

While my new brush elements, and especially those modified as shown in FIGS. 7 and 9, may be inserted in transverse grooves 24 in dovetail fashion and be mechanically retained therein (thus permitting removal and replacement), it will ordinarily be preferred also to bond them in place. Much will depend on the use to which the brush is to be put.

It will be seen from the foregoing that I have provided a novel form of brush element particularly suited

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for mounting on flexible belts, although they may also be used for other purposes where brush strip is desired. The belt brushes are quickly assembled, greatly reducing the cost of manufacture, but are long-lived and efficient in performance. While resiliently deformable elastomers are generally preferred to form the elongated molded bases or back portions of the brush elements (brush strip), other more rigid plastics may also be employed.

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. A brush element comprising a pair of stem wires having opposed substantially flat faces of substantial width, and flat-tufts of brush material clamped therebetween at spaced intervals between straight portions of said wires, said wires being secured together intermediate said tufts, said tufts projecting a substantial distance in one direction from said wires in parallel alignment to form a brushing face and projecting a much shorter distance in the other direction, the brush material of the shorter projecting portions of said tufts being bonded together and to said wires.

2. The brush element of claim 1 wherein said wires are nicked intermediate said tufts to facilitate fracture upon subsequent flexing.

3. The brush element of claim 1 wherein said tufts are formed of doubled brush material, the end portions thereof extending side-by-side in the same direction to form the brushing tuft proper and the region of doubling protruding slightly beyond said stem wires in the other direction, the doubled tufts being clamped between the latter.

4. The brush element of claim 1 wherein said tufts are formed of double brush material, the end portions thereof extending side-by-side in the same direction to form the brushing tuft proper and the region of doubling protruding slightly beyond said stem wires in the other direction, the doubled tufts being clamped between the latter, and adhesive bonding together the brush material of such doubled regions and adhering them to said stem wires.

5. The brush element of claim 1 wherein said stem wires and shorter projecting portions of said tufts are enclosed within an elongated plastic strip.

6. The brush element of claim 1 wherein said stem wires and shorter projecting portions of said tufts are enclosed within an elongated resiliently deformable elastomeric strip of generally rectangular cross-section.

7. The brush element of claim 1 wherein said stem wires and shorter projecting portions of said tufts are enclosed within an elongated resiliently deformable elastomeric strip of generally triangular cross-section, said tufts emerging from one apex of such triangle.

8. The brush element of claim 1 wherein said stem wires and shorter projecting portions of said tufts are enclosed within an elongated resiliently deformable elastomeric strip of generally rectangular cross-section; and said strip is fitted and secured within an elongated sheet metal channelform back with said tufts extending from the channel mouth.

9. The brush element of claim 1 wherein said stem wires and shorter projecting portions of said tufts are enclosed within an elongated resiliently deformable elastomeric strip of generally rectangular cross-section; said strip is fitted and bonded within an elongated sheet metal channelform back with said tufts extending from the channel mouth; and teeth are punched in from the channel sides overlying said stem wires and strip intermediate said tufts.

10. As a new article of manufacture, a brush element

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comprising two wires having opposed faces secured together at longitudinally spaced intervals to form a stem and brush material interposed at spaced intervals transversely between straight portions of said wires to form a series of flat laterally extending tufts, said stem wires being thus secured together only in the regions intermediate said tufts to clamp and space the latter, and the faces of said stem wires engaging said brush material being of substantial width better to grip said material and maintain said tufts flat.

11. A belt brush comprising the combination of a generally flat flexible belt, a transversely extending groove on one surface thereof, and a brush element, said brush element comprising two wires having opposed faces secured together at longitudinally spaced intervals to form a stem and brush material interposed at spaced intervals transversely between straight portions of said wires to form a series of flat laterally extending tufts, said stem wires being thus secured together only in the regions intermediate said tufts to clamp and space the latter, and the faces of said stem wires engaging said brush material being of substantial width better to grip said material and maintain said tufts flat, said brush element being secured in said groove with said tufts extending outwardly therefrom.

12. A belt brush comprising the combination of a generally flat flexible belt, transversely extending grooves on one surface thereof, and a brush element, said brush element comprising two wires having opposed faces secured together at longitudinally spaced intervals to form a stem and brush material interposed at spaced intervals transversely between straight portions of said wires to form a series of flat laterally extending tufts, said stem wires being thus secured together only in the regions intermediate said tufts to clamp and space the latter, and the faces of said stem wires engaging said brush material being of substantial width better to grip said material and maintain said tufts flat, the stem of said brush element being received in at least one of said grooves with said tufts extending outwardly therefrom; said grooves having inturned lips preventing outward withdrawal of said stem.

13. A belt brush comprising the combination of an endless flexible belt and a brush element, said brush element comprising two wires having opposed faces secured together at longitudinally spaced intervals to form a stem and brush material interposed at spaced intervals transversely between straight portions of said wires to form a series of flat laterally extending tufts, said stem wires being thus secured together only in the regions intermediate said tufts to clamp and space the latter, the faces of said stem wires engaging said brush material being of substantial width better to grip said material and maintain said tufts flat, said brush element extending transversely of said belt with said tufts extending from said stem outwardly away from said belt; and flexible elastomeric material buttressing each side of said stem and sloping toward said belt.

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