April 18, 1950 C. F. HENLEY 2,504,330

BRUSH BRISTLES HAVING A REDUCED FRACTURABLE TRANSVERSE AXIS

Filed Nov. 2, 1945

Fig. 1.

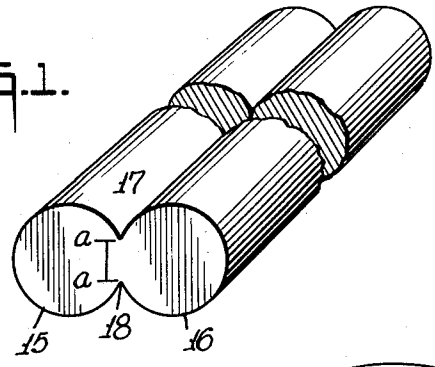


Fig. 2.

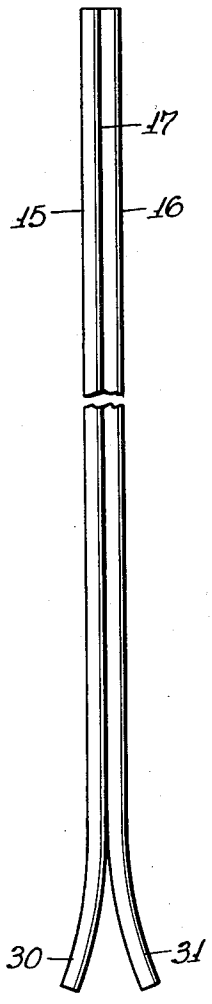


Fig. 3.

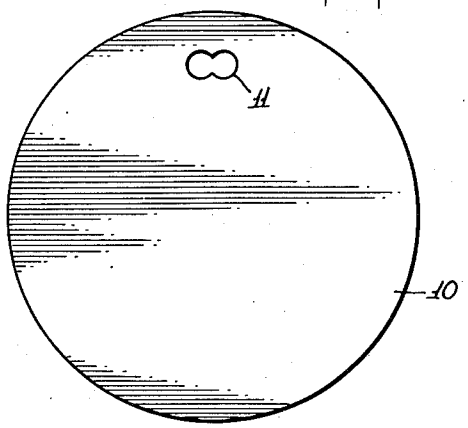


Fig. 4.

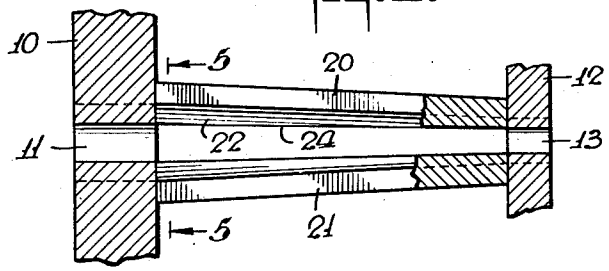
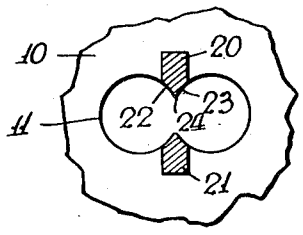


Fig. 5.



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BRUSH BRISTLES HAVING A REDUCED FRACTURABLE TRANSVERSE AXIS

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2 Claims. (Cl. 15—159)

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This invention relates in one aspect to brush bristles and in another to their production from synthetically extruded filaments of indefinite length.

Some of the general objects of my invention are: the provision of a brush bristle whose end will tend to split into outwardly flagging sections when the brush is applied to a surface; the provision of a brush bristle which is readily fracturable in the direction of its length by sharply diminishing its cross-section along a diameter thereof; the provision of a brush bristle comprised of longitudinally extending lobes connected in lateral relation by a longitudinally extending neck to define a line of fracture; and the provision of a bristle of the character referred whose cross-section is generally kidney shaped.

Other general objects of my invention are: the provision of a synthetically formed filament of indefinite length and whose cross-section is such that the end of a brush bristle length cut therefrom will tend to split into outwardly flagging sections when applied to a surface in a normal brushing or painting operation; the provision for this purpose of a filament whose thickness is reduced for a portion of its cross-section and more particularly whose cross-section is kidney shaped; and the provision of a procedure and apparatus whereby the aforementioned cross-section is given the filament simultaneously with its formation.

Synthetic filaments are formed of indefinite length by extruding a plastic mass through openings in a die and generally then passing the already formed filaments under tension through smaller sized openings in a second die spaced from the first to thereby reduce the thickness of the filaments. This procedure is shown diagrammatically in the accompanying drawings and will be referred to hereinafter by reference to this showing.

I attain the second group of general objects by the use of openings in the first mentioned die which shapes each filament so that it is readily fracturable along its length. In the disclosed embodiment the filaments are each shaped to define lobes or threads connected by a neck of reduced thickness and along which the filaments of reduced lengths thereof are weakened lengthwise thereof and more specifically filaments whose cross-sections are generally kidney shaped. Where the overall thickness of the filament is reduced by passing it, after its extrusion, through smaller openings, the attainment of my

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invention contemplates that means be provided whereby the shape initially given the filament is maintained as its thickness is being reduced and these means comprise elements which extend from die to die as will be fully set forth hereinafter.

For the attainment of these objects and such other objects as may hereinafter appear or be pointed out, I have illustrated one embodiment of my invention and drawings wherein:

Fig. 1 is a perspective, partly broken away, of my new brush bristle, shown on an enlarged scale;

Fig. 2 is a front elevational view, partly broken away, of the bristle of Fig. 1 drawn on a smaller scale, showing the outwardly flagging split lower end;

Fig. 3 is a diagrammatic showing of an extrusion die for forming the filament;

Fig. 4 shows diagrammatically a means which may be employed for maintaining the contour of the filament while its thickness is being reduced; and

Fig. 5 is a section taken on line 5—5 of Fig. 4 looking in the direction of the arrows.

Before proceeding to describe the details of the disclosed embodiment and of its production, I will premise that the ultimate object of my invention is a synthetic brush bristle which initially is integral throughout but which will readily fracture lengthwise of that end thereof which is applied to a surface during the brushing or painting operation and that it is an ancillary object of my invention that this brush bristle be produced simultaneously with and by the apparatus generally employed in the production of synthetic filaments, which I will now briefly describe by reference to Figs. 3, 4, and 5 of the drawings.

The element 10 in Fig. 4 is intended as a diagrammatic showing of the extrusion die having openings 11 through which the mass is extruded to form synthetic filaments of continuous length. In general practice, the dimensions of these openings 11 are uniform, e. g., circular. The filaments extruded through the openings 11 are then led under tension to the openings 13 in a second die member 12, positioned at a distance from the first mentioned die member 10. The openings 13 are shaped like the openings 11 but are much smaller than the openings 11. The purpose of this operation is to compact or reduce the thickness of the filament.

I avail myself of this procedure and arrangement to the following extent. The openings 11

through which the mass is initially extruded and which as stated has a regular cross-section to form a filament of uniform thickness is given a cross-section wherein the intermediate portion of the opening is narrower than the portions to the side thereof so that a filament extruded through such opening will be caused to take that conformation and therefore to have its intermediate portion lengthwise thereof, of reduced thickness and therefore weakened to that extent and my invention contemplates that this weakening be effected in a manner and to a degree and for the purpose shortly to be pointed out. This may be effected in various ways. One specific way is shown in Fig. 3 wherein the opening in the extrusion die 10 is shaped as shown at 11 in Fig. 3. This opening can be described as kidney shaped or as resembling the number 8 and will shape the filament correspondingly so that it is comprised of two laterally related lobes demarked or defined by depressions oppositely and centrally thereof.

While Fig. 1 is intended to illustrate a finished bristle in accordance with my invention, it can also be considered as a section of the filament produced by the die of Fig. 3 because the brush bristle is cut from the filament so formed. In Fig. 1 the brush bristle (or the filament) is shown as having the appearance of twin threads 15 and 16 which are joined or fused into each other to leave the opposed depressions 17 and 18 which define a narrow neck portion in between the two lobes 15 and 16. The thickness of this neck portion is much less than that of the bristle portions 15 and 16 to each side thereof. This reduced thickness is shown at *a*—*a* in this figure. The reduced openings 13 in the reducing die 12 conform generally to the contour of the openings 10 of the extrusion die, except that their dimensions are substantially and proportionately reduced. This can be seen by comparing the size of the openings 11 and 13 in Fig. 4.

One of the problems which presented itself in using procedures hitherto employed in forming synthetic filaments was the fact that the extruded filaments were led under tension into and through the reduced openings 13 and the shape and conformation given them by the openings 11 in the extrusion die were altered by the tension imposed upon the filament as it was led to and through the reducing opening 13. I have therefore provided the opposed shape retaining members 20 and 21 shown in Fig. 4 partly in side elevation and partly broken away and shown in cross-section in Fig. 5. These shaping members 20 and 21 comprise curved surfaces 22 and 23 which intersect at the apex 24. These curved surfaces are predeterminately conformd so that at their right end they are dimensioned to seat into the depressions 17 and 18 of the initially extruded filament and which dimensions diminish gradually to those of the corresponding portions of the opening 13 and for which purpose the apex 24 and the faces 22 and 23 all converge as shown in Fig. 4 approximately and to the extent that the dimensions of the filament are reduced in its passage to and through the openings 13. The character contours and dimensions of these shape retaining members are controlled by the shape which it is desired the bristle shall have and the specific characteristics shown and described are built around the specific showing of Fig. 1.

The showings in the drawings are entirely diagrammatic and the proportionings are not intended to represent either actually or approximately the proportions actually employed in practice. In the general practice of forming conventional filaments, the initially extruded filament may have a diameter of the order of from .016" to .056" and is reduced in diameter in the proportion of 3 or 4 to 1, so that in the aforementioned order of range the diameter of the filament extruded through the opening 13 will range between .004" to .014". In the finished product of Fig. 1, which, as stated, may be construed either as a section of the filament or as a completed brush bristle, the diameter of the lobes can therefore be assumed to be within the range of reduced diameters of .004 to .014 so that the filament or bristle along its longest dimension would be approximately twice that length whereas the distance across its shortest dimension along the line *a*—*a* may be as low as .001 to .0015.

It will be understood that these dimensions are merely exemplary and are given as stated because they are in line with the present practice in manufacturing a conventional synthetic filament.

Fig. 2 is intended to show the manner of functioning of a bristle of the specific character which has herein been disclosed for purposes of exemplification. The lower end is presumed to have been applied to a surface in the normal operation of painting and to have split into the sections 30 and 31 which are automatically flagged outwardly. This materially increases the capacity of the bristle to handle paint and also its flexibility and presents other advantages which will be understood by those skilled in the art. As the split end sections 30 and 31 wear away and new end portions are brought against the surface in the painting operation, the splitting will be continued upwardly so that the bristle end will gradually split automatically along its length into outwardly flagging sections with wear.

The specific embodiment shows a bristle whose cross-section is contoured symmetrically with reference to both its long and short axes so as to define two similar lobes and give the appearance of a twin thread construction. It will be understood that the attainment of all the objects of my invention does not require that the contour of the cross-section be symmetrical or that it be kidney shaped or that the diminishment of the thickness of the intermediate portion be such as to define lobes or that where it does define lobes that their number be restricted to two.

It will also be pointed out that my invention does not require that the twin threads be each contoured cylindrically.

What I claim as new and desire to secure by Letters Patent is:

1. A synthetic bristle adapted for use in a paint brush presenting the ends of a plurality of held bristles to the surface to be painted, the cross section of said bristle having a major longitudinal axis and a minor transverse axis, and an outline which is symmetrical with respect to both said axes, said bristle having its maximum transverse dimension at points equi-distanced from said minor axis and a substantially reduced transverse dimension at said minor axis, said transverse dimension at the minor axis being sufficiently small to result in fracture of the bristle at its said minor axis to present two symmetrical flagged portions at the bristle end, the remainder of the bristle remaining integrally united at the minor axis, action of the brush against said surface causing said flagging fracture of the bristle, said flagging action being uniformly progressive along the

length of the bristle as the end thereof becomes worn.

2. A synthetic bristle adapted for use in a paint brush presenting the ends of a plurality of held bristles to the surface to be painted, the cross section of said bristle having a major longitudinal axis and a minor transverse axis, and having its maximum transverse dimension at points equidistanced from said minor axis and a substantially reduced transverse dimension at said minor axis, said transverse dimension at the minor axis being sufficiently small to result in fracture of the bristle at its said minor axis to present two flagged portions at the bristle end, the remainder of the bristle remaining integrally united at the minor axis, action of the brush against said surface causing said flagging fracture of the bristle, said flagging action being uniformly progressive along the length of the bristle as the end thereof becomes worn.

CHARLES FREDERICK HENLEY.

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