Oct. 4, 1949. V. F. DALE 2,483,627

METHOD OF PRODUCING HELICAL BRUSHES

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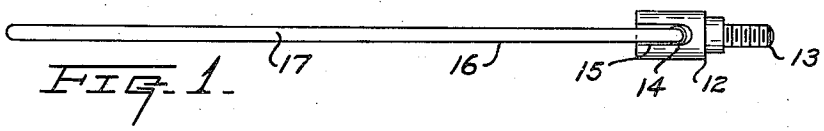

FIG. 1.

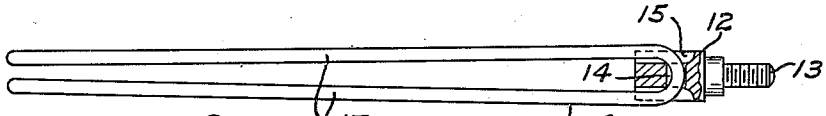

FIG. 2.

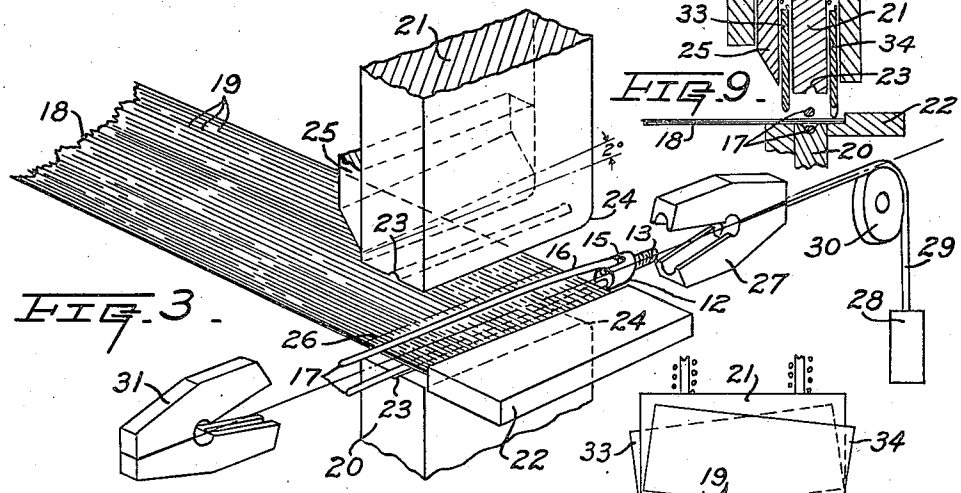

FIG. 3.

FIG. 9.

FIG. 10.

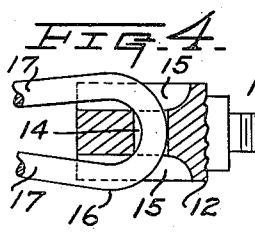

FIG. 4.

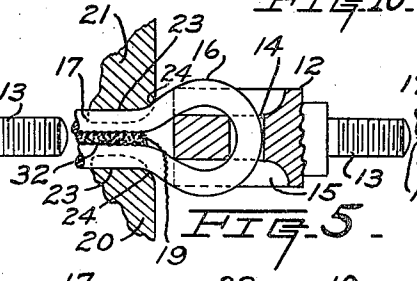

FIG. 5.

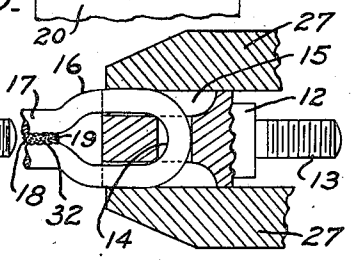

FIG. 6.

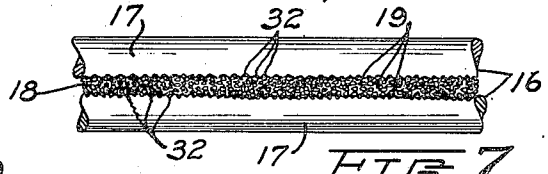

FIG. 7.

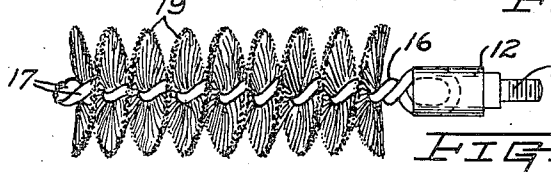

FIG. 8.

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METHOD OF PRODUCING HELICAL BRUSHES

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5 Claims. (Cl. 300—21)

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The present invention relates in general to improvements in the art of brush making, and relates more specifically to an improved twisted brush assemblage and to an improved method of producing such brushes.

The primary object of my invention is to provide an improved method of manufacturing better and more durable elongated longitudinally twisted brushes, than has heretofore been possible, in a more expeditious and simplified manner.

It has long been common commercial practice in the brush making industry, to manufacture elongated helical brushes by inserting batches of bristles in layer formation between two approximately parallel rods or wires, and by thereafter twisting the wires about each other so as to dispose the bristles in helical arrangement along and to retain them between the twisted wires. It has also heretofore been proposed to produce cylindrical gun barrel cleaning brushes of the twisted type having helical groups of metallic bristles confined between twisted metal wires, by feeding an elongated flat layer or ribbon of the metallic bristle stock between the prongs or wires each applied in U-shaped formation to a brush mounting and manipulating element or tip, and by thereafter cutting off successive sections of the bristle stock and twisting the complementary wire prongs so as to hold the bristles rather loosely in place. The bristles used in this more recent method, are ordinarily formed of relatively hard bronze while the wires are of comparatively softer metal, and in order to facilitate application of the wires to the tips, the latter are provided with transverse holes, and with longitudinal grooves extending away from the opposite ends of each hole and in which the looped end of the adjacent twisted wire finally becomes anchored.

After several years of commercial use of this prior method of manufacturing gun cleaning brushes, I have discovered that the brushes so produced were relatively defective or objectionable for several reasons. In the first place, the original method did not provide for proper staking or positive positioning of the bristles relative to the wire prongs between which they were ultimately confined, and the bristle layers would lose their regularity and would bunch up locally during the final twisting operation, and many of the individual bristles were finally improperly clamped and could be readily pulled out from between their twisted confining wires or prongs. In the second place, this prior commercial method

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did not provide for proper formation of the loops so that when the prongs were finally twisted about each other, the twisting action would not progress uniformly from both ends of each brush, and the looped ends of the twisted wires would be severely stressed and would break in actual use, due to the excessive rigidity between the wires and the corresponding tips to which they were attached. In the third place, this prior method of manufacturing gun cleaning brushes, failed to make provision for uniform initial distribution of the bristles along the wire prongs, prior to clamping and staking of bristles between the prongs; and it was also difficult with the previous method, to insure clean cutting of the hard bristles from the ribbon stock.

In order to make a gun cleaning brush of this type most practicable and durable, the bristles must be uniformly distributed, spaced, and firmly clamped in place, and sufficient wire stock should be provided at the looped end of each wire so as to insure uniform twisting of the prongs throughout their lengths without weakening the loops. The final brushes should also be of substantially identical construction and of uniform dimensions, and should be capable of being manufactured in rapid succession at relatively low cost; and none of these desirable features were adequately provided for in the previous production method above referred to.

It is therefore a more specific object of this invention to provide an improved method of producing elongated cylindrical and longitudinally twisted brushes in a manner whereby the bristles are most effectively staked or uniformly spaced, and are firmly held against subsequent displacement.

Another specific object of the present invention is to provide an improved method of producing tip mounted helically twisted brushes in a manner whereby uniform twisting of the wire prongs is made possible throughout the entire length of each brush, without undesirably stressing the connections between the tips and the bristle confining wires.

A further specific object of the present invention is to provide an improved method of producing brushes from a ribbon of bristle stock or the like, whereby the bristles of the stock ribbon are thoroughly and uniformly distributed throughout the entire area of the ribbon, before these bristles are clamped between their final retaining wires.

Still another specific object of my invention is

to provide an improved method of rapidly and effectively manufacturing twisted brushes whereby a vastly improved product results.

An additional specific object of the invention is to provide an improved method of producing brush assemblages which is simple and durable in construction, and which is moreover highly efficient in use.

Another specific object of this invention is to provide a new and useful method of constructing simple and durable twisted brushes the structure of which may be rapidly and accurately reproduced at moderate cost and in diverse sizes.

These and other specific objects and advantages of my present invention will be apparent from the following detailed description.

A clear conception of the construction of the improved brushes produced with the aid of this invention, and of the steps involved in my improved production method, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is an enlarged side elevation of a typical wire and tip assemblage used in the production of my improved brushes;

Fig. 2 is a similarly enlarged part sectional elevation of the same assemblage viewed at right angles to the plane of Fig. 1;

Fig. 3 is a diagrammatic perspective view of a simple assemblage of elements employed in carrying on the improved method, showing a wire and tip assemblage of the type disclosed in Figs. 1 and 2 initially applied to a ribbon of bristle stock;

Fig. 4 is an enlarged fragmentary sectional view illustrating the first step in the formation of the loop attachment connecting the bristle clamping wire to the manipulating tip;

Fig. 5 is a view similar to that of Fig. 4, illustrating the second step involved in the formation of the attaching loop;

Fig. 6 is another view similar to those of Figs. 4 and 5, illustrating the third loop forming step or operation;

Fig. 7 is a further enlarged fragmentary side view of a pair of cooperating wire prongs showing a group of bristles staked and clamped therebetween just prior to final twisting of the brush;

Fig. 8 is a side elevation of a completed brush made with the aid of my improved method, and illustrating the final loop connection between the bristle confining prongs and the manipulating tip;

Fig. 9 is a fragmentary transverse vertical section through a more refined and modified ribbon combing, bristle staking, and cut-off assemblage; and

Fig. 10 is a diagrammatic front elevation of the modified bristle combing and staking assemblage of Fig. 9.

While I have specifically illustrated and described my improved method as being advantageously applicable in the production of helical gun cleaning brushes each having metallic bristles clamped between the twisted prongs of a U-shaped retaining wire which is connected to a manipulating tip by means of an integral loop, it is not my desire or intension to unnecessarily restrict all feature of the invention to the production of this particular type of brushes.

In accordance with the simplest embodiment of the present invention illustrated in Figs. 1 to 8 inclusive, when producing successive brushes of the same predetermined size, I first provide a plurality of brush tips 12 each having a threaded shank 13 at one end adapted to be screwed into the end socket of an ordinary manipulating rod, and also having a transverse through opening 14 and parallel grooves 15 extending longitudinally of the tip 12 away from the shank 13 and from the opposite ends of the opening 14. These tips 12 may be rapidly and accurately produced in an ordinary screw machine; and a relatively soft wire 16 of suitable pre-selected length and of lesser diameter than that of the openings 14, should thereafter be inserted through each of these tip openings 14 and should be subsequently bent into U-shape to provide elongated laterally spaced substantially straight prongs 17, as shown in Figs. 1, 2, 3 and 4.

An elongated ribbon 18 formed of a multiplicity of relatively hard bristle wires 19 extending longitudinally of the ribbon 18, is also provided, and this ribbon 18 is adapted to be fed forwardly between a lower die 20 and an upper punch or plunger 21, against a stop plate 22, in any convenient manner, as illustrated in Fig. 3. The die 20 and the punch plunger 21 are provided with alineable staking recesses 23 extending thereacross, and preferably have curved lower side edges 24; and the plunger 21 may be reciprocated vertically toward and away from the normally fixed die 20, in any suitable manner. The lower die 20 may also be retracted from its active fixed position in any suitable manner, and a cut-off knife 25 coacts with the rear face of the plunger 21, and is movable relative to this plunger while also being cooperable with the rear upper edge of the die 20, in order to sever successive lengths of bristle stock from the forward end of the ribbon 18 along the dot-and-dash line 26 shown in Fig. 3. In order to cause the knife 25 to produce a clean draw cut, the cutting edge of the blade is preferably inclined at a slight angle of approximately 2° as illustrated in Fig. 3; and it is to be understood that the ribbon 18 must be fed forwardly by increments equal to the length of each group of bristles severed therefrom by the knife 25, as the successive brushes are completed and removed.

Located on one side of the punch and die assemblage, is a set of non-rotatable loop clamping and tip holding jaws 27, the motion of which toward the die 20 is restrained by a weight 28 suspended from a cable 29 coacting with a sheave 30; while a set of rotary prong clamping and brush twisting jaws 31 is disposed in axial alinement with the jaws 27 on the opposite side of the die 20. These jaws 27, 31 are of well known construction, and may be manipulated in any convenient and suitable manner by the operator, in order to perform their intended function at the proper moment; and while the jaw 27 becomes active to finally form the loops which connect the prongs 17 with the tips 12 before the punch 21 and die 20 have been retracted, the twisting jaws 31 only become active to perform twisting operations after the punch and die assembly has been retracted.

During normal operation of the mechanism above described, when carrying on my improved method, the previously prepared bristle stock ribbon 18 should have its extreme front end positioned over the die 20 and against the stop plate 24 as indicated in Fig. 3, whereupon a pre-assembled wire and tip assembly such as shown in Figs. 1 and 2, may be positioned with one prong 17 disposed within the recess 23 of the die 20,

and with its other prong 17 in vertical alinement with the recess 23 of the plunger 21. The initially assembled wire 16 and tip 12 will appear as shown in enlargement in Fig. 4, and after an assemblage has been thus initially applied to the end of the stock ribbon 18 and to the die 20, the plunger 21 should be lowered as illustrated in Fig. 5, so as to compress the mass of bristles 19 and to cause the outer bristles of the mass to produce spacing or staking indentations 32 in the prongs 17. This compression of the mass of bristles 19 and production of the indentations 32, will cause the rounded edge portions 24 of the die 20 and plunger 21 to produce a substantially circular loop at the closed end of the U-shaped wire 16, as clearly shown in Fig. 5; and after this rounded loop has been formed and while the prongs 17 are still firmly clamped between the punch and die, the jaws 27 should be brought into action against the rounded loop of the wire 16 as illustrated in Fig. 6. When the jaws 27 are thus brought into action and drive the loop of the wire into the grooves 15 of the tip 12, the excess stock of the loop is pushed away from the jaws 27 and provides twisting stock beyond the tip 12 as clearly shown in Fig. 6. After the final loop has been formed as depicted in Fig. 6, the jaws 31 may be caused to engage the protruding free ends of the prongs 17 and to firmly clamp these free ends together, whereupon the knife 25 may be caused to sever the group of bristles which are clamped between the prongs 17 from the stock ribbon 18. The die 20 and plunger 21 may thereafter be withdrawn and the jaw 31 may be rotated to twist the prongs 17 about each other. During this twisting operation the indentations 32 will prevent the relatively short bristles 19 from shifting longitudinally of the prongs 17, and the excess stock provided at the looped end of the wire 16 as in Fig. 6, will permit the rotating jaw 31 to gradually and uniformly twist the two prongs 17 about each other throughout their entire length, thus firmly and permanently clamping the bristles between the prongs and arranging them in helical formation as illustrated in Fig. 8. The weight 28 will permit the jaws 27 to move toward the twisting zone, and will eventually cause the wire prongs 17 to break off at the outer end of the brush as illustrated in Fig. 8, thereby completing the brush assemblage.

While the relatively simple apparatus shown in Figs. 3, 5 and 6 has been utilized commercially to produce highly satisfactory results when the stock ribbons 18 have been carefully prepared, it has been found that even with most careful initial preparation of these ribbons 18, the bristles are not uniformly distributed thereacross. In order to obviate this difficulty, I have provided a modified punch assemblage such as shown diagrammatically in Figs. 9 and 10 and comprising rear and front combing plates 33, 34 respectively carried by the punch ram 35 and which are normally forced outwardly beyond the lower end of the staking plunger 21 by compression springs 36. The rear combing plate 33 is preferably confined with its lower combing edge inclined in one direction, while the front plate has its combing edge inclined in the opposite direction; and when the ram 35 is lowered, the plates 33, 34 will resiliently engage the bristle stock 18 before the plunger 21 becomes active to clamp the bristles between the prongs 17, thereby combing or leveling the successive batches of loose bristles 19 into uniform layers before the staking operation takes place. In this manner subsequent uniform

distribution and accurate spacing of the indentations 32 during staking, is always assured, and the production of better final brushes therefore results.

From the foregoing detailed description it will be apparent that my present invention provides vastly improved final brush structures, and also provides an extremely simple and highly efficient method of commercially producing such brushes in rapid succession. The initial uniform distribution of the bristles 19 throughout the area of each batch, is important in order to produce uniform and accurate distribution of the staking indentations 32, and the formation of the indentations 32 for the purpose of spacing and staking the bristles is extremely important in order to prevent the production of brushes having loose bristles and in which the bristles can be pulled out of the clamping zone between the twisted prongs 17. With my improved method of manufacturing the brushes, the bristles 19 are in fact locked in place and cannot be pulled from between the twisted prongs 17, but since the metal used in the bristles 19 is relatively hard as compared to that used in the prongs 17, the bristles are not undesirably weakened at the zone of clamping. The formation of the loops at the closed ends of the U-shaped wire 16 so as to provide twisting stock beyond the ends of the tips 12, is also of considerable importance in providing brushes in which the twisting action proceeds from both ends of the prongs 17. By providing for such progression of the twisting action, the looped ends of the wires 16 are not excessively stressed and a stronger brush structure obviously results. By forming the loops in accordance with my improved method, some flexibility is also provided between the tips 12 and the brush proper, thus permitting the helical rows of bristles 19 to more effectively cooperate with the gun bores on which they are used. The provision of the rounded corners 24 on the die 20 and punch 21, is also relatively important because these rounded corners prevent weakening of the prongs 17 adjacent to the loops, and aid in forming the round loops which are subsequently flattened by the clamping jaws 27. The inclined disposition of the cutting edge of the knife 25 also cooperates with the combing plates 33, 34 to uniformly distribute the bristles and to produce a clean cut without dislodging the bristles 19 from their spacing indentations 32, thus making it unnecessary to subsequently trim the ends of the brush bristles in the final assemblages. The present improved method therefore obviously makes it possible to produce better brushes than were heretofore possible, in rapid succession and at relatively low cost, and all features of the invention have gone into highly successful commercial use and have proven of great utility.

While the method of staking the bristles described herein has been confined to the use of bristles 19 which are in fact harder than the prongs 17 between which the bristles are ultimately confined, this method of staking may also be utilized in connection with bristles which are in fact softer than their confining wires. The same type of apparatus may be utilized when thus staking the softer bristles, and the ultimate results are the same as when harder bristles are in fact used.

It should be understood that it is not desired to limit this invention to the exact steps of the method, or to the exact details of construction

of the brushes, herein described and shown, since various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. The method of producing helical brushes, which comprises, fixing a tip having a transverse thru-opening to a relatively soft wire by inserting a length of the wire through the tip opening and bending the wire to provide elongated prongs extending away from the tip, disposing the prongs on opposite sides of a layer of harder bristles extending transversely of the prongs, pressing the prongs against the intervening bristle layer to cause the outer bristles of the layer to form spacing indentations in the softer wire, and finally twisting the prongs about each other to clamp the bristles therebetween in helical formation.

2. The method of producing helical brushes, which comprises bending a wire into U-shape having relatively soft elongated spaced prongs, inserting a layer of harder bristles between the prongs, pressing the prongs against the intervening bristles with sufficient force to cause the outer bristles to indent the prongs, and finally twisting the prongs about each other to lock the bristles therebetween in helical formation.

3. The method of producing helical brushes, which comprises, arranging a multiplicity of relatively hard bristles in ribbon formation with the bristles disposed longitudinally of the ribbon, positioning relatively soft wires on opposite sides of and across the ribbon, pressing the wires against the ribbon with sufficient force to cause the bristles to indent the wires, severing the compressed batch of bristles from the ribbon, and twisting the wires about each other.

4. The method of producing helical brushes, which comprises, arranging a multiplicity of bristles in ribbon formation, placing wires on opposite sides of and across the ribbon, combing the ribbon adjacent to the wires so as to uniformly distribute the bristles throughout the wire lengths, pressing the wires against the combed bristles with sufficient force to cause the bristles to produce spacing indentations in the wires, severing the compressed batch of bristles from the ribbon, and twisting the wires about each other to cause the confined batch of bristles to assume a helical formation.

5. The method of producing helical brushes, which comprises, applying a tip to the medial portion of a relatively soft length of wire and bending the wire to provide elongated spaced prongs extending away from the tip, disposing the prongs on opposite sides of and across a ribbon of longitudinally extending relatively hard bristles, pressing the prongs against the ribbon with sufficient force to cause the bristles to indent the soft wire, severing the compressed batch of bristles from the ribbon, and twisting the prongs about each other to clamp the severed bristles therebetween.

VERNON F. DALE.

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