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METHOD OF MAKING FILAMENT BRISTLE BRUSHES

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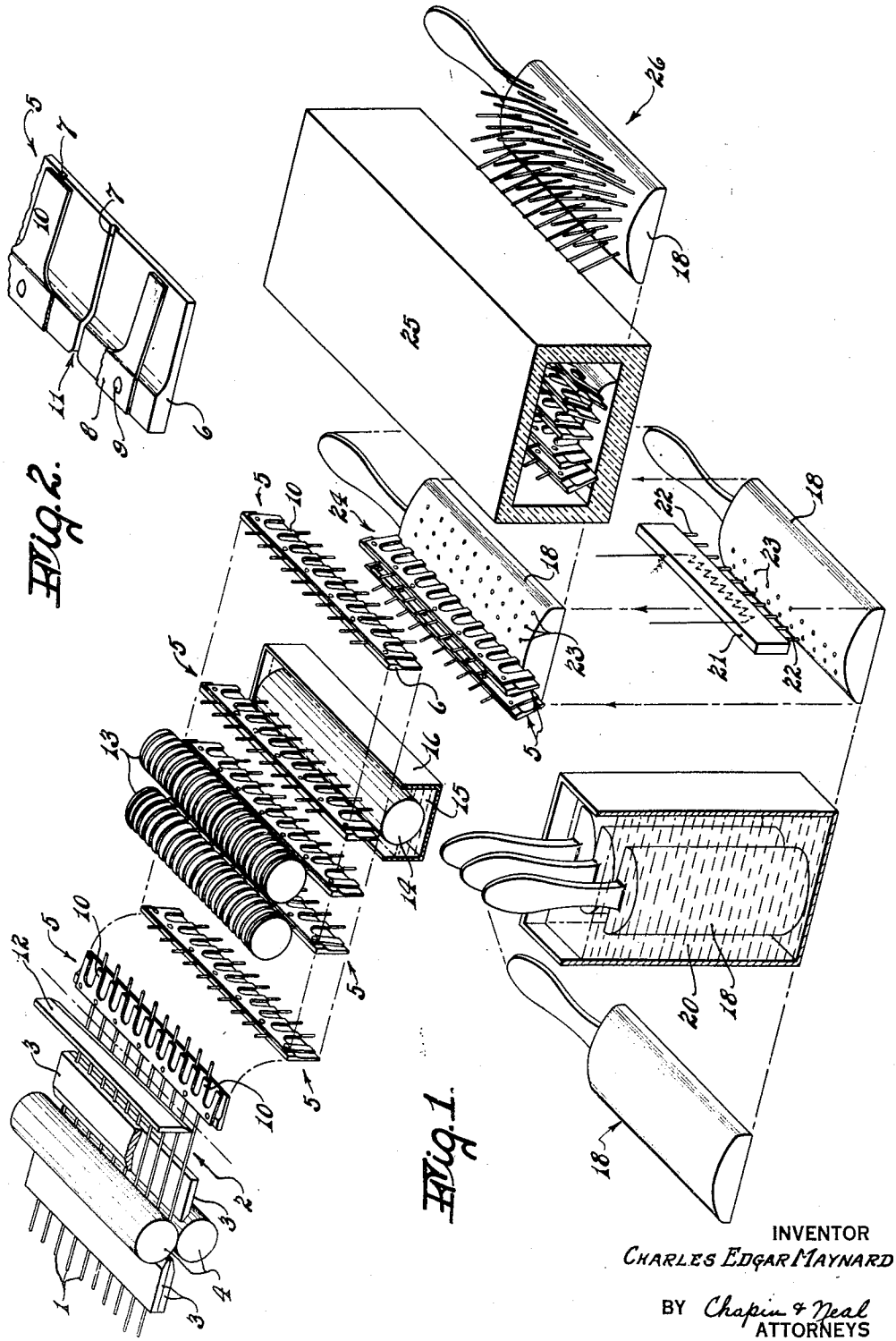


Fig. 2.

Fig. 1.

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METHOD OF MAKING FILAMENT BRISTLE BRUSHES

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This invention relates to a method of making brushes, and more particularly to a method of making brushes of the type in which single filament bristle elements are made of a thermo-plastic material and are set in spaced relation in a brush back also formed of a thermo-plastic material.

One object of the invention is to provide a better preparation of the individual bristles.

Another object is to provide a more precise and accurate arrangement of the bristles in the brush back.

A further object is to provide a better and stronger connection of the bristles in the brush back.

Another and important object is to provide a method in which the several operations are so integrated and coordinated that the method may be carried out by automatic or semi-automatic machinery, but whether carried out by machinery, or in part or wholly by hand, will provide a superior brush at the same time that economies in the manufacturing operations and in the materials used are secured.

In the accompanying drawings,

Fig. 1 is a generally perspective view in diagrammatic form illustrating the steps of the method; and

Fig. 2 is a fragmentary generally perspective view of one suitable form of aligning clamp.

According to my method a plurality of single strands or filaments 1 of a suitable thermo-plastic material, such as nylon, are drawn from reels or other suitable packages and arranged in spaced parallel relation in a common plane or "web" as generally indicated at 2 in Fig. 1. Preferably this desired arrangement of the filaments is secured by drawing and advancing the filaments between grooved guide plates 3 by one or more pairs of driven rolls 4.

The spacing of the grooves in the guide plates is that desired between the bristles making up a longitudinal row or file in the finished brush.

From the guide plates the filaments are projected into a clamp member, such as is generally indicated at 5. The clamp is held spaced from the forward guide plates 3 so that the "web" of filaments bridges the gap between the latter plates and the clamp. The function of the clamp is to fix the directly engaged and adjacent portions of the filament web in the parallel relationship established by the guiding means and to maintain this relationship through the subsequent operations. As shown the clamps 5 comprise a base member 6 formed with spaced parallel grooves 7, the spacing of which conforms to the

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spacing of the grooves in the guide plates 3. A comb shaped member 8 is riveted or otherwise secured as at 9 to the base member 6. Member 8 is formed of steel or other material having sufficient inherent spring so that the teeth 10 thereof, which overlie the grooves 7, resiliently hold the filaments in the grooves. The entrances to the grooves 7 are flared as indicated at 11 (Fig. 2) so that as the filaments are projected across the gap between the clamp 5 and the adjacent guide 3 the advancing ends of the individual filaments will enter the grooves of the clamp.

When the web of filaments has been advanced into or through the clamp 5 a predetermined distance, the forward portion of the web is severed in the space between the guide plates 3 and the clamp, as by a knife 12. The extent of the advance of the web of bristle filaments between the cutting operation determines the length of the bristles.

The fingers 10 of the clamp engage the bristles with sufficient tension to normally hold the bristles against movement in the clamp longitudinally of the bristles, but when for the purposes of manufacturing operations it is desirable to increase the extension of the bristles from one edge of the clamp or to re-align the ends of the bristles this may be done by pressing the ends of the bristles against a plane surface.

The ends of the bristles as they are left by the cutting blade have blunt cylindrical ends, the edges of which are relatively sharp and unsuitable for hair brushing purposes, as such ends tend to scratch and injure the scalp of the user. I therefor shape and finish the outer ends of the bristles by passing the bristles, still held in the clamp through or against suitable shaping means, as beneath one or more constantly rotating buffing or grinding rolls, as indicated at 13. The rolls 13 may be formed of any material suitable for the purpose. The rolls 13 are formed with closely spaced, shallow, parallel or helical grooves. As the clamp held bristles pass beneath the rapidly rotating rolls 13 the bristle ends engage in the grooves and are bent from side to side and slip from one groove of the rolls to another with the result that the edges of the bristles are ground to a rounded or oblate shape which prevents scratching or other injury to the scalp. The bristles may be passed back and forth beneath the rolls 13 one or more times as is found necessary or desirable, and the rolls or the bristles may be given a relatively transverse movement simultaneously with the passage of the bristles.

Following the finishing of the outer ends of the

bristles the inner ends of the bristles are carried, by movement of the clamp, over the surface of a roll 14 rotating in a bath of a suitable cement 15 in a tank or other container 16. The ends of the bristles pick up a small amount of liquid as they are moved through the film on the roll.

In the meantime a brush back 18 has been molded in any suitable manner from a thermoplastic composition such as methyl-methacrylate. These backs are heated as by immersion for 4 to 6 minutes in a water bath, as generally indicated at 20. The water of the bath is maintained at a temperature to soften the material of the back but below the distortion point of the material. For methyl-methacrylate a temperature of about 180° or slightly below is satisfactory. This temperature is not too critical as long as distortion does not take place.

The backs are then positioned in a suitable press, not shown, and a heated member 21 having pins 22 is pressed against the brush back to form a plurality of longitudinally arranged series of bristle receiving openings 23. It will be understood that the desired number of rows of openings may be formed by successive operations of the punch, the punch or brush being moved between operations to secure the desired spacing of the rows. The openings in adjacent rows may be staggered or offset relative to each other. A gang punch may be used if desired. The pins 22 are spaced apart in the member 21 the same distance that the grooves in guides 3 and clamp 5 are spaced. The punch pins 22 are slightly oversize, that is, their diameter is slightly larger than that of the bristles. The pins are preferably lubricated with a silicone lubricant. When the desired number of rows or series of openings have been formed in the brush back a row of clamped bristles having their inner ends coated with adhesive from roll 14 is inserted in each row of openings as indicated at 24. The brush with its complement of clamp supported bristles is then placed in an oven as indicated at 25 to set the cement. The cement preferably comprises a phenolic resin which condenses and polymerizes when subjected to the relatively low heat (about 170° F.) of the baking oven for a period of from one to two hours. The actual time necessary is that required to effect the heat transfer for setting the resin at the temperature and pressure employed. As the phenolic resin sets it bonds both to the bristle and to the surrounding material of the brush back to firmly secure and fix the bristles in place.

The brush is then removed from the oven and the clamps stripped off to leave the completed brush as shown at 26.

It will be noted that each row of bristles remains in a clamp from the time the bristles are formed by severance from the strands 1 to the time they are finally secured in the brush back. The bristles are thus held in accurately spaced parallel relation through the end finishing and cementing operations, their insertion in the punched openings, and during the setting of the cement. As a result the bristles are accurately and rapidly assembled in the brush back and are in accurate relation to each other in the finished brush, which is extremely important in this type of brush since any misalignment or displacement of one of the bristles is instantly noticeable and detracts from the appearance of the brush to a far greater extent than is the case of a brush formed with tufts each containing a plurality of bristles.

As will be obvious, after the bristles are formed in the clamps, the succeeding operations of finishing their outer ends, cementing their inner ends, heating the brush backs, punching the bristle receiving openings, inserting the clamped rows of bristles, placing the back with its clamp supported bristles in, and removing them from, the baking oven and finally stripping the clamps from the bristles, may be carried out manually by the same or successive operators using appropriate tools for each operation. Such manner of carrying out the method is commercially feasible and produces a satisfactory product.

The method however is well adapted to complete or partial automatic machine operation in view of the fact that each row of bristles is positioned and held in a clamp through all of the preparatory operations and the assembly steps. Also since the bristles are handled in rows and the bristle receiving openings are punched in rows a natural time relationship exists in that for a given brush the number of clamped bristle rows equal the number of punching operations needed to prepare the brush back for the full complement of bristles carried by the clamps. This constant control of the relatively flexible bristles by the clamps and the timed relationship of the successive operations facilitates the construction of automatically operated mechanisms of various forms for carrying out some or all the successive preparatory and assembly steps.

What I claim is:

1. In a method of making a brush the steps which comprise arranging a plurality of filaments of bristle material in spaced relation, confining the end portions of the so-arranged filaments in a unitarily movable clamp, severing the filaments rearwardly of the clamp to leave the severed portions of the filament in the form of a plurality of individual bristles of desired length and spacing within the clamp and movable therewith for handling as a unit, said severed bristles being free from each other except for the confining action of the clamp.

2. The method of making a brush which comprises arranging a plurality of filaments of bristle material in spaced relation, the spacing and arrangement of the filaments being that desired between the bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a series of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, shaping the ends of the bristles extending from one side of the clamp, applying a controlled quantity of bonding material to the bristles extending from the other side of the clamp, forming a plurality of openings in a brush back, the openings being the same in number and spacing as the bristles in the clamp, inserting the clamped bristles, one in each of said openings as a single operation, securing the bristles in said openings by the setting of the bonding material and finally removing the clamp from the bristles.

3. The method of making a brush which comprises arranging a plurality of filaments of bristle material in spaced relation, the spacing and arrangement of the filaments being that desired between the bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, shaping the

ends of the bristles extending from one side of the clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of bonding material to the bristles extending from the other side of the clamp, forming a plurality of openings in a brush back, the openings being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the clamp, inserting the clamped bristles, one in each of said openings, as a single operation, securing the bristles in said openings by the setting of the bonding material and finally removing the clamp from the bristles.

4. The method of making a brush which comprises arranging a plurality of filaments of thermo-plastic bristle material in spaced relation, the spacing and arrangement of the filaments being that desired between the bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, shaping the ends of the bristles extending from one side of the clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of bonding material to the bristles extending from the other side of the clamp, forming a brush back of thermo-plastic material, heating the brush back to a point below the distortion point, punching by means of a heated die, a plurality of openings in the brush back, the openings being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the clamp, inserting the clamped bristles, one bristle in each of said openings, as a single operation, securing the bristles in said openings by the setting of the bonding material and finally removing the clamp from the bristles.

5. The method of making a brush which comprises arranging a plurality of filaments of thermo-plastic bristle material in spaced relation, the spacing and arrangement of the filaments being that desired between the bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, shaping the ends of the bristles extending from one side of the clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of thermo-setting material to the bristles extending from the other side of the clamp, forming a brush back of thermo-plastic material, heating the brush back to a point below the distortion point, punching by means of a heated die, a plurality of openings in the brush back, the openings being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the clamp, inserting the clamped bristles, one bristle in each of said openings, as a single operation, subjecting the back and bristle assembly to heat sufficient to set the thermo-setting material but below the distortion point of the thermo-plastic material to thereby secure the bristles in place, and finally removing the clamp from the bristles.

6. The method of making a brush which comprises intermittently advancing a plurality of filaments of bristle material arranged in spaced parallel relation, the spacing of the filaments being that desired between the bristles in a file of bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, repeating the clamping and cutting operations to provide the number of clamped files needed to complete the complement of bristles desired in the finished brush, shaping the ends of the bristles extending from one side of each clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of bonding material to the ends of the bristles extending from the other side of each clamp, forming a plurality of files of openings in a brush back, the openings in each file being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the respectively clamps, the number of the files of openings equalling the number of the bristle filled clamps, inserting each clamp full of bristles in one of said files of openings, securing the bristles in said openings by the setting of the bonding material and finally removing the several clamps from the several files of bristles.

7. The method of making a brush which comprises intermittently advancing a plurality of filaments of thermo-plastic bristle material arranged in spaced parallel relation, the spacing of the filaments being that desired between the bristles in a file of bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending from opposite sides of the clamp, repeating the clamping and cutting operations to provide the number of clamped files needed to complete the complement of bristles desired in the finished brush, shaping the ends of the bristles extending from one side of each clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of bonding material to the ends of the bristles extending from the other side of each clamp, forming a brush back of thermo-plastic material, heating the brush back to a point below the distortion point, punching by means of a heated die a plurality of files of openings in the brush back, the openings in each file being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the respective clamps, the number of the files of openings equalling the number of the bristle filled clamps, inserting each clamp full of bristles in one of said files of openings, securing the bristles in said openings by the setting of the bonding material and finally removing the several clamps from the several files of bristles.

8. The method of making a brush which comprises intermittently advancing a plurality of filaments of thermo-plastic bristle material arranged in spaced parallel relation, the spacing of the filaments being that desired between the bristles in a file of bristles in the completed brush, confining the end portions of the filaments in a clamp, severing the so-clamped portions from the filaments to form a file of bristles of desired length with the ends of the bristles extending

from opposite sides of the clamp, repeating the clamping and cutting operations to provide the number of clamped files needed to complete the complement of bristles desired in the finished brush, shaping the ends of the bristles extending from one side of each clamp by bringing said ends of the bristles into flexible sidewise engagement with an abrading surface, applying a controlled quantity of thermo-setting material to the ends of the bristles extending from the other side of each clamp, forming a brush back of thermo-plastic material, heating the brush back to a point below the distortion point, punching by means of a heated die a plurality of files of openings in the brush back, the openings in each file being the same in number and spaced from each other the same distance as the number and spacing of the bristles in the respective clamps, the number of the files of openings equalling the number of the bristle filled clamps, inserting each clamp full of bristles in one of said files of openings, subjecting the back and bristle assembly to heat sufficient to set the thermo-setting material but below the distortion point of the thermo-plastic materials to thereby secure the bristles in place and finally removing the several clamps from the several files of bristles.

9. A clamp for use in making brushes which comprises an elongated base member having spaced transverse grooves, a thin plate member superposed on the base member and secured along one edge to one edge of the base member, said plate member including spaced spring members extending one over each groove, the entrances of the grooves along that edge to which the plate member is attached being flared to facilitate the entrance of filament bristle material into the grooves.

10. The method of making a brush which comprises arranging a plurality of bristles in individually spaced parallel relation in a plurality of file formations, applying independent restraining means to each file formation to maintain the spacing and parallelism of the bristles in each file while permitting a restrained axial movement of the bristles relative to the restraining means, forming a brush back with file-wise extending openings, positioning the ends of the several independently restrained files of bristles in said openings, permanently securing the bristles in

said openings and thereafter removing the bristles axially from the restraining means.

11. The method of making a brush which comprises independently supporting each of a plurality of files of bristles in respective clamps, the bristles in each file being positively held in spaced relation by the clamps and frictionally held by the clamps against axial movement, forming a brush back with a plurality of file receiving openings, positioning the ends of the several files of clamped bristles in said openings, permanently securing the bristle ends in said openings and thereafter stripping the clamps axially from the free ends of the secured bristles.

12. The method of making a brush which comprises independently supporting each of a plurality of files of bristles in respective clamps, the bristles in each file being held in predetermined spaced relation by the clamps, forming a brush back with a plurality of file receiving openings, positioning the ends of the several files of clamped bristles in said openings, permanently securing the bristle ends in said openings and thereafter removing the clamps from the bristles.

13. The method of making a brush which comprises arranging a plurality of filaments of bristle material in spaced relation, confining the end portions of the filaments in a clamp, severing the so-clamped portions of the filaments to form a file of bristles within the clamp with one end of the bristles extending therefrom, repeating said steps to provide a plurality of individually clamped files of bristles, forming a brush back with a plurality of file-wise extending openings, inserting the extending ends of a clamped file of bristle file-wise in each of said openings to provide the full bristle complement of the brush, securing the bristle ends in said openings and thereafter stripping the several clamps from the several files of bristles.

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