Jan. 5, 1971 L. F. KUTIK ET AL 3,551,936

BRISTLED PRODUCT

Filed Aug. 7, 1968 2 Sheets-Sheet 1

FIG. 1

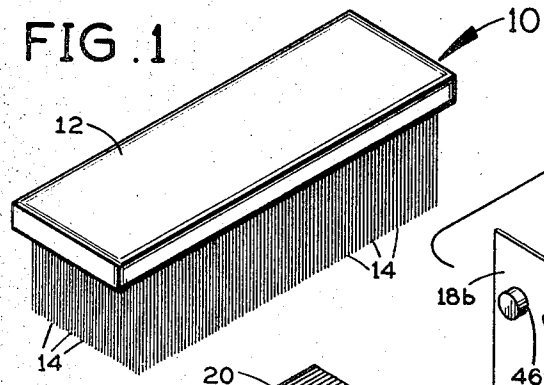
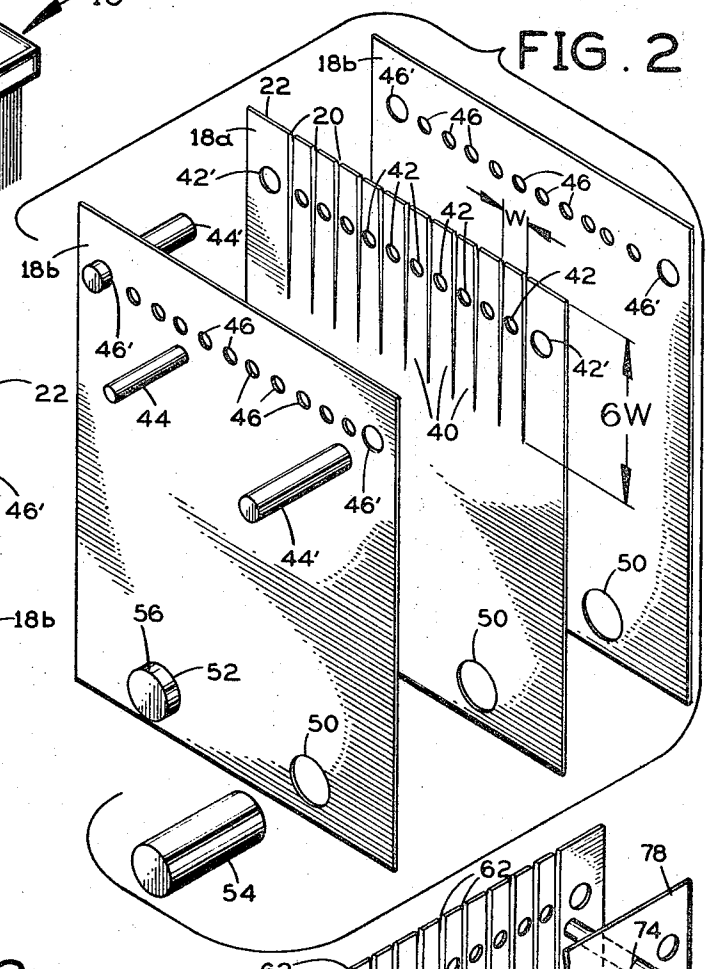


FIG. 2



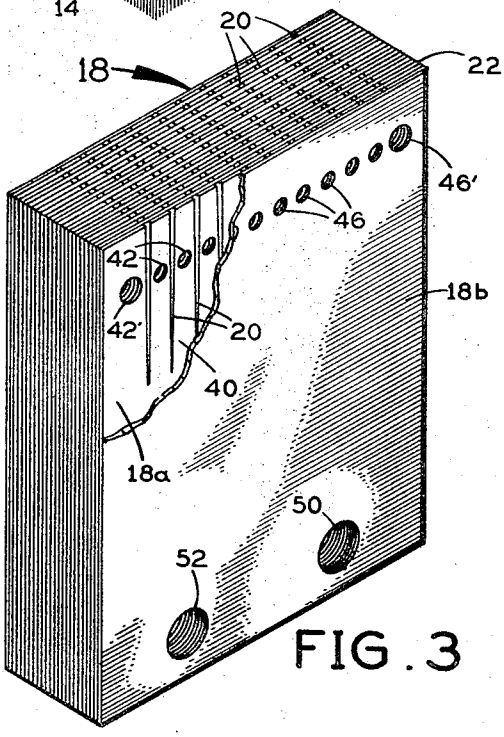


FIG. 3

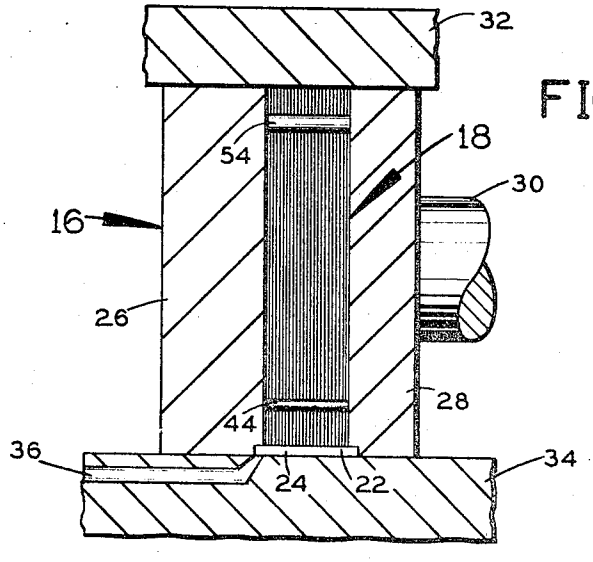


FIG. 4

FIG. 5

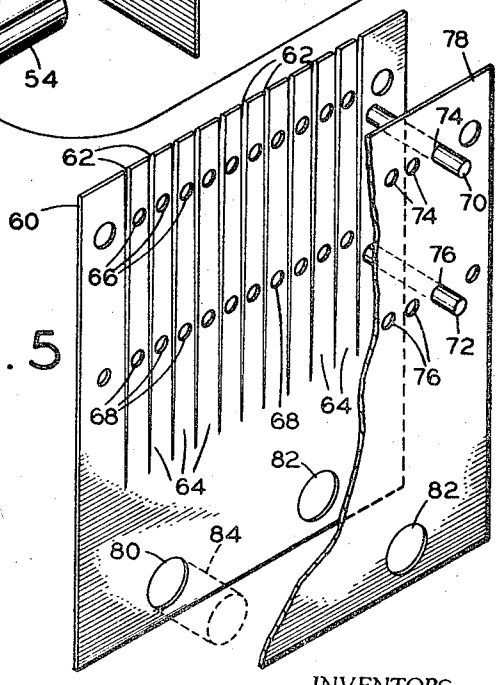


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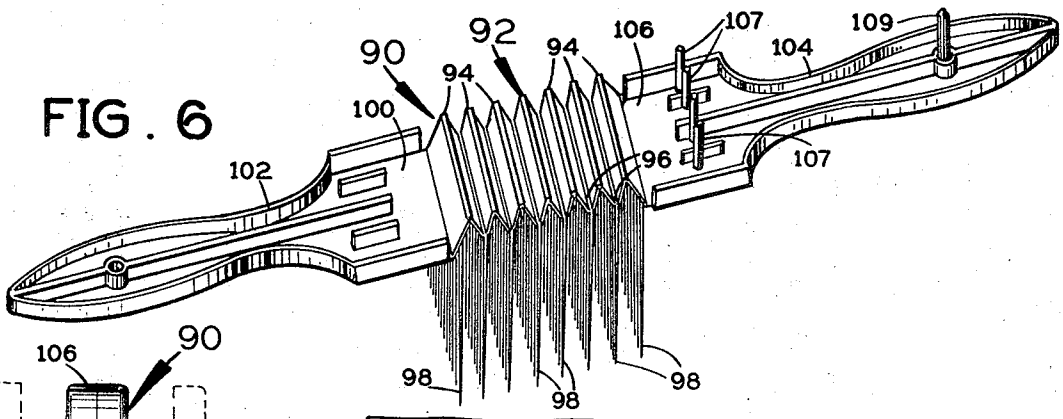
FIG. 6



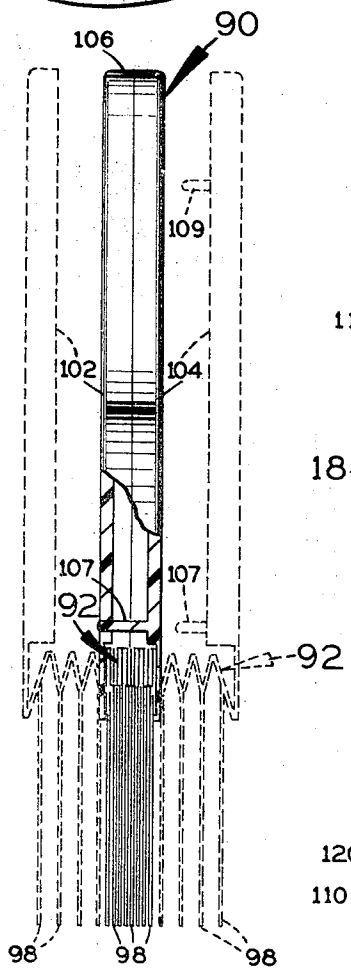


FIG. 7

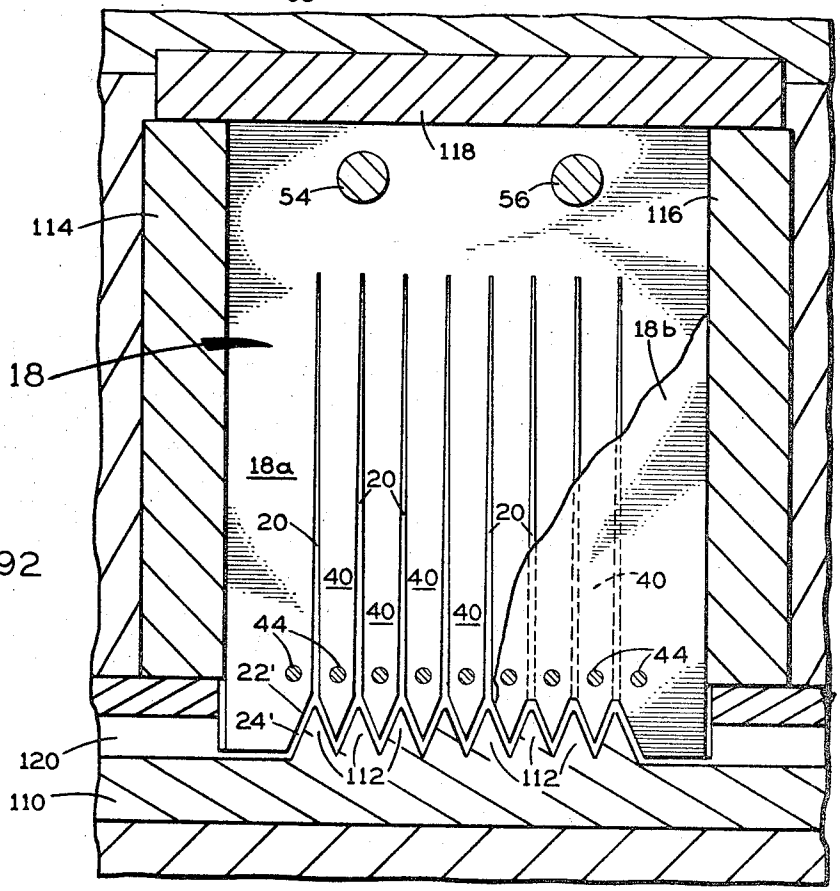


FIG. 8

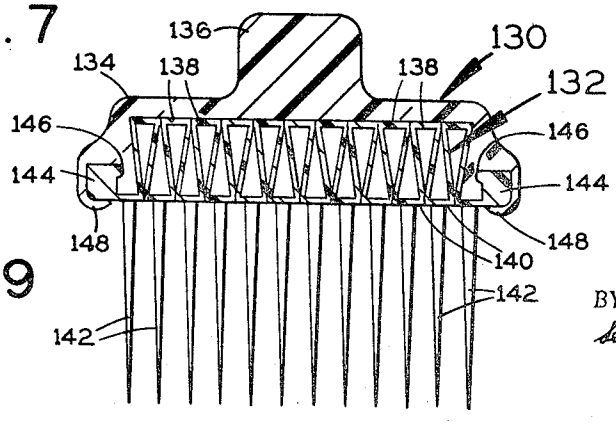


FIG. 9

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3,551,936

BRISTLED PRODUCT

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Int. Cl. A46b 1/00, 5/02
U.S. Cl. 15—187 7 Claims

ABSTRACT OF THE DISCLOSURE

A bristled product including a backing portion made of plastic material and plastic bristles integral therewith. The backing portion is in a zig-zag or accordian or pleated configuration such that it may be collapsed to position the bristles closer together than in the extended condition.

BACKGROUND OF THE INVENTION

This invention is related to the inventions described and claimed in the previous U.S. Pat. Nos. Re. 26,403 and 3,357,058 of Louis F. Kutik which respectively cover a bristled product and method and apparatus for making such bristled product. In the earlier of these patents, a brush is disclosed in which the bristles are integral with the backing portion of the brush, and the bristles of each adjacent row are staggered with respect to the other bristles and have flat sides and sharp edges, such being particularly desirable in toothbrushes for good flexing and cleaning action. The injection molding of such brushes is covered in the later patent, and this involves the use of a mold of relatively thin laminations with the laminations having slots cut entirely therethrough in the shape of the bristles to be formed, the slots communicating with a cavity for forming the backing portion of the brush.

In some cases, it is desirable to make brushes having relatively long bristles, examples of such brushes being paint brushes, brooms, industrial brushes, utility brushes and others. It has been found as a practical matter that if the slots in the laminations are more than about six times longer than the center-to-center spacing between slots, there is an excessive tendency for the material of the laminations or plates between slots to bend sidewise and thus narrow a slot. This interferes with the proper molding of the bristles, and can also interfere with removal of bristles from the slots.

It has also been found that in some cases it is desirable to increase the density of the bristles beyond that obtained with the bristled product in the condition it has when it is removed from the mold. Thus, with a given spacing of slots in a plate or lamination of the mold, a given distance between rows of bristles will be attained. For some brushes, such as paint brushes, it is desirable to have the rows of bristles closer together than is obtained by normal spacing of the slots, and this is particularly true where the brush is to have long bristles.

SUMMARY OF THE INVENTION

The present invention alows the use of slotted laminations or plates for molding bristled products with long bristles by providing means for bracing the material between slots to prevent sidewise deflection thereof during the molding process. In a preferred embodiment, the bracing means consists of pins which extend through openings in the plates, there being at least one opening between each adjacent pair of slots. The longer the slots, the more openings, and pins are provided between each adjacent pair of slots. The use of such pins requires a relatively great lateral separation between each adjacent pair of slots, and since the slots of alternate plates are

aligned, the rows of bristles in the product formed by the mold will also be widely separated. The invention provides a way of reducing the separation between these rows of bristles, and this is accomplished by molding the backing of the product in a zig-zag or accordian or collapsible configuration such that it may be collapsed to position the bristles closer together than in the extended condition of the backing portion. The invention includes the product with the zig-zag backing. The product may include a holder retaining the backing portion in the collapsed condition and providing a handle to be grasped in manipulating the product where it is used as a brush or broom.

An object of the invention is to provide a bristled product including a plastic backing portion and plastic bristles integral therewith wherein the backing portions can be collapsed to increase the density of the bristles.

Another object of the invention is to provide a bristled product having a backing portion and integral bristles wherein the backing portion has a pleated configuration facilitating collapsing or folding thereof.

A further object of the invention is to provide a pleated backing for a bristled product having peaks and valleys with rows of bristles located respectively at the valleys and with the peaks between the rows of bristles so that the backing can be collapsed to position the rows of bristles closer together than in the extended condition of the backing portion.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

On the drawings:

FIG. 1 is a perspective view of a bristle brush of the type having a backing portion with relatively long bristles integral with the backing portion;

FIG. 2 is an exploded perspective view showing three of a plurality of plates or laminations which are assembled together with pins to form a mold for molding the brush of FIG. 1;

FIG. 3 is a perspective view of a large number of laminations as shown in FIG. 2 assembled together;

FIG. 4 is a fragmentary sectional view of a mold utilizing the laminations of FIGS. 2 and 3;

FIG. 5 is a perspective view showing a modification of the plates or laminations of FIG. 2 to utilize longer slots, the material between slots being braced by two pins instead of one as in FIG. 2;

FIG. 6 is a perspective view of a paint brush in a partially disassembled conditon showing a pleated backing with relatively long bristles integral therewith;

FIG. 7 is an elevational view, partly in section, showing the paint brush of FIG. 6 in assembled condition, and also showing in dashed lines the condition of the parts of the brush just prior to assembly;

FIG. 8 is a fragmentary sectional view of a mold in which the pleated backing and bristles for the brush of FIGS. 6 and 7 can be molded; and

FIG. 9 is a cross-sectional view of a collapsed backing portion with integral bristles held in place by a holder having a handle thereon.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phaseology or terminology employed herein is for the purpose of description and not of limitation.

As shown on the drawings:

A brush **10** is shown in FIG. 1, and includes a plastic backing portion or head **12** and a plurality of elongated plastic bristles **14** integral with the head **12** and projecting from one side thereof. This brush is of the type described and claimed in the aforementioned Pat. No. 3,214,777 and so will not be described in detail herein. It is worth mentioning, however, that the bristles **14** may be arranged in parallel rows, and that the bristles in adjoining rows may either be aligned with each other or may offset from each other depending upon the type of mold which is used to fabricate the brush.

FIGS. 2, 3 and 4 illustrate a mold assembly in accordance with the invention which may be used in fabricating the brush **10** of FIG. 1.

The mold **16** (FIG. 4) includes a plurality of laminations or plates **18** which are specifically designed to facilitate the injection molding of relatively long bristles **14** on the backing portion **12** of the brush. Laminations **18** are of two types, those designated **18***a* being provided with slots **20** and those designated **18***b* having no slots therein. Slots **20** are cut, ground or otherwise formed entirely through plate **18***a* and have the shape and dimensions desired for the bristles **14**. The slots **20** open at the top edge **22** of plate **18***a*, and when all of the plates **18** are assembled in a mold **16** and as in FIG. 4, the open ends **20** at edge **22** communicate with a cavity **24** having the shape and dimensions of the backing portion **12** of the brush. It may be that the unslotted plates **18***b* on opposite sides of plate **18***a* close the slots **20** at the sides thereof so that the slots are closed on all sides except at the open ends which communicate with cavity **24**.

In the mold **16** of FIG. 4, the plates **18** are clamped together laterally by blocks **26** and **28**, and holding force may be applied to one of the blocks such as **28** by suitable clamping or holding means. In the illustrated embodiment, a hydraulic or pneumatic cylinder device is employed which has a piston **30** for applying force to the block **28** to hold the plates **18** together. It will be understood, however, that other holding means can be employed, and a wedging device for this purpose is described and claimed in applicant's Pat. No. 3,357,058. Additional blocks **32** and **34** are provided on the top and bottom respectively of the mold **16**, and the block **34** cooperates with blocks **26** and **28** and plates **18** to define the cavity **24** for the backing portion of the brush. Similar blocks are provided at the front and rear ends of the mold.

Plasticized material is introduced into the cavity **24** through a passage **36**, and this plasticized material is injected under pressure into cavity **24** and the slots **20** of the slotted plates **18***a*. When the plastic has solidified, the mold is separated and the brush is removed from cavity **24** and slots **20**. The structure for separating the mold and for removing the brush from the mold may be of the type illustrated in FIGS. 18 and 19 of applicant's prior Pat. No. 3,357,058.

It has been found that when the slots **20** are made more than about six times greater in length than the width W which is the center-to-center spacing between the slots **20**, there is a tendency for the material between the slots, such as at **40**, to bend sideways as a result of an injection pressure. Thus, a slot at one side of the material **40** will be narrowed and a slot at the other side of the material **40** will be enlarged. This not only makes the bristles formed by the slots non-uniform in size, but it may also interfere with the removal of the bristles from the slots. Specifically, those slots which are narrowed as a result of the deflection of the material **40** might tend to bind a bristle formed therein, and thus make it difficult to remove a bristle from the slot.

In accordance with the invention, this problem is solved by bracing the material **40** between each adjacent pair of slots **20** to prevent sidewise displacement of the material **40**. In the illustrated embodiment, this bracing is accomplished by providing at least one opening **42** through

the material **40** between each adjacent pair of slots, and by providing pins **44** which extend through the openings **42** and engage the material **40** to prevent it from being deflected. The pins **44** fit snugly in the openings **42** so that they contact material **40** and hold it against displacement. Of course, openings **46** are also provided in the plates **18***b* on opposite sides of plate **18***a*, the openings **46** being in alignment with respect to the openings **42** in plate **18***a*. Thus, each pin **44** is inserted through an aligned set of openings in the plates **18***a* and **18***b*. Although only three plates are shown in FIG. 2, it will be readily understood that openings **42** and **46** are provided in all of the plates **18** included in the assembly of plates shown in FIGS. 3 and 4. Somewhat larger openings **46'** and **42'** are provided in the material at the ends of the plates **18***a* and **18***b* as shown, and the pins **44'** fitted in these openings are also somewhat larger than pins **44**. It will be understood, however, that this difference in size is not essential.

At the ends of the plates **18***a* and **18***b* opposite those where the openings **42** and **46** are provided, additional openings **50** and **52** are formed in all plates to receive guide pins **54** and **56** for retaining the respective ends of the plates in alignment. The pins **54** and **56** may extend only through the thickness of the plate assembly as shown in FIG. 4, or they may extend through blocks **26** and **28** if desired.

The longer the bristle defining slots, the more tendency there is for the molding pressure to deflect the material btween the slots. FIG. 5 shows an embodiment in which a plate **60** is provided with slots **62** which are substantially longer than the slots **20** of FIG. 2, although the slots **62** are in all other respects similar to the slots **20**. It is apparent with slots as long as the slots **62**, the material **64** between each adjacent pair of slots is comparatively weak and may be very easily deflected if their is a substantial imbalance of pressure in the two slots on opposite sides of the material **64**. Accordingly, to brace the material **64** properly, two openings **66** and **68** are provided in the material **64** between each adjacent pair of slots, and two pins **70** and **72** are received snugly by the openings **66** and **68**. Of course, openings **74** and **76** are provided in the plates **78** on opposite sides of plate **60** in alignment with openings **66** and **68** respectively in order to receive the pins **70** and **72**. It will be apparent that the pins **70** and **72** extend through a whole series of plates identical to the plates **60** and **78** shown in FIG. 5. Guide openings **80** and **82** and guide pins **84** are also provided.

In order to receive the pins **44** in the embodiment of FIGS. 2 through 4 or the pins **70** and **72** in the embodiment of FIG. 5, it is apparent that the material between slots must be wide enough to accommodate the pins. Since this width might be greater than is desired for the spacing between rows of bristles in some brushes, it is desirable to provide some way of increasing the density of the bristles. This has been accomplished in the embodiment of FIGS. 6, 7 and 8 by providing a brush which has a collapsible backing portion, as will now be described.

FIGS. 6 and 7 illustrate a brush **90** which has a plastic backing portion **92** with a zig-zag or pleated configuration allowing it to be collapsed. The backing portion **92** includes a series of peaks **94** and a series of valleys **96** with rows of bristles **98** being provided respectively on the valleys **96** of the backing portion. The peaks **94** are located between the rows **98** of bristles. The backing portion **92** may be molded integrally at **100** with holder members **102** and **104**, and the holder members **102** and **104** may be joined together in the manner illustrated in FIG. 7 to form a holder for the brush, the holder providing a handle **106** to be grasped in manipulating the brush. Alignment pins **107** and **109** are provided on member **104** to be received in openings in member **102** when these members are assembled as in FIG. 7. In the completed brush, the holder members **102**, **104** cooperably define a socket receiving the compressed backing portion **92** therein.

In FIG. 7, the backing portion **92** and the holder members **102** and **104** are shown in dashed lines in an extended condition prior to assembly to form the complete brush. When the holder members **102** and **106** are brought together, the pleated backing portion **92** collapses or folds to the configuration shown in solid lines in FIG. 7, thus positioning the rows of bristles **98** closer together than when the backing portion is in its extended condition.

FIG. 8 illustrates the method and apparatus for molding the backing portion **92** and rows **98** of bristles shown in FIGS. 6 and 7. Since this apparatus is very similar to that shown in FIG. 2, like reference numerals will be used for like parts. A plurality of plates **18** are provided and as indicated in FIG. 2, there are slotted plates **18***a* and unslotted plates **18***b* on opposite sides of plates **18***a*. Only the slotted plates **18***a* are shown in FIG. 8. The bristle defining slots **20** open at their ends into a zig-zag or accordian-fold shaped cavity **24'** which is defined by the edge **22'** of the plate **18***a* and a block **110** which is also part of the mold. The edges **22'** of the plates **18** have a zig-zag configuration desired for one surface of the backing portion **92**, and the block **110** also has a zig-zag configuration at projections **112** matching that of the edges **22'** but spaced from those edges so as to define the cavity **24'**. The pins **44** for bracing the material **40** between each adjacent pair of slots are apparent, as are the pins **54** and **56** for aligning the plates **18**.

The mold includes side blocks **114** and **116**, an upper block **118**, and suitable surrounding structure for retaining the plates **18** in the proper positions. Clamping blocks similar to blocks **26** and **28** of FIG. 4, and a holding device similar to piston **30** may also be used.

In molding the backing portions **92** and the bristles **98**, plasticized plastic material is injected under pressure through a passageway **120** into the backing-defining cavity **24'** and from there into the slots **20**. After the plastic has solidified, the mold is separated and the bristled product is removed from the mold. The backing portion **92** formed by the mold is then collapsed and held in collapsed condition as with holder members **102** and **104** in the manner described previously.

FIG. 9 shows an embodiment similar to that of FIGS. 6 and 7. In this embodiment, the bristled product **130** includes a plastic backing portion **132** of a pleated configuration held in a collapsed or compressed condition by a holder **134** having a handle **136** which can be grasped in manipulating the product. The backing portion **132** is initially molded to have a pleated configuration like the backing portion **92** shown in FIG. 6. Thus, backing portion **132** has peaks **128** and valleys **140**, with the rows **142** of bristles projecting from the valleys **140**. The peaks **138** are located between the valleys **140**. Thus, when the backing portion **130** is compressed and collapsed as shown in FIG. 9, the valleys **140** contact each other and the peaks **138** also contact each other to give a certain amount of rigidity to the backing portion, even though the peaks and valeys are flat in this embodiment. The backing portion **132** includes upturned sides **144** which are received in slots at the sides of the holder **134** and portion **144** have lips **146** which, together with the fingers **148**, secure the backing portion **132** in place in the receiving socket defined by the holder **134** and the fingers **148**.

Thus, the invention provides bristled products which facilitates the provision of long bristles on the products, and also provides a way of increasing the density of the bristles, even though the bristles are integral with the backing portion of the product. The structure involved in the product is not complicated and all that is required to increase the density of the bristles is to collapse or compress the backing portion of the product. The method and apparatus for molding the product have been provided with efficient means for preventing sidewise deflections of portions of the bristle-defining plates. This allows longer bristles to be molded on the product. The structure for preventing such deflection is compatible with the molding of the collapsible backing portion, as has been described.

Having thus described our invention, we claim:

1. In a bristled product of the type including a backing portion having a plurality of bristles projecting from one side thereof, the improvement wherein said backing portion has a collapsed condition and an extended condition and in the extended condition thereof said backing portion has a pleated configuration and includes a plurality of valleys at which rows of bristles are respectively located and a plurality of peaks located respectively between adjacent ones of said valleys, said backing portion being collapsible into said collapsed condition wherein said rows of bristles are closer together than in said extended condition of said backing portion.

2. The bristled product as claimed in claim **1** including a holder for said backing portion holding the same in said collapsed condition.

3. The bristled product as claimed in claim **2** in which said holder includes a handle to be grasped manually to permit manipulation of said product.

4. The bristled product as claimed in claim **2** in which with said holder holding said backing portion in said collapsed condition thereof, said valleys of said backing portion are in contacting relation each with the valleys at the side or sides thereof.

5. In a bristled product of the type including a backing portion made of plastic material and a plurality of plastic bristles integral with said backing portion, the improvements wherein said backing portion has a pleated configuration and includes a plurality of peaks and valleys with rows of bristles located at least at said valleys, said backing portion having a collapsed condition wherein said rows of bristles are respectively adjacent to each other, and handle means having a retaining socket receiving the compressed backing portion therein.

6. In a product as defined in claim **5**, the further improvement of said handle means being integral with said backing portion and comprising separate sections secured together to define said socket.

7. In a product as defined in claim **5**, the further improvements of said handle means being separate from said backing portion and means securing said backing means in said retaining socket.

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U.S. Cl. X.R.

15—143, 146, 203; 18—42; 264—243