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2,878,069

PROCESS FOR MANUFACTURING BRUSHES

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FIG. 1a

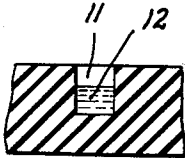


FIG. 1b

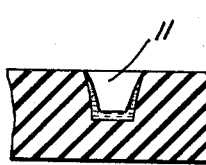


FIG. 1c

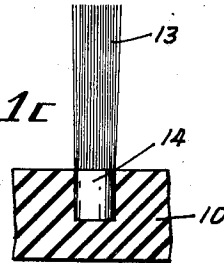


FIG. 2a

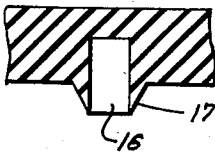


FIG. 2b

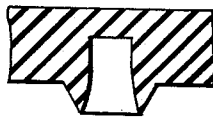


FIG. 2c

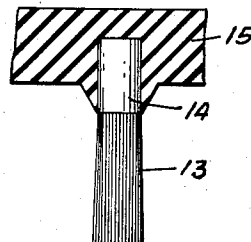


FIG. 3

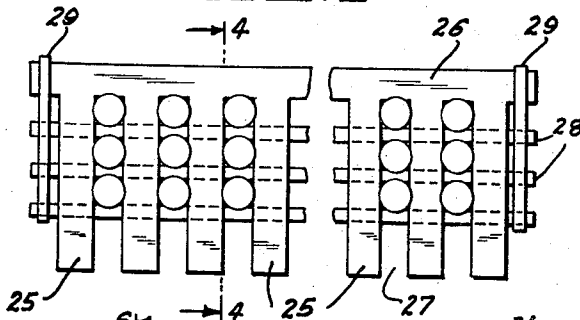


FIG. 4

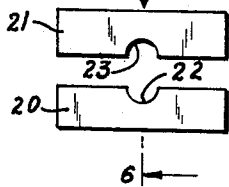
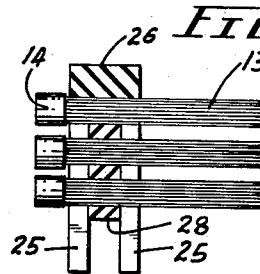


FIG. 5

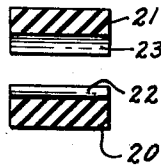


FIG. 6

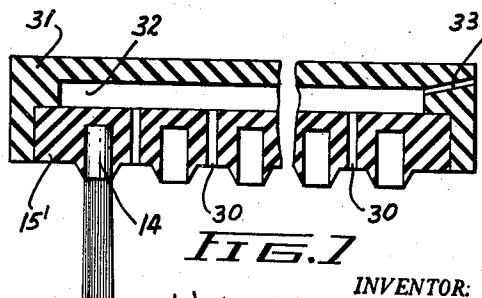


FIG. 7

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PROCESS FOR MANUFACTURING BRUSHES

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12 Claims. (Cl. 300—21)

The present invention relates to a process for manufacturing brushes.

Known brushes as well as processes and apparatus for manufacturing the same have several disadvantages. Thus, it is exceedingly difficult to provide a brush whose tufts are carried by a relatively soft, yieldable and bendable member and at the same time are reliably secured to such a member. With known brushes the tufts inevitably become loose and fall out after a relatively short period of time, and furthermore the processes used in manufacturing such known brushes are very costly and time-consuming and require very special, expensive apparatus for interconnecting the parts of the brush as well as for heating elements and properly positioning the same during the manufacture of the brush.

One of the objects of the present invention is to provide a brush where the tufts are securely connected to a bendable, relatively soft, tuft-carrying member in such a way that the tufts will not loosen even though the brush is flexed sharply and repeatedly and even though the brush is used with liquids for a long period of time.

Another object of the present invention is to provide a brush where the tufts are secured by forces in addition to those resulting from adhesion.

A further object of the present invention is to provide a process capable of causing the recesses which receive the tufts to expand temporarily so that the tufts can be inserted very easily into these recesses.

An additional object of the present invention is to provide a process and tuft-carrying member which causes the entrance ends of the recesses which receive the tufts to flare outwardly when the recesses expand so as to prevent scraping of adhesive from the tufts when the latter are inserted into the recesses.

Yet another object of the present invention is to provide a washing brush between whose tufts a liquid may pass through openings of the tuft-carrying member, this washing brush having its tufts secured in a very reliable manner which prevents the tufts from becoming loose even after repeated flexing of the brush and use of the same with liquids over a long period of time.

Also, it is an object of the present invention to provide a process capable of being performed in its entirety at room temperature and enabling a brush to be manufactured in an exceedingly simple, inexpensive, quick manner which requires no skill to provide a brush of very superior characteristics and which does not in any way endanger the personnel with fumes or the like from chemicals used in the process.

With the above objects in view, the present invention mainly consists of a brush wherein a resilient member is formed with recesses into which a plurality of tufts respectively extend, these tufts being resiliently clamped by the resilient member. The brush of the invention is manufactured according to a process which includes placing against the surface of recesses of a resilient elastic member a swelling agent which causes said recesses to

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expand while said swelling agent is in contact with the resilient elastic member, the recesses contracting to their normal size upon removal of the swelling agent, e. g. by evaporation thereof, and while the recesses are in their expanded condition tufts are respectively inserted into the same, these tufts having in the recesses a cross-section at least as great as that of said recesses when they are not expanded. A suitable adhesive joins the tufts to the resilient member and is located on the ends of the tufts which are inserted into the recesses. The tuft ends which are located in the recesses may have a cross-section greater than that of the unexpanded recesses so that when the latter resume their original shape the tufts are resiliently gripped by the resilient member as well as being secured thereto by adhesion. The expansion of the recesses is particularly desirable because the tufts are then very easily inserted, and according to the present invention the resilient body may be provided with annular extensions of each recess of a tapered cross-section which causes the entrance ends of the recesses to flare outwardly when the recesses expand. With this arrangement adhesive on the ends of the tufts will not be scraped from the same during insertion of the tufts into the recess.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figs. 1a-1c are fragmentary, sectional, elevational views illustrating one embodiment of a process and article according to the present invention;

Figs. 2a-2c are fragmentary, sectional, elevational views illustrating another embodiment of a process and article according to the present invention;

Fig. 3 is a partly broken away, plan view of part of the apparatus used in the manufacture of the article of the present invention;

Fig. 4 is a sectional view taken along lines 4-4 of Fig. 3 in the direction of the arrows;

Fig. 5 is an elevational diagrammatic view of a pair of dies used in the manufacture of the article of the present invention;

Fig. 6 is a sectional view taken along lines 6-6 of Fig. 5 in the direction of the arrows; and

Fig. 7 is a sectional elevational view of a washing brush according to the present invention.

Referring now to the drawings, Figs. 1a-1c show a resilient elastic member 10, e. g. of vulcanized rubber formed with a plurality of recesses 11 in one face thereof, these recesses 11 having the size shown in Fig. 1a when the member 10 is unstressed. In the example shown in Figs. 1a-1c, an adhesive solution 12 of an adhesive dissolved in a solvent therefor, which solvent is also a swelling agent for the resilient elastic member is poured into the recesses 11, and before the swelling agent evaporates it is absorbed by the material at the faces of the recesses 11 and covers all parts of the recesses by capillary action and by rising of the vapors as they evaporate. As a result the recesses 11 expand temporarily to the size shown in Fig. 1b, and the adhesive medium remains in the recesses. While the recesses 11 are in their expanded condition, a tuft 13 is placed in each of these recesses, and the end portion of the tuft which enters each recess is embedded in a body 14 which is caused to adhere to the member 10 by the adhesive medium remaining after the swelling agent-solvent evaporates. After such evaporation the recesses 11 contract to their original size and the structure shown in Fig. 1c results.

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The part 14 of each tuft 13 has a cross-sectional area at least as great as that of the recesses 11 when the member 10 is unstressed as shown in Fig. 1a. When the part 14 of each tuft is equal in cross-sectional area to the cross-sectional area of the recesses 11 of the unstressed member 10, then the tufts are joined to the member 10 by the adhesive medium, and the expansion of the recesses is of great value because the tufts are very easily inserted into the recesses while they are temporarily expanded. On the other hand, according to the present invention, the end portions 14 of the tufts 13 may have a cross-sectional area greater than that of the recesses 11 of the unstressed member 10 but smaller than that of the expanded recesses 11, and in this case the tufts are still very easily inserted into the recesses, and at the same time the tufts are connected to the member 10 not only by adhesion but also by the resilient gripping action applied by the member 10 to the tufts when the member 10 returns toward its original configuration during contraction of the expanded recesses. The recesses may expand to a size approximately 10% greater than their original size.

According to the embodiment of the present invention illustrated in Figs. 2a-2c, an elastic resilient member 15 is formed with recesses 16 which have the size and configuration shown in Fig. 2a when the member 15 is unstressed. It will be noted that the member 15 includes a plurality of annular projections 17 respectively forming extensions of the recesses 16 and having the tapered, somewhat conical cross-section indicated in Fig. 2a, these projections being integral with the member 15. The member 15 is immersed in a swelling agent which causes the recesses 16 to swell to the size indicated in Fig. 2b, and it will be noted that the tapering of the annular projections 17 cause these annular projections to flare outwardly as a result of the swelling, as indicated in Fig. 2b. Thus the annular projections reduce the time required for expansion. Then tufts 13 whose ends are embedded in bodies 14 are, after bodies 14 are dipped in a suitable adhesive solution, inserted into the temporarily expanded recesses 16, and because of the outward flaring of the annular projections 17, there is no danger of any of the adhesive medium becoming scraped from the tuft during insertion thereof into the recess. These recesses then automatically contract to their original size due to evaporation of the swelling agent, and the structure then appears as shown in Fig. 2c. As was the case with the embodiment of Figs. 1a-1c, with the embodiment of Figs. 2a-2c the end 14 of the tuft has a size in cross-section at least as great as the cross-section of each recess 16 of the unstressed member 15, so that when the cross-section of part 14 of each tuft is equal to the cross-section of each recess 16 the tufts are connected to the member 15 by the adhesive and when the cross-section of part 14 is greater than that of each recess 16 the tufts are connected to the member 15 by the adhesive and by being resiliently gripped by member 15.

Each of the tufts of the present invention is formed from a group of fairly long hairs which preferably are fairly soft, and this group of hairs is inserted at one end into a solution of a suitable plastic adhesive agent such as rubber, as will be described below, so that the rubber starts to dry on the end portions of the group of hairs after they are withdrawn from this solution. At this time the hairs, particularly at the parts which have been inserted in the solution, are spread apart from each other undesirably. Therefore, while the plastic material on the ends of the hairs of each group has not yet hardened, it is placed between a pair of dies 20 and 21 shown in Figs. 5 and 6, the bottom die 20 being fixed to the table of a suitable press while the top die 21 is connected to a known mechanism actuated by the operator for moving the top die 21 down to the bottom die 20. When these dies engage each other the channels 22 and 23 thereof cooperate to form a cylindrical space, and the end portions of the

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hairs which were previously inserted in the plastic solution are pressed between the dies so that the plastic material which has not yet hardened, so that it is still deformable, becomes shaped by the dies 20 and 21 into a cylindrical body having a predetermined cross-section which, as was pointed out above, is at least as great as the cross-section of recesses 11 or 16 and may in fact be preferably slightly greater than this latter cross-section. Moreover, the pressing of the tufts in this way between the dies 20 and 21 forms the plastic on the ends of the hairs of each tuft into a dense mass in which the hairs of each tuft are embedded.

Figs. 3 and 4 show a device used in the manufacture of the brush of the invention. This device includes a pair of spaced parallel side walls 25 interconnected by a third wall 26 so as to form a member of substantially U-shaped cross-section. The side walls 25 are formed with elongated cutouts extending from their free edges up to the wall 26 with the elongated cutouts 27 of one wall 25 aligned with those of the other wall 25. A row of tufts 13 is placed next to the wall 26 in a position extending through the free space between the wall 25 and through the cutouts therein and beyond the walls 25, as indicated in Fig. 4. Then a strip 28 of a predetermined thickness is placed between the walls 25 against this row of tufts and a second row of tufts are placed in a position extending through the pairs of aligned cutouts 27 and located against the strip 28, as is indicated in Fig. 4, and then a second strip 28 is placed against the second row of tufts. This is repeated until a plurality of rows of tufts are carried by the structure in the manner indicated in Figs. 3 and 4. Elastic bands 29 are then placed around the free ends of the wall 26 and the strips 28 in the manner indicated in Fig. 3 in order to hold the tufts in position. With this structure all of the tufts 14 of the tufts may be simultaneously inserted into a solution of a suitable adhesive medium, and the spaces between the cutouts 27 and the thickness of the strips 28 is such that there is no danger of a pair of tufts sticking to each other. After the adhesive is thus placed on the ends 14 of the tufts, the latter, after removal from the devices of Figs. 3 and 4, may be inserted into the recesses 11 or 16.

Fig. 7 shows the structure of the invention incorporated into a washing brush according to the invention. This brush preferably has an elongated substantially rectangular configuration, and as is indicated in Fig. 7 the structure of Fig. 2 is shown forming part of the washing brush of the invention, this structure of Fig. 2 being modified only in that the member 15' is formed between the recesses 16 with bores 30 through which wash liquid may flow. The member 15' is joined with a suitable adhesive to an elastic, resilient, bendable member 31 in the manner indicated in Fig. 7, this member 31 defining with the member 15' a free space 32 which communicates with the bores 30 and with a bore 33 formed in member 31. Any suitable fitting is fixed to the member 31 and communicates with bore 33 for connecting the brush to a source of water or the like which may flow through the bore 33 into the chamber 32 and from the latter through the bores 30.

The structure of Fig. 7 forms a particularly fine washing brush for several reasons. In the first place the member 31 as well as member 15' are both easily bendable and made of an elastic relatively soft material which will not scratch a painted surface or the like. Because of their bendability, the brush can easily conform to complicated shapes in order to provide a particularly good cleaning action. Furthermore, a brush of this type because it is used with liquid and because it is bent in different ways frequently is subject to great stresses which would cause conventional brushes to deteriorate rapidly. However, with the present invention the brush of Fig. 7 is assured of a long life for the following reasons:

When the brush is bent so that the top face assumes

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a concave curvature and the bottom face of member 15' assumes a convex curvature, there is a tendency for the recesses in which the tufts are located to expand at their outer ends and eventually cause the tufts to become loose and fall out. This does not happen with the present invention because of the annular projections 17 which remain in engagement with the tufts even if the brush is bent in this manner. If these projections 17 were not present and the recesses terminated flush with the outer face of member 15', there would indeed be a tendency for the tufts to become loose after a certain period of time and use of the brush, particularly if the tufts are not resiliently gripped and are held only by adhesion. Furthermore, where the end portions of the tufts which are located in the recesses have a cross-section greater than that of the recesses when the member 15' is unstressed, the member 15' resiliently grips the tufts so that they are held in place by this gripping action in addition to the adhesion, and for this reason also with the brush of the invention, in spite of sharp bending and contact over a longer period of time with washing liquids, the brush of the invention will not deteriorate and the tufts will remain securely joined to the brush. Thus, it will be seen that the invention is of particular significance with a washing brush as indicated in Fig. 7.

As was pointed out above, the device of Figs. 3 and 4 is used to simultaneously dip a plurality of tufts in an adhesive solution before they are inserted into the recesses. Such dipping is essential when only a swelling agent is applied to the recesses of the embodiments shown in Figs. 1a-1c and 2a-2c. However where, as was described in connection with Figs. 1a-1c, the swelling agent is also a solvent for the adhesive agent and the adhesive agent solution is in the recesses, the dipping of the tufts in a separate adhesive medium may be omitted. It is pointed out that the embodiment of Figs. 1a-1c may be immersed in a swelling agent, as was described in connection with Figs. 2a-2c, and the latter embodiment may have a swelling agent alone or a swelling agent in solution with an adhesive medium poured into its recesses, as was described above in connection with Figs. 1a-1c. Of course, if only a swelling agent is poured into the recesses to expand the same temporarily, then the tufts must be dipped in an adhesive solution before being inserted into the recesses. The recesses remain expanded for a period of time (3-5 minutes, e. g.) sufficient to enable all the tufts to be respectively placed therein.

The mechanical aspects of the invention have been described above. The following is an elaboration of the somewhat chemical aspects of the invention to facilitate a better understanding thereof.

The resilient elastic material of which the body formed with the recesses is made and into which recesses the tufts are inserted may be of any natural or synthetic material which is easily bendable, resilient and at least somewhat elastic, and mainly which has the property of being swelled by a liquid swelling agent, which does not dissolve the material but only causes it to swell when in contact therewith, and which material further returns to its original dimensions upon removal of the liquid swelling agent, e. g. by evaporation thereof. Among the suitable materials of which the resilient member formed with recesses may be made are vulcanized natural rubbers and synthetic rubbers such as polychloroprene, butadiene rubbers including butadiene-acrylonitrile rubbers, butadiene-styrene rubbers, and the like, polysulfide rubbers, polyisobutylene rubbers, and the like, as well as materials made from a mixture of such rubbers. Vulcanized rubber is used rather than raw or unvulcanized rubber because the latter is dissolved by liquids which may be used as swelling agents, e. g. trichloroethylene, whereas according to the present invention it is only desired that the body formed with the recesses swell by the action of the

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swelling agent liquid in order to increase the size of the recesses, temporarily until the swelling agent is removed e. g. by evaporation.

In addition to vulcanized natural rubber and synthetic rubbers the resilient member formed with recesses into which the tufts are introduced according to the present invention may be made of resilient high molecular weight synthetic resins such as polyvinylchloride, polyvinylidene chloride, copolymers of vinyl chloride with other monomers such as vinyl acetate and the like, polyvinyl alcohols, polyesters, polyamides, etc.

Liquids which have the effect of swelling the above-mentioned materials are well known. A particular liquid may be suitable as a swelling for one material and not for another material. This is also well known, and the particular liquid for any particular material is also well known and may be determined from known compendiums or by simple pretesting.

Suitable swelling agents for natural rubber for example include hydrocarbons, and particularly aromatic hydrocarbons such as benzene, naphthalene, turpentine and the like, vegetable oils, ether, carbon disulfide, trichloroethylene, and the like. Many of these same liquids may be used as swelling agents for the different synthetic rubbers such as polychloroprene, and the butadiene rubbers, as well as swelling agents such as toluol, xylol, ketones, chlorinated hydrocarbon such as carbon tetrachloride, etc. It is preferred according to the present invention to utilize as a swelling agent a liquid which can be removed by evaporation at room temperature, this having the advantage of reducing noxious fumes and also reducing the costs of apparatus which would be necessary if heating to high temperatures were required. The swelling agents may be evaporated after they have achieved the desired degree of swelling and the tufts have been inserted not only at room temperature but at higher temperatures also. The only criterion is that the temperature should not be so high as to deleteriously affect the resilient body and/or the tufts.

Any suitable adhesive agent may be utilized according to the present invention, the adhesive agent generally being a low molecular weight rubber or artificial plastic dissolved in a suitable solvent. As indicated above, according to a preferred embodiment of the present invention the solvent for the adhesive should preferably be a swelling agent for the resilient body formed with the recesses. For example the adhesive agent may be raw rubber dissolved in trichloroethylene or benzene, which in addition to being solvents for raw rubber also have the effect of swelling vulcanized rubber. Similarly, in the case of artificial plastics, where the resilient body is for example made of a high molecular weight plastic such as polyvinylchloride having a molecular weight of about 4000, e. g., Geon 121, the adhesive agent may be a solution of low molecular weight polyvinylchloride dissolved in acetone, e. g. Vinylite VYHH dissolved in acetone.

The walls forming the recesses of the resilient body are contacted with the swelling agent, e. g. by immersion of the body in the swelling agent liquid for a sufficient time to permit the recesses to enlarge sufficiently to enable the tufts to be inserted into the temporarily enlarged recesses, e. g. for about 5 to 10 minutes.

As indicated above, it is preferred to embed the ends of the tufts in a material before insertion of the tufts into the recesses. This material may be of the same composition as the recessed member which carries the tufts or, it may be somewhat different, e. g. raw rubber while the recessed member is vulcanized rubber.

The tuft ends may be embedded in the material preferably after the tuft ends have been shaped cylindrically by the dies of Figs. 5 and 6 and placed in the device of Figs. 3 and 4 by immersing the tuft ends in an adhesive solution which upon evaporation of the solvents of the

adhesive leaves a solid material in which the tuft ends are embedded. The adhesive solution may for example be natural raw rubber dissolved in trichloroethylene. It has been found advantageous according to the present invention to add a small amount of polyurethane, e. g. 4-6% to the adhesive solution.

As also indicated above, the adhesive solution may be poured into the recesses, the solvent of the solution acting as swelling agent, in addition to the solution acting as an adhesive for the tuft ends inserted into the recesses after the recesses have become enlarged by the swelling agent. Upon evaporation of the solvent the recesses contract to their normal size and the adhesive holds the tufts to the walls of the body. It is also possible to utilize as adhesive agent a self-vulcanizing adhesive solution which may contain for example triphenylmethane-triisocyanate in solution in addition to the rubber.

The tufts may be of any suitable material for example badger hair, camel hair, and the like.

Although it is believed that the present invention has been adequately described above, the following example is given to further illustrate the method of the invention, the scope of the invention not however being limited to the specific details of the example.

Example

A series of tufts are immersed at one end portion of each in a solution consisting of 15% raw natural rubber and 5% polyurethane dissolved in trichloroethylene. The tufts are then removed from the solution and the material on the tufts is allowed to solidify and harden. Before hardening is completed the end portions of the tufts with the partially hardened material thereon are placed between the dies described above in connection with Figs. 5 and 6 to form at the ends of the tufts dense cylindrical bodies in which the hairs of the tufts are embedded.

In the meantime, a body formed with recesses and made of vulcanized rubber is immersed in trichloroethylene for about 5 minutes or until the recesses have enlarged by about 10%. It should be noted that the original diameter of the recesses was somewhat smaller than the diameter of the tuft ends prepared above, though in enlarged state the recesses are larger.

The tuft ends prepared above are inserted, after the material thereon has substantially hardened, into the same solution as above to provide the ends with an adhesive coating and then the ends are introduced into the enlarged recesses. The trichloroethylene is then evaporated by simply allowing the body to stand in open air at room temperature thus causing the recesses to contract to their original dimensions and the brush is thus formed with the tufts securely embedded in the resilient member.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of brush and apparatus and process for making the same differing from the types described above.

While the invention has been illustrated and described as embodied in washing brush and apparatus and process for making the same, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A process for manufacturing a brush comprising

the steps of applying to the faces of recesses of a resilient elastic rubber member a swelling agent which causes said recesses to expand temporarily to a given size, said recesses contracting to their original size when said swelling agent evaporates; and respectively placing in said recesses while they are in their expanded condition a plurality of tufts which have in said recesses cross-sectional areas greater than that of the cross-sectional area of said recesses when they have their original size, so that when said recesses contract said tufts will be gripped by said rubber member.

2. A process for manufacturing a brush comprising the steps of applying to the faces of recesses of a resilient elastic member a swelling agent which causes said recesses to expand temporarily to a given size, said recesses contracting to their original size when said swelling agent evaporates; and respectively placing in said recesses while they are in their expanded condition a plurality of bodies in which end portions of a plurality of tufts are respectively embedded and which have cross-sectional areas at least as great as said recesses when said member is unstressed, with a medium between said bodies and member for causing said bodies to adhere to said resilient member.

3. A process for manufacturing a brush, comprising the steps of placing in recesses of a resilient rubber member a solvent which causes said body to swell so that said recesses expand temporarily and then contract; and placing in said recesses while they are expanded a plurality of tufts which respectively fill said recesses in their contracted condition, so that when said recesses contract said tufts will be gripped by said resilient rubber member.

4. A process for manufacturing a brush comprising the steps of dipping a rubber member formed with recesses with said recesses thereof into a rubber swelling agent for a length of time sufficient to cause said recesses to expand when said rubber member swells; and inserting a plurality of tufts which respectively fill said recesses in their original size into said recesses while they are expanded, so that when said recesses contract to their original size said rubber member will grip said tufts.

5. A process for manufacturing a brush comprising the steps of dipping a rubber member form with recesses with said recesses thereof into a solution of trichloroethylene for from five to ten minutes at room temperature to cause said recesses to expand when said rubber member swells; and inserting a plurality of tufts which respectively fill said recesses in their original size into said recesses while they are expanded, so that when said recesses contract to their original size said rubber member will grip said tufts.

6. A process for manufacturing a brush, comprising the steps of placing in recesses of a resilient rubber member a rubber adhesive solution containing a swelling agent which causes said member to swell so that said recesses expand temporarily and then contract; and placing in said recesses while they are expanded a plurality of tufts which respectively fill said recesses in their contracted condition, so that when said recesses contract said tufts will be gripped by said resilient rubber member.

7. A process for manufacturing a brush, comprising the steps of placing in recesses of a resilient rubber member a rubber adhesive solution containing a swelling agent which causes said member to swell so that said recesses expand temporarily and then contract; and placing in said recesses while they are expanded a plurality of rubber bodies which fill said recesses in their contracted condition and in which end portions of a plurality of tufts are respectively embedded so that said rubber bodies adhere to said resilient member and so that the latter resiliently grips said tufts when said recesses contract to their original size.

8. A process for manufacturing a brush comprising the steps of dipping a rubber member formed with recesses with said recesses thereof into a rubber swelling agent for a length of time sufficient to cause said recesses to

expand when said rubber member swells; dipping a plurality of rubber bodies in which end portions of a plurality of tufts are respectively embedded in a rubber adhesive solution, said rubber bodies having a size at least equal to that of said recesses when the latter are at their original size; and then inserting the thus dipped rubber bodies respectively into the expanded recesses so that said bodies adhere to said member and so that the latter resiliently grips said tufts when said recesses contract to their original size.

9. A process for manufacturing a brush comprising the steps of applying a swelling agent to the faces of recesses of a resilient rubber member which is provided with annular projections of tapered cross-section which respectively form extensions of said recesses so that said recesses expand and said annular projections flare outwardly; dipping a plurality of rubber bodies having a size corresponding at least to that of the unexpanded recesses and having end portions of tufts respectively embedded therein into a solution of rubber adhesive; then inserting said rubber bodies respectively into said recesses, said flared projections preventing the adhesive from being removed from said rubber bodies during insertion of the same into said recesses, whereby when said recesses contract to their original size said rubber bodies will adhere to said resilient member and the latter will grip said tufts.

10. A method of manufacturing a brush, comprising the steps of placing the faces defining recesses of predetermined cross-section of a resilient body formed of a material adapted to be swelled by a liquid agent in contact with a liquid swelling agent for said material so as to increase the cross-section of said recesses; introducing into said recesses with said increased cross-section tuft ends having a smaller cross-section than said increased cross-section of said recesses and a larger cross-section than said predetermined cross-section; and removing said liquid swelling agent from said faces defining said recesses, thereby causing said recesses to contract to said predetermined cross-section and thus to securely hold said tufts in said recesses.

11. A method of manufacturing a brush, comprising the steps of placing the faces defining recesses of predetermined cross-section of a resilient body formed of a material adapted to be swelled by a liquid agent in contact with a liquid swelling agent for said material so as to increase the cross-section of said recesses; introducing into said recesses with said increased cross-section tuft ends and an adhesive agent adapted to be activated, said tuft ends having a smaller cross-section than said increased cross-section of said recesses and a larger cross-section than said predetermined cross-section; and removing said liquid swelling agent from said faces defining said recesses and activating said adhesive agent, thereby causing said recesses to contract to said predetermined cross-section and thus to securely hold said tufts in said recesses.

12. A method of manufacturing a brush, comprising the steps of placing the faces defining recesses of predetermined cross-section of a resilient body formed of a material adapted to be swelled by a liquid agent in contact with a vaporizable liquid swelling agent for said material so as to increase the cross-section of said recesses; introducing into said recesses with said increased cross-section tuft ends having a smaller cross-section than said increased cross-section of said recesses and a larger cross-section than said predetermined cross-section; and evaporating said liquid swelling agent from said faces defining said recesses, thereby causing said recesses to contract to said predetermined cross-section and thus to securely hold said tufts in said recesses.

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