Jan. 11, 1966 M. F. LEVENSON 3,228,055

DEVICE FOR CLEANING TEETH

Filed Oct. 31, 1963 3 Sheets-Sheet 1

Fig. 1.

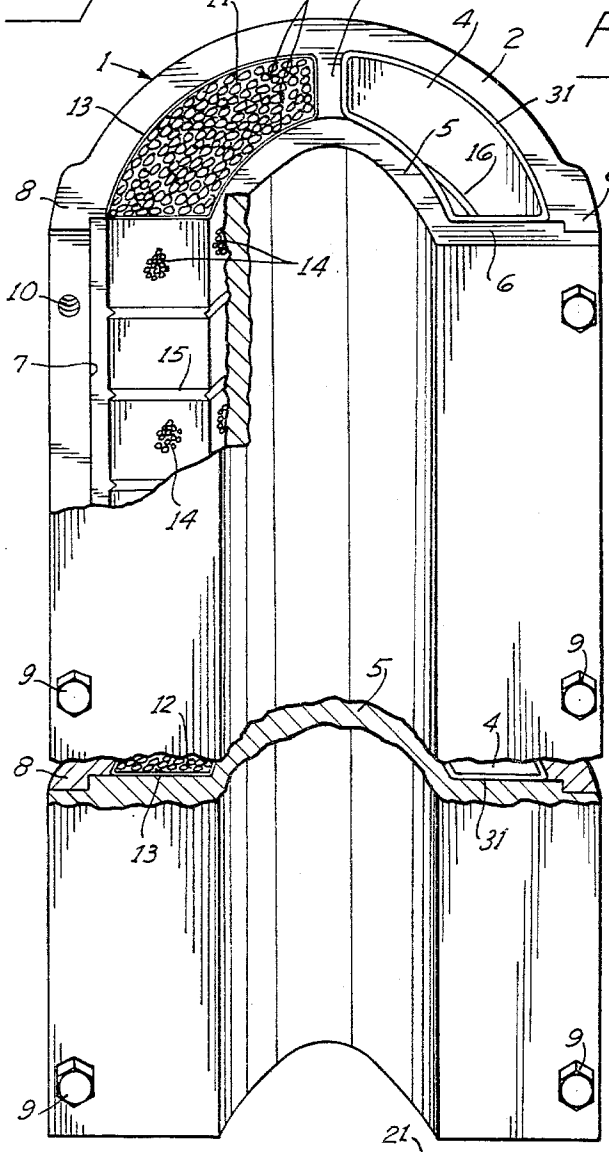


Fig. 2.

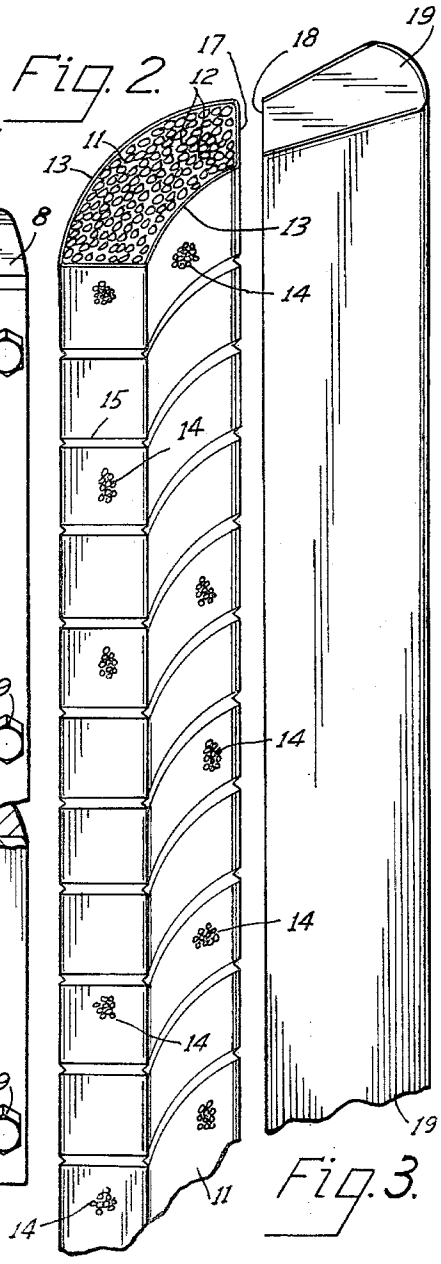
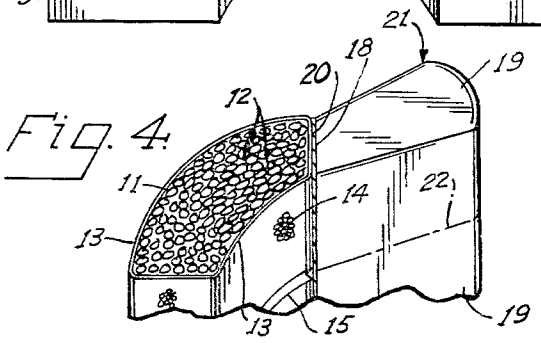


Fig. 3.

Fig. 4.



INVENTOR.
MYRON. F. LEVENSON
BY Dowell, Rogers, Kenyon & Knowles
ATTORNEYS.

Jan. 11, 1966 M. F. LEVENSON 3,228,055

DEVICE FOR CLEANING TEETH

Filed Oct. 31, 1963 3 Sheets-Sheet 2

Fig. 7.

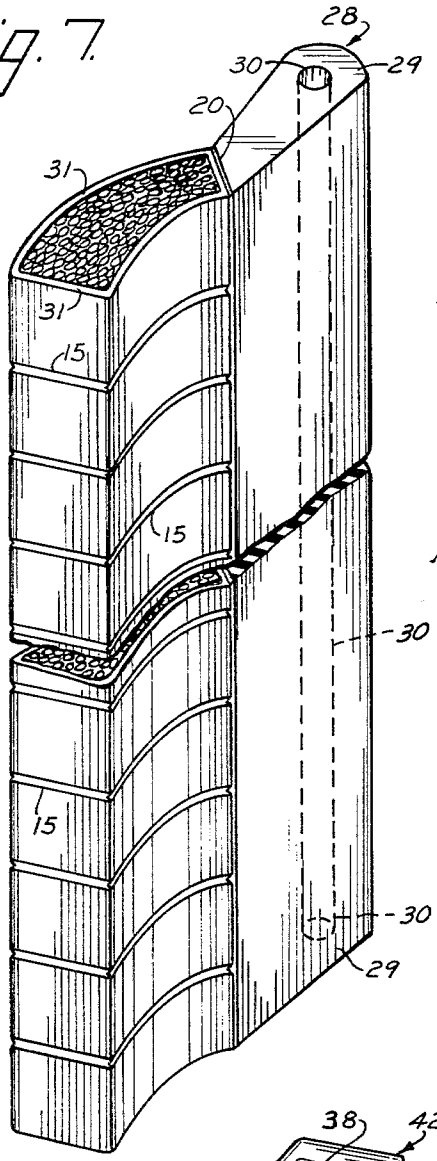


Fig. 5.

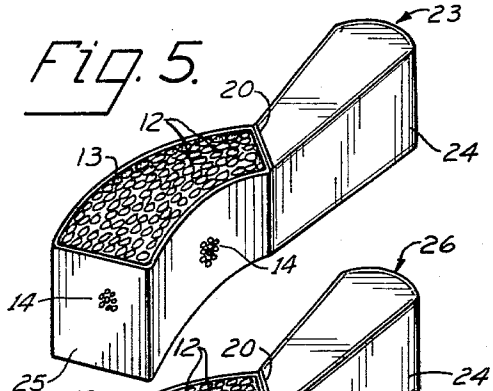


Fig. 6.

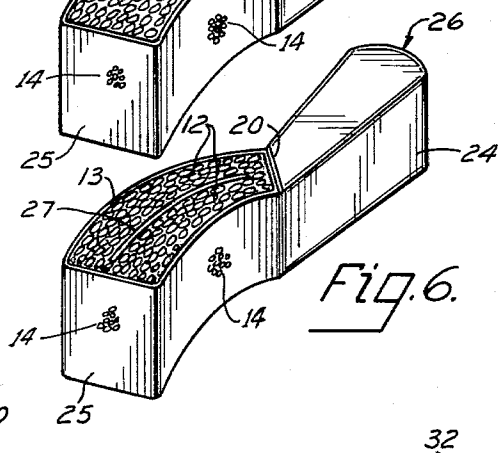


Fig. 8.

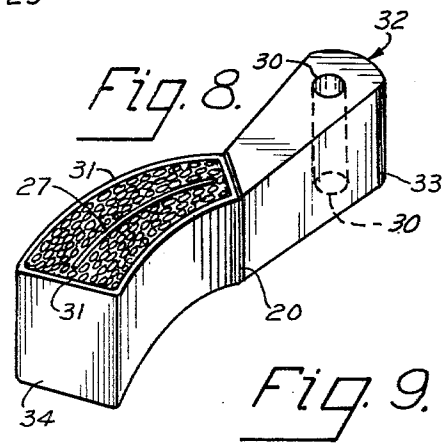


Fig. 9.

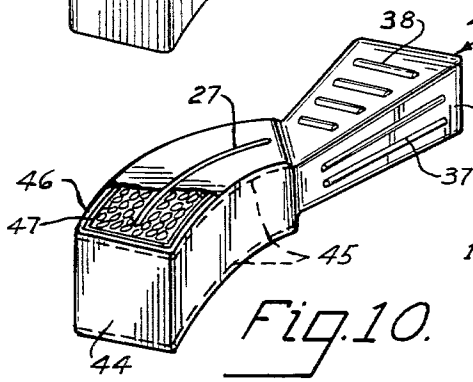
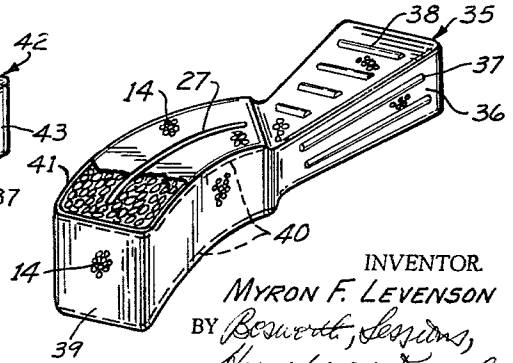


Fig. 10.



INVENTOR.
MYRON F. LEVENSON
BY Bosworth, Sessions, Herrstrom & Knowles
ATTORNEYS.

Jan. 11, 1966 M. F. LEVENSON 3,228,055

DEVICE FOR CLEANING TEETH

Filed Oct. 31, 1963 3 Sheets-Sheet 3

Fig. 11.

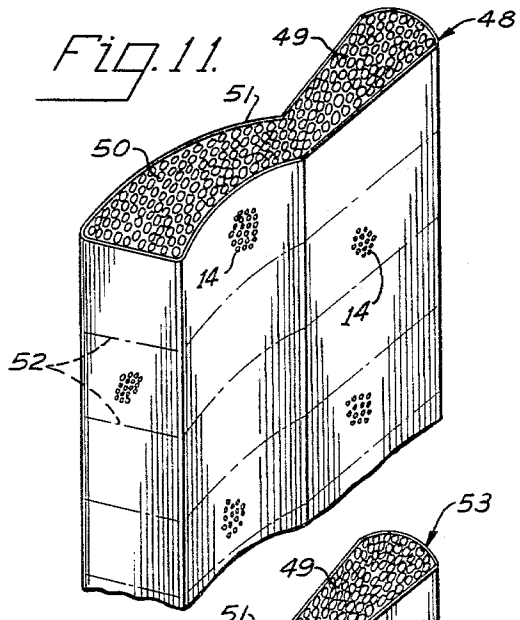


Fig. 12.

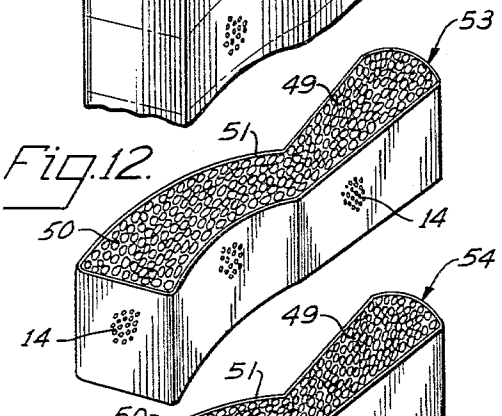


Fig. 13.

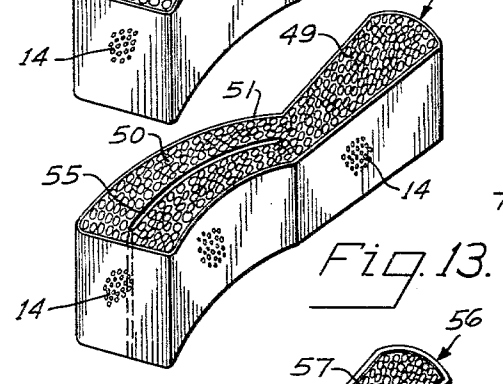


Fig. 14.

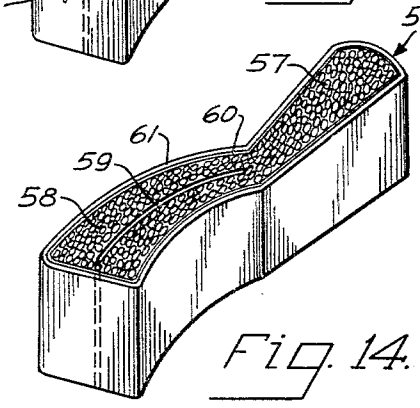


Fig. 15.

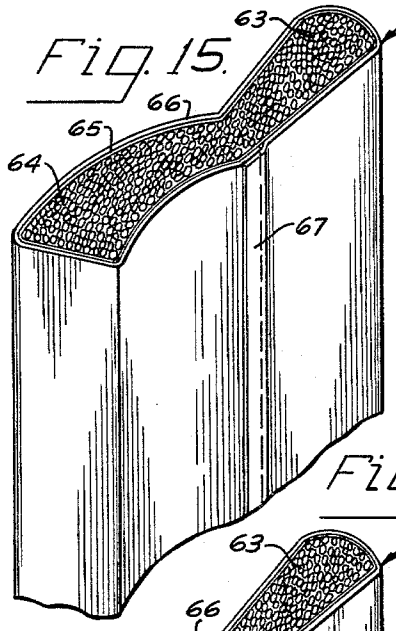


Fig. 16.

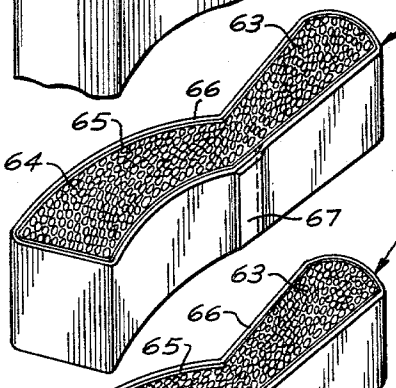


Fig. 17.

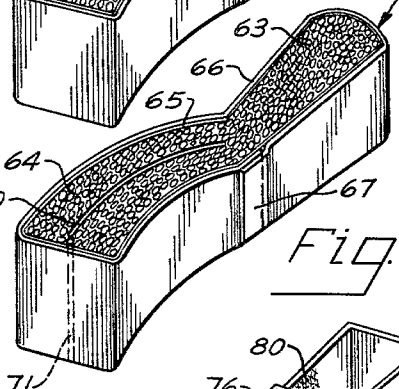
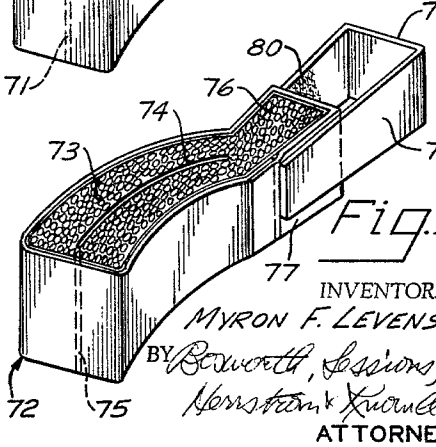


Fig. 18.



INVENTOR.
MYRON F. LEVENSON
BY Bennett, Sessions, Hornstein & Knowles
ATTORNEYS.

United States Patent Office

3,228,055
Patented Jan. 11, 1966

3,228,055

DEVICE FOR CLEANING TEETH

Myron F. Levenson, Shaker Heights, Ohio
(2974 Montgomery Road, Cleveland, Ohio)

Filed Oct. 31, 1963, Ser. No. 320,335
7 Claims. (Cl. 15—244)

This invention relates generally to products for cleaning the teeth by mastication and for applying dentifrices or medication to them.

U.S. Patent 3,109,192, granted on Nov. 5, 1963 on an application filed Aug. 29, 1960 as Serial No. 52,741, shows, describes and claims a variety of such aids. In each case, the device is characterized by an internal skeletal structure of generally H-shaped cross-section. On such skeletal structure a porous material is supported in one of several different ways. When the user chews on the device, intimate contact occurs between the denture and the porous material. The action, which is largely a scrubbing action, has been found to be especially effective in cleaning the teeth.

The internal skeletal structure is considered to be one of the largest, if not the largest, of the factors entering into the over-all cost of manufacturing such devices. This is because it must be separately produced before the porous material can be applied to it. With this H-shaped structure present as a reinforcement, the user tends to look upon the device as a whole as something that should have a useful life comparable to that of the ordinary toothbrush. As a result, it becomes difficult to market it as a throw-away item.

The present invention has for its object to provide devices that are simple and not particularly expensive. A further object is to provide inexpensive dental aids that may be discarded after a single use, thus obviating any need for sterilizing or cleaning and reusing them: in the description which follows, several different devices are disclosed, certain of them elaborated to improve their appearance. Sundry objects, advantages and features of the invention will be apparent from the accompanying drawings and from the following description.

By constrast with the devices of Patent 3,109,192, a typical tooth cleaning device within the purview of the present invention consists largely, but not necessarily entirely, of a suitably shaped body of porous material that is devoid of any internal skeletal structure. The lack of any internal skeletal structure simplifies not only the device but also the process of its manufacture, which in a typical case can be accomplished by foaming a suitable material in a mold, which may be either open or closed or, if desired, may take the form of an extrusion die. Although processes using extrusion dies are often called extrusion processes, the ordinary extrusion operation is basically one of molding; accordingly, the term "molding" as hereinafter used comprehends extrusion techniques except where the context requires otherwise.

In the drawings, wherein all of the views are isometric,

FIGURE 1 is a representation of an open-ended two-cavity mold of a kind that may be used to advantage in connection with the present invention,

FIGURE 2 is a representation of a foamed plastic loaf of the kind formed in the left-hand cavity of the mold of FIGURE 1,

FIGURE 3 is a representation of a solid plastic loaf of the sort used to provide the handle portion of the tooth cleaning device of FIGURE 6,

FIGURE 4 is a fragmentary representation of the upper portion of the two-loaf composite obtained by cementing the foamed plastic loaf of FIGURE 2 to the solid plastic loaf of FIGURE 3,

FIGURE 5 shows the intermediate product obtained by slicing the two-loaf composite of FIGURE 4 normally to its longitudinal axis,

FIGURE 6 shows the final product,

FIGURE 7 is a representation of a two-loaf composite generally similar to that of FIGURE 4 in which, however, the left-hand or body portion is smooth-surfaced,

FIGURE 8 shows the final product obtained from the two-loaf composite of FIGURE 7,

FIGURES 9 and 10 show two generally similar tooth cleaning devices produced by molding in a closed mold,

FIGURE 11 is a representation of a single foamed plastic loaf yielding products wherein the body and handle portions are integral with each other,

FIGURES 12 and 13 show the corresponding intermediate and final products,

FIGURE 14 shows a product similar to that of FIGURE 13 wherein a surface coating is used to impart smoothness to the side walls,

FIGURES 15, 16 and 17 are views similar, respectively, to those of FIGURES 11, 12 and 13 but have to do with products in which a second skin is used to give smooth side walls,

FIGURE 18 is a tooth cleaning device similar to that of FIGURE 17 in which the handle portion is replaced by a detachable handle.

Referring to FIGURE 1, what is there shown is an open-ended two-piece mold 1 made up in part of a generally semicircular outer shell 2 provided with a forwardly extending longitudinal rib 3 that serves to divide the space within the mold into two like cavities one of which is designated 4. The other part consists of a U-shaped inner shell 5 provided with two laterally extending longitudinal flanges 6 the edge portions of which are adapted to seat in longitudinally extending grooves 7 in enlargements 8 on the edge portions of outer shell 2. The two mold shells are held together by cap screws 9 that enter into and engage tapped openings 10 in enlargements 8.

In FIGURE 1, the cavity to the left of rib 3 is shown as occupied by a non-rigid foam loaf 11 produced from a suitable composition including a synthetic resin or analogour plastic material. As a result of having been trimmed to provide a top surface conforming to the top plane of mold 1, loaf 11 reveals a porous structure characteristic of the trimmed surface of a typical foamed plastic material. In the trimmed surface, pores 12 may be of small, medium or large size, depending on such factors as the manner of formulation, the nature of the blowing medium, and the temperature characterizing the mold and/or mold charge at the time the mold cavity is filled. They may be connected or unconnected with each other. In foam loaf 11, there are shown for convenience in illustration as large and unconnected with each other; however, it is usually best if most of the pores are connected to some extent.

Where the latter state of affairs prevails in the foam loaf, the end product, when used in the mouth, has a desirable hydraulic flushing action.

Where foam loaf 11 has come into contact with the inside surfaces of mold 1, it normally has a soft, integral skin 13, often of a thickness less than a thousandth of an inch. This skin usually exhibits a pore structure quite different from that exhibited by a trimmed surface such as that shown at the top of foam loaf 11. Characteristically, such a skin has over its entire area a seemingly endless multiplicity of small, fine pores, most or all of them much smaller than pores 12. In the drawings, these pores have to be represented by clusters 14; in practise, they are of course co-extensive in area with the skin itself.

A clearer view of foam loaf 11 is to be found in FIGURE 2, which shows the foam loaf after its removal from the mold cavity. At intervals along its length it has

transverse indentations 15 as a result of the presence on the interior surfaces of mold 1 of correspondingly shaped ridges 16: see the upper right hand corner of FIGURE 1. Indentations 15 serve as guide lines in the subsequent step of slicing to form blanks as hereinafter explained.

The mold cavities are preferably so shaped that where foam loaf 11 adjoins flange 3 on outer shell 2 foam loaf 11 has a plane face 17: see FIGURE 2. Plane face 17 is for the purpose of permitting a correspondingly shaped plane face 18 on a solid loaf 19 of plastic or like material (FIGURE 3) to be brought into juxtaposition to it. As will appear from FIGURES 4 to 6, solid loaf 19 supplies the handle portion of the final product. Preferably formed of a synthetic resin of almost any grade; e.g., a reclaimed synthetic resin, solid loaf 19 may be made by extrusion or by molding it in a matched metal mold, as indicated. Except where plane face 18 is to mate with plane face 17 on foam loaf 11, the surfaces of solid loaf 19 may depart considerably in shape from those appearing in FIGURES 3 and 4.

If the materials of which foam loaf 11 and solid loaf 19 are formed are such that both will soften readily under the influence of a mutual solvent, plane faces 17 and 18 may first be prepared by wetting them with the solvent, after which they may be brought together under pressure with attendant fusion and adhesion of each to the other. In some cases, a flame lamination technique may be employed to bring about fusion and adhesion, likewise under pressure. In most cases, however, it is preferable to use a suitable cement 20, interposing it between plane face 17 on foam loaf 11 and plane face 18 on solid loaf 19: see FIGURE 4. Numerous commercial cements that will serve this purpose are available.

At this stage, the composite product, designated 21, is made up of two elongated loaves; viz., foam loaf 11 and solid loaf 19, both of which retain their original shapes. In solid loaf 19, counterparts of the indentations 15 found in foam loaf 11 may or may not be present. However, in slicing transversely through foam loaf 11, as by means of a hot wire, it is a simple matter to continue along the path indicated in FIGURE 4 by dotted line 22. This gives a series of blanks, one of which is shown in FIGURE 5.

In the blank shown in FIGURE 5, there designated 23, handle portion 24 is the part derived from solid loaf 19 (FIGURE 3) and body portion 25 is that derived from foam loaf 11. FIGURE 6 shows the same blank, there designated 26, following the introduction of an incision 27. The latter, a generally arcuate incision reaching close to the central horizontal plane, receives the teeth of the user. On the bottom face of the device is a similar incision, not shown, likewise reaching close to the central horizontal plane. Toothpaste or a liquid dentifrice may be introduced into either or both of these incisions, after which, using handle portion 24 to manipulate the device, it may be introduced into one side of the mouth. Following use, it may be removed and reintroduced into the opposite side of the mouth.

What is shown in FIGURE 7 is a two-loaf composite that is similar to but not identical with that shown in FIGURE 4. Designated 28, such two-loaf composite incorporates an extruded solid loaf 29 of a suitable plastic material. The handle portion of the final product is formed from solid loaf 29, which may be provided, if desired, with a longitudinally extending opening 30. At the opposite end of solid loaf 29 is a flat face similar to face 18 (FIGURE 3) to which, by a layer of cement 20, is adhered the proximate end of a foam loaf similar to the foam loaf 11 of the two-loaf composite of FIGURE 4.

Differences between foam loaves in the two-loaf composites of FIGURES 4 and 7, respectively, are to be found in the fact that where the foam loaf of the former has a thin skin 13 characterized by many small pores 14 the foam loaf of the latter has a thick skin 31 devoid of such pores. The pore-free effect comes about as a result of an extra step in the process, one designed to provide more attractive surfaces on the end and side walls of the foam loaf. To this end, the interior of mold cavity 4 (FIGURE 1) in which the foam loaf of FIGURE 7 is formed is preliminarily sprayed with a plastic or other coating composition containing monomeric solids similar to those to be used in the composition employed in the foam loaf itself. This is indicated by the showing in FIGURE 1 of a heavy film 31 on the inside of mold cavity 4.

When foamed plastic material is poured into mold cavity 4 and permitted to set up, this film becomes the thick, smooth skin 31 appearing in FIGURE 7. Skin 31 may or may not develop as an integral skin, depending in part on the coating composition used and in part on the length of time permitted to elapse before the foam is poured into mold cavity 4. In some circumstances, typified in FIGURE 7, skin 31 will take the form of a non-integral film of considerable thickness; in others, it may be integral with the foam loaf. In the latter case, it will be somewhat thicker than but otherwise more like skin 13 in the foam loaf 11 appearing in FIGURES 1, 2 and 4.

When the composite loaf appearing in FIGURE 7 is sliced transversely; i.e., normally to its longitudinal axis, a product is obtained which, after having been incised as at 27, presents the general appearance shown in FIGURE 8. The latter product, designated 32, is the finished product. In it, opening 30 accommodates a metal loop for holding the device on a stand. Handle portion 33 is derived from solid loaf 29. The opposite end of the device, which is derived from the foam loaf shown in FIGURE 7, consists of body portion 34. It has the smooth skin 31 introduced as above explained by preliminarily coating the interior surfaces of mold cavity 4.

FIGURE 9 shows a tooth cleaning device 35 that has been formed in a closed mold provided with a cavity of a shape such as to yield a device with integral handle and body portions. In the interests of rigidity, handle portion 36 is reinforced by longitudinal ridges 37 on its sides and by transverse ridges 38 on its top. If formed in an uncoated mold, the exterior surfaces of the molded product will display the multiplicity of fine pores described above as characterizing the side walls of loaf 11, more or less as indicated in FIGURES 1, 2 and 4. If desired, however, the molded product may be trimmed along the parallel planes indicated by dotted lines 40. In such case, much as where the surface is shown as broken away, the trimmed top surface will reveal a thin, integral skin 41 analogous to skin 13 in the products of FIGURES 5 and 6.

Even if molded in a closed mold, as in the case illustrated in FIGURE 9, the product may be given a smooth exterior surface by dipping it in or spraying it with a suitably thick liquid coating composition. Such a surface is shown in FIGURE 10, wherein the device as a whole, designated 42, consists of a handle portion 43 and a body portion 44, both smooth except where the reinforcing ridges 37 and 38 show up in the former. The top and bottom surfaces of body portion 44 may, if desired, be removed by trimming along the planes indicated by dotted lines 45, thus exposing the type of surface illustrated at the left-hand end of FIGURE 10. In such case, the product will be seen to have a thick outer skin 46 attributable to the coating composition overlying a thin inner skin 47 similar to that indicated at 41 in FIGURE 9.

A layered skin of the type shown in FIGURE 10 can also be achieved by molding the product in an internally coated mold, provided the coating composition used on the mold is sufficiently different from that used in the foam to give rise to an interface.

FIGURES 11, 12 and 13 show, respectively, an extruded foam loaf obtained by forcing a synthetic resin foam through an extrusion die, a typical intermediate product, and a typical final product. In foam loaf 48, the handle portion 49 and the body portion 50 are inte-

gral. Trimming at the top of foam loaf 48 reveals a thin, integral skin 51 analogous to the skin designated 13 in FIGURES 1, 2 and 4 to 6. Depending on the die opening, the cross sections may or may not be of the shape indicated in FIGURES 11 to 13.

Slicing transversely of foam loaf 48 along the planes indicated by dotted lines 52 (FIGURE 11) gives rise to a series of intermediate products 53 similar to that shown in FIGURE 12. When incised, this in turn yields the final product designated 54 in FIGURE 13. As there indicated, incision 55 is deeper than those previously described, striking through the product from top to bottom as suggested by the dotted lines at the left-hand end of FIGURE 13. Unless steps are taken to modify the appearance of the end and side walls of the product, their surfaces will have the multiplicity of fine pores characterizing certain of the products previously described. As before, this is indicated by pore clusters 14.

By dipping, spraying or otherwise coating the foam loaf shown in FIGURE 11, one can arrive at a final product of the type indicated generally at 56 in FIGURE 14. This product is marked by handle portion 57, an integral body portion 58, an incision 59 and a layered skin made up of layers 60 and 61. The former is a skin of the type shown at 51 in FIGURE 13. The latter is an outer skin produced by the coating step. Inner skin 60 is of course integral with handle portion 57 and body portion 58.

FIGURES 15 to 17, inclusive, deal with a modified form of the process and product of the invention in which a continuous pellicle of plastic material, preferably but not necessarily opaque, is applied to the foam loaf illustrated in FIGURE 11. The modified loaf, designated 62, consists of integral handle and body portions 63 and 64 and a layered skin made up of an inner layer 65 and an outer layer 66. Except for the fact that it is covered by a superimposed plastic pellicle having a thickness that may be as little as a fraction of a mil or as much as several mils, inner layer 65 is the same or substantially the same as the thin skin 51 appearing in FIGURE 11.

The superimposed pellicle; i.e., outer layer 66, may be purchased in film or sheet form and adhered to inner layer 65 by means of a suitable cement; alternatively, it may be purchased and used in a form in which it carries a conventional pressure-sensitive adhesive on its inner face. In some cases, a mutual solvent, flame lamination or the like may be employed to the end of causing the superimposed pellicle to adhere to inner layer 65. Where the ends of the pellicle overlap, indicated at 67, outer layer 66 will of course be of multiple thickness.

The intermediate product obtained by slicing transversely through the pellicle-coated foam loaf of FIGURE 15 is shown in FIGURE 16. Designated 68, such intermediate product has handle and body portions 63 and 64 and a layered skin consisting as before of an inner layer 65 and an outer layer 66. The final product, designated 69 in FIGURE 17, is obtained by incising to form a single incision 70, 71 that extends completely through the product.

In the device illustrated in FIGURE 18, a separate handle is employed. The device as a whole, designated 72, is comprised of a body portion 73, preferably incised as at 74, 75, a stub handle portion 76, and a plastic or metal gripping member characterized by a transversely extending bridge 78 connecting two longitudinally extending arms 79. The latter are biased toward each other at their inner ends. If desired, they may be knurled or otherwise roughened at 80 where they come into contact with such handle portion 76.

The foam loaf from which body portion 73 and stub handle portion 76 are derived can advantageously be made by an extrusion process such as that described in connection with FIGURES 11 to 13. If the foam loaf is provided with an adherent pellicle, the product will have a layered skin analogous to that already described in connection with FIGURES 15, 16 and 17. The gripping member is used only for the purpose of manipulating the device when introducing it into and removing it from the mouth; accordingly, it is not necessary that it be rigidly or permanently attached to parts that the user may wish to discard and replace after a single use.

In none of the above-described forms of the invention is there any internal skeletal structure. It has been found that such is not necessary in a device that is to be discarded after having been used but once or at most only a few times. Adequate reinforcement is usually provided by the skin on the end and side walls, which may range between a thin, integral film on one hand and a multi-layered skin on the other. The degree of reinforcement provided by the skin or skins on the end and side walls is usually sufficient unless the foamed plastic material itself is especially soft, in which case the external reinforcement provided by the skin may, if desired, be augmented by external reinforcing ribs of the type described in connection with FIGURES 9 and 10 of the accompanying drawings.

A wide variety of changes within the skill of persons versed in the arts with which the present invention has to do can be made in the processes and products of the invention. For instance, the chemical nature of the foamed material is not intrinsically important provided the material is otherwise suitable, particularly as regards physical properties. In the production of all of the dental aids that have been described, a non-rigid foam based on the use of vinyl monomers along with a conventional blowing agent may be utilized. Much the same holds true as regards the non-rigid silicone foams, many of which have particularly valuable physical properties. In the several forms of the invention illustrated by FIGURES 1 to 10, inclusive, the foam may, if desired, take the form of a non-rigid polyurethane foam produced by reacting an isocyanate with a polyester, polyether or other substance capable of generating carbon dioxide in situ. Various other processes and techniques may be employed in lieu of those specifically mentioned.

It is intended that the patent shall cover, by summarization in appended claims, all features of patentable novelty residing in the invention.

What is claimed is:

1. A device for use in cleaning the human denture by mastification comprising a handle portion for manipulating the device when introducing it into and removing it from the mouth; an arcuate body of foamed material carried by said handle portion, such body of foamed material being unsupported internally thereof; a long, narrow slit for the teeth in said body of foamed material, such long, narrow slit conforming generally to the shape of the denture; and a layered skin adhering tenaciously to, defining the lateral limits of, and providing end and side walls for said body of foamed material.

2. A device according to claim 1 wherein the skin is a multi-layered skin.

3. A device according to claim 2 wherein the outermost layer of the skin takes the form of a solid residue of a liquid coating composition.

4. A device according to claim 2 wherein the outermost layer of the skin takes the form of a layered skin of the kind produced by molding a synthetic resin foam and adhering a continuous pellicle to the molded product.

5. A device of the nature of a dental aid for use in cleaning the human denture by mastication comprising a handle portion for manipulating the device when introducing it into and removing it from the mouth; an arcuate body of foamed material carried by said handle portion, such body of foamed material being unsupported internally thereof; an incised slit for the teeth in said body of foamed material, such incised slit conforming generally to the shape of the denture; and adhering firmly to and providing end and side walls for said body of foamed material, a layered skin the outer layer of which

comprises the solid residue of a liquid coating composition.

6. A device of the nature of a dental aid for use in cleaning the human denture by mastication comprising a handle portion for manipulating the device when introducing it into and removing it from the mouth; an arcuate body of foamed material carried by said handle portion, such body of foamed material being unsupported internally thereof; an incised slit for the teeth in said body of foamed material, such incised slit conforming generally to the shape of the denture; and, adhering firmly to and providing end and side walls for said body of foamed material, a layered skin, the outer layer of which takes the form of a continuous pellicle.

7. A device of the nature of a dental aid for use in cleaning the human denture by mastication comprising a handle portion for manipulating the device when introducing it into and removing it from the mouth; an arcuate body of foamed material carried by said handle portion, such body of foamed material being unsupported internally thereof; a slit for the teeth extending completely through said body of foamed material, such slit conforming generally to the shape of the denture; and a layered skin adhering firmly to and providing end and side walls for said body of foamed material.

References Cited by the Examiner

UNITED STATES PATENTS

2,249,721	7/1941	Morris	128—621
2,637,871	5/1953	Moser	15—244
2,753,642	7/1956	Sullivan	264—45
2,761,166	9/1956	Connolly	15—167 X
2,804,728	9/1957	Polizter et al.	
2,962,746	12/1960	Heroy et al.	15—210 X
2,987,742	6/1961	Kittle et al.	15—115
3,007,203	7/1961	Ammons	264—48
3,029,809	4/1962	Madlung.	
3,060,935	10/1962	Riddell	128—136 X
3,087,183	4/1963	Semon	15—244
3,099,516	7/1963	Henrickson	264—48

FOREIGN PATENTS

636,835	5/1950	Great Britain.

DANIEL BLUM, *Primary Examiner.*

CHARLES A. WILLMUTH, *Examiner.*