July 28, 1959 J. CHAMBERS 2,896,265

METHOD OF MAKING ORAL DENTURES

Filed Sept. 12, 1955

Fig. 1.

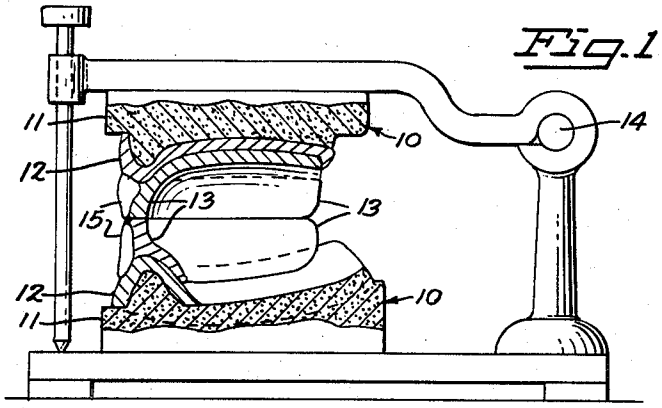


Fig. 2.

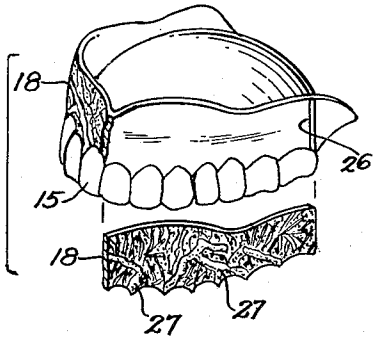


Fig. 3.

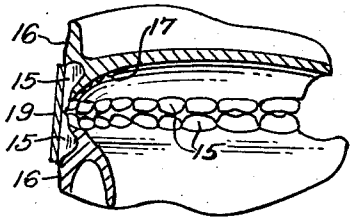


Fig. 4.

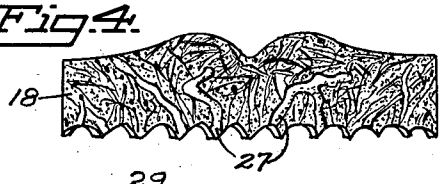


Fig. 5.

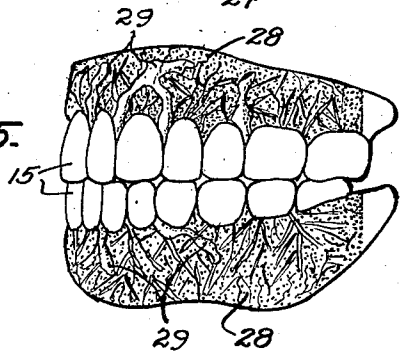
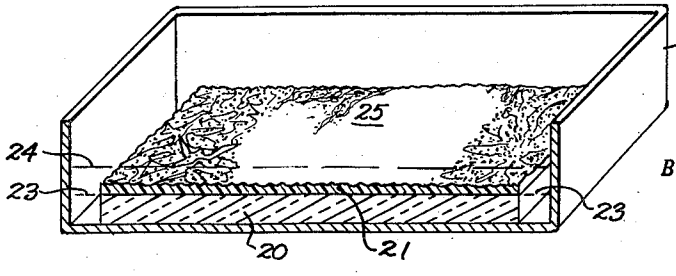


Fig. 6.



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METHOD OF MAKING ORAL DENTURES

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4 Claims. (Cl. 18—55.1)

This invention relates to oral dentures and method of making same, and more particularly relates to a surfacing finish on such dentures.

In oral dentures there are objectionable factors in the surface finish of the denture and particularly at the bucco-labial surface which is visible when the denture is installed in use. This is particularly present in dentures which have a polished smooth visible surface, since such surfaces reflect light and glare, do not hold surface saliva to lubricate lingual, buccal and labial contact and are so different in appearance from the irregular surfaces of the natural gums that they are objectionable to sight and easily disclose the presence of an artificial denture.

Attempts have been made to provide a more realistic appearance to such dentures by roughly or unevenly contouring the visible surfaces, such as by manually carving, stippling with a tufted brush, and similar operations. Resort has also been had to coloring in an effort to provide a visible denture surface simulating the appearance of natural gingival surfaces.

Among the objects of this invention are to provide oral dentures the visible surface of which stimulate the appearance of natural gum surfaces; to provide simulated anatomical surfaces of such dentures with unpolished, uneven surfaces devoid of sharp edges; to provide in such dentures unevenly contoured surfaces having smooth channels or valleys and smoothly formed upraised portions or hillocks and to provide a method for forming such surfaces on such dentures.

Briefly described the invention comprises an oral denture or plate and method of making same, in which the palatal rugae and the labial and buccal visible surfaces are uneven and irregular, providing striated delineations, valley channels and hills, and the surface irregularities of which are smooth at the edges. In the steps of the method for making such dentures the invention comprises forming such hills and valleys and delineations by subjecting the appropriate superficial surfaces of the plastic material usually dental plastic wax, from which the trial or base plates of dentures are formed, to heat until the surface is superficially melted and then subjecting that melted surface to contact with a fluid, preferably a liquid, while such surfaces are in a soft uncoagulated state, and thereby forming hills and valleys or channels on such surfaces by the surface reaction of the material to the contact with the fluid flow, as distinguished from the forming of such irregularities manually or by mechanical means, the natural flow of the fluid contact carving the irregular hills and valleys or channels fortuitously and irregularly in design and contour, free of sharp uneven edges such as are caused by manual or mechanical operation. A mold or matrix is made from such trial denture or "case" and thereby transferring the delineations to the matrix, whereby such delineations are formed in the final completed denture.

A preferred form in which the invention may be embodied is described herein in connection with the accompanying drawing which is referred to and made a part hereof.

In the drawing:

Fig. 1 is a vertically sectioned view longitudinally of an articulator device showing mounting thereon of a denture case in carrying out the invention;

Fig. 2 is a perspective view of a denture case partly broken away to show an inset for a veneer strip;

Fig. 3 is a longitudinal vertical section to a denture case showing one step in the method of the invention;

Fig. 4 is a front elevational view of a veneer strip of the invention;

Fig. 5 is a side elevational view of a completed denture; and

Fig. 6 is a perspective view of apparatus and material to illustrate a method step of the invention.

The usual steps in making of a denture may be briefly stated in order better to describe the sequence of introducing the novelty of the present invention and the steps in the process of making such dentures. Briefly stated, such usual steps comprise the making of an impression of the anatomical contour of the appropriate dental arch and alveolar ridge or ridges with an alignate or other moldable product from which a cast generally indicated 10 is made with a dental plastic or stone on a base block 11. From this cast a trial denture 12 is made of prepared dental base wax or other firmly deformable moldable, heat soluble material, and a bite block 13 is mounted thereon in order that this trial denture may be appropriately fitted to the patient's mouth and the relation of teeth indicated thereon for mounting of the teeth in the final denture. After trial fitting of the trial denture and bite block in the patient's mouth to establish proper tooth relationship, the trial dentures 12 including the bite blocks 13 are refitted upon the stone cast and mounted on the jaws of a mechanical device which simulates the natural articulated relation of the jaws, called an articulator 14. The artificial teeth 15 are then positioned in the desired relation against the trial denture and bite block and are adhered thereto in proper relation to the alveolar ridges by means of a heat soluble preparation such as a well known combination of wax and resin. When the teeth are thus mounted, the assembly is generally referred to as a "case" which may then, if desired, be given a final trial fitting in the patient's mouth, after which it is again placed on the stone cast on the articulator and sealed to the cast, whereupon the sealed and integral composite of cast and case are removed from the articulator and invested in a flask which is filled with dental stone or plastic which is permitted to form a set thus making a mold or matrix. The flask is then mildly heated such as by immersion in hot water until the wax of the trial denture and bite blocks melts, and may be drawn off, whereupon the wax-set teeth remain securely embedded in the dental stone, and the impression of the case and the bite blocks and casts are likewise made into walls or matrix of the molds. Then the case and the casts are removed from the mold leaving the teeth, in their established position, embedded in the body of the mold. The mold is then invested with a dental plastic known as acrylic or other moldable dental material from which the final denture plates are made, which thus take the form of the inner surface of the mold and thereby embeddingly engages the teeth which are embedded in the mold, and upon curing or hardening, and removal of the mold-plaster, the denture is complete, except for touch-ups or refinement by surface polishing of the surfaces to remove minute roughness.

The present invention becomes a factor in the denture at the stage when the trial denture or case is prepared ready to be set into the flask or final mold. In

order that the gingival walls and rugae of the molds may have the impression desired for the irregularity of surface of the final denture, obviously such walls and dental arches of the so-called case must have the desired surface delineations thereon to make the impression in the matrix mold. The invention resides in the method of forming such delineation and in the final and complete denture having bucco-labial gingival and rugae surfaces formed thereby.

The delineation may be made directly upon the respective gum and rugae surfaces **16** and **17** of the case by means of treating those surfaces as an integral part of the trial denture or case, or such delineations may be made in the form of flexible wax veneers **18** and mounted upon the respective surfaces of the case, a veneer for the gingival surface of an upper plate case being indicated **18** in Fig. 2.

Since the palatal arch and gum portions of the trial denture or case are made of a moldable wax preparation it is subject to softening of its surfaces by heat. If the delineation is applied in the form of veneers, such veneers are made of such heat sensitive wax.

When the delineations are to be formed integrally in the respective surfaces of the case, the manner of forming the delineations is to heat such surfaces superficially until the wax thereof is liquid to a depth of a few hundredths of an inch, preferably such as $^{3}/_{100}$ or $^{5}/_{100}$, and while the wax is liquid subjecting its liquid surface to a fluid flow of air or water, thereby making hills and valleys or channels and ridges in the surface by the fluid flow. Such air or water should be at such temperature as will coagulate the wax in the surface formation induced by the force of the jet. The exact temperature of such jet is not critical though preferably at normal temperature of 60 to 80 degrees F. In applying such heat direct to the trial denture, it is desirable to shield the wax biteblock and the teeth, if previously set therein, from the applied heat, such as by a shielding strip **19**.

In making the delineations by means of veneer **18**, the veneers may be made in planar form and, therefore, is the preferred form of practicing the method of this invention.

In making such veneers a polished planar plate **20** is employed, preferably glass, which may be of convenient size, such as 6 inches by 4 inches, and of any suitable thickness. Upon the planar surface of this plate is placed a relatively thin sheet of base-plate dental wax **21**, for example, substantially $^{5}/_{100}$ to $^{10}/_{100}$ of an inch in thickness, and preferably of substantially the same planar size as the plate. Two sheets of such wax may, if desired, be superimposed one upon the other since such a step facilitates the handling of the wax sheet upon which the pattern is formed.

When the delineations are formed by immersing the sheet of wax **21** in water, which is the preferred form of the invention, the glass plate and sheet of wax are placed flatly in a planar container **22**, of somewhat greater planar dimension than the sheet of wax, and water at normal temperature is added to the container around the perimeter of the wax sheet and glass plate substantially up to the level of the upper face of the plate **20** upon which the wax sheet as indicated **23** reposes. Then with a suitable means, such as a low-heat torch, the exposed surface of the wax sheet **21** is slowly heated superficially until it has a liquid surface to a desired depth of the pattern; normally heating to a depth of $^{3}/_{100}$ to $^{6}/_{100}$ of an inch is sufficient. A greater depth of such liquefying of the wax surface will provide a pattern of greater depth. When the surface of the wax is thus liquefied, more water at normal temperature is slowly added to the container until the water slowly flows over and covers the liquefied surface of the wax sheet to a suitable depth, such as one-fourth inch, as indicated **24**, such flow being directionally undefined and forming and congealing a natural fluid flow pattern **25** of the upper or exposed face of the wax sheet. In forming such pattern the water may be agitated by tilting or rocking the container to provide varying patterns of flow, the design, however, being fortuitous and irregular in accordance with the flow of the liquid in miscellaneous paths not definitely defined in direction.

When the delineations are made in the sheet of wax **21**, by an air jet, the sheets of wax are likewise placed on a plate **20**, and the container may be optionally employed, though it is preferably employed if the wax is to be chilled to coagulate it by water. The exposed surface of the wax is heated in like manner as previously described until the surface thereof is liquefied, whereupon such liquefied surface is subjected to a jet of air forming a natural flow pattern of such upper or exposed surface of the wax sheet. Normally and usually the air jet will sufficiently coagulate the liquid wax in its formed pattern, but if desired, water may be added to the container to cover and congeal the formed pattern.

The pattern may be varied if desired by vibrating, swirling, flowing, dropping, rapid immersion, or sprinkling of the water upon the surface of the liquefied wax, and when air jet is employed similar variations may be made by variations of air pressure and direction of the air jet.

Whether the fluid for forming the pattern is air or water, the patterns formed thereby are the result of the forces of directionally undefined natural flow of a fluid and are therefore in fortuitously irregular natural-flow delineations of striations or channels of hills and valleys and devoid of roughness, sharp ridges or jagged indentations and the like, which are present when such delineations are made by manually stippling or other manual manipulations.

After making the delineated pattern of the wax sheet material by the fluid flow, the sheets may be cut to provide the veneers **18** to fit the buccal, labial, lingual and rugae surfaces of the case. Such veneers are mounted on the respective areas of the case by trimming away of the respective walls of the wax case as at **26** sufficiently to receive such veneers without substantially increasing the dimensions of the case as previously fitted to a patient's mouth, as shown in Fig. 2.

If it is desired to add touches of emphasis to the delineated pattern to more nearly simulate particular characteristics of some individual human gums or to retouch the interdental gingival papillea, or provide a median line, or other individual characteristic desired, this may best be accomplished by manually depositing striations of liquefied wax **27** on the respective areas of the case, after the pattern has been formed by application of the fluid flow, and, manifestly congealing same before investing the case in the final matrix or flask.

After forming the delineations on said respective surfaces of the case, the entire case is then invested in a flask which is packed with dental cement or stone which takes the matrix impression of the entire case including the wax-delineated gingival and rugae impressions and waxed-in teeth, whereupon the wax is melted out, leaving only the matrix impression and the teeth set in the mold. This matrix mold is then packed with dental plastic generally known as acrylic, and thereupon cured, thereby forming the completed plates **28** of the denture with the teeth set therein and the gingival and rugae delineations, requiring no polishing of rough mechanically formed or manually carved surface irregularities. The emphasized portions which are indicated **27** in the case are indicated **29** in their reverse counterpart of the completed denture of Fig. 5.

The dentures produced by this method are characterized by having channels which have no undercuts or obstacles to collect dirt or bacteria of any kind: with saliva washing through these channels naturally formed by fluid flow, a slight scouring action is formed which in turn keeps the denture in a clean condition: the coagulation of

the wax as the result of fluid flow gives the denture a more natural appearance than mechanical or manually formed irregularities: the saliva which adheres to these channels keeps the denture moist and lubricated with relation to the cheeks and lips; and by the many variations which may be accomplished by the fluid flow of either water or air upon the wax, the pattern can be made to harmonize with the natural gums of the particular person.

Coloring material may be employed in the usual manner to add natural appearance to the completed denture.

Having thus described the invention, what is claimed as new and patentable is:

1. In a method of making surface irregularities in surfaces of oral dentures the steps including forming simulated anatomical portions of a denture case of a moldable dental material which liquefies by application of heat and congeals at normal temperature, applying heat to a surface of such material until said dental material liquefies superficially at such surface, subjecting said liquefied surface of said material to a directionally undefined fluid flow thereagainst whereby a fortuitous and irregular delineated pattern is formed thereon by said fluid flow, and congealing the liquefied material at said superficially liquefied surface and thereby fixing said pattern therein, successively investing in and then removing from a mold the dental case and delineated pattern thereon and thereby providing a matrix molding cavity having said delineated pattern defined in the walls thereof and molding the body of the final oral denture in said delineated matrix cavity.

2. In a method of making surface irregularities in surfaces of oral dentures, the steps as set forth in claim 1 and in which the heat is applied to said liquefiable material of the case in sheet form and the congealing fluid flow applied thereto is a liquid.

3. In a method of making surface irregularities in surfaces of oral dentures, the steps of applying heat to a surface of a suitable sized sheet of meltable dental plastic material which liquefies by application of heat and congeals at normal temperatures, said heat being applied until such dental material liquefies superficially at such surface, subjecting the liquefied surface of said material

to a directionally undefined flow of liquid thereagainst whereby a surface pattern is fortuitously and irregularly delineated thereon by said liquid flow, and congealing the liquefied material at said superficially liquefied surface thereby fixing the delineated pattern therein, mounting strips of said congealed delineated sheet material upon the surfaces of a dental case corresponding to the surfaces on which it is desired that such irregularities of the surface shall be formed on a finished oral denture, investing said dental case in a mold and thereby forming a matrix of said dental case and the surface irregularities delineated thereon, removing said dental case from the mold and thereby providing a matrix cavity in the mold having delineated in the matrix face thereof the said surface irregularities, and molding the walls of an oral denture in said matrix cavity.

4. In the making of oral dentures, the method of making sheet material for application as veneers to dental cases for forming a denture matrix, comprising the steps of applying heat to a surface of a suitable sized sheet of meltable dental plastic material which liquefies by application of heat and congeals at normal temperatures, said heat being applied until such dental material liquefies superficially at such surface, subjecting the liquefied surface of said material to a directionally undefined flow of liquid thereagainst whereby a surface pattern is fortuitously and irregularly delineated thereon by said liquid flow, and congealing the liquefied material at said superficially liquefied surface and thereby fixing the delineated pattern therein.

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