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J. R. SCHWARTZ

2,186,468

METHOD OF PRODUCING TOOTH FORMS

Filed May 5, 1938

Fig. 1

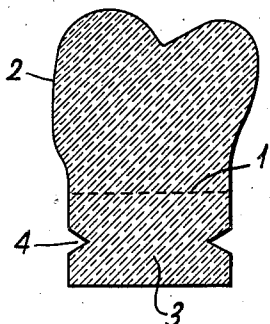


Fig. 2

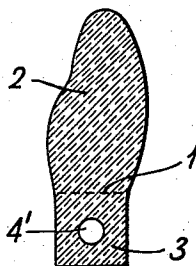


Fig. 3

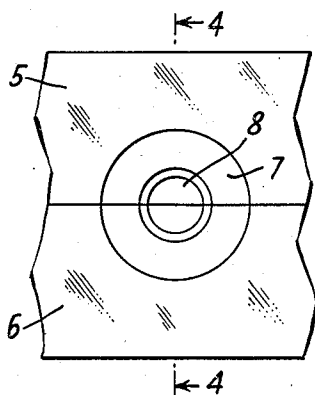


Fig. 4

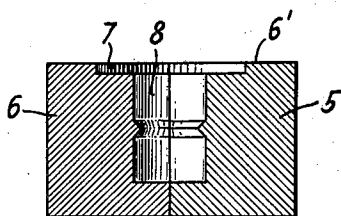


Fig. 5

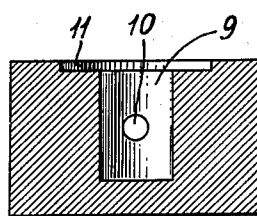


Fig. 6

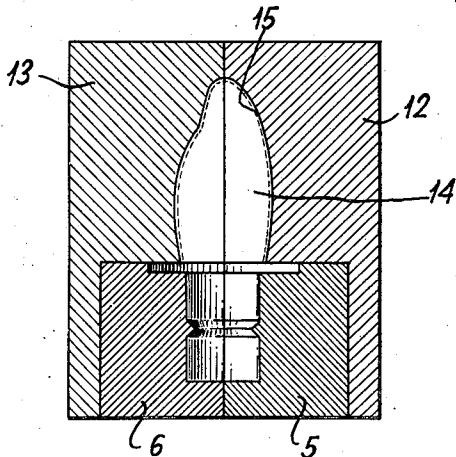
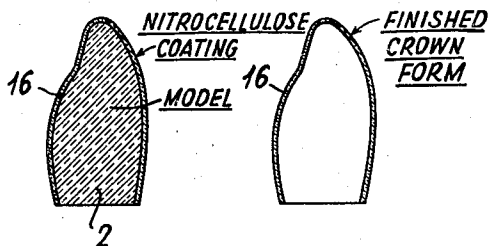


Fig. 7

Fig. 8



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METHOD OF PRODUCING TOOTH FORMS

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2 Claims. (Cl. 18—55.1)

My present invention relates to methods of, and means for, producing tooth forms, and more particularly to a novel method of, and apparatus for, producing crown forms.

5 It may be stated that one of the main objects of my present invention is to provide a method of producing crown forms of a wide variety of shapes and sizes; the method essentially comprising coating a tooth model composed of a substance easily and quickly soluble in a solvent which has no effect on the coating material, and subjecting the coated model to the solvent action when the coating is dry.

10 Another important object of my invention is to provide a method of producing dental crown forms which includes the steps of forming a tooth crown model of a water-soluble composition; coating the model surface with a water-insoluble material; hardening the coat; and finally placed the coated model in a water bath thereby to dissolve completely the model while leaving a rigid shell whose form is exactly that of the model configuration.

15 Another object of the invention is to provide a method of producing a large number of crown forms of the same, or even different, configuration with a minimum of manipulations; the method including the formation of a plurality of tooth crown models of one, or more, shapes, positioning the models on a support so that they can be readily dipped in or sprayed with, a nitro-cellulose solution to provide a coating of uniform thickness on each model, the coated models being placed into a bath, after drying and baking, to provide a clean separation of the rigid, formed coat from each model by a rapid dissolving of the model material.

20 Other objects of my invention are to provide dental model support devices constructed positively to retain a large number of models during the coating of the latter; the support devices being additionally provided with specially designed baking molds for use during the hardening step of the present process.

25 Still other objects of my invention are to improve generally the efficiency and speed of production of dental crown forms, and more especially to provide a method of producing crown forms which is reliable and economical.

30 The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims; the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in

connection with the drawing in which I have indicated diagrammatically several constructions by the aid of which my invention may be carried into effect.

In the drawing:

5 Figs. 1 and 2 show central, longitudinal sectional views of alternate types of dental crown models adapted to be used in the process according to my invention.

10 Fig. 3 is a plan view of a portion of a model support device adapted for use with models of the type shown in Fig. 1.

15 Fig. 4 is a transverse sectional view of the support shown in Fig. 3, and taken along line 4—4 looking in the direction of the arrows.

20 Fig. 5 is a transverse sectional view of a modified model support adapted for use with models of the type shown in Fig. 2.

25 Fig. 6 shows the support device of Fig. 4 fitted with a special baking mold, both being shown in transverse section.

30 Fig. 7 is a central longitudinal sectional view of a coated model just prior to removal of the model.

35 Fig. 8 is a central, longitudinal sectional view of a finished crown form after removal of the model.

Referring now to the accompanying drawing, wherein like reference characters in the different figures denote similar constructional elements, there are shown in Figs. 1 and 2 different types of crown models which can be used to produce crown forms thereof. The model in Fig. 1 comprises two essential sections; the sections are separated by a finished neck line 1 whose function it is to designate the base of the crown form after the coating operation is completed. The section 2 above line 1 is the true model, or core, whose contour is to be duplicated in the form. The section 3 below line 1 is a locking base whose function it is to cooperate with a model support device to retain the model in position during the coating operation. The base 3 is provided with a V-shaped circular groove 4 which registers with a male element on the support device to provide positive retention of the model.

The model in Fig. 2 mechanically differs from that in Fig. 1 in that the locking base 3 is provided with a bore 4' which is adapted to receive a rod to lock the model to a support device. Of course, the upper section 2 has a different contour; the contour of the upper section can be of any desired shape. Thus, it is to be understood that in carrying out this invention a com-

plete set of crown models may be molded to represent the crown contours of the upper and lower jaws, both anterior and posterior. Such complete sets of models may be of the type provided with a locking base of the type shown in Fig. 1, or they may have the type of locking base shown in Fig. 2.

Those skilled in the dental art are fully aware of the manner of molding tooth models such as shown in Figs. 1 and 2. Each particular type of crown contour will have its set of dies, front and rear, to cast a model. When constructing a set of dies to mold the type of model shown in Fig. 1, the dies will be constructed to provide the groove 4 in the base 3. Similarly in the case of Fig. 2, each set of dies will be constructed to produce a bore 4' in the base 3 of the model. It will be obvious that the molding dies can be arranged in a wide variety of contours and sizes; these will depend upon the requirements of the dental profession.

In molding the models it is desirable to use for the composition thereof a material generally soluble in a solvent which will not affect the rigidity or configuration of the coating to be applied on the model. For example, when using a nitrocellulose solution for coating the model, the latter is preferably composed of a substance quickly and completely soluble in water. Such a substance may be corn starch, potato starch or potato dextrine; or a mixture of plaster and any of the aforementioned substances may be used. Models composed of such materials are quickly soluble in hot water, while the nitrocellulose coat is completely unaffected by the water. For the purposes of this method, however, the aforementioned materials are not the sole materials to be used. In general, as stated above, the material to be used for the model will depend upon the action of the solvent bath upon the model coating; the essential requirement being that the coating be unaffected while the model core is being dissolved. Of course, any desired type of model solvent other than water may be used.

When a group of models have been selected for production of contour-forms, the models are mounted in a support device. The latter may comprise, as shown in Figs. 3 and 4, a pair of metallic sections 5 and 6 which are mirror image duplicates and provide front and rear locking sections for the bases of models. While Fig. 3 shows only a single locking well 9, it will be understood that as many similar units as desired may be employed. As shown in Fig. 4, and assuming the type of locking base shown in Fig. 1 is employed, each locking well corresponds in contour to a locking base 3. When a model base 3 is positioned between the sections 5-6, the base fits snugly in its well. Preferably, the neck line 4 will be in alignment with the top face 6' of the support sections. A shallow basin 7 is provided in the upper face 6' to collect the small excess of coating solution which may drip from the model during the coating step, and which may collect by virtue of mold pressure during the subsequent baking.

The two sections 5 and 6 may be locked together by any desired removable clamping means (not shown to preserve simplicity of disclosure). It should be understood that the models placed in a given multi-model support device may be of common or different contours. Preferably, the models of like tooth contour will be locked into the support device for coating. In Fig. 5 there is shown a transverse section through a

locking well 9 of the type of support device adapted to position the models with locking bases shown in Fig. 2. In this case the support device is in one piece and a bore 10 is provided longitudinally through the successive wells 9. When the models are in position a rod (not shown) is run through the registered bores 4' and bore 10 and locked in place. In this way the models of Fig. 2 may be locked in position for coating. Of course, any other type of locking base may be provided on a tooth model; also, support devices may be provided with any desired locking means adapted to cooperate with such locking bases.

Assuming, now, that the models of a desired type of tooth contour are locked in position on a support device, the coating of the model sections 2 is begun. Let it be further assumed that the models being coated are those having locking bases of the type shown in Fig. 1, while the contour sections are those of Fig. 2. The actual coating with the nitrocellulose solution is preceded by providing on the exposed surface of each model a glazed surface. This is done to close the pores of the model material, and may be accomplished by spraying the exposed surfaces with a fine layer of shellac or gelatine. This glazing coat should be of a material which will not adhere to the nitrocellulose coating, and is, furthermore, water-soluble so that it will subsequently wash out with the model material.

After the glazed surfaces are provided on the models, the latter are dipped into an acetone solution of nitrocellulose. The consistency of the nitrocellulose solution (which may be of any type readily purchased on the open market) is such as to coat the exposed surface of each model with a layer of uniform thickness. If desired, the uniform coating can be provided upon the models by spraying. In actual usage the coating is extremely thin, and is of the order of one-fourth of a millimeter in thickness. The nitrocellulose coats on the models are permitted to dry and harden while still in the support device. It will be appreciated that because of the common mounting for the plurality of models, it is possible to eliminate the many manipulations it would require to operate on each model separately. Once locked in a support device, a great many models are simultaneously operated upon for the successive steps of the process.

The coatings on the models having dried and hardened, there is associated with the support device a special baking mold shown in Fig. 6. In the latter there is shown only the relation between the special mold sections and the support device sections. The special mold may comprise complementary metallic sections 12 and 13. When locked together, and as shown in Fig. 6, the sections 12-13 provide a plurality of mold units; in each mold unit 14 is disposed a coated model. Hence, each mold unit 14 has a configuration exactly corresponding to that of the models to be subjected to heat. The dotted line 15 shows the space occupied by the uncoated model; the space between line 15 and the mold unit surface is that occupied by the nitrocellulose coating. Any desired type of adjustable clamping means can be used to secure the special mold device to the support device 5-6. When the mold sections 12-13 have been fitted in position and locked together, the assembly is placed in any desired type of baking oven. The nitrocellulose coats are subjected to dry heat for further hardening. The sections 12-13 are then removed, and the contour sections of the models sheared off at the

neck lines 1. During the heat treatment the model material, especially where plaster is used, becomes highly frangible, and is thereby more readily dissolved.

5 Fig. 7 shows the sheared, coated model; the coating 16 is rigid and transparent. It conforms exactly to the contour of the crown form. Since the neck line 1 of each model is positioned in alignment with upper face of the support device, 10 any well known type of slicing mechanism can be used to successively shear through the model bodies along the plane of the upper face of the support device. For example, a power-driven, rotatable, circular knife, of proper dimensions, 15 can be employed for this purpose. In this way the periphery of the base of the crown form is even, and will have no edge irregularities capable of harming the gum tissue since any excess coating material which may have accumulated on the 20 portion of the model within the basin 7 will necessarily be cut off from the remainder of the coating when the model is sheared by the knife.

The sheared, coated models are now passed into a bath of water. It is preferred to use water of 25 a temperature sufficiently high to dissolve the model body in a rapid manner. The finished crown form is shown in Fig. 8; the model body has been removed without in any way affecting the configuration or rigidity of the coating 16. The 30 aqueous solvent for the model material has no effect on the nitrocellulose; however, it does dissolve the glazed surface on the model body. The separated crown forms may now be collected from the bath and dried.

35 While I have indicated and described a method of, and means for, carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular apparatus shown and described nor to

the sequence of steps outlined; many modifications may be made without departing from the scope of my invention as set forth in the following claims.

What I claim is:

5 1. In the art of producing dental crown forms, the method which includes molding from water-soluble material a tooth model which has a contour section and a locking base, locking the base 10 to a support and exposing only the contour section, coating the surface of the exposed section with a layer of nitrocellulose which becomes rigid upon drying, drying the layer of nitrocellulose, shearing the coated contour section from said 15 base at the support whereby the base of the nitrocellulose layer is formed even and without irregularities, and dissolving the contour section away with water to effect a separation of the rigid nitrocellulose coat.

2. In the art of producing dental crown forms, 20 the method which includes providing a plurality of tooth models each having a contour section and a locking base, the models being composed of a material which readily disintegrates in hot water, locking the bases to a common support and ex- 25 posing solely the contour sections of the models, coating the surfaces of each of the exposed sections with a layer of nitrocellulose, permitting the layers on each surface to become rigid thereby to provide said forms, shearing the coated contour 30 sections away from the base sections at said support whereby the base of each layer of nitrocellulose is formed even and without irregularities, and subjecting the sheared contour sections to hot 35 water thereby to effect complete separation of each rigid form from its contour section without affecting the rigidity of the form.

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