March 2, 1971 J. P. DYAL 3,567,806

METHOD FOR MAKING TRAY DENTURES

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FIG - 1

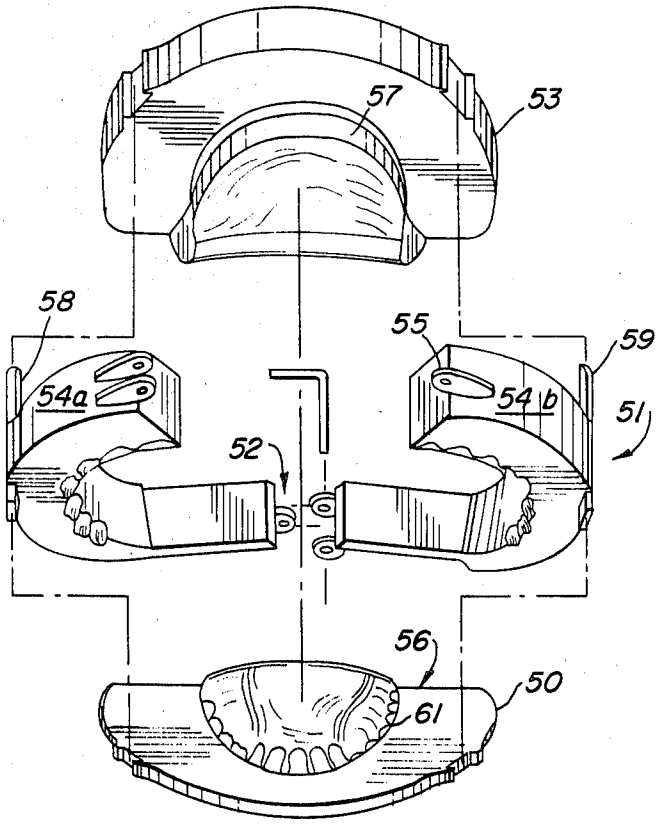


FIG - 2

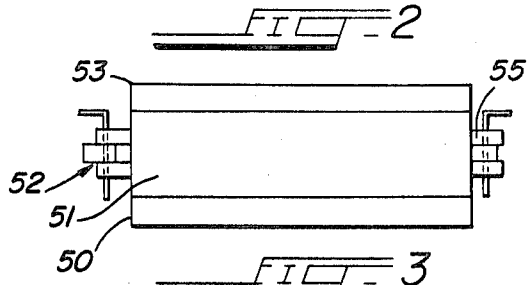


FIG - 4

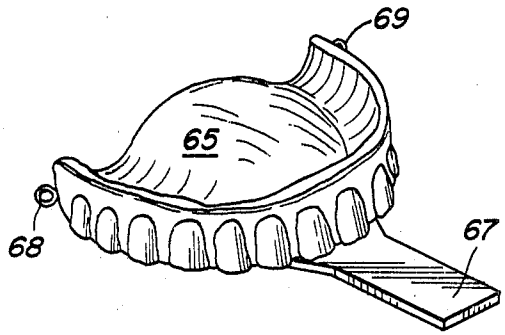
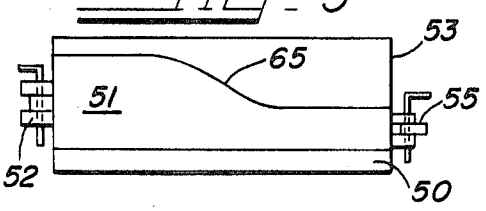


FIG - 3



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METHOD FOR MAKING TRAY DENTURES

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FIG - 5

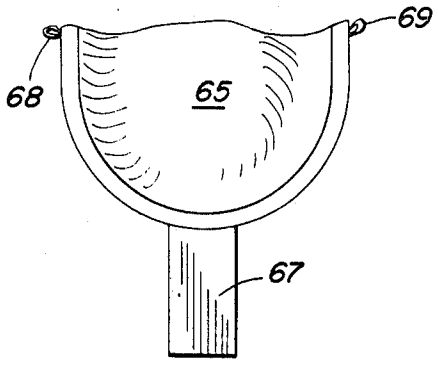


FIG - 6

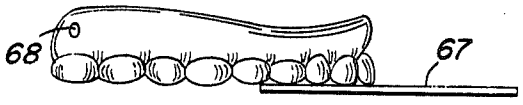
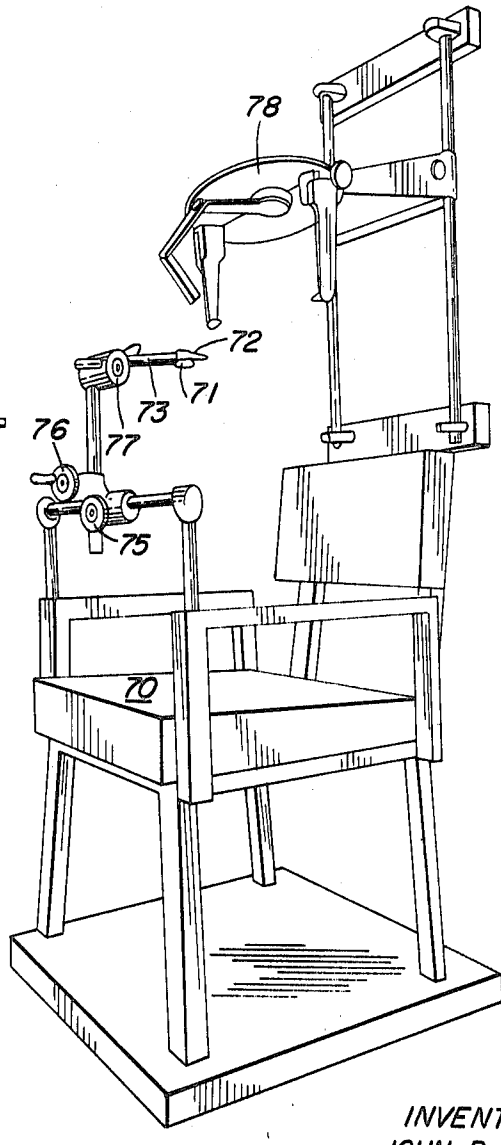


FIG - 7



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METHOD FOR MAKING TRAY DENTURES

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ABSTRACT OF THE DISCLOSURE

An entire denture is prefabricated on a non-anatomical base tray. The tray is then at least partially covered with a self-conforming material and placed in a patient's mouth, thereby building an anatomical base conforming to the patient's alveolar ridges. Following this, the anatomical base is given a custom fit by means of suitable trimming and edge sealing. The invention encompasses the equipment for making the prefabricated denture and for fitting the denture to the patient's mouth.

This invention relates to apparatus and methods of making artificial dentures, and more particularly to methods of prefabricating entire tray dentures that are ready for fitting during which an anatomical base is built upon the tray.

Conventional methods of denture fabrication require a high degree of operator skill, sometimes approaching an artistic skill. This requirement has resulted in the use of expensive and time-consuming methods leading to a relatively high cost end product. According to the invention, the operator does not need to have the same high level of artistic skill. Instead, he can utilize the technical help of lesser skilled persons, and the content of hand labor is reduced.

In greater detail, conventional denture fabrication methods generally involve the following steps: First, impressions are taken of the patient's alveolar ridge. Sometimes these impressions are used as a guide to prepare a second and even more custom-made impression. After satisfactory impressions are made, they are mounted on an articulator for mimicking a denture bite which corresponds to the patient's bite. Since this adjustment is very important, one or more extra fitting steps may be required to check this bite.

After both the impression and the bite ar acceptable, the actual construction of hte denture begins. First, anatomically shaped base plates are constructed, and then pre-manufactured teeth are set in wax attached thereto. These teeth are selected on a basis of their shape, size, and color, as well as on a basis of the age of the patient and the shape of his face. If there is a precise selection, it means that the dentist has a high level of artistic skill, and much time may have been consumed during the "artistic" stage of production. On the other hand, if the selection is just average, as it usually is, there is no reason for providing the wide and artistic range of teeth, color, size, shape, etc.

After the wax-up of the dentures is completed, it is usually necessary to try them in the patient's mouth. Any number of further adjustments and corrections may or may not be made, as required to obtain a perfect fit. Then, the waxed dentures are invested in plaster within a metal denture flask. The wax is removed and a denture plastic is inserted in the void now present in the flask. After a suitable curing process, usually involving a heat cycle, the flask is opened and the plaster is removed. The processed denture is then cleaned, smoothed, and polished.

The steps described above are somewhat fewer than those which might occur in an actual process. Nevertheless, they are adequate to high-light the paintaking hand labor and the high skill level required to make a conventional set of artificial dentures.

Accordingly, an object of the invention is to reduce the cost of artificial dentures and to shorten the time required between the ordering and the delivery of the dentures. In this connection, an object of the invention is to provide prefabricated dentures which can be fitted to the patient's mouth during as few as one or two fittings. More particularly, an object is to provide prefabricated tray dentures which may be fitted to the patient.

In keeping with an aspect of the invention, the novel manufacturing process is somewhat reversed from the conventional process. Instead of starting with an impression of the patient's mouth and building the dentures—a-tooth-at-a-time—on that impression, the invention starts with a completed denture on a tray base void of tissue-bearing anatomical form and converts the base into a custom-made product which is fitted to the patient's mouth.

A preferred embodiment of apparatus and an example of an inventive method, for accomplishing these and other objects, may be understood best from a study of the attached drawings wherein:

FIG. 1 is a perspective view of a metal flask for making a prefabricated tray denture;

FIG. 2 is a side elevation view of the flask drawn in FIG. 1;

FIG. 3 is a side elevation view of an alternative embodiment of the invention especially well suited for the manufacture of lower dentures;

FIG. 4 is a perspective view of a tray denture which is processed in the mold of FIG. 1;

FIG. 5 is a top plan view of the denture of FIG. 4;

FIG. 6 is a side elevation view of the denture of FIG. 4; and

FIG. 7 is a perspective view of a chair used to aid in the fitting.

According to the invention, a number of prefabricated tray dentures are made in the form of unfitted trays with the teeth already mounted thereon. There should be a variety of sizes and shapes of trays so that there is at least one optional denture for almost any dental arch. The upper and lower tray dentures are correctly occluded for the size, shape, and bite of the particular dental arches which they will fit. In addition, provisions may be made for including a choice of tooth color. As will become more apparent, the inventive process starts with this artificial tray denture configuration having the teeth thereon. Then, the dentist constructs on the tray part the anatomical form of the tissue bearing areas.

The first step in the inventive process comprises the fabrication of a waxed-up model for each predetermined and selected tray denture shape and size. The model is made in a conventional manner except that it is constructed on a non-anatomical base. Furthermore, since this model serves as the master for making many artificial dentures, its cost is amortized over many end products. Thus, there is an economic justification for the technician who is making it to spend as much time as it is necessary for him to use his finest "artistry" and skills when he works.

After the waxed-up model is made, a "lost-wax" process may be used to convert it into a suitable flask. In one case, this flask was made entirely from brass. However, other materials (such as: bronze, iron, steel, aluminum, or even various forms of rubber or plastic) may also be used to make the flask.

FIG. 1 shows one example of a flask which is suitable for practicing the invention. This is a drawing of an all brass flask that was actually built and tested with excellent results.

The flask included a base plate **50**, a separate two-piece middle part **51** hinged together at **52**, and an upper part **53**. These three parts are cast from a plaster replica of the waxed-up model of the tray denture which is constructed by the technician. Therefore, the interior of the flask is a matrix which has the shape and form of the specific tray denture.

The drawings show a part **54***a* which is essentially a mirror image of the part **54***b*. When the hinged parts **54***a* and **54***b* are swung together on either of the pivot points **52** or **55**, they are locked together by a pin at the other pivot point. These hinges and locks may be activated with pins (as shown), cams, or a threaded set-up; or, they may be made similar to a luggage closing clasp. Thus, these two parts **54***a*, **54***b* may be opened or closed from either side, at the option of the person who is using the flask. The top **53** is then lowered into a closed position on top of the middle part **51**. The resulting matrix comprises a mold of the teeth, as at **56**, and a mold which is somewhat similar in shape to a non-anatomical dental tray, as at **57**. In more technical terms, the base plate **56** includes the palatal surface of the patient's mouth and teeth, the middle part **51** includes the bucco-labial of the teeth and gums, and the upper plate **53** is a universal, non-anatomical, tray shape. Two or more suitable guides **58**, **59** are rigidly attached to sides **54***a* and **54***b* in order to maintain the alignment of the various parts of the flask. The mold line **61** is intended to show that the bottom plate **50** joins the middle portion **51** at a point along the occlusal surfaces of the stock denture teeth. Here, this mold line coincides with the biting edge of the teeth. This is a preferred embodiment (FIG. 2) of a flask for making at least the upper denture trays. However, the invention is not necessarily limited to this particular arrangement.

In some flasks (FIG. 3) especially well suited for making lower dentures, the parts may separate at a line **65** running from low in the incisal area, and diagonally upward a centimeter or more to the heel area—as distinguished from having the component parts of the flask separate in parallel lines, as shown in FIG. 2. In like manner, as those skilled in the art will readily perceive, the flask may take any of many other forms which are particularly well suited to the dentures being molded therein.

FIGS. 4–6 show one example of a tray denture which might be made in a flask such as that shown in FIG. 1. The upper contours at **65** result from the non-anatomical shape of the matrix **57** on the top plate **53** of the flask. The other teeth contours result from the shape of the matrix in the middle portion **51** of the mold. The lower contours—not visible in FIG. 2—result from the shape of the mold built upon the base plate **50**.

The tray dentures may be fitted with means for facilitating handling and manipulation. For example, the drawing shows a handle **67** which may be attached to the tray denture during fitting. The method of attaching the handle to the tray dentures is irrelevant. It could be attached by means of a lug, magnets, screw, or the like. Also, various loops **68**, **69** could be molded into the dentures for attaching dental floss, rubber bands, or the like to aid in manipulation during fittings. After the fitting is completed, these handles, lugs and loops may be removed, holes may be filled, and all visible traces of them may then be removed by polishing.

In any event, the dentist has or can buy a series of properly occluded and matched upper and lower tray dentures in a range of sizes, shapes, and shades. From this series, he selects the tray denture which he deems appropriate or necessary for a particular patient. An experienced dentist is able to make such a selection by a visual inspection of the patient. A somewhat less experienced dentist might prefer to take an impression in a gelatin material which may be used to make a plaster model of the patient's alveolar ridges. Then the various

stock sizes and shapes of tray dentures may be tried on that plaster model.

In any event, the dentist arrives at his selection of a correct tray denture. Depending upon the needs in a particular case, he may then trim the periphery of the selected dentures to make a better fit.

The first step in fitting is to place the upper denture in the patient's mouth with an anatomical conforming material therein. If the dentist has sufficient experience, the conforming material may be a self-curing acrylic which hardens quickly. Then, the dentist muscle-trims as required at the edges of the acrylic material when it has set up.

If the dentist prefers, this tray denture is filled with a suitable self-conforming plastic material such as that sold under the trademark "Coe-Soft." Then, the dentures are fitted to the patient's mouth by following the procedures which are conventionally used in connection with the selected conforming material. The upper denture is considered to be properly positioned when about one millimeter of the incisal edge of the anterior teeth is showing, when the midline of the teeth is centered, and when a plane through the occlusal surfaces of the back teeth is parallel with the floor in the fitting room (assuming that the patient's head is erect).

The second fitting step is to muscle-trim and to form a peripheral seal, as by the use of a commercial product called "Bosworths Rim-Seal." If retouching is necessary, it may be done in any conventional manner.

The third step is to fit the lower tray denture by following essentially the same steps which are outlined above in connection with the fitting of the upper dentures. While the lower denture is being fitted, the patient is instructed to close his jaw. The dentist moves the patient's chin as required to be certain that the upper and lower dentures are centrically positioned and the teeth interdigitate properly. The patient then swallows and holds position.

After the conforming materials have set up, the dentures are removed and finished in a conventional manner. The finishing steps may include conversion to hard acrylic, touching up, polishing, hardening, washing, etc.

To facilitate the fitting of the upper denture, the patient may be seated in a chair (FIG. 7) having an adjustable tri-directional lift attached to the chair arms. In greater detail, the handle **71** of the tray denture **72** is attached to a movable terminal **73** mounted on the tri-directional lift. The tray denture **72** may then be moved to any convenient location along X, Y, and Z axes by turning wheels **75**, **76**, and **77**, respectively.

First, the patient is seated in the chair **70** where his head is stabilized by means of the head clamp **78**. Then, the tri-directional lift **71–77** is attached to the arms of the chair. By suitably turning the wheels **75–77**, the denture **72** may be positioned in the patients' mouth with a high degree of accuracy.

The foregoing method of manufacture is cited by way of example only. Those who are skilled in the art will readily perceive modifications which may be made in the method. Accordingly, the appended claims are to be construed broadly enough to cover all equivalents reasonably falling within the true scope and spirit of the invention.

I claim:

1. A method of manufacturing artificial dentures comprising the steps of:

(a) molding upper and lower acrylic dentures as completely prefabricated units with a mold line coinciding with the biting edge of the teeth, each of said dentures having correctly occluded manufactured teeth mounted on a non-anatomical tray base,

(b) attaching removable means for manipulating said dentures from outside a patient's mouth while said dentures are inside the patient's mouth, said manipulation being independent of the head position,

(c) placing an acrylic lining material in said upper denture tray, said material having a characteristic

such that it conforms to the shape of a patient's mouth and hardens while in a patient's mouth,

(d) fitting and manipulating the upper denture tray to a patient's mouth while said conforming material is soft to build an anatomical form base thereon,

(e) allowing said conforming material to set up at least partially,

(f) muscle-trimming and rim sealing the peripheral edges of said denture tray,

(g) removing said removable means from said upper denture,

(h) placing a lining of said acrylic material in said lower denture tray,

(i) fitting the lower denture tray in said patient's mouth while having said patient close his jaw and move his chin, and

(j) having said patient swallow and hold a bite position until after said material sets up at least partially.

2. The method of claim 1 wherein said step of providing a removable manipulating means includes the step of temporarily attaching a handle and loops to said tray.

3. The method of claim 1 wherein the fitting steps (d) and (i) comprise the steps of:

(k) seating said patient in a chair having a tri-directional lift attached thereto,

(l) stabilizing said patient's head,

(m) sequentially attaching said denture trays to said lift and inserting said denture trays in said patient's mouth, and

(n) moving said tri-directional lift to precisely position said denture trays on the patient's alveolar ridges.

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U.S. Cl. X.R.

32—2, 21