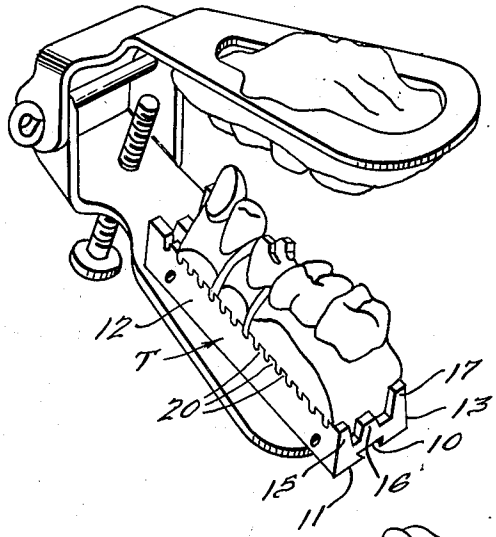
Dec. 2, 1952 R. A. ROESER 2,619,725

DENTAL TRAY

Filed Aug. 8, 1949

Fig. 3.



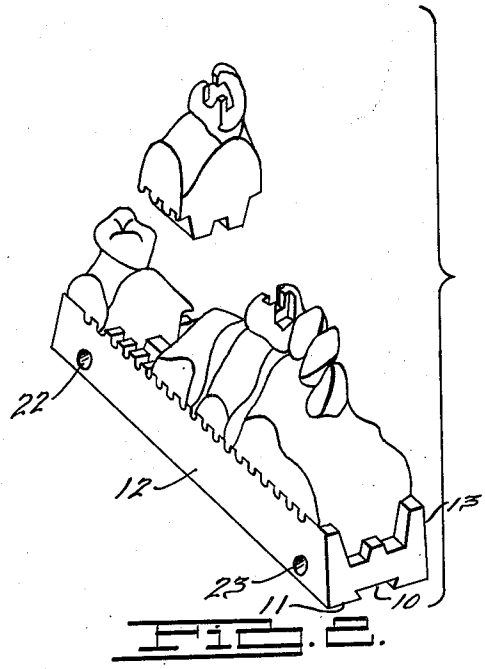


Fig. 2.

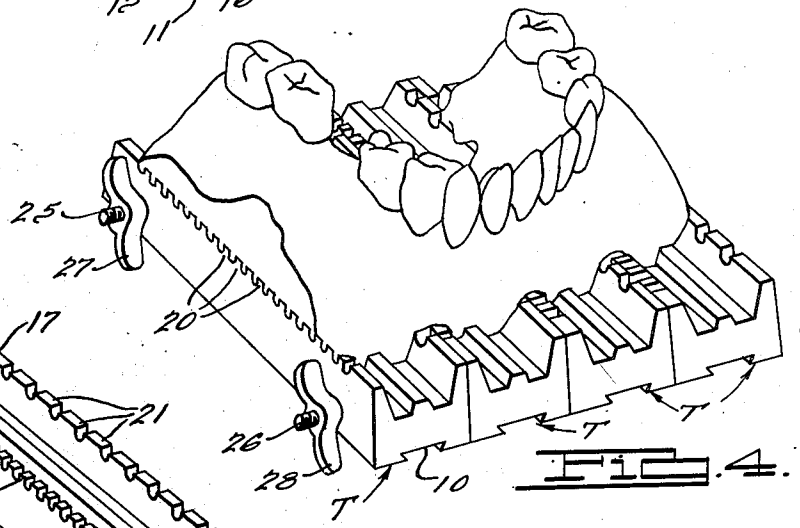


Fig. 4.

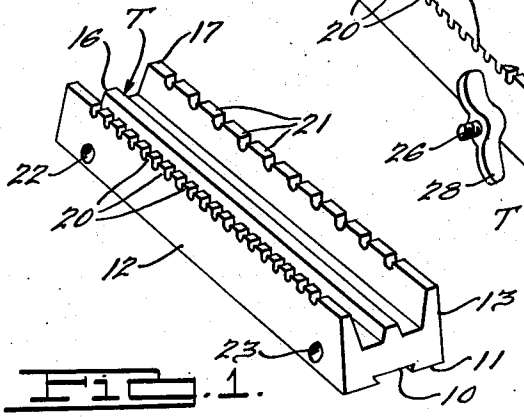


Fig. 1.

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DENTAL TRAY

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7 Claims. (Cl. 32—32)

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This invention relates to dentistry, and more particularly to an improved method and apparatus for producing inlays, restorations, bridgework as well as other types of restorative work in operative dentistry.

In the process of restorative work of the above nature it is necessary to produce by casting so-called inlays or pieces of gold or other material which fit perfectly into special recesses provided in teeth and have outer surfaces restoring a tooth as closely as possible to its desired configuration. Furthermore it is often also necessary to secure or assemble a number of such inlays with a number of false teeth to fill the empty places after removal of some teeth, thus producing a so-called "bridge," or to assemble a number of false teeth provided with prongs adapted to embrace adjacent teeth and thus to produce a so-called "removable appliance." Such assembly or connection done with the use of high melting point solders and similar expedients must by necessity be done out of patient's mouth, and yet preserving exactly the same space relationship as these elements must have with respect to each other and the adjacent teeth for a perfect fit in the patient's mouth. Both, the production of such inlays and the assembly operations possess numerous problems and difficulties acutely felt in the art of dentistry and they have so far defied the efforts of those skilled in the art to solve them.

One of such problems resides in making an inlay which would fit perfectly the surfaces of the recess provided in a tooth and also have such outside surfaces that fit exactly the edges of the recess and restore the tooth to the configuration dictated by the adjacent and/or opposing teeth. In order to produce such an inlay, a wax pattern must first be made, which pattern is placed into a paster material before such material sets and hardens thus making a mold for casting the inlay in gold after the wax is burned out. Producing a desired wax pattern is a delicate operation of great nicety, involving numerous difficulties. When such a wax pattern is produced by the so-called "direct method," i. e. by application of heated wax directly to an actual cut or recessed tooth (inlay candidate) and then carving the wax on the tooth in patient's mouth to restore the tooth to its substantially original configuration, the main difficulty resides in inaccessibility of various teeth or some portions of their areas, making it often virtually impossible to carve the wax to the required configuration.

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To eliminate the above difficulty the so-called "indirect method" is often employed. In accordance with this method, a plaster of Paris replica or model of the inlay candidate tooth is first made, and the heated wax is forced unto and carved on such replica which, being out of patient's mouth, is fully accessible at all of its surfaces. For making such a replica or model a mold or negative impression of the tooth must first be made. Two methods of making such a mold are most commonly employed. In accordance with the first of such methods a copper tube is first fitted over the tooth and suitable wax-like material heated until plastic is forced on the tooth and chilled. When removed, the tube has within it the wax negative impression of the prepared tooth. Thereupon the replica or model of the tooth may be made by copper plating the model, or by packing it with silver amalgam filling material, or by pouring plaster of Paris into it. Having thus taken care of the separate tooth or teeth, for placing such replica teeth in a proper space relationship with respect to each other for connecting the wax pattern, at the time of making the negative impressions of the separate teeth, the patient is also asked to bite into a bar or strip of wax, whereby negative impression of both upper and lower teeth of one-half jaw are produced in opposite sides of the wax. Such a strip is called a "wax bite." After the replica or models of the teeth are made as explained above, and their root ends are tapered and lubricated, they are placed into the corresponding impressions in the wax bite and are secured in place by flowing a small amount of wax around them and the wax bite. Thereupon stone plaster is poured around the replica teeth and into the depressions of the adjacent teeth in the wax bite. When the stone plaster is set, the opposite side of the bite is similarly assembled and poured. When both "sides" are poured, the pieces so produced are fastened to a hinged articulator. The wax bite held between the sides is then softened by heat, the sides opened up and the wax bite discarded. It will now be seen that there is thus produced a substantial replica or model of the upper and lower teeth of a half-jaw with replica of the prepared or candidate teeth removable from their sockets or nest because of their tapered and lubricated ends or "handles." Thus the operator may remove the inlay candidate tooth replica from the half-jaw replica for working on it separately. After having been so worked on, the inlay candidate tooth replica is inserted back into its

socket in the half-jaw replica and thus returned into its proper space relationship with respect to its adjacent teeth for subsequent operation.

While the above method often referred to in the art as "compound method" has the great advantage eagerly sought by the dental profession of providing replica of separate teeth for carving the wax to bring the tooth to the required shape with all of its surfaces being easily accessible, and furthermore permits returning the replica of the separate tooth into the replica of the jaw in the proper space relationship to the adjacent teeth, it has a number of most serious disadvantages. One of the most serious disadvantages results from the fact that teeth do not necessarily have an upwardly tapering form but have bulges at their middles, or in other words they are of smaller cross sectional areas at their "necks" than at their middles. The wax used for the wax bite as well as for the wax mold of the inlay candidate tooth replica, and the various compounds also employed, are practically inelastic or non-resilient.

Therefore after the wax is chilled on a tooth in patient's mouth it is not possible to "draw up" the mold so formed without distorting the negative impression so made. The above point may be illustrated by reference to foundry molding practice where the so-called "draft" or taper is provided on patterns to permit their withdrawal from the sand of the mold. In withdrawing the mold from a tooth, the opening formed at the neck of the tooth is expanded to permit the bulge at the middle of the tooth to pass, and this inevitably destroys the originally true character of the mold surfaces under the bulge, and often considerably distorts the surfaces above the bulge also. Therefore, when the replica of a tooth is made in such a distorted model, the inlay cast from the wax pattern molded and carved on such a replica does not fit well the actual tooth. For ensuring a true negative impression, it would be necessary to limit the impression of the tooth only to its surfaces above the bulge or cross-section plane of largest area. This is not possible in many cases, since restorations must extend under such plane.

It has been proposed to use some elastic or resilient material instead of wax for making such negative impressions or mold and a number of such resilient materials has been developed. One of such materials, a hydrocolloid, is particularly satisfactory, and has been commercially available for considerable length of time. This material upon setting by cooling or chemical action becomes resilient or elastic, and therefore "gives" at the teeth bulges as the mold is being withdrawn and returns to its original shape to give the originally imparted negative impression. In accordance with the generally followed technique developed with the use of such a material, an impression of the opposite teeth (upper and lower) is taken and then a wax bite is made at the same appointment. These negative impression or molds are poured with a suitable plaster of Paris-like material and the models or replica so made are placed in a hinged "articulator." In order to have models of individual teeth separately free to work on, another impression and model of the candidate and opposite teeth is made as explained above, the required teeth cut out and the rest of the model discarded. In making the wax patterns, the wax is applied or adapted to the models of the individual teeth and then transferred to its place on the model of the

whole one-half jaw in the articulator to arrive at its correct external size and shape. Thereupon the wax is again transferred to the lone or separate candidate model in order to finish the edges or margins that were unfinishable on the uncut hinged model because of inaccessibilty of some areas of the tooth therein. However, since the wax is very fragile and will fracture or distort very easily, the necessity of such transferring the wax several times made the final results uncertain and the method not practicable or advisable except for a limited number of special situations. Thus the advantages of said resilient material can seldom be utilized.

One of the objects of the present invention is to provide an improved method and apparatus whereby the above described difficulties are overcome and eliminated and the resulting technique possesses the advantages of both of the above described methods without having the above disadvantages thereof.

Another object of the present invention is to provide an improved dental method and apparatus whereby the dental restorative work is made more precise and exact and yet the technique employed is made more simple and easy.

A further object of the present invention is to provide an improved method and apparatus whereby the negative impressions of teeth are taken in a speedier and simplified manner using elastic or resilient material realizing the advantages thereof explained above, and providing both the separately workable lone or separate candidate teeth models as well as the entire half-jaw models with the use of only one negative impression and model.

A still further object of the present invention is to provide an improved apparatus whereby a whole half-jaw model may be cut into lone teeth models, with each model workable on separately and thereupon returnable into and automatically and positively locatable at its exact original place in the half-jaw model. Such construction insures exact and precise space relationship of the lone model to its adjacent teeth in spite of the fact that some material was removed or consumed in the form of chips or filings when the model was cut up, and in spite of the fact that the adjacent surfaces at cuts or slits are no longer in contact and cannot be depended upon for such positive locating.

A still further object of the present invention is to provide an improved apparatus of the character specified in the preceding paragraph, which in addition to the functions specified therein also insures that in returning the removed lone tooth model into the half-jaw model it cannot by mistake or otherwise be inserted into a wrong place or otherwise placed improperly.

It is an added object of the present invention to provide an apparatus of the foregoing description, which is simple and rugged in construction, dependable in operation and is relatively inexpensive to manufacture.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Fig. 1 is a perspective view of a single dental tray embodying the present invention.

Fig. 2 is a perspective view illustrating the tray of Fig. 1 and showing the cast and cut or sectioned model reinserted into the tray piece by piece in the same relative or mutual space rela-

tionship as the corresponding teeth occupied before the model was sectioned.

Fig. 3 shows the loaded tray placed into a conventional hinged articulator.

Fig. 4 illustrates the method of casting a model of a full jaw on the composite tray assembled from four single trays.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawing there is shown by way of example a dental tray embodying the present invention. Referring to Fig. 1, tray T illustrated therein is of an integral construction adapted to be made from a rolled or extruded stock of a special cross section, which cross section is uniform throughout the length of a stock bar. It will be understood, however, that while the use of such stock has a number of important production or manufacturing advantages, the present invention is not limited to the use of stock of uniform cross section or stock manufactured by rolling or extrusion methods, and that the use of the trays having cross sections varying longitudinally and/or transversely of the tray, as well as produced by other manufacturing methods, such for instance as by die casting, may be resorted to in many instances.

The tray T is provided with means for securing it to the hinged dental articulator, such as one shown in Fig. 3, which means are exemplified in the construction of Fig. 1 by the dove tail slot 10 provided on the bottom surface 11 of the tray T and adapted to engage a bead or ridge (not shown) of the complementary cross section, provided on the articulator. The side walls 12, and 13 of the body of the tray T are perpendicular to the bottom surface 11, and therefore are vertical when the tray rests on a horizontal surface. By virtue of such a construction, assembling a desired number of the single trays into a composite tray of any desired width may be done more conveniently.

On the top surface of the tray T there is provided a number of longitudinally extending beads or ridges 15, 16 and 17 having upwardly converging walls, as shown. The upward convergence of the walls, usually termed "draft," ensures easier withdrawal of the cast model by pulling it upwardly. The longitudinal beads 15, 16, and 17 locate the cast model transversely. In other words, the cast model when cast or when sectioned and reinserted into the tray becomes fixed in the direction transversely of the tray. While there are three beads provided on the tray illustrated in the drawing, it will be understood that the present invention is not limited to any particular number of such beads, and that, in fact, a single bead may be sufficient in some instances.

Means locating the model and the separate portions thereof longitudinally of the tray are exemplified in the illustrated embodiment of the invention by the serrations or teeth 20 and 21 provided on the longitudinal beads 15 and 17, respectively. The teeth 20 and 21 are also provided with a suitable draft as can be clearly seen from an examination of the drawing, in order to facilitate "drawing" of the cast model. It will

be noted that the respective pitches of the teeth 20 and 21 are different and preferably have an irregular or fractional relation to each other, such as 1:2–1/8; or 1:1–12/13 and the like. By virtue of such a construction replacement of the portions of the model into a wrong place is prevented. This is due to the fact that a portion of the model can not be misplaced, say by one tooth 20, and still fit into the teeth 21. It will be understood, that if there were a simple regular relationship between the pitches, such as 1:2, such a misplacement may easily occur, since the space relationship of the teeth repeats itself at each of the teeth of lesser pitch. For instance, with each of the teeth 21 being of ¼" pitch and teeth 20 being of ⅛" pitch and therefore producing a pitched relationship of 2:1, a piece cut out by slits on centers of teeth 21 would fit into each and every space between any two teeth 21 of a row (providing the slits between such teeth were cut on centers thereof) without teeth 20 offering any interference. On the other hand, with teeth 21 being made of ¼" pitch and teeth 20 of 3/16" pitch (producing a pitched relationship of 1:¾), a piece cut on centers of first and second of the teeth 21 of a row would fit into the space cut on centers between the 4th and 5th teeth of the same row, but would not fit into the spaces between the 2nd and 4th teeth, or 3rd and 4th teeth of the same row, since teeth 20 in the latter intervals would offer interference.

There are thus provided on the tray T means locating the model thereon both in longitudinal and in transverse directions. While said means are exemplified by the serrated beads or ridges, the requisite locating means may be produced in a number of different ways. For instance, a number of irregularly distributed raised spots, or depressions may be equally effective for positively locating the portions of the cut model, providing such spots or depressions are so distributed that at least one of them is provided for each separate portion of the cast model. Also by providing an irregular hilly surface, or surface with a sufficient slope, location of the separable portions of the cut model when reinserted into the tray may be also properly effected, since improper placement of separate portions would cause the top surfaces of the teeth to be so much off the proper elevation as to give the operator a sufficient notice of mistake.

Means are provided to connect or assemble a desired number of single trays into a composite tray on which a full jaw model may be cast. In the present embodiment said means are exemplified by holes 22 and 23 through which proper connector, such as bolts 25 and 26 of desired length may be passed. Nuts 27 and 28, preferably of the wing type, may be used to tighten and securely hold the assembly together.

When used to carry out my improved method, a single or a composite tray is first greased or treated with any other suitable material a number of which is well known in the art to prevent sticking of the plaster of Paris like material to the tray. Plaster of Paris or a similar material is then poured on the tray, and the model of the full jaw or a portion thereof previously cast in a mold made of resilient material is placed into the mass of the poured plaster of Paris and permitted to set therein. When set, the plaster of Paris becomes an integral portion of the model, providing a locating base therefor.

The model of the opposing jaw or a desired portion thereof is prepared in a similar manner.

Thereupon the corresponding wax bite is placed on one of the models and the opposing jaw or portion thereof placed into the opposite side of the wax bite. Thereupon this assembly or combination is attached to an articulator, see Fig. 3, in a usual manner. Then the sides of the articulator may be opened out and the bite discarded.

The removable candidate side (i. e. side of a jaw, adapted to receive inlays and the like) can now be removed and cut or sectioned into desired portions. Thus the replica of candidate teeth may be completely freed for separate working thereon and reinserted into the tray in the exact space relationship in the model which such candidate teeth replica occupied therein prior to the cutting up or sectioning of the model.

By virtue of such a method the required inlays or restorations can be constructed to accurate candidate, accurate adjacent teeth, and accurate opposing teeth.

There are thus provided an improved method and one form of a dental apparatus for carrying out said method, whereby objects of the present invention listed above and numerous additional advantages are attained.

I claim:

1. A dental locating tray for receiving replica of at least a portion of a jaw to be cast thereon, said tray being adapted to be connected to a dental articulator, a number of locating serrations provided on said tray said serrations extending transversely of the tray and adapted to locate each individual tooth longitudinally, and a number of beads extending longitudinally of the tray and adapted to locate the replica transversely.

2. A dental locating tray for receiving replica of at least a portion of a jaw to be cast thereon, said tray being adapted to be connected to a desired base, a number of longitudinally extending raised portions provided on said tray for locating the replica transversely, and a number of transversely extending integral raised portions adapted to locate the individual teeth longitudinally.

3. A dental tray adapted to receive replica of at least a portion of a jaw to be moldably formed on the tray to receive at the bottom side of said replica an impression of the replica-contacting surface of the tray, a number of longitudinally extending beads provided on the replica-contacting surface of said tray and a number of raised elements provided on said beads and extending transversely thereof.

4. A dental tray adapted to receive replica of at least a portion of a jaw to be moldably formed on the tray and to produce at the bottom side of said replica an impression of the replica-contacting surfaces of the tray, a number of longitudinally extending beads provided on the replica-contacting surface of said tray, and a number of raised elements provided on said beads and extending transversely thereof, the said beads and raised elements having vertically extending surfaces slanted to provide draft angles.

5. A dental tray adapted to have a replica of at least a portion of a jaw moldably connected thereto to accept the configuration of the upper surfaces of said tray for locating purposes, at least two longitudinally extending beads formed on said tray, a number of teeth formed on each of said beads to extend transversely thereof, the teeth on said beads having different pitches.

6. A dental tray adapted to have a replica of at least a portion of a jaw moldably connected thereto to form on said replica the negative configuration of the upper surface of said tray, the upper surface of said tray forming a channel with two raised sides and a bottom extending therebetween, teeth cut on the tops of the sides of the channels, and a central bead provided on the bottom of said channel and extending longitudinally thereof.

7. A dental tray as defined by the preceding claim 6, the teeth of said channel sides being of uniform but different respective pitches.

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