

May 4, 1943.

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2,318,402

PREPARATION OF DENTAL BRIDGE PROTHESIS

Filed July 31, 1941

3 Sheets-Sheet 1

Fig. 1.

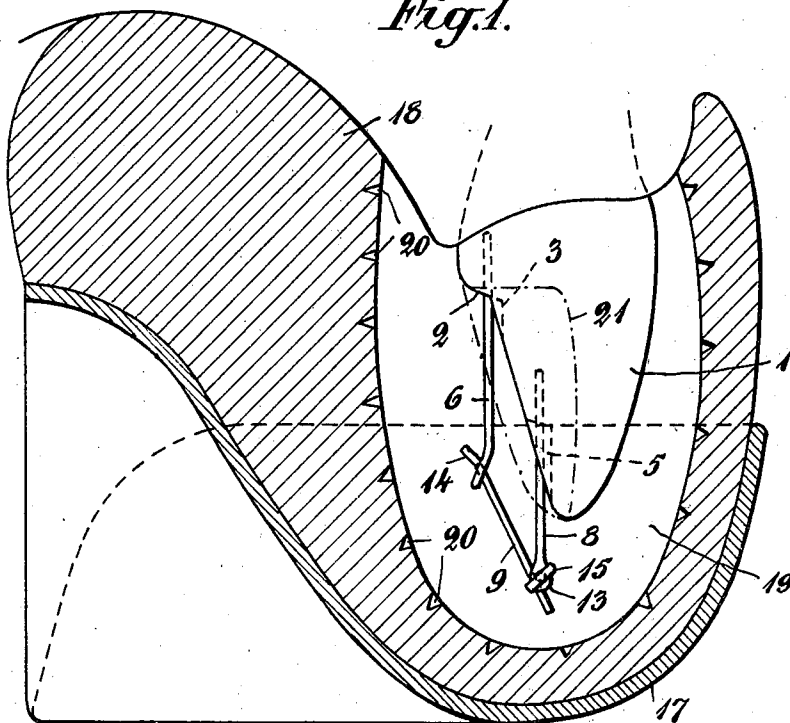
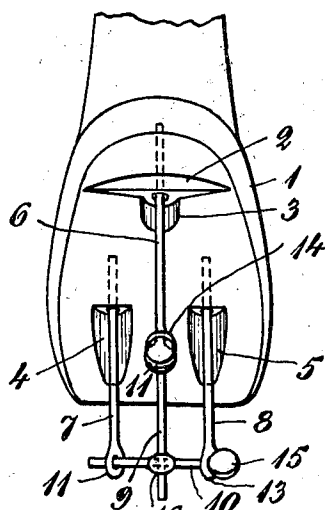


Fig. 2.



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Fig. 3.

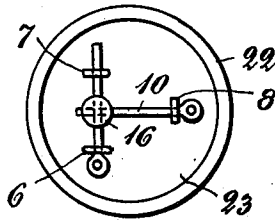


Fig. 4.

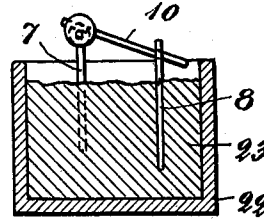


Fig. 5.

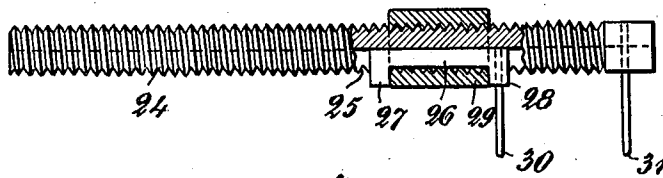


Fig. 6.

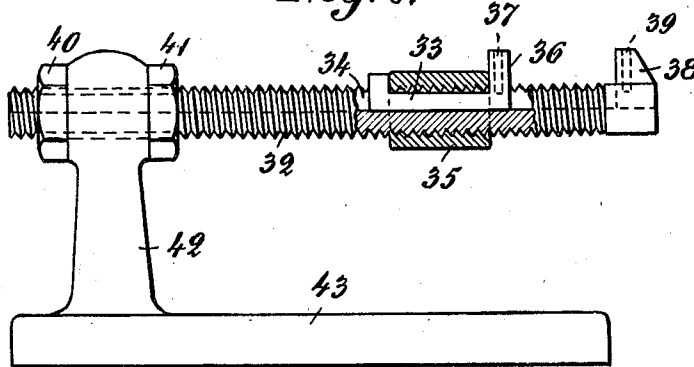
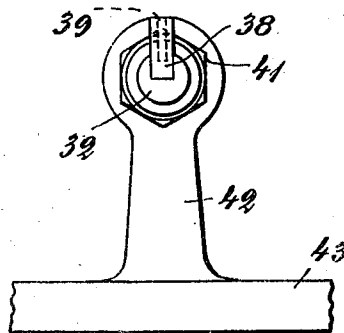


Fig. 7.



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Fig. 8.

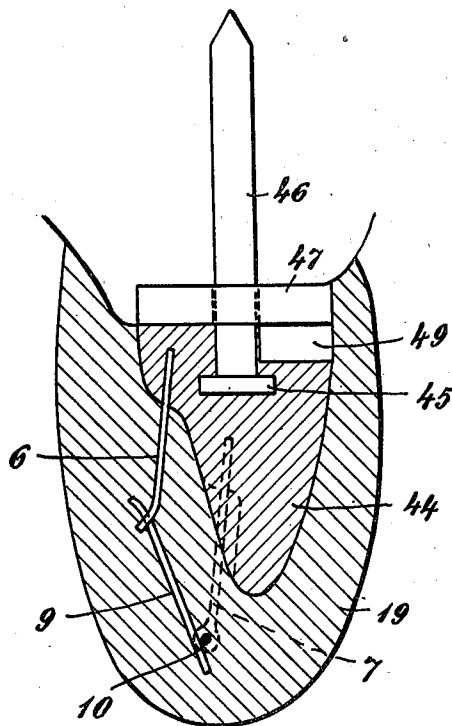


Fig. 9.

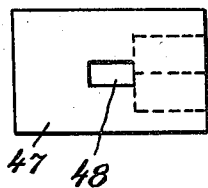
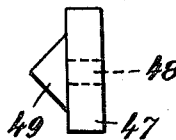


Fig. 10.



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UNITED STATES PATENT OFFICE

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PREPARATION OF DENTAL BRIDGE
PROTHESIS

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6 Claims. (Cl. 32-5)

The invention relates to such methods for preparing dental bridge prosthesis in which the prosthesis is secured to the teeth by means of mutually parallel holding pins inserted into the tooth crowns. The invention particularly relates to that step of the preparation which comprises the making of a working model. This is usually carried out in such a way that, after finished preparation of the teeth which are to be used as abutments for the prosthesis, an impression is taken of the tooth or jaw portion in question a working model being then produced by taking a cast of the impression in a mass of plaster or a similar substance. Usually a mouldable mass of colloidal type is used for taking the impression said mass being cast over the tooth portion in a liquid state. As this mass is elastic in its solid state it may be separated from the teeth without changing its shape and, therefore, will represent an exact cast of the tooth portion in question. In this mass also the holding pins are embedded, which therefore should be retained in the impression when the latter is taken out of the mouth. In practice, however, it has proved difficult to produce impressions in a mass of said kind without the holding pins being displaced from their correct positions either upon applying the impression mass or on removing the impression. The present invention has for its object to eliminate this trouble and chiefly consists therein that the pins, before taking the impression, are fixed in correct mutual positions by being united at their free ends *i. e.* by means of transverse pins or braces or the like, the impression mass being then cast or pressed about the tooth portion and the pins thus fixed.

The invention will be more closely described with reference to the accompanying drawings. Figure 1 shows one of the teeth which are to be used as an abutment for the bridge prosthesis, and a mould placed in operative position relatively to the teeth. Figure 2 shows the prepared tooth as seen from the inner side. Figure 3 is a plan view and Figure 4 a vertical section of a matrix serving as a means for fixing the pins outside of the mouth. Figure 5 is a side view, partly in section, of a matching device for fixing the distance between two pin channels. Figure 6 is a side view, partly in section, of a matrix suiting said matching device. Figure 7 shows the last mentioned matrix as seen from the one end. Figure 8 is a cross section through the impression showing a model tooth removable from the model and cast into the impression mass with the appertaining working appliances. Figures 9 and 10 are a plan view and an end view respectively of an implement for use in connection with the preparation of a removable model tooth.

The invention is primarily intended for use in such cases when the prosthesis is to be secured

to vital teeth in such a way as to avoid damage of the pulp. The tooth is then first worked into proper shape in the way illustrated in the drawings. In the example shown an artificial crown is intended to be secured to a tooth *1* for instance a front tooth of the upper jaw. In the first instance, so much of the inner side of the tooth is ground off which is to be replaced by the gold crown, a ledge *2* being then formed closed to the root portion. A number of recesses, usually three recesses, *3, 4, 5* in the form of niches or the like are then made at those places where the holding pins *6, 7, 8* are to be inserted. The channels in which the pins are to be inserted are then drilled from the bottom of said niches so that the channels will be mutually parallel. After the pins have been inserted in the channels they are joined together at their free ends by means of transverse braces, which in the example shown consist of pins *9, 10*. The pins are provided with pierced heads *11, 12, 13, 14, 15* formed by flattening out the ends of the pins. The brace pins *9, 10* are put through the holes in the holding pins as shown in the drawings. Thus, the pin *10* is inserted through the heads of the two pins *7, 8* whereas the pin *9* is inserted through the head of the pin *6* and secured to the pin *10* at the middle portion thereof by means of a piece of wax *16* or other binding substance. Finally the brace pins *9, 10* are connected with the heads of the holding pins by means of wax or the like so that all of the pins will form together a rigid system. The pins may also be screwed together or joined in any other convenient manner.

After finished preparation of the tooth or further teeth respectively which are to be used as bridge abutment, an impression is taken of the jaw portion involving the bridge abutment, which is done in the following way. The teeth included in the bridge are covered with a layer of soft wax of the thickness of 4 to 5 mm. In a cast spoon *17*, which is shown in cross section in Figure 1, and which has a form corresponding to the row of teeth or the jaw respectively, there is provided a heated plastic composite mass of a resin type for instance a Kerr-mass. The spoon is introduced into the mouth and is pressed against the row of teeth. After the impression mass has cooled down and solidified the impression is taken out, the layer of wax around the teeth being removed together with impression mass. The wax is then removed from the impression so that a free space *18* is obtained around the tooth and jaw portions from which a cast is to be taken. This space is filled with a heated viscous impression mass of a colloidal type for instance a Surgident-mass. The cast spoon is now again introduced into the mouth so as to enclose the row of teeth, the impression mass being then brought in close contact

with the teeth. The spoon is thereupon cooled down so that the colloidal mass will solidify. The mass last mentioned is preferably of such a nature as to be elastic in its solid condition, the separating of the impression from the teeth being thereby facilitated and the form of the impression being not changed by the removal of the impression from the teeth. In order that impression mass may be firmly connected with a surrounding mass 18 the latter is provided, on the walls enclosing the space 19, with notches 20 which are filled up by the impression mass. Owing to the fact that the holding pins are connected together at their free end in the way described, they are held firmly in their correct positions so that no change of their positions will take place, when the impression mass is pressed against them. The bracing pins 9, 10 also have the advantage that the pins will be effectively anchored in the impression mass so as to be retained in the impression mass, when the latter is removed from the mouth, without the mutual positions of the pins being altered. This fact is of a particular importance in using an impression mass of the kind mentioned which is soft and elastic in its solid state, as otherwise the holding pins would be retained in the pin channels in the tooth upon removal of the impression. By means of the impression thus obtained a working model is produced by using the impression as a mould for a plaster like substance. The preparation of the gold crown itself is carried out in known manner by means of wax models of a form corresponding to the form of the crown desired. The dot and dash line 21 in Figure 1 indicates the form and extension of a crown which, by way of example, may be secured to the tooth.

In the method above described the steps involved in fixing the pins to each other are carried out while the pins are still inserted in the tooth what may be inconvenient in some cases owing to the difficulties of performing the fixing operation inside the mouth. Hereinafter an improved method will be described whereby it may be possible to carry out the fixing procedure outside the mouth. According to this method the pins are inserted into a matrix in which holes are provided in agreement with the arrangement of the channels in the tooth the pins being then joined together in the way above-described while remaining in the matrix. The rigid system of pins thus obtained is then removed from the matrix and inserted into the tooth.

The apparatus shown in Figures 3 and 4 is intended to be used in cases where the tooth is provided with at least three parallel pin channels. It consists of a container 22, partly filled with an easily fusible cast mass 23, preferably a metal alloy having a low melting point, for instance Wood metal. Plaster or other moulding substance may, however, also be used. After the tooth has been worked into shape in the usual way and has been provided with parallel pin channels, in this instance three channels, the tooth is oiled, whereupon the pins are inserted in the appertaining channels. Instead of fixing the pins in relation to one another whilst they are at their places in the tooth, as is the case above described, this procedure is carried out by the aid of said apparatus outside the mouth in the following manner.

A piece of impression composite mass, preferably so-called Kerr mass, which is compact and

comparatively hard at ordinary temperatures, is heated so as to obtain a suitable plastic consistency, whereupon it is directly pressed against the prepared surface of the tooth, where the pins 6, 7, 8 are loosely inserted. After the impression mass has been cooled and has become hard, it is taken out together with the pins which are now fixed in the mass, whereupon the free ends of the pins are oiled for instance with castor oil and entered into the molten metal 23. After this latter has been cooled down into solid condition, the pins are taken out, which, after having been free from the mass that holds them together, are again inserted in the appertaining holes in the matrix thus obtained. If desired, new pins may be inserted in the matrix. After having ascertained that the pins slide easily in their channels, the pins are interconnected by the aid of transverse pins 9, 10, which by means of wax 16 are connected with one another and with the pins 6, 7, 8 so that all the pins form a rigid system. The pins united in this manner are then removed from the matrix and are put at their places in the tooth. Subsequently, the colloidal mass is cast round the tooth or a plurality of teeth, similarly treated in the manner described above.

In cases where the supporting tooth is to be provided with two pins 7, 8 only, the fixation of the pins can take place outside the tooth in a more simple manner by the aid of the apparatus shown in Figures 5 and 6. Said apparatus consists partly of a matching device, Figure 5, in the form of a screw-threaded shank 24 provided with a longitudinal groove 25, in which a movable pin holder 26 is fitted which at the ends is provided with radially projecting portions 27, 28. The holder 26 is retained in place in the groove by means of a sleeve 29, which at its ends bears on the portions 27, 28 and which is threaded onto the shank 24 so that the holder 26 can be displaced in the groove by rotation of the sleeve 29. The holder 26 carries at one end a fixed pin 30. Rigidly united with the outer end of the shank 24 is a similar pin 31 which is parallel to the pin 30.

The apparatus shown in Figure 6 is intended to be used as a matrix and consists of a screw-threaded shank 32 in which a holder 33 is arranged to slide in a longitudinal groove 34 and to be adjusted in the longitudinal direction by the aid of a nut 35 similarly to the holder 26 of Figure 5. At one end the holder 33 is provided with a radially projecting portion 36 in which is bored a radially extending hole 37. Inserted in the groove 34 at the end of the shank 32 is a radially projecting portion 38 which likewise is provided with a radial bore 39 which is parallel to the bore 37. The portion 38 is rigidly united with the shank 32. At the opposite end the shank 32 is inserted in and, by means of nuts 40, 41, fixedly united with an upright 42 extending from a base plate 43.

After the pin channels have been bored in the tooth, the pin 30 is adjusted by means of the nut 29 provided on the shank 24 so that both pins 30, 31 can be inserted in the pin channels in the tooth. By this means, the distance between the pin channels will be fixed on the matching device 24. Thereafter the holder 33, Figure 6, is adjusted relatively to the member 38 so that the pins 30, 31 on the matching device can be inserted in the holes 37, 39 the distance between the pin channels being thus fixed and registered in the matrix, Figure 6. After the matching device has been removed, two loose pins 7, 8 are inserted in

the holes 37, 39, which pins may be secured to the holders 36, 38, by suitable means, for instance screws (not shown) and which are subsequently fixed relatively to one another, for instance by the aid of a transverse pin 10 which is secured to the pins 7, 8 by waxing so that all the pins form together a rigid system. The pins thus united with one another are then inserted in the pin channels in the tooth, whereupon the casting in the colloidal mass takes place in the previously described manner.

Also in case of the use of three or more pins in each separate tooth, the fixation of the pins may be carried out by the aid of a matching device and a matrix which to this end are provided with a corresponding number of pins and pin holders, respectively, adjustable in relation to one another.

As described above, the impression obtained in the colloidal mass is used for casting a plaster pattern which in known manner is used for producing the prosthesis. During the work in the model it is usually necessary to prepare and shape the wax crown of each separate tooth alone. According to the invention, this work can be highly facilitated, particularly when the teeth are located close together, by that one or more separate teeth in the model are made detachable so that they can be separately removed from the model. Figure 8 illustrates means which may be used for that purpose.

After the casting of the colloidal mass 19 has been carried out and the impression has been removed from the mouth, the cavity corresponding to the detachable tooth is first filled with a plaster-like mass 44 suitable for the model, for instance diolite. Before this mass solidifies, there is inserted from above a pin 46 rectangular in cross-section and having a head 45, together with a plate 47 sliding on this pin and provided with a hole 48 corresponding to the cross sectional shape of the pin. The plate 47, which should be oiled at the side thereof, facing the mass, is placed with a gentle pressure against the upper side of the mass 44 so that said upper side obtains an even surface corresponding to the under side of the plate. After the mass has solidified, the plate 47 is removed, leaving an even and smooth surface on the end of the loose model tooth. Subsequently the casting of the model is concluded in the usual manner, and the pin 46 in the finished model will thus be embedded with its head turned upwards. The tooth together with the pin 46 may then be separately removed from the model and, by the aid of the pin 46, be inserted again in the correct position in the model. In order to facilitate the re-insertion of the tooth in the correct position the under side of the plate 47 is provided with a triangular projection 49, which upon the casting of the tooth brings about a corresponding indication in the model which ensures the insertion of the tooth at the right place in the model. One end face of the triangular projection 49 forms simultaneously a guidance for the plate 47 along the edge of the pin 46 so that the position of the plate in relation to the pin remains unaltered when the plate 47 is mounted on the pin 46.

The plaster model thus obtained will have pin holes corresponding to the pins 6, 7, 8 situated in the mass 19. After the pins have been inserted in their proper places in the model, the

crown to be produced is modelled into the desired shape in wax, whereby a wax model of the crown is obtained in which the pins are in fixed positions. By the aid of this wax model the crown is thereafter cast in gold in the ordinary manner.

I claim:

1. In a method of making dental bridge prosthesis adapted to be secured to vital teeth by means of mutually parallel holding pins the procedure which consists in fixing the pins, prior to taking an impression, in correct mutual positions by uniting the pins at their projecting ends and casting an impression mass around the tooth and the pins thus united.

2. A method as claimed in claim 1, in which the holding pins are united by means of braces in the form of pins or the like connecting the ends of the holding pins and secured to said pins for instance by means of wax or other binding substance.

3. A method of making detachable teeth in a working model, characterized in that the cavity corresponding to the tooth is filled with cast mass in which a guiding pin is partly inserted, whereupon the inner end of the tooth is smoothed down by means of a plate passed over the pin and pressed against the cast mass, said plate being removed after the cast mass having solidified and the moulding of the model being then completed.

4. In a method of making dental bridge prosthesis adapted to be secured to vital teeth by means of mutually parallel holding pins the procedure which consists in fixing the pins, prior to taking an impression, in correct mutual positions by inserting the pins in a matrix wherein holes have been provided in accordance with the holes in the tooth, firmly uniting the pins at their projecting ends, while remaining in the matrix, inserting the pins, thus united, into the holes of the tooth, and casting an impression mass around the tooth and the united ends of the pins to form a mould for the preparation of a working model.

5. In a method of making dental bridge prosthesis adapted to be secured to vital teeth by means of mutually parallel holding pins the procedure which consists in pressing an impression mass against the tooth and the pins loosely inserted therein, introducing the pins thus united by the impression mass into a cast mass, which after solidification forms a matrix for the pins, removing the impression mass firmly uniting the ends of the pins projecting from the matrix, inserting the pins, thus united, into the holes of the tooth, and casting an impression mass around the tooth and the united ends of the pins to form a mould for the preparation of a working model.

6. In a method of making dental bridge prosthesis adapted to be secured to vital teeth by means of mutually parallel holding pins the procedure which consists in fixing the pins, prior to taking an impression, in correct mutual positions by providing holes in the heads of the holding pins, inserting cross pins through said holes, firmly uniting said holding pins and cross pins by means of a binding substance, and casting an impression mass around the tooth and the pins thus united.

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