Dec. 21, 1965 K. REDTENBACHER 3,224,050

PRE-FABRICATED DENTAL FRAME MODEL WITH A SEAL FACILITATING GROOVE

Filed Oct. 1, 1962 2 Sheets-Sheet 1

FIG. 1

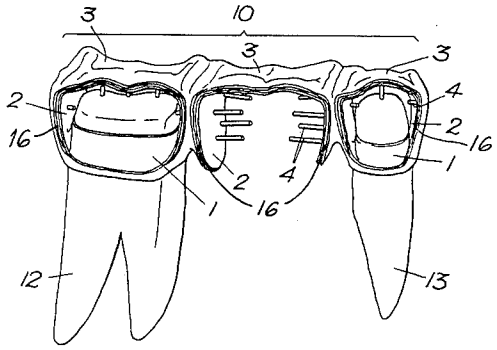



FIG. 2

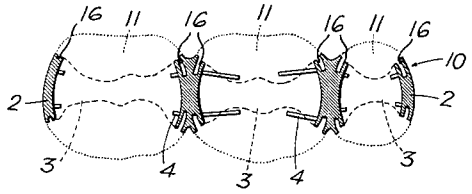



FIG. 3

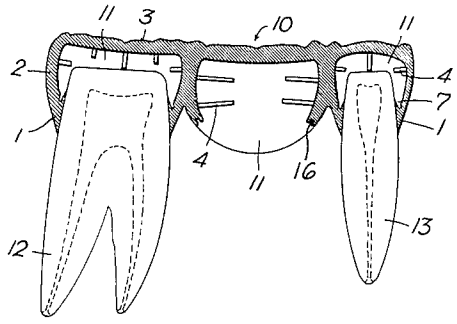



FIG. 4

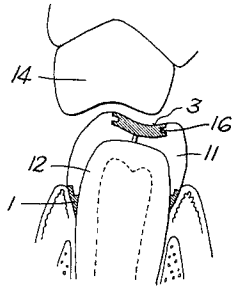
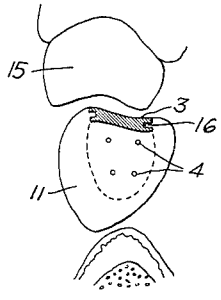



FIG. 5



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PRE-FABRICATED DENTAL FRAME MODEL WITH A SEAL FACILITATING GROOVE

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FIG. 6

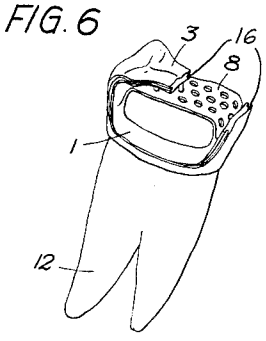



FIG. 7

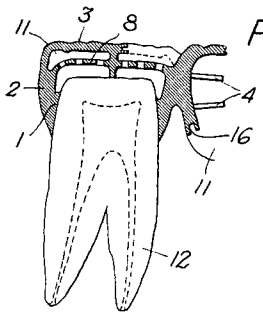



FIG. 8

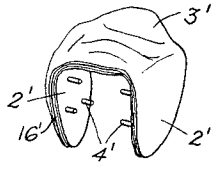
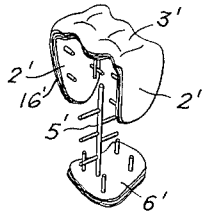



FIG. 10



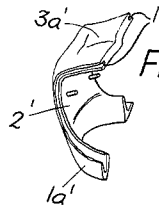




FIG. 9

FIG. 11

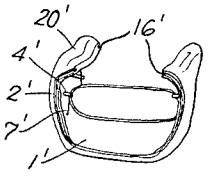
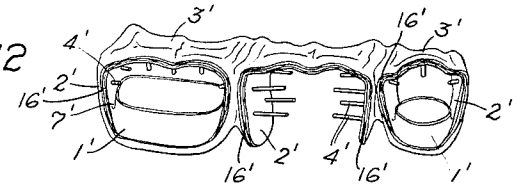



FIG. 12



United States Patent Office

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# PRE-FABRICATED DENTAL FRAME MODEL WITH A SEAL FACILITATING GROOVE

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Claims priority, application Austria, Oct. 6, 1961, A 7,535/61; Oct. 11, 1961, A 7,655/61
1 Claim. (Cl. 22—158)

This invention relates to a dental restoration member, particularly to artificial crowns or bridge elements as well as to a process for the manufacture of such a dental restoration member and to frame models for producing same and prefabricated parts for the production of said frame models.

When using normal crowns with completely enclosed walls made of special casting material with fused porcelain the following disadvantages result: The crowns are too hard and their manufacture is both difficult and expensive and can only be effected in a few special laboratories. Another known method is the construction of artificial tooth crowns from a hollow metallic crown component with a window-like cut at the labial surface and a layer of synthetic material filling the cut. The metal part which is, with the exception of the window, completely closed does not look attractive and the plastic part discolours.

According to the present invention these disadvantages can be avoided if in an artificial crown or bridge link the filling consisting preferably of synthetic material is supported by a metal basic frame which consists of an occlusal bar forming at least part of the occlusal surface and/or a basic ring sealing the tooth stump as well as proximal adjoining walls which provide an undercut for the filling body. Shell-shaped walls with the concave surface facing inwards are preferable. According to the invention thus a reliable connection between filling and frame is secured. The construction of the basic frame is relatively attractive aesthetically since the tooth-like filling is visible for the most part rather like a natural tooth with an inlay (cast filling). The construction of a metallic frame consisting of an occlusal bar and proximal adjoining walls is already known in principle. These are, however, saddle-inlays directly cemented into natural teeth, which are not equipped with an undercut, but on the contrary have inside surfaces whose distance from each other increases towards the gum edge of the tooth and must have in no dimension any undercut or tapered parts.

The edges of the occlusal bars and the proximal walls may have a groove. A particularly good connection may be achieved by equipping the proximal walls with retention elements, which may rest on the tooth stump, and/or retention grooves for the filling body. The occlusal bars may be equipped with supporting elements which secure the mounting or adjusting of the frame to the crown stump.

A crown or bridge made according to the invention has the advantage of being made in such a way that a frame model is formed of a thermoplastic material such as wax or synthetic material, the frame is cast from the model and the filling body is then inserted, for example polymerized, into the frame. In this connection it is presumed that the shape of the crown or frame to be cast in metal is modeled in wax directly on the tooth stump model by hand. This wax model frame is adjusted to neighbouring and antagonist teeth and the stump itself and then



taken from the model and put into a fireproof, shape preserving investing material. Once this liquid investment has hardened, the enclosed wax model is dissolved, preferably by the action of heat. The thus resulting hollow shape is cast in metal. The manufacture of the wax model requires the highest craftsmanship and a great deal of time. The wax shapes are very delicate and easily destroyed, particularly when lifting them from the model and investing them. A better solution is to make the metal basic frame from a frame model of thermoplastic particularly of plastic material, preferably consisting of serialised and prefabricated parts. As a result the process becomes independent to a great extent of top craftsmanship. The prefabricated assembly parts are adjusted to the tooth and in bridgework joined either thermoplastically or by means of appropriate adhesives.

It is advantageous to use prefabricated parts for frame models which consist of an occlusal bar and two, preferably shell-shaped, proximal walls. It is, however, also possible to construct a prefabricated part from one proximal wall and adjoining to it half of an occlusal bar and half of a basic ring. The prefabricated part can also enclose the two proximal, particularly shell-shaped walls and a basic ring which can be produced therewith in one piece or separately. Furthermore, the contacting proximal walls or the occlusal bar may be provided with retention or supporting elements, for example reinforcing prongs. These elements facilitate the fitting of prefabricated parts of the frame model on the tooth stump model and secure the interstice between the tooth stump and the metallic frame as it is desired for the filling body. Furthermore, it is advantageous to equip the basic ring between the edge of the gums and the bottom of the gingival pocket, that is approximately between the half and the lower third of its height, with a continuous groove. The basic frame can, among others, also be made in one piece of the basic ring, the walls and the occlusal bar. It can, however, also be made of a prefabricated basic ring and a separately prefabricated part consisting of the occlusal bar and the proximal walls. The occlusal bar can, in a further variation, be connected to a pressure plate with a connecting pin.

The invention is illustrated in the accompanying drawings:

FIG. 1 shows the metallic basic frames of a bridge spanning a gap, set on two natural teeth which serve as anchor crowns without synthetic filling bodies.

FIG. 2 shows a section approximately parallel to the occlusal surface,

FIG. 3 is a longitudinal section,

FIG. 4 is a cross-section in the tooth area and

FIG. 5 is a cross-section in the area of the gap through the bridge unit and, as may be, through teeth and jaws respectively.

FIGS. 6 and 7 show a further variation with an occlusal bar and a type of double bottom.

FIGS. 8 to 11 show prefabricated assembly parts for the manufacture of a frame model for a single crown and finally

FIG. 12 shown a combination of prefabricated parts assembled to form a bridge.

FIGS. 8 and 10 to 12 thus show also the form of the basic frame models of the tooth crowns and bridge links respectively, according to the invention.

The combination crowns and bridge parts according to the invention consist of a functional part **10** made for

example of gold, a functional frame or cage which serves for chewing, and a filling body **11**, whose purposes are mainly cosmetic, thermo-isolating and metal saving.

The functional part **10**, consists in the area of the teeth **12** and **13**, of a metallic basic ring **1**, which fits exactly to the gum line of the natural tooth stump or crown stump and thus achieves an ideal seal, and of vertical walls **2**, facing the neighbouring teeth, viz. the proximal walls, which are put on the basic ring **1**, next to the gums and an occlusal surface connection or occulusal bar **3**. The walls **2** are in contact with the adjoining teeth, their outer surfaces are convex following the natural shape of the tooth and concave on the inside facing the natural tooth or bridge unit tooth, here preferably equipped with prongs **4**, which may rest on the stump and serve to adjust the frame to the stump of the tooth.

The occlusal bar connects the proximal walls **2** according to the level of occlusion. With the exception of the third of the basic ring **1** sealing the tooth stump on the gum line there is space between the frame and the stump for the filling body **11**.

The frame thus consists of the basic ring **1** which ensures exact seal, of the contacting proximal walls **2** which secure the best possible contacts and of the occlusal bar **3** which ensures exact occlusion. The basic ring has a groove **7** as mentioned above.

It is advantageous to pre-fabricate the frame **10** of thermoplastic material which can be completely dissolved in the casting mould, for example wax or synthetic materials, and is fitted to the model and then invested. Upon dissolving of the thermoplastic original model for example burning, the hollow mould is made and the frame cast. By adjusting the occlusal bar **3** to the size of the area in contact with the antagonist teeth **14**, **15** as well as by appropriate positioning of the connecting bar to the counter bite the amount of stress and strain on the stump bearing the crown can be adjusted to its periodontic stability. Furthermore the choice of the frame material with regard to the appropriate Brinell-hardness and abrasion can vary the presumable working stress to a great extent. The proximal walls (FIG. 2) and occlusal bars (FIGS. 4 and 5) have a groove **16** in their free edges which continues into the wedge of the basic ring to provide a tight seal between the metal frame and the filling body.

The filling body **11** completely fills the space between the frame **10** and the tooth stump, it forms the inner and outer surfaces of the crown which are under little or no stress and is made of synthetic material. The filling body guarantees satisfying cosmetic results, thermo-isolation and saving in metal weight of up to 70 percent in comparison with cast crowns of the usual type, while functioning better.

The combination crown according to the present invention, for the first time, enables exact fitting of the occlusal working surface, i.e. that facing the antagonist teeth, by the size and situation of the occlusal bar with the best possible stress and occlusion conditions for the crown-bearer and its antagonists while fully keeping the anatomic and cosmetic structure of the tooth.

The crown frame can be fitted on to the natural stump as well as on to a pivot and can also be used as a bridge link for tooth bridges, as can be seen for example in FIGS. 1 to 3.

According to FIGS. 6 and 7 the occlusal bar has a double bottom **8**, which is perforated all over or in the surface facing the tooth. Thus securing of the metal frame on the one hand and a better anchorage for the filling body **11** on the other hand, are achieved and an alternative to the appearance of the final crown is made possible, as the upper occlusal bar **3** can be taken away either partially or wholly.

In the following the manufacture of frame models is described in detail by way of examples. As shown in FIG. 8 a pre-fabricated assembly part which is made in



the shape of a bridge from the wall parts **2'** and the occlusal bar **3'** can be used for the thermoplastic frame model. It is, however, also possible to produce assembly parts as a semi-frame **1***a'*, **2'**, **3***a'*, as shown in FIG. 9. In this case the two semi-frames are fitted to the tooth stump from the mesial and the distal side, respectively, whereby a fitting of the vertical walls **2'** and the occlusal bar **3***a'* to the mesiodistal dimension of the tooth is just as feasible as the fitting of the semi-ring **1***a'* to the dimension of the circumference of the tooth stump.

The prefabricated parts can also be made in such a way that the vertical wall **2'** and occlusal bar **3'** are put upon various sizes of basic rings **1'** (FIG. 12). According to FIG. 12 the frame model consists of a grooved basic ring **1'** having a groove **7'** directed towards the crown and approximate vertical walls **2'**, which are convex towards the neighbouring teeth and concave towards the natural stump or bridge tooth mass and carry guide or retention elements **4'** on the concave surface. Furthermore the frame has an occlusal bar **3'** which has also guide or retention elements **4'** towards the natural tooth stump or the bridge tooth mass.

As FIG. 10 shows, a pressure plate **6'** can be provided in the model and thus also in the metallic basic frame of the artificial crown or bridge member. When using the basic frame as a bridge member this can be attached to the occlusal bar by means of a connecting pin **5'**. When the filling body is under too much lingual or buccal pressure the pressure plate **6'** transmits the pressure to the frame by means of the connecting pin **5'**.

Any necessary adjustments towards the tooth stump and antagonist or neighbouring teeth are effected by applying synthetic material or wax which is completely dissolved in the cast mould.

According to FIG. 11 the assembly part made of synthetic material and consequently the metallic frame is constructed of the grooved basic ring **1'** and the vertical proximal wall parts **2'** extending, if desired, with parts **2'** to the occlusal surface.

As shown in FIGS. 8–12 the wall parts **2'** and the occlusal bar **3'** have a continuous groove **16'** in their edge faces.

The manufacture of bridge links as illustrated in FIG. 12 merely requires fitting the individual pre-fabricated parts together. These can be fitted to each antagonist tooth, in particular in height. A precision-adjustment of the height or of the contact is achieved by applying soft wax and then closing the articulator in closing bite position. The individual parts are glued together. Then the model is invested and cast. By using the pre-shaped frame the proximal parts in particular can be made completely smooth, anatomically and thus cosmetically and hygienically faultless.

It is advantageous to choose thermoplastic material of a kind that makes up for metal contractions in casting by expansion.

The thermoplastic frame model can also be given the shape of the frame as it is shown in FIGS. 6 and 7.

The parts of the bridge in practice correspond to a number of U-pillars, they are stable, free from torsion and produce a functionally and cosmetically satisfactory restoration.

The undercut of the walls can be effected at any time of the manufacture of the tooth crown or bridge link according to the invention.

What I claim is:

A pre-fabricated thermoplastic part for the manufacture of the mold of a metallic frame intervening in the producton of a dental restoration member, comprising an occlusal bar, proximal walls defining an under cut with said occlusal bar, and said occlusal bar and proximal walls having a continuous groove in their edge faces.

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