Jan. 11, 1938. A. BARRETT ET AL 2,105,398

REENFORCED PORCELAIN TOOTH CROWN

Filed Nov. 30, 1935

Fig. 1

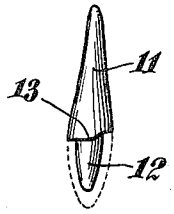


Fig. 2

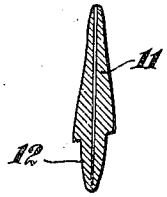


Fig. 3

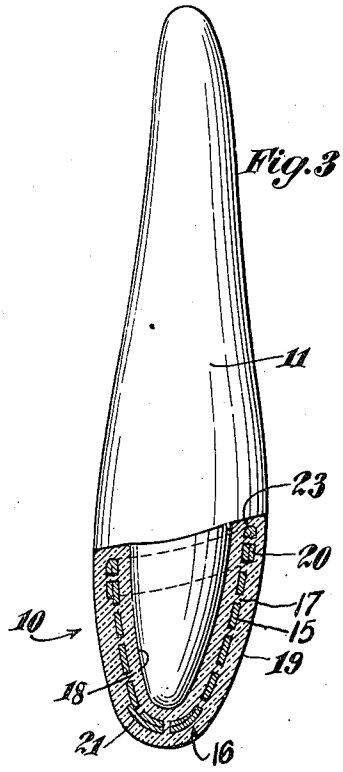


Fig. 5

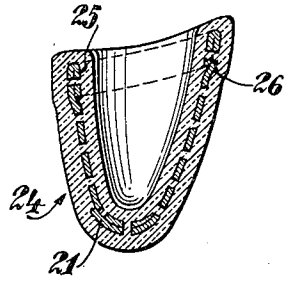
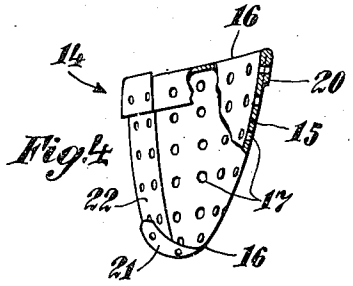


Fig. 4



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Patented Jan. 11, 1938

2,105,398

UNITED STATES PATENT OFFICE

2,105,398

REENFORCED PORCELAIN TOOTH CROWN

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Application November 30, 1935, Serial No. 52,316

5 Claims. (Cl. 32—12)

This invention relates to reenforced dental tooth crowns and methods of making the same.

Heretofore difficulties in non-metallic tooth crowns have been experienced by reason of breakage thereof due to bending or labial stresses, or other uneven strains, or washing out of cement, and for other causes.

It has been difficult to reenforce such crowns, particularly if made of porcelain, because the fusion temperature of this material is very high and because it will not strongly adhere to metal or bond therewith. The logical reenforcement material is platinum, and still better, an alloy of platinum and iridium, for superior strength, but it is impossible to cast a reenforcement of such metal, due to its high melting temperature.

With the foregoing considerations in mind, and realizing the extremely brittle character of porcelain, the thinness required of the wall of the porcelain crown, and further, that every crown must be fitted to a particular tooth so that quantity production methods cannot be readily used, we have devised the comparatively simple and inexpensive structure and method herein disclosed.

The invention provides a crown of porcelain or other like material and can be made by any standardized technique and without requiring that the tooth be devitalized. An impression is first made as in the ordinary construction of a porcelain crown, then a model and die are made which should duplicate the exact conditions in the mouth. Over the die a platinum foil matrix may be adapted, and upon the latter a coping or shell of iridio-platinum foil. This shell or reenforcement is perforated sufficiently to allow for subsequent bonding with the porcelain and without unduly weakening the structure. This shell or reenforcement is made sufficiently loose to allow for the disposition of a layer of porcelain between it and the first platinum matrix. An outside layer of porcelain is then applied over the reenforcement, and the entire mass removed from the die and placed in a furnace to fuse the porcelain on the reenforcement. Then the crown is finished to blend with the other teeth in the mouth.

Our invention in structure and method as above generally described fulfills the requirements for a reenforced porcelain crown, overcomes the difficulties mentioned, and is highly advantageous in use.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described, in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawing, wherein like parts are designated by the same reference characters throughout the several views.

In the drawing:

Figure 1 is a perspective view of an incisor tooth with our improved crown, shown in dotted lines, applied thereto.

Fig. 2 is a longitudinal sectional view showing the manner of preparing the tooth.

Fig. 3 is an enlarged vertical sectional view of a crown embodying the invention and as applied to a tooth.

Fig. 4 is a view in elevation with parts in section showing the reenforcing element.

Fig. 5 is a vertical sectional view showing a modification of the invention.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

Referring in detail to the drawing, 10 denotes a dental tooth crown or jacket embodying the invention. The same may be applied in any suitable or conventional manner to a tooth 11 with the portion 12 thereof, which protrudes from the gum (not shown) being undercut to a reduced size and to provide an annular lip 13 which may be in the regularly accepted relation to the gum. The crown 10 may be secured to the portion 12 as by cement or the like.

The crown 10 is characterized by a reenforcement which extends throughout a major portion or the entire extent of the crown, and which may be confined to one side or face of the porcelain, but is preferably disposed mainly or in substantial part within the wall of the crown. Since porcelain is brittle and of relatively low tensile strength, but high in compressive strength, we use a reenforcement which is high in tensile strength and is so uniformly disposed throughout the crown wall, or in such strong bonded relation therewith, that the combined qualities of porcelain and reenforcement supplement each other to

prevent breakage of the porcelain, despite the comparative pliability of the reenforcement itself.

Fig. 4 shows the reenforcement **14** which is in the nature of a jacket or shell having continuous side and bottom walls **15**, **16**, and being open at the top as at **16**. This shell may be made of platinum or of a platinum-iridium alloy. The metal used may be in the nature of a foil, so as to be pliable and easily workable.

If desired, the shell **14** is perforated substantially throughout with holes of any suitable size and shape as indicated at **17**, for permitting an integral union or bond between the inner and outer porcelain layers **18**, **19**.

Preferably, the shell **14** may have a reenforcement, for example, a band, fold or hem **20** along the rim or margin of the opening **16**.

For a further understanding of the structure the method of making the same will now be described. We first construct a matrix corresponding to the tooth portion **12**. Then the perforated metal foil is worked over the matrix by pressing, folding and otherwise manipulating the foil. This shaping is preferably done loosely to leave a clearance or space for the inner porcelain layer **18**. These operations necessarily result in the overlapping of certain parts of the foil at the bottom at **21** and at the posterior of the shell as at **22**. At the same time the hem **20** is folded over and formed or otherwise applied. A female die element may be applied, if desired, to tightly conform the jacket to the matrix. Finally, the fold portions as at **21**, **22** are soldered, as with platinum solder, so that the bottom and side walls become continuous. The shell **14** is now complete.

In certain cases, it may be preferred to tightly receive the shell, prior to soldering, between male and female dies of suitable size to assure a requisite uniformity or smoothness in the shell or reenforcement.

To complete the crown, porcelain may be applied to the inner and outer surfaces, and the crown then heated to fuse the porcelain, thus causing the layers **18**, **19** to provide a uniform one piece structure which extends through the perforations **17** and which unites over the rim of the crown opening as at **23** to thus cause the reenforcement to be wholly encased by the porcelain.

In certain instances a second coating of an especially opaque porcelain may now be applied, and fused on the crown to wholly conceal the reenforcement or any effect thereof.

The completed crown **10** may now be applied to the tooth **11**.

In Fig. 5 is shown a crown **24** illustrating a form that is modified in that the reenforcing hem or bead is inwardly directed as at **25** to maintain the outer face of the reenforcement as smooth as possible. In certain cases, it may be desired to slightly outwardly form the hem **25** to lie more nearly in the planes of the side walls, and thus to assure evenness of the porcelain layers, both internally and externally.

It is noted that at the fold sections as at **20**, **21**, and **25** certain of the perforations may be closed due to the overlapping, but the fused porcelain can still enter the perforations. If required, these perforations, particularly at the rim reenforcement may be punched or drilled as at **26** so that the porcelain may be positively bonded through at the rim portions.

The mode of operation of the invention will now be described. It will be borne in mind that breakage of porcelain crowns most frequently occurs in relative proximity to the lip or shoulder **13**, and may occur either in the longitudinal or transverse direction. Further such breakage is most general at the labial portions of the crown. Sometimes some of the cement dissolves out, and breakage may occur due to resulting unevenness of strains. In general, we have found that the breakage is due to bending strains produced by stresses at the lingual side of the tooth by reason of biting engagement or stress with a complementary tooth. Furthermore, the tooth portion to which the crown is attached, generally possesses some degree of flexibility which further promotes breakage of the ordinary porcelain crown. According to our invention, the crown is reenforced throughout so that, under a bending stress, not only is all annular tension taken up, but longitudinal tensions, including those at various angles are wholly assumed by the reenforcement; and since every bending strain produces its counterpart of compression, the porcelain bears such stresses, and since the reenforcement extends throughout the porcelain, and is in bonded relation therewith, the interacting tensions and compressions fully balance each other. At the crown rim, the reenforcement possesses added strength but it will be understood that the hem or fold part thereat as at **20**, **25** may be omitted. Likewise the perforations may in certain cases be omitted, since the porcelain wholly encases the reenforcement, particularly at the rim thereof. With the use of perforations, it will be appreciated that the inner porcelain layer may sometimes be omitted, as the outer layer may fuse into the perforations and thus bond the porcelain with the metallic reenforcement. The perforated shell herein described is representative of any foraminous or skeletonized structure that may be used for a like purpose.

We claim:

1. A tooth crown having an inner foil of a platinum-like metal and an outer layer of a porcelain-like material, said inner foil having perforated side walls, and said outer layer having portions fused into said perforations, said outer layer completely surrounding said inner foil.

2. A tooth crown having an inner layer of a platinum-like foil, and an outer layer of a porcelain-like material, said inner layer having irregularities defining points of attachment for the outer layer, the latter having fused engagement with the inner layer at said points, said outer layer completely surrounding said inner layer.

3. A tooth crown having an intermediate perforated foil of a platinum-like material, said foil having bottom and side walls, and inner and outer layers of a porcelain-like material fused upon said intermediate foil and integrally united through said perforations.

4. A tooth crown including an outer layer of a refractory non-metallic material having a relatively high compressive strength and a relatively low tensile strength, and an inner foil of metallic material having a relatively high tensile strength, the inner foil being so thin as to be comparatively pliable, both said layer and said foil being preformed to the shape of the tooth portion to which the crown is to be attached and extending substantially throughout the wall area of the crown, and said layer and sheet being directly permanently united throughout the said area to constitute a unit possessing the combined strengths of both said materials, said foil having irregular-

ities in its side walls providing points of attachment for said layer, and said layer being firmly interlocked with said foil by projections extending from said layer and having fused engagement with said foil at the points defined by said irregularities, said layer further completely surrounding said foil.

5. A tooth crown including an inner layer of a platinum-like foil material providing a continuous annular side wall, said wall being perforated and comprising an annular reenforcing band along the top rim thereof, and an outer layer of a porcelain-like material fused on said inner layer around and over said band and into said perforations, to constitute a unitary tooth crown.

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