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DENTAL CROWN, COATED ON THE FRONT WITH ENAMEL, MADE OF NOBLE METAL OR NOBLE METAL MATERIAL AND PROCESS FOR ITS PRODUCTION

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I have filed applications in Hungary, July 28, 1930, and in Germany August 1, 1930.

Attempts have already frequently been made to replace the solid or hollow dental crowns, bridge pillars or caps, and so called solo dental crowns, which for aesthetic reasons are not absolutely satisfactory since they are to a large extent made of gold alloy or platinum, by crowns etc. made of a material which matches as far as possible the colour of the natural teeth, so that these dental crowns, like artificial teeth usually produced from porcelain material, can be distinguished from the natural teeth only with difficulty. These attempts, however, have not attained the desired results since up to now an equivalent substitute for the previously mentioned noble metals having the colour of the natural teeth has not been found, nor has an enamel material of such properties been found which would be capable of being used as a firmly adhering coating at least for the visible front surface of dental crowns etc., made of the previously mentioned noble metals. Up to now all attempts made in the latter direction have been unsuccessful owing to the fact that the coefficient of thermal expansion of the various enamels experimentally employed deviates substantially from that of the aforesaid noble metals, so that, as a result of the unavoidable variations in temperature, the enamel coating always came away, so that dental crowns of practical utility never came into question at all.

This invention relates to a dental crown, and a process for the production of same, by means of which the aforesaid disadvantages are removed, since by means of it the production of dental crowns from the noble metals previously mentioned is rendered possible, the front surface whereof, visible in the mouth, is provided with a firm and permanently adhering enamel coating of a colour precisely the same as that of the natural teeth.

The essence of the invention consists in this that the noble metal alloy of the front half of the dental crowns, provided with the enamel coating, and the enamel coating applied thereto, have the same coefficient of thermal expansion, the provision of an enamel material particularly suitable for the said purpose and which will adhere rigidly and permanently, and of a noble metal alloy which is particularly suited for permanently holding this material, being the objects in view. These two new materials are characterized by the fact that, besides being suitable for the special purposes mentioned, they are also non-poisonous, resistant to acid, and are elastic to the necessary extent.

Owing to the fact that the coefficient of thermal expansion of the noble metal alloy is precisely the same as that of the enamel coating, the new enamel adheres rigidly and permanently to the new noble metal alloy. Owing to the acid stability, the enamel is completely protected against the acids which arise or form in the mouth and which would impair its lustre and colour. The invention, therefore, comprises two main parts, viz., the new dental crowns of the two materials referred to, and the process for making these dental crowns and the two new materials for the same (enamel material and noble metal alloy).

As regards the production of the two materials mentioned above, the enamel material according to the invention is made from the materials set forth below by means of the process subsequently described, the relative quantities given by way of example being taken as a basis:

	Parts by weight
Silicon	6.50
Borax	2.00
Calcined soda	1.65
Sodium nitrate	0.30
Cryolite	1.20
Tin oxide	0.50

These materials are thoroughly mixed as a dry powder and heated for about 2 hours at approximately 1,000° C., until a hard caked-together mass is formed which is then cooled down and powdered. About 10 parts by weight of this powder are thoroughly mixed, also in the form of a dry powder, with about 0.50 parts by weight of white clay and about

1.00 parts by weight of some white turbidifying material.

This powdered mixture is ground for about 24 hours to a fine powder with the necessary quantity of metal oxides usual for producing the desired shade and colour and with a little water (about 0.75 l. for each kg. of the mixture). The fine powder obtained thus is dried, and when required for use is worked up in the usual way to a plastic pulp by addition of water or turpentine, which pulp is applied in the manner described below to the portion of the dental crown made from the metal alloy provided by the invention, and which is also described below.

The new noble metal alloy is made of the following noble metals, the following proportions stated by way of example being used as a basis, by means of the usual alloying process and consequently by heating, (melting together) at about 1,500° C.

	Parts by weight
Fine gold	100
Fine silver	15
Chemically pure copper	10
Platinum	12.5

This mixture as already mentioned is fused together, after which the melt is poured out, and allowed to set and cool. The very ductile noble metal alloy obtained is finely rolled out to a thin sheet (about 0.5 mm thick).

The dental crowns or the like according to the invention are made as follows, the aforedescribed enamel and the new metal alloy being used:

The back surface, the chewing surface, and approximately the rear halves of the two side surfaces of the crown are produced in the usual way from sheets of the usual gold alloy or platinum or other suitable noble metal having a thickness of about 0.3 mm, whilst the remaining portion of the crown, which is to be provided with enamel coating, is made of the metal alloy provided in accordance with the invention, and described above, having a thickness of about 0.5 mm. The two parts of the dental crown are soldered together in the known manner, the front part of the finished soldered dental crown made of the new alloy, being uniformly hollowed out to a depth of about 0.2 mm, a narrow margin, about 0.4 mm wide, being left. The aforedescribed enamel material provided according to the invention is introduced into the recess formed in this way in a perfectly uniform layer, which, therefore, is likewise of a thickness of 0.2 mm; is distributed and burnt in in a furnace at about 750° C. Experiments have shown that a thickness of 0.2 mm is necessary in the enamel layer, but it is also sufficient completely to cover the colour of the metal support.

In order to give the front surface of the dental crown, enamelled in this way, the appearance of a natural tooth, three differently tinted enamel masses provided by the invention are used for the same dental crown, two of the said masses corresponding in colour to the colour of the neck of the tooth and of the tooth itself, whilst the third effects the adjustment of the natural transition between these two colours. These three enamels are applied either together, and therefore before being burnt in, or else only the two first named masses are applied before the burning in, the third being applied only after the two first enamels have been burnt in, in a furrow made in the enamel layer having a cross-section with the shape of a flat wedge, and likewise 0.2 mm deep, it then being subsequently burnt in as described above.

What I claim is—

1. A dental crown comprising a rear half of noble metal alloy of the normal kind, a front half of an alloy comprised of 100 parts by weight of fine gold, 15 parts by weight of fine silver, 10 parts by weight of chemically pure copper and 12.5 parts by weight of platinum, and an enamel coating on said front half of the same coefficient of thermal expansion as said front half of the crown.

2. A dental crown comprising a rear half of noble metal alloy of the normal kind, a front half of an alloy comprised of 100 parts by weight of fine gold, 15 parts by weight of fine silver, 10 parts by weight of chemically pure copper and 12.5 parts by weight of platinum; an enamel coating on said front half burnt thereon said coating being comprised of 6.5 parts by weight of silicon, 2 parts by weight of borax, 1.65 parts by weight of calcined soda, 0.3 parts by weight of sodium nitrate, 1.2 parts by weight of cryolite, 0.5 parts by weight of tin oxide, to every ten parts of which mixture has been added 0.5 parts by weight of white clay and 1 part by weight of a white turbidifying medium.

3. A method of producing dental crowns consisting in separately making a rear half of the usual noble metal alloy and a front half of a second noble metal alloy, soldering the two halves together in a butt joint with flush inner and outer surfaces so as to form one piece with perfectly smooth outer and inner surfaces, then uniformly recessing, to a depth of about 0.2 mm. the portion of the front half which is going to be enamelled while leaving a margin about 0.4 mm. wide then uniformly distributing in the recess so formed, a layer of about 0.2 mm. thick of enamel material stirred up to a pulp with a turbidifying medium in the usual manner, and finally smoothing and burning in the enamel at about 750° C., said second alloy for the front half of the crown consisting of approximately 100 parts of fine gold, 15 parts of fine silver, 10 parts of chemically pure copper, and 12.5 parts of platinum; said enamel

consisting of approximately 6.50 parts of silicon, 2.00 parts of borax, 1.65 parts of calcined soda, 0.30 parts of sodium nitrate, 1.20 parts of cryolite and 0.50 parts of tin oxide, all parts by weight.

4. A method in accordance with claim 3 in which two enamel layers are placed side by side in the recess formed in the front halves of the dental crowns, one of the said enamel layers being given the colour of the neck of the tooth and the other enamel layer the colour of the tooth itself, whilst a third enamel layer, given a colour which effects the natural transition between the colours of the other two enamel layers, is applied between the said two enamel layers, the three coloured enamel layers being burnt in and each having a thickness of 0.2 mm.

In testimony whereof I have signed my name to this specification.

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