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PROCESS FOR INCREASING THE RETENTION CAPACITY OF THE SEALING SURFACE OF ARTIFICIAL PORCELAIN TEETH

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FIG. 1.

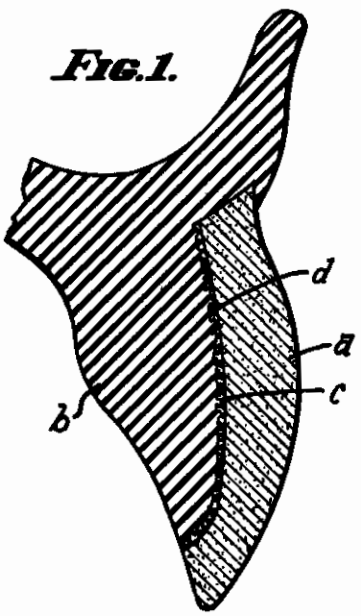


FIG. 3.

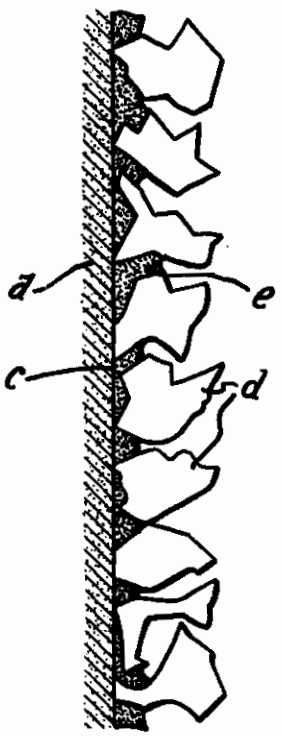
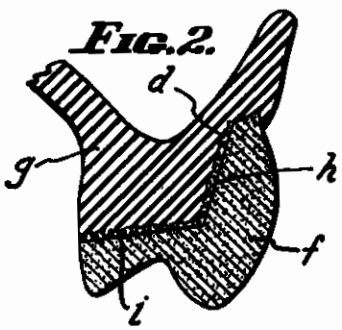


FIG. 2.



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PROCESS FOR INCREASING THE RETENTION CAPACITY OF THE SEALING SURFACE OF ARTIFICIAL PORCELAIN TEETH

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The present invention relates to porcelain artificial teeth and more particularly to teeth which are to be secured onto a supporting part composed of a plastic material shaped by contact with said teeth, or to be secured by sealing onto any denture base whatsoever, and the present application is a continuation-in-part application of our application Serial No. 286,126 filed July 24th, 1939.

It is known that the securing of such teeth onto their denture base is generally obtained by metal pins one extremity of which is embedded in the body of the tooth, or by rentention holes of relatively large sizes provided in said body, or again by sliding means adapted to a metallic stud or tenon integral with the denture base. In order to avoid the well known inconveniences inherent to these various systems, a method for forming retention means on the retention surface of porcelain teeth has already been proposed, which method consists in applying onto this retention surface a mixture of tooth porcelin powder, of ground cork, of a powder of a ceramic substance which increases the fusing point of the porcelain and prevents glazing, and of a sticking substance such as an aqueous solution of soda silicate, then in heating the tooth structure with the said mixture to the fusing point of the tooth porcelain. As a result of this heating, the cork contained in the said mixture burns and provides on the retention surface of the tooth numerous undercuts, which condition gives this surface a roughness the object of which is to ensure a firmer attachement of the tooth on its supporting part. However, with this method only imperfect results can be obtained. The above defined mixture which is applied to the retention surface of the tooth constitutes a conglomerate in which the particles of ceramic material having a high fusing point are completely enveloped and in which the undercuts resulting from the combustion of the cork particles form small cavities more or less spherical, ill-fit for ensuring a good retention of the tooth by the supporting part and which are distributed haphazardly, the only cavities which can have a useful retention power being those which are superficially widely open. On the other hand, the internal cavities resulting from the combustion of the cork particles contained throughout the layer of the mixture applied onto the retention surface of the tooth play no part in the retention and have a harmful effect by rendering this layer extremely porous and by consequently reducing its own resistance to a considerable extent, so that there are great chances that the breaking away of the tooth will occur rather easily by breakage of this layer. Moreover, this porosity is particularly unsanitary due to the fact that is is subject to septic infiltrations.

The object of the present invention is a process which presents none of the above mentioned inconveniences and which allows to obtain, on the retention surface of artificial porcelain teeth anchoring shapes presenting counter-draught and capable of ensuring a very fast sealing of the teeth on their supporting parts and the proper resistance of which is very high while being, at the same time, intimately and securely soldered to the body of the tooth.

The process according to the invention consists in coating the retention surface of the tooth with a binding substance and in sprinkling the so coated surface with particles of ground alumina, the in subjecting the tooth to a firing operation.

Thus, teeth are obtained—after firing—the surface of which presents, in that part which is provided with alumina particles, asperities in proportion to the sizes of the alumina particles utilized, which condition obtains, by means of sealing, a considerably increased retention capacity. Ground alumina particles have in general very irregular and ragged forms and, thanks to the fact that their distribution on the retention surface of the tooth takes place by sprinkling onto the binder applied before hand on this surface, they are held fast, only by their base, in most cases, in the tooth porcelain and are elsewhere completely free and exposed. These particles thus present asperities which constitute so many anchoring points for the sealing substance, especially for the plastic material constituting the tooth support. Moreover, an excellent soldering of the alumina particles to the porcelain of the tooth is observed, which may presumably be explained by the fact that the alumina is superficially attacked in the presence of heat by the silicates entering into the composition of the porcelain.

Practically, the process according to the invention may be applied either to porcelain teeth in a green state, in which case the baking occurring after sprinkling of the alumina powder, corresponds to the normal baking of the tooth, or to porcelain teeth already baked, in which case the teeth are subjected after sprinkling of the alumina powder to a second baking carried on under the conditions defined hereafter.

In the case where the teeth are in green state it is possible to use, as a binder, a substance possessing an agglutinating power at the ordinary temperature, the function of this substance being only to ensure a sufficient adherence of the alumina particles to the retention surface of the tooth during the handling which takes place between the sprinkling of the alumina particles and the firing operation during which the alumina particles will be soldered to the porcelain of the tooth. It is desirable that the adhesive substance utilized possess a good agglutinating power, that it preferably present a consistency which will per-

mit its laying on by means of a brush and that it does not dry too much, or that it does not dry at all if possible, in order that its agglutinating power be maintained between the moment when the said substance is applied onto the retention surface of the tooth and the moment when the sprinkling of the alumina particles takes place. Glue for example is an agglutinating substance which is particularly satisfactory with regard to those conditions. Pitch, dextrine, starch, alginates and the like may be also used with advantage.

In the case where the treated teeth are already baked, it is desirable to add to the binder applied on the retention surface of the tooth a small quantity of ceramic material having a fusing point below that of the tooth porcelain and the fusing of which, during the final firing operation, will ensure the soldering of the alumina particles to the procelain of the tooth. The final firing is then carried on at a temperature sufficiently high to fuse the ceramic material contained in the binder but not sufficiently high to fuse the tooth. The said ceramic material may be constituted for example by porcelain powder of substantially the same composition as the tooth porcelain but the fusing point of which is slightly lowered by the addition of an appropriate flux. Despite the fact that the addition of such a ceramic material is not absolutely indispensable in the case where the treated teeth are in a green state, it is also possible to have recourse to this addition in this case, for it facilitates the obtention of a better soldering of the alumina grains to the porcelain of the tooth.

The alumina utilized for putting the invention into practice may notably be natural or artificial fused alumina, for example corundum. The alumina particles are obtained by grinding. Practically, it is possible to use alumina particles passing through sieves ranging from N° 43 (corresponding to grain sizes of 400 to 1410 microns) to N° 220 (corresponding to grain sizes of 25 to 90 microns). The best results seem to be obtained with particles passing through sieves ranging from N° 43 to N° 100 the optima sizes for these particles appearing to be between 300 microns and 720 microns (sieve N° 60). As far as the shape of the alumina particles is concerned it seems desirable, in order to carry out the process according to the invention, to choose particles having a rather elongated form. It is then possible, during the sprinkling of these particles onto the retention surface of the tooth which has previously been coated with a binder, to orient the said particles by means of a magnetic field for example, so that these may be anchored to the surface by their most narrow base, which condition allows to obtain asperities which project more substantially out from the retention surface of the tooth. On the abrading substance market can commonly be found alumina particles ground to all sizes fit for use in carrying out the invention as well as chosen particles which, for any given sieve number, can be of an elongated or short shape.

In all cases the fastness of the seals obtained with teeth treated according to the invention is quite remarkable, the asperities presenting counter draught and formed by the alumina particles constituting a multiplicity of anchoring points by which the teeth are effectively held by the hardened rubber or other supporting material. For flat teeth, for example, the firmness of such a seal is superior to that obtained by means of one or two metal pins which condition allows the manufacture of teeth of this type without metal pins and allows in addition the space occupied by the invisible part of the tooth to be reduced to a minimum. For molar teeth, the effectiveness of the seal obtained thanks to the invention allows to do away with metal pins and encumbering geometrical retentive forms, habitually utilized and allows to give substantial draught to the central hole which may go as far as the complete disappearance of this hole in the case of low teeth. On the other hand it has also been observed that with regard to teeth manufactured according to the invention the withdrawing of the plastic material constituting the denture base, and vulcanite in particular, practically no longer takes place at the level of the retention surface of the tooth, the plastic substance remaining intimately bound to this surface. The hollows habitually created by this withdrawing and which lend themselves to infiltrations and retentions of putrescible substances are thus avoided which condition leads to an important progress from a sanitary point of view.

In the appended drawing, embodiments of the invention are represented. In this drawing: Fig. 1 is a sectional view of a flat tooth secured on a prosthesis, only a part of which is represented; Fig. 2 is a similar sectional view of a molar tooth; Fig. 3 a large scale fragmentary sectional view of the retention surface of the tooth treated according to the invention.

In the case of Fig. 1, *a* is a flat porcelain tooth secured on a denture base *b* of hardened rubber for example. According to the invention, on the retention surface c of the tooth *a* are soldered alumina particles *d* between which the hardened rubber constituting the denture base *b* penetrates. In the large scale section of Fig. 3 the binding layer applied onto the retention surface *c* of the tooth can be seen at *e* the alumina particles *d* having been distributed by sprinkling onto the said retention surface. These particles are thus enveloped only at their base of contact with the surface *c*. The contours by which the particles *d* are represented in Fig. 3 correspond to some of the ragged forms which may be observed by a microscopic examination of these particles.

In the embodiment of Fig. 2 the molar tooth is sealed onto a denture base *c* composed of hardened rubber for example by means of surfaces *h*, *i* provided with alumina particles *d* as in the preceding case.

Hereunder are examples of binding compositions which may be utilized according to the invention to coat the retention surface of the teeth before sprinkling with alumina particles:

Example 1

For treating a green porcelain tooth baking at 1350° C, a mixture is used as a binder, which mixture is obtained by intimately mixing:

	Grs.
English glue	10
Finely divided feispar of the same composition as that of the one entering into the composition of the tooth porcelain	8
Calcium carbonate	0.4

If the mixture thus obtained is too thick to be laid on by means of a brush, it may be rendered more fluid by heating in a water bath, or by diluting it with a few drops of castor oil. After applying a coating of this mixture onto the retention surface of the tooth, corundum powder passing

through a N° 60 sieve is sprinkled onto this surface, and the tooth is then baked in the usual way.

Example 2

For treating an already baked tooth, the same mixture as in the preceding example is used but in which the addition of calcium carbonate is increased to 0.8 gr. After applying a coating of this mixture onto the retention surface of the tooth and sprinkling corundum powder thereon, the tooth is fired at about 1280° C.

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