ABSTRACT: Apparatus and method for production of dental mixtures poor in porosity from a powdery material and a material in a liquid state. The two materials are inserted in a chamber which is evacuated by means of a vacuum pump so that the powdery material is substantially removed from air. The mixing is then performed under vacuum by shaking the chamber or by inserting a spatula in an airtight manner through the wall of the chamber. The vacuum pump is thereafter disengaged from the chamber and the mixture is ready for use.
APPARATUS AND METHOD FOR THE PRODUCTION OF DENTAL MIXTURES POOR IN POROSITY

The invention relates to an apparatus and a method for the production of dental mixtures from a pulverous material and a material in a liquid state, for example a so-called "alloy" and mercury respectively for the production of amalgam, and pulverous materials and materials in a liquid state for the production of various dental cements.

The dental amalgams used by the dentists today are produced according to international specifications and standard prescriptions. The basic materials of amalgam are file dust of a silver alloy and other metals, so-called alloys, and chemistry clean mercury. These two components are mixed by the dentist either through manual mixing in a mortar by means of a pestle or as is more and more usual in a capsule by means of electrically driven shaker apparatuses, so-called amalgamators, which capsule consists of two dismountable halves and in which prescribed amounts of an alloy and mercury are inserted.

The temporarily plastic compound obtained after the mixing is then packed under pressure a portion at a time in the bored up cavity of a tooth so that excess mercury is removed and an amalgam as homogeneous as possible which fills out all parts of the cavity is obtained in the cavity as a final product.

However, said stoppages according to all available literature throughout show an undesirable richness in porosity, although this may vary somewhat according to different stopping methods. In the special literature said porosities seem up till now to have been accepted simply as a necessary evil. This is e.g. clear from the article "Die Porositaet unserer Amalgam-Fuellungen" by P. Schoch and O. Loeboch, published in "Deutsche Zahnarztliche Zeitschrift" of May 15, 1955. Especially in page 789, the last two paragraphs it is stated that "Diese Poren lasse sich auf eine Weise vermeiden" and "Ein Weg zur Beseitigung dieser Porositat ist noch nicht gefunden."

It is true that the porosities have been described in detail from different aspects but it has not been possible fully to explain their origin in an acceptable manner. The descriptions of the locations and of the size of the porosities have been made a gauge of the effectiveness and suitability of different stopping methods.

The test performed in connection with the invention have confirmed the hypothesis that air is mixed into the amalgam already at the triturating which obviously has previously been completely overlooked. This occurs in the shaking in a capsule as well as in the mixing in a mortar.

It is certainly known that air bubbles in mixtures can be removed by vibration and/or by inserting the prepared mixture in a vacuum. On account of the high surface tension and tenacity of the amalgam compound and of other cements intended for tooth stopping this however, cannot be done with said mixtures. Moreover amalgam is very sensitive to working.

The object of the present invention is to produce mixtures for tooth stopping such as amalgam mixtures and different cements which are essentially poorer in air and thus in porosities that the hitherto used mixtures of this kind.

The object according to the invention is reached by means of an apparatus and a method, wherein the two materials to be mixed in pulverous and liquid states respectively, i.e. especially so-called alloys and mercury respectively, are placed in a chamber which is evacuated down to the lowest practically available value by means of a pump connected to the chamber, so that the powder is substantially removed from air and the two materials are not until then mixed together in the evacuated chamber, preferably by shaking the chamber or by means of a spatula inserted in an airtight manner through the wall of the chamber.

Other objects, advantages and features of this invention will become apparent when the following description is taken in confirmation with the accompanying drawings, in which:

FIG. 1 shows schematically a chamber in the form of a capsule having an output to a vacuum pump, which chamber is intended to be attached to a shaker apparatus or a so-called amalgamator.

FIG. 2 shows schematically a chamber having a transparent cover with a spatula inserted airtightly through a diaphragm in the wall of the chamber.

The capsule shown in FIG. 1 consists of two parts 1, 2 and has an output 3 to a vacuum pump (not shown) in part 1. Before the capsule is placed in the intended position in the shaker apparatus (not shown) the alloy and mercury are inserted into it by screwing off the cover or part 1. Then the cover 1 is put on again and the capsule is attached to the shaker apparatus, whereupon the output 3 is connected e.g. by means of a flexible tube to a vacuum pump. Then the pump is started and when the pressure in the capsule can be read by means of a pertaining pressure gauge (not shown) to e.g. a few mm. Hg the shaking is started for example with a frequency of about 3,000 cycles per minute, the pump being operating during the whole shaking or mixing operation. After a suitable time, which is determined empirically, the shaker apparatus is stopped, air is let into the capsule and the same is removed from the shaker apparatus. Then the tube to the air pump is disengaged from the output 3 and the cover 1 is screwed off, whereupon the amalgam mixture is withdrawn and is ready for use.

The chamber according to FIG. 2 consists of a bottom part 4 and a plexiglass cover 5. The wall of the plexiglass cover comprises an airtightly connected diaphragm 6 through which is airtightly inserted a spatula 7 for stirring the mixture components consisting of e.g. different dental cements such as phosphate cement, silicate cement, zinc oxide-eugenol cement etc. and lying on a glass plate 8. Moreover, the cover has an output 9 to a vacuum pump (not shown). As in the case of the capsule according to FIG. 1 the chamber is first evacuated to a suitable pressure, e.g. a few mm. Hg, after the pulverous and liquid components to be mixed have been put upon the glass plate 8. The materials are thereafter mixed by means of the spatula 7 while the pump is operating. After the mixing or triturating is finished air is let into the chamber, the cover is removed and the prepared mixture can be removed.

Tests performed have shown that the mixtures produced according to the invention are essentially poorer in air than corresponding mixtures produced according to previously known methods. Moreover the mixtures produced according to the invention are essentially more homogeneous. While a specific apparatus and method have been described to fully disclose the invention, it is apparent that modifications may be made other than those described. The present disclosure is illustrative of a preferred embodiment, the invention comprehending all variations within the scope of the disclosure.

I claim:

1. Apparatus for the production of dental mixtures from a pulverous material and a material in a liquid state, which apparatus comprises a chamber for the pulverous and liquid materials respectively, wherein the chamber has an output which is connectable to a vacuum pump for evacuation of the chamber before the mixing of the materials is started, said chamber being provided with or being connectable to means for carrying through the mixing, and wherein said chamber consists of a bottom part with a detachable transparent cover and comprises a plate for introduction of the two materials before the evacuation, a spatula being airtightly inserted into said chamber through an airtightly closing diaphragm in the cover for mixing the two materials after evacuation of air from said chamber.

2. The process for the production of dental amalgams from a pulverulent metal alloy and liquid mercury metal comprising positioning said pulverulent metal alloy and said liquid mercury metal out of contact with each other in a vacuum mixing chamber, evacuating the air from said vacuum mixing chamber and then mixing said pulverulent metal alloy and said liquid mercury metal within said evacuated vacuum mixing chamber to form a homogeneous dental amalgam.
3. The process of claim 2 wherein said pulverulent metal alloy and said liquid mercury metal are mixed by agitating said evacuated vacuum mixing chamber.

4. The process of claim 2 wherein said pulverulent metal alloy and said liquid mercury metal are mixed by vibrating said pulverulent metal alloy and said liquid mercury metal whereby they are brought into contact with each other and homogeneously admixed.