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SUBSTANTIALLY RADIOPAQUE TOOTH LINING COMPOSITION

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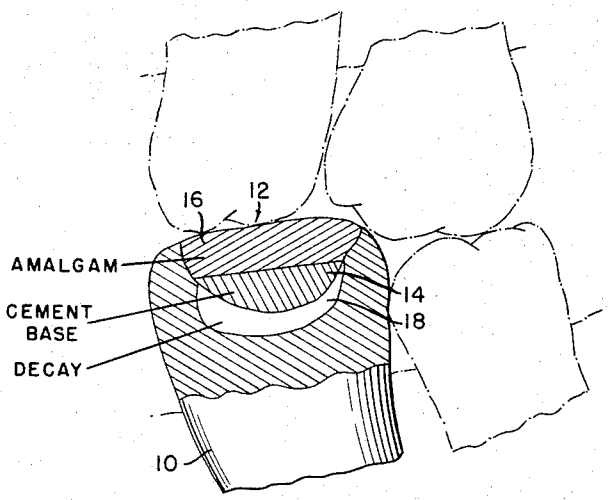


FIG. 1.

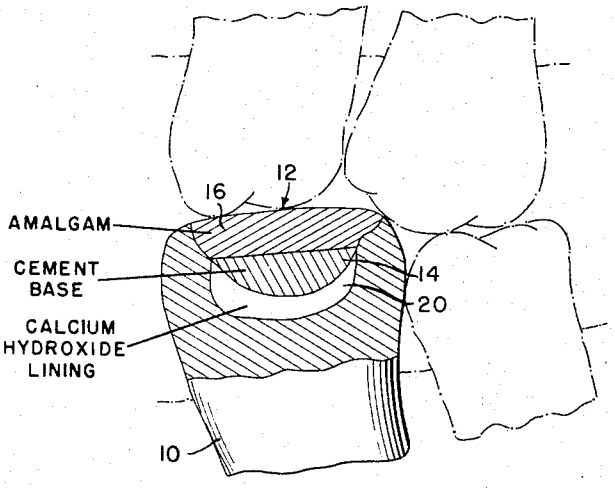


FIG. 2.

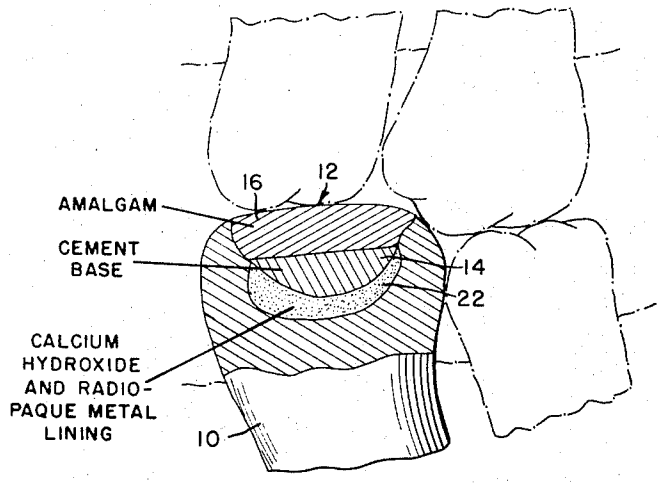


FIG. 3.

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SUBSTANTIALLY RADIOPAQUE TOOTH LINING COMPOSITION

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Continuation-in-part of application Ser. No. 95,900, Mar. 15, 1961. This application Sept. 23, 1963, Ser. No. 315,104

4 Claims. (Cl. 106—35)

This invention relates to a substantially radiopaque tooth lining composition and, in particular, to a dental preparation containing finely divided radiopaque metal such as silver and a calcium compound for lining of a tooth cavity and is a continuation-in-part of application Ser. No. 95,900, filed Mar. 15, 1961, now abandoned.

In the art it is known to line a tooth cavity after preparation by boring out any decay of the tooth and by coating the dentine or capping the pulp with a calcium compound which lines the cavity and caps the pulp, promoting the healing of the damaged pulp tissue and stimulating secondary dentine in the tooth.

For such composition, various calcium compounds such as calcium carbonate, calcium fluoride, calcium phosphate are useful tooth lining substances, but calcium hydroxide or calcium oxide which is converted to calcium hydroxide with moisture, is generally superior, and preferred herein. The preparation, sometimes used dry with addition of water just prior to use from the powdered form is improved by adding of the water and a suspending or thickening agent to ready-to-use form as a liquid-to-gelatinous suspension of the finely powdered calcium compound, immediately available for coating of the tooth cavity.

An outstanding weakness of the art of cavity lining and pulp capping without the radiopaque metal has been that the calcium compound alone, even after setting to a healthy emplacement in which the secondary dentine may have begun to develop and the damaged tissue has been adequately repaired by the calcium, is radio translucent. Therefore, in appearance, the calcium compound is not distinguishable from the normal dental decay that was initially present in the tooth as observed radiographically, that is, by X-ray.

According to this invention, the fine powdered pure radiopaque metal is incorporated with the pulp capping calcium compound, and preferably, both calcium compound and the finely divided metal, preferably silver, are mixed with a small quantity of water. A suspending or thickening agent is also mixed therewith which converts the moistened mass to a flowable suspension of liquid-to-gelatinous consistency.

The main object of this invention is to provide a dental lining preparation which is readily discernible and distinctly different radiographically, and substantially radiopaque, outlining the cavity of a dental preparation.

A further object is to render the pulp capping or cavity lining material distinctly different radiographically without decreasing the therapeutic effectiveness of the pulp capping or lining substances. These and other objects will be readily apparent from the following detailed disclosure of the present invention.

The widespread use and acceptance of normally translucent materials for pulp capping and cavity lining has created the problem of differentiating carious dentine from capping materials, typically radio translucent calcarious substances, when the restoration is radiographically examined. This similarity can cause the dentist to remove a sound restoration. In so doing, prior treated deep-seated carious areas subject the tooth to re-exposure, thereby endangering the vitality of the tooth. The general result of re-exposure may lead to root canal therapy or needless extraction, at additional expense to the patient and time loss to the dentist.

In an attempt to develop a substantially radiopaque pulp capping substance, many combinations were tested that could also be used as a base to insulate healthy pulp from acid and thermal irritations. The investigation led to the superior and preferred combination of calcium hydroxide, methyl cellulose, and silver. This selection was made since it produced the most consistent result, producing a very distinctive appearance of the lining radiographically. Furthermore, there was no apparent chemical reaction between the silver and calcium hydroxide, as was evidenced by other substances examined. An important advantage of using silver is that the silver did not show any tendency to separate or settle out of the mixture once it was well combined. This latter compatibility is substantiated by making radiographs of the tubes containing the mixture after a storage period.

The lining material is prepared for use by combining in any sequence, as a predominant part of the mixture, a calcium compound preferably the calcium hydroxide, with a water soluble alkyl cellulose, preferably methyl cellulose. These two ingredients, or either of them separately, are mixed with water to form a paste, usually of creamy consistency. Next, particles, such as fine particles of silver, usually in the range of 105 to 300 microns, preferably in the range of 105 to 150 microns, are admixed into the paste. Alternately, all of these said components are mixed, then wet with water to form a paste. The finely divided silver, previously defined, may be added to the preparation in any sequence. The finely divided silver can be, as a dry powder, mixed with water and then added to the preparation.

As a general formulation, our composition comprises a calcium compound, such as calcium hydroxide, 40 to 50% by weight, preferably 47.5 to 49.5% by weight, precipitated finely divided metal, 10 to 25% by weight, preferably a silver metal 15 to 18% by weight, ranging from 50 to 300 microns, preferably 105 to 150 microns in size, and a thickening agent, preferably methyl cellulose in quantity sufficient to impart stability to the finely powdered calcium compound and silver as a suspension in water, usually being 4 to 10% by weight, preferably 2 to 5%.

Where silver is merely added to the dry lining material, the ratio is generally about ½ to 2 parts of silver to 1 to 6 parts of dry carrier, by weight, with water added in quantity sufficient to form a liquid suspension of any desired consistency ranging from a free flowing liquid to a paste.

The following example illustrates the practice of our invention. Forty-eight point eight parts of pure calcium hydroxide slacked lime powder is added to a gelatinous solution of 3% of methyl cellulose by weight. Thereafter, 16% of dry particles of silver is stirred into the suspension. The composition is then ready for use as a lining material. The cleaned dental preparation after boring out the decay, is coated with the lining material and dried to a stable consistency. Thereafter, the usual cement base may be placed over the coating to complete the preparation. Finally, the cavity is filled with dental amalgam or other conventional filling material.

The invention is further explained with reference to the drawings wherein:

FIG. 1 illustrates a typical dental preparation in which decay is underneath the filling.

FIG. 2 illustrates the same kind of dental preparation in which the ordinary calcium lining material has been coated over the dentine or the pulp of the tooth (over the surface of the cavity) before filling, and

FIG. 3 illustrates the same type of preparation in which the composition of this invention is used to line the dentine or cap the pulp of the tooth.

As shown in FIG. 1, a typical X-ray photograph is reproduced which comprises a tooth body **10**, having a bored out cavity **12** which was filled without a lining material, but with a cement base **14**, and finally with amalgam **16**. Sometimes, after filling the tooth, the tooth continues to decay at **18** beneath the filling, and the filling, of course, needs to be bored out again to completely remove the decayed portion before refilling. It will be observed that the decayed portion is radio translucent and clearly shows up as a dark shadow in contrast to radio-opaque portions, such as the cement base **14**, the amalgam filling **16**, and hard portions of the tooth **10**.

FIG. 2 illustrates a similar tooth preparation in which calcium hydroxide as a lining compound **20** has been applied to the bored out tooth, that lining material **20** serving to cap the pulp or line the cavity, and upon which a cement base **14** is placed, the cavity finally being filled with amalgam **16** as usual. That calcium lining material is very useful. However, radiographically, it is not distinct in appearance from the decay portion **18** as shown in FIG. 1. That is, both the calcium lining material and the decay portion **18** beneath the applied layer of cement **16** of the tooth are both radio translucent and are substantially indistinguishable. Thus, a tooth in which the filling is satisfactory is indistinguishable by X-ray from a tooth in which there is recurrent decay beneath the filling.

FIG. 3 illustrates the difference between a calcium lining composition containing radiopaque metal and the calcium lining composition without a radiopaque metal. For instance, the lining layer **22** has fine dots of silver which is a layer readily discernible and distinguishable both from the calcium lining layer **20** of FIG. 2 as well as the dental caries in the decay layer **18** of FIG. 1, as well as any substance used in dentistry to date. In this manner the dentist observing the X-ray can tell whether the tooth is still healthy after a lapse of a reasonable time following the filling, or whether the onset of further decay is actually present, and that decay **18** or calcium hydroxide layer **20** would be easily visible in contrast to the layer **22**.

Other radiopaque metals such as gold, platinum, etc., may readily be employed in substitution for the silver disclosed herein.

Some variation is possible for the ingredients and proportions specified herein without departing from the basic spirit of our invention, and accordingly, it is intended

that the examples given be illustrative and not limiting except as defined in the claims.

What is claimed is:

1. A dental preparation for cavity lining and pulp capping consisting essentially of 40 to 50% of calcium hydroxide, 10 to 25% silver metal particles, methyl cellulose in quantity of 2 to 5%, said percents being by weight, and the balance to 100% being water, said water forming a thick paste of the solid components in which the silver particles remain stably suspended.

2. A dental preparation for cavity lining and pulp capping consisting essentially of 47.5 to 49.5% of calcium hydroxide, 15 to 18% precipitated silver metal particles, methyl cellulose in quantity of 2 to 5%, said percents being by weight, and the balance to 100% being water, said water forming a thick paste of the solid components in which the silver particles remain stably suspended.

3. A dental preparation for cavity lining and pulp capping consisting essentially of 40 to 50% of calcium hydroxide, 10 to 25% silver metal particles having a particle size in the range of 50 to 300 microns, methyl cellulose in quantity of 2 to 5%, said percents being by weight, and the balance to 100% being water, said water forming a thick paste of the solid components in which the silver particles remain stably suspended.

4. A dental preparation for cavity lining and pulp capping consisting essentially of 47.5 to 49.5% of calcium hydroxide, 15 to 18% precipitated silver metal particles having a particle size in the range of 105 to 150 microns, methyl cellulose in quantity of 2 to 5%, said percents being by weight, and the balance to 100% being water, said water forming a thick paste of the solid components in which the silver particles remain stably suspended.

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