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DENTAL IMPRESSION MATERIAL

James Cresson, Milford, Del., assignor to The L. D. Caulk Company, Milford, Del., a corporation of Delaware

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This invention relates to dental impression materials, and more particularly to an impression composition utilizing as a primary component thereof an alginate having certain known characteristics.

A primary object of the invention is to provide a dental impression composition whereby a clean, hard surfaced model can be obtained without the need of a so-called "fixing" bath such as heretofore necessary.

It is a further objective of the invention to provide a composition of the identified type which is of singular toughness and strength and although reasonably elastic, is sufficiently rigid to resist being permanently deformed. Thus the possibility of rupture and distortion of the impression when being removed from undercuts is substantially reduced if not entirely eliminated.

A further object of the invention is the provision of a dental impression material having characteristics that enable the production of models, the surfaces of which are hard and glasslike without any semblance of chalkiness, and which, accordingly, will not chalk off in subsequent handling.

Another object of the invention is provision of a material of the described type which, when mixed with water for use, wets practically instantly and will not ball up, but develops the required creamy consistency within a period of mere seconds.

An additional object of the invention is to provide an impression material which possesses greater stability and will not deteriorate with age and atmospheric conditions but can be stored for a comparatively long time. Thus prolonged exposure of the impression powder in unsealed packages will not deleteriously affect the material nor the manipulations thereof when finally used. Additionally, the setting time is not speeded up appreciably as the material becomes aged.

It is known that alginates in general are most suitable for making mouldable compositions since when dissolved in water they form soluble gels that mould readily into the desired shape; i. e., the shape of the interior of the mouth. Alginate impression compositions based on the elastic gel forming reaction which occurs between a water soluble salt of alginic acid and calcium sulphate are well known to the art. The alkali metal alginates, such as, specifically, sodium or potassium alginate, are particularly useful in impression material formulations. The type of gel produced by these alginate compositions plus the simplicity of their use and comfort to the patient, have made them most suitable for use as dental impression materials.

The use of the referred-to sulphate is necessary to transform the soft alginate gel into an insoluble alginate which then exhibits properties of elasticity and resilience. This enables removal of the impression material from the mouth with a resultant accurate impression. Such removal accordingly does not destroy the impression, the elastic gel after distortion immediately reassuming its original shape.

In using the alginates in the formulation of impression

compounds it has been necessary heretofore to treat the impression after it has been taken. Thus, before pouring with dental stone or plaster of paris to obtain a satisfactory and positive replica of the mouth, a process known as "fixing" the impression is generally employed. Heretofore this "fixing" has been absolutely essential since, because of the colloidal nature of the algin, plaster or stone adjacent to the impression did not set to the required hardness. Furthermore, without the so-called fixing of the material after taking the impression, it was found that the surface of the plaster or stone model produced would powder off during handling, resulting in the destruction of the accuracy of the model.

"Fixing" of the impression thus became a necessary adjunct to the technique. Generally, this involves soaking of the impression in a special treating bath prior to pouring it with stone or plaster. Such fixing baths consist of water solutions of certain inorganic crystalline salts, such as potassium sulphate, manganese sulphate, zinc sulphate, alum, etc. Such salts act as plaster set accelerators. By immersing the impression in a solution of such a salt before the cast is poured, a thin film of this solution remains on the surface of the impression and serves to promote the setting of the plaster or stone in that area, thus producing relatively hard, clean surfaces on the model.

It has been found that whenever the pH value of the alginate impression material is reduced the resulting stone cast has a smoother surface. I have found that the impression material can be changed in this manner, from alkaline to acidic, without affecting adversely the other essential properties of the impression material. This is done by the addition to an impression material of the alginate type, of an alkali metal zinc fluoride. In the instant invention, sodium zinc fluoride and potassium zinc fluoride are preferred.

Of great significance in the instant invention is the fact that the addition of such a component to the impression material eliminates the fixing bath referred to and, accordingly, as can be well appreciated, results in a greater advantage to the dentist. While the system employing the fixing bath does produce models of relatively hard surfaces, the dentist is required to expend considerable additional time and effort when such technique is employed. Thus he must prepare the bath solution, provide a special container for it and have on hand a basin in which the impression has been soaked for a sufficient length of time. This procedure is obviously time consuming. It is entirely eliminated by the instant invention which enables the production of accurate casts without concern about the additional fixing step.

A clean, hard surfaced model can be obtained without the need of fixing and by the incorporation in the formulation of a relatively small amount of either sodium or potassium zinc fluoride. The amount thereof may vary from approximately 1% to 10% of the total powder weight and will give good results in any proportion within this range. The preferred working range, however, is approximately 2% to 4% of alkali metal zinc fluoride.

When, for example, this amount of alkali metal zinc fluoride is incorporated in the dental impression mixture, plaster or stone models can be poured as soon as the impression is removed from the mouth without any further treatment. Exceptionally hard surfaced models, with smooth flinty surfaces ideally suited to the needs of the technician, will result. At the same time the presence of this alkali metal zinc fluoride imparts good toughness and strength to the impression material thereby reducing the possibility of rupture or distortion of the impression when passing undercuts.

From the foregoing it is to be understood that my invention contemplates primarily the use of an alkali metal zinc fluoride in a dental impression material, the other

essential components thereof being the alginate and the calcium sulphate hardener.

It is necessary to also incorporate a gel retarder in the composition. In the past various forms of phosphates such as trisodium phosphate have been employed for this purpose. In the practice of the instant invention the use of sodium pyrophosphate is regarded as desirable. This component tends to retard the formation of the calcium alginate gel—providing time for the manipulation of the composition to obtain the impression.

The ingredients of the composition which I have mentioned in the foregoing may be incorporated with a filler material which is supplied in substantially greater amounts—in the instant case, diatomaceous earth and magnesium oxide.

I have found that a successful impression material can be made within the following ranges of the ingredients of the formulation, the formulae being set forth in parts by weight:

	Parts
Potassium alginate	20–28
Calcium sulphate dihydrate	20–30
Sodium pyrophosphate	5–12
Alkali metal zinc fluoride	1–10
Magnesium oxide	0–20
Diatomaceous earth	100–130

A preferred composition, wherein each of the components are within the range of the foregoing, is as follows:

	Parts
Potassium alginate	24
Calcium sulphate dihydrate	28
Sodium pyrophosphate	7
Sodium or potassium zinc fluoride	5
Magnesium oxide	15
Diatomaceous earth	101

In the manufacture of the dental impression material all ingredients as set forth in the foregoing are reduced to a fine powder and presieved through an 80 mesh screen. They are well mixed together in a ribbon type of mixer and may then be packaged in bulk without the necessity of sealing. Any pigments and flavoring oil desired are first premixed with the magnesium oxide in order to obtain good dispersion.

When required by the dentist the powdered impression material is mixed at room temperature with water to make the consistency of the composition that of a smooth, creamy paste. Spatulation of the material results in this creamy consistency within about thirty seconds. It is preferable, however, that mixing be continued for at least one minute. The pasty material is then placed in a tray and applied to the mouth while in this easily deformable condition. In a matter of a few minutes the effect of the hardener is to set the gel to a solid form which is, however, sufficiently elastic to be withdrawn without permanent distortion; i. e., the material is resilient and although it may be temporarily distorted during withdrawal from the mouth it quickly assumes the shape of the original impression.

The water temperature is not rigidly critical. Water at 70° F. is preferable, however, in the interests of uniform behavior. Mixture with water at lower temperature slows the setting reaction, and at higher temperatures accelerates the reaction; otherwise the chemistry of the reaction is unaffected by water temperature. The proportion of water to impression powder is approximately 2.5:1 by weight, as when this proportion is used the desired working consistency of the material is readily obtained.

As stated in the foregoing, with the addition of an alkali metal zinc fluoride the need for further treatment of the composition by the dentist after taking of the impression is eliminated. No further fixing of the surface of the composition is necessary in order to obtain a clean, hard surfaced cast and one that will not chalk off with subsequent handling or use. The impression material itself is resistant to exposure and does not readily deteriorate but on the contrary has a relatively long shelf life.

Obviously many modifications and equivalents of the invention hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

What I claim is:

1. A composition for taking dental impressions consisting essentially of an alkali metal alginate, calcium sulphate and an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

2. A composition for taking dental impressions consisting essentially of an alkali metal alginate, calcium sulphate dihydrate and an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

3. A composition for taking dental impressions consisting essentially of a potassium alginate, calcium sulphate dihydrate and an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

4. A composition for taking dental impressions consisting essentially of an aqueous solution of an alkali metal alginate, calcium sulphate and an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

5. A dental impression composition consisting essentially of an alkali metal alginate, calcium sulphate, alkali metal zinc fluoride, and sodium pyrophosphate, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

6. A dental impression composition consisting essentially of an alkali metal alginate, calcium sulphate, alkali metal zinc fluoride, an inert filler, magnesium oxide and sodium pyrophosphate, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

7. A dental impression composition consisting essentially of an alkali metal alginate, calcium sulphate and approximately 1% to 10% by weight of an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

8. A dental impression composition consisting essentially of an alkali metal alginate, calcium sulphate and approximately 2% to 4% by weight of an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

9. A dental impression composition consisting essentially of potassium alginate, calcium sulphate, magnesium oxide, sodium pyrophosphate, an inert filler and approximately 1% to 10% by weight of an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

10. A dental impression composition consisting essentially of an aqueous solution of an alkali metal alginate, calcium sulphate, and approximately 1% to 10% by weight of an alkali metal zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

11. A composition for taking dental impressions consisting essentially of an alkali metal alginate, calcium sulphate and sodium zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

12. A composition for taking dental impressions con-

sisting essentially of an alkali metal alginate, calcium sulphate and potassium zinc fluoride, said fluoride being adapted to eliminate fixing of said composition while maintaining the shelf life and proper setting time thereof.

13. A composition as claimed in claim 10 in which the fluoride is sodium zinc fluoride.

14. A composition as claimed in claim 10 in which the fluoride is potassium zinc fluoride.

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