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IMPRESSION MATERIALS

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This invention relates to impression materials and to the methods of forming and using same.

This invention pertains to materials for taking any sort of impression but having particular reference to those capable of taking intra and extra oral and aural impressions, or the like, by the practice of which models can be made to effect an exact reproduction of the surface contours of the impression areas. As it has particular relevance to the taking of impressions by dentists, as a preliminary to the construction or formation of dentures and the like, it will be described in particular reference to this use, although this is to be understood as purely illustrative and not limitative.

It is known in dentistry that perfect adhesion of the denture to the oral surfaces can only be attained when the mucosa-engaging surface is exactly complemental to every contour of the mouth tissues with which it has contact. If exactly a complement of every irregularity of the tissue structure is obtained without distortion of the tissues, the adhesion is perfect and the comfort and ease of use of the denture are perfect. According to previous practices and materials, it was very difficult to secure such identical relationship, and in the main the closest approximations rely upon manipulative pressures to establish the intimate impression required, which is a function of the skill of the practitioner, and not an inherent characteristic of the impression materials used.

As impression materials have been developed hitherto, they have manifested characteristics militating against such exact impressions, and additionally have had special disadvantages attendant upon their own special characteristics. Thus, such prior materials have in most part had a more or less granular surface texture precluding exact following and reproduction of minute irregularities of the mucosa, have required excessive time for the completion of the impression, have involved the use of cutting or braking tools, or exposure of the teeth and tissues to extremes of hot and cold with consequent discomfort and inconvenience to the patient, and with undercut or bulbous teeth the impression was distorted in withdrawing from the teeth, with consequent inaccuracies in the model.

In my patent, No. 2,296,877, issued September 29, 1942, there were disclosed improvements in such impression materials and in the methods of forming same, which in large measure overcame the various deficiencies and disadvantages attaching to the more or less conventional prior art

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impression materials, as discussed in that patent. While the materials used in accordance with the teachings of that patent were generally satisfactory, and the material has had satisfactory response from dental practitioners, it has been found that there are some factors thereof which were undesirable, either of themselves, or as creating psychologically disadvantageous effects, which have militated against the universal acceptance of the patented materials in the profession. The essentials of the said patented materials as heretofore provided were ethyl methacrylate, and an alcohol, either ethyl alcohol or one or more of the higher alcohols.

The disadvantageous factors in the patented impression materials mentioned using ethyl methacrylate and an alcohol may be summarized as follows:

1. The setting up period of the impression materials was quite rapid and in its final phases was accompanied by a certain amount of shrinkage. This was not particularly objectionable if the model was poured promptly after the completion of the impression, but undue delay permitted a time factor to intervene to cause shrinkage of the impression and the model poured late would be too small. This placed an inconvenient burden on the practitioner who too frequently could not stop his other work in order to complete the prompt pouring of the model.

2. It was found that the impression area of the impression material exhibited a rather granular surface, depending upon the particular size of the granules of the ethyl methacrylate used, and as it has been difficult to secure extremely minute granules for the purpose, the use of larger granules has had an actual effect upon the surface texture of the impression material.

3. When the plastic mass of ethyl methacrylate and alcohol was placed in the patient's mouth, the alcohol component effected dehydration of the membraneous surfaces of the oral cavity with which it was in contact, and while this did not actually hurt the tissues in any way, the sensation was received by the patient as burning of the tissues, with consequent irritation and consequent displeasure with the treatment.

It is among the objects of this invention: to obviate the disadvantages of previous impression materials; to provide an impression material which retains its dimensional stability; to provide an impression material which after initially setting up is capable of making accurate models up to seventy-two hours after such initial setting up; to provide an impression material by

which models formed thereby are both highly accurate and also are possessed of a smooth non-granular appearance; to provide an improved impression material which precludes dehydration of the tissues of the patient's mouth, and which imparts no burning sensation of the patient; to provide an impression material to the use of which the patient's reaction is pleasant; to provide an impression material which sets up in the patient's mouth in not to exceed 1½ minutes, in contrast to all previous impression materials; to provide an impression material and method of procedure by which the impression after being taken can be coated with a methacrylate solvent by painting a film coating thereon, and after drying for a short interval can be returned to the mouth under slight pressure to effect a microscopically accurate mucosal seal duplicating the actual impression area; to provide a method and material for impressions by which models can be made which duplicate microscopically, in almost cellular faithfulness, all details of the mouth; to provide a method and materials by which dentures can be made from a poured model having an average fit and adhesion never before attained without extreme manipulative skill by the practioner; to provide an impression material which is free from contraction or shrinkage for several days after setting up; to provide an impression material which although quickly set and quickly used can be used for the pouring of a mold as long as seventy-two hours after the impression; and many other objects and advantages will become more apparent as the description proceeds.

I have discovered that certain chlorinated solvents, such as carbon tetrachlorid, trichlorethylene, methylene chloride, ethylene dichloride and chlorbenzene, and hydrocarbons, such as benzene, toluene, xylene, cyclohexane, hexane, gasoline and naphthalene are nondehydrating to the muscoa and the mouth tissues, and that when used with simple plasticizers such as dibutyl phthalate and liquid petrolatum, and when combined with various common flavoring agents (which serve no part in the chemical or physical reaction) a pleasant tasting result is obtained.

Poly-isobutyl-methacrylate is soluble in these hydrocarbons and chlorinated solvents, and the reaction is much the same as when combining an alcohol and ethyl methacrylate, in that an impressionable mass is formed which after a certain length of time sets up into a springy mass, retaining its form. As such it is quite suitable for taking dental impressions, and other impressions, such as of the ear, etc., with all of the advantages of the ethyl methacrylate-alcohol mixture recited in said patent, plus additional advantages not available from that mixture.

In a preferred embodiment of the invention, I use

Poly-isobutyl Methacrylate (3 parts)	+	Hydrocarbon and/or Chlorinated Solvents (1 part)	⟶	Impressionable Mass

For a specific illustration of the preferred liquid for the impression material, it is preferred to use a combination of naphtha and carbon tetrachlorid. It is not particularly important what the order of combination may be although carbon tetrachlorid is preferred as a part thereof, and enough should be added or included to make the resulting mixture comply with the postal regulations dealing with inflammability.

For the powder of the impression material, it is preferred to use iso-butyl methacrylate, screened to approximately 40 to 60 mesh, and with a suitable coloring agent.

For the mixing of the above impression material I use approximately 5 c. c. of liquid to 15 c. c. of powder, mixing the two together until an impressionable mass is obtained of substantially the proper volume for the purpose of the average impression. If desired, Vaseline may be added to slow down the setting time in order to facilitate ease of placement of the mixture in the mouth. Ordinary dental impression trays as desired by the particular techniques of the dentist may be used to place the impression material in the mouth.

It may be pointed out that there are four definite advantages attaching to the combination of elements just recited for impression purposes which do not occur with the poly-ethyl methacrylate-alcohol combination used in accordance with the teachings of the patent. These may be summarized as follows:

1. The impression retains its dimensional stability and does not contract until after seventy-two hours, and a model poured prior to the expiration of that time limit is quite accurate.

2. The resulting model formed from an impression made with these materials, is not only of high accuracy but also is possessed of a smooth, non-granular appearance highly desired by the profession.

3. There is no dehydration of the tissues and the patient reaction is quite pleasant, as there is no impartation of a burning sensation.

4. Despite the duration of time within which the model may be safely and accurately poured as noted above, the actual setting up in the patient's mouth is so rapid that the impression requires a mere minute and a half in the patient's mouth, which is a marked advance over all known impression materials and techniques. The advantage of this factor is obvious, but it may be noted that it eliminates a great deal of present patient unpleasantness, such as gagging and the like, aside from the sheer tedium and annoyance incident to time factors necessary with other impression materials.

Accurate as the impression is when formed from materials as just recited, I have discovered that when and if desired a final superlative touch can be added which effects a further final series of steps in creating a practically cellular reproduction of the mucosa with which the impression is in contact. This comprises the steps, after the formation of the impression in the recited minute and a half by the present impression materials, or those of the said patent, of removal from the patient's mouth, and the painting on the impression surface of a glaze formed of any methacrylate solvent with methacrylate. After the glaze, to be described, is coated on the formed impression, it is permitted to dry for a short drying interval, variable according to room temperature. The internaly glaze-coated and dried impression is then returned to the mouth and pushed under slight pressure into its impression position, to bring the soft glaze into contact with the tissues of the patient's mouth for approximately one minute, after which the impression is again removed and can be poured any time within the next seventy-two hours.

An illustrative glaze is from 1 to 8 dwt. of polymethacrylate to 1 oz. of solvent. After the glaze is painted or otherwise coated on the impression

surface of the initial impression, it requires a drying interval of from 30 seconds to 2 minutes, depending upon room temperature, but when the impression is returned to the mouth the glaze is still soft, and effects a microscopic mucosal seal. After retention in the intimate contact with the mucosa under slight pressure, the surface of the impression, and the resulting model when poured, duplicates microscopically, in almost cellular faithfulness, all details of the impression surface of the mouth. Dentures made from such a subsequently glazed impression exhibit fit and adhesion which have heretofore never been obtained except by purely manipulative methods involving overcompression of certain areas creating adhesion.

The illustrative composition of the glaze is

Poly-methacrylate (1 to 8 dwts.)	+	Methacrylate Solvent (1 oz.)	⟶	Glaze or Syrup

For the glaze of this impression material it is preferred to use a methacrylate solvent such as amyl or ethyl acetate, 1 oz. to 3 dwt. of isobutyl methacrylate, as a purely illustrative disclosure. Although the proportions may differ with the solvents and methacrylates used, the important thing is the production of a thickened liquid or syrup capable of being painted or coated conveniently on the acrylic impression material.

It is a further feature of this invention to modify the impression materials recited in said patent by adding thereto the impression materials of this invention, in a new and important combination by which all of the advantages of the present previously described invention can be attained, while also retaining the advantages of the earlier patented impression material without the disadvantages thereof. This creates a new impression material which solves all of the problems, and which can also be painted with the glaze previously discussed to the perfection of the impression techniques of the users thereof.

In carrying out this phase of the invention, it is preferred to use three parts of ethyl methacrylate with one part of iso-butyl methacrylate, as the powdered portion of the impression material, and three parts of ethyl or higher alcohols with one part of a combination of naphtha and carbon tetrachlorid. The impression material thus formed has all of the pleasant taste factors of the impression material discussed above, and the freedom from the sensations due to dehydration of the tissues, while being slow to contract, and having the high speed of application and removal that is so desirable. It is, therefore, to be understood that although I may prefer to use the just described impression material alone, I may also combine the new one in unexpectedly beneficial combination with the patented material, as the combination, as noted, retains all of the advantages while obviating the disadvantages of the patented materials. As noted, the step of painting with the glaze is applicable to, and its functions attainable by, either impression material.

The impression when made can be removed from either undercut or bulbous teeth, being possessed of elastic memory to return to the initial impression condition after slight distortions, and is also possessed of all of the other advantages recited in said patent of the earlier impression material.

Having thus described my invention, I claim:

1. An impressionable mass for taking intra and extra oral impressions consisting essentially of approximately three parts of ethyl methacrylate polymer and one part of isobutyl methacrylate polymer, with approximately three parts of alcohol and approximately one part of naphtha.

2. An impressionable mass for taking intra and extra oral impressions consisting essentially of approximately three parts of ethyl methacrylate polymer and one part of isobutyl methacrylate polymer, with approximately three parts of alcohol and one part of carbon tetrachlorid.

3. An impressionable mass for taking intra and extra oral impressions consisting essentially of approximately three parts of ethyl methacrylate polymer and one part of isobutyl methacrylate polymer, with approximately three parts of alcohol and one part of naphtha and carbon tetrachlorid.

4. The method of taking intra and extra oral impressions, which comprises making an impression of acrylic materials, painting the inner surface thereof with a superposed liquid glaze formed of an acrylic resin and a solvent therefor, permitting the glaze surface to dry for a short interval, and returning the impression to the impression surface under slight pressure while the glaze is still soft to effect an enhanced mucosal seal.

5. An impressionable mass for taking intra and extra oral impressions consisting essentially of approximately three parts of ethyl methacrylate polymer and one part of isobutyl methacrylate polymer, with a solvent consisting essentially of approximately three parts of alcohol and one part selected from a group consisting of chlorinated hydrocarbon and hydrocarbon solvents.

6. An impressionable mass for taking intra and extra oral impressions consisting essentially of approximately three parts of ethyl methacrylate polymer and one part of isobutyl methacrylate polymer, with a solvent consisting essentially of approximately three parts of alcohol and one part selected from a group consisting of chlorinated hydrocarbon and hydrocarbon solvents, and a superficial glaze thereon formed of from one to eight dwts. of the polymer of an ester of methacrylic acid to one ounce of solvent therefor selected from a group consisting of amyl acetate and ethyl acetate.

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