PROCESS AND APPARATUS FOR MIXING AND DISPENSING DENTAL PLASTER

Charles L. Jaeger, 5655 Benson Drive, Minneapolis, Minn. 55432
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11 Claims

ABSTRACT OF THE DISCLOSURE

A dental plaster mixing and dispensing device consisting of a syringe formed from a tough impact plastic resistant material such as plastic having a plunger mounted for sliding movement therein, a combined mixing and valve element, e.g. a steel ball positioned in the syringe and adapted when the syringe is in an upright position to seal an outlet.

This invention relates to dentistry and particularly to a method of preparing and dispensing dental plaster.

Previous methods used by dentists for mixing plaster have been time consuming and the resulting plaster has not always been uniform in consistency. For this reason, vacuum mixing equipment has been resorted to in spite of its expense. While plaster is used in a number of dental techniques, it will be described herein in detail for relating the maxilla to the mandible when impressions or bases are to be held in centric position during the preparation of dentures.

Previous methods used for preparing and dispensing plaster for this purpose requires from about 3 to 15 minutes. Moreover, the techniques do not produce a finished product of uniform consistency and high strength.

This resulted primarily from the non-homogeneous character of the mix.

The process previously used consisted of mixing plaster and water in a rubber bowl and applying the mixture directly with a spatula. By using a spatula it is difficult to completely fill the space between the bases and the process tends to be rather untidy. Furthermore, because the mixture must be transferred from the rubber bowl to a glass syringe, a rather thin plaster mix is required. This takes longer to set. If the mixture, on the other hand is too firm, it may set up in the syringe and is impossible to remove.

Because of these problems in prior mixing and dispensing procedures, a loss of valuable time results and the plaster is often weak because of its non-homogeneous character and low density.

In view of these and other deficiencies of the prior art, it is a prime object of the present invention to provide an improved method and apparatus for mixing and dispensing dental plaster having the following characteristics and advantages: (a) the rapid and accurate mixing of dental plaster or store for general application; (b) the attainment of a density in the finished plaster which approaches that obtained using vacuum mixing equipment; (c) a mixing procedure that takes less than about 30 seconds from the time water is introduced until the plaster is dispensed; (d) an improved procedure for preparing plaster and injecting the same into a mold, the impression of a dental arch or portion thereof; (e) a procedure which lends itself to the prevention of voids (trapped air holes) in the filling of relatively deep depressions; (f) a provision for storing dry plaster and preventing damage from moisture present in the air; (g) the provision of an instrument for both mixing and dispensing plaster in which a single element serves both as a mixing element and as a valve.

These and other more detailed and specific objects will be apparent in view of the following specification and claims wherein:

FIG. 1 is a vertical sectional view of a mixing and dispensing instrument of the invention.

FIG. 2 shows the instrument after water has been introduced in the position used for mixing.

FIG. 3 shows plaster being dispensed for relating upper and lower bases in centric position.

Briefly, the invention comprises mixing plaster in a syringe by placing a mixing body within the syringe and subjecting the syringe to agitation prior to expelling the mixture. The syringe preferably includes a single body that serves both as a valve and as a mixing element.

Shown in the figures is a syringe 10 which consists of a tubular syringe housing 12 having a lateral extension 12a and its upper end against which the fingers are placed when material is to be dispensed. A plunger 14 fits slidably within a central bore 16 of housing 12. At the lower end of the housing is a dispensing tube or outlet 18 having a nozzle opening 20 at its lower end.

The plunger 14 consists of an elongated body portion 22, an integral thumb plate 24 at its upper end and a sealing element 26 at its lower end which can be formed from rubber or other resilient material. The sealing element 26 in this instance consists of a cup-shaped member engaged frictionally over the lower end of the plunger. It includes a pair of longitudinally spaced sealing rings 28 and 29 and a dome-shaped central portion 30 which is also formed from a resilient material.

When the syringe is to be packed, typically about 25 cc. of dental plaster 34 in dry form is used. Before the plaster is placed in the syringe, the outlet 18 must be sealed. This is accomplished by means of a valve 32 which functions as a sealing element. The valve 32 is dropped into the syringe and allowed to rest in engagement with valve seat 33 at the upper end of the outlet 18. When the syringe 10 is then introduced and the plunger 14 is inserted to the position of FIG. 1. It was found that unless the valve element 32 is used, all of the plaster could be expelled by pressing down on the plunger.

To remove the last remaining air trapped in the plaster, the syringe is inverted and a pointed instrument (not shown) is introduced to unseat valve 32 while a light pressure is applied to the plunger 14. The last remaining quantity of air can be heard escaping. In this condition the packed syringe can be stored indefinitely and will not be damaged by ambient moisture.

When the device is to be used, the nozzle 20 is inserted in a container holding about 10 cc. of water. The plunger 14 is then withdrawn until all of the water has been drawn into the syringe. The syringe is then inverted to the position of FIG. 2 and shaken for about 20-30 seconds with one finger over the nozzle opening 20. The valve 32 then acts as a mixing element and produces a mixture having a high degree of uniformity. The element 32, it will be seen, seals the nozzle from the bore when the syringe is upright or when the syringe is filled with plaster during storage thereby preventing damage to the plaster by ambient humidity. After mixing, with the syringe in a horizontal or inclined position as in FIG. 3 the bore is not sealed and the plaster can be easily expelled. When injecting plaster with the syringe in a vertical position the ball can be removed if necessary or jarred away from the nozzle.

The mixed plaster is then dispensed as shown in FIG. 3 by applying pressure to the plunger 14, for example, to relating upper and lower bases 38 and 40 respectively in centric position.

Some types of plaster are known as "die stone" which is generally understood to be composed of a highly refined pulverulent material having a gypsum base. Die stone is usually employed in forming die models from which oral bridgework is constructed because of its hardness, dense structure and ability to accurately reproduce fine surface...
3,618,216 3 details. The present invention is particularly useful in mixing and dispensing die stone and can be effectively employed for the direct injection of the stone into a cavity beginning at the bottom and filling from the bottom upwardly to avoid the entrapment of air bubbles.

It will be noted that the instrument is inexpensive, operates rapidly (usually less than 30 seconds from mixing to expulsion of the plaster) and results in a very homogeneous mix.

The invention will be better understood by reference to the following examples:

EXAMPLE I

25 cc. of dental plaster in dry form was introduced into a syringe of the type shown in FIG. 1 and composed of polypropylene resin. The ball 32 introduced before the plunger consisted of stainless steel.

The plunger was lubricated with a silicone lubricant and introduced to the position of FIG. 1. Trapped air was expelled by contacting the ball 32 with a needle and applying pressure to the plunger 14. The syringe was then stored for a period of time. Ten cc. of water were introduced by withdrawing the plunger 14. The syringe was then shaken for 20 seconds, at which time the plaster was expelled. Finished plaster was examined by a trained technician and found to have a very high density and to be unusually uniform in consistency. It appeared to approach the quality of plaster prepared in an electric vacuum mixing apparatus.

The plunger was used to lock together mandibular and maxillary training devices on edentulous ridges after true centric position has been registered preparatory to transfer to an articulator in the preparation of dentures.

EXAMPLE II

The procedure is performed as in Example I, except that the plunger is used to lock together edentulous mandibular and maxillary base rims for transference to an articulator.

EXAMPLE III

The plunger was dispensed as in Example I to lock together dentulous or partially dentulous maxillary and mandibular arches with a plaster index for mounting on an articulator.

EXAMPLE IV

The plunger is mixed and dispensed as in Example I to prepare dental impressions on edentulous ridges for complete dentures or partial areas for fixed bridge techniques.

EXAMPLE V

Plaster is mixed and dispensed as in Example I, except that the plunger consists of dental die stone. The die stone is injected into the bottom of an indirect bridge impression formed from rubber, silicone, colloidal material or the like, so that the flow is upwardly rather than downwardly to prevent the trapping of air bubbles.

I claim:

1. A dental plunger, mixing and dispensing instrument comprising an elongated cylindrical syringe formed from an impact resistant material, said syringe having an elongated bore therein with a constant cross sectional configuration throughout its entire length, a plunger slidably mounted in the bore for reciprocating movement therein, a means sealing the plunger to the bore of the syringe, a nozzle communicatively connected to the bore and located at one end of the syringe, a sealing element within the syringe adapted to seal the nozzle from the bore when the syringe is in an upright position with the nozzle at the lower end thereof and to allow communication between the nozzle and the bore when the syringe is horizontal or in an inclined position and a loose mixing body within the syringe for agitating the plaster mix within the syringe when the syringe is shaken.

2. The instrument of claim 1 wherein the sealing element between the nozzle and the bore is the mixing body.

3. The apparatus of claim 1 wherein the lower portion of the bore adjacent to the nozzle comprises a circular valve seat, the sealing element comprises a ball adapted to rest against the seat, said ball being loosely contained within the syringe to thereby act as a mixing body when the syringe is shaken.

4. The apparatus of claim 1 wherein the syringe is formed from a breakage resistant resin, the plunger is provided with a resilient internal end to act as a cushion for allowing the mixing body to bounce rapidly back and forth through the bore of the syringe.

5. The instrument of claim 1 wherein a circular valve seat is provided in the syringe between the bore and the nozzle, said sealing element comprises a ball located within the bore of the syringe and adapted to rest against the seat in sealing relationship when the syringe is in an upright position and serve as a mixing body when the syringe is shaken and a resilient member on the internal surface of the plunger to act as a cushion for assisting the ball in bouncing rapidly up and down within the syringe when shaken.

6. A method of mixing and dispensing dental plaster from a syringe having a mixing body loosely mounted therein and a plunger adapted to slide within the syringe, said method comprising placing a measured quantity of plaster within the syringe, withdrawing the plunger a sufficient distance to draw into the syringe a measured quantity of water without at the same time drawing air into the syringe whereby the mixture in the syringe comprises essentially water and plaster with little air entrapped therein, shaking the syringe to thereby agitate and mix the plaster through the action of the mixing body moving within the syringe and thereafter expelling the plaster from the syringe directly onto a work piece.

7. The process according to claim 6 wherein the plaster is first subjected to compression within the syringe to expel air therefrom and is thereafter mixed with water.

8. The process according to claim 6 wherein the plaster is injected directly between a pair of bases for holding the bases in centric position.

9. The process according to claim 6 wherein the plaster is injected directly between the mandibular and the maxillary training devices on edentulous ridges in centric position.

10. The process of claim 6 wherein the plaster is injected directly between dentulous maxillary and mandibular arches with a plaster index.

11. The process of claim 6 wherein the plaster is injected into the bottom of an indirect maxillary and mandibular arches with a plaster index.

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