June 16, 1942. E. L. CHOTT 2,286,599

MORTAR AND PESTLE

Filed April 22, 1940

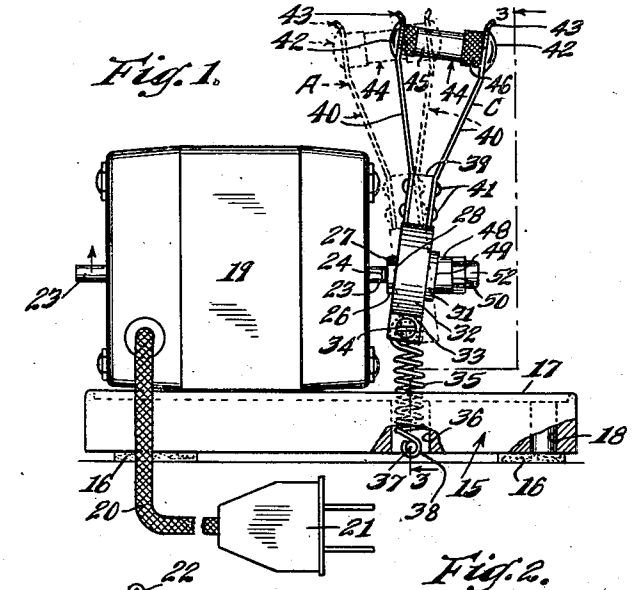


Fig. 1.

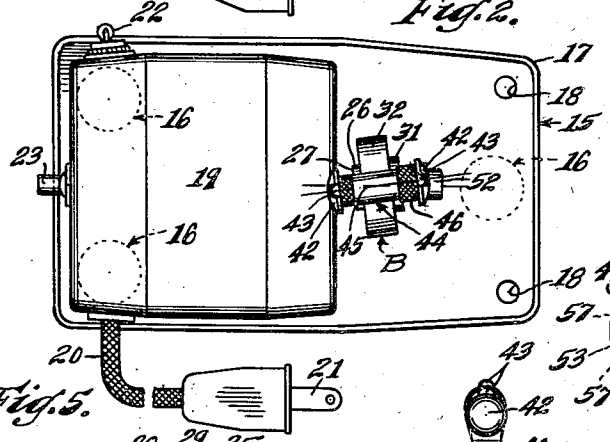


Fig. 2.

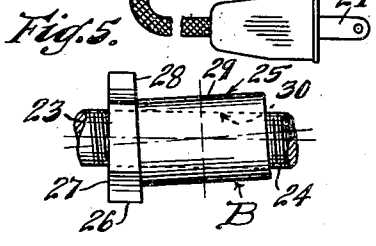


Fig. 5.

Fig. 6.

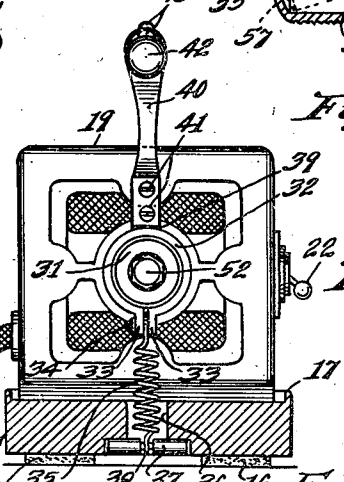


Fig. 3.

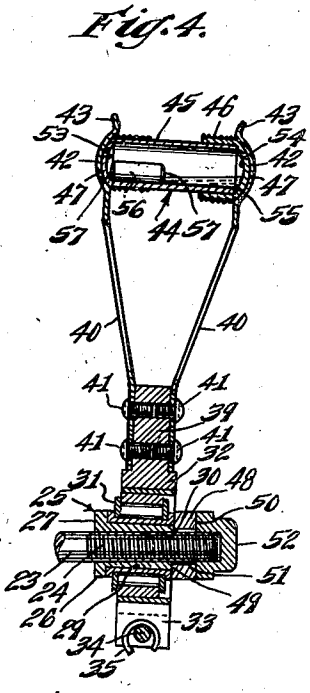


Fig. 4.

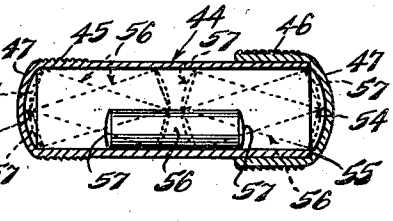


Fig. 9.

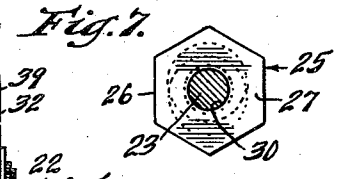


Fig. 7.

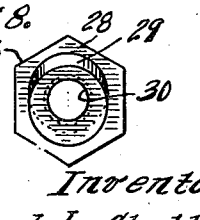


Fig. 8.

Witnesses:
C. E. Wessels
Madeleine Mac Master

Inventor:
Edward L. Chott,
By Joshua R. H. Potts
his Attorney.

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2,286,599

MORTAR AND PESTLE

Edward L. Chott, Chicago, Ill.

Application April 22, 1940, Serial No. 330,941

5 Claims. (Cl. 83—10)

My invention relates to trituration and amalgamation of materials and especially dental alloys, and more particularly to a novel triturator or amalgamator and pestle or pellet adapted to be used in a mortar in the form of a capsule which is moved or oscillated in several directions from a power driven shaft.

There are over fifty brands of dental alloys on the market and each manufacturer furnishes directions for triturating it in a hand mortar.

The triturating pressures vary from 5 pounds pressure on the pestle to just stirring it without applying any pressure. It is therefore necessary to simulate these various pressures from 5 pounds where it is necessary to grind the alloy and reduce the particle size to practically no pressure on some of the alloys where the particle size is not to be disturbed by mixing.

From a series of experiments and research I have found that different alloys require different size pestles, ranging in weight from 1.5 grams to .1 gram in order to meet the various technics of trituration to simulate the various pressures recommended by the different manufacturers. Here, it is also necessary to have the pestle of a given weight.

If this mortar in the form of a capsule is agitated without any weight or pestle in it, the amalgamation is very slow, and when amalgamation does take place it forms a globule which is dry in the center, because the inertia caused by this agitation forces the mercury to the outer ends or surface of the globule, which is due to the difference in the specific gravity of the mercury and alloy materials. The mercury being forced to the surface causes the center to be dry, or in order to make the amalgam fit for practical use, it is or would be necessary to place it in a glass mortar and triturate it until it becomes a plastic, homogeneous mass. This latter operation however, in the majority of cases, causes an over trituration which renders it useless for insertion into the tooth cavity, because over trituration causes shrinkage, leaky fillings, and loss of strength.

Under Government requirements, an amalgam must expand when used as a filling in order to prevent same from getting loose or falling out, as distinguished from contraction or shrinking. In coarse cut amalgams a heavy pestle and pressure is required in the mortar. For fine cut amalgams a lighter type of pestle is required to finely divide and triturate the material and to prevent too severe a pressure and impact, or any of the objections heretofore referred to herein.

The primary object of the present invention is to provide a novel mortar and pestle for quickly triturating the ingredients, and which can be used in certain sizes and weights so that the time required for triturating or amalgamating any amalgam can be determined in advance so that the proper trituration and the best results are insured in the shortest possible time.

Another object is to provide a novel capsule mortar and pestle for use therewith, particularly in a machine hereinafter described and as set forth in my prior application for patent for Dental amalgamator, Serial No. 262,118, filed March 16, 1939, which matured in Patent No. 2,201,428 on May 21, 1940, whereby points or sharp portions are avoided at the ends or points of impact or engagement with the ends of the capsule mortar, to prevent piercing the latter, and at the same time, to insure proper and thorough mixing of mercury and alloy materials in less time, without too much pressure where light pressure or practically no pressure, but substantially merely a mixing operation is required.

Further objects and advantages will appear and be brought out more fully in the following specification, reference being had to the accompanying drawing, in which:

Fig. 1 is a side view of the device showing the capsule in solid and dotted lines at the ends of its stroke in either direction;

Fig. 2 is a plan view of same in another or midposition;

Fig. 3 is a sectional elevation of same taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged vertical sectional view of the mortar supporting means or arm, mortar with a pestle or pellet therein and arm actuating means;

Fig. 5 is a plan view of the eccentric bushing and its mounting in the position shown in Fig. 2 or a side view of the bushing with the parts in the dotted line position shown in Fig. 1;

Fig. 6 is a plan view of same with its position changed, turned or oscillated on a horizontal axis, 180 degrees or a side view of the bushing in the full line position shown in Fig. 1;

Fig. 7 is an end view of the eccentric bushing;

Fig. 8 is a view from the opposite end of the bushing; and

Fig. 9 is an enlarged central longitudinal sectional view of the mortar taken horizontally or vertically and with the pestle in elevation and dotted line positions of operation.

Referring to the drawing, there is shown in

Figs. 1 to 3, the type of amalgamator or triturator shown in my copending application, Serial No. 262,118, filed March 16, 1939, which matured in Patent No. 2,201,428 on May 21, 1940, of which this is a division in part and a continuation in part and in which 15 designates the base having cushion feet 16 and a surrounding top flange 17 which forms a sort of pan to collect and retain any droppings of amalgam while openings 18 are provided in any suitable number to fasten the base to a horizontal support, bench or table by means of screws or the like. 19 is an electric or other motor, either A. C. or D. C., or both, having a wiring conduit 20 with a plug 21 for connection with a suitable electric outlet or wall socket for electric current supply. 22 is a switch for controlling the operation of the motor, the shaft 23 of which has an angular or eccentric portion. The end 24 is shown threaded to take an eccentric sleeve 25 having a collar 26 at its inner end with the face 27 normal to the axis of the shaft and the face 28 normal to the axis of the sleeve with a slight divergence between the angle of the periphery of the bushing or axis thereof, and that of the shaft which is acute and preferably about six degrees. The peripheral surface 29 of the sleeve is similarly eccentric to the shaft and forms the eccentric portion thereof which as designated at 30 is internally threaded to fix the sleeve to the shaft. Loosely mounted on the sleeve is a bushing 31 with suitable anti-friction bearings and a split collar 32 having apertured ears 33 connected by the bolt 34 to clamp the same to the bushing or loose part. Suitable means is provided to hold the collar in a fixed position or upright, such as shown in my prior application and illustrated in the form of a contractile spring 35 connected to the bolt 34 and in an opening 36 in the base secured to a pin 37 by means of a coil 38.

An arm 39 projects up from the collar 32 and carries a mortar supporting means with divergent spring arms 40 anchored to the arm portion 39 by suitable fastenings 41. The arms are provided with concavo-convex sockets 42 and outturned ends 43 by which the arms may be separated so as to receive a mortar in the form of a cylindrical chamber or capsule 44 comprising a body section 45 and a cap 46 with convex ends received in the sockets 42 against the concave faces 47. In order to retain the bushing and mortar supporting means on the sleeve, an eccentric collar 48 is provided which contacts with the bearing, but not with the outer end of the sleeve to permit rotation of the shaft and sleeve without undue friction. The inner face 49 of the collar is eccentric to the axis of the shaft and the outer face 50 is normal thereto while the bore 51 is loose and the collar is held in position by a cap nut threaded on the end of the shaft. With this device, as the shaft is rotated, the arm and capsule will be oscillated horizontally laterally on a central upright or vertical axis, and simultaneously reciprocated, oscillated or caused to take a swinging motion back and forth with each horizontal lateral oscillation as shown in dotted lines in Fig. 1 and in Fig. 2. This is due to the fact that there is a connection between the shaft and the mortar or capsule supporting means for oscillating the mortar on its central transverse upright or vertical axis or at the point of intersection of the transverse and longitudinal centers or axes thereof which passes radially through said sleeve 25 and substantially radially through the shaft 23 in a vertical plane passing through the axis of the drive shaft and for simultaneously reciprocating the mortar on a horizontal axis or its longitudinal axis while preventing rotation of the mortar supporting means with the shaft. This movement is particularly effective with a form of pestle or pellet as will be later described and it is possible to advise a dentist, laboratory expert, or assistant just how long a time is required for properly preparing any type of amalgam.

It will be understood that while I have stated that I have found arranging the axis of the cylindrical surfaces of the bushings at an angle of six degrees to the shaft is preferable, this can of course be varied.

The letter A in Fig. 1, referring to the dotted lines, represents the rearmost position of the mortar holding arms and mortar. In this position, the longitudinal axis of the mortar will be at an angle to the motor shaft and in the plane of the motor shaft.

The letter B in Fig. 5 represents the position of the bushing after it has turned at an angle of 90 degrees from the position which it would have had with the mortar holding arms in the position of letter A and is the same as the position of the bushing in Fig. 2.

The letter C indicates the position of the mortar and mortar holding arms after the bushing has been moved 90 degrees further in its revolutions or 180 degrees from the dotted line position in Fig. 1 and the mortar arms and mortar and bushing are in the opposite position from that which they occupy in the dotted line position in Fig. 1. This is the foremost position of the mortar holding arms and mortar; that is, the position when they are farthest away from the motor housing or farthest to the right, as shown in Fig. 1.

The letter D in Fig. 6 represents the position of the bushing after the bushing has been further turned 90 degrees from the position shown in Fig. 1 and this position is opposite from the position shown in Figs. 2 and 5.

Letter E indicates a point on the axis of the cylinder of the cylindrical surface of the bushing and the bushing turns horizontally on this axis during every revolution.

In this way, as the bushing rotates, the mortar travels in a circular manner from a rearward to a forward position changing or reversing the direction of the axes of the mortar when it travels from a rearward to a forward position and back again as it moves from the forward to the rearward position in its rotary path. In other words, it travels from the rear forwardly and from the forward position to a rear position and from side to side and changes the direction of its axes in each revolution of the bushing.

It should be noted from Figs. 4 and 9 of the drawing that the outer convex faces 47 of the body section 45 and cap 46 are not only convex, but preferably formed on true arcs and the inner concaved ends or surfaces 53 and 54 thereof have the same radius and are also cut or formed on true arcs with the same radii. Inasmuch as the cap 46 is larger in diameter than the body section, a shoulder 55 is formed annularly within the cap around the concaved end 54 and this shoulder is abutted by the adjacent open end of the body section. Both the body section and the cap are in the form of a cylindrical chamber or shell with concaved ends internally and convex ends externally cut on true circles. Each

has a closed end and an open end so that the body section fits within the cap or the cap over the body section, and is securely retained thereon with the open end of the body section snugly fitting the annular shoulder 55. The pestle or pellet is designated at 56 and consists of a cylindrical member or body of uniform diameter throughout its length which is not affected by the mixture or materials used in the amalgam, such as mercury and alloys used in conjunction therewith and has convex ends 57 also cut on true arcs substantially the same as the concaved ends 53 and 54 of the mortar. This pestle is shown approximately one-half the length and diameter of the mortar or chamber thereof, but this may be slightly varied, and the size and weight of the cylindrical body forming the pestle will vary according to the pressure desired in the triturating action so that the exact time required to properly prepare the amalgam with the particular machine and movements produced by the device shown and described can be determined in advance and advised, so that accurate results are absolutely insured and can be guaranteed as is a matter of record.

It should be noted from Fig. 9 of the drawing that the pestle or elongated body forming the same will normally lay on the bottom of the mortar and when the latter is actuated in the manner described, the pestle will be oscillated tnrown back and forth so that the convex ends 57, as well as the cylindrical sides of the chamber or mortar and pestle will act with proper impact as well as sliding motion against the material within the mortar in preparing the amalgam and the ends of the pestle thrown violently against the ends of the mortar to impact the material therebetween. This is effectively accomplished by the conformity of the ends of the pestle with the concaved ends of the mortar, and as shown by dotted lines in said Fig. 9, the pestle will be caused to be thrown laterally and slide in different directions diametrically on the ends of the mortar in substantially diagonal positions at opposite ends of the mortar chamber due to the fact that the chamber of the capsule mortar 44 is considerably larger in diameter and length than the diameter and length of the pellet or pestle 56 so as to give an effective triturating or grinding action which is particularly instrumental in speeding the preparing of the amalgam in a much shorter time than is possible with any other device heretofore produced. As shown, the mortar chamber is approximately eight times the size, cubic area or volume of the pestle, i. e., twice the diameter and length.

The mortar being oscillated and reciprocated in the manner described and restrained from movement laterally and longitudinally under its inertia by the holding arms of the supporting means, while the pestle being a heavier body and unrestrained in its movements under its inertia, except by the walls of the mortar, will be oscillated and reciprocated within and independently of the mortar and slide against the walls of the mortar and material therebetween to be canted or thrown laterally in an arc, particularly at its ends, against and slide on the concaved ends of the mortar as shown in dotted lines in Fig. 9 of the drawing, to effectively comminute, mix and triturate the mixture or alloy and mercury for forming the amalgam.

The pestle of the present application prevents the possibility of the amalgam forming into a ball or globule because the force of agitation of the amalgam is distributed and thus prevented from forming a globule, wherein the inertia could effect a dry center of the mass formed in the mortar alone, that is, the capsule. With the proper sized pestle for a given alloy I have been able to have amalgamation take place in three seconds using 1.25 grams of alloy and 2.25 grams of mercury; whereas, without the use of a pestle of proper weight and design it takes from one-half to one minute to amalgamate this above mass and then the amalgam is not ready for immediate use. With my method of mixing amalgam it is ready for immediate use, and trituration is completely finished in approximately one-twelfth the time, or less in some cases.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A mortar and pestle for use in an amalgamating machine of the class described, comprising a cylindrical capsule having internal concave ends, and a cylindrical pestle having convex ends of approximately the same radii as said concave ends of the capsule, the relative diameters and lengths of the capsule and pestle being such that when the diametrically opposite points on the opposite ends of the cylindrical portion of the pestle are in contact with diametrically opposite portions of the side walls of the capsule, the surfaces of the ends of the pestle will be in substantial parallelism with the concave surfaces of the ends of the capsule.

2. A mortar and pestle comprising a mortar in the form of a cylindrical shell with a cylindrical internal chamber having the entire area of each end concaved and a pestle comprising an elongated cylindrical body with convex ends, said concaved ends and said convex ends having the same radii, the chamber of the shell being at least twice the length and diameter of the pestle.

3. A mortar and pestle comprising a cylindrical mortar in the form of a capsule including a body section with a closed end and an open end and a cap of similar form fitted over and held on the open end forming a cylindrical internal chamber, the closed ends being concaved internally and of the same radius, and a pestle comprising an elongated cylindrical body about one-half the length and diameter of the chamber with convex ends of the same curvature as said concaved ends to substantially conform to the latter, the cylindrical wall of the body section contacting the closed end of the cap to present a smooth working surface for the pestle and the mortar and pestle being circular in transverse cross section.

4. The combination with a mortar in the form of a cylindrical shell having a cylindrical chamber with internal concaved ends, and a pestle in the mortar comprising a cylindrical weighted body having convex ends, said pestle being approximately one-half the length and diameter of the said chamber, means for supporting and oscillating said shell horizontally laterally on a substantially vertical axis and simultaneously

reciprocating the same with a swinging motion back and forth on a substantially horizontal axis with each horizontal lateral oscillation, whereby the pestle will be oscillated within the mortar and slid longitudinally in alternately differently diagonal positions onto the ends of the mortar chamber when the shell is actuated in the manner set forth.

5. The combination with a mortar in the form of a cylindrical shell having a cylindrical chamber with internal concaved ends, and a pestle in the mortar comprising a cylindrical weighted body having convex ends, said pestle being approximately one-half the length and diameter of the said chamber, the concave ends of the chamber and the convex ends of the pestle being spherical surfaces having approximately the same radii, means for supporting and oscillating said shell horizontally laterally on a substantially vertical axis and simultaneously reciprocating the same with a swinging motion back and forth on a substantially horizontal axis with each horizontal lateral oscillation, whereby the pestle will be oscillated within the mortar and slid longitudinally in alternately differently diagonal positions onto the ends of the mortar chamber when the shell is actuated in the manner set forth.

EDWARD L. CHOTT.