

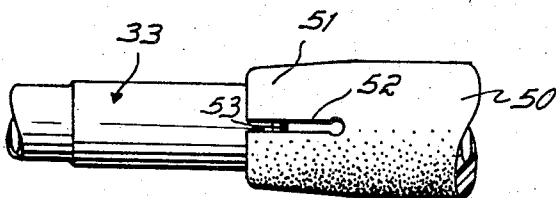
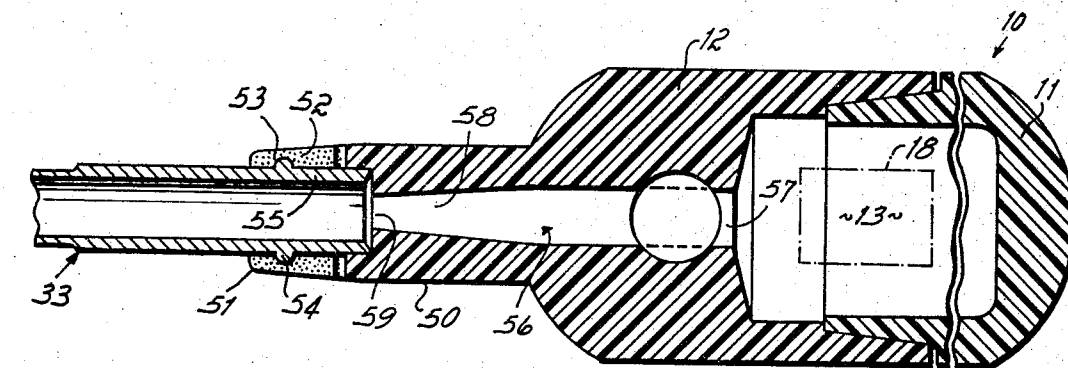
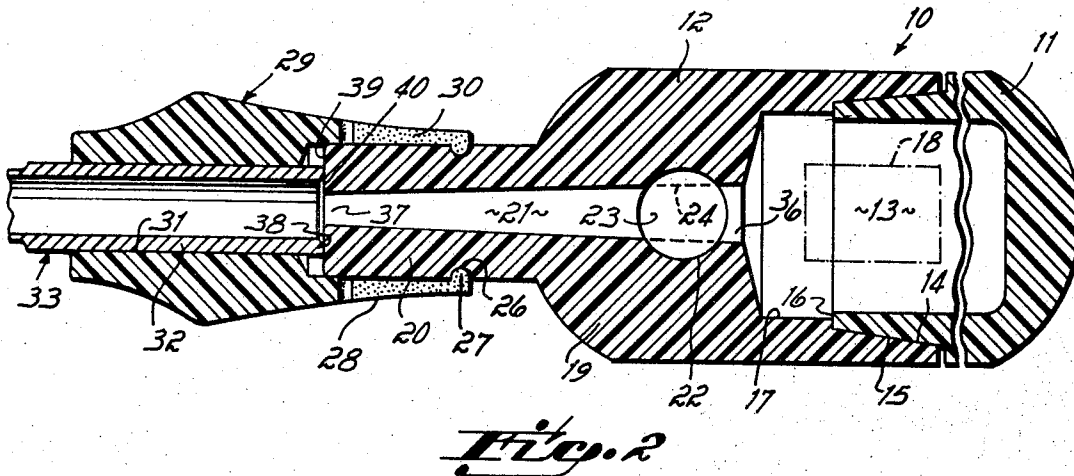
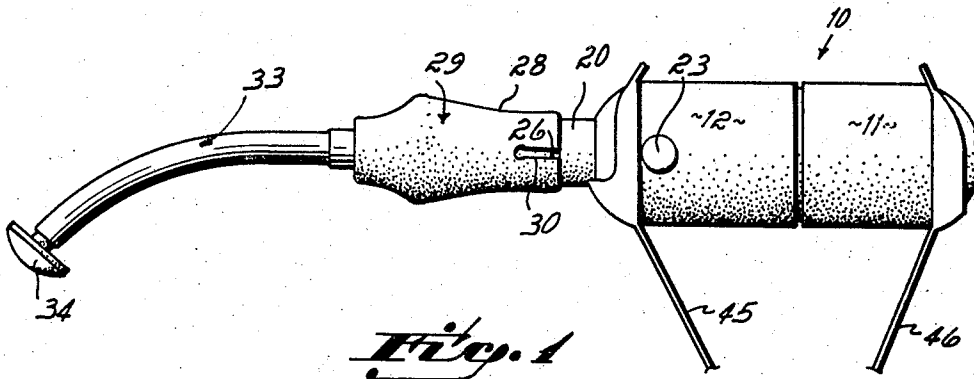
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3,368,592

DEVICE FOR MIXING AMALGAM AND LOADING IT INTO A TUBE

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3,368,592

DEVICE FOR MIXING AMALGAM AND LOADING IT INTO A TUBE

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This invention relates to a device for mixing amalgam, and, more particularly, the invention is directed to a device for mixing amalgam and thereafter discharging the amalgam into a tube from which it may be dispensed directly into the tooth of the patient.

In our copending application Ser. No. 145,878 filed Oct. 18, 1961, now U.S. Patent Number 3,222,037, we disclosed an amalgam mixing and dispensing apparatus comprising a capsule and pestle adapted to be mounted on a vibrating mechanism, the capsule being adapted to receive a charge of amalgam-forming constituents (usually mercury and alloy) along with the mixing pestle. The capsule has at one end a valved passageway for the discharge of the mixed amalgam and a tube removably mounted at the discharge end of the passageway to receive the amalgam as it is being discharged from the capsule. The tube is adapted to be mounted on a dispenser having a plunger which drives the amalgam in desired amounts from the tube into the patient's tooth.

Through this apparatus, it is possible to effect the complete operation of mixing the amalgam constituents and depositing the mixed amalgam into the patient's tooth without having the amalgam contact the bands of the dentist or his technician. That operation is as follows: the technician deposits the alloy, a charge of mercury, and a pestle in the capsule and mounts the capsule on the vibrating mechanism. The capsule is vibrated for a sufficient length of time to enable the pestle to effect the thorough mixing of the amalgam. Thereafter, the valve in the discharge passageway is opened and the vibration is continued for another few seconds while the pestle drives the amalgam into the tube. The tube is detached from the capsule and mounted on the dispenser where it is ready for immediate introduction into the patient's tooth.

We discovered that the discharge of the amalgam from the capsule into the tube would be performed more efficiently and reliably by providing an annular shoulder intermediate the ends of the capsule, and we described and claimed this invention in our copending application Ser. No. 284,249 now U.S. Patent Number 3,229,963.

Usually, in performing operations described above, the amalgam becomes packed firmly in the tube after it is dispensed from the capsule. Occasionally, however, the amalgam is dispensed rather loosely in the tube, and it has a tendency to drift rearwardly past the inner end of the tube. When the tube is removed from the capsule and attached to a dispenser, the amalgam which drifted rearwardly past the inner end of the tube remains in the valved passageway between the capsule and the discharge end of the tube and tends to set up there. The amalgam must be cleaned out of the capsule and passageway, for it will interfere with the discharge of the new amalgam into the tube by forming an obstruction in the capsule discharge passageway. Sometimes the amalgam protrudes rearwardly from the tube after the tube is removed from the capsule. The protruding amalgam interferes with the application of the tube to a dispensing unit or carrier and fouls the tube and its coupling fitting and requires it to be cleaned for subsequent use.

It has been an objective of the invention to provide an amalgam mixing and discharging method for apparatus utilizing a capsule having a discharge passageway in

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which the capsule and mixing pestle within the capsule cooperate to provide a self-cleaning of the entire capsule during the discharge step of the operation. To achieve this objective, the invention provides means for assuring the positive discharge of all of the amalgam from the capsule into the tube while blocking any tendency of the amalgam to retreat from the tube back into the discharge passageway. More particularly, we provide an outwardly facing annular shoulder at the joint between the capsule's discharge passageway and the tube. The shoulder not only eliminates any tendency of loose amalgam particles to drift rearwardly out of the tube, but additionally assists in compacting the amalgam in the tube so that none inadvertently falls out of its discharge end before application to the patient's tooth.

As an additional feature of the invention, we provide a tapering discharge passageway between the capsule and the tube. Further, the tapering passageway provides a large entrance opening at one end of the passageway which facilitates the driving of the amalgam particles from the capsule receptacle into the passageway and provides a small diameter discharge opening which creates the shouldered joint with the tube. The taper of the passageway tends to converge the discharging amalgam particles into a higher velocity stream than has been heretofore employed. The higher velocity of the amalgam particles causes the particles to be compacted in the tube and thereby reduces the tendency of the particles to drift loosely in the tube. The tapered passageway and the outwardly facing shoulder thus combine their effects to facilitate movement of the amalgam in the direction of discharge into the tube and to impede movement of the amalgam in the opposite direction.

The several features of the invention will become more readily apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is an elevational view of an amalgam mixing capsule and tube combination including a fragmentary showing of the arms by which the capsule is supported in the vibrating apparatus,

FIG. 2 is a longitudinal cross sectional view of the capsule and a portion of the tube,

FIG. 3 is a longitudinal cross sectional view of an alternative embodiment, and

FIG. 4 is a fragmentary elevational view of the tube and capsule joint.

The capsule 10 is formed of two separable halves, the rearward half 11 telescoping into the forward half 12 to form a normally closed receptacle 13. The rearward half 11 has an externally tapered surface 14 at its open end which telescopes into a mating surface 15 on the open end of the forward capsule half 12. The capsule half 11 has an annular end surface 16 which projects into the receptacle 13 and forms a shoulder with respect to a cylindrical inner surface 17 of the forward capsule half. The capsule is adapted to receive a mixing and loading pestle 18.

The forward capsule half has an end wall 19 of substantial thickness, the end wall terminating in a forwardly projecting spigot 20. A passageway 21 extends axially through the end wall 19 and the spigot 20, the passageway being enlarged as at 22 to receive a rotatable valve 23 having a port 24 through which amalgam may pass when the valve is open. When rotated through ninety degrees, the valve closes and seals the passageway 21.

The spigot 20 has an annular groove 26 on its external surface which receives an internal annular lip 27 integral with the rearward end 28 of a tube coupler 29. The rearward end 28 of the tube coupler 29 is slotted at two or more positions 30 to permit the segments formed thereby to flex slightly outwardly, thereby facilitating the application of the coupler 29 to the spigot 20. The forward end

of the coupler has a bore 31 which receives the rearward end 32 of an amalgam receiving tube 33. The outside diameter of the end 32 of the tube should be slightly greater than the diameter of the bore 31 so that a press fit is required to apply the coupler to the tube. The coupler normally remains attached to the tube and serves not only to attach the tube to the capsule but also to attach the tube to a dispensing device such as that disclosed in our copending application Serial No. 158,681 filed December 12, 1961, now U.S. Patent No. 3,221,409, or application Serial No. 198,185, filed May 28, 1962. The tube has a removable plug 34 which contains the amalgam as it is being discharged into the tube but which is removable after the tube has been applied to the dispenser to permit the amalgam to be discharged from the tube into the patient's tooth.

The discharge passageway 21 is uniformly tapered from its inner end 36 to its discharge end 37. At the discharge end 37 of the passageway which forms a concentric junction with the tube 33, the diameter of the passageway is substantially smaller than the inside diameter at the rearward edge 38 of the tube 33. The spigot 20 has a forwardly facing surface 39 which engages the rearward edge 38 of tube 33 and forms a shoulder 40 projecting radially inwardly of the tube. The elements of the invention, including the capsule, the receptacle formed by the capsule, the passageway, and the tube, are of circular cross section, although it should be understood that such circular cross section is not a requirement of the invention but rather a matter of manufacturing convenience.

In the operation of the invention, the capsule halves are separated and the valve 23 is rotated to a closed position. The dental technician deposits a predetermined amount of amalgam forming alloy and mercury along with a pestle 18 in one of the capsule halves and then telescopes the capsule halves together to form the closed receptacle 13. The capsule is then snapped into position between a pair of arms 45 and 46 forming a part of the vibrating or agitating apparatus. The vibrating mechanism is turned on and run for a predetermined length of time as, for example, twenty seconds to effect the complete mixing of the alloy and mercury to form the amalgam. Thereafter, the valve 23 is rotated either automatically or manually to open position and the vibrating apparatus is operated for another predetermined interval as, for example, five seconds. In that interval, the mixed amalgam is driven by the pestle 18 from the receptacle 13 through the passageway 21 and into the tube 33. In moving through the passageway 21, the taper of the passageway tends to converge the particles into a jet which drives them positively toward the plugged end of the tube. The forwardly facing shoulder 40 adjacent the end of the tube blocks any tendency of the amalgam particles to drift rearwardly past the rear edge 38 of the tube and probably acts as a ram, adding impetus to the movement of the amalgam particles into the tube, although its precise action on the amalgam particles has not been determined.

When the amalgam has been completely discharged from the receptacle 13 into the tube, the coupler 29 is removed from the spigot 20 and the tube and coupler are snapped onto a dispensing mechanism for the deposit of the amalgam into the patient's tooth.

In the alternative embodiment of FIGURE 3, the elements and their operation are substantially the same as those of FIGURE 2. The forward capsule half 12 has a differently formed spigot 50 which eliminates the separate coupler of the previous embodiment. The spigot has an integral coupler 51 which is formed by providing two or more slots 52 in the end of the spigot to permit the end to flex radially outwardly to receive a tube. The integral coupler 51 also has an internal annular groove 53 which receives an external annular rib 54 on the rearward end 55 of the tube 33.

In the embodiment of FIGURE 3, the capsule has a passageway 56 whose rearward section 57 is of uniform

diameter and whose forward end 58 tapers toward the discharge end 59. The diameter of the discharge end 59 is smaller than the inside diameter of the tube and its rearward end 55 so that the shoulder 40 is formed at the joint between the passageway and the tube 33, the shoulder projecting radially inwardly of the bore through the tube 33. The operation of the embodiment of FIGURE 3 is substantially identical to that of the embodiment of FIGURE 2.

In both embodiments, the discharge passageway in the capsule and wall is tapered at least in part. The invention is operative using a passageway which is of uniform diameter throughout, the diameter of the passageway being smaller than the internal diameter of the tube in order to provide the shoulder at the joint between the passageway and tube. The tapered embodiment, however, is preferred for it provides a larger opening at the rearward end of the passageway through which the amalgam must pass from the receptacle 13 into the passageway and it tends to converge the amalgam particles at the discharge end of the passageway, thereby providing an improved compacting of the amalgam particles in the bottom of the tube.

We claim:

1. A device for loading amalgam into a tube comprising,
 - a capsule having walls forming a closed receptacle, an elongated passageway in an end wall of said capsule, a tube removably mounted on the end wall at the outer end of said passageway and forming a continuation of said passageway, and
 - said tube and passageway being concentric at their junction, and at their junction said tube having a larger inside diameter than said passageway, thereby forming an outwardly facing annular shoulder in said passageway at the junction of said tube and passageway which impedes movement of amalgam from said tube into said passageway.
2. A device for mixing amalgam and loading it into a tube comprising,
 - a mixing capsule having walls forming a closed receptacle,
 - a pestle in said receptacle,
 - an elongated passageway in an end wall of said capsule,
 - a valve in said passageway for opening and closing said passageway,
 - a tube removably mounted on the end wall at the outer end of said passageway and forming a continuation of said passageway, and
 - said tube and passageway being concentric at their junction, and at their junction said tube having a larger inside diameter than said passageway, thereby forming an outwardly facing annular shoulder in said passageway at the junction of said tube and passageway.
3. A device for mixing amalgam and loading it into a tube comprising,
 - a mixing capsule having walls forming a closed receptacle,
 - an elongated passageway in an end wall of said capsule, said passageway tapering from its inner end to a smaller diameter at its outer end,
 - a tube removably mounted on the end wall at the outer end of said passageway and forming a continuation of said passageway, and
 - said tube and passageway being concentric at their junction, and at their junction said tube having a larger inside diameter than said passageway, thereby forming an outwardly facing annular shoulder in said passageway at the junction of said tube and passageway.
4. A device for mixing amalgam and loading it into a tube comprising,
 - a mixing capsule having walls forming a closed receptacle having an end wall,

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a spigot projecting from said end wall,
 an elongated passageway through said end wall and
 spigot,
 a tube removably mounted on the end wall at the outer
 end of said spigot and forming a continuation of
 said passageway, and
 said tube and passageway being concentric at their
 junction, and at their junction said tube having a
 larger inside diameter than said passageway, thereby
 forming an outwardly facing annular shoulder in
 said passageway at the junction of said tube and
 spigot.
 5. A device for mixing amalgam and loading it into a
 tube comprising,
 a receptacle,
 means for opening and closing said receptacle for re-
 ceiving and mixing the amalgam forming constituents,
 a discharge passageway in the wall of said receptacle
 through which amalgam is discharged after it is
 mixed,
 said discharge passageway tapering to a narrower diam-
 eter at its forward end,
 a tube removably secured to the discharge end of said
 discharge passageway,
 the inside diameter of said tube being larger than the
 diameter of said passageway at its discharge end
 whereby said wall forming the discharge end of said

passageway provides a shoulder which impedes move-
 ment of amalgam from said tube into said passage-
 way.

6. A device for mixing amalgam and loading it into a
 tube comprising,
 a receptacle,
 means for opening and closing said receptacle for re-
 ceiving and mixing the amalgam forming constituents,
 a discharge passageway in the wall of said receptacle
 through which amalgam is discharged after it is
 mixed,
 a tube removably secured to the discharge end of said
 discharge passageway,
 the inside diameter of said tube being larger than the
 diameter of said passageway at its discharge end
 whereby said wall forming the discharge end of said
 passageway provides a shoulder which impedes move-
 ment of amalgam from said tube into said passage-
 way,
 said passageway having a rearward section of uniform
 diameter and a forward section tapering toward the
 discharge end of said passageway.

No references cited.

25 LAVERNE D. GEIGER, *Primary Examiner*.
 H. S. BELL, *Assistant Examiner*.