

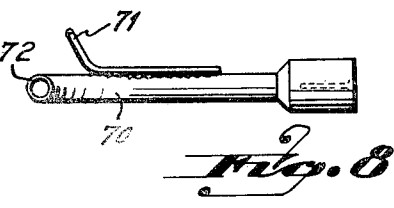
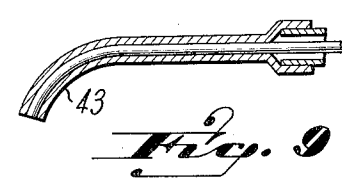
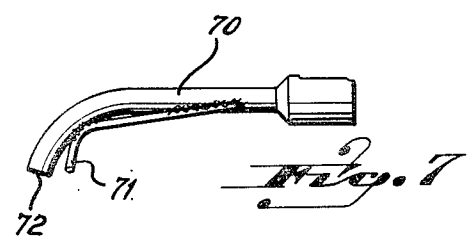
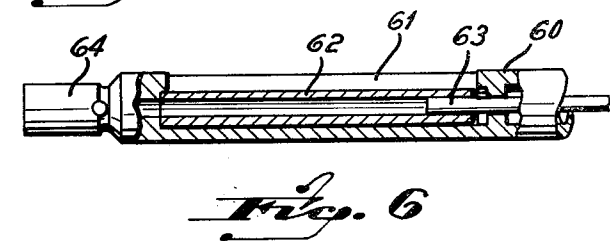
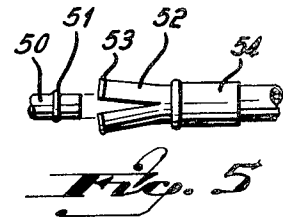
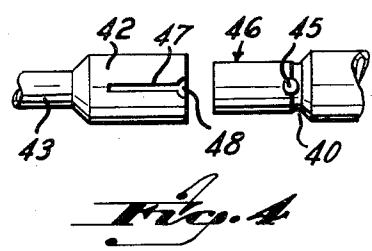
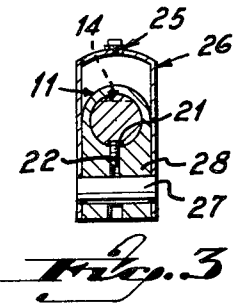
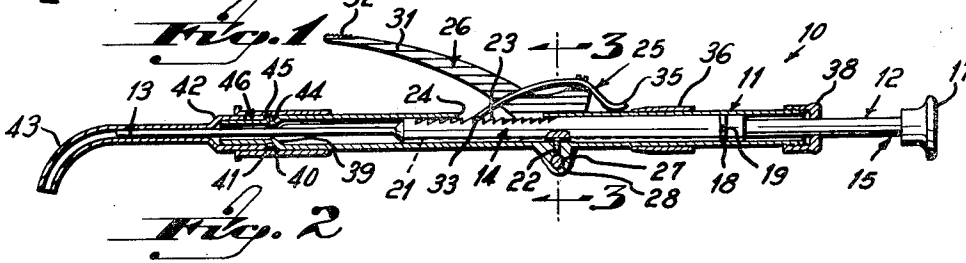
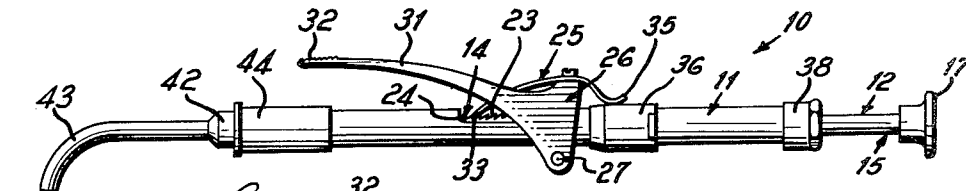
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3,221,409

AMALGAM DISPENSER

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3,221,409

AMALGAM DISPENSER

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This invention relates to an amalgam dispenser and more particularly this invention relates to a plunger operated amalgam dispenser by which the amalgam can be discharged through a tube in step-by-step fashion by manipulating a lever pivoted on the dispenser.

In the practice of dentistry, one of the most tedious aspects of filling a cavity is that operation which consists of the mixing of the amalgam and dispensing and packing the amalgam into a tooth. The mixing of amalgam preparatory to introduction into a tooth has been greatly simplified by the apparatus disclosed in our co-pending application Serial No. 145,878 filed October 18, 1961. That application is directed to apparatus for mixing amalgam and, in the preferred embodiment of that application, the amalgam is dispensed from the mixing chamber into an elongated tube. The tube is adapted to be removed from the mixing apparatus and snapped either onto the end of a dispenser or in the breech of a dispenser for subsequent ejection through the manipulation of a plunger projection from the rear of the dispenser. Discharging of amalgam from the dispenser disclosed in that application is a somewhat awkward process in view of the necessity of pushing the plunger from the rear of the instrument while at the same time guiding the discharging amalgam into the tooth of the patient.

The present invention is directed to an improvement in the dispenser shown in our co-pending application. It has been an objective of the present invention to provide a dispenser having a lever extending generally parallel to the dispenser the lever being connected to the plunger passing through the dispensing tube in such a manner as to drive the plunger in a forward direction when the lever is depressed. Preferably the lever is positioned on the dispenser so that it can be conveniently manipulated by the dentist as he holds the dispenser in one hand while directing the dispensing tube into the mouth of the patient adjacent the cavity to be filled.

It has been another objective of the invention to provide a dispenser having a lever operated plunger in which the cooperative engagement of the lever to the plunger is in the form of a ratchet and pawl. With the ratchet and pawl mechanism it is possible to provide for the step-by-step dispensing of the amalgam through repeatedly depressing and releasing the lever. Also through the use of the ratchet and pawl mechanism, the dentist can be assured of dispensing only a predetermined quantity of amalgam with each manipulation of the lever and thereby obviate the necessity of regulating the exact distance through which the lever is depressed.

It has been still another objective of the invention to provide a dispenser having a ratchet and pawl actuated plunger in which a mechanism is provided for pre-selecting a one or two or even more tooth traverse of the pawl with respect to the ratchet. This mechanism permits the dentist to pre-select for himself the quantity of amalgam which will be discharged with each depression of the lever. A two tooth traverse of the pawl with respect to the ratchet will effect the dispensing of twice as much amalgam as a one tooth traverse of the pawl with respect to the ratchet.

Another objective of the invention has been to provide an amalgam packer on the dispensing tube at the discharge end of the dispenser. Through the provision of the combination of a tube through which amalgam is discharged and a packer, it is possible to dispense a pre-

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selected quantity of amalgam and, without removing the dispenser from the mouth of the patient slight rotation of the dispenser will bring the packer into position to pack the amalgam in the patient's tooth.

These and other objectives of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a side elevational view of a dispenser in accordance with the present invention,

FIG. 2 is a cross sectional view thereof,

FIG. 3 is a cross sectional view taken along lines 3—3 of FIG. 2,

FIG. 4 is a disassembled view of the connection of the discharge tube to the dispenser,

FIG. 5 is a disassembled view of an alternative connector,

FIG. 6 is a fragmentary view, partly in section, showing the application of the invention to a breech loading dispenser,

FIG. 7 is a fragmentary side elevational view of a discharge tube with an integrally mounted packer,

FIG. 8 is a bottom plan view of the device of FIG. 7, and

FIG. 9 is a fragmentary sectional view of a discharge tube showing the flexible plunger extending to the end of the tube.

Referring to the drawings the dispenser indicated at 10 has a tubular body portion 11 into which a plunger 12 is slidably mounted. The plunger has a discharge section 13 which is a flexible nylon rod in the preferred embodiment, a ratchet section 14 and a handle section 15. The handle section 15 has a retracting knob 17 at the end thereof.

The ratchet section is of a diameter just slightly less than the inside diameter of the tubular body portion 11 so that it can slide freely without rattling in the dispenser. A friction drag ring 18 is mounted in an annular groove 19 in the ratchet section to provide the frictional force between the ratchet section and the body portion 11 which is necessary to assure proper operation and to avoid inadvertent operation.

The ratchet section 14 has a longitudinal groove or keyway 21 in the bottom thereof which cooperates with a key 22 to prevent rotation of the ratchet section with respect to the body portion 11 of the dispenser. On the side of the ratchet section opposite the groove 21 is a set of ratchet teeth 23 which are accessible through a slot 24 formed in the body portion 11 of the dispenser. The ratchet teeth are engageable by a pawl 25 which is in the form of a leaf spring. The leaf spring pawl 25 is fixed intermediate its ends to an operating lever 26 which is pivoted at 27 to a bracket 28 on the body portion 11.

The operating lever 26 has an elongated lever arm 31 which lies close to the body portion 11 of the dispenser but is spaced away a distance sufficient for it to be moved toward the body portion in order to actuate the dispenser. The tip portion 32 of the arm 31 is knurled for convenient engagement by the thumb or fingers of the dentist.

The pawl 25 has a forward end 33 which is engageable with the ratchet teeth. The ratchet teeth are inclined in such a direction as to permit the forward portion 33 of the pawl to ride over them when the lever 26 is released, and to drive the ratchet section in a forward direction when the operating lever 26 is depressed. The pawl 25 also has a rearward end portion 35 which bears against the body portion 11 as shown in FIG. 2 or bears against a step-up sleeve 36 as shown in FIG. 1. The step-up sleeve 36 is slidably mounted on the body portion and can be moved into or out of operative engagement with the rearward end portion 35 of the leaf spring pawl

in order to change the stroke of the operating lever. In the operable or engaged position of FIG. 1, the stroke of the operating lever is shortened to a one tooth stroke, that is a stroke which permits the forward portion 33 of the pawl to traverse only one ratchet tooth with each operation of the operating lever. When the sleeve 36 is withdrawn as shown in FIG. 2, the operating lever has a larger stroke which permits the traversal of two of the ratchet teeth with a consequent discharge of twice as much amalgam with each stroke.

The bearing of the leaf spring pawl at the forward end against the ratchet section and at the rearward end against the body portion 11 provides a spring biasing of the operating lever toward the position shown in FIGS. 1 or 2 and assures the return of the operating lever to that position at the end of each stroke.

The plunger is confined within the tubular body portion 11 at the rearward end thereof by a stop cap 38. At the forward end, the ratchet section is confined within the body portion 11 by an annular depression 39 which may be spun into the tip of the body portion.

The depression 39 provides an annular groove 40 which receives a lip 41 on the end of the discharge tube fitting 42. The discharge tube 43 has been described in detail in our co-pending application Serial No. 145,878 the disclosure should be considered to be incorporated herein by reference.

A locking sleeve 44 slidably mounted on the body portion 11 and is adapted to be slid over the flexible fitting 42 to provide assurance against the inadvertent detachment of the discharge tube 43 from the dispenser.

It is also desirable to provide assurance against rotation of the discharge tube with respect to the dispenser. Referring to FIG. 4 as well as FIG. 2, a pin 45 projects radially from the tip 46 of the body portion 11 at approximately the location of the annular groove 40. The flexible fitting 42 which is slotted as at 47 for proper flexing has a recess 48 which is engageable with the pin 45. When the fitting 42 is properly seated on the tip 46 as shown in FIG. 2, the recess 48 on the tip is brought into engagement with the pin 45. The subsequent sliding of sleeve 44 over the fitting clamps the fitting against axial removal and maintains the engagement of the recess 48 with the pin 45 thus preventing inadvertent rotation of the discharge tube 43 with respect to the dispenser.

An alternative form of means for connecting the discharge tube to the dispenser is illustrated in FIG. 5. In FIG. 5, the rearward end of the discharge tube indicated at 50 has a rim 51. The tube 50 and the rim 51 are receivable in a split locking end 52 of the body portion 11. The ends of the split locking end 52 are grooved as at 53 in order to receive the rim 51. A locking sleeve 54 is slidable over the split locking end 52 to clamp the tip 50 within the split locking end 52.

In FIG. 6 a fragment of a breech loading dispenser is illustrated. There, a body portion 60 of a dispenser has a cavity 61 to receive a loaded tube 62 in a manner similar to that described in connection with our co-pending application Serial No. 145,878. A nylon plunger 63 is slidable through the tube or cartridge 62 in order to expel amalgam from the cartridge through the tip 64 and out through a discharge tube which may be of any suitable configuration as for example, as shown in FIGS. 1 and 2. The plunger 63 is actuated by the mechanism illustrated in FIGS. 1 and 2.

The present invention is ideally adapted for a combined dispenser and packer. Such a construction is illustrated in FIGS. 7 and 8. There the discharge tube indicated at 70 has a packer 71 secured integrally therewith and angulated with respect to the discharge end 72 of the discharge tube. The angulation of the packer with respect to the discharge tube assures that the packer will be out of the way of the tooth when it is being filled by discharge of amalgam through the discharge end 72, but by mere rotation of the dispenser through a small angle,

the packer 71 can be brought into position for tamping or packing that amalgam which has just been discharged into the tube.

OPERATION

Preparatory to filling a patient's tooth, the amalgam is mixed preferably in the apparatus illustrated in our co-pending application Serial No. 145,878. At the conclusion of the mixing cycle the amalgam is discharged into a tube which may be either a tube of the type illustrated at 43 in FIGS. 1 and 2 or a tube such as is illustrated at 62 in FIG. 6. Assuming for the purposes of this description that the tube is similar to tube 43, that tube is removed from the mixing apparatus and secured to the dispenser 10.

Prior to applying the discharge tube to the dispenser the plunger is withdrawn into the dispenser by pulling handle section 15 all of the way out by grasping the knob 17 while holding pawl portion 33 out of the way of the ratchet teeth. The tube is secured to the dispenser merely by slipping it over the forward end thereof and sliding the locking sleeve 44 over the fitting 42 as described above.

When the discharge tube with a load of amalgam has been applied to the dispenser, the dispenser is ready for operation. Now at this point the dentist may wish to make a decision as to the quantity of amalgam he wishes to have discharged with each operation of the lever 31. If he is filling a large cavity, he probably will want to discharge more amalgam than he would in the filling of a very small cavity. By positioning the sleeve 36 as shown in FIG. 2, approximately twice the amount of amalgam can be discharged with each stroke of the operating lever 31 as compared to the setting of the sleeve in FIG. 1.

Assuming that the sleeve 36 has been set as shown in FIG. 2, the dentist brings the dispenser in the patient's mouth and when the end of the discharge tube 43 is positioned adjacent the cavity to be filled, the lever 31 is depressed. The depressing of the lever 31 swings the pawl 25 in a counterclockwise direction which results in the forward end portion 33 of the pawl sliding in a forward direction a distance equal to the pitch of two ratchet teeth. This will effect the discharge of a pre-selected quantity of amalgam. Release of the lever 31 permits the leaf spring pawl to return the operating lever 31 to its normal position as shown in FIG. 2. During the return of the lever arm to its position of rest, the end portion 33 of the pawl traverses two ratchet teeth and lodges in a position ready to drive the plunger forward during the next stroke of the operating lever.

If the discharge tube shown in FIGS. 7 and 8 is employed, the dentist is not even required to set the dispenser down and pick up a packing implement, rather, he needs to rotate the dispenser slightly in order to bring the packer 71 into position and then proceed to pack the amalgam into the cavity. The series of operations of dispensing and packing can be repeated until the tooth has been filled.

After the dispensing operation has been completed and all of the amalgam has been expelled from the discharge tube 43 by advancing said plunger to the end of a tube as shown in FIG. 9, the plunger should be withdrawn. This is effected by lifting the forward portion 33 of the ratchet pawl 25 out of the way of the ratchet teeth 23 and pulling back on the knob 17. The lifting of the end portion 33 is accomplished by swinging the operating arm 31 slightly in a clockwise direction.

While provision has been made, as illustrated in the drawings, for selectivity between a two tooth dispensing operation and a one tooth dispensing operation, it should be well understood that through minor modification of the cooperating pawl 25 and sleeve 36, settings can be made for the pawl to traverse even 3 or 4 teeth during the dispensing. It should also be understood that the

complete tube 43 can be discharged by driving the plunger forward through the operation of the knob 17.

We claim:

1. An amalgam dispenser comprising,
an elongated tubular holder having a fitting at its forward end,
an amalgam supply tube having a fitting at one end thereof by which it is attached to the fitting of said holder, the remaining portion of said tube being of substantially uniform internal diameter throughout its length,
said tube adapted to be pre-loaded with amalgam and constituting the sole source of supply of amalgam to be dispensed,
a plunger slidably mounted in said holder, said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn,
said forward end portion being adapted to pass through said tube to its end to force the amalgam out of said tube,
a plurality of longitudinally spaced ratchet teeth on said plunger,
a pawl having a longitudinally movable portion engaging said teeth,
a lever pivoted on said holder and cooperating with said pawl to move said pawl forwardly and rearwardly to move said plunger in a forward direction step-by-step.
2. An amalgam dispenser comprising,
an elongated tubular holder having a fitting at its forward end,
an amalgam supply tube having a fitting at one end thereof by which it is attached to the fitting of said holder, the remaining portion of said tube being of substantially uniform internal diameter throughout its length,
said tube adapted to be pre-loaded with amalgam and constituting the sole source of supply of amalgam to be dispensed,
a plunger slidably mounted in said holder,
said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn,
said forward end portion being adapted to pass through said tube to its end to force the amalgam out of said tube,
a plurality of longitudinally spaced ratchet teeth on said plunger,
a pawl having a longitudinally movable portion engaging said teeth,
a lever pivoted on said holder and cooperating with said pawl to move the movable portion of said pawl forwardly and rearwardly to move said plunger in a forward direction step-by-step,
and a projecting handle on the rearward end of said plunger for returning said plunger to its rearward position after completion of the dispensing operation.
3. An amalgam dispenser comprising,
an elongated tubular holder having a fitting at its forward end,
an amalgam supply tube having a fitting at one end thereof by which it is attached to the fitting of said holder, the remaining portion of said tube being of substantially uniform internal diameter throughout its length,
said tube adapted to be pre-loaded with amalgam and constituting the sole source of supply of amalgam to be dispensed,
a plunger slidably mounted in said holder,
said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn,
said forward end portion being adapted to pass through

- said tube to its end to force the amalgam out of said tube,
a plurality of longitudinally spaced ratchet teeth on said plunger,
a pawl having a longitudinally movable portion engaging said teeth,
a lever pivoted on said holder and cooperating with said pawl to move the movable portion of said pawl forwardly and rearwardly to move said plunger in a forward direction step-by-step,
and means for selectively varying the number of ratchet teeth traversed by said pawl with each operation of said lever.
4. An amalgam dispenser comprising,
an elongated tubular holder having a fitting at its forward end,
a curved amalgam supply tube having a fitting at one end thereof by which it is attached to the fitting of said holder, the remaining portion of said tube being of substantially uniform internal diameter throughout its length,
said tube adapted to be pre-loaded with amalgam and constituting the sole source of supply of amalgam to be dispensed,
an elongated flexible plunger slidably mounted in said holder,
said plunger having a forward end portion terminating adjacent the rear end of said tube when said plunger is rearwardly withdrawn,
said forward end portion being adapted to pass through said tube to its end to force the amalgam out of said tube,
a plurality of longitudinally spaced ratchet teeth on said plunger,
a pawl having a longitudinally movable portion engaging said teeth,
a lever pivoted on said holder and cooperating with said pawl to move the forward portion of said pawl forwardly and rearwardly to move said plunger in a forward direction step-by-step.
 5. An amalgam dispenser comprising,
an elongated tubular holder having a fitting at its forward end,
an amalgam supply tube having a fitting at one end thereof by which it is attached to the fitting of said holder, the remaining portion of said tube being of substantially uniform internal diameter throughout its length,
said tube adapted to be pre-loaded with amalgam and constituting the sole source of supply of amalgam to be dispensed,
a plunger slidably mounted in said holder,
said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn,
said forward end portion being adapted to pass through said tube to its end to force the amalgam out of said tube,
a plurality of longitudinally spaced ratchet teeth on said plunger,
an operating lever pivoted on said holder, said lever having a forwardly projecting arm lying close to and generally parallel to said holder,
and a pawl mounted on said lever and having a portion engaging said teeth,
said pawl being movable forwardly and rearwardly upon depressing and releasing said lever arm to expel amalgam step-by-step.
 6. An amalgam dispenser comprising, an elongated tubular holder, a plunger slidably mounted in said holder, said plunger being adapted, at the forward end thereof to pass through a tube containing amalgam to force the amalgam out of said tube, a plurality of longitudinally spaced ratchet teeth on said plunger, an operating lever pivoted on said holder, a leaf spring pawl mounted

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on said lever and having a forward end engaging said teeth and a rearward end engaging said holder, said pawl resiliently holding said lever in normal released position, said pawl being movable forwardly and rearwardly upon depressing and releasing said lever to expel amalgam step-by-step, and adjustable ring selectively slidable under the rearward end of said pawl for varying the angle of movement of said lever to vary the stroke of said pawl.

7. An amalgam dispenser comprising, an elongated tubular holder, an amalgam supply tube removably mounted at the forward end of said holder, a plunger slidably mounted in said holder, said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn, said forward end portion being adapted to pass through a tube containing amalgam to force the amalgam out of said tube, a plurality of longitudinally spaced ratchet teeth on said plunger, an operating lever pivoted on said holder, a leaf spring pawl mounted on said lever and having a portion engaging said teeth, said leaf spring pawl resiliently biasing said operating lever to a released position.

8. An amalgam dispenser and packer comprising, an elongated holder, an amalgam supply tube having a curved discharge end, said supply tube being removably mounted on said holder, a packer fixed on said tube and having a free end adjacent said discharge end and projecting forwardly at an angle away from said discharge end, said packer being adapted to tamp amalgam into a tooth, a plunger slidably mounted in said holder,

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said plunger having a forward end portion terminating adjacent the rear end of said tube when said tube plunger is rearwardly withdrawn,

said forward end portion being adapted to pass through said tube containing amalgam to force the amalgam out of said tube,

a plurality of longitudinally spaced ratched teeth on said plunger,

a pawl having a longitudinally movable portion engaging said teeth,

and a lever pivoted on said holder and having its free end extending toward said tube and operable to move the movable portion of said pawl forwardly and rearwardly to move said plunger in a forward direction step-by-step.

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