

[54] DENTAL INSTRUMENT

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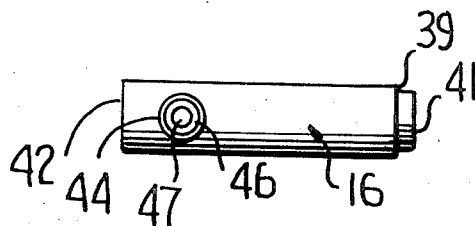
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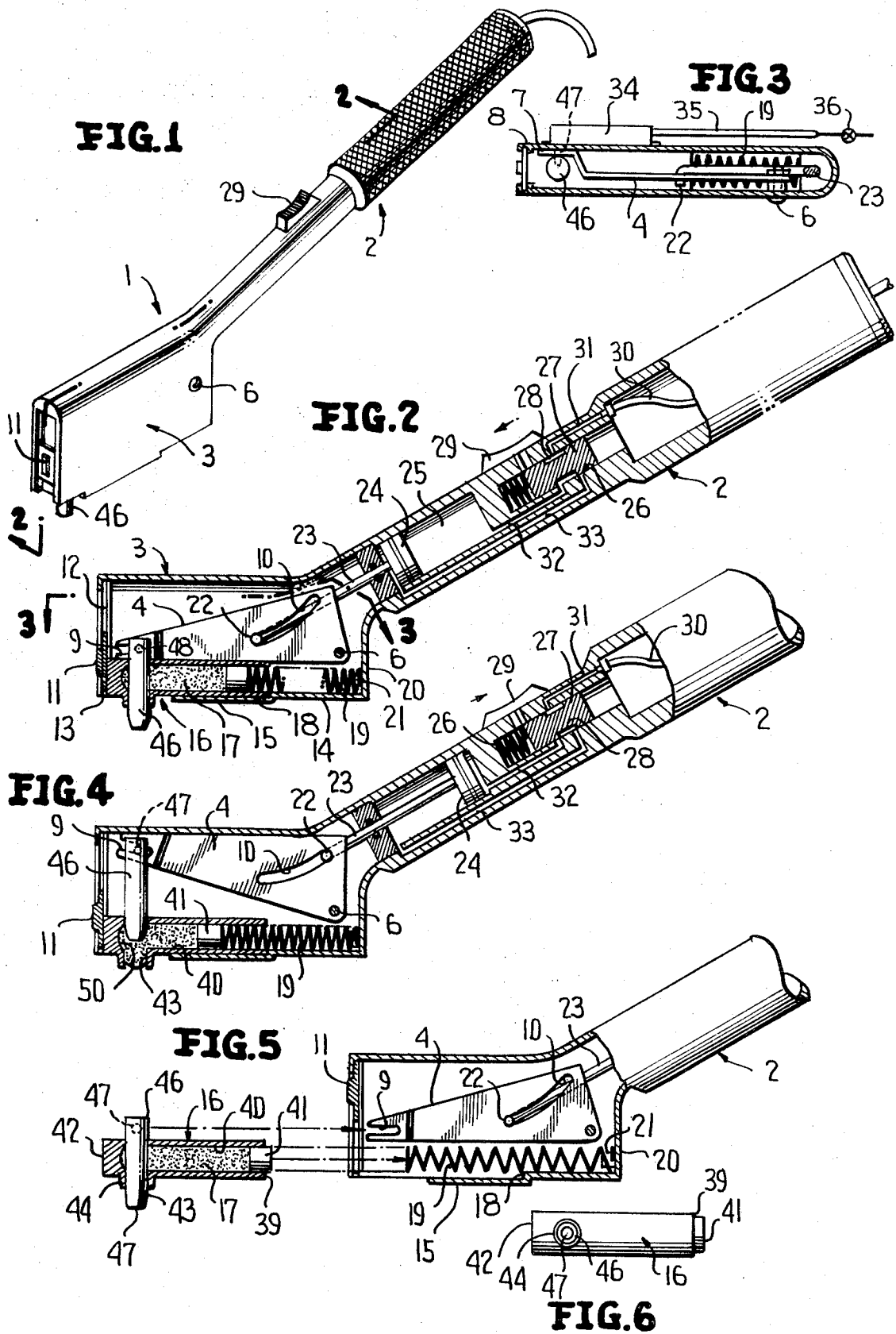
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[57] ABSTRACT

A dental instrument for dispensing tooth filling material into a cavity and for compacting the filling material in the cavity. The compacting element of the instrument ejects the tooth filling material and then closes a dispensing opening of the filling material container so the instrument can be used to compact the dispensed filling material. The container and compacting element are releasably secured to the instrument as a unit with the compacting element closing the dispensing opening of the container. The container can be prefilled with the ingredients of the tooth filling amalgam and can be shaken to mix same, or alternatively, the container can be filled with mixed amalgam just before use.

15 Claims, 6 Drawing Figures





DENTAL INSTRUMENT

This invention relates to a dental instrument for dispensing a tooth-filling material and for compacting the filling material into a cavity of a tooth.

More specifically, the invention relates to an instrument to be held in the hand of a dentist for dispensing a tooth-filling material such as amalgam, and in which the compacting implement ejects amalgam from an amalgam container mounted on the instrument.

In the past, a dentist filling a tooth has required several instruments. In addition, the conventional amalgam used for filling a tooth cavity must first be mixed and the amalgam must be pressed into the tooth cavity before the amalgam sets. Hence, it has been necessary for the dentist to first mix the amalgam, use a first instrument to press the amalgam into the tooth cavity, and use a second instrument to compact the amalgam into the cavity and smooth the exposed surface of the amalgam. This procedure usually requires an assistant who mixes the amalgam and thereafter, the amalgam is picked up in an ejector, and subsequently a separate compactor and smoother is used. Such changing of instruments increases the time required to fill a tooth and correspondingly is time consuming and adds to the discomfort of the patient.

The present invention overcomes the shortcoming of the prior techniques by providing a dental instrument in which an amalgam container is releasably connected to the instrument and in which dispensing and compacting the amalgam can be accomplished without removing the instrument from the patient's mouth. Since the compacting tool is also the ejector for the amalgam, the instrument is maintained in essentially the same position relative to the tooth and filling and compacting the amalgam into the tooth cavity can be accomplished quite quickly with minimum discomfort to the patient and without the need for an assistant.

The amalgam dispenser is of itself unique and includes a container in the form of a cartridge with a follower or piston via which the amalgam is urged toward a dispensing opening of the container. The dispensing opening is normally sealed by the compacting tool which takes the form of a plunger and is also used to eject amalgam through the dispensing opening. The amalgam container is arranged to be quickly secured to the instrument and can be easily removed when the supply of amalgam is depleted. The amalgam container can be filled with prepared amalgam at the beginning of the tooth filling operation, for example, by the dentist's assistant, and thereafter, the assistant is no longer required. Alternatively, the container can be prefilled with the components of the amalgam system and the components can be mixed by shaking in the usual amalgam mixer. Advantageously, the amalgam dispenser is of the throw-away type so the dentist need not be concerned about cleaning hardened amalgam from the container.

Amalgam is dispensed from the container by reciprocating the compacting tool to withdraw the tool to a position out of the path of amalgam forced toward the dispensing opening by the piston. Then the plunger is advanced thereby ejecting a quantity of amalgam and at the same time advancing the compacting tool to an exposed position in which it is locked so it can be used to compact the amalgam into the tooth cavity. Advancing and retracting the plunger-compactor is accomplished

by manipulating a suitable control, for example, a valve on the handle of the tool to selectively actuate a motor, for example, an air motor contained within the tool. Where an air motor is used, this motor is, of course, compatible with the air supply available at the dentist's office.

Correspondingly, an object of this invention is a dental instrument in which the compacting element or tool of the instrument also serves to eject a tooth-filling material from an amalgam container which can be releasably secured to the instrument.

Another object is the container for tooth-filling material which is adapted to be secured to a dental instrument and in which the dispensing opening of the container is closed by an element which is also used to compact and tool the tooth filling material into a tooth cavity.

Numerous other objects, features and advantages of the invention will become apparent with reference to the drawings which form a part of the specification and in which:

FIG. 1 is a pictorial view of the dentist's instrument of this invention;

FIG. 2 is a partial view in vertical section taken along line 2 — 2 of FIG. 1 and showing the compactor tool extended;

FIG. 3 is a partial view in horizontal section taken along line 3 — 3 of FIG. 2;

FIG. 4 is a view corresponding to FIG. 2 and showing the compactor tool retracted;

FIG. 5 is a view corresponding to FIG. 2 and showing the manner in which the amalgam container is inserted in the tool; and

FIG. 6 is a bottom plan view of the amalgam container.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawings in detail, there is shown a dental instrument 1 in accordance with this invention. Instrument 1 includes a hollow handle 2 inclined upwardly from and fixed to a hollow housing 3.

Within housing 3 is a generally triangularly shaped cam plate 4 connected to wall 5 of the housing for pivotal movement by a pivot 6 including screw and nut assembly. Cam plate 4 is bent to provide an offset front end 7, which is flat and is in a plane adjacent a side wall 8 of the housing. The offset front end 7 has a horizontal slot 9 formed therein which opens toward the front of instrument 1. Formed in the body of cam plate 4 at a location spaced from front end 7 is a curved cam slot 10 with closed ends.

At the front of instrument 1 is a latch element 11 in the form of a rectangular plate which is slidable in a pair of facing grooves 12 at the front of the housing. A stop 13 is provided at the bottom of the grooves to prevent separation of the latch from the housing.

A bottom wall 14 of housing 3 has an offset front portion 15 to support a container 16 containing tooth-filling material 17, which can be amalgam. At the offset, bottom wall 14 presents a shoulder 18 which limits the distance that container 16 can be inserted into the housing from the front of the housing. Adjacent bottom wall 14 is a compression spring 19 which seats against rear wall 20 of the housing and is retained against displacement by a projecting tip 21.

Extending through slot 10 is a transversely extending end 22 of a piston rod 23. Rod 23 is connected to a piston 24 located in a cylinder 25 formed in handle 2.

Disposed in a chamber 26 spaced from cylinder 25 is a valve element 27 having a cylindrical groove 28. Valve element 27 is connected to a knob 29 on the outside of handle 2 via a stem which extends through a slot in the side wall of the handle. A source of pressure air (not shown) communicates with a tube 30 that extends through the handle and is connected to a passage 31 which communicates with groove 28 in all positions of valve element 27. The head end of cylinder 25 communicates with chamber 26 via a conduit 32 and the piston rod end of cylinder 25 communicates with chamber 26 via a conduit 33. The passage and conduits 31 - 33 can be formed in the side wall of handle 2, as shown at FIGS. 2 and 4. It is to be noticed that the ends of passages 32 and 33, which communicate with chamber 26, are spaced apart a distance slightly greater than the length of groove 28 so groove 28 cannot communicate with both passages simultaneously.

Mounted on side wall 8 is a vibrator 34 which can take the form of a vibrating air motor connected to an air supply (not shown) via suitable tubing 35 and a control valve 36.

THE AMALGAM CONTAINER

As shown in FIGS. 5 and 6, amalgam container 16 is generally rectangular and takes the form of a casing having a chamber 40 therein which can be either rectangular or cylindrical. Chamber 40 opens through an end 39 of the container and this opening has the same cross-sectional configuration as the chamber so a piston 41 of the same cross-sectional configuration as the chamber 40 and which initially closes the chamber can slide through the chamber. Chamber 40 terminates adjacent a front wall 42 of the container. Communicating with chamber 40 at a location adjacent front wall 42 is a dispensing opening 43 having its axis transverse to the length of the chamber and defined in part by a tubular wall 44. There is also a second opening 45 in the opposite wall of the container, opening 45 having its axis aligned with opening 43. Extending through openings 45 and 43 is a cylindrical elongated compactor element 46 which closes and seals both the openings. Compactor element 46 has a working face 47 of a desired configuration for tooling the amalgam after it is dispensed. As shown in FIG. 3, a pin 48 projects radially from tool element 46 at a location adjacent the upper end of the compactor element and extends into the slot 9 at the front of cam plate 4.

The amalgam 17, or other tooth-filling material within chamber 40, can be placed in the chamber manually by the dentist. The amalgam is mixed in the customary manner. Alternatively, chamber 40 can initially contain the ingredients necessary to form the amalgam mix, and the entire container 16 can be shaken to mix the amalgam directly within the chamber 40.

OPERATION AND USE

The first step in use of the dental instrument 1 is to load container 16 into housing 3 of the instrument. This is accomplished, as shown in FIG. 5, by first lifting latch 11 and then sliding the container into the housing so it rests on bottom wall 15 of the housing and end 39 of the container abuts shoulder 18 of the bottom wall of the housing. The length of the container between end

42 and end 39 is essentially the same as the distance between shoulder 18 and the inside surface of latch 11 whereupon, positioning edge 48 against shoulder 18 and lowering latch 11 to the position of FIGS. 2 or 4 secures container 16 in position on the dental instrument. As the container assembly is moved into the housing, pin 48 slides into slot 9 at the front end of cam plate 4. With the container so positioned, compactor element 46 is connected to cam plate 4 via pin 48 and slot 9, and the compactor element will be raised and lowered as the cam plate is pivoted between the positions of FIGS. 4 and 5.

In use, to dispense amalgam, knob 29 is moved from the position of FIG. 2 to the position of FIG. 4 so groove 28 of valve element 27 communicates with passages 31 and 33, whereupon air under pressure is introduced to the rod end of cylinder 25 and causes piston 24 to retract to the FIG. 4 position. During such movement of the piston, cam plate 4 is pivoted in a clockwise direction by engagement of end 22 of piston rod 23 in slot 10. The upward movement of the forward end 7 of the cam plate retracts compactor element 46 to the FIG. 4 position. During such movement of the piston, cam plate 4 is pivoted in a clockwise direction by engagement of end 22 of piston rod 23 in slot 10. The upward movement of the forward end 7 of the cam plate retracts compactor element 46 to the FIG. 4 position. In the FIG. 4 position of the compactor element, dispensing opening 43 is unobstructed as is at least a portion of end 50 of chamber 40. This permits spring 19 to force piston 41 further into chamber 40 so amalgam flows toward the dispensing opening and into the path of travel of compactor 46. Then, when valve 29 is moved to the position of FIG. 2 by manipulating knob 29, groove 28 of valve element 27 communicates passage 32 with passage 31 so air under pressure is introduced into the head end of cylinder 25, thereby forcing piston 24 downwardly toward cam plate 4. The curved slot 10 causes cam plate 4 to move to the position of FIG. 2 in which compactor 46 extends through the dispensing opening 43 and projects a substantial distance from the opening. During its movement toward and through dispensing opening 43, the tool ejects a quantity of amalgam through the tube 44.

If more amalgam is needed, knob 29 is shifted to retract compactor element 46 so additional amalgam 17 flows toward the dispensing opening under the action of spring 19 on piston 41. Knob 29 is then shifted to extend compacting element 46 and dispense an additional quantity of amalgam. The tube 44 which surrounds dispensing opening 43 permits the dentist to position the end of the tube adjacent the cavity so the amalgam will be dispensed directly into the cavity. Since compactor 46 is exposed immediately after the amalgam is dispensed the dentist can, without removing the instrument from the patient's mouth, press the amalgam into the cavity or otherwise tool the amalgam with the compactor element.

The shape of the lower end of cam slot 10 is such that the cam plate 4 is locked in its extended position, and correspondingly, forces exerted on the working face of compactor element 46 cannot move the cam plate. This permits application of pressure to the compacting element without danger of movement of the compacting element from its extended position. To assure complete filling of a cavity with the amalgam, the dentist may open valve 36 to actuate the vibrator 34. The vi-

brator 34 vibrates the entire instrument 1 including the compactor element 46 and thereby assists compacting the amalgam to completely fill the tooth cavity.

The chamber 40 of container 16 is filled with amalgam 17 or other tooth filling material before the container is secured to the housing of instrument 1. With compacting element 46 extending through and closing openings 43 and 45 of the container, the dentist can fill chamber 40 with amalgam which has been recently mixed in a separate vessel. The plug or piston 41 is inserted into the chamber before the container is mounted on the tool. Alternatively, the container assembly shown at FIG. 5 including compactor element 46 and piston 41 can be pre-filled with the ingredients necessary to form the amalgam and the entire container assembly can be shaken with the usual amalgam mixer just before the dentist uses the instrument to fill a tooth.

In view of the foregoing explanation it is apparent that the dental instrument of this invention provides for rapid filling of tooth cavities without the need for an assistant. Since the compacting element is extended after each quantity of amalgam is dispensed, the dentist can immediately press the amalgam into the cavity without removing the instrument from the patient's mouth. This arrangement greatly decreases the time required to fill a tooth, and where the container 16 is pre-filled with the ingredients to form the amalgam, the dentist need only place the container 16 in the amalgam mixer or shaker immediately before he begins filling a tooth. While amalgam sets quickly after it is mixed, the dentist need not be concerned about cleaning container 16 since the container is quite inexpensive and can be discarded after use. Since the compacting element 46 is a part of the container assembly, the container and compactor element can be sterilized and maintained in a sterile package until the container 16 is used. Alternatively, the openings 43 and 45 can be sealed with a suitable plastic film and the dentist can select a desired compacting element and simply force same through the openings 43 and 45 before mixing the ingredients in chamber 40.

While a preferred embodiment of a dental instrument in accordance with this invention has been shown and described, it is to be understood that numerous changes can be made in the disclosed construction without departing from the scope of this invention as disclosed herein and set forth in the appended claims.

What is claimed is:

1. A tooth filling material container adapted to be releasably connected to a dental instrument for dispensing and compacting the dispensed material comprising a casing having a chamber adapted to receive tooth filling material and having a dispensing opening communicating with said chamber, and compactor-ejector means, initially closing the dispensing opening, for opening and closing the dispensing opening and for ejecting tooth filling material through the dispensing opening, said means comprising a compacting-ejecting element movable between a retracted position in which said dispensing opening is opened and an extended position in which the dispensing opening is closed and the compacting element is exposed to tool the dispensed tooth filling material, said compacting element including means thereon for mechanically releasably connecting the compacting element to an operating mechanism of a dental instrument with which the container

is used so that the container and compacting element can be installed on and removed from the instrument as a unit with the compacting element closing the dispensing opening when the container is separated from the instrument.

2. A filling material container according to claim 1 wherein said chamber is elongated, and said casing includes guide means for guiding said compacting-ejecting element along a predetermined path during movement between said retracted and extended positions.

3. A filling material container according to claim 2 wherein said guide means includes the sides of a second opening aligned with said dispensing opening along the path of travel of said compacting-ejecting element.

4. A filling material container according to claim 3 wherein said second opening and said dispensing opening are aligned transversely of said chamber.

5. A filling material container according to claim 1 which further includes movable means within said chamber for forcing amalgam toward said dispensing opening.

6. An amalgam container according to claim 5 wherein said casing has an additional opening communicating with said chamber and spaced from said dispensing opening, said chamber has a uniform cross-sectional configuration along the portion of its length adjacent said second opening, and said movable means includes a piston closing said additional opening and movable through said chamber to force tooth-filling material to said dispensing opening.

7. A dental instrument for dispensing and compacting a tooth filling material comprising a housing, a container having a chamber adapted to receive tooth filling material and mounted on said housing, said container having a dispensing opening, a compacting-ejecting device movable between a first position in which said dispensing opening is opened and a second position in which said dispensing opening is closed and said compacting-ejecting device is extended and has an end face and a side face exposed for tooling tooth filling material dispensed from the container, and means for selectively moving said compacting device between said first and second positions and for locking the compacting device in its extended position.

8. A dental instrument according to claim 7 which further includes means for vibrating said compacting device.

9. A dental instrument according to claim 7 which further includes means for releasably securing said container to said housing.

10. A dental instrument according to claim 7 wherein said means for moving said compacting device between said extended and retracted positions and for locking the compacting device in its extended position includes cam means for locking said compacting device in said extended position.

11. A dental instrument according to claim 10 wherein said cam means includes a cam plate within said housing, means for moving said cam plate to a compacting device locking position, and means for selectively operating said cam plate moving means.

12. A dental instrument according to claim 7 which further includes follower means for urging tooth filling material in said chamber toward said dispensing opening.

7

13. A dental instrument according to claim 7 wherein said means for selectively moving said compacting device between said extended and retracted positions includes a lever engaging said compacting device, means for locking said lever in said extended position of said compacting device, and means for operating said locking means, said operating means comprising selectively actuable motor means carried by said tool, and manually operable means for selectively operating said motor means.

14. A dental instrument according to claim 7 wherein

8

said container is releasably secured to said housing, and said compacting device and said means for moving said compacting device include cooperating means for releasably connecting said compacting device to said compacting device moving means.

15. A dental instrument according to claim 14 wherein said cooperating means include interengaging slip fit slot and projecting means on said compacting device and said compacting device moving means.

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