United States Patent

Austin, Jr.

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[54] DENTAL SYRINGES

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[51] **Int. Cl.**.....**A61c 19/02**

[58] **Field of Search**.....128/224, 257, 401, 173.1; 251/335.1

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[57] **ABSTRACT**

A dental syringe (FIGS. 1–4) includes a head having air and water passages normally blocked by valves opening into a manifold leading to a syringe tip and opened by pushbutton actuators in bores having cupped diaphragms serving to seal the bores and also serving as springs to return pushbuttons to their normal positions and each serving to draw the fluid back into its own portion of the manifold. Another dental syringe (FIGS. 5 and 6) has a head with a slide valve selectively positionable to connect either water or a medicament to one valve leading to a manifold.

12 Claims, 6 Drawing Figures

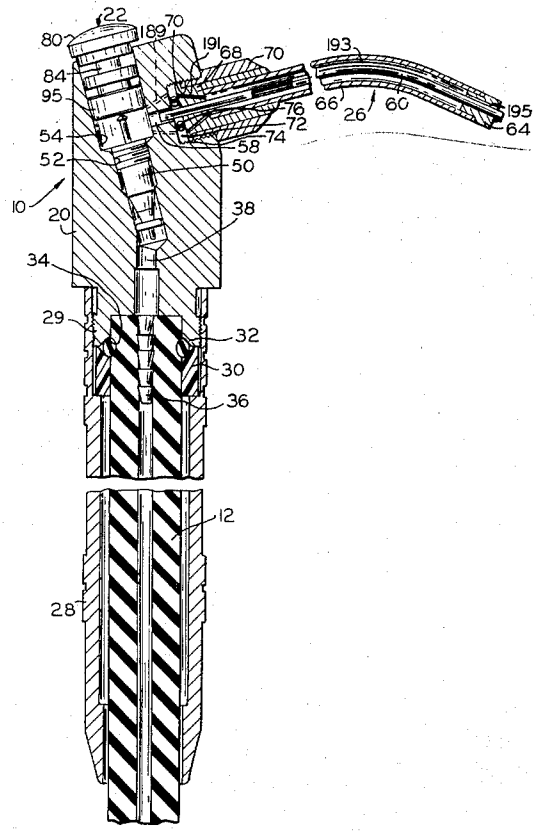


FIG. 1

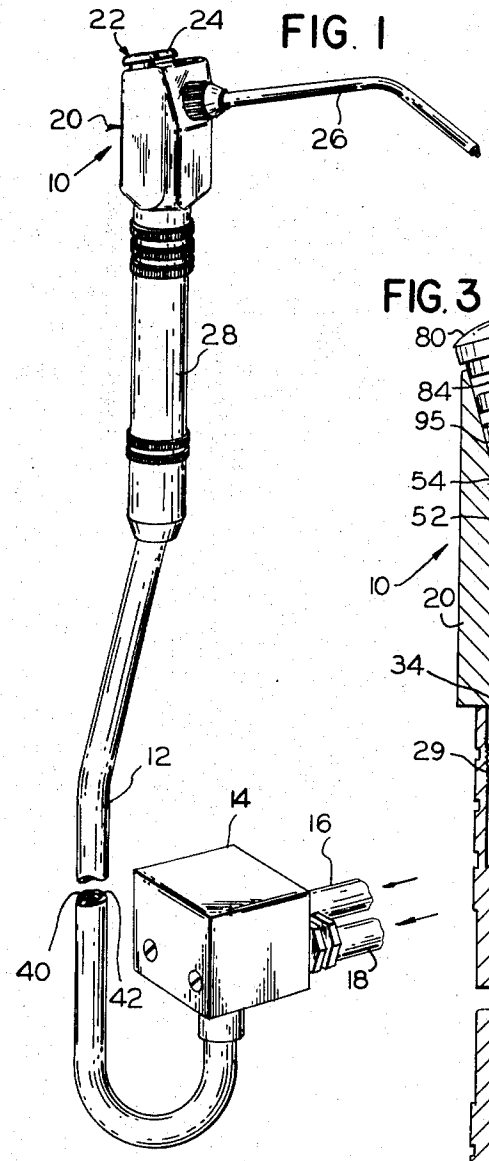


FIG. 2

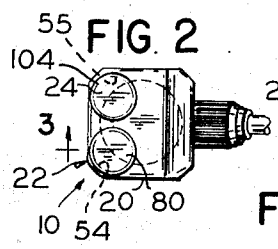


FIG. 4

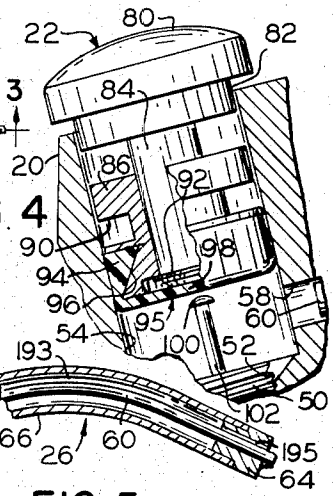


FIG. 3

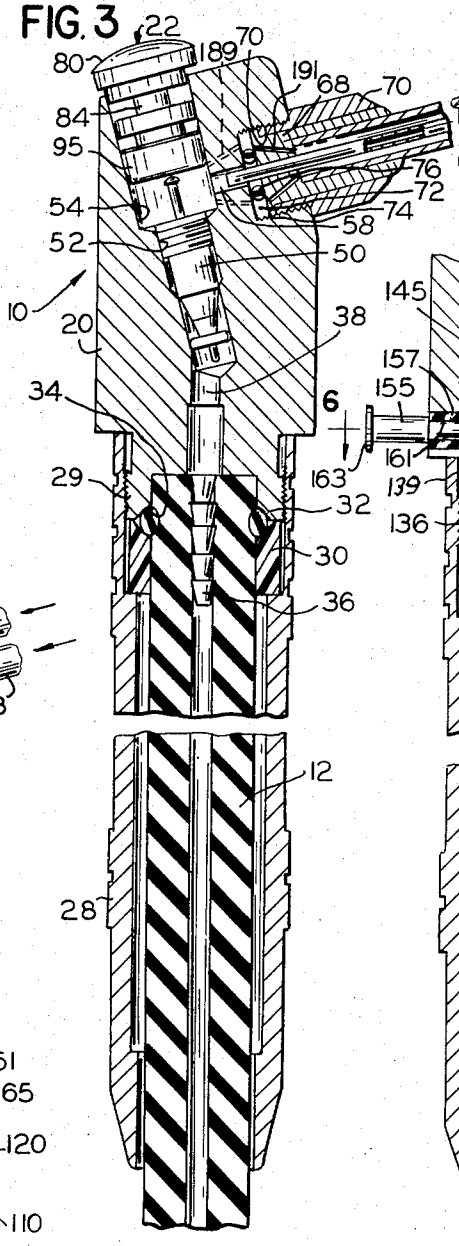


FIG. 5

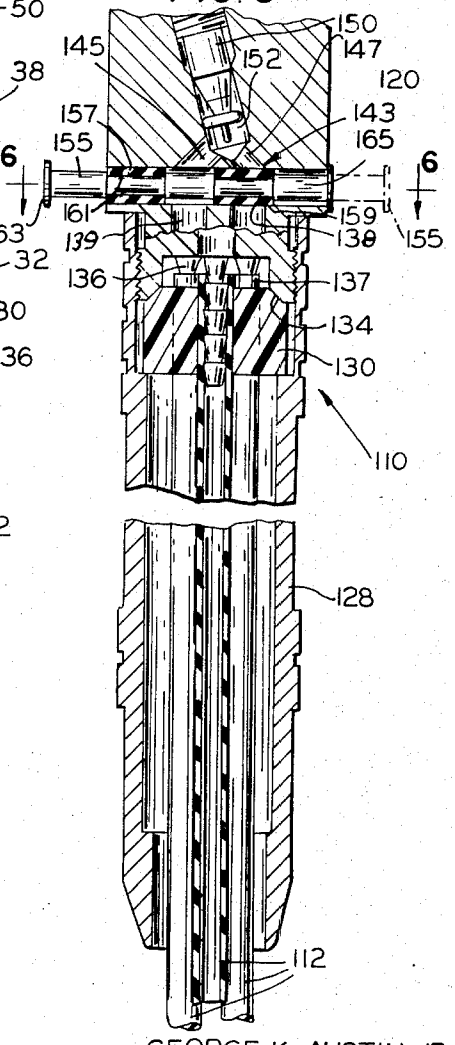
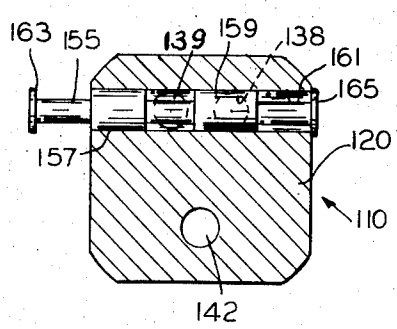


FIG. 6



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DENTAL SYRINGES

DESCRIPTION

This invention relates to improved dental syringes, and more particularly to improved multifluid dental syringes.

An object of the invention is to provide improved dental syringes.

Another object of the invention is to provide improved multifluid dental syringes.

A further object of the invention is to provide a dental syringe having a pushbutton actuator in which a diaphragm acts both to seal a bore in which the actuator is mounted and to engage and actuate a valve.

Another object of the invention is to provide a dental syringe having a manifold having an air chamber and a liquid chamber leading respectively from an air valve and a liquid valve, the manifold also having an exit passage leading to a syringe tip, the syringe also having momentary actuators, one for each valve, the actuator for the liquid valve serving to draw liquid out of the syringe tip when released so that when air is supplied the syringe tip is free of water.

Another object of the invention is to provide a dental syringe serving to supply air alone, water alone, air and water, medicament alone or air and medicament.

Another object of the invention is to provide an improved dental syringe in which a valve actuator includes a diaphragm which serves to seal off an actuator bore, to actuate a valve, and to act as a pump to draw liquid out of a syringe tip.

The invention provides improved dental syringes, each of which includes a head containing a normally closed valve which can be opened by a valve actuator to connect a supply of fluid under pressure to a syringe tip, each actuator preferably including a cupped diaphragm serving to seal an actuator mounting bore the head, to transmit actuating force from an actuating plunger to a valve and to draw liquid in the syringe tip back into a liquid storing portion screwed onto the head to press a collet ring against an O-ring to grip a hose connected to inlet connectors of the head. There also may be provided a terminal nut pressing a flanged end of the syringe tip against an O-ring and the O-ring against the head to form a seal. A syringe forming an alternate embodiment includes a head having a manifold passage connecting a syringe tip to a manifold passage having two valved inlets, one valved inlet leading to air and the other valved inlet leading to a manually positioned valve adapted to connect either water or medicament to that valved inlet.

In the drawings:

FIG. 1 is a perspective view of an improved dental syringe forming one embodiment of the invention;

FIG. 2 is a top plan view of the dental syringe of FIG. 1;

FIG. 3 is an enlarged, vertical sectional view of the dental syringe of FIG. 1;

FIG. 4 is an enlarged, fragmentary, vertical sectional view of the syringe of FIG. 1;

FIG. 5 is a fragmentary, vertical sectional view of a dental syringe forming an alternate embodiment of the invention; and

FIG. 6 is a horizontal sectional view taken along line 6—6 of FIG. 5.

Referring now in detail to the drawings, there is shown in FIGS. 1 to 4 an improved dental syringe 10 forming one specific embodiment of the invention to which a dual-passage hose 12 leads from a junction block assembly 14 having a hose 16 leading to a source of air under pressure and a hose 18 leading to a source of water under pressure. The syringe includes a head 20 carrying a pair of valve actuators 22 and 24 adapted to be pressed manually to supply air alone, water alone or both air and water to a syringe tip 26. A tubular handle 28 serves not only as a handle but also is threaded on a threaded connector boss 29 of the head to jam a partly split collet ring 30 (FIG. 3) against an O-ring 32 to force the O-ring against an annular, beveled surface 34 of the boss 29 and into the hose 12 to seal the hose on serrated connectors 36 secured in passages 38 in the head and extending into the two passages 40 and 42 in the hose. The central portion of the hose preferably is coiled and set in a helix to form a retractible hose.

Normally closed valves 50 (FIG. 3) of the type commonly used in vehicle tires have tubular housings screwed into and sealed in threaded outlet portions 52 of the passages 38, and close off the passages 38 from well or sump portions formed by the lower portions of counterbores 54 and 55 (FIG. 2), the outlet of the water passage being a bore 58 into which an end portion of a tube 60 of the tip 26 projects loosely. The tube 60 is supported at one end by a nozzle bushing 64 in an outer tube 66, and is supported at its other end by and is sealed to a bushing portion 68 rigidly secured to the tube 66. A tubular nut 70 screwed into a tapped counterbore 72 presses against an outer flange 74 of the outer tube 66 to press an O-ring 76 against the bottom of the counterbore 72 to sealingly connect the tube 60 to the bore 58. The tip can be rotatably adjusted, the bushing portion 68 rotating in the nut 70, the O-ring 76 frictionally holding the tip in adjusted position. Thus, as shown in FIG. 3, a sealed water passage is provided from the counterbore 54 through the tube 60. Air is supplied to the tip 26 from the air counterbore 55 (FIG. 2) through passages 189 (FIG. 3) in the head 20, extending counterbore 55 to the portion of the counterbore 72 exterior of the O-ring 76 and through this exterior portion of the counterbore 72, passages 191 in the bushing portion 68, the space between the inner tube 60 and the outer tube 66 and nozzle passages 195 through the nozzle bushing 64.

The actuators 22 and 24 are identical, and only the actuator 22 will be described in detail. The actuator 22 (FIG. 4) includes a pushbutton 80 having a guide portion 82 slidable in the upper end of the counterbore 54 and also having a plunger 84 slidable in bushing 86. A split ring 92 limits upward travel of the plunger 84 relative to the bushing 86. An undercut rim portion 94 of a cupped diaphragm 95 is pressed tightly against the wall of the counterbore 54 by an undercut portion 96 of the bushing to seal off the counterbore 54 and frictionally retain the bushing 86 against movement in the counterbore 54. A resilient diaphragm portion 98 of the diaphragm 95 presses the plunger 84 toward its uppermost, normal position. When the pushbutton 80 is pressed downwardly, the diaphragm portion 98 engages rounded head 100 of actuator rod 102 of the valve 50 to depress the rod 102 to open the valve against the action of a spring (not shown) of the valve

50. When the pushbutton 80 is released, the diaphragm portion 98 moves the pushbutton back up to its normal retracted position and the spring moves the rod 102 back up to its normal, closed position. Pushbuttons 80 and 104 of the actuators 22 and 24 are positioned for easy actuation of either or both by the forefinger or thumb of the user while the user grips the handle 28 with his fingers. The diaphragm preferably is composed of polyurethane. When the pushbutton 80 is released, the diaphragm portion 90 moves upwardly to act as a piston to draw the liquid in the tube 60 back along the tube 60 into the sump portion of the counterbore 54.

EMBODIMENT OF FIGS. 5 AND 6

An improved dental syringe 110 forming an alternate embodiment of the invention is generally similar to the syringe 10 but is adapted to supply selectively medicament only and medicament and air as well as air only, water only and air and water, which the syringe 10 can supply. The syringe 110 includes three hoses 112 supplying water, liquid medicament and air to three separate passages 138, 139 and 142 in a head 120. The air passage 142 leads directly to one of two valves 150 like the valves 50 and controlled by one of two pushbutton actuators (not shown) like the pushbutton actuators 22 and 24, the pushbutton actuator serving when pressed to open the air valve 150 to admit air into an air chamber like the chamber 55 to the air passages in the syringe tip (not shown) like the syringe tip 26. The medicament and water hoses 112 are connected by connectors 136 and 137 to branch passages 138 and 139. A collet 130 is sealingly jammed by a handle 128 and a tapered socket 134. Two passages 138 and 139 lead to a spool valve 143 having two branch outlets 145 and 147 both leading to a single passage 152 in which one of the valves 150 is mounted, the outlet of that valve 150 opening into the liquid chamber (not shown) like the counterbore 54. A spool valve rod 155 carries two enlarged, spaced, sealing cylindrical spools 157 and 159 fitting tightly in a transverse bore 161 in the head 120. The bore 161 intersects the passages 138, 139, 145 and 147. Enlarged heads 153 and 165 on the ends of the rod 155 act as stops to engage the head 120. When the valve rod 155 is in its full line position of FIG. 5, the valve 143 blocks off the water passage 139 and opens the medicament passage 138 to the valve 150. The syringe 110 then may be used to supply liquid medicament alone, air alone, or liquid medicament and air. When desired, the user may push the rod 155 to its broken-line position of FIG. 5 in which the rod head 163 abuts the head 120, and the passage 138 is blocked off and the water passage 139 is opened to the passage 147 and the valve 150. The syringe 110 then may be used to supply water alone, air alone, or water and air.

What is claimed is:

1. In a dental syringe,
head means having a recess and a fluid passage therethrough,
tip means secured to the head means and having a fluid passage extending from the fluid passage in the head means,
valve means having an actuating rod and mounted in one of said fluid passages,
a pushbutton mounted in the recess in the head means,
guide means fixed in the recess and guiding the pushbutton and a flexible diaphragm urging the pushbutton toward a retracted position and sealing the recess from the fluid passages,
the diaphragm being cup-shaped, being composed of a resilient plastic material, and fitting over the guide means and securing the diaphragm and guide means in the recess,
the rim portion of the diaphragm being jammed radially outwardly by the guide means against the wall of the recess to hold the diaphragm and the guide means in the recess.

2. The dental syringe of claim 1 wherein one of the fluid passages includes a sump portion between the diaphragm and the tip and the flexible diaphragm acts as a pump when retracted to draw fluid from the tip into the sump portion.

3. The dental syringe of claim 1 wherein the diaphragm is of polyurethane.

4. The dental syringe of claim 1 wherein the guide means is a bushing and the rim of the cup-shaped diaphragm fits over the bushing and is jammed thereby against the wall of the recess to form a seal therewith, the pushbutton having a rod portion slidable in the bushing and adapted to push the diaphragm against the rod of the valve means.

5. In a dental syringe a pushbutton actuator,
a pushbutton having a head portion and a rod portion,
a bushing having an annular groove in the end portion thereof guiding the rod portion,
and a flexible diaphragm secured to the bushing in a position covering one end thereof and adapted to be flexed by the rod portion,
the diaphragm being cupped and fitting over the end portion of the bushing and into the groove in the bushing,
the diaphragm being adapted to be pressed radially by the end portion of the bushing into gripping engagement in a bore, the pushbutton, the bushing, and the diaphragm forming a unitary assembly adapted to be slid into a bore of a valve.

6. The pushbutton actuator of claim 5 wherein said end portion of the bushing is undercut.

7. The pushbutton actuator of claim 5 wherein said end portion of the bushing has an undercut annular groove and the rim portion of the diaphragm is undercut and fits into the annular groove.

8. In a dental syringe, a head having a threaded boss portion and a passage through the boss portion to an exit,
tip means secured to the head in communication with the exit of the passage,
a tubular handle threaded on the boss portion and having an internal shoulder facing the boss portion,
a tubular connector secured to the boss portion in communication with the passage,
a flexible hose positioned over the connector,
and collet means engaged by the shoulder and pressed by the shoulder against the head to press the hose inwardly against the connector.

9. In a dental syringe,
a head having a bore, a fluid passage at one end of the bore and a counterbore at the other end of the bore,

a tip having a flanged end portion fitting closely in the counterbore and a tubular portion projecting into the bore,

an O-ring surrounding the tubular portion of the tip and positioned between the end portion of the tip and the bottom of the counterbore,

the external diameter of the O-ring being substantially less than the diameter of the counterbore,

and retainer means in the counterbore pressing the flanged end portion against the O-ring and permitting rotation of the flanged end portion in the counterbore,

the head including a fluid passage separate from the bore and opening into the counterbore radially outwardly from the O-ring,

the tip having a fluid passage separate from the tubular portion and opening at the end of the tip into the counterbore radially outwardly from the O-ring.

10. The dental syringe of claim **9** wherein the tip includes an inner tube including the tubular portion, and also includes an outer tube enclosing the inner tube and defining with the inner tube the fluid passage separate from the tubular portion.

11. In a dental syringe,

a head having a bore therethrough and a counterbore opening at the top of the head and also having an exit passage extending angularly from the counterbore to the front of the head,

a tip mounted on the head in communication with the exit passage,

valve means in the bore,

a guide bushing in the counterbore,

a cupped diaphragm on an end portion of the bushing and pressed by the bushing against the wall of the counterbore to secure the diaphragm and the guide bushing in the counterbore and seal off the counterbore,

and a manually depressed pushbutton rod extending through the bushing and engaging the bottom of the diaphragm for pressing the diaphragm against the valve means.

12. In a dental syringe,

a head having a pair of parallel passages extending from the bottom thereof to the front face thereof, and also being provided with a pair of socket portions opening on the top thereof and extending to the passages,

a tip communicating with the passages,

a pair of valves mounted in the passages,

a pair of pushbutton actuator means sealed in and mounted in the socket portions,

one of the passages having a branched entrance portion,

the head having a guide bore extending through the head and the branches,

and third valve means comprising a spool valve member mounted in the bore for selectively opening either of the branches and closing the other branch and operable from the exterior of the head.

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