

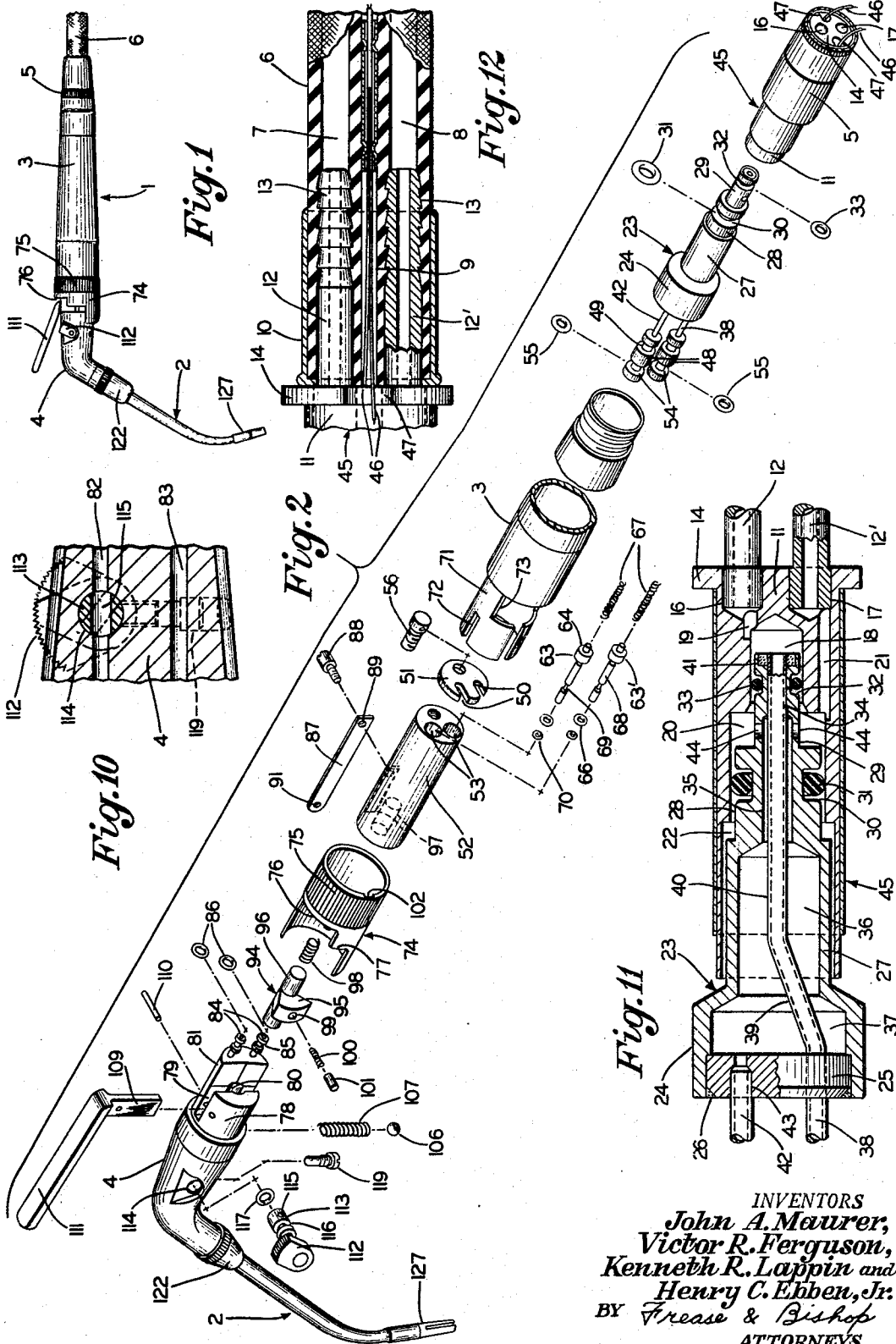
April 14, 1970

J. A. MAURER ET AL
DENTAL SYRINGE CONSTRUCTION

3,506,002

Filed May 25, 1967

2 Sheets-Sheet 1



INVENTORS
John A. Maurer,
Victor R. Ferguson,
Kenneth R. Lappin and
Henry C. Ebben, Jr.
BY *Freese & Bishop*
ATTORNEYS

April 14, 1970

J. A. MAURER ET AL

3,506,002

DENTAL SYRINGE CONSTRUCTION

Filed May 25, 1967

2 Sheets-Sheet 2

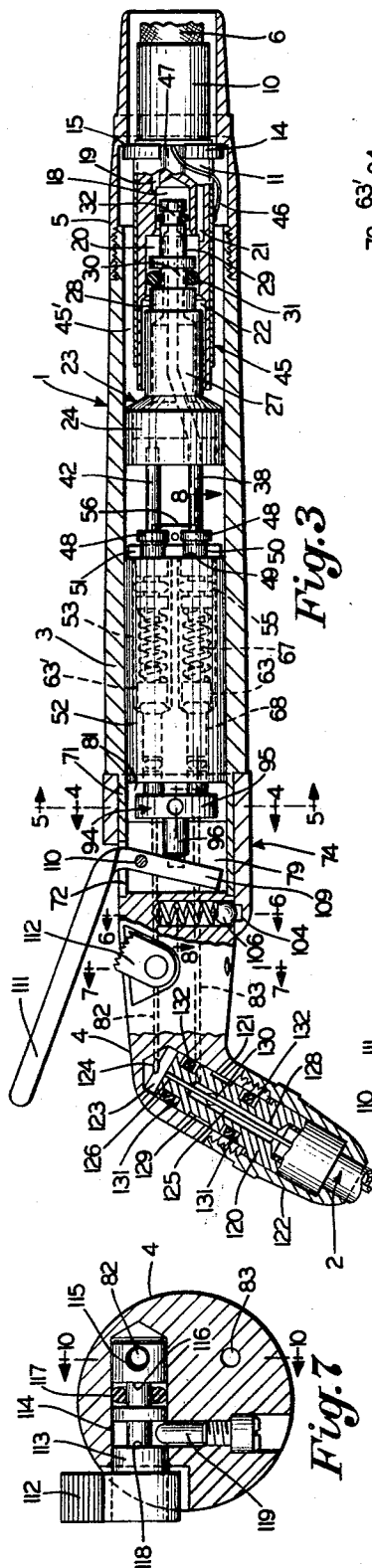


Fig. 3

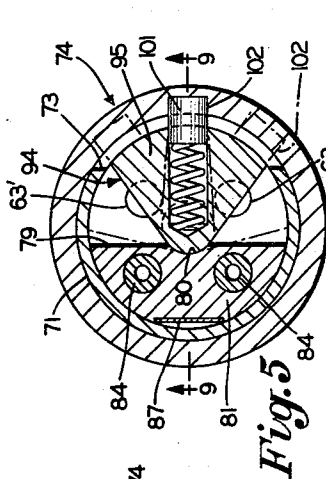


Fig. 5

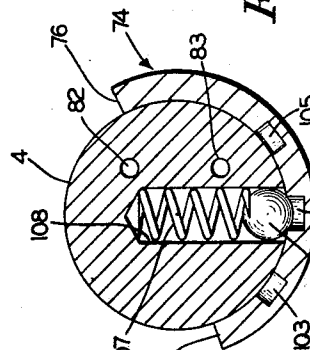


Fig. 6

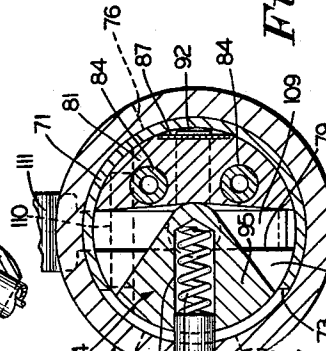


Fig. 4

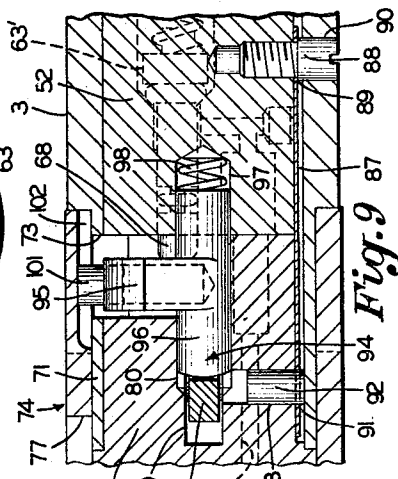


Fig. 9

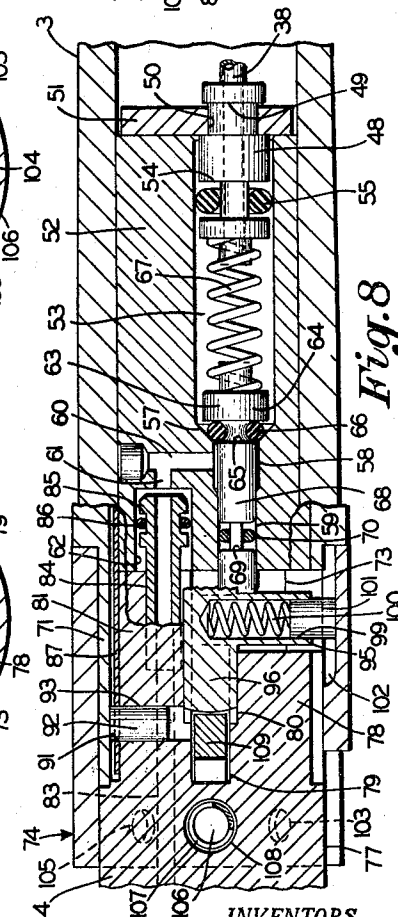


Fig. 8

INVENTORS
John A. Maurer,
Victor R. Ferguson,
Kenneth R. Lappin and
Henry C. Ebben, Jr.
 BY *Frese & Bishop*
 ATTORNEYS

1

2

3,506,002

DENTAL SYRINGE CONSTRUCTION

John A. Maurer, Victor R. Ferguson, Kenneth R. Lappin, and Henry C. Ebben, Jr., Canton, Ohio, assignors, by mesne assignments, to The Stern-Web Company, a corporation of Delaware

Filed May 25, 1967, Ser. No. 641,373

Int. Cl. A61c 17/02

U.S. Cl. 128—173.1

8 Claims

ABSTRACT OF THE DISCLOSURE

A dental syringe construction having a handle portion formed of a tubular housing with a nozzle portion attached to a head at one end and air and water hose connections at the other end. Air and water conduits are located through the tubular housing from the hose connections to the nozzle. Valves, in a valve body connected by a bracket to the head, are located in the air and water conduits with a lever for operating either or both of the valves and a metering valve is provided in the water conduit for regulating the amount of water admitted to the nozzle. An electric heating element surrounds the air and water conduits within the tubular housing but is spaced from the housing to provide an insulating air space therebetween.

CROSS REFERENCE TO RELATED APPLICATION

The nozzle portion of the syringe may be of the type shown in application of John A. Maurer, Ser. No. 397,398, filed Sept. 18, 1964, now Patent No. 3,374,789, issued Mar. 26, 1968.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to syringe constructions and more especially to a dental syringe construction. More specifically, the invention relates to a dental syringe construction which, through selective adjustment and manipulation, may be used for ejecting either air or water, or predetermined mixtures thereof.

Description of the prior art

Although most prior constructions of dental syringes have been of a single-purpose type, that is for ejecting either water or air but not a combination of the two, attempts have been made to provide a syringe construction arranged for selectively ejecting either air or water or a mixture of the two.

With one such prior form of syringe construction, it has been necessary to provide a complicated, expensive and bulky control device mounted on the dental unit for directing the desired fluid or fluids to the syringe when and as desired.

Another such syringe has a very complicated control construction located within the handle of the syringe, and none of the prior art constructions has means for regulating the flow of water through the syringe.

SUMMARY OF THE INVENTION

In general terms, the syringe construction embodying the present invention may be stated as comprising a handle portion and a nozzle portion. The handle portion includes a tubular housing within which is located a valve body, water and air conduits and heating means, a head being located at one end of the handle for operably connecting the nozzle portion, and means being located at the other end of the handle for attaching an air and water hose. Means is provided in the head for regulating the flow of water so that either a solid stream of water or a fine spray may be ejected from the nozzle.

An air valve and a water valve are located in the valve body, and a rotatable and longitudinally movable selector switch is provided for selectively operating either or both valves.

It is an object of the present invention to provide an improved syringe of the multi-purpose type which overcomes the difficulties and inconveniences of the prior art constructions.

Another object of the invention is to provide such a syringe construction in which the selector switch is spring loaded and adapted to be operated by an operating lever extending outwardly from the tubular housing.

A further object of the invention is to provide a syringe construction of this character having means for regulating the flow of water to the nozzle.

It is also an object of the invention to provide a syringe construction of this type in which an electric heating element within the housing surrounds the water and air conduits.

Another object of the invention is to provide such a syringe construction which satisfies the above objects in a simple, efficient and compact manner, and which may be produced at a minimum of expense.

These and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangements and combinations, subcombinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicants have contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a side elevation of a syringe embodying the invention;

FIG. 2 is an exploded view of the syringe;

FIG. 3 is a fragmentary, longitudinal sectional view through the handle and head portion of the syringe;

FIG. 4 is an enlarged transverse sectional view on the line 4—4, looking in the direction of the arrows in FIG. 3;

FIG. 5 is an enlarged section on the line 5—5, looking in the direction of the arrows in FIG. 3;

FIG. 6 is an enlarged transverse section on the line 6—6, FIG. 3;

FIG. 7 is an enlarged transverse section on the line 7—7, FIG. 3;

FIG. 8 is an enlarged fragmentary longitudinal section on the line 8—8, FIG. 3;

FIG. 9 is an enlarged fragmentary longitudinal section on the line 9—9, FIG. 5;

FIG. 10 is a fragmentary longitudinal section through the head, taken on the line 10—10, FIG. 7;

FIG. 11 is an enlarged longitudinal sectional view through the rear nipple assembly; and

FIG. 12 is an enlarged longitudinal sectional view showing the connection of the hose to the hose nipple assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the construction illustrated, the syringe construction comprises the handle portion indicated generally at 1 and the nozzle portion indicated generally at 2, the handle portion including the tubular housing 3 with head 4 at one end, to which the nozzle 2 is attached, and a coupling nut 5 at the other end.

Air and water are supplied to the interior of the handle through the hose 6 (FIG. 12), having the air supply conduit 7, the water supply conduit 8, and the electric wire conduit 9 therein. A ferrule 10 is located upon this end

of the hose 6. The hose 6 is attached to the hose nipple 11 by means of the similar nipples 12 and 12' having the corrugated end portions 13 received into the air conduit 7 and water conduit 8, respectively, of the hose 6.

The nipple body 11 has a peripheral flange 14 at its end which is engaged by the internal shoulder 15 in the coupling nut 5 to retain the nipple body in the tubular housing 3. The ends of the air and water nipples 12 and 12' are received in longitudinal openings 16 and 17, respectively, in the nipple body 11.

The hose nipple body 11 has a central bore 18 which communicates with the air nipple 12 through the short conduit 19. At a point spaced from this end of the hose nipple body the bore is considerably enlarged as at 20 and the water nipple 12' communicates with this enlarged portion of the bore through the longitudinal passage 21. The bore in the nipple body 11 may be further enlarged toward the other end as shown at 22.

A rear nipple assembly is associated with the hose nipple body 11 and includes the connecting nipple 23 having the circumferentially enlarged inner portion 24, closed at its inner end by the end plug 25 which may be secured therein by any suitable means such as silver solder indicated at 26.

The connecting nipple is then reduced as at 27 and received within the portion 22 of the bore of the hose nipple body, and then further reduced as at 28 and received within the portion 20 of the bore of the hose nipple body, and finally reduced as at 29 and received within the smallest bore 18 of the hose nipple body 11.

A peripheral groove 30 is formed in the intermediate portion 28 of the connecting nipple 23 and receives an O-ring 31 which forms a seal between the same and the portion 20 of the bore of the hose nipple body.

A peripheral groove 32 is formed in the reduced end portion 29 and receives an O-ring 33 which forms a seal between the same and the reduced portion 18 of the bore of the hose nipple body.

An axial bore 34 is formed in the outer end portion of the connecting nipple, this bore being slightly enlarged as shown at 35 and then considerably enlarged at 36 and further enlarged at 37 within the enlarged inner end 24 of the connecting nipple.

The rear air tube 38 is located through a suitably sealed aperture in the end plug 25, then bent upwardly and outwardly as at 39, and then axially as shown at 40, through the bores 35 and 34, being connected to the outer end of the connecting nipple by any suitable means such as silver solder indicated at 41.

The outer end of the rear water tube 42 is sealed within the bore 43 of the end plug 25 in any suitable manner as by soldering. With this arrangement, air is admitted from the air conduit 7 of the hose through the nipple 12 and passage 19 and bore 18 to the interior of the rear air tube 38.

Water is admitted from the conduit 8 of the hose through the nipple 12', passage 21 to the enlarged bore 20 of the hose nipple body, then through the apertures 44 to the reduced bore 35 of the connecting nipple, then to the enlarged bores 36 and 37 and out through the rear water tube 42.

A cylindrical heating element indicated generally at 45, provided with silicone, "Teflon" or other suitable insulation to withstand 185° F. is located around the hose nipple body 11 to heat the air and water passing through the same. Wires 46 connected to the heating element may be located through the central conduit 9 in the hose and through the side notches 47 in the flange 14 of the hose nipple body.

The heating element 45, as shown in FIG. 3, is spaced inwardly from the tubular housing 3, thus forming an air chamber 45' between the heating element and the tubular housing to insulate the handle against heat from the heating element.

A nipple 48 is soldered or otherwise attached to the

inner end of each of the water tubes 42 and air tubes 38. Each of these nipples has an annular groove 49 adapted to be received in one of the slots 50 in the end cap 51 of the valve body 52. The inner portions of these nipples are received in the similar bores 53 in the valve body 52. An annular groove 54 in the inner end portion of each nipple 48 receives an O-ring 55, as shown in FIG. 8, forming a seal between the nipple 48 and the bore 53.

The valve body 52 is of generally cylindrical shape and the end cap 51 is attached to the end thereof by the screw 56. Each bore 53, as shown in FIG. 8, is provided with an internal shoulder 57 intermediate its ends, the remaining portion of the bore being straight and of reduced diameter as indicated at 58 and further reduced toward the end as at 59. A transverse passage 60 communicates with the portion 58 of each bore and, through a longitudinal passage 61, with a bore 62 located through the left end of the valve body 52.

An air valve 53 is mounted in the air passage 53 shown in FIG. 8 and a similar water valve 63' is mounted in the water passage equivalent to the bore 53 in FIG. 8. As both of these valves are alike, only the air valve shown in FIG. 8 will be described in detail.

This valve has an enlarged head 64 with an annular groove 65 adjacent thereto within which is located an O-ring 66 normally held in contact with the shoulder 57 by the coil spring 67. This spring and the other springs shown herein, as well as other parts which may come in contact with the water may be formed of stainless steel.

The stem 68 of the valve is slidable within the reduced bore 59 and has an annular groove 69 therein within which is located an O-ring 70 forming a seal between the valve stem and the bore. The end of the valve stem normally protrudes from the left hand end of the valve body.

The left hand end portion of the tubular housing 3 is reduced in diameter as shown at 71 and is provided with an elongated slot 72 in the top and at opening 73 upon one side. A selector ring, indicated generally at 74, is rotatably mounted upon the reduced diameter end portion 71 of the tubular housing 3 and is provided with an externally knurled portion 75 and has the cut away portion 76 and the further cut away portion 77.

The inner end of the head has a reduced cylindrical portion 78, with a vertical slot 79 therethrough and an axial bore 80, and the substantially semi-cylindrical extension 81. Water and air conduits 82 and 83 respectively are bored longitudinally through the head, at one side of the center thereof, and each is enlarged at the extension 81 to receive a nipple 84 which is received in the corresponding bore 62 in the valve body 52.

An annular groove 85 is formed in each nipple 84 to receive an O-ring 86 forming a seal between the nipple and the bore 62. The head is held attached to the valve body by means of a metal bracket strap 87, a screw 88 being located through an aperture 89 therein and being screwed into the valve body 52, the head of the screw being received in an aperture 90 in the tubular housing 3.

An aperture 91 in the other end of the metal bracket strap 87 receives a pin 92 located in an aperture 93 in the head 4. Between the opposed ends of the head 4 and the valve body 52 is located the selector switch 94, comprising the quadrant 95 mounted upon a stem 96.

On end of the stem 96 is journaled in the axial bore 80 in the head and the other end thereof within the axial bore 97 in the valve body, a spring 98 being located in the bore 97 to urge said selector switch to the left as viewed in the drawings.

A radial bore 99 is formed in the quadrant 95 of the selector switch and a coil spring 100 therein holds the pin 101 in engagement with a longitudinal groove 102 in the selector ring 74 so that the selector switch will be rotated with the rotation of the selector ring.

The selector switch is adapted to be moved to three positions; first, so as to contact only the end of the air

5

valve stem 68; second, to a position where it will contact the ends of both the air valve and water valve stems, and third to a position where it will contact only the end of the water valve stem.

For indexing the selector switch to these three positions, three depressions indicated at 103, 104 and 105 are formed on the inside of the selector ring 74. A ball 106, biased by spring 107 in the bore 108 in the head 4, is adapted to be selectively received in each of the depressions 103, 104 and 105, as indicated in FIG. 6.

For the purpose of actuating the selector switch to selectively open the air and/or water valves, an operating lever is provided. This lever is L-shaped, the shorter arm 109 being pivoted within the slot 79 in the head by the pivot pin 110, while the longer arm 111 extends outwardly in position to be grasped in the hand of the dentist so that he may with one hand rotate the selector ring 74 to desired position, and then operate the lever to selectively open the desired valve or valves.

For the purpose of regulating the flow of water through the conduit 82 in the head, a meter device is provided comprising the meter lever 112 and the meter stem 113 attached thereto. The stem is rotatably mounted in a transverse bore 114 in the head, which intersects the water bore 82.

A port 115 is formed diametrically through the stem 113 and adapted to register at both ends with the opposed ends of the water bore 82, as shown in full lines in FIG. 10, in order to provide for a solid stream of water to be delivered to the nozzle, or when turned to the broken line position as shown in FIG. 10 will almost, but not entirely, shut off the water so that a spray may be delivered to the nozzle by proper manipulation of the selector switch and operating lever 111.

An annular groove 116 is formed in the meter stem 113 and an O-ring 117 is located therein to form a seal between the stem and the bore 114. A second annular groove 118 is formed in the stem 113 and receives the end of a screw 119 which prevents accidental removal of the stem from the bore.

The meter stem 113 may be soldered or otherwise connected to the meter lever 112, and the end of the lever may be knurled as shown, in order to facilitate operation thereof. The upper end of the nozzle 2 is soldered or otherwise secured within the lower end of the end nipple 120. This end nipple is received within the bore 121 in the head 4 and is secured to the head by means of the head nut 122. The upper end of the end nipple 120 is spaced from the upper end of the bore 121, forming a chamber 123, into which water from the bore 82 is discharged as at 124.

The upper end of the water outlet tube 125 is secured within a bore 126 in the end nipple 120 and leads down through the nozzle to the nozzle nipple or tip 127. The bore 126 is enlarged at 128 and the lower end communicates with the open upper end of the nozzle 2.

The end nipple 120 has a peripheral groove 129 forming an annular chamber communicating with the end of the air bore 83 and an aperture 130 forms communication between said chamber and the enlarged bore 128 so that air from the bore 83 will pass into the enlarged bore 128 and then down through the nozzle to the nipple or tip 14.

On either side of the annular groove 129 are formed peripheral grooves 131 in each of which is located an O-ring 132 forming an air seal between the end nipple 120 and the bore 121 on each side of the groove 129.

OPERATION

In the operation of the syringe, the air and water conduits 7 and 8 of the hose are connected to suitable sources of compressed air and water respectively, and the wires 46 are connected to a source of electric power. This will maintain a supply of water in the uppermost chamber 53 and air under pressure in the lowermost chamber 53 as viewed in FIG. 3.

6

Both the air and water will be heated as they pass through the rear nipple assembly which is surrounded by the heater 45. The selector ring 74 is rotated to the proper position to operate either the water valve 63' or the air valve 63, or the combination of both.

With the parts in the position shown in FIGS. 4, 5 and 6, with the detent ball 106 received in the recess 104, the quadrant 95 of the selector switch is positioned to register with both of the valves 63 and 63' as best shown in FIG. 5.

To regulate the amount of water to be discharged through the nozzle at this time, the meter lever 112 is operated to rotate the meter stem 113 to any desired position between the full line and broken line positions of FIG. 10.

The handle 111 of the operating lever is then depressed, moving the selector switch 94 to the right against the stems of the valves 63 and 63' moving each valve to the open position or right as viewed in FIG. 8, thus withdrawing the O-rings 65 from contact with the valve seat shoulders 57 permitting the fluid to pass from the chambers 53 into the passages 60 and then through the nipples 84 and bores 82 and 83 to the nozzle.

If it is desired to discharge only air from the nozzle, the selector ring 74 is rotated counter clockwise as viewed in FIGS. 4 and 6, seating the ball 106 in the recess 103 and moving the quadrant 95 of the selector switch away from the water valve 63', and in position to register only with the air valve 63. Operating handle 111 of the lever 109 is then depressed to actuate the selector switch 94 and open only the air valve.

If it is desired to discharge only water from the nozzle of the syringe, the selector switch 94 is moved clockwise until the ball 106 is sealed in the recess 105. Then when the lever 109 is operated to actuate the selector switch 94 only the water valve 63' will be opened.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby; the new and useful construction, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

We claim:

1. A dental syringe comprising a tubular housing having separate air and water passages therein, independently movable normally closed valves within said passages for controlling the flow of air and water therethrough, valve selector means rotatably and axially movable within said housing, said valve selector means being rotatable between a position registering with the air valve only, another position registering with both valves and another position registering with the water valve only, said valve selector means being movable axially for opening the valves registering therewith, a lever for axially moving said valve selector means, and a head attached to the end of the tubular housing, a cylindrical valve body located within the tubular housing and having longitudinal passages in which the valves are located, a bracket attaching the head to said cylindrical valve body, a selector ring rotatably mounted upon the exterior of said tubular housing, means connecting the selector ring to said valve selector means, the selector ring having three spaced recesses in its inner surface, and a spring-biased detent in the head adapted to

7

be selectively seated in said recesses to hold the valve selector means in any of said positions.

2. A dental syringe as defined in claim 1, including a metering device located in the water for regulating the amount of water discharged from the syringe.

3. A dental syringe as defined in claim 2, in which the metering device comprises a meter lever having a stem fixed thereto and journaled in a bore intersecting the water passage, there being a diametric port in said stem.

4. A dental syringe as defined in claim 1, in which the selector means comprises a quadrant fixed midway upon a stem, one end of the stem being journaled in the head and the other end of the stem being journaled and spring biased in the selector ring.

5. A dental syringe as defined in claim 4, in which there is a radial bore in said quadrant and a spring-biased pin in said bore is located in a longitudinal groove in the interior of the selector ring.

6. A dental syringe as defined in claim 1, in which said longitudinal passages are located at one side of the center of said cylindrical valve body, and a transverse passage beyond the valve connects each longitudinal passage with a longitudinal passage in the other side of the center of head.

7. A dental syringe comprising a tubular housing having separate air and water passages therein, independently movable normally closed valves within said passages for controlling the flow of air and water therethrough, valve selector means rotatably and axially movable within said housing, said valve selector means being rotatable between a position registering with the air valve only, another position registering with both valves and another position registering with the water valve only, said valve selector means being movable axially for opening the valves regis-

8

tering therewith, a lever for axially moving said valve selector means, and a head attached to the end of the tubular housing, a hose nipple body within the tubular housing, the air and water conduits being located through said hose nipple body, an electric heating element located around the outside of the hose nipple body, there being an annular air space between said heating element and the inner surface of the tubular housing, a selector ring rotatably mounted upon the exterior of said tubular housing, means connecting the selector ring to said valve selector means, the selector having three spaced recesses in its inner surface, and a spring-biased detent in the head adapted to be selectively seated in said recesses to hold the valve selector means in any of said positions.

8. A dental syringe as defined in claim 7, in which a hose is connected to said hose nipple body, said hose having an air conduit and a water conduit connected to the air and water conduits respectively of the hose nipple body by nipples, and an electric wire conduit containing wires connected to said heating element.

References Cited

UNITED STATES PATENTS

950,738	3/1910	Baker	128—173.1
2,757,668	8/1956	Meyer-Saladin	128—173.1
3,254,646	6/1966	Staunt et al.	128—173.1 XR
3,375,823	4/1968	Pamplin et al.	128—173.1
3,393,676	7/1968	Kummer et al.	128—173.1

ANTON O. OECHSLE, Primary Examiner

P. E. SHAPIRO, Assistant Examiner

U.S. Cl. X.R.

124—229