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DENTAL SYRINGE

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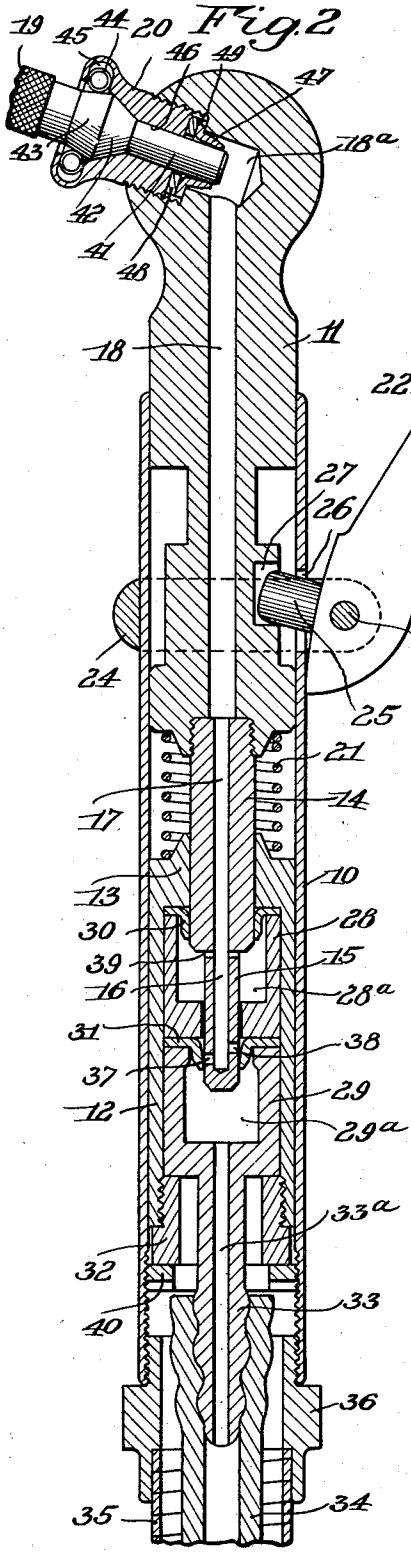


Fig. 2

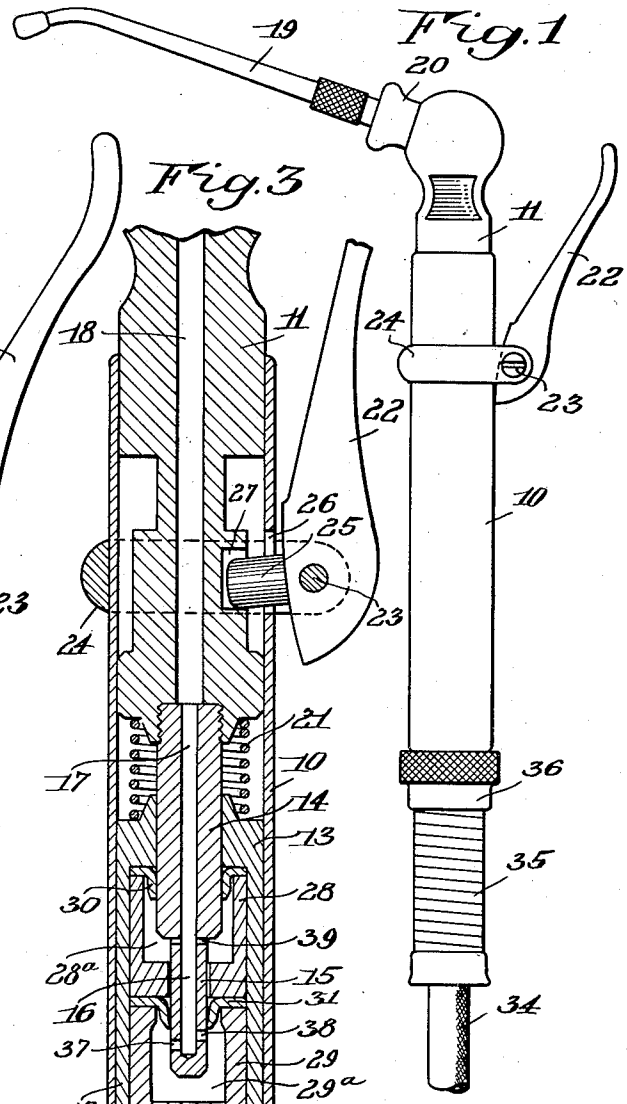


Fig. 1

Fig. 3

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DENTAL SYRINGE

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19 Claims. (Cl. 128—257)

The present invention relates to syringes of the type for example used by members of the dental profession, one object being to provide an improved sanitary instrument of this class constructed in a manner to permit parts thereof to be readily detached from the body portion of the instrument for cleaning and sterilizing so that a plurality of such parts may be provided for use interchangeably with said body portion from time to time.

A further object of the invention is to provide in a syringe of the class described, improved means for controlling or regulating the flow of the liquid in order to provide for a gradual increase in the volume of the stream discharging from the nozzle during initial operation of the syringe whereby to insure a smooth and even flow of the liquid, as distinguished from the usual rapid expulsion of the same from the nozzle.

A further object of the invention is to provide improved means for producing suction within the nozzle or parts connected therewith upon movement in one direction of the liquid or fluid control valve whereby to retract or suck back the liquid remaining in the nozzle to prevent dripping of the same from the free end of the nozzle.

A further object of the invention is to provide in a syringe of the present type, an improved self-cleaning valve structure for controlling the flow of the liquid through the syringe.

A further object of the invention is to provide a syringe having a simple, practical, and economical form of construction which can be conveniently handled and controlled in operation.

A still further object of the invention is to provide an improved nozzle and nozzle mounting which will permit the nozzle to be readily detached from and inserted upon the mounting and which will also insure an efficient liquid tight joint between the nozzle and the part of the syringe with which it is connected.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a view in elevation of a syringe embodying the invention;

Fig. 2 is a longitudinal section through the body of the syringe shown in Fig. 1, drawn to an enlarged scale and showing the valve in closed position, and

Fig. 3 is a somewhat similar view with the valve shown in open position.

The same reference numerals throughout the several views indicate the same parts.

Referring to the drawing, 10 designates the casing or housing of the syringe and 11 and 12 comprise relatively movable tubular members located within the housing. The member 12 constitutes a casing having a guide portion 13 slidably receiving a reduced extension 14 on the tubular member 11 which is preferably threaded therein for detachment therefrom when desired. The extension 14 carries a reduced portion 15 preferably made integral with the extension and constituting what may be termed a valve or valve stem having a longitudinally extending passage 16 forming a continuation of the passage 17 of the extension 14. The passage 17 communicates with the outlet passage 18 of the tubular member 11 carrying the nozzle 19 which is detachably connected with a mounting element 20 described hereinafter and suitably connected with the tubular casing 11, preferably as shown in Fig. 2.

A spring 21 is positioned within the housing 10 between the portion 13 of the tubular member 12 and the tubular member 11 for returning the latter from the operating position shown in Fig. 3 to the normal valve closing position shown in Fig. 2 upon release of the lever or operating member 22, pivoted at 23 between the jaws of a collar or band-like member 24 suitably secured upon the housing 10 of the syringe. The lever 22 carries a lateral projection 25 extending through an opening 26 in the housing 10 and operatively engaging the tubular member 11 within a recess 27 formed therein as shown in Fig. 2.

Mounted within the tubular member 12 are a pair of inner and outer valve receiving members 28 and 29 provided respectively with liquid receiving chambers 28a and 29a as shown in Figs. 2 and 3.

Located between the member 28 and the inner end of the tubular member 12 is a flexible inverted cup-shaped packing element 30 and located between the members 28 and 29 is a similar inverted cup-shaped element 31 constituting a flexible valve seat for the tubular valve 15 which extends through the end wall of the member 28 into the valve seat or closing element 31.

The members 28 and 29 are clamped in position within the tubular member 12 upon their respective packing elements by means of a nut 32 mounted within the casing 10 and threaded within the end of the tubular member 12 as shown in Fig. 2.

The valve receiving member 29 has a reduced extension 33 provided with a liquid inlet pas-

sage 33a, the extension being connected with a hose or flexible liquid supply conduit 34 adapted for connection with a suitable liquid supply source, not shown.

A guard 35 is provided for the hose or conduit 34 adjacent its point of connection with the syringe and is connected with the latter by means of a nut 36 threaded within the end of the tubular casing 10.

The valve stem 15 is provided with a plurality of inlet ports or passages 37 and 38 arranged in staggered relation or one in advance of another so as to afford a gradual flow of the liquid from the chamber 29a to the passage 16 of the valve stem upon operating the lever 22 to move the tubular member 11 inwardly from the position shown in Fig. 2 to that shown in Fig. 3. In other words, the several inlet ports or passages are so arranged that one opens in advance of another, each successive port beginning to open at or about the time of the complete uncovering of the port next in advance thereof. Opening of the ports in this manner takes place upon movement of the lever 22 to operate the tubular member 11 and valve stem 15 connected therewith at which time the liquid inlet port 37 will be moved past the lower edge of the valve seat or closing portion of the inverted cup-shaped member 31 for communication with the liquid supply chamber 29a, thus allowing a limited amount of liquid to enter the tubular member for passage to the nozzle as previously stated. Upon further inward movement of the tublar member the liquid inlet port 38 will also be moved past the valve seat into position to communicate with the supply chamber 29a, thus permitting an additional supply of liquid to enter the nozzle carrying member. The admission of two or more small streams of liquid into the nozzle carrying member successively in the manner described affords a gradual control of the volume of the flow and serves to prevent a too rapid discharge of liquid from the nozzle when opening the valve to spray or irrigate the parts of the oral cavity under treatment.

Means has been provided for producing suction in the nozzle upon closing the liquid control valve whereby to suck back any liquid remaining in the nozzle to prevent it from discharging therefrom in the form of drippings. This means comprises the liquid receiving chamber 28a with which the valve stem passage 16 communicates by means of one or more relatively small ports 39 formed in the valve stem 15 as shown in Fig. 2, and through which the liquid finds its way into the chamber 28a during operation of the valve. On movement of the valve from the closed position shown in Fig. 2 to the open position shown in Fig. 3, a certain amount of the liquid in the chamber 28a will be displaced by the plunger like part 14 of the valve and subsequently when the valve operating lever is released and the tubular parts 11 and 14 are returned to normal position by the spring 21, a partial vacuum will be produced within the chamber 28a by return of the part 14 to normal position, at which time suction will be produced in the passages 17 and 18, thus causing the liquid in the nozzle to be retracted or sucked back within said passages whereby to prevent dripping of the same from the free end of the nozzle.

It will be understood that the pressure of the liquid surrounding the flexible cup-shaped portions of the packing elements 30 and 31, within the chambers 28a and 29a, will act on said portions to urge them in contact with the parts 14 and 15 respectively of the tubular member 11 to insure liquid tight joints between said parts whereby the liquid is prevented from escaping to the nozzle when the valve is closed.

The flexible packing member 30 also prevents escape of the liquid into that portion of the casing containing the spring 21 for returning the tubular member 11 to normal position.

A self-wiping action is afforded between the valve stem 15 and the flexible packing 31 surrounding the same upon reciprocation of the stem, whereby the latter will be thoroughly cleaned during operation, thus being kept free from dirt and various foreign particles, which if allowed to accumulate would tend to decrease the efficiency of the valve.

Means is provided for adjusting the tubular member 12 and the parts therein relative to the liquid inlet ports 37 and 38 of the valve stem 15 after assembling said parts within the casing 10. Heretofore this means has been operable from the exterior of the casing and frequently tampered with or adjusted by unauthorized persons, with detrimental results, by reason of the relative change in the positions of the valve and valve seat members. With the present arrangement the controlling or adjusting part comprises a nut 40 located within the casing where it is concealed and protected by reason of its inaccessibility.

In effecting the proper adjustment between the cup-shaped valve seat member 31 and the port 37 of the valve stem 15 the nut 40 is turned to advance the tubular member 12 within the casing to a position at which a very slight opening will be afforded between the lip or lower edge of the cup-shaped member 31 and the liquid inlet port 37 of the valve stem 15, or in other words, until a slight leak of the liquid through the port develops, after which the nut is turned slightly in the opposite direction to allow the port 37 to be covered by the cup-shaped portion of the packing member, this adjustment being made before attaching the nut 36 and hose guard to the casing 10. The nut 40 is designed to be operated within the casing by a suitable instrument such, for example, as a spanner wrench.

The nozzle 19 is detachably connected with the tubular member 11 for cleaning and sterilizing, and if desired a plurality of the nozzles or other parts for controlling the flow of the liquid may be kept on hand for use interchangeably with said tubular member from time to time.

The inner end of the nozzle has an extended cylindrical portion 41 lying in advance of the oppositely inclined tapered shoulders 42 and 43 of the nozzle as shown in Fig. 2. The nozzle is yieldably held in position by suitable resilient means, such for example, as a circular coil spring 44, which engages the tapered shoulder 43 of the nozzle within an annular recess 45 formed in the outer end of the socket or mounting element 20. The socket member 20 has a relatively long cylindrical bore 46 within which the extension 41 closely fits whereby the latter is properly centered and held against lateral movement upon approaching and entering the flexible cup-shaped packing element 47, thus avoiding injury to the packing by scratching or abrading the same. The packing element 47 is provided to insure a liquid tight or sealed joint around the portion 41 of the nozzle, the packing element being maintained in gripping relation with respect to said portion by the pressure of the liquid within the chamber 18a during operation of the syringe. A washer 48 is preferably interposed between the

packing element 47 and the socket member and both the washer and packing element are clamped in position between the shoulder 49 of the head of the tubular member and the socket member by tightly screwing the latter within the head. When inserting the nozzle within the socket member the tapered shoulder 42 thereon will expand the spring 44 and as the nozzle moves inwardly to final position the spring will grip the tapered shoulder 43 to securely hold the nozzle in operating position. The nozzle is, of course, free to rotate within the socket so that the angularly disposed tip or outer end portion thereof may be directed at various angles with respect to the axis of the casing 10 for convenience in use under different operating conditions. Removal of the nozzle can be readily effected by an outward pull thereon, at which time the tapered shoulder 43 will expand the spring to release the nozzle for cleaning or sterilizing as previously stated.

I claim:

1. A syringe comprising a discharge outlet, a valve controlling said outlet, means for operating said valve, and a device actuated by said operating means for retracting fluid from said outlet when said valve is closed whereby to prevent drippage from the outlet.

2. A syringe comprising connections for a nozzle and a supply line, a valve between said connections, a suction device, and operating means for said valve arranged to actuate said device to retract fluid from said nozzle connection when said valve is closed whereby to prevent drippage from the nozzle.

3. A syringe comprising a discharge outlet, a valve controlling said outlet, a fluid chamber communicating with said outlet, a displacement element movable in said chamber, and operating means for said valve connected with said element for retracting the same when said valve is being closed to create a partial vacuum for the purpose of preventing drippage from said outlet.

4. In a syringe, a fluid discharge outlet, a valve therefor comprising a casing, a plunger having lateral port means therein communicating with said outlet, and a flexible cup-shaped, packing on said casing engaging said plunger to control said port means and held seated on the plunger by the pressure of the fluid, a suction device communicating with said outlet, and operating means for effecting relative movement between said casing and plunger to open and close said valve and for actuating said suction device when said valve is being closed whereby to produce a partial vacuum for preventing drippage from said outlet.

5. A syringe having connections for an outlet and a fluid supply line, a valve for said outlet comprising a casing, a hollow plunger having lateral port means therein, a cup-shaped flexible packing on said casing engaging said plunger to control said port, means and held seated on the plunger by the pressure of the fluid, and operating means for effecting relative movement between said casing and plunger to open and close said valve by a sliding, self-cleaning movement between said packing and said plunger port means, and a nozzle detachably mounted on said outlet independently of said operating means.

6. A syringe having inlet and outlet connections, a valve between said connections comprising a casing portion normally communicating with one of said connections and provided with a cup-shaped flexible packing, a hollow plunger portion in said casing portion communicating with the other of said connections and provided with lateral port means cooperating with said packing, the packing being held seated on said plunger portion by the pressure of the fluid means for adjustably positioning one of said valve portions, and operating means for effecting relative movement betwen said valve portions to open and close said valve.

7. In a syringe, a housing, fluid inlet and outlet connections, a valve between said connections comprising a casing portion normally communicating with one of said connections and provided with a packing, a hollow plunger portion in said casing portion communicating with the other of said connections and provided with lateral port means normally closed by said packing, means for adjustably positioning one of said valve portions relative to said housing, spring means normally holding said valve portions in closed relation, and operating means on said housing for effecting relative movement between said valve portions to open said valve.

8. A syringe having inlet and outlet connecnections, a valve between said connections comprising a casing portion having a first chamber and also a second chamber normally communicating with said inlet connection and provided with a packing, and a hollow plunger portion in said casing portion communicating with said first chamber and having a lateral port therein for communication with said second chamber and normally closed by and movable relative to said packing, said plunger portion having an enlarged section in said first chamber to form a displacement element, and operating means for effecting relative movement between said valve portions to open and close the valve and retract fluid from said outlet connection when the valve is closed to prevent drippage.

9. In a syringe, a housing having inlet and outlet connections, a valve between said connections comprising a casing portion having a first chamber and also a second chamber normally communicating with said inlet connection and provided with a packing, and a hollow plunger portion in said casing portion communicating with said first chamber and having a lateral port for communication with said second chamber normally closed by said packing, said plunger portion having an enlarged section in said first chamber to form a displacement element, means for adjustably positioning one of said valve portions relative to said housing, spring means normally holding said valve portions in closed relation, and operating means on said housing for effecting relative movement between said valve portions to open and close the valve and retract fluid from said outlet connection when the valve is being closed to prevent drippage.

10. In a syringe, a housing, a valve casing therein having a shoulder, a packing on said shoulder, a gland for said packing enclosing a first chamber and forming a second shoulder, a packing on said second shoulder, a second gland for said second packing enclosing a second chamber, a nut for securing said glands and packings on said shoulders, an adjustable abutment on said housing for positioning said casing, a hollow plunger in said casing and packing having a port communicating with said first chamber, and a later port communicating with said second chamber and cooperating with the second packing to form a valve, a displacement element on said plunger movable in said first chamber, and oper-

ating means on said housing for moving said plunger.

11. A springe comprising a nozzle carrying portion having a socket formed therein and provided with a shoulder, resilient means positioned within the socket, and a nozzle detachably received within the socket and held against inward displacement by said shoulder and also held in position within the socket by said resilient means, detachment of the nozzle being effected by an outward pull thereon against the resistance of the resilient means without removal of the latter from the socket.

12. A syringe comprising a nozzle carrying portion having a socket formed therein, a nozzle detachably received within the socket and provided with an inclined shoulder, and resilient means within the socket substantially surrounding and engaging said shoulder and operating to yieldably resist outward withdrawal of the nozzle from the socket, detachment of the nozzle being effected by an outward pull thereon to overcome the resistance of the resilient means.

13. In a syringe, a nozzle carrying tube having a socket formed therein, a nozzle insertable within and detachably received by the socket and provided with oppositely inclined shoulders, an inclined seat in said socket, and spring means within the socket encircling the nozzle and positioned for expansion by one of said shoulders when inserting the nozzle within the socket and for engaging the other of said shoulders for yieldably holding said first shoulder on said seat and said nozzle in said tube socket.

14. In a syringe, a nozzle carrying tube formed with a guide bearing and seat communicating with said tube, packing means for said bearing, a nozzle having an end detachably fitting said bearing and packing and a shoulder cooperating with said seat, spring means on said tube adjacent said bearing, and an inclined abutment on said nozzle cooperating with said spring means to hold said nozzle on said tube and permitting it to be withdrawn by an outward pull thereon.

15. In a syringe, a nozzle carrying tube formed with a guide bearing and seat communicating with said tube, packing means for said bearing, a nozzle having an end detachably fitting said bearing and packing and a shoulder cooperating with said seat, a coiled spring on said tube, and an inclined abutment on said nozzle for engaging said spring and holding said nozzle on said tube and permitting it to be withdrawn by an outward pull thereon.

16. A syringe comprising cooperating nozzle and fluid supply connections, a member associated with one of said connections and forming a fluid holding suction chamber, a valve movable to establish communication between said connections and having a part associated therewith for displacing fluid in said chamber when the valve is opened, said part communicating with said nozzle connection and said chamber, and operating means for said part and said valve, the suction chamber operating through said part to retract fluid in the nozzle connection when the valve and said part are returned to normal inoperative position.

17. A syringe comprising cooperating nozzle and fluid supply connections, one of said connections being movable relative to another to establish communication between the same, a fluid holding suction chamber, said movable connection having a part adapted to displace the fluid in the suction chamber when said connection is moved in one direction, said part adapted to communicate with the suction chamber when said movable connection is moved in another direction whereby to produce suction in the nozzle connection to prevent dripping from the nozzle, and means for operating said movable connection.

18. A syringe comprising cooperating nozzle and fluid supply connections having passageways therethrough normally out of communication, one of said connections being movable longitudinally of another to a predetermined position whereby to establish communication between said passageways, a fluid holding suction chamber in which the movable connection is adapted to operate to displace the fluid when said connection is moved to said predetermined position, said movable connection having a port for establishing communication between its passageway and said chamber when said connection is returned to normal position whereby to produce suction in the nozzle connection to prevent dripping from the nozzle, operating means interposed between said connections for returning the movable connection to normal position, and means for moving said last mentioned connection from normal inoperative to operative position.

19. A syringe comprising a casing, a fluid supply connection extending therefrom, a fluid discharge connection movable within the casing from normal to a predetermined position at which it is adapted to communicate with the supply connection, a nozzle on said discharge connection, a fluid holding suction chamber the fluid of which is displaced by movement of the discharge connection to said predetermined position, said suction chamber communicating with the discharge connection when the latter is being returned to normal position whereby to produce suction therein to prevent dripping from the nozzle, operating means for moving the fluid discharge connection to said predetermined position, and means for returning it to normal position.

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