Jan. 4, 1938. A. F. PIEPER 2,104,670

DENTAL SYRINGE

Filed Jan. 17, 1935

Fig. 1

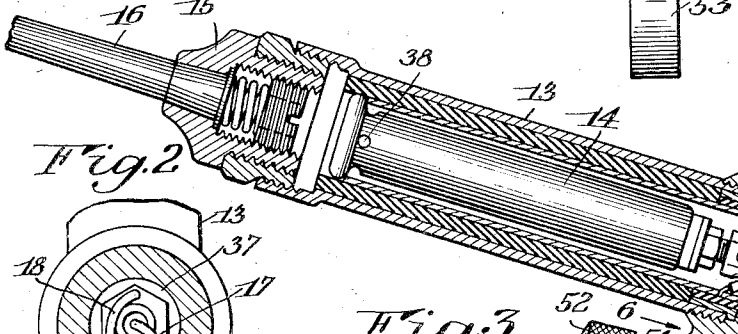


Fig. 7

Fig. 6

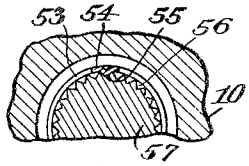


Fig. 2

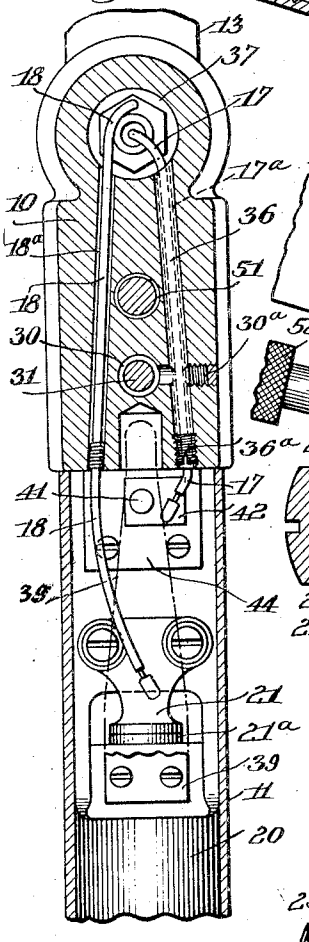
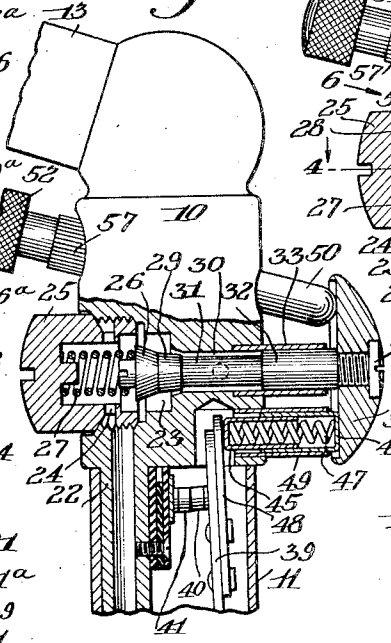


Fig. 3



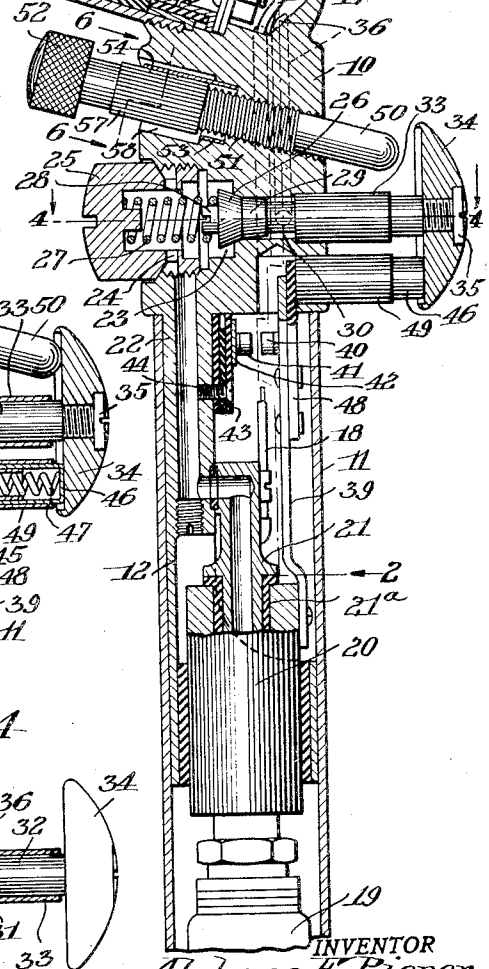


Fig. 4

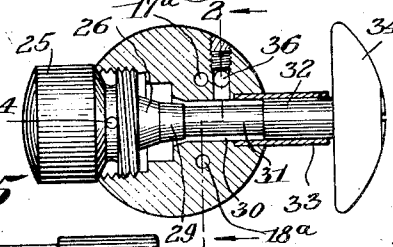
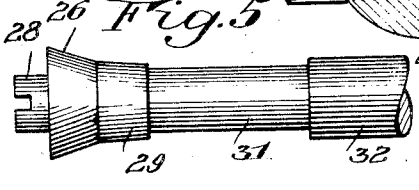


Fig. 5



INVENTOR

Alphonse F. Pieper

BY Edward H. Cumpston

his ATTORNEY

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DENTAL SYRINGE

Alphonse F. Pieper, Rochester, N. Y.

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13 Claims. (Cl. 128—257)

The present invention relates to syringes of the type used, for example, by the dental profession and has for its object to provide improved valve means for controlling or regulating the flow of the fluid in order to provide for a gradual increase in the discharge thereof from the nozzle during initial operation of the syringe to insure a smooth and even flow of the fluid as distinguished from the usual rapid discharge of the same when opening the valve.

A further object of the invention is to provide in combination with means for operating or controlling the fluid valve, an improved device actuated by said means in advance of the full or complete opening of the valve to effect closing of the circuit of an electric heater associated with the syringe for heating the fluid discharged by the nozzle.

A further object of the invention is to provide improved operating means for the switch under control of the valve operating means.

A further object of the invention is to provide improved regulating means for the valve which can be set or adjusted to different positions to vary the extent of movement of the valve whereby to provide for a definite or fixed rate of flow of the fluid under different operating conditions.

A further object of the invention is to provide improved means for preventing accidental displacement of the valve regulating means from the different positions to which it may be adjusted.

A further object of the invention is to provide in a syringe of the present type, improved structural features and arrangements of parts for heating and controlling the flow of the fluid.

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

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 fragmentary longitudinal section through a syringe embodying one form of the invention;

Fig. 2 is a longitudinal section taken substantially on lines 2—2 of Figs. 1 and 4.

Fig. 3 is a fragmentary part sectional view showing the fluid control valve in open position and the switch for controlling the heater circuit in closed position;

Fig. 4 is a transverse section taken substantially on line 4—4 of Fig. 1;

Fig. 5 is a detailed view of the fluid control valve drawn to an enlarged scale;

Fig. 6 is a fragmentary sectional view taken on line 6—6 of Fig. 1 and illustrating a portion of the means for holding the valve regulating means in adjusted position, and

Fig. 7 is a detailed view of the yieldable retaining or holding member for the adjustable regulating means.

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

A syringe constructed in accordance with the present invention embodies a head or body portion 10 on which is fitted a tubular hand grip 11 affording a housing for the extension 12 of the head and parts carried by the extension and described hereinafter. The head is recessed to receive the casing 13 containing the heating element designated generally by the reference numeral 14. The casing 13 is provided with a detachable mounting element 15 for receiving and supporting the nozzle 16 through which the heated fluid such, for example, as air, is discharged.

The heating element may be of any well known or preferred design and includes a heating coil, not shown, electrically connected with the relatively short conductors 17 and 18 under control of a switch in the housing 11 described hereinafter.

The air or other fluid to be heated is supplied under pressure from a suitable source, not shown, through the conduit 19 having its outlet end suitably secured within a sleeve 20 carried by the inner end of the extension 12 of the head 10 of the syringe. The sleeve 20 carries a tubular member 21 communicating at one end with the conduit 19 and at the other end with the tubular portion 22 of extension 12, said tubular portion being in communication with the valve chamber 23 of the head through the inlet port 24 of a hollow screw plug 25 forming a closure for the valve chamber as shown in Fig. 1.

The fluid control valve includes a tapered head 26 normally held on its correspondingly tapered seat by a spring 27 within the recess of the plug 25 the spring having its outer end seated in the plug and its inner end on the valve, the latter having a reduced portion 28 extending within the spring to maintain the spring in position upon thhe valve.

The valve head has a relatively long tapered extension 29 positioned within a transverse recess 30 within which is disposed the operating stem

of the valve, said stem comprising the inner and outer portions 31 and 32, respectively. The outer portion of the stem is guided by a sleeve 33 secured within and projecting from the head 10, as shown in Figs. 1 and 3 a fluid tight seal being afforded between the sleeve and the outer portion of the stem. The outer end of the stem is provided with an operating member 34 suitably connected therewith as by means of the screw 35. The inner portion of the stem is of less diameter than the recess 30, whereby to provide clearance for the passage of the fluid through the latter to the longitudinally extending passage 36 leading to the recess 37 in the outer end of the body portion 10 which recess is at all times in communication with the interior of the heater casing so that the fluid is permitted to pass around and to enter the heater through the opening 38 therein for circulation therethrough around the heating coil before discharging to the nozzle.

The fluid passage 36 is formed preferably by drilling through that portion of the head lying between the recess 30 in which the valve stem is disposed and the outer recess 37 for receiving the inner end of the heater casing, the inner end of the recess 36 being closed by a screw plug 36*a*. Communication between the recess 36 and the valve stem recess 30 is afforded by drilling from the outside of the head transversely through the passage 36 to the recess 30, the outer end of the passage thus formed being closed by a screw plug 39*a*.

Passages 17*a* and 18*a* are also provided within the head for receiving the insulated conductors 17 and 18, respectively, said conductors comprising a part of the circuit connections for supplying current to the heater.

Switch means for effecting closure of the heating coil circuit is provided, which means comprises a yieldable or spring-like arm 39 connected at one end with the sleeve 20 and having at its other end a contact 40 for engaging a similar contact 41 on a metal part 42 with which the conductor 17 is connected, as shown in Fig. 2. The part 42 is carried by insulation 43 secured on the extension 22 of the head 10 by the screws 44. The other conductor 18 is suitably connected with the tubular member 21 which is separated from the sleeve 20 by the insulation 21*a*, Fig. 1. The wires for completing the circuit through the heating coil when the switch is closed are not shown but are preferably carried through the conduit 19, one being suitably connected with the tubular member 21 and the other with the surrounding insulated sleeve 20.

The operating means for the switch comprises the inner and outer telescoping tubular members 45 and 46, respectively, carrying a spring 47 for urging them in opposite directions, the inner member bearing against a strip of insulating material 48 on the spring-like arm 39 of the switch and the outer member being seated upon the inner face of the valve operating member 34, as shown in Fig. 3. The outer telescoping member 46 is supported by and guided in a sleeve 49 suitably secured in the head 10 of the syringe, as shown in Fig. 3.

From this arrangement of parts it will be seen that if the operating part 34 of the valve is moved inwardly to effect opening of the valve the resilient switch arm 39 will be moved inwardly to the switch closing position shown in Fig. 3 by the telescoping members 45 and 46 at which time the spring 47 will be compressed. It will also be apparent that after the switch has been closed, continued inward movement of the valve can be effected by applying pressure on the operating part 34 whereby the tapered portion 29 of the valve will continue to move also, without interruption of the gradual increase in the flow of the fluid through the heater to the nozzle.

Upon release of the valve operating member the valve will be returned to closed position by the spring 27 and at the same time the resilient switch arm 39 will return to normal position and will move the inner telescoping member 45 outwardly in the sleeve 49, the outer telescoping member being then moved to normal position by the spring 47.

The regulating means for controlling the extent of movement of the valve when operating the same comprises an adjustable member 50 extending transversely through the head 10 of the syringe and being threaded therein at 51 and provided with an operating portion 52 lying beneath the heater casing 13 on the opposite side of the head from the valve operating member 34. In this position the part 52 can be conveniently gripped by the fingers and turned when it is desired to change it from one adjusted position to another at such times as it may be desired to vary the rate of flow of the fluid to the nozzle by regulating the extent of movement of the tapered portion 29 in the fluid passage 30.

Means is provided for holding the adjustable regulator against accidental displacement from whatever position it may be adjusted to, for the purpose of limiting the operating movement of the valve. This means preferably comprises a ring-shaped member 53 surrounding the regulating member within the head 10 and having a yieldable or spring-like member 54 projecting therefrom and provided with a longitudinally extending V-shaped part 55, preferably formed integral with the member 54 by striking it outwardly therefrom. The part 55 is yieldably held in one of the grooves or notches 56 of an enlarged portion 57 of the regulator 50, as best shown in Fig. 6, but does not interfere with the proper adjustment of the regulator when sufficient pressure is employed to rotate the same in the desired direction. However, the frictional resistance offered by the V-shaped part 55 of the spring-like member 54 to rotation of the regulator is sufficient to prevent the latter from being accidentally turned or displaced through engagement with any moving parts which may accidentally contact with the finger grip 52 from time to time.

It will be noted that the grooved portion 57 of the regulator and the spring-like member 54 engaging the same are housed in a recess 58 formed in the head 10 of the syringe whereby interference with the proper functioning of the yieldable member by external means is prevented during operation of the syringe.

By providing the valve with a relatively long and gradually tapered portion in the fluid outlet passage 30 said portion will, when being moved rearwardly in and from said passage, afford a very gradual increase in the size of the opening through which the fluid is permitted to flow from the valve chamber to the nozzle. This will result in a smooth, even and gradually increased flow of the fluid with a resultant gradual increase in the size of the stream discharging in the mouth of the patient at each operation of the valve, as distinguished from the usual and objectionable

rapid increase in the rate of flow when using the ordinary type of valve.

I claim:

1. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a nozzle connected with said body portion and communicating with said outlet passage, a valve in said chamber for closing said outlet passage including a tapered extension movable within the outlet passage when opening the valve whereby to provide for a gradual increase in the flow of the fluid through the outlet passage to the nozzle, operating means for the valve, and means adjustable on said body portion for cooperation with said operating means to vary the extent of movement of the valve operated thereby whereby to vary the rate of discharge of the fluid to the nozzle under different operating conditions.

2. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a nozzle connected with said body portion and communicating with said outlet passage, a valve in said chamber for closing said outlet passage including a tapered extension movable within the outlet passage when opening the valve to provide for a gradual increase in the flow of the fluid through the outlet passage to the nozzle, operating means for the valve, means adjustable on said body portion for cooperation with said operating means to vary the extent of movement of the valve operated thereby whereby to vary the rate of discharge of the fluid to the nozzle under different operating conditions, and yieldable means associated with said adjustable means for holding it against accidental displacement from its different positions of adjustment.

3. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a nozzle connected with said body portion and communicating with said outlet passage, a valve in said chamber for closing said outlet passage including a tapered extension movable within the outlet passage when opening the valve to provide for a gradual increase in the flow of the fluid through the outlet passage to the nozzle, operating means for the valve, an element threadedly mounted on said body portion for adjustment to different positions relative thereto and for cooperation with said operating means to vary the extent of movement of the valve operated thereby whereby to vary the rate of discharge of the fluid to the nozzle under different operating conditions, said element having a series of grooves formed therein, and a yieldable member secured on said body portion and having a part for engaging said element within said grooves to hold the element against accidental displacement from the different positions to which it is adjusted.

4. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a nozzle connected with said body portion and communicating with said outlet passage, a valve in said chamber for closing said outlet passage including a tapered extension movable withinthe outlet passage to afford a gradual increase in the flow of the fluid to the outlet passage when opening the valve, operating means for the valve, an element extending through said body portion and rotatably adjustable therein for cooperation with the valve operating means to vary the extent of movement of the valve whereby to vary the rate of flow of the fluid to the nozzle under different operating conditions, said body portion having a recess formed therein around said element, and a member housed in said recess and having a yieldable part frictionally engaging said element within the recess to prevent accidental displacement thereof.

5. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a nozzle connected with said body portion and communicating with said outlet passage, a valve in said chamber for closing said outlet passage including a tapered extension movable within the outlet passage to afford a gradual increase in the flow of the fluid to the outlet passage when opening the valve, operating means for the valve, an adjustable element threaded in said body portion and extending on opposite sides thereof, one end of said element having an operating portion and the other serving to engage the operating means to limit the extent of movement of the valve when opening the same, said body portion having a recess formed therein around said adjustable element and the latter having a plurality of abutments formed thereon, and yieldable means disposed within said recess and cooperating with said abutments to prevent accidental displacement of said adjustable element.

6. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve in said chamber including a tapered extension movable within said outlet passage when opening the valve whereby to provide for a gradual increase in the flow of the fluid through the outlet passage, a casing connected with said body portion and communicating with said outlet passage, a nozzle connected with said casing and communicating therewith, an electric heater within the casing for heating the fluid discharging therethrough to the nozzle, circuit connections for the heater, a normally open switch interposed in said connections, and means including relatively movable telescoping parts actuated by the valve operating means for closing the switch in advance of movement of the valve to full open position.

7. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve movable in said chamber to open and close said outlet passage, operating means for the valve, a casing connected with said body portion and communicating with said outlet passage, a nozzle connected with said casing and communicating therewith, an electric heater within the casing for heating the fluid discharging therethrough to the nozzle, circuit connections for the heater, a normally open switch interposed in said connections, and means actuated by the valve operating means for closing the switch in advance of movement of the valve to full open position, said switch closing means comprising parts mounted for movement one upon another and having resilient means therebetween for moving one of the parts to normal position relative to another upon return of the valve operating means to normal position.

8. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve movable in said chamber to open and close said outlet passage, operating means for the valve, a casing connected with said body portion and communicating with said outlet passage, a nozzle connected with said casing and communicating therewith, an electric heater within the casing for heating the fluid discharging therethrough to the nozzle, cir-

cuit connections for the heater, a normally open switch interposed in said connections including a resilient closing element automatically returning to normal position upon release, and a device actuated by movement of the valve operating means for moving said element to closing position in advance of movement of the valve to full open position comprising relatively movable parts having resilient means for moving one of the parts to normal position and another of said parts being returned to normal position by said resilient element upon return of the valve operating means to normal inoperative position.

9. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve movable in said chamber to open and close said outlet passage, operating means for the valve extending laterally from said body portion, a casing connected with said body portion and communicating with said outlet passage, a nozzle connected with said casing and communicating therewith, an electric heater within the casing for heating the fluid discharging therethrough to the nozzle, circuit connections for the heater within said body portion, a normally open switch interposed in said connections within said body portion including a movable closing element, operating means for said closing element comprising relatively movable parts interposed between said element and a portion of the valve operating means for operation by the latter when opening the valve, and resilient means tending to move said parts in opposite directions and operating to return one of said relatively movable parts to normal position upon return of the valve operating means to normal inoperative position.

10. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve movable in said chamber to open and close said outlet passage, operating means for the valve extending laterally from said body portion, a casing connected with said body portion and communicating with said outlet passage, a nozzle connected with said casing and communicating therewith, an electric heater within the casing for heating the fluid discharging therethrough to the nozzle, circuit connections for the heater within said body portion, a normally open switch interposed in said connections within said body portion including a movable closing element, operating means for said closing element comprising telescoping parts movable one upon another between said movable closing element and a portion of said valve operating means, said telescoping parts having resilient means therein for returning the parts to normal position upon return of the valve operating means to normal valve closing position, and guide means on said body portion for one of said telescoping parts.

11. A syringe comprising a body portion provided with a valve chamber having fluid inlet and outlet passages, a valve movable in said chamber to open and close said outlet passage, operating means for the valve including a stem extending laterally from the body portion and having an operating part thereon, a casing connected with said body portion and communicating with said outlet passage, a nozzle conected with said casing and communicating therewith, an electric heater within the casing for heating fluid discharging therethrough to the nozzle, circuit connections for the heater within said body portion, a normally open switch interposed in said connections within said body portion including a resilient closing member for the switch extending longitudinally of said body portion, a sleeve extending laterally from said body portion opposite said closing member, inner and outer operating members for said closing members disposed in said sleeve, one engaging said resilient closing member and the other engaging the operating part on said valve stem, said operating members being actuated by said operating part when opening the valve, and a spring interposed between said inner and outer operating members for moving one to normal position relative to another upon return of the valve to closed position.

12. A syringe comprising a casing having a fluid passage and having a nozzle connected therewith, a valve normally closing said passage, actuating means for the valve extending from the casing, an electric heater within the casing for heating the fluid, circuit connections for the heater, a normally open switch interposed in said connections including a movable contact member, and means extending from the casing for moving said contact member to closed position comprising a resilient element operated under tension by the valve actuating means to effect closing of the switch in advance of movement of the valve to full open position, the valve actuating means operating upon further movement of the valve thereby to increase the tension of said resilient element, the latter facilitating return of the valve to closed position upon releasing the valve actuating means.

13. A syringe comprising a casing having a fluid passage and having a nozzle connected therewith, a valve normally closing said passage, operating means for the valve extending from the casing, an electric heater within the casing for heating the fluid, circuit connections for the heater, a normally open switch interposed in said connections including a movable contact member, and means extending from the casing for moving said contact member to closed position comprising relatively movable parts movable one longitudinally of another, said parts responding to inward movement of the valve operating means to effect closing of the contact member in advance of movement of the valve to full open position and one of the parts further responding to the valve operating means during inward movement thereof subsequent to the closing of the switch.

ALPHONSE F. PIEPER.