

[54] INJECTOR APPARATUS

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389, 148; 137/240; 239/304, 305, 307, 104,
112, 113, 414; 251/75

[56]

References Cited

UNITED STATES PATENTS

1,090,863	3/1914	Kelley	239/305 X
2,921,582	1/1960	Sadd	128/173
3,240,225	3/1966	Barrows	137/240
3,292,621	12/1966	Banker	128/173
3,366,279	1/1968	Parker, Jr. et al.	222/144.5 X

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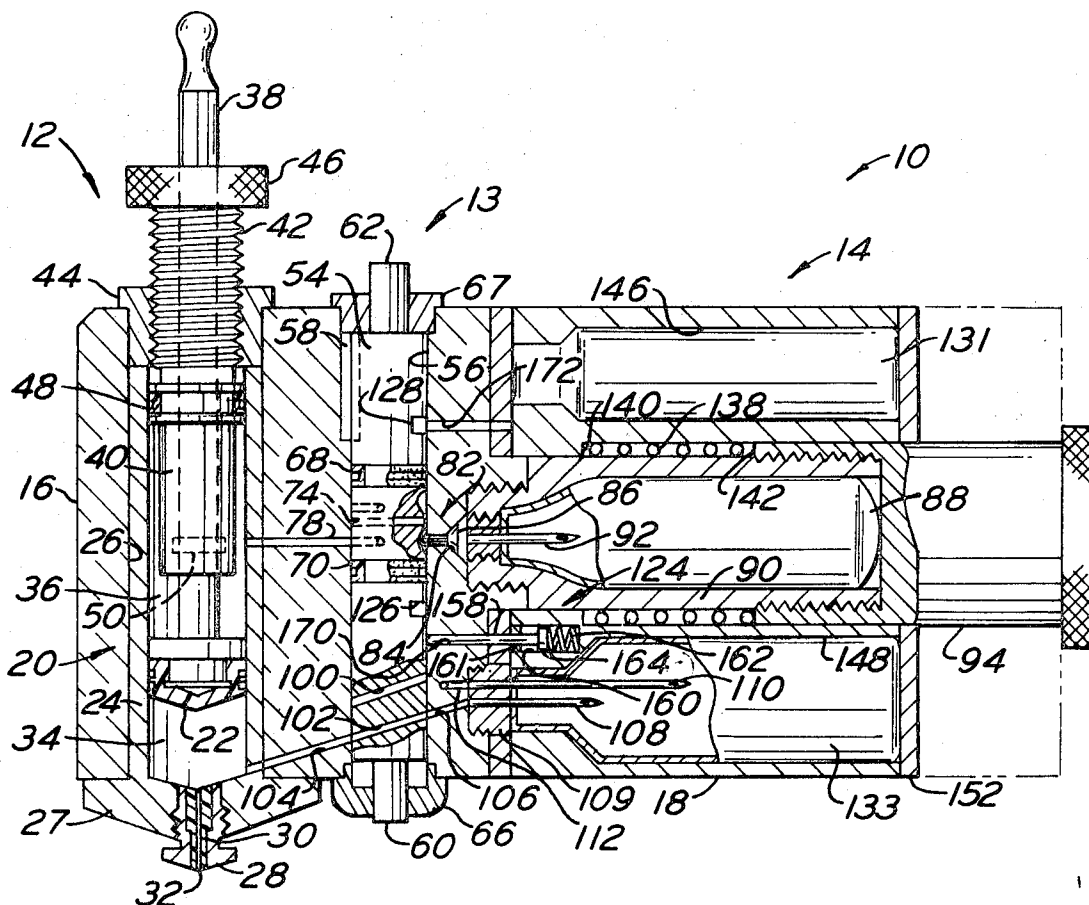
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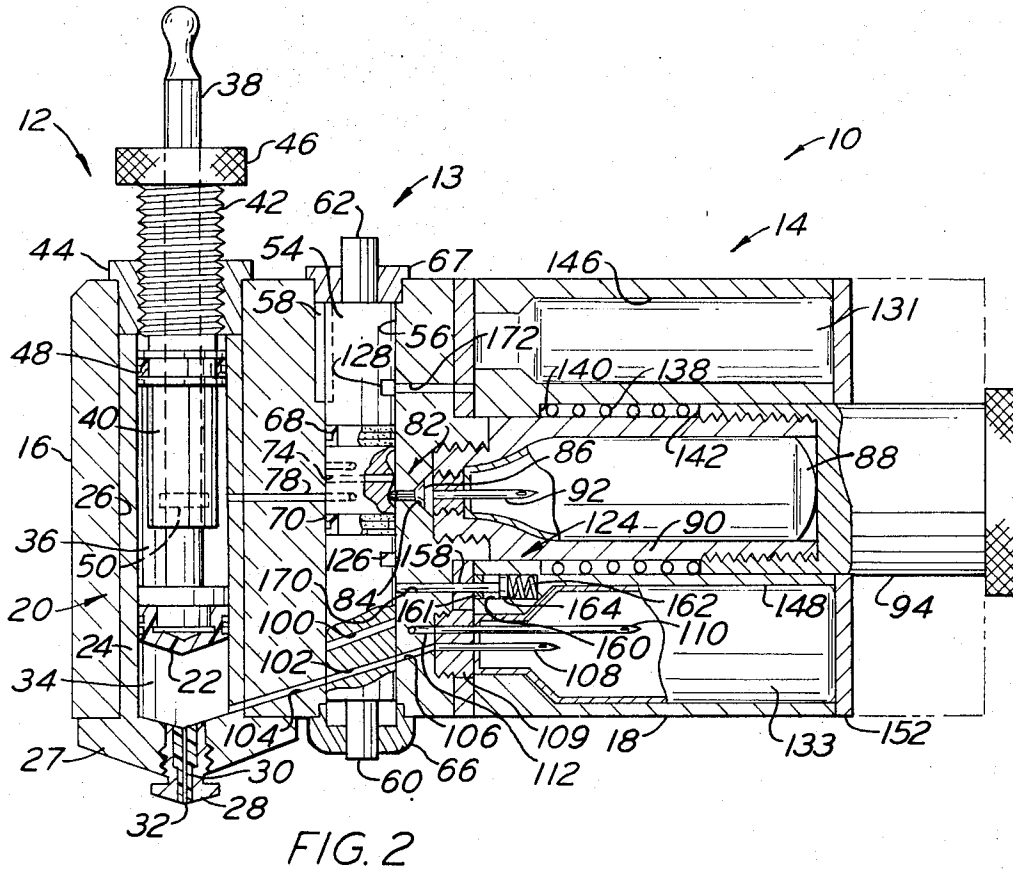
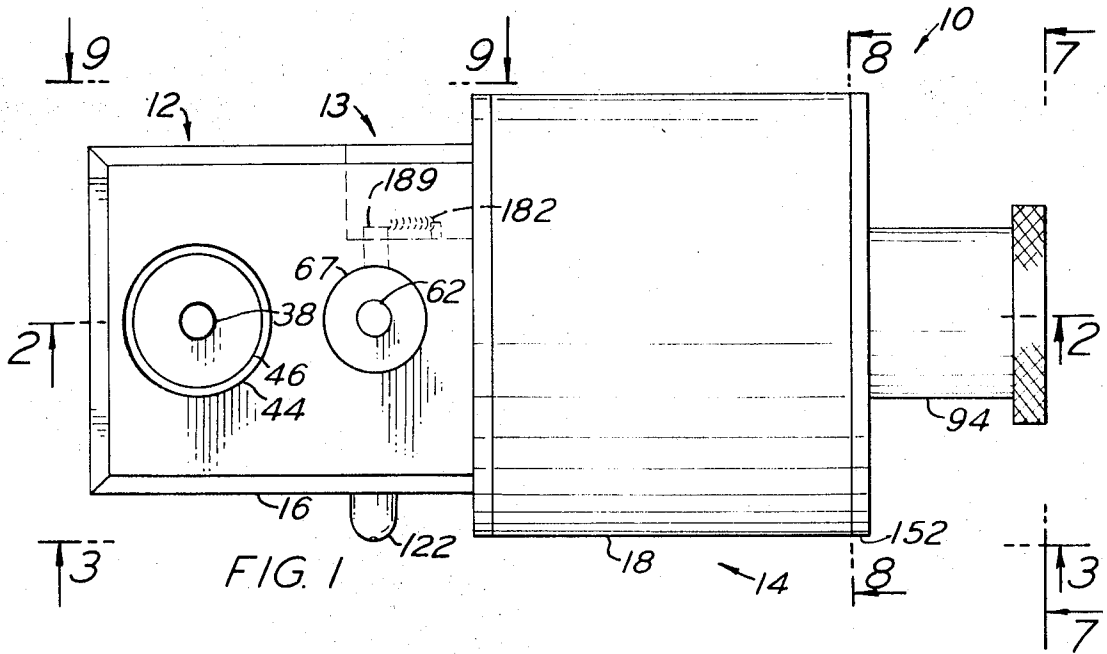
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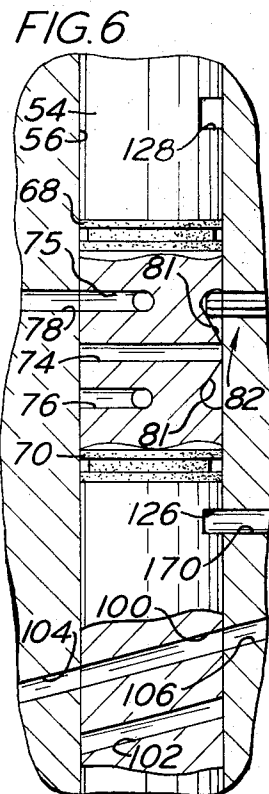
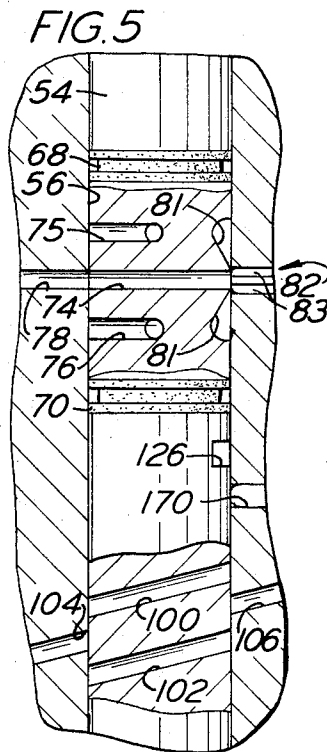
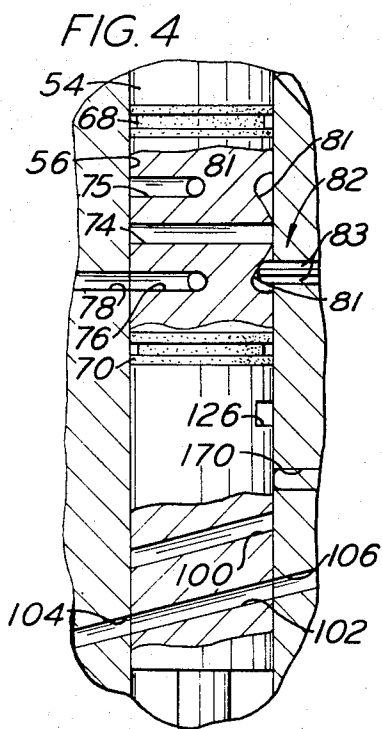
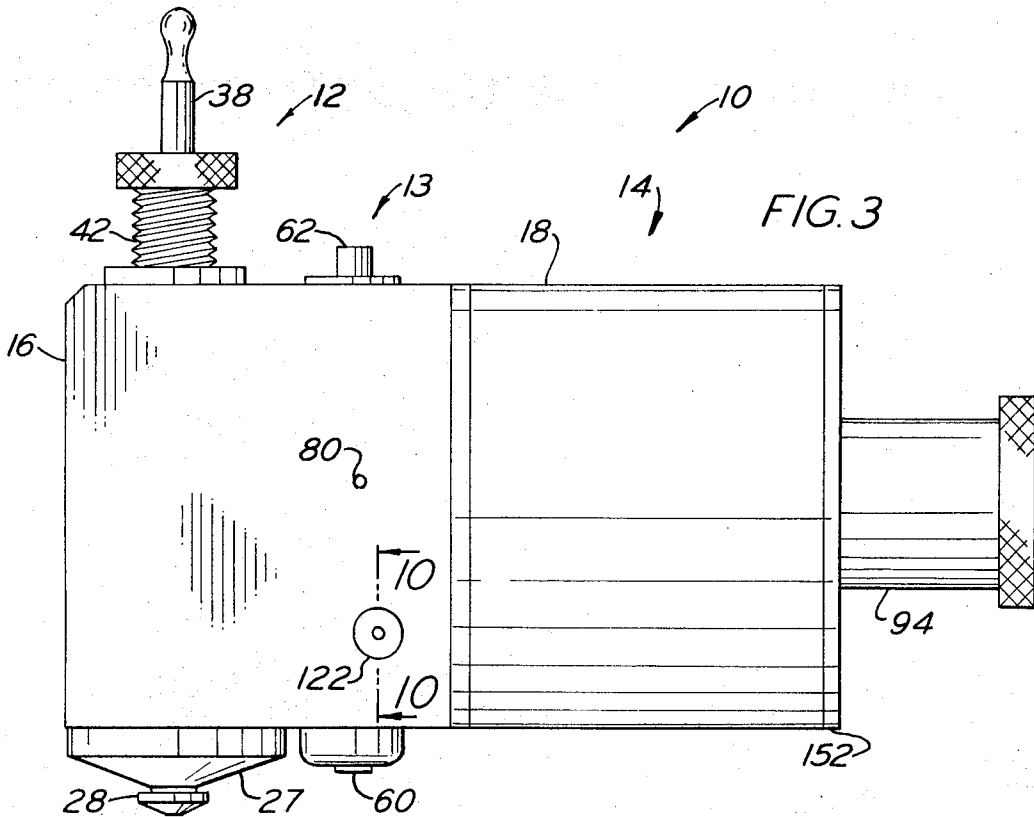
[57] ABSTRACT

The specification and drawings disclose an apparatus for dispensing or injecting substances such as medications. The disclosed apparatus includes a dispensing chamber associated with a source of pressurized fluid which can serve to expel substances from the chamber. A movable housing or the like is provided for containing first and second different substances which, in the case of medicament injection, are preferably medicament and cleaning fluid. Flow of the substances to the chamber is regulated by a valve assembly. Additionally, a control assembly is provided for requiring that the second substance be supplied to the chamber following a predetermined number of expulsions of the first substance. In the particular embodiment disclosed, the first substance is the medicament and the second substance is the cleaning fluid. This arrangement thus prevents repeated uses of the device for ejecting medicament without a cleaning operation.

13 Claims, 11 Drawing Figures







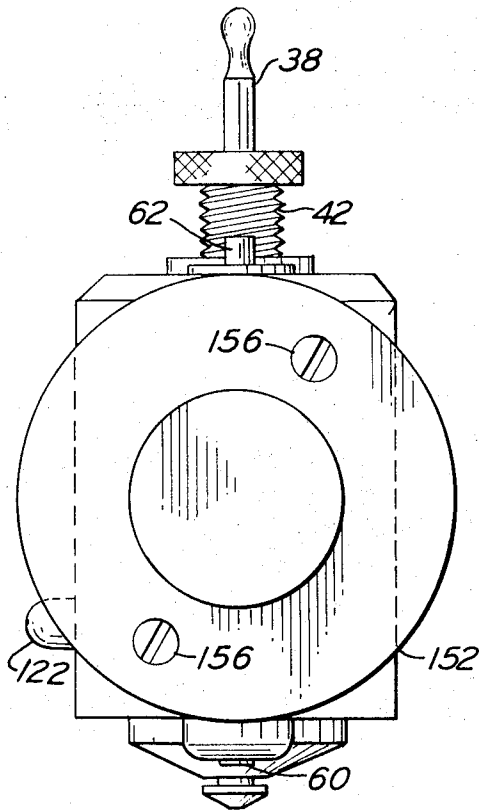


FIG. 7

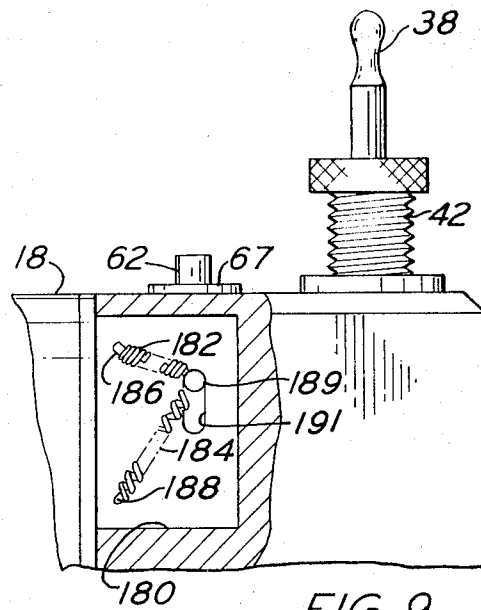


FIG. 9

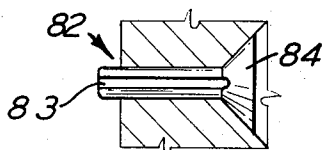


FIG. 11

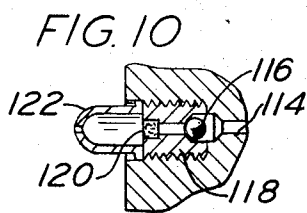


FIG. 10

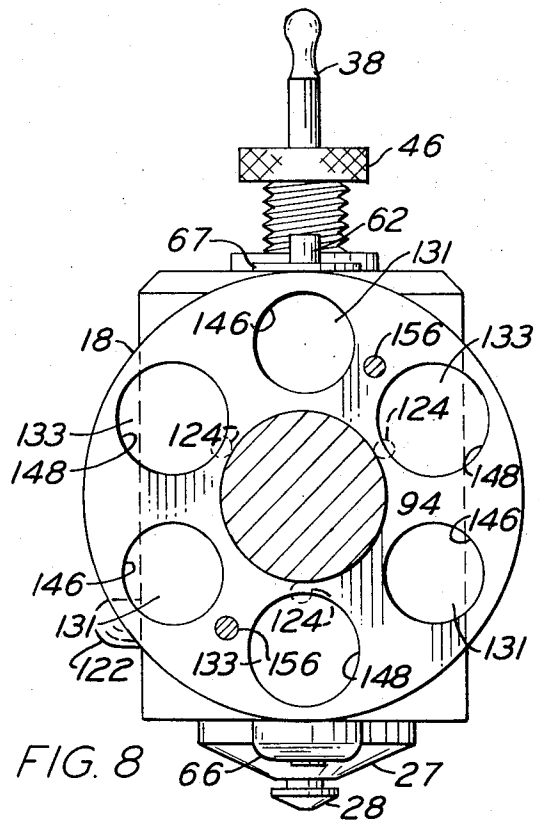


FIG. 8

INJECTOR APPARATUS

The subject invention is directed toward the dispensing art and, more particularly, to a self-contained apparatus for dispensing high velocity streams of substances.

The invention is particularly suited for use in injecting medicaments and the like and will be described with reference to an injector of the general type generally referred to as a "velocity" injector; however, as will become apparent, the apparatus could be used for dispensing or injecting other types of fluids, or flowable substances.

Self-contained "velocity" type medicament injectors are known. Typically, the injectors comprise a chamber having an outlet nozzle and a movable piston for expelling medicament from the chamber and through the nozzle. Generally, small CO₂ cartridges or the like are used for supplying a relatively high gas pressure for moving the piston. Control valves regulate the supply of gas to the piston.

One of the problems present in prior velocity-type injectors has been the difficulty of cleaning them following a medicament injection operation. Because of the small passages and the enclosed chamber, it has generally been necessary to substantially completely disassemble the units for cleaning. This has been a difficult and time consuming job and, for this reason, velocity-type injectors of the smaller self-contained variety have not been widely used.

The subject invention provides an injector of the general type described wherein both the medicament and cleaning fluid are carried within the unit and arranged so that cleaning must take place following a predetermined number of medicament injections. The invention is preferably arranged so that a cleaning operation is required following one or more medicament injections.

The invention also provides an improved control arrangement between the cleaning-medicament supply sources and the dispensing chamber so that a differential rate of firing for the cleaning and medicament fluids can be provided so that when the cleaning fluid is being dispensed from the chamber, it will not be under sufficient pressure for a great enough time to allow penetration of the skin.

In accordance with one aspect of the invention, there is provided an apparatus for dispensing substances which includes a dispensing chamber associated with means for containing a source of pressurized fluid which can serve to expel substances from the chamber. Additionally, movable means in the form of a housing or the like are provided for containing first and second different substances which, in the case of a medicament injector, are preferably medicament and cleaning fluid. Located at a first location are means which serve to connect the substances with the chamber. Flow of the substances to the chamber is regulated by valve means associated with the conducting means. Additionally, means are provided for requiring that the second substance be supplied to the chamber following a predetermined number of expulsions of the first substance. In the particular embodiment disclosed, the first substance is the medicament and the second substance is the cleaning fluid. This arrangement thus prevents repeated uses of the device for ejecting medicament without a cleaning operation.

Preferably, and in accordance with a more limited aspect of the invention, the movable means comprise a rotatable housing in which the first and second different substances are carried in separate removable capsules or cartridges. The means for requiring that the second substance be supplied to the chamber after a predetermined number of expulsions of the first substances include means interconnected between the movable cylinder and the valve means. These means are disclosed in the drawings as pin members associated with the movable means and adapted to engage the valve means following its movement.

A further aspect of the invention concerns the provision of means for providing a differential firing rate so that the supply of gas pressure to the chamber can be different, depending upon the particular fluid being expelled. For example, when used as a medicament injector, the differential firing rate permits the medicament to be expelled at one velocity and the cleaning fluid at another. This serves as a safety mechanism for preventing inadvertent injection of cleaning fluid into the body.

Another aspect of the invention contemplates that the cleaning fluid and the medicament will be drawn into the dispensing chamber by manual movement of a piston carried in the chamber. Alternately, other aspects of the invention contemplate that it would be possible to utilize pressurized containers of cleaning fluid so that cleaning fluid is flushed through the unit automatically upon operation of the control valve. Another somewhat limited aspect of the invention contemplates that the movable cylinder which carries the medicament and cleaning fluid will be arranged with cleaning fluid and medicament at alternate locations so that cleaning must be carried out following each medicament injection.

A still further, somewhat limited aspect of the invention is directed to the use of a single slide valve member for controlling gas, cleaning fluid, and medicament supplied to the injection chamber. This valve is preferably interlocked with the movement of the medicament and cleaning fluid supplies.

Accordingly, a primary object of the invention is the provision of a velocity-type injector apparatus wherein plural different fluids can be dispensed with means that require one fluid to be dispensed following a predetermined number of injections or expulsions of another substance.

A further object of the invention is the provision of an apparatus of the type described wherein the rate of dispensing of the fluids can be varied.

A still further object is the provision of an apparatus of the type described wherein the dispensing means includes means for varying the quantity of fluid dispensed as well as its velocity.

The above and other objects and advantages will become apparent from the following description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a top view of a medicament injector formed in accordance with a preferred embodiment of the subject invention;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1 and showing in some detail the internal operating mechanisms of the injector;

FIG. 3 is a left side elevation (taken on line 3—3) of the injector shown in FIG. 1;

FIGS. 4 through 6 are enlarged views of the valve member showing it in various positions of movement;

FIG. 7 is an end view of the injector taken on line 7—7 of FIG. 1;

FIG. 8 is a cross-sectional view through the medicament and cleaner portion of the injector and taken on line 8—8 of FIG. 1;

FIG. 9 is a partial side elevational view taken on line 9—9 of FIG. 1 with portions broken away to show the over-center mechanism used for controlling valve operation;

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 3 and showing the details of one of the check valve mechanisms; and,

FIG. 11 is an enlarged view of one of the valve mechanisms of the unit.

THE UNIT IN GENERAL

Referring more particularly to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting the same, FIGS. 1 and 2 best illustrate the overall arrangement of the injector unit 10 which broadly includes a variable volume injector chamber assembly 12, a valving or control assembly 13 and medicament-cleaning fluid supply assembly 14.

The unit 10 is shown in the drawings somewhat larger than the preferred actual size. However, it should be appreciated that not only the size, but the configuration and structural details of the device could vary substantially within the scope of the invention.

In the embodiment shown, the assemblies 12 and 13 are carried in a first body or housing member 16 which can be formed from any suitable material or combinations of materials, either metals, plastics or ceramics. The medicament-cleaning fluid supply assembly 14 is, in the subject embodiment, mounted from the first body portion 16 for movement relative thereto. Preferably, the assembly 14 is rotatably mounted and includes a cylindrical body or housing 18 carried for rotation generally about the longitudinal center axis of the unit. The details of section 14 will subsequently be described.

Before dealing with the more specific aspects of the unit, it should be understood that the unit is arranged so that selective rotation of housing 18 allows medicament or cleaning fluid to be indexed to a position wherein they can be supplied through the valve assembly 13 to the injector chamber assembly 12.

INJECTION CHAMBER ASSEMBLY 12

Referring more particularly to the variable volume injection chamber assembly 12, it will be seen that it comprises an elongated cylindrical chamber 20. Chamber 20 is divided into two variable volume sections 34 and 36 by a reciprocable piston member 22. The chamber 20 is defined by a sleeve member 24 which is press-fitted in a bore 26 formed through the forward end of body portion 16. The lower end of sleeve 24 has an enlarged flange section 27 which engages the lower surface of body portion 16. The injection or outlet nozzle of the unit is removably mounted in the flange portion 27. Note that the nozzle 28 is threaded in a bore formed through flange portion 27. An insert 30 which defines the medicament outlet orifice 32 is press-fitted in nozzle 28. This arrangement allows the nozzles to be changed as required for different types of injections.

Additionally, the orifice defining insert in the nozzle member can be changed so that during manufacturing, one common nozzle can be used with different inserts to provide different nozzle assemblies with variable numbers and sizes of orifices.

It should be understood that all portions of the assembly which are contacted by medicament should preferably be formed from materials which will provide a non-wettable surface.

Referring again to piston 22, it will be seen that, as mentioned above, piston 22 divides the chamber 20 into a medicament chamber portion 34 and a pressurizing gas chamber portion 36. It should be appreciated that rather than a piston as shown, a movable diaphragm or the like could, in certain instances, equally well be used. In the embodiment under consideration, piston 22 is formed from a suitable elastomeric material and mounted for sealed, sliding movement within the sleeve 24. A stem member 38 is connected to the piston and extends axially upwardly through the chamber 36. The stem 38 is guided by a sleeve 40 which extends downwardly from an externally threaded adjustment member 42. Member 42 is threadedly received in a collar member 44 press-fitted in the upper end of bore 26. It should be appreciated that by rotating the knurled outer end flange 46 of the threaded member 42, the lower end of member 40 can be adjusted in a vertical direction to vary the upper limit of movement of the piston 22. This permits the volume of the medicament chamber section 34 to readily be controlled.

The upper chamber section 36 is supplied with gas or other pressurizing fluid at a pressure sufficiently high to drive the piston 22 downwardly to expel medicament from the chamber 34 at a desired velocity. For this reason, the gas chamber 36 is preferably sealed by a seal ring 48 which is carried on the upper end of member 40 and engages the internal walls of the sleeve 24. Similarly, a seal ring 50 is carried within member 40 and about the stem 38.

As can be appreciated, by controlling the supply of medicament to the chamber portion 34 and the supply of pressurized gas to the chamber portion 36, the medicament can be expelled through the orifice 32 at a velocity sufficiently high to penetrate to substantially any desired depth. Velocity and depth of penetration can, of course, be controlled by the pressure at which the gas is supplied, or the orifice size, etc.

The supply of medicament, cleaning fluid and pressurizing gas to the chamber 20 is controlled, as mentioned, by the assembly 13.

CONTROL ASSEMBLY 13

Referring in particular to FIGS. 2, and 4 through 6, the preferred form for control assembly 13 is shown, however, it should be appreciated that various other arrangements could be used. In the embodiment shown, the control assembly comprises a generally cylindrical slide valve member 54 which is mounted between the chamber assembly 12 and the cleaning-medicament supply assembly 14. The cylindrical slide valve 54 is carried for reciprocation in a cylindrical bore 56 formed vertically through the body portion 16. In the embodiment under consideration, the valve member 54 is permitted to have free sliding movement while being prevented from rotating by a key member 58 which is fitted in aligned grooves formed in the bore 56 and the valve member 54. At the opposite axial ends

of member 54, there are reduced diameter portions 60 and 62 which can be formed integrally with the main valve body or affixed thereto. It should be noted that the reduced diameter end portions extend outwardly through guide members 66 and 67 respectively. The guide members are preferably merely press-fitted in counterbores formed at the ends of the bore 56.

Although the operational details of the valve member 54 will subsequently be described in detail, it should be noted that, as best shown in FIGS. 2, 4, 5 and 6, the valve is provided with a pair of circumferentially extending seal or piston ring members 68 and 70. The seal rings can be formed from any suitable material but are preferably formed from Teflon. Positioned between seal rings 68 and 70 is a first through-bore 74 and a pair of spaced flow passages 75 and 76. A bore 78 connects through the body 16 with the chamber portion 36. By reciprocating the valve member 54, selected ones of passages 74 through 76 are connected with the passage 78. Referring to FIG. 3, it will be understood that the passages 74 and 75 extend laterally to connect with a vent passage 80 formed through body 16.

The right-hand end of passage 74 (as viewed in the drawings) has a cam surface 81 (see FIG. 4) formed generally about it. Cam surface 81 serves to operate a check or shut-off valve 82 which is carried in a bore 84. Note that valve 82 is arranged for reciprocation in the bore 84 and has an enlarged head 86 adapted to sealingly engage the conically shaped portion of bore 84. The stem portion of the valve 82 is provided with flow grooves 83 (see FIGS. 4 through 6) to permit flow about it when the head 86 is moved away from the conical portion of the bore. In the position shown in FIGS. 2, 4 and 6, the contour of the cam surface 81 permits the valve member 82 to be moved to the left under the influence of the gas pressure, thereby closing the passage or bore 84. However, when the valve member 54 is reciprocated from either of the positions shown in FIGS. 4 or 6, the inner end of the valve 86 is cammed to the right causing it to open and allowing flow of pressurizing gas through the bore 84.

As previously mentioned, the pressurizing gas supply for the unit is preferably a gas cartridge member 88 which is removably carried in the unit. For example, commercially available CO₂ cartridges can be used. As shown in the subject embodiment, the gas cartridge 88 is received in a generally cylindrical housing portion 90 (see FIG. 2) which is threadedly connected to the body portion 16. A needle member 92 is carried in the forward end of the housing 90 and serves to pierce the seal of the gas cartridge 88. As can be appreciated, the cartridge is removed and replaced from the unit by removal of the cylindrical end cover 94 which is removably connected to the outer end of the body portion 90 by cooperating threads. A knurled outer end flange facilitates removal of end cover 94.

Referring again to FIGS. 2, and 4 through 6, it will be seen that a pair of parallel passages 100 and 102 are formed through the lower end of the valve member 54. These passages are arranged to alternately connect a passage 104 (which leads to the medicament chamber 34) with a passage 106. Passage 106 is connected with a flow needle 108 carried in an insert 109 threaded in body 16 as shown in FIG. 2. For reasons which will subsequently be discussed, a second somewhat longer needle 110 is mounted parallel to needle 108 and connects through passage 112 and lateral passage 114 (see FIG.

10). Passage 114 is a vent passage and is connected to atmosphere through a small check valve 116 carried in a threadedly mounted insert 118. Insert 118 also includes a bacterial filter member 120. A small, perforated cover member 122 encloses the outer end of the valve insert 118.

Although their function will subsequently be described in detail, it should be noted that the unit includes safety lock assemblies 124 which are carried in the medicament-cleaner assembly 14 and cooperate with recesses 126 and 128 formed in the slide valve member 54.

THE CLEANING-MEDICAMENT SUPPLY ASSEMBLY 14

The cleaning-medicament assembly 14 of the unit is arranged so that separate containers of medicament and cleaner can be selectively brought into position for filling and/or cleaning the chamber portion 34. Additionally, one aspect of the invention proposes to interlock the operation of the (cleaning-medicament) supply assembly with the valve 54 so that cleaning fluid must be passed through the medicament chamber prior to each filling with medicament or after each shot. Further, the assembly is arranged to prevent inadvertent injection of cleaning fluid.

Broadly, in the preferred embodiment, the cleaning fluid and medicament are carried in separate disposable containers 131 and 133, respectively, which are arranged to be indexed to a location at which they can be selectively connected with the chamber portion 34. The indexing movement could be achieved with many different types of structures from simple slide-type cartridges to more complicated non-linear movement arrangements. In the subject embodiment, the medicament and cleaner are carried in the rotating cylinder-like housing member 18 which is mounted for rotation about the cylindrical body portion 90 and the cylindrical end cap 94. As best shown in FIG. 2, the housing member 18 is rotatable about the member 90 and, also, can be reciprocated axially outwardly to the dotted line position. A compression spring 138 is positioned between a shoulder 140 formed in the housing 18 and the end 142 of the cylindrical cap member 94. This maintains the cylinder continually biased to the left, as viewed in FIG. 2.

Referring to FIG. 8, it will be noted that the housing member 18 includes a plurality of spaced, longitudinally extending openings 146 and 148 which are spaced circumferentially about the cylinder. In the embodiment shown, the openings are alternately located so that, for example, each opening 146 will contain a container 131 of cleaning fluid, while each location 148 will contain a container of medicament 133. Preferably, the containers are of differing size or configuration so that a cleaner container cannot inadvertently be inserted in a medicament chamber or vice versa.

The medicament and cleaning fluid containers are maintained in the openings 146, 148 by a cover plate member 152 which is releasably connected to the housing 18 in any convenient manner, such as through the use of a pair of screws 156 (see FIGS. 7 and 8).

SAFETY LOCK 124

Referring again to the safety lock 124, it will be seen that, as best shown in FIGS. 2 and 8, a safety lock 124 including a pin member 158 is associated with each of

the medicament chamber openings 148. The pin members 158 are slidably mounted in bores 160 and continually biased in an outward direction by a compression spring 162. Guide members 161 are press-fitted in the ends of bores 160. An enlarged head portion 164 is formed on the pin 158 and prevents it from moving out of the bore 160. Formed in the body portion 16 are openings 170, 172 which are aligned with the slide valve bore 56. With the cylinder 18 in the position shown in FIG. 2, pin 158 extends through opening 170 until its inner end engages the slide valve member 54. However, when the slide valve 54 is at the downward end of bore 56, pin 158 will enter the recess 126 because of spring 162 to prevent the valve from being moved upwardly. The reasons for this interlock will subsequently be described with reference to the overall operation of the device. The interlock arrangement also contemplates that when the cleaning container is moved into the position in alignment with the needles 108 and 110, a diagonally opposite medicament chamber having a lock pin 158 will be in position with its pin aligned in opening 172. This minimizes the possibility of the valve member 54 from being moved downwardly for medicament fire operation. However, when the valve member 54 is in a down position of FIG. 6, (following a medicament firing) and the housing has been rotated to bring a cleaning cartridge into alignment with needles 108 and 110, the valve can thereafter to moved upwardly until the pin enters the recess 128. The reason for this will likewise be explained with reference to the overall operation of the device.

OPERATION OF THE UNIT

The operation of the unit can best be understood by reference to FIGS. 2, and 4 through 6. FIG. 2 shows the assembly at the start of a fill operation. The piston, however, is shown at mid-point between a fill and discharge operation. For the purposes of the subject explanation, assume that the piston is at the bottom of the cylinder. It should be noted that a medicament cartridge 133 is aligned with the needles 108 and 110. The needles, of course, extend through the seal on the medicament cartridge and allow its contents to be connected with passage 106. At this time, the piston operating shaft 38 can be pulling up, causing medicament to be withdrawn from the medicament cartridge 133 through lines 106, 102, and 104 to the chamber portion 34. The amount of medicament withdrawn from the cartridge is, of course, controlled by the adjustment of the sleeve 40. When the stem has been retracted to the position wherein the piston is in engagement with the undersurface of member 40, the apparatus is ready for firing. To fire the device, the outwardly extending reduced diameter portion 62 of the valve member 54 is pressed inwardly. This causes the cam surface 81 to open valve 82 (see FIG. 5) to permit pressurizing gas to pass through the bore 84, passages 74 and 78 to the upper gas pressurizing chamber 36 to drive the piston downward and expel the medicament through the discharge nozzle or orifice 32. After the passage 74 passes the valve 82, the second portion of the camming surface allows the valve 82 to close (see FIG. 6). Simultaneously, the gas pressure chamber 36 is vented to atmosphere by passage 75 being aligned with passage 78 and vent passage 80 (see FIG. 3).

When the valve member 54 is in its downward position, the pin 158 enters the recess 126 and prevents

movement of the valve to the upper position. The only way in which the valve can be moved to the upper position is by retracting the medicament/cleaner housing 18 to the dotted line position of FIG. 2 and then rotating it sufficiently to bring the adjacent cleaning cartridge in alignment with the needles 110 and 108. Thereafter, the housing 18 is released so that it moves to the left and needles 108 and 110 penetrate the seal of the cleaning cartridge. It must be remembered that, at this time, a medicament cartridge and its associated lock pin are in the position shown for the cleaner cartridge in FIG. 2. Accordingly, cleaning can now take place merely by retracting or withdrawing the piston stem 38 to pull cleaning fluid through the needle 108, passages 100 and 104 to the medicament chamber portion 34. The valve member 54 can then be moved upwardly by pressing against the reduced diameter lower end portion 60 and causing the camming surface 81 to pass over the end of the valve member 82 to allow pressurizing gas into the pressurized gas chamber 36. This expels the cleaning fluid from the medicament chamber to clean the nozzle. Any type of suitable cleaning fluid could be used. Alternately, rather than manually withdrawing the cleaning solution by retracting the stem 38, it should be appreciated that the cleaning solution (as well as the medicament) could be under a slight pressure so as to automatically discharge into the medicament chamber, as shown in FIG. 10.

After the valve stem has been moved back upwardly, the pin 158 which is at that time in passage 172, enters the groove 128 to prevent the apparatus from being fired again until a medicament chamber has been moved into position in alignment with the needles 108 and 110.

As can be appreciated, in many instances, it is desirable to have the movements of the valve member 54 controlled so that the duration of gas pressure application to the pressure chamber portion of the cylinder is regulated. Additionally, it is also desirable, in many instances, to arrange the control valve so that its opening movement is not completely dependent on the user's speed of actuation. For this reason, the valve is preferably provided with an over-center spring mechanism. Many types of over-center or snap acting mechanisms could be used, however, a preferred form of mechanism is shown in FIG. 9. As shown, the mechanism is mounted in a recess 180 formed in the side of the body portion 16. In general, the mechanism includes first and second compression springs 182 and 184 which are respectively connected to pins 186 and 188. Their opposite ends are connected to and act against a pin 189 which extends laterally from the valve member 54 through a slot 191. As the valve 54 is moved downwardly, the effective force components placed on pin 189 by the springs change because of the varying angles of application. At some mid-point, forces exerted by spring 182 overcome those exerted by spring 184. Thereafter, the valve is rapidly moved the remainder of the distance to the opposite position. Although not shown, adjusting means can be provided for varying the forces exerted by one or the other of the springs to change the point at which the over-center action takes place. Further, it should be appreciated that by using springs having different time constants, the rate of movement of the valve member can be regulated.

The invention has been described in great detail sufficient to enable one of ordinary skill in the art to make

and use the same. Obviously, modifications and alterations of the preferred embodiment will occur to others upon a reading and understanding of the specification and it is our intention to include all such modifications and alterations as part of our invention insofar as they come within the scope of the appended claims.

What is claimed is:

1. In a velocity type injector including a chamber from which a substance can be expelled by the use of a pressurized fluid, a source of said pressurizing fluid connected to said chamber by a first passageway, and movable means for selectively moving at least a first source and a second source of different substances to a supply position wherein they are connected with said chamber through a second passageway, the improvement comprising control valve means in said first and second passageways operable in at least two directions for regulating flow of a substance from said supply position through said second passageway to said chamber and for regulating flow of said pressurizing fluid through said first passageway to said chamber and lock means for preventing movement of said valve means in one of said two directions when said first source is at said supply position and after said first source has been supplied to said chamber.

2. The injector as defined in claim 1 wherein operation of said lock means is interrelated with said movable means.

3. The valve as defined in claim 1 wherein said lock means includes means for preventing movement of said valve means until said movable means has been moved to bring the second source of substance to said supply position.

4. The valve as defined in claim 1 wherein said lock means engages said valve means at the end of movement in either of said at least two directions.

5. In a velocity-type injector having separate supplies of medicament and cleaning fluid and a source of pressurized gas and passage means for connecting said supplies and said gas to a chamber wherein said supplies can be expelled by said pressurized gas supplied to said chamber, the improvement comprising valve means for regulating the flow of gas and fluid to said chamber through said passage means, and control means for requiring that cleaning fluid be supplied to

said chamber following a selected number of discharges of medicament fluid.

6. The injector as defined in claim 5 wherein said control means includes means for preventing movement of said valve means following movement of said valve means in one direction until a different one of said supplies has been connected to said chamber.

7. The valve as defined in claim 5 wherein said medicament and cleaning fluid supplies are carried in movable means and wherein said control means are operated by movement of said movable means.

8. The injector as defined in claim 5 wherein said valve means comprise a slide valve member and wherein said medicament and cleaning fluid supplies are carried in movable means.

9. The valve as defined in claim 8 wherein said control means includes a lock member engageable with said slide valve and operable by said movable means.

10. The valve as defined in claim 8 wherein means are provided for controlling the velocity of movement of said slide valve member.

11. The valve as defined in claim 10 wherein said means for controlling the velocity of said slide valve member comprise over-center spring means.

12. The valve as defined in claim 8 wherein said lock means include at least one pin member carried in said movable means and engageable with said slide valve member.

13. An apparatus for dispensing substances comprising:

- means defining a dispensing chamber;
- means for containing a source of pressurized fluid for expelling substances from said chamber;
- movable means for holding first and second different substances;
- conducting means located at a first position for connecting said substances to said chamber, valve means for regulating connection of said conducting means with said chamber; and,
- means for requiring that said second substance be supplied to said chamber after said first substance has been supplied to said chamber for a predetermined number of consecutive times.

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