

[54] **MEDICAMENT INJECTION DEVICE**

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[52] U.S. Cl. **128/173 H; 128/218 G; 222/325**

[51] Int. Cl.² **A61M 5/30**

[58] Field of Search **128/173 H, 215, 128/218 G, 218 DA, 218 R, 272, 2 F; 222/325; 141/383-386, 18, 19, 329, 330; 285/322; 184/105 A, 26**

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Primary Examiner—Richard A. Gaudet

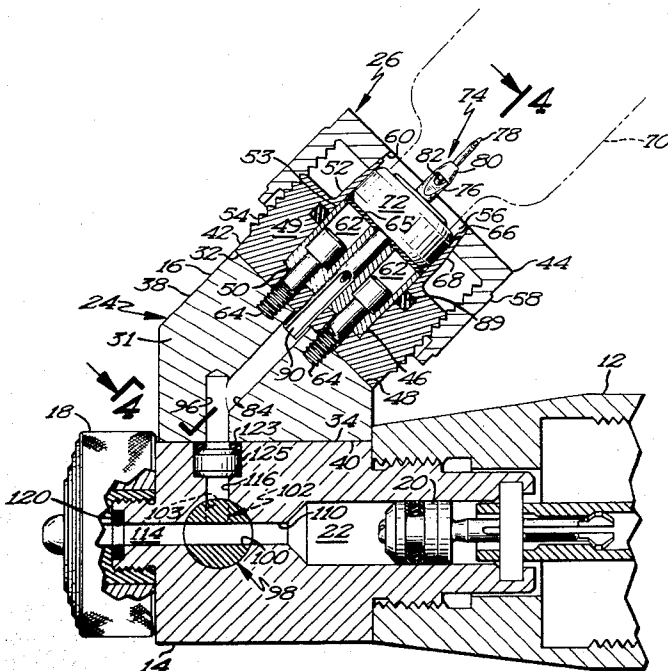
Assistant Examiner—Henry J. Recla

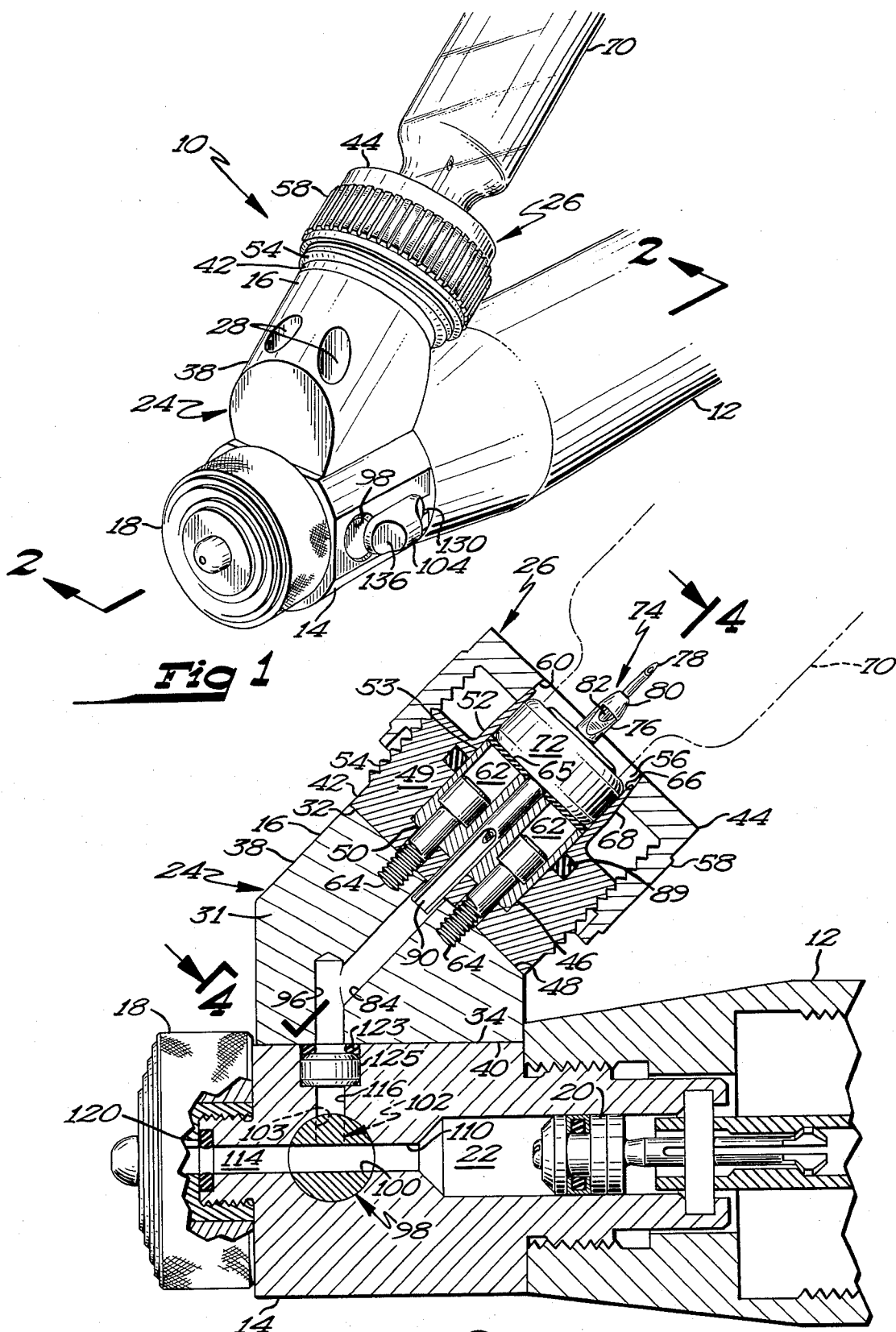
Attorney, Agent, or Firm—Wicks & Nemer

[57] **ABSTRACT**

A device for injecting medicament without the use of a needle is disclosed wherein medicament is expelled from the device at high pressure, caused to break the skin of a patient, and appropriately forced into the patient's body. A preferred embodiment of the present invention is a jet injector having a piston slidably movable within a medicament chamber to selectively change the volume of the medicament chamber and a mechanism for advancing the piston including releasably held springs which may be compressed by a winding mechanism or pressurized fluid. Medicament is provided to the medicament chamber from a medicament container mounted on the injector by a container holder assembly including flexible fingers that can be caused to grasp the pierceable cap of the medicament container. Medicament is then selectively directed from the medicament container to the medicament chamber by valving which, in a first position, interacts with a safety to provide air to the medicament container during the filling of the medicament chamber and, in a second position, allows injection into the patient while the safety prevents movement of the valve member from the second position during injection and simultaneously blocks air communication to the medicament container.

14 Claims, 8 Drawing Figures





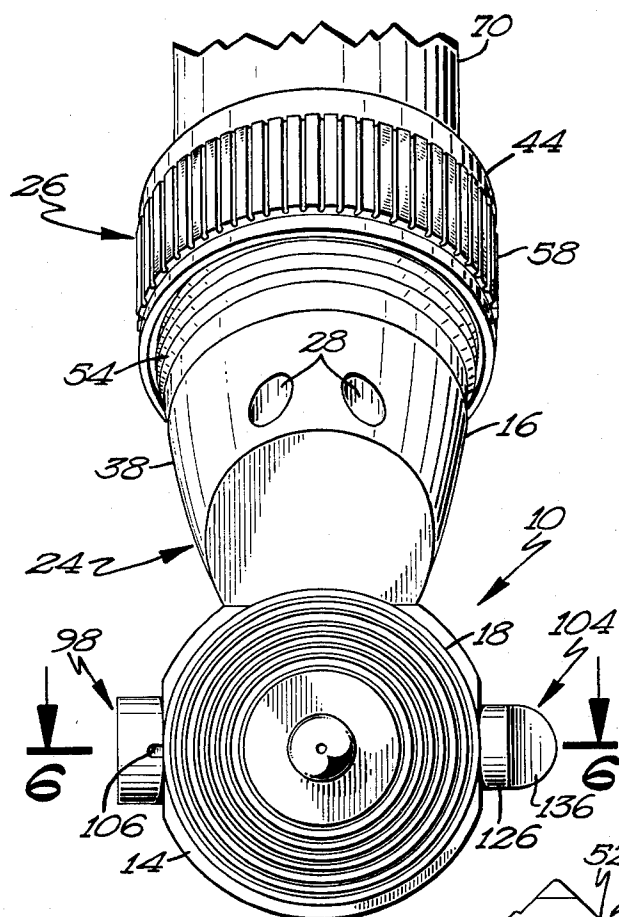


Fig 3

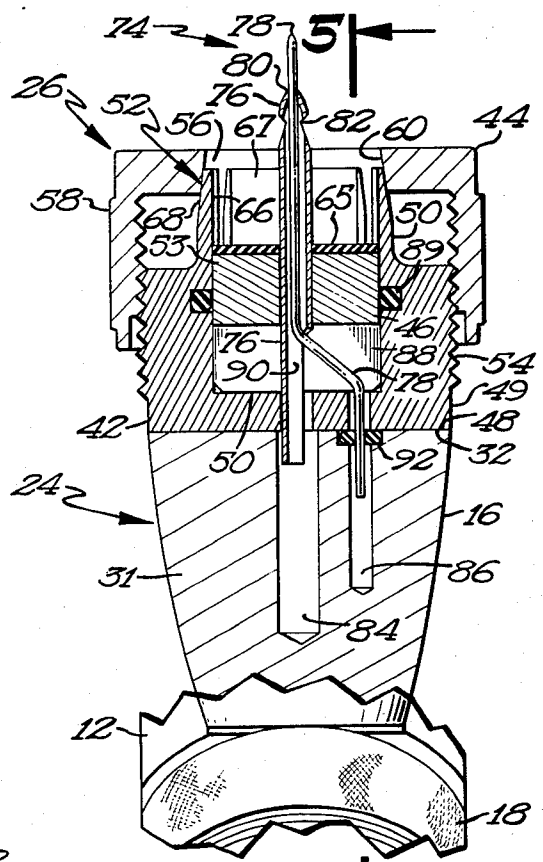


Fig 4

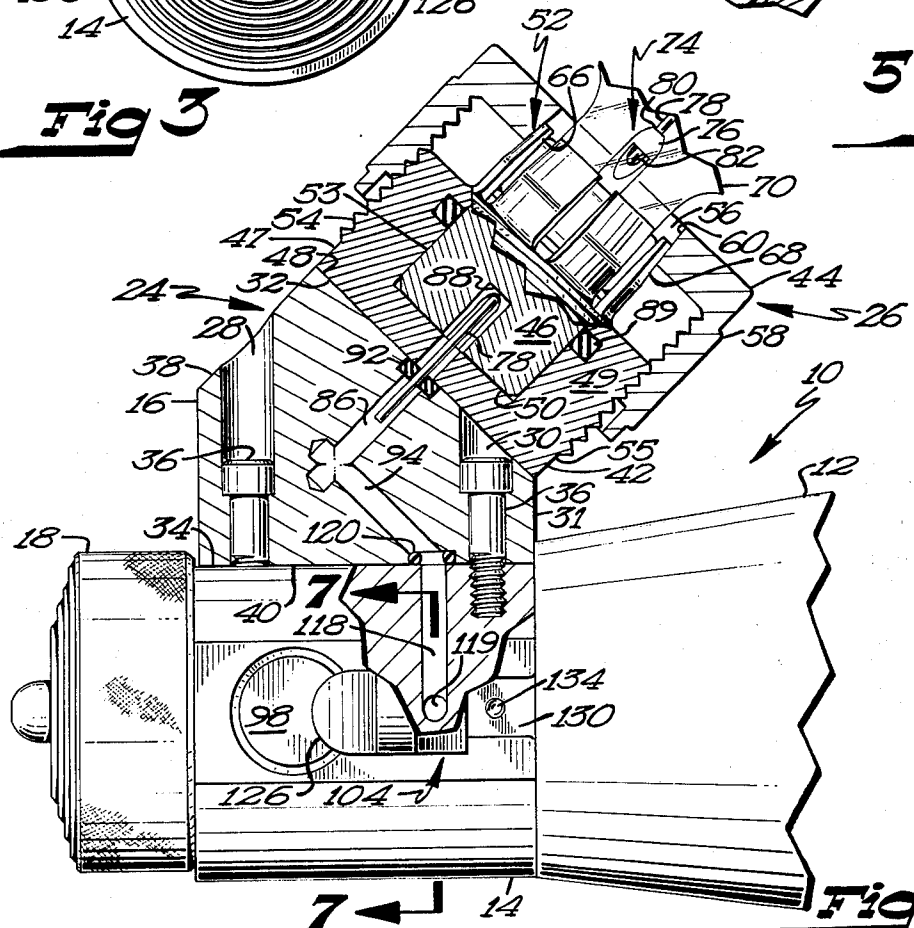
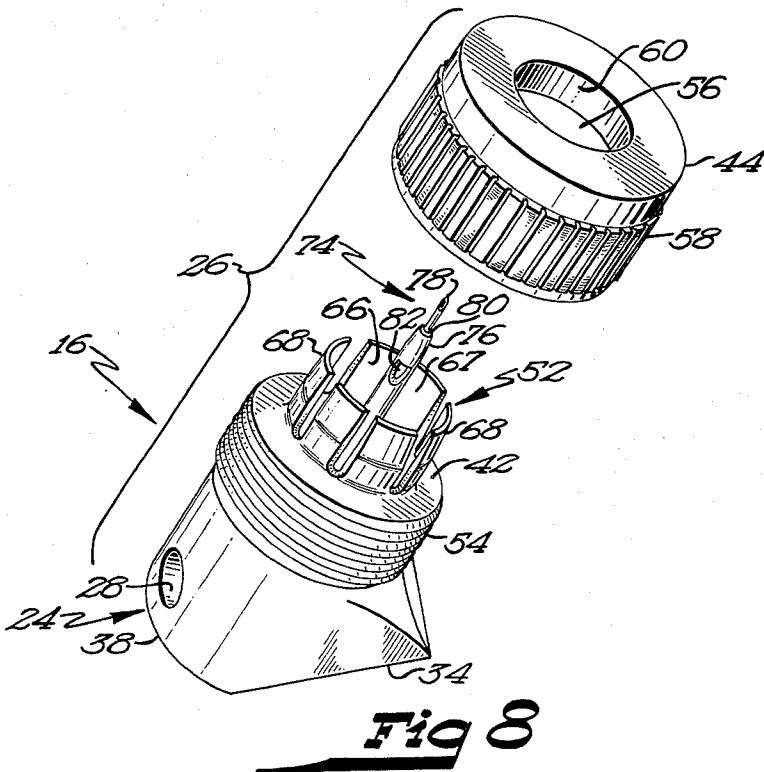
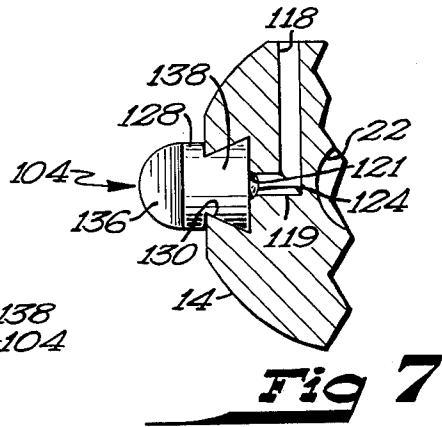
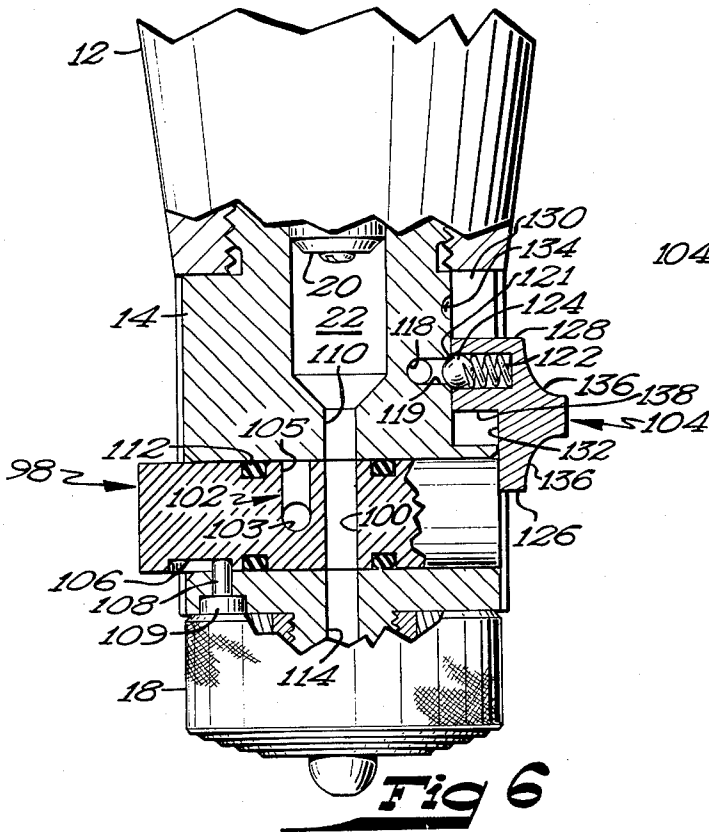


Fig 5



MEDICAMENT INJECTION DEVICE

BACKGROUND

This invention relates generally to devices for injection of medicament and more specifically to devices for injection of medicaments through the use of jet injection.

Many people require daily amounts of medicament to combat various illnesses, such as the daily dosages of insulin required for a person suffering from diabetes. Thus far the majority of these medicaments are required to be administered by daily injections. Therefore, many people have learned to inject themselves with medicament through the use of a common needle syringe.

Injectors of the type not utilizing a needle have been used to overcome the undesirable characteristics of needle syringes, such as the reluctance of some persons to self inject, scarring, and general esthetics. With the advent of one of these needleless devices, hypodermic jet injectors, and the increasing popularity of their use by medical personnel and nonmedical personnel, including children, there exists an increasing need for improved hypodermic jet injectors.

The present invention provides such an improved device for the jet injection of medicaments.

SUMMARY

Briefly, an injector according to a preferred embodiment of the present invention includes: a piston slidable within a medicament chamber; several springs, operatively connected to the piston which may be compressed upon retraction of the piston; mechanism which can be used to compress the springs; a trigger mechanism which can selectively release the energy in the springs thus advancing the piston to force the medicament from the medicament chamber and through a control nozzle; a container mounted upon the injector to store medicament; and a valve member which can selectively direct the medicament from the container to the chamber.

A safety mechanism is further provided to perform a dual purpose in that it interacts with the valve member and with the air flow to the medicament container. In a first position, the safety blocks the outlet of an air passageway formed in the valve body, thus sealing the air passageway from the outside air to prevent contamination of the medicament in the container. Simultaneously the safety locks the valve member in the proper position to administer medicament. In a second safety position, the safety is moved from the outlet of the air passageway such that the interior of the medicament container communicates with the outside air thus enabling air to enter the medicament container and allow filling of the medicament chamber. The second position of the safety also allows the valve member to be moved to a position allowing fluid communication between the medicament container and the medicament chamber.

Thus, when the injector is to be filled, the safety is moved to a second position and the valve member is moved to the fill position. Medicament can then be drawn from the medicament container into the injector and is replaced by air drawn from the atmosphere through the open air passageway into the container. When the medicament chamber within the injector is filled, the valve member is moved to the position allow-

ing injection, and the safety is moved to the first position, thereby blocking the air passageway and preventing movement of the valve member from the injection position.

A container holder mechanism is also provided for mounting a medicament container on the injector. The container holder mechanism includes a container retainer having flexible fingers forming a chamber for receiving the pierceable cap of a medicament container such that when the cap of the container is placed in the chamber, the fingers may be flexed against the cap by a retainer ring to thereby secure the container in the container holder mechanism.

It is thus an object of the present invention to provide an improved medicament injection device.

It is a further object of the present invention to provide such a device of relatively simple design such that it can be used by unskilled practitioners, including children, for injecting themselves with medicament.

It is a further object of the present invention to provide such a device that may be manufactured at a relatively low cost.

It is a further object of the present invention to provide such a device having an improved container holder for securely mounting a medicament container thereon.

It is a further object of the present invention to provide such a device having a dual purpose safety to control movement of a valve member and simultaneously control air communication to the medicament container.

These and further objects and advantages of the present invention will become clearer in the light of the following detailed description of an illustrative embodiment of this invention described in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial perspective view of an injection device according to the present invention.

FIG. 2 is a partial sectional view of the injection device of FIG. 1 according to section line 2—2 of FIG. 1.

FIG. 3 is a partial front view of the injection device of FIG. 1.

FIG. 4 is a further partial sectional view of the injection device of FIG. 1 according to the section line 4—4 of FIG. 2.

FIG. 5 is a further partial sectional view of the injection device of FIG. 1 according to the section line 5—5 in FIG. 4.

FIG. 6 is a further partial sectional view of the injection device of FIG. 1 according to the section line 6—6 in FIG. 3.

FIG. 7 is a further partial sectional view of the injection device of FIG. 1 according to the section line 7—7 of FIG. 5.

FIG. 8 is a partial, exploded perspective view of the container holder mechanism of the injection device of FIG. 1.

DESCRIPTION

Referring to the drawings, a device for the injection of medicament is shown and generally indicated as 10. Injector 10 includes an injector body 12, shown in fragmentary form, a valve body 14, a container holder mechanism 16, and a nozzle 18. Body 12 contains the mechanism necessary for selectively changing the vol-

ume of a medicament chamber 22 to cause suction of medicament therein and expulsion of medicament therefrom.

The mechanism includes compressible springs, not shown, operatively connected to a piston 20 such that the springs can be compressed in retracting piston 20 in medicament chamber 22. A suitable trigger mechanism, not shown, is provided to selectively release the energy stored in the springs thus advancing piston 20 to cause expulsion of medicament from chamber 22 and through injector nozzle 18. Suitable means for compressing the springs may be of the hand wind-up type as illustrated in U.S. Pat. No. 2,754,818, or the pressurized fluid type as illustrated in U.S. Pat. No. 3,130,723, or others.

Container holder mechanism 16 includes a container support member 24 and a container holding apparatus 26. Container support member 24 includes an irregularly shaped body 31 which terminates, at its opposite ends, in surfaces 32 and 34, the planes of which are arranged at a relatively acute angle with respect to one another. Counter bores 28 and 30 are formed in body 31 to allow the admittance of screws 36 to secure surface 34 of body 31 of container support member 24 onto a top surface 40 of valve body 14.

Container holding apparatus 26 includes a container retainer 42, a retainer ring 44, and a needle base 46. Container retainer 42 is a cup-shaped member including a flat annular base 47 including lower and upper surfaces 48 and 50, respectively. Spaced flexible fingers 52 project upwardly from the inside periphery 53 of cup-shaped container 49 of container retainer 42 to form a generally cylindrical chamber 67. Threads 54 are located on the outside periphery 55 of container retainer 42.

A finger flexing member 44 is shown in its preferred form as a retainer ring. Retainer ring 44 is a cap-like member having integral, internally threaded, cylindrical side walls 58. A centrally positioned aperture 56 is defined by radially outwardly inclined side walls 60 projecting downward from the top of ring 44.

Intake needle base 46 is located in the hollow, cup-like portion 49 of container retainer 42 and has counter bores 62 into which screws 64 may pass. The screws 64 extend through intake needle base 46, through surfaces 50 and 48 of container retainer 42 and through surface 32 into body 31 of container support member 24 thus mounting the container holding apparatus 26 to the container support member 24. A suitable pad 65 can be provided to cover the counter bores 62 and also act as abutment means for the container 70. Also, a suitable bushing, not shown, may also be added between surfaces 32 and 48.

Fingers 52 have generally straight, smooth inside surfaces 66 forming a generally cylindrical chamber 67. The thickness of fingers 52 increases towards the intake needle base 46 to provide a sloped surface 68 on the exterior of the outermost portions of fingers 52. When retainer ring 44 is screwed on threads 54 of container retainer 42, inclined sides 60 of aperture 56 of ring 44 engage sloped exterior sides 68 of fingers 52 such that fingers 52 are caused to flex inwardly towards the center of chamber 67. When a pierceable cap 72 of a suitable bottle or similar container 70 is inserted through aperture 56 into cylindrical chamber 67 formed by fingers 52, container 70 is releasably secured onto container holder mechanism 16 by thread-

ing retainer ring 44 on container retainer 42 such that ring 44 flexes fingers 52 to securely grasp pierceable cap 72, as best seen in FIG. 2.

To receive fluid communication and to provide air communication to the medicament container 70 a needle assembly 74 is provided. Needle assembly 74 passes through container retainer 42 and intake needle base 46 and through pierceable cap 72 of any container 70 in container holder mechanism 16 to the interior of container 70. Needle assembly 74 contains a diametrically larger, elongated, hollow, cylindrical needle 76 and a diametrically smaller, longer length, hollow, elongated cylindrical needle 78 concentrically arranged within needle 76 to leave an annular space 80 surrounding needle 76 to allow the medicament from container 70 to enter the hollow interior of needle 76. A notch 82 may be provided in needle 76 to allow medicament to enter needle 76 at a higher rate or to allow a more certain entry.

As best seen in FIG. 4, container support member 24 includes spaced parallel passageways 84 and 86 that lead from container retainer element 26 to the interior of container support member 24. Passageway 84 has a larger cross-sectional area than passageway 86 so that it can accommodate liquid flow while passageway 86 accommodates the required air flow. Needle assembly 74 extends into a fluid chamber 88 formed in intake needle base 46, as best seen in FIGS. 4 and 5.

As best seen in FIG. 4, needle 76 includes a removed section 90 located in fluid chamber 88 allowing needle 78 to be bent and positioned in passageway 86. Sealing means 92, for example an O-ring, may be provided to prevent liquid from entering passageway 86 from fluid chamber 88. The lower portion of needle 76 extends through intake needle base 46 and into passageway 84 in container retainer 42. Sealing means 89, for example an O-ring, is provided to prevent liquid from leaking from fluid chamber 88 to chamber 67.

Passageways 94 and 96 intersect with passageways 86 and 84, respectively, as seen in FIGS. 5 and 2, to provide fluid communication with valve body 14 such that the outlets of passageways 94 and 96 at the upper surface of valve body 14 are in a longitudinally spaced relation along valve body 14.

Valve body 14 includes a valve member 98, shown in its preferred form as a slide shuttle valve, and a safety 104. As can best be seen in FIG. 6, a pin 108 extends from the injector body into a slot or groove 106 in slide shuttle valve 98 to prevent axial rotation of shuttle valve 98 with respect to the valve body 14. The length of slot 106 also determines how far shuttle valve 98 may longitudinally slide, therefore the length of the slot 106 is such that the valve is in a predetermined position when pin 108 abuts against the ends of groove 106 to thus form lateral stops for valve 98. Pin 108 is held in position by a bore 109 in valve body 14 and also the back wall of nozzle 18.

Medicament chamber 22 formed in injector 10 narrows at its forward end into a passage 110 that extends through valve body 14 to slide shuttle valve 98. Slide shuttle valve 98 contains two laterally spaced passageways 100 and 102, with passageway 100 generally straight and passageway 102 formed of two further perpendicularly meeting passageways 103 and 105 defined within the body of valve 98 to form the shape of the letter "L". Two suitable sealing means 112, for example O-rings, quad rings, or the like, are provided on shuttle

valve 98 to prevent fluid from leaking from valve body 14.

As best seen in FIG. 2, valve body 14 also includes passageway 114 which extends from the shuttle valve 98 to nozzle 18, passageway 116 which extends from container holder mechanism 16 to shuttle valve 98, and passageway 118, best seen in FIG. 5 which extends from container holder mechanism 16 to a point in a spaced relation from shuttle valve 98. Suitable sealing means 120, such as for example O-rings, are provided in passageways 114 and 118 to prevent fluid leakage.

A check valve 125 is also provided in passageway 116 to prevent back flow of medicament through passageway 116 to container 70. Cooperating with valve 125 is an O-ring 123 to provide suitable sealing between surfaces 34 and 40 and the check valve 125. A check valve bushing, not shown, can be provided to prevent O-ring 123 from protruding around the top of check valve 125. A filter screen, not shown, may be inserted above O-ring 123 adjacent surfaces 34 and 40 to filter the medicament passing from passageway 96 to passageway 116.

As best seen in FIGS. 6 and 7 safety 104 includes a slide portion 128 adapted to move in a slot 130 provided in valve body 14 and a longitudinally projecting portion 126 having a flat bottom wall 132. Slide portion 128 also includes a detent ball 124 which is biased against valve body 14 by a spring 122. As can be best seen in FIG. 6, a detent hole 134 is provided in the bottom of the slot 130 in the valve body 14. A passageway 119, the diameter of which is less than that of ball 124, intersects with passageway 118 and has an outlet 121 that is longitudinally spaced from detent hole 134 towards nozzle 18.

Slide portion 128 of safety 104 includes a necked portion 138, best seen in FIG. 7, that rides in the slot 130 to prevent safety 104 from disengaging from valve body 14. Also, as slot 130 abuts body 12, safety 104 is prevented from sliding out of the end of slot 130. Removed portions 136 may be provided in the top portion of safety 104 to provide finger gripping means.

Safety 104 may be placed in either of two general positions, an ON or an OFF position. In the OFF position, not shown, safety 104 is placed in a rearmost position away from nozzle 18 such that ball 124 is captured by the detent 134 and the projecting portion 126 is located rearward of the end of the periphery of shuttle valve 98. In the ON position, as best seen in FIG. 6, safety 104 is in a forward position such that ball 124 is located in outlet 121 of passageway 119 such that ball 124 blocks outlet 121. When the safety 104 is located in its forward or ON position surface 132 of projection 126 extends over the end of the shuttle valve 98.

Slide shuttle valve 98 may be placed in either of two positions, a fill position or a fire position, in cooperation with safety 104. When valve 98 is in the fill position, not shown, passageway 105 of passage 102 is in fluid communication with passageway 110 in the valve body 14 such that medicament chamber 22 is in fluid communication with the interior of container 70 through passageways 110, 102, 116, 96, and 84 and needle 76. When valve 98 is in the fire position, shown in FIG. 6, medicament chamber 22 is in direct fluid communication with nozzle 18 through passageways 110, 100, and 114.

OPERATION

In operation the device 10 is used for administering medicament to a patient without the use of needles. This is done by first causing the injection of a small amount of medicament at extremely large velocities such that it punctures the skin and then injecting the remaining medicament into the body through this puncture. The technique is explained in U.S. Pat. No. 2,704,542 and others.

For the sake of explanation, assume that the injector 10 has just been fired, that shuttle valve 98 is in the fire position, that safety 104 is in the ON position, and that piston 20 is in its advanced position.

A container 70 containing the desired medicament and having a pierceable cap 72 of a suitable diameter such that it will fit into cylindrical chamber 67 is found. Retainer ring 44 is then unscrewed to an upper position on container retainer 42 away from retainer 42. Container 70 is then first positioned centrally of and over aperture 56 such that needle assembly 78 can begin to puncture the pierceable cap 72 and extend into the interior of the container 70. Container 70 is then pushed through aperture 56 of retainer ring 44 until it contacts pad 65. Retainer ring 44 is then screwed down on container retainer 42 causing the inclined side walls 60 of aperture 56 of the retainer ring 44 to engage the sloped back sides 68 of fingers 52. Fingers 52 are thereby flexed towards cap 72 to grasp and retain the cap 72.

With the safety 104 in the assumed ON position, surface 132 thereof extends over the end of shuttle valve 98 such that, in combination with the groove 106 on the pin 108, shuttle valve 98 is rigidly held in the fire position within body 14. With safety 104 in the ON position, as explained, ball 124 is positioned in outlet 121 of passageway 119 thereby sealing the air passage to the interior of container 70. Thus the safety 104 simultaneously prevents accidental movement of valve 98 from the fire position and blocks air communication to the container 70 in the fire position. When the injector 10 is to be filled, safety 104 is moved longitudinally rearward, away from nozzle 18, to the OFF position such that ball 124 falls into detent 134. Thus, air may pass around the forward projecting portion 126 into slot 130, through passageways 119, 118, 94, 86, and needle 78, thereby providing fluid communication between the interior of container 70 and the atmosphere.

At this time shuttle valve 98 can be laterally moved into the fill position. The valve 98 is then laterally pushed from the position shown in FIG. 6 until pin 108 abuts the opposite end of slot 106. When in the fill position, passageway 102 aligns with passageways 110 and 116 such that medicament chamber 22 is in continuous fluid communication with container 70. Medicament then enters needle 76 through the annular space 80, or notch 82, or both, flows through needle 76 to fluid chamber 88 in intake needle base 86, flows into and through passageways 84 and 96 of container support member 24, into and through passageway 116, and into and through passageway 102 of shuttle valve 98. Passageway 102 will then direct the fluid into passageway 110 and into medicament chamber 22.

The piston 20 of medicament chamber 22 is then retracted by the mechanism in body 12 such that medicament chamber 22 increases in volume. This increase in volume places medicament chamber 22 under a slight vacuum condition such that medicament from con-

tainer 70 is sucked into medicament chamber 22 as piston 20 is retracted. The medicament that flows out of container 70 is then replaced by air drawn into needle 78 from outlet 121.

After piston 20 has been retracted to its desired position, such that the volume of medicament chamber 22 is equal to the dosage of medicament desired, valve 98 is laterally moved back to the position shown in FIG. 6 or until pin 108 abuts an end of slot 106 where it is in the fire position again. At this time, slide 128 of safety 104 is moved forward, toward nozzle 18 and back into the ON position thus capturing valve 98 in the fire position.

When safety 104 is in the ON position, ball 124 again blocks outlet 121 of passageway 119. Thus the interior of container 70 is cut off from the outside air so that the air cannot contaminate the medicament inside container 70. Thus the only time the contents of container 70 is allowed to communicate with the air is when safety 104 is in the OFF position, or more particularly, when chamber 22 is being filled with medicament. Thus the present injector does not require a filter placed in the air passageway into container 70 as is commonly done in the art.

When safety 104 is in the ON position, valve 98 is rigidly fixed by abutting portion 126 and pin 108 in the fire position. This prevents accidental movement of valve 98 from the fire position before or during inoculation. Since during inoculation injector 10 is prone to slide over the surface of the skin if not held securely, injector 10 is commonly held by the hands of the operator near valve body 14. When held in this position, valve 98 would be susceptible to accidental sliding if a safety means of some sort were not provided.

It may now be appreciated that use of such a safety as disclosed herein prevents the accidental sliding of valve 98 and the blockage of the air passageway to container holder mechanism 16 in a very simple manner. Safety 104 is so constructed and arranged such that its assembly time is short and its parts are few in number. The simplicity of design also lends itself towards the use of such an injector by individuals not trained in the medical arts.

Owing to the simple design and the small number of parts, an injector embodying the present invention lends itself toward disassembly, cleaning, and assembly without the need of any special tools, technical skill, or special training.

Thus since the invention disclosed herein may be embodied in other specific forms without departing from the spirit or general characteristics therein, some of which forms have been indicated, the embodiments described herein, are to be considered in all respects illustrative and not restrictive. The scope of the invention is indicated by the appended claims rather than by the foregoing description, and all changes which come within meaning and range of the equivalency of the claims are intended to be embraced therein.

What is claimed is:

1. Apparatus for providing jet injection of medicament for use in combination with medicament stored in containers comprising, in combination: an injector body; an injector nozzle on one end of the injector body; a medicament chamber within the injector body; first means for selectively changing the volume of the medicament chamber to cause suction of medicament therein and expulsion of medicament therefrom; sec-

ond means for receiving medicament from a medicament container; a medicament passageway for providing medicament communication between the second means and the injector body; a valve member located within the injector body having a first position for directing medicament from the medicament passageway to the medicament chamber and having second position for directing medicament from the medicament chamber to the injector nozzle; a container holder apparatus including: a retainer member having flexible fingers formed in a closed curve thereon and directed away from the injector body to define a chamber for receiving a portion of the medicament container, third means for mounting the retainer member to the injector body, and fourth means for flexing the fingers inwardly to securely grasp a portion of the medicament container placed within the chamber defined by the flexible fingers of the retainer member; and fifth means for providing air communication from the atmosphere to any medicament container within the container holder apparatus.

2. The apparatus of claim 1 wherein the means for flexing the fingers is a retainer ring in the form of a cap-like member including a top portion, side walls, and an aperture defined by radially outwardly inclined side walls projecting downwardly from the top portion toward the injector body from the aperture such that the aperture side walls ride on the outer surface of the fingers of the retainer member to cause the fingers to flex and grip a portion of the medicament container when the retainer ring is moved towards the injector body to thereby securely mount the container to the injector body.

3. The apparatus of claim 2 wherein the thickness of the flexible fingers increases as the distance from the fingers to the injector body decreases to form an outwardly inclined outer surface on the fingers such that the inclined side walls of the aperture of the retainer ring ride on the outwardly inclined surface of the fingers.

4. The apparatus of claim 3 wherein the retainer ring is threadably connected to the injector body to thereby allow positioning of the retainer ring with respect to the flexible fingers.

5. Apparatus for providing jet injection of medicament for use in combination with medicament stored in medicament containers comprising, in combination: an injector body; an injector nozzle on one end of the injector body; a medicament chamber located within the injector body for receiving appropriate dosages of medicament; first means for selectively changing the volume of the medicament chamber to cause suction of medicament therein and expulsion of medicament therefrom; medicament container holder apparatus, including: a retainer member having flexible fingers formed in a closed curve thereon and directed away from the injector body to define a chamber arranged to receive a portion of the medicament container, second means for mounting the retainer member to the injector body, and third means for flexing the fingers inwardly to securely grasp a portion of the medicament container placed within the chamber defined by the flexible fingers of the retainer member; fourth means for receiving medicament from any medicament container within the medicament container holder apparatus; fifth means for providing air communication to any medicament container within the medicament con-

tainer holder apparatus; a medicament passageway for providing medicament communication between the fourth means and the interior of the injector body; an air passageway, at least partially located within the injector body and having an outlet formed in the injector body, for providing air communication between the fifth means and the atmosphere; valve member located within the injector body having a first position for directing medicament from the medicament passageway to the medicament chamber and having a second position for directing medicament from the medicament chamber to the injector nozzle; and safety member having a first position for interfering with the valve member from the second position of the valve member and for simultaneously blocking the outlet of the air passageway and having a second position for allowing movement of the valve member from the second position of the valve member to the first position of the valve member and for allowing air communication from the atmosphere into the air passageway.

6. The apparatus of claim 1 wherein the means for flexing the fingers is a retainer ring in the form of a cap-like member including a top portion, side walls, and an aperture defined by radially outwardly inclined side walls projecting downwardly from the top portion toward the injector body from the aperture such that the aperture side walls ride on the outer surface of the fingers of the retainer member to cause the fingers to flex and grip a portion of the medicament container when the retainer ring is moved towards the injector body to thereby securely mount the container to the injector body.

7. The apparatus of claim 1 wherein the valve member is a slide shuttle valve including two passageways, one of the passageways being substantially straight for directing medicament from the medicament chamber to the injector nozzle and the second of the passageways being laterally spaced from the first and having a general shape of the letter "L" for directing medicament from the medicament passageway to the medicament chamber.

8. Apparatus for use in providing jet injection of medicament for use in combination with medicament stored in containers comprising, in combination: an injector body; an injector nozzle on one end of the injector body; a medicament chamber within the injector body for receiving appropriate doses of medicament; first means for selectively changing the volume of the medicament chamber to cause suction of medicament therein and expulsion of medicament therefrom; second means for receiving medicament from a medicament container; third means for providing air communication to the medicament container; a medicament passageway for providing medicament communication

between the second means and the interior of the injector body; an air passageway, at least partially located within the injector body and having an outlet formed in the injector body, for providing air communication between the third means and the atmosphere; valve member located within the injector body having a first position for directing medicament from the medicament passageway to the medicament chamber and having a second position for directing medicament from the medicament chamber to the injector nozzle; and safety member having a first position for interfering with the valve member for preventing movement of the valve member from the second position of the valve member and for simultaneously blocking the outlet of the air passageway to the third means and having a second position for allowing movement of the valve member from the second position of the valve member to the first position of the valve member and for allowing air flow into the air passageway from the atmosphere to the third means.

9. The apparatus of claim 8 wherein the valve member is a slide shuttle valve including two passageways, one of the passageways being substantially straight for directing medicament from the medicament chamber to the injector nozzle and the second of the passageways being laterally spaced from the first and having a general shape of the letter L for directing medicament from the medicament passageway to the medicament chamber.

10. The apparatus of claim 9 wherein the safety includes a projection that can be positioned over the end of the slide shuttle valve such that the projection acts as abutment means for slide shuttle valve.

11. The apparatus of claim 9 wherein means for preventing rotation of the slide shuttle valve is provided including a slot formed in the shuttle valve and a pin secured in the injector body and extending into the slot formed on the shuttle valve.

12. The apparatus of claim 11 wherein the slide shuttle valve is selectively captured in the second position by the combination of the means for preventing rotation, including the pin and the slot, and the safety member.

13. The apparatus of claim 8 wherein the safety member includes, in combination: a detent member biased towards the injector body that can be selectively positioned within the outlet of the air passageway to thereby block the air communication to the means for providing air communication to any medicament container.

14. The apparatus of claim 8 wherein the means for receiving medicament from any medicament container and the means for providing air communication to any medicament container are needles.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,908,651 Dated September 30, 1975

Inventor(s) Robert G. Fudge

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 9, line 22, cancel "1" substitute -- 5--;

Column 9, line 34, cancel "1" substitute -- 5 --.

Signed and Sealed this

ninth Day of *March* 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks