as flow preventers. In this condition, controller 28 directs stepper motor 20 to only advance the actuator the sufficient number of steps (distance) necessary to dispense the corresponding volume.

[00034] If more than one fill chamber volume is to be delivered to one or more syringes, the controller causes the stepper motor to advance the plunger to expel all of the fluid from cavity 38. The process is then repeated to achieve a desired total volume delivered.

[00035] One non-limiting embodiment of fill chamber 18 is shown in figure 2. Cavity 38 is created in structure or body 40. Passage 42 and further passages 44 and 45 direct fluid into and out of cavity 38. Fittings and/or integral features 46 and 47 provide connections for attaching tubing or other fluid conveyance structures to structure 40 to permit the flow of fluid into and out of passages 42, 44, and 45. Plunger 36 carries one or more O rings or other seals (37a, 37b) and is located in cavity 38 at the distal end of plunger actuator shaft 34 that is coupled to the output shaft of stepper motor 20.

[00036] An embodiment of syringe stands 14 or 16 is shown in figures 3a, 3b and 3c, where figure 3c is a cross-sectional view taken along line A-A of figure 3b. Passage 46 directs fluid in a volumetrically balanced manner from inlet fittings and/or integral features 48, providing a connection for attaching tubing or other fluid conveyance devices, to luer activated valves 30 and/or other fill port components to which a syringe 31 can be fluidly coupled. Fluid flows from fill chamber 18 into syringes 31, filling them to the predetermined volume/height.

[00037] Figure 4 depicts system 50 for delivering fluid from a previously-filled syringe 52 to device 70 located on surface 58. This is but one type of fluid delivery device contemplated herein. Syringe 52 has chamber ~~54~~ filled with fluid 54, and plunger 64 that is moved via leadscrew 62 up and down in the direction of arrow "A" by stepper motor 60. Controller 66 operates stepper motor 60. Digital memory 68 can be a removable memory card that is adapted to be used to provide operating information to controller 66. Alternatively, controller 66 and memory 68 can be accomplished by a microprocessor. The microprocessor can be but need not be networked to receive operating information. The operating information may comprise the number of steps

that are needed to be accomplished by stepper motor 60 to dispense a defined amount of fluid 54 through dispensing tip (hypodermic needle) 56.

[00044] Assembly 150 includes pivoting brackets 154 and 155 that are held in place via thumb screw assemblies 156 and 157, Brackets 154 and 155 tightly hold fill chamber 152 in place relative to the housing assembly. Half round housing structure 162 holds the fill chamber in place when brackets 154 and 155 are tightened down against the fill chamber.

[00045] In order to replace the wetted parts (i.e., replace assembly 140), knurled couplings 116 and 132 are turned counter-clockwise to release end 114 of plunger assembly 100 from the stepper motor lead screw. Brackets 154 and 155 are then released and swung open. Valves 172 and 175 are closed. The inlet line is removed from coupling 171. The entire assembly 140 can then be lifted out of the enclosure and replaced with another similar assembly that is adapted to be used with a different fluid. When that replacement assembly is in place, valve 172 is opened and air is purged from the fill chamber (as necessary) as described above. Valve 175 can then be opened. The fill chamber can then be operated to supply fluid to either a syringe stand or directly to other fluid dispensers as described elsewhere herein.

[00046] Figure 10 shows system 120a in which the fill chamber directly dispenses fluid through a dispense tip 206 rather than the fill chamber feeding separate dispensing devices such as syringes as described above. Hose or line 202 runs from output control valve 204 to dispense tip 206, which may for example be a needle. Dispense tip 206 is held in place by mounting block 208, which is itself held on stand 210. This arrangement allows the fill chamber to be used as the dispenser, rather than the fill chamber being used to fill a separate dispenser.

[00047] A number of embodiments and options have been described herein. Modifications may be made without departing from the spirit and scope of the invention. For example, the

[00048] Accordingly, other embodiments are within the claims. ~~What is claimed is:~~

What is claimed is:

1. A system for accurately delivering controlled amounts of viscous fluid from a fluid reservoir to one or more fluid delivery devices, comprising:

a variable- volume fill chamber that defines a cavity that is adapted to contain the fluid; a movable plunger in the fill chamber cavity that can be moved within the cavity to vary the effective volume of the cavity;

structure fluidly interconnecting the reservoir to the fill chamber;

a device that automatically moves the plunger so as to dispense fluid from the fill chamber;

structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices; and

a controller that automatically controls operation of the device that moves the plunger, to dispense a predetermined amount of fluid from the fill chamber to the fluid delivery devices;

wherein the plunger defines a plunger body that carries a seal proximate its distal end that is located in the fill chamber cavity, and further defines a passageway in the plunger body that begins distally of the seal and terminates proximally of the seal, and further defines a selectively-operable valve in the passageway, wherein the valve can be opened to allow air to be bled from the cavity.

2. The system of claim 1 wherein the fluid delivery devices comprise syringes, and the fluid is an adhesive to be dispensed from the syringes.

3. The system of claim 2 further comprising a syringe stand that is constructed and arranged to releasably hold a plurality of syringes to be filled in syringe locations, and comprises a luer-activated valve associated with each syringe location.

4. The system of claim 3 wherein the syringe stand has a body and a plurality of luer-activated valves in the body in fluid communication with a fluid passage in the body, wherein the fluid passage terminates at two separate openings in the body, one used as a fluid inlet and one used as a fluid outlet.

5. The system of claim 1 further comprising a compressed air assist for conveying fluid from the reservoir to the fill chamber.

6. The system of claim 1 wherein the device that moves the plunger comprises a stepper motor with an output shaft that is adapted to be mechanically coupled to the plunger.

7. The system of claim 1 further comprising valving used to selectively allow and prevent fluid flow to and from the fill chamber, wherein the controller also automatically controls operation of some or all of the valving.

~~8. The system of claim 1 wherein the plunger defines a plunger body that carries a seal proximate its distal end that is located in the fill chamber cavity, and further defines a~~

~~passageway in the plunger body that begins distally of the seal and terminates proximally of the seal, and further defines a selectively-operable valve in the passageway, wherein the valve can be opened to allow air to be bled from the cavity.~~

~~9~~ 8. The system of claim 8 wherein the selectively-operable valve is a luer-activated valve.

~~10~~ 9. The system of claim ~~9~~ 1 wherein the plunger defines a releasable coupling at its proximal end that is adapted to be coupled to the device that moves the plunger.

~~11~~ 10. The system of claim 1 wherein the structure fluidly interconnecting the reservoir to the fill chamber and the structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices and the fill chamber and the plunger are all part of an interconnected fluid handling assembly, wherein the system further comprises a support structure that releasably supports and holds the fluid handling assembly such that it can be removed and replaced from the system as a unit.

~~12~~ 11. A system for accurately delivering controlled amounts of viscous fluid from a fluid reservoir to one or more fluid delivery devices, comprising:

a variable-volume fill chamber that defines a cavity that is adapted to contain the fluid;

a movable plunger in the fill chamber cavity that can be moved within the cavity to vary the effective volume of the cavity, wherein the plunger defines a plunger body that carries a seal proximate its distal end that is located in the fill chamber cavity, and a releasable coupling at its distal end;

a passageway defined in the plunger body that begins distally of the seal and terminates proximally of the seal;

a selectively-operable valve in the passageway, wherein the valve can be opened to allow air to be bled from the cavity;

structure fluidly interconnecting the reservoir to the fill chamber;

a stepper motor with an output shaft that is adapted to be releasably mechanically coupled to the releasable coupling of the plunger, wherein the stepper motor is adapted to be

automatically controlled to move the plunger so as to dispense fluid from the fill chamber;

structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices;

valving used to selectively allow and prevent fluid flow to and from the fill chamber;

a controller that automatically controls operation of the device that moves the plunger and also automatically controls operation of some or all of the valving, to dispense apredetermined amount of fluid from the fill chamber to the fluid delivery devices;

wherein the structure fluidly interconnecting the reservoir to the fill chamber, the structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices, the fill chamber and the plunger are all part of an interconnected fluid handling assembly; and

a support structure that releasably supports and holds the fluid handling assembly such that it can be removed and replaced from the system as a unit.

~~13~~ 12. A method of accurately delivering controlled amounts of viscous fluid from a fluid reservoir to one or more fluid delivery devices, comprising:

(i) providing a fluid fill system comprising:

a variable-volume fill chamber that defines a cavity that is adapted to contain the fluid;

a movable plunger in the fill chamber cavity that can be moved within the cavity to vary the effective volume of the cavity;

structure including one or more valves fluidly interconnecting the reservoir to the fill chamber;

a stepper motor that is controlled to automatically move the plunger so as to dispense fluid from the fill chamber;

structure including one or more valves fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices; and

a controller that automatically controls operation of the stepper motor and at least some of the valves;

(ii) using the controller to automatically control the valves so as to:

open valves used to channel fluid flow from the reservoir to the fill chamber, and close valves used to channel fluid flow from the fill chamber to a fluid delivery device; and

once the fluid delivery device has been filled, close valves used to channel fluid flow from the reservoir to the fill chamber, and open valves used to channel fluid flow from the fill chamber to a fluid delivery device;

(iii) while the valves used to channel fluid flow from the fill chamber to a fluid delivery device are open, using the controller to operate the stepper motor to move the plunger to expel fluid from the fill chamber, so as to move fluid into the fluid delivery devices.

~~14. The method of claim 13 wherein the plunger defines a plunger body that carries a seal proximate its distal end that is located in the fill chamber cavity, and further defines a passageway in the plunger body that begins distally of the seal and terminates proximally of the seal, and further defines a selectively-operable valve in the passageway, wherein the valve can be opened to allow air to be bled from the cavity.~~

~~15~~ 13. The method of claim ~~14~~ 12 wherein the selectively-operable valve is a luer-activated valve.

~~16~~ 14. The method of claim ~~15~~ 13 wherein the plunger defines a releasable coupling at its proximal end that is adapted to be coupled to an output shaft of the stepper motor.

~~17~~ 15. The method of claim ~~16~~ 14 wherein the structure fluidly interconnecting the reservoir to the fill chamber, the structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices, the fill chamber, and the plunger are all part of an interconnected fluid handling assembly, wherein the fluid fill system further comprises a support structure that releasably supports and holds the fluid handling assembly such that it can be removed and replaced from the system as a unit.

16. A system for accurately delivering controlled amounts of viscous fluid from a fluid reservoir to one or more fluid delivery devices, comprising: a variable-volume fill chamber that defines a cavity that is adapted to contain the fluid;

a movable plunger in the fill chamber cavity that can be moved within the cavity to vary the effective volume of the cavity;

structure fluidly interconnecting the reservoir to the fill chamber;

a device that automatically moves the plunger so as to dispense fluid from the fill chamber;

structure fluidly interconnecting fluid flowing from the fill chamber to one or more fluid delivery devices;

a controller that automatically controls operation of the device that moves the plunger, to dispense a predetermined amount of fluid from the fill chamber to the fluid delivery devices wherein the fluid delivery devices comprise syringes, and the fluid is an adhesive to be dispensed from the syringes;

and a syringe stand that is constructed and arranged to releasably hold a plurality of syringes to be filled in syringe locations, and comprises a luer-activated valve associated with each syringe location.

17. The system of claim 16, wherein the syringe stand has a body and a plurality of luer-activated valves in the body in fluid communication with a fluid passage in the body, wherein the fluid passage terminates at two separate openings in the body, one used as a fluid inlet and one used as a fluid outlet.