CLAIMS

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A fluid injection system, comprising:

a housing comprising an inner surface and an outer surface which extend from a proximal trigger end to a distal dispensing end along an injection axis;

a housing top retainer at said trigger end comprising a lower stop socket, an upper pop-in socket, and a venting slot;

a syringe adapter connected to the dispensing end of the housing and configured to retain a needle-free syringe such that a plunger of the needle-free syringe is movable within the housing along the injection axis;

a piston retained within the housing by the syringe adapter and movable along the injection axis between a loaded position near the trigger end and an unloaded position near the dispensing end, the piston comprising a piston head near the dispensing end and a trigger catch near the trigger end of the housing, the piston head being movably positioned to bias the plunger of the needle-free syringe along the injection axis;

a compression spring associated with the piston, the piston and compression spring sized relative to the housing such that the compression spring is compressible along the injection axis within the housing; and

a trigger mounted within the housing near the trigger end and movable between a non-actuated position and an actuated position by depression of a user trigger means positioned at said trigger end of the housing, the trigger comprising a trigger latch configured to engage the trigger catch when the trigger is in the non-actuated position and the piston is in the loaded position and to release the trigger catch when the trigger is in the actuated position.

2. The fluid injection system of claim 1, wherein the housing, syringe adapter, and needle-free syringe are configured such that a gas within and a sound created within the housing are directed out the venting slot upon actuation of said fluid injection device.

3. The fluid injection system of claim 1, wherein:

the trigger catch comprises an annular engagement surface extending radially outward from the injection axis and facing toward the dispensing end of the housing; and

the trigger latch comprises an engagement surface extending inwardly toward the injection axis and facing toward the trigger end of the housing, and which engages the annular engagement surface of the trigger catch when the trigger is in the non-actuated position and clears the trigger catch when the trigger is in the actuated position.

4. The fluid injection system of claim 1, wherein:

the trigger catch further comprises an annular beveled surface which faces away from the injection axis toward the trigger end of the housing; and

the trigger latch further comprises a beveled surface which faces towards the injection axis and toward the dispensing end of the housing.

5. The fluid injection system of claim 1, wherein said user trigger means comprises a trigger lever rotatable about a trigger lever pivot point.

6. The fluid injection system of claim 5, wherein the trigger further comprises an internal lever biased towards the trigger lever by a return spring disposed within the housing.

7. The fluid injection system of claim 6, wherein:

the trigger further comprises an internal extension means connected to said trigger lever about said trigger lever pivot point; and

said internal extension is configured to counteract said return spring when said trigger lever is engaged.

8. The fluid injection system of claim 6, wherein the return spring is a clip spring biased against the internal lever of the trigger.

9. The fluid injection system of claim 1, further comprising a selectively deployable safety cap for blocking depression of the user trigger means.

10. The fluid injection system of claim 1, wherein the interior surface of the housing comprises a portion extending toward the injection axis configured to block the compression spring from contacting the trigger.

11. The fluid injection system of claim 1, wherein the syringe adapter comprises an outer surface that extends away from the injection axis beyond the outer surface of the housing.

12. The fluid injection system of claim 1, wherein the syringe adapter is removable, and the housing is configured to removably accept alternatively configured syringe adaptors.

13. The fluid injection system of claim 12, wherein:

the piston and the compression spring are removable from the housing when the syringe adapter is removed from the housing; and

the housing is configured to removably accept at least one of the alternatively sized pistons and springs.

14. The fluid injection system of claim 1, wherein the syringe adapter is irremovably affixed to the dispensing end of the housing.

15. The fluid injection system of claim 1, wherein the compression spring is retained around the piston by the piston head.

16. The fluid injection system of claim 1, further comprising:

a prefilled syringe adapter comprising a needle-free syringe connector end opposite a prefilled syringe connector end and a straw extending therethrough; and

wherein said prefilled syringe adapter is configured for sealing connection to a needle-free syringe and a prefilled syringe and to allow aseptic transfer of a fluid from said prefilled syringe into said needle-free syringe.

17. The fluid injection system of claim 16, wherein said prefilled syringe adapter prefilled syringe connector end comprises a luer lock connector configured to engage with a luer lock prefilled syringe.