CLAIMS:

1. A pump device for fluid delivery comprising:

a housing,

a pump having a variable volume fluid chamber disposed within the housing and configured with a first end thereof that can be translated relative to a second end thereof to vary length of the fluid chamber along a longitudinal axis of the housing during pumping motion;

a fluid intake port that is in fluid communication with a fluid supply for the fluid chamber;

a fluid discharge port that is in fluid communication with a fluid path that receives fluid from the fluid chamber and directs the fluid to a fluid output;

a valve assembly movable relative to the fluid intake port and the fluid discharge port, the valve assembly comprising a first throughway and a second throughway;

the housing having an opening from the fluid chamber to the valve assembly, and the valve assembly configured to be controllably translated and disposed between the opening and the fluid intake port to provide fluid communication therebetween via the first throughway for fluid intake into the fluid chamber, and between the opening and the fluid discharge port to provide fluid communication therebetween via the second throughway for fluid discharge from the fluid chamber, during valving motion;

wherein the translation of the first end of the pump and the translation of the valve assembly are controlled to coordinate the valving motion of the valve assembly with the pumping motion of the pump;

wherein the housing and the pump have a first interlock mechanism that employs cam action to translate the first end of the pump relative to the second end when rotated by a drive mechanism; and the valve assembly has a second interlock mechanism that employs cam action to translate the valve assembly with respect to rotation of the drive mechanism;

wherein the pump further comprises a plug and a piston disposed in the housing, a distal end of the plug and a proximal end of the piston respectively forming the second end and the first end of the pump, a proximal end of the piston being connected to the drive mechanism;

wherein the first interlock mechanism between the housing and the piston comprises an arcuate cam slot in one of the housing and the piston, and a pin on the other one of the housing and the piston that is configured to engage with the cam slot; and

wherein, when the piston is rotated, the cam slot is configured to control a distance by which the proximal end of the piston translates relative to the distal end of the plug and direction along the longitudinal axis for fluid intake and fluid discharge operations.

2. The pump device of claim 1, wherein the second interlock mechanism between the valve assembly and the drive mechanism comprises an arcuate cam slot one of in the valve assembly and the drive mechanism, and a pin on the other one of the valve assembly and the drive mechanism that is configured to engage with the cam slot; and

wherein, when the drive mechanism rotates, the cam slot is configured to control a distance by which the valve assembly translates along the longitudinal axis for fluid intake and fluid discharge operations.

3. The pump device of claim 1, wherein the valve assembly comprises at least one valve shaft comprising the first throughway and the second throughway and seals disposed along the at least one valve shaft on respective sides of the first throughway and the second throughway.

4. The pump device of claim 3, wherein the valve shaft is selectively translated along the longitudinal axis of the housing to align the opening of the housing, the first throughway of the value shaft, and the fluid intake port, and to seal the second throughway of the value shaft, during a fluid intake operation of the fluid delivery device, and

to align the opening of the housing, the second throughway of the valve shaft, and the fluid discharge port, and to seal the first throughway of the value shaft, during a fluid discharge operation of the fluid delivery device.

5. The pump device of claim 1, wherein the plug and the piston are each provided with a seal for respective ones of the first end and the second end of the fluid chamber to prevent leakage except when fluid is received in the fluid chamber via the opening in the housing and when fluid is discharged from the fluid chamber via the opening in the housing.

6. The pump device of claim 1, wherein a pump member chosen from the plug and the piston is configured to have a shim coupled thereto to reduce volume of the fluid chamber.

7. The pump device of claim 1, wherein volume of the fluid chamber is reduced using at least one modification of the pump device selected from a reduction in diameter of the fluid chamber, and a reduction in a travel distance of the piston to vary the volume of the fluid chamber.

8. The pump device of claim 1, wherein volume of the fluid chamber is reduced by providing a boss on one of the piston and the plug, and a corresponding recess on other one of the piston and the plug.

9. The pump device of claim 1, wherein the valve assembly comprises a first valve shaft comprising the first throughway and a second valve shaft comprising the second throughway, the first valve shaft and the second valve shaft each being selectively translated along the longitudinal axis of the housing to align the opening of the housing, the first throughway of the first value shaft, and the fluid intake port, and to seal the second throughway of the second value shaft, during a fluid intake operation of the pump device, and to align the opening of the housing, the second throughway of the second valve shaft, and the fluid discharge port, and to seal the first throughway of the first value shaft, during a fluid discharge operation of the pump device.