What is claimed is:

1. A peristaltic pump, comprising:

a cam shaft;

first and second pinch-valve cams coupled to the cam shaft;

first and second pinch-valve cam followers configured to engage the first and second pinch-valve cams;

a plunger cam coupled to the cam shaft;

a plunger-cam follower configured to engage the plunger cam;

a tube receiver configured to receive a tube;

a spring-biased plunger coupled to the plunger-cam follower, wherein expansion of the plunger cam along a radial angle intersecting the plunger-cam follower as the cam shaft rotates pushes the plunger cam to disengage the spring-biased plunger from the tube, and wherein a spring coupled to the spring-biased plunger biases the spring-biased plunger to apply the crushing force to the tube;

a position sensor operatively coupled to the spring-biased plunger configured to determine a position of the spring-biased plunger; and

a processor coupled to the position sensor, wherein the processor is configured to estimate fluid flow of fluid within the tube utilizing the position using the position sensor.

2. The peristaltic pump according to claim 1, further comprising an angle sensor operatively coupled to the cam shaft configured to determine an angle of rotation of the cam shaft.

3. The peristaltic pump according to claim 1, wherein the processor compares a first static region of the position sensor to a second static region of the position sensor to estimate the fluid flow.

4. The peristaltic pump according to claim 3, wherein the processor determines the first static region by identifying the first static region within a predetermined range of angles as indicated by the angle sensor.

5. The peristaltic pump according to claim 4, wherein the processor determines the second static region by identifying the second static region within a second predetermined range of angles as indicated by the angle sensor.

6. The peristaltic pump according to claim 4, wherein the processor determines the first and second static regions by measuring position sensor at predetermined angles as indicated by the angle sensor.

7. The peristaltic pump according to claim 1, wherein the processor compares a first static region measured by the position sensor to a second static region measured by the position sensor to estimate the fluid flow.

8. The peristaltic pump according to claim 6, wherein the processor determines the first static region by identifying a peak movement of the plunger as measured by the position sensor and identifies the second static region to be after the identified peak.

9. The peristaltic pump according to claim 6, wherein the processor determines the second static region by identifying an end of the first static region.

10. The peristaltic pump according to claim 1, further comprising:

a balancer cam;

a balancer-cam follower; and

a balancer spring configured to apply a force against the balancer-cam follower and thereby apply a force from the balancer-cam follower to the balancer cam;

wherein the balancer cam is shaped to reduce a peak torque of the cam shaft as the cam shaft rotates around its axis of rotation.

11. The peristaltic pump according to claim 1, further comprising an electric motor operatively coupled to the cam shaft to apply a rotational torque to the cam shaft.

12. The peristaltic pump according to claim 10, wherein the electric motor is one of a stepper motor, a DC motor, a brushless DC motor, a brushed DC motor, an AC motor, a

polyphase induction motor, an electric motor with at least one permanent magnet coupled to a stator or a rotor, and an induction motor.

13. A pump, comprising:

a first layer; and

a second layer at least partially disposed adjacent to the first layer defining an inlet fluid path, a bubble chamber, and an outlet fluid path, wherein the inlet fluid path is in fluid communication with the bubble chamber and the outlet fluid path is in fluid communication with the bubble chamber; and

an assembly having a variable-volume chamber, a reference chamber, and an acoustic port in operative communication with the variable-volume and reference chambers, wherein the variable-volume chamber includes an opening disposed around the bubble chamber on at least one of the first and a second layers.

14. The pump according to claim 13, further comprising a plunger positioned to engage the bubble chamber.

15. The pump according to claim 13, further comprising a source of pressure and a fluid port coupled to the reference chamber, wherein the source of pressure is in fluid communication with the fluid port to apply at least one of a negative pressure and a positive pressure thereto.

16. The pump according to claim 13, further comprising:

a reference speaker disposed within the reference chamber;

a reference microphone disposed within the reference chamber; and

a variable-volume microphone disposed within the variable-volume chamber.

17. The pump according to claim 16, further comprising a processor in operative communication with the reference speaker, and the reference and variable-volume microphones, wherein the processor is configured to control the speaker to generate a plurality of frequencies and sense the frequencies through the reference and variable-volume microphones, wherein the processor is further configured to estimate a volume of

the variable volume using the sensed frequencies from the reference and variable-volume microphones.

18. The pump according to claim 16, wherein the processor is further configured to estimate a flow rate of the pump using the estimated volume of the variable volume.

19. A flow rate meter, comprising:

a first layer;

a second layer at least partially disposed adjacent to the first layer defining an inlet fluid path, a bubble chamber, and an outlet fluid path, wherein the inlet fluid path is in fluid communication with the bubble chamber and the outlet fluid path is in fluid communication with the bubble chamber;

an assembly having a variable-volume chamber, a reference chamber, and an acoustic port in operative communication with the variable-volume and reference chambers, wherein the variable-volume chamber includes an opening disposed around the bubble chamber on at least one of the first and a second layers;

a reference speaker disposed within the reference chamber;

a reference microphone disposed within the reference chamber; and

a variable-volume microphone disposed within the variable-volume chamber; and a processor in operative communication with the reference speaker, and the reference and variable-volume microphones, wherein:

the processor is configured to control the speaker to generate a plurality of frequencies and sense the frequencies through the reference and variable-volume microphones,

the processor is further configured to estimate a volume of the variable volume using the sensed frequencies from the reference and variable-volume microphones; and

the processor is further configured to estimate a flow rate using the estimated volume of the variable volume.

20. A peristaltic pump, comprising:

a housing;

a motor;

a cam shaft operatively coupled to the motor such that rotation of the motor rotates the cam shaft;

a plunger cam coupled to the cam shaft for rotation therewith;

a pivot shaft operatively coupled to the housing;

a plunger pivotally coupled to the pivot shaft, the plunger having a cam follower configured to engage the plunger cam of the cam shaft, wherein the plunger is configured to pivot to a first position to compress a tube and to a second position away from the tube;

a bias member configured to bias the plunger to the first position to compress the tube;

a position sensor coupled to the plunger to measure a position of the plunger; and

a processor coupled to the position sensor to estimate a volume of fluid discharged from the tube when the bias member causes the plunger to move towards the first position.

21. The pump according to claim 20, wherein:

the plunger and plunger cam are configured to compress the tube using only a force of the bias member,

the plunger cam is configured to only retract the plunger to the second position, and

the plunger is configured to engage the plunger cam such that the plunger cam does not force the plunger against the tube.

22. The peristaltic pump according to claim 20, wherein the plunger is L-shaped.

23. The peristaltic pump according to claim 20, wherein the plunger is U-shaped.

24. The peristaltic pump according to claim 20, further comprising:

a inlet valve; and

an outlet valve.

25. The peristaltic pump according to claim 24, where the inlet valve, the outlet valve, the plunger and the plunger cam are configured to compress the tube while the inlet and outlet valves are closed such that the processor can measure the first position of the plunger using the position sensor.

26. The peristaltic pump according to claim 25, where the inlet valve, the outlet valve, the plunger and the plunger cam are configured to open the outlet valve after the first position of the plunger is measured to discharge fluid out of the tube through the outlet valve, wherein the processor is configured to measure the second position of the plunger using the position sensor after the outlet valve is opened.

27. The peristaltic pump according to claim 26, wherein the processor compares the first measured position to the second measured position to determine an amount of fluid discharged through the outlet valve.

28. The peristaltic pump according to claim 24, wherein the inlet valve and the outlet value are spring biased against the tube.

29. The peristaltic pump according to claim 28, wherein the inlet valve includes an inlet-valve cam follower configured to interface an inlet-valve cam coupled to the cam shaft.

30. The peristaltic pump according to claim 29, wherein the outlet valve includes an outlet-valve cam follower configured to interface an outlet-valve cam coupled to the cam shaft.

31. A peristaltic pump, comprising:

a housing having a first slot;

a door pivotally coupled to the housing and having a platen configured to receive a tube, the door configured to have a closed position and an open position, wherein the door includes a second slot;

a carrier having a pivot defining first and second portions pivotally coupled together, wherein the first portion is slidingly disposed within the first slot of the housing, wherein the second portion is slidingly disposed within the second slot of door; and

a lever handle pivotally coupled to the door and operatively coupled to the carrier.

32. The peristaltic pump according to claim 31, wherein when the door is open, the first portion of the carrier is disposed within the first slot and the second portion of the carrier is

disposed within the second slot, and the first and second portions of the carrier are disposed orthogonal to each other away from a pivot point when the door is open.

33. The peristaltic pump according to claim 31, wherein the peristaltic pump is configured such that when the door is shut, the first and second portions of the carrier are positioned adjacent to each other such that the carrier is slidable within the first and second slots as the lever handle moves.

34. The peristaltic pump according to claim 33, wherein the second portion is configured to receive a slide occluder coupled to the tube in the occluded position when the door is in the open position, wherein the door and lever handle are configured such that when the door is in the closed position, movement of the lever handle moves the first and second portions of the carrier towards the first slot to thereby move the slide occluder into an unoccluded position.

35. The peristaltic pump according to claim 31, further comprising a plunger configured to compress the tube in the platen when the door is closed, wherein the lever handle is operatively coupled to the plunger to lift the plunger away from the tube when the lever handle is in an open position and to actuate the plunger towards the tube when the lever handle is in a closed position.

36. The peristaltic pump according to claim 31, wherein the second portion is configured to receive a slide occluder coupled to the tube in the occluded position when the door is in the open position.

37. The peristaltic pump according to claim 31, wherein the door comprises a leaf spring, wherein the door is configured to latch onto the housing when the door is in the closed position and the lever handle is pivoted against the door such that the leaf spring compresses the door against the housing.

38. A peristaltic pump, comprising:

a motor means for rotating;

a cam means coupled to the motor means for rotating;

a plunger means for compressing against a tube; and

a volume measurement means for estimating a volume of fluid discharged through the tube.

39. Any and all features of novelty of the infusion pump prescribed, referred to, exemplified, or shown herein.

40. An apparatus substantially as shown and described.

What is claimed is:

1. A peristaltic pump, comprising:

a cam shaft;

first and second pinch-valve cams coupled to the cam shaft;

first and second pinch-valve cam followers configured to engage the first and second pinch-valve cams;

a plunger cam coupled to the cam shaft;

a plunger-cam follower configured to engage the plunger cam;

a tube receiver configured to receive a tube;

a spring-biased plunger coupled to the plunger-cam follower, wherein expansion of the plunger cam along a radial angle intersecting the plunger-cam follower as the cam shaft rotates pushes the plunger cam to disengage the spring-biased plunger from the tube, and wherein a spring coupled to the spring-biased plunger biases the spring-biased plunger to apply the crushing force to the tube;

a position sensor operatively coupled to the spring-biased plunger configured to determine a position of the spring-biased plunger; and

a processor coupled to the position sensor, wherein the processor is configured to estimate fluid flow of fluid within the tube utilizing the position using the position sensor.

2. The peristaltic pump according to claim 1, further comprising an angle sensor operatively coupled to the cam shaft configured to determine an angle of rotation of the cam shaft.

3. The peristaltic pump according to claim 1, wherein the processor compares a first static region of the position sensor to a second static region of the position sensor to estimate the fluid flow.

4. The peristaltic pump according to claim 3, wherein the processor determines the first static region by identifying the first static region within a predetermined range of angles as indicated by the angle sensor.

5. The peristaltic pump according to claim 4, wherein the processor determines the second static region by identifying the second static region within a second predetermined range of angles as indicated by the angle sensor.

6. The peristaltic pump according to claim 4, wherein the processor determines the first and second static regions by measuring position sensor at predetermined angles as indicated by the angle sensor.

7. The peristaltic pump according to claim 1, wherein the processor compares a first static region measured by the position sensor to a second static region measured by the position sensor to estimate the fluid flow.

8. The peristaltic pump according to claim 6, wherein the processor determines the first static region by identifying a peak movement of the plunger as measured by the position sensor and identifies the second static region to be after the identified peak.

9. The peristaltic pump according to claim 6, wherein the processor determines the second static region by identifying an end of the first static region.

10. The peristaltic pump according to claim 1, further comprising:

a balancer cam;

a balancer-cam follower; and

a balancer spring configured to apply a force against the balancer-cam follower and thereby apply a force from the balancer-cam follower to the balancer cam;

wherein the balancer cam is shaped to reduce a peak torque of the cam shaft as the cam shaft rotates around its axis of rotation.

11. The peristaltic pump according to claim 1, further comprising an electric motor operatively coupled to the cam shaft to apply a rotational torque to the cam shaft.

12. The peristaltic pump according to claim 10, wherein the electric motor is one of a stepper motor, a DC motor, a brushless DC motor, a brushed DC motor, an AC motor, a polyphase induction motor, an electric motor with at least one permanent magnet coupled to a stator or a rotor, and an induction motor.

13. A peristaltic pump, comprising:

a housing;

a motor;

a cam shaft operatively coupled to the motor such that rotation of the motor rotates the cam shaft;

a plunger cam coupled to the cam shaft for rotation therewith;

a pivot shaft operatively coupled to the housing;

a plunger pivotally coupled to the pivot shaft, the plunger having a cam follower configured to engage the plunger cam of the cam shaft, wherein the plunger is configured to pivot to a first position to compress a tube and to a second position away from the tube;

a bias member configured to bias the plunger to the first position to compress the tube;

a position sensor coupled to the plunger to measure a position of the plunger; and

a processor coupled to the position sensor to estimate a volume of fluid discharged from the tube when the bias member causes the plunger to move towards the first position.

14. The pump according to claim 13, wherein:

the plunger and plunger cam are configured to compress the tube using only a force of the bias member,

the plunger cam is configured to only retract the plunger to the second position, and

the plunger is configured to engage the plunger cam such that the plunger cam does not force the plunger against the tube.

15. The peristaltic pump according to claim 13, wherein the plunger is L-shaped.

16. The peristaltic pump according to claim 13, wherein the plunger is U-shaped.

17. The peristaltic pump according to claim 13, further comprising:

a inlet valve; and

an outlet valve.

18. The peristaltic pump according to claim 17, where the inlet valve, the outlet valve, the plunger and the plunger cam are configured to compress the tube while the inlet and

outlet valves are closed such that the processor can measure the first position of the plunger using the position sensor.

19. The peristaltic pump according to claim 18, where the inlet valve, the outlet valve, the plunger and the plunger cam are configured to open the outlet valve after the first position of the plunger is measured to discharge fluid out of the tube through the outlet valve, wherein the processor is configured to measure the second position of the plunger using the position sensor after the outlet valve is opened.

20. The peristaltic pump according to claim 19, wherein the processor compares the first measured position to the second measured position to determine an amount of fluid discharged through the outlet valve.

21. The peristaltic pump according to claim 17, wherein the inlet valve and the outlet value are spring biased against the tube.

22. The peristaltic pump according to claim 21, wherein the inlet valve includes an inlet-valve cam follower configured to interface an inlet- valve cam coupled to the cam shaft.

23. The peristaltic pump according to claim 22, wherein the outlet valve includes an outlet-valve cam follower configured to interface an outlet- valve cam coupled to the cam shaft.