Claims

1. A system for controlling flow of a liquid (122) to a patient through use of an intravenous delivery system (100), the system comprising:

a flow rate sensor (180) that:

measures a flow rate of the liquid (122) through the intravenous delivery system (100); and

generates a flow rate signal indicative of the flow rate;

a controller (184) that:

receives the flow rate signal;

compares the flow rate with a desired flow rate to determine that the flow rate is different from the desired flow rate; and

in response to determining that the flow rate is different from the desired flow rate, transmits a control signal; and

a flow rate regulator that:

receives the control signal; and

in response to receipt of the control signal, modifies the flow rate to bring the flow rate closer to the desired flow rate,

characterized in that

the flow rate sensor (180) is secured to a drip unit (104) of the intravenous delivery system (100), wherein the drip unit (104) comprises a drip chamber (134) and an orifice (136) that delivers drops of the liquid (122) from a liquid source (102) to the drip chamber (134) via gravity feed, wherein the flow rate sensor (180) measures the flow rate by counting drops received by the drip chamber (134) within a predetermined time period, and

the system comprises the drip unit (104);

wherein the drip unit (104) comprises a key feature (350) indicative of an orifice (136) size of the orifice;

wherein the flow rate sensor (180) comprises a key feature receiver (396)

that

receives the key feature in response to securement of the flow rate sensor (180) to the drip unit (104);

wherein the flow rate sensor (180) uses the orifice (136) size to determine

the size of the drops (138) and

a volume of the liquid (122) in each of the drops to facilitate measurement of the flow rate.

2. The system of claim 1, wherein the flow rate sensor, the controller (184), and the flow rate regulator all operate iteratively throughout a plurality of time increments such that, in each of the plurality of time increments, the flow rate sensor (180) measures the flow rate and generates the flow rate signal, and the controller (184) receives the flow rate signal and compares the flow rate with the desired flow rate;

wherein the controller (184) determines that the flow rate is different from the desired flow rate by determining that the flow rate is greater than the desired flow rate;

wherein, in response to receipt of the control signal, the flow rate regulator: modifies the flow rate by moving from an open state that permits the liquid (122) to flow through the intravenous delivery system (100), to a closed state that substantially prevents the liquid (122) from flowing through the intravenous delivery system (100) and

remains in the closed state for a predetermined number of the time increments.

3. The system of claim 1, wherein the flow rate sensor, the controller (184), and the flow rate regulator all operate iteratively throughout a plurality of time increments such that, in each of the plurality of time increments, the flow rate sensor (180) measures the flow rate and generates the flow rate

signal, and the controller (184) receives the flow rate signal and compares the flow rate with the desired flow rate;

wherein the controller (184) determines that the flow rate is different from the desired flow rate by determining that the flow rate is less than the desired flow rate;

wherein, in response to receipt of the control signal, the flow rate regulator:

modifies the flow rate by moving from a closed state that substantially prevents the liquid (122) from flowing through the intravenous delivery system (100), to an open state in that permits the liquid (122) to flow through the intravenous delivery system (100); and

remains in the open state for a predetermined number of the time increments.

4. The system of claim 1, wherein the controller (184) determines that the flow rate is different from the desired flow rate by determining that the flow rate is greater than the desired flow rate by a differential flow rate;

wherein, in response to receipt of the control signal, the flow rate regulator moves, in proportion to the differential flow rate, to a less open state that permits the liquid (122) to flow through the intravenous delivery system (100) at a modified flow rate smaller than the flow rate.

5. The system of claim 1, wherein the controller (184) determines that the flow rate is different from the desired flow rate by determining that the flow rate is less than the desired flow rate by a differential flow rate;

wherein, in response to receipt of the control signal, the flow rate regulator moves, in proportion to the differential flow rate, to a more open state that

permits the liquid (122) to flow through the intravenous delivery system (100) at a modified flow rate greater than the flow rate.

6. The system of claim 1, wherein the controller (184) is incorporated into a computing device comprising a display screen and a user input device, wherein the controller (184) further:

receives the desired flow rate from a user via the user input device; and initiates display of the flow rate on the display screen.

7. The system of claim 1, wherein the flow rate sensor (180) measures the flow rate of the liquid (122) through the system by:
measuring a first weight of a subset of the intravenous delivery system (100) at a first time; and

measuring a second weight of the subset at a second time separated from the first time by a time increment;

wherein at least one of the flow rate sensor (180) and the controller (184):

subtracts the second weight from the first weight to obtain a differential weight; and

obtains the flow rate based on the differential weight and the time increment.

8. The system of claim 1, wherein the flow rate sensor (180) measures the flow rate of the liquid (122) through the system by:

measuring a first volume of the liquid (122) in a subset of the intravenous delivery system (100) at a first time; and

measuring a second volume of the liquid (122) in the subset at a second time separated from the first time by a time increment;

wherein at least one of the flow rate sensor (180) and the controller (184):

subtracts the second volume from the first volume to obtain a differential volume; and

obtains the flow rate based on the differential volume and the time increment.

9. The system of claim 8, wherein the flow rate sensor (180) measures the flow rate of the liquid (122) through the system by:

measuring a first temperature of the liquid (122) at a first location within the intravenous delivery system (100); and

measuring a second temperature of the liquid (122) at a second location, downstream of the first location, within the intravenous delivery system (100);

wherein at least one of the flow rate sensor (180) and the controller (184):

subtracts the second temperature from the first temperature to obtain a differential temperature; and

obtains the flow rate based on the differential temperature.

10. The system of claim 1, wherein the intravenous delivery system (100) comprises tubing that conveys the liquid (122), wherein the flow rate regulator comprises:

an opposing member positioned adjacent to the tubing;

a cam member positioned on an opposite side of the tubing from the opposing member; and

a motor that rotates the cam member about an axis;

wherein the cam member comprises a variable radius curved rim that, in response to rotation of the cam member about the axis, cooperates with the opposing member to exert a varying degree of compression on the tubing to modify the flow rate.

11. The system of claim 1, wherein the intravenous delivery system (100) comprises tubing that conveys the liquid (122), wherein the flow rate regulator comprises:

a fixture comprising a slot oriented nonparallel and nonperpendicular to the tubing;

a pinching member positioned in the slot; and

a motor that urges the pinching member to move along the slot such that the pinching member exerts a varying degree of compression on the tubing to modify the flow rate.

12. The system of claim 1, further comprising the intravenous delivery system (100), wherein the intravenous delivery system (100) comprises:

a drip unit (104) that receives the liquid (122) from a liquid source (102) via gravity feed;

tubing comprising:

a first end connectable to the drip unit (104) to receive the liquid (122) from the drip unit (104) via gravity feed; and

a second end; and

an intravenous access unit connectable to the second end of the tubing,

wherein the intravenous access unit is configured to receive the liquid (122) from the second end via gravity feed and deliver the liquid (122) intravenously to a patient.