[0005] The accuracy of the overall infusion is dependent upon the accuracy of each pumping cycle. It is therefore important to know accurately the volume of fluid pumped with each pumping cycle and to know the volume of the entire infusion over time. The volume of each pumping cycle is dependent upon factors such as the tube's internal diameter and the tube's wall thickness. A problem arises due to the variability of internal diameter and wall thickness from tube to tube. This variability is due to, for example, manufacturing processes and tolerances. It would be helpful to provide an infusion pump capable of determining, or measuring the internal diameter and/or wall thickness of the specific IV tube being used for a specific infusion.

SUMMARY

[0005a] According to an aspect, there is provided a method of measuring tube thickness, the method comprising: providing an infusion pump having a loading portion and a pressure sensor, the pressure sensor located on a wall of the loading portion; loading a tube into the loading portion such that the tube imparts a force on the pressure sensor that contacts an outside wall of the tube; recording the force imparted on the pressure sensor by the outside wall of the tube; and determining the thickness of the tube by comparing the force imparted by the tube on the pressure sensor with a plurality of predetermined force values, each predetermined force value corresponding to a specific tube having a predetermined thickness.

[0005b] According to another aspect, there is provided a method of measuring tube thickness, the method comprising: providing an infusion pump having a loading portion and a pressure sensor, the pressure sensor located on a wall of the loading portion; loading a tube into the loading portion such that the tube imparts a force on the pressure sensor that contacts an outside wall of the tube; applying a pressure sweep to the interior of the tube, wherein the pressure sweep starts at a minimum value and ends at a maximum value; and recording a plurality of forces imparted on the pressure sensor by the outside wall of the tube, each force recorded at step-wise increments during the pressure sweep; and determining the thickness of the tube by plotting the plurality of forces along the pressure sweep to produce a sensor plot for the tube and comparing the sensor plot with a plurality of predetermined sensor plots, each predetermined sensor plot corresponding to a specific tube having a predetermined thickness.

[0006] Further, tThe present disclosure sets forth two primary embodiments for accurately determining the wall thickness of a tubing set loaded into an infusion pump. Knowing the tubing thickness is important to the accurate delivery of a desired volume of a drug to the patient. Based on the tubing wall thickness, the pump can adjust the functionality of the pumping mechanism (speed and stroke length of the pumping mechanism) to ensure and maintain pumped fluid volume accuracy regardless of variances in the tubing thickness or inner diameter. Additionally, the pump can use this information to avoid overly compressing the tube (decreasing tube life due to overstressing) and under compressing the tube (leading to inaccuracies and inefficiencies). The embodiments discussed herein are also financially beneficial because they obtain the wall tubing information without major structural adjustments to the infusion pump.

[0007] In one primary embodiment, the tubing thickness is determined by counting encoder pulse counts on a linear actuator as the actuator compresses a tube between two platens of a pump. A motor applies a constant current to the linear actuator until fully compressing the tube. The number of encoder pulses counted until full compression occurs is used to determine the distance traveled by the linear actuator, which is in turn used to determine the thickness of a tube. The constant current applied by the motor is sufficient to compress fully the tube without elastically compressing the tube wall.

[0008] In this embodiment, one platen is stationary and one is movable. Moreover, the rate of new encoder pulses decreases and the motor's current increases as the tube approaches full compression, with full compression occurring when no new encoder pulse counts are generated.