tubing and pushing fluid forward of the pinch point, e.g., closer to the patient than to the source of fluid toward the patient. Typically, the volume of fluid to be administered to the patient is controlled in the pump by counting the number of aliquots, each being of substantially the same volume, and stopping when the number reaches an amount corresponding to the total desired volume of fluid to be delivered. Peristaltic pumps are sanitary and generally accurate and therefore very useful in the administration of medication and therapeutic fluids to the patient.

**[0005]** As disclosed, a method of delivering fluid from a syringe to a subject using a pumping device of a flow control apparatus generally comprises locating the flow control apparatus on a horizontal support surface. Providing the syringe with a volume of fluid including a total amount of preferred nutrient and an amount of non-preferred nutrient liquid. Mounting the syringe relative to the flow control apparatus whereby the syringe is oriented in a generally vertical orientation such that an outlet of the syringe faces upward. Initiating operation of the pumping device to draw the fluid from the syringe for a duration of time. Delivering at least a portion of the volume of fluid from the syringe to the subject such that at least 40% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first third of the duration of time the pumping device is operated to draw the fluid from the syringe.

**[0006]** In an aspect, a syringe stand for supporting a syringe including a barrel having an outlet and a plunger received in an end of the barrel opposite the outlet generally comprises a base for supporting the syringe stand on a horizontal support surface. A holder secures the syringe to the syringe stand. The holder is attachable to the base and selectively positionable relative to the base to orient the syringe in at least two different positions, wherein the holder comprises a receptacle configured to receive at least a portion of the barrel and plunger of the syringe; and a guide assembly configured to guide movement of the plunger in the receptacle, the guide assembly comprising at least one rail and a slide moveable along the rail, the slide being engagable by the plunger to move along the rail to guide the movement of the plunger in the receptacle.

**[0006a]** In another aspect, there is provided a support for a flow control apparatus including a pumping system for engaging a pump set mounted on the apparatus, the support comprising: a base for receiving at least a portion of the flow control apparatus, the base being configured to support the flow control apparatus on a horizontal support surface

whereby the flow control apparatus is oriented in a generally horizontal orientation; and at least one adjustable leg on the base configured to change an angular orientation of the base with respect to a horizontal axis when the base is supported on the horizontal support surface thereby changing an angular orientation of the flow control apparatus when the flow control apparatus is received in the base.

**[0006b]** In yet another aspect, there is provided a method of delivering fluid from a syringe to a subject using a pumping device of a flow control apparatus, the method comprising: locating the flow control apparatus on a horizontal support surface; providing the syringe with a volume of fluid including a total amount of preferred nutrient and an amount of non-preferred nutrient liquid; mounting the syringe relative to the flow control apparatus whereby the syringe is oriented in a generally vertical orientation such that an outlet of the syringe faces upward; initiating operation of the pumping device to draw the fluid from the syringe for a duration of time; and delivering at least a portion of the volume of fluid from the syringe to the subject such that at least 40% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first third of the duration of time the pumping device is operated to draw the fluid from the syringe.

**[0007]** In yet another aspect, a flow control apparatus for use with a pump set to deliver fluid from a feeding source through the pump set to a subject generally comprises a pumping device capable of acting on the pump set to produce a fluid flow within the pump set during a feeding cycle. A controller is in communication with the pumping device for controlling operation of the pumping device in a feeding configuration for producing flow of a fluid in the pump set. The controller includes a processor and a memory. The controller is adapted to store in the memory a selected flow rate and a desired fluid volume of the fluid. The controller is configured to execute in the processor a feed time compensator to adjust a feed time for operating the pumping device for delivering the fluid through the pump set during

the feeding cycle to account for a detected deviation in actual flow rate from the feeding source from the selected flow rate.

**[0008]** As disclosed, a support for a flow control apparatus including a pumping system for engaging a pump set mounted on the apparatus generally comprises a base for receiving at least a portion of the flow control apparatus. The base is configured to support the flow control apparatus on a horizontal support surface whereby the flow control apparatus is oriented in a generally horizontal orientation. At least one adjustable leg on the base is configured to change an angular orientation of the base with respect to a horizontal axis when the base is supported on the horizontal support surface thereby changing an angular orientation of the flow control apparatus when the flow control apparatus is received in the base.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** Fig. 1 is a perspective view of a feeding system including an enteral feeding pump, a pump support, a feeding set assembly and a syringe;

**[0010]** Fig. 2 is an fragmentary, perspective view of the feeding system including the enteral feeding pump, and part of the feeding set assembly;

**[0011]** Fig. 3 is the perspective view of Fig. 2, but with portions of the cassette removed;

**[0012]** Fig. 4 is a front perspective view of the enteral feeding pump;

**[0013]** Fig. 4A is a rear perspective view of the enteral feeding pump;

**[0014]** Fig. 5 is a perspective of the cassette;

**[0015]** Fig. 6 is a perspective of a fitting of the cassette;

**[0016]** Fig. 7 is a front perspective view of a pump support and syringe of the feeding set assembly;

**[0017]** Fig. 8 is a rear perspective view of the pump support and syringe;

**[0018]** Fig. 9 is a perspective of a syringe connector of the feeding set assembly;

**[0019]** Fig. 10 is another perspective of the syringe connector;

**[0020]** Fig. 11 is a section of the syringe connector;

What is claimed:

1. A syringe stand for supporting a syringe including a barrel having an outlet and a plunger received in an end of the barrel opposite the outlet, the syringe stand comprising:

a base for supporting the syringe stand on a horizontal support surface; and

a holder for securing the syringe to the syringe stand, the holder being attachable to the base and selectively positionable relative to the base to orient the syringe in at least two different positions, wherein the holder comprises a receptacle configured to receive at least a portion of the barrel and plunger of the syringe; and

a guide assembly configured to guide movement of the plunger in the receptacle, the guide assembly comprising at least one rail and a slide moveable along the rail, the slide being engagable by the plunger to move along the rail to guide the movement of the plunger in the receptacle.

2. The syringe stand of claim 1, wherein the holder is positionable in a first position where the syringe is oriented in a generally vertical orientation such that a longitudinal axis of the syringe is generally parallel to a vertical axis and the outlet of the syringe faces upward, and a second position where the syringe is oriented generally horizontal such that the longitudinal axis of the syringe is generally parallel to a horizontal axis.

3. The syringe stand of claim 2, wherein the holder is positionable in a third position where the longitudinal axis of the syringe is oriented at an angle with respect to the vertical and horizontal axes.

4. The syringe stand of claim 1, wherein the holder is configured to hold the barrel of the syringe in a fixed position relative to the stand.

5. The syringe stand of claim 1, further comprising a position sensor attached to the holder and configured to detect movement of the plunger with respect to the holder indicative of fluid being delivered out of the barrel.

6. The syringe stand of claim 5, wherein the position sensor comprises one of a potentiometer, a camera, a magnetic foil sensor, and a non-magnetic induction sensor.

7. The syringe stand of claim 1, wherein the base is configured to mount the apparatus to the base.

8. The syringe stand of claim 7, further comprising a pass-thru connector on the base, the connector including a port and a plug in communication with the port, the plug being configured to connect with a port on the flow control apparatus, and the port on the base being configured to receive a plug for connecting the plug with the port on the flow control apparatus though the connector.

9. The syringe stand of claim 1, wherein the base includes a mount for attaching to a clamp to mount the syringe stand to a vertical support.

10. A support for a flow control apparatus including a pumping system for engaging a pump set mounted on the apparatus, the support comprising:

a base for receiving at least a portion of the flow control apparatus, the base being configured to support the flow control apparatus on a horizontal support surface whereby the flow control apparatus is oriented in a generally horizontal orientation; and

at least one adjustable leg on the base configured to change an angular orientation of the base with respect to a horizontal axis when the base is supported on the horizontal support surface thereby changing an angular orientation of the flow control apparatus when the flow control apparatus is received in the base.

11. The support of claim 10, wherein the at least one adjustable leg is pivotably attached to the base, the leg being pivotable to engage the support surface to change the angular orientation of the base.

12. The support of claim 10, wherein the at least one adjustable leg is configured to change the angular orientation of the base by up to about 40 degrees.

13. The support of claim 10, further comprising a pair of adjustable legs, each leg being independently adjustable.

14. The support of claim 13, wherein a first adjustable leg is configured to change the angular orientation of the base in a first direction, and a second adjustable leg is configured to change the angular orientation of the base in a second direction.

15. A method of delivering fluid from a syringe to a subject using a pumping device of a flow control apparatus, the method comprising:

locating the flow control apparatus on a horizontal support surface;

providing the syringe with a volume of fluid including a total amount of preferred nutrient and an amount of non-preferred nutrient liquid;

mounting the syringe relative to the flow control apparatus whereby the syringe is oriented in a generally vertical orientation such that an outlet of the syringe faces upward;

initiating operation of the pumping device to draw the fluid from the syringe for a duration of time; and

delivering at least a portion of the volume of fluid from the syringe to the subject such that at least 40% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first third of the duration of time the pumping device is operated to draw the fluid from the syringe.

16. The method of claim 15, wherein at least 60% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first half of the duration of time the pumping device is operated to draw the fluid from the syringe.

17. The method of claim 16, wherein at least 65% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first two thirds of the duration of time the pumping device is operated to draw the fluid from the syringe.

18. The method of claim 17, wherein at least 80% of the total amount of preferred nutrient in the fluid is delivered from the syringe within a first five sixths of the duration of time the pumping device is operated to draw the fluid from the syringe.

19. The method of claim 15, wherein the outlet of the syringe is centered on a barrel of the syringe.

20. The method of claim 15, wherein the subject is an infant and the fluid comprises breast milk such that the preferred nutrient is fat.

21. The method of claim 15, wherein delivering at least a portion of the volume of fluid comprises drawing the fluid from the syringe by applying a vacuum pressure to the outlet of the syringe using the flow control apparatus.

22. A flow control apparatus for use with a pump set to deliver fluid from a feeding source through the pump set to a subject, the flow control apparatus comprising:

a pumping device capable of acting on the pump set to produce a fluid flow within the pump set during a feeding cycle; and

a controller in communication with the pumping device for controlling operation of the pumping device in a feeding configuration for producing flow of a fluid in the pump set, the controller including a processor and a memory, the controller being adapted to store in the memory a selected flow rate and a desired fluid volume of the fluid, the controller configured to execute in the processor a feed time compensator to adjust a feed time for operating the pumping device for delivering the fluid through the pump set during the feeding cycle to account for a detected deviation in actual flow rate from the feeding source from the selected flow rate.

23. The flow control apparatus of claim 22, wherein the controller pauses operation of the pumping device to compensate for the detected deviation of the actual flow rate from the selected flow rate.

24. The flow control apparatus of claim 22, wherein the controller compares a total actual delivered volume of fluid with the desired volume of the fluid and ends the feeding cycle if the difference is within a predetermined threshold.

25. The flow control apparatus of claim 22, wherein the feed time compensator calculates the compensated feed time based on the equation: $X = (Y+Y_1)/(Z+Z_n)$ where X is the selected flow rate for the fluid, Y is a volume of the fluid already delivered from the feeding source during the feeding cycle, $Y_1$ is a volume of feeding fluid delivered from the feeding source

since the most recent prior compensation calculation, Z is a total time elapsed in the feeding cycle, and $Z_n$ is a feed time adjustment.

26. The flow control apparatus of claim 22, wherein the controller is programmed to execute the feed time compensator only after a threshold volume of fluid has been delivered from the feeding source.