

## **CAP HUB INTERFACE FOR INTRADERMAL INJECTION DEVICE**

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

[0001] The present disclosure, generally, is directed to a cap hub interface for an injection device and, in particular, to a cap hub interface for an intradermal injection device.

#### **Description of Related Art**

[0002] Currently, conventional luer lock syringes allow for connection of several different types and styles of needles. These different types of needles are used for a variety of applications, including intradermal needles, subcutaneous needles, intramuscular needles, and intravenous needles. Pharmaceutical companies have developed medicaments and drugs that are suitable for only one specific application (for example, only for an intradermal application). Local regulations in some regions of the world require the avoidance of any misconnection of a particular injection device with an undesired product or medicament. Therefore, there is a current need for an injection device configured to only receive a desired or predetermined syringe including a desired medicament or drug. Furthermore, there is a current need for an injection device configured to only connect to a predetermined or desired needle specific to the desired application.

### **SUMMARY OF THE INVENTION**

[0003] In one example of the disclosure, an injection device including a syringe comprising a barrel having a distal end and a proximal end and a tip provided on the distal end of the barrel, the barrel defining an internal bore extending from the proximal end to the distal end of the barrel; a luer lock adaptor comprising a body having a proximal end and a distal end, a reduced-diameter portion provided on the proximal end of the body, and a threading provided on an outer surface of the body, the reduced-diameter portion defining an opening to receive the tip of the syringe in a friction fit; and a needle hub comprising a body defining an inner cavity, a needle receiving portion extending distally from the body, and a skirt extending inwardly into the inner cavity, wherein an inner surface of the body includes a threading corresponding to the threading of the luer lock adaptor to connect the luer lock adaptor to the needle hub, wherein the needle receiving portion defines a bore to receive the tip of the syringe.

[0004] In one configuration, the opening is sized to only accommodate the tip of the syringe, wherein the syringe is a predetermined syringe-type. The diameter of the opening may be smaller than an outer diameter of the tip of the syringe.

[0005] In certain configurations, the opening has a star-shaped configuration. In other configurations, the opening is discontinuous and includes a plurality of recesses that are formed with a central opening to form the opening. An edge of the opening may be chamfered.

[0006] The tip may include a groove therein and an edge of the opening may be chamfered to engage with the groove to hold the syringe within the luer lock adaptor. The bore defined by the needle receiving portion may have an inner surface which tapers from a distal end to a proximal end of the needle receiving portion. A diameter of the distal end of the bore may be greater than the diameter of the proximal end of the bore. In certain configurations, the diameter of the proximal end of the bore limits a distance between the distal end of the tip of the syringe and a distal end of the luer lock adaptor. The predetermined distance may be from between 2 and 2.5 mm.

[0007] In certain configurations, the body of the needle hub includes a plurality of gripping ribs defined in an outer surface of the body to assist a user in the holding of the needle hub during connection of the syringe into the luer lock adaptor and the needle hub.

[0008] These and other features and characteristics of the connecting arrangement, as well as the methods of operation and functions of the related elements of the arrangement, will become more apparent upon consideration of the following description with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purposes of illustration and description only, and are not intended as a definition of the limits of the disclosure. As used in the specification, the singular form of “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0009] **FIG. 1** is a perspective view of an injection device according to one example of the present disclosure;

[0010] **FIG. 2** is another perspective view of the injection device of **FIG. 1**;

[0011] **FIG. 3** is a cross-sectional view of a distal end of the injection device of **FIG. 1**;

[0012] FIG. 4 is a cross-sectional view of another example of the injection device of the present disclosure;

[0013] FIG. 5 is an exploded cross-sectional view of the distal end of the injection device of FIG. 4;

[0014] FIG. 6 is a perspective view of a needle hub and luer lock adaptor according to one example of the present disclosure;

[0015] FIG. 7 is an exploded perspective view of the distal end of the injection device of FIG. 4;

[0016] FIG. 8 is an exploded side view of the distal end of the injection device of FIG. 4; and

[0017] FIG. 9 is an exploded cross-sectional side view of the distal end of the injection device of FIG. 4.

### DESCRIPTION OF THE DISCLOSURE

[0018] For purposes of the description hereinafter, the terms “upper”, “lower”, “right”, “left”, “vertical”, “horizontal”, “top”, “bottom”, “lateral”, “longitudinal”, and derivatives thereof, shall relate to the invention as it is oriented in the figures. However, it is to be understood that the invention may assume alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific systems and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary examples of the invention. Hence, specific dimensions and other physical characteristics related to the examples disclosed herein are not to be considered as limiting.

[0019] The present disclosure, generally, is directed to an injection device 10 and, in particular, a luer lock adaptor 12 configured to assist in connecting a syringe 14 to a needle hub 16. The injection device 10 is described with reference to FIGS. 1-9.

[0020] With reference to FIGS. 1-9, the injection device 10 includes a syringe 14, a luer lock adaptor 12, and a needle hub 16. It is also contemplated that a removable gripping handle (not shown) may be provided on the syringe 14 to assist a user in holding or grasping the injection device 10. The syringe 14 includes a generally cylindrical syringe barrel 18, an integral flange 20 provided on a proximal end thereof, and a tip 22 provided on a distal end thereof. The tip 22 may have a smaller diameter than the syringe barrel 18. The tip 22 is configured for connection with a needle (not shown). In one example, as shown in FIG. 4, the tip 22 may define a groove 23 therein for assistance in connecting the syringe 14 to the luer lock adaptor 12, as explained in

greater detail below. In one example, the syringe **14** may be made of glass. It is also contemplated that the syringe **14** may be made of transparent medical-grade plastic. The syringe **14** defines an internal bore **24** that extends from the proximal end to the distal end of the syringe **14**. The internal bore **24** is configured to receive and hold a medicament to be injected into a patient.

[0021] As shown in **FIGS. 3** and **4**, in one example of the present disclosure, the luer lock adaptor **12** is threadedly connected to the needle hub **16** and friction fit on the tip **22** of the syringe **14**. In one example, the luer lock adaptor **12** is made of a deformable plastic. The luer lock adaptor **12** includes a body member **26** and a reduced-diameter inner protrusion **28**. The body member **26** defines an inner cavity **30** configured to receive a portion of the needle hub **16** and the tip **22** of the syringe **14**. In one example, a diameter of the inner cavity **30** is generally 6.5-7 mm. The portion of the needle hub **16** is received in a distal end of the luer lock adaptor **12**. The tip **22** of the syringe **14** is received within a proximal end of the luer lock adaptor **12**. In one example, the body member **26** is generally cylindrical in shape. As shown in **FIGS. 3** and **4**, at least a portion of the outer circumferential surface of the body member **26** includes threading **32** to connect the luer lock adaptor **12** to the needle hub **16**, as described in greater detail below. It is contemplated that the thread geometry of the threading **32**, such as pitch and number of threads, can be adapted and modified as desired.

[0022] The inner protrusion **28** of the luer lock adaptor **12** defines an opening **34** in the proximal end of the luer lock adaptor **12**. The opening **34** is configured to receive the tip **22** of the syringe **14**. It is contemplated that the diameter of the opening **34** can be modified or adapted to accommodate different size syringe tips. The opening **34** is sized such that only a desired or predetermined syringe **14** can be received within the luer lock adaptor **12**, thereby avoiding misconnection of an undesired syringe **14** within the injection device **10**. In one example, the diameter of the opening **34** is slightly less than an outer diameter of the tip **22** of the syringe **14** so that the tip **22** is held by a friction fit within the opening **34**. It is also contemplated that a snap-fit connection, an interference fit connection, an adhesive, or any other connection method could be used to hold the tip **22** within the opening **34**. As shown in **FIG. 6**, the opening **34** may have a star-shaped configuration. The opening **34** may be discontinuous and include several different recesses **36** that are formed with a central opening **38** to form the overall opening **34**. Certain edges **40** of the opening **34** may be chamfered to assist in the insertion of the syringe

tip **22** into the luer lock adaptor **12**. With reference to **FIG. 4**, in the embodiment of the injection device **10** in which a groove **23** is defined on the tip **22** of the syringe **14**, as the syringe tip **22** is inserted into the luer lock adaptor **12**, the edges **40** engage with the groove **23** defined on the syringe tip **22** to hold the syringe **14** within the luer lock adaptor **12**.

[0023] With reference to **FIGS. 1-4**, the needle hub **16** has a generally cylindrical body **42**, a needle receiving portion **44**, and an inner skirt member **45**. The needle receiving portion **44** is provided on a distal end of the body **42** and has a smaller diameter than the body **42**. The needle receiving portion **44** defines a bore **46** adapted to receive a needle (not shown) for connection to the tip **22** of the syringe **14**. The inner surface of the bore **46** tapers from a distal end to a proximal end of the needle receiving portion **44**. Therefore, the diameter of the distal end of the bore **46** is greater than the diameter of the proximal end of the bore **46**. Due to the reduced diameter of the proximal end of the bore **46**, the tip **22** of the syringe **14** is held in a friction fit with the needle hub **16**. In one example, the diameter of the proximal end of the bore **46** is designed such that a predetermined distance **A** between a distal end of the tip **22** and a distal end of the luer lock adaptor **12** is maintained. In one example, the distance **A** is measured to be generally between 2 and 2.5 mm. This distance is maintained to ensure that only a particular predetermined needle (not shown) can be received within the bore **46** of the luer lock adaptor **16**. In the event this distance is too great, the desired needle may not be able to reach the tip **22** of the syringe **14** for connection thereto. In the event this distance is too small, other needles besides the particular predetermined needle may be received within the bore **46**. By providing a specific interface between the needle hub **16** and the luer lock adaptor **12**, the predetermined distance **A** can be maintained such that only one needle, one type of needle, or one length of needle may be fitted to the injection device **10**. For example, by providing a specific interface between the needle hub **16** and the luer lock adaptor **12**, only an intradermal needle could be fitted to the injection device **10**, and not a subcutaneous, intramuscular, or intravenous needle.

[0024] The body **42** of the needle hub **16** defines an inner cavity **48** that receives the luer lock adaptor **12** and the tip **22** of the syringe **14**. An inner surface of the body **42** includes a threading **50** that corresponds to the threading **32** of the luer lock adaptor **12**. It is contemplated that the thread geometry of the threading **50**, such as pitch and number of threads, can be adapted and modified as desired. The luer lock adaptor **12** may be threaded into the inner cavity **48** of the needle hub **16** by connecting the corresponding threading **32**, **50** with one another. This threaded

connection prevents the luer lock adaptor **12** from moving proximally out of the needle hub **16**. The body **42** may also define a plurality of gripping ribs **52** in an outer circumferential surface of the body **42**. The ribs **52** assist a user in holding and gripping the needle hub **16** during connection of the syringe **14** into the luer lock adaptor **12** and the needle hub **14**.

**[0025]** While several examples of the injection device are shown in the accompanying figures and described in detail hereinabove, other aspects will be apparent to, and readily made by, those skilled in the art without departing from the scope and spirit of the disclosure. Accordingly, the foregoing description is intended to be illustrative rather than restrictive.

## THE INVENTION CLAIMED IS:

1. An injection device, comprising:
  - a syringe comprising a barrel having a distal end and a proximal end and a tip provided on the distal end of the barrel, the barrel defining an internal bore extending from the proximal end to the distal end of the barrel;
  - a luer lock adaptor comprising a body having a proximal end and a distal end, a reduced-diameter portion provided on the proximal end of the body, and a threading provided on an outer surface of the body, the reduced-diameter portion defining an opening to receive the tip of the syringe in a friction fit; and
  - a needle hub comprising a body defining an inner cavity, a needle receiving portion extending distally from the body, and a skirt extending inwardly into the inner cavity, wherein an inner surface of the body includes a threading corresponding to the threading of the luer lock adaptor to connect the luer lock adaptor to the needle hub, wherein the needle receiving portion defines a bore to receive the tip of the syringe.
2. The injection device of claim 1, wherein the opening is sized to only accommodate the tip of the syringe, wherein the syringe is a predetermined syringe-type.
3. The injection device of claim 1, wherein the diameter of the opening is smaller than an outer diameter of the tip of the syringe.
4. The injection device of claim 1, wherein the opening has a star-shaped configuration.
5. The injection device of claim 1, wherein the opening is discontinuous and includes a plurality of recesses that are formed with a central opening to form the opening.
6. The injection device of claim 1, wherein an edge of the opening is chamfered.

7. The injection device of claim 1, wherein the tip includes a groove therein and an edge of the opening is chamfered to engage with the groove to hold the syringe within the luer lock adaptor.

8. The injection device of claim 1, wherein the bore defined by the needle receiving portion has an inner surface which tapers from a distal end to a proximal end of the needle receiving portion.

9. The injection device of claim 8, wherein a diameter of the distal end of the bore is greater than the diameter of the proximal end of the bore.

10. The injection device of claim 9, wherein the diameter of the proximal end of the bore limits a distance between the distal end of the tip of the syringe and a distal end of the luer lock adaptor.

11. The injection device of claim 10, wherein the predetermined distance is from between 2 and 2.5 mm.

12. The injection device of claim 1, wherein the body of the needle hub includes a plurality of gripping ribs defined in an outer surface of the body to assist a user in the holding of the needle hub during connection of the syringe into the luer lock adaptor and the needle hub.