

CLAIMS

We claim:

1. An access system, comprising:

a hub, comprising a distal end, a proximal end, a lumen extending through the distal end and the proximal end;

a needle protection device to shield a sharp distal tip of a needle, the needle protection device comprising:

a housing disposed within the lumen of the hub, wherein the housing comprises a tubular portion, a first arm, and a second arm, wherein the first arm comprises a first end coupled to the tubular portion, a second end disposed within the tubular portion, and a bent portion disposed between the first end of the first arm and the second end of the first arm, wherein the second arm comprises a first end coupled to the tubular portion, a second end disposed within the tubular portion, and a bent portion disposed between the first end of the second arm and the second end of the second arm, wherein the second end of the first arm and the second end of the second arm form a duckbill valve; and

a needle, comprising a sharp distal tip, wherein the needle extends through the housing and biases the first arm and the second arm outwardly towards the hub to facilitate retention of the housing within the hub, wherein in response to the sharp distal tip being withdrawn in a proximal direction beyond the second end of the first arm and the second end of the second arm, the duckbill valve closes and the first arm and the second arm move inwardly to facilitate removal of the housing from the hub.

2. The access system of claim 1, wherein the tubular portion comprises a distal end and a proximal end, wherein the first end of the first arm is formed by a first slit and a second slit

within the tubular portion, wherein the first end of the second arm is formed by a third slit and a fourth slit within the tubular portion, wherein the first slit, the second slit, the third slit, and the fourth slit extend through the distal end of the tubular portion.

3. The access system of claim 2, wherein the tubular portion is closed except for a portion of the housing between the first slit and the second slit that comprises the first arm and another portion of the housing between the third slit and the fourth slit that comprises the second arm.

4. The access system of claim 1, wherein the needle comprises a feature disposed proximal to the sharp distal tip, wherein the housing comprises a proximal opening, wherein a diameter of the proximal opening is less than a diameter of the feature such that the sharp distal tip is prevented from being withdrawn proximally through the proximal opening.

5. The access system of claim 4, further comprising a washer coupled to a proximal end of the tubular portion, wherein the washer comprises the proximal opening.

6. The access system of claim 5, wherein the needle further comprises a notch providing access to a lumen of the needle, wherein in response to the sharp distal tip being withdrawn in the proximal direction beyond the second end of the first arm and the second end of the second arm and the feature contacting the washer, the notch is disposed within the tubular portion proximal to the duckbill valve.

7. The access system of claim 1, wherein the hub further comprises an inner surface forming the lumen, wherein the inner surface comprises a recess wherein the first arm comprises a first interlock protrusion and the second arm comprises a second interlock protrusion, wherein in response to the needle extending through the duckbill valve, the first interlock protrusion and

the second interlock protrusion are disposed within the recess to facilitate retention of the housing within the hub, wherein in response to the sharp distal tip being withdrawn in the proximal direction beyond the second end of the first arm and the second end of the second arm, the duckbill valve closes and the first interlock protrusion and the second interlock protrusion are removed from the recess to facilitate removal of the housing from the hub.

8. The access system of claim 7, wherein the first bent portion comprises the first interlock protrusion, and the second bent portion comprises the second interlock protrusion.

9. The access system of claim 7, wherein the first interlock protrusion is disposed proximal to the first bent portion, wherein the second interlock protrusion is disposed proximal to the second bent portion.

10. The access system of claim 1, further comprising a friction pad coupled to the first arm, wherein the needle extends through the housing and biases the first arm outwardly towards the hub such that the first friction pad contacts the hub.

11. The access system of claim 10, further comprising another friction pad coupled to the second arm, wherein the needle extends through the housing and biases the second arm outwardly towards the hub such that the second friction pad contacts the hub.

12. The access system of claim 11, wherein in response to the sharp distal tip being withdrawn in the proximal direction beyond the second end of the first arm and the second end of the second arm, the first friction pad and the second friction pad are spaced apart from the hub.

13. The access system of claim 1, further comprising a friction band surrounding the housing, wherein the needle extends through the housing and biases the first arm and the second arm outwardly towards the hub such that the friction band contacts the hub.

14. The access system of claim 13, wherein in response to the sharp distal tip being withdrawn in the proximal direction beyond the second end of the first arm and the second end of the second arm, the friction band is spaced apart from the hub.

15. The access system of claim 1, wherein the first end of the first arm and the first end of the second arm are generally planar and flush with an outer surface of the tubular portion.

16. The access system of claim 1, wherein the housing is monolithically formed as a single unit.

17. An access system, comprising:
a hub, comprising a distal end, a proximal end, a lumen extending through the distal end and the proximal end;

a needle protection device to shield a sharp distal tip of a needle, the needle protection device comprising:

a housing disposed within the lumen of the hub, wherein the housing comprises a tubular portion, a first arm, and a second arm, wherein the first arm comprises a first end coupled to the tubular portion, a second end disposed within the tubular portion, and a first bent portion disposed between the first end of the first arm and the second end of the first arm, wherein the second arm comprises a first end coupled to the tubular portion, a second end disposed within the tubular portion, and a second bent portion disposed between the first end of the second arm and the second end of the second arm, wherein the second end of the first arm and the second end of the second arm form a duckbill valve; and

a housing retention mechanism, comprising:

at least one friction component disposed between the first arm and the hub
and between the second arm and the hub; or

an interlock protrusion extending from at least one of the first arm and the second arm and contacting a groove in an inner surface of the hub; and

a needle, comprising a sharp distal tip, wherein the needle extends through the housing and biases the first arm and the second arm outwardly towards the hub to facilitate retention of the housing within the hub, wherein in response to the sharp distal tip being withdrawn in a proximal direction beyond the second end of the first arm and the second end of the second arm, the duckbill valve closes and the first arm and the second arm move inwardly to facilitate removal of the housing from the hub.

18. The needle protection device of claim 17, wherein at least one of the first bent portion and the second bent portion comprises the interlock protrusion.

19. The needle protection device of claim 17, wherein the housing retention mechanism comprises the interlock protrusion extending from the at least one of the first arm and the second arm and contacting the groove in the inner surface of the hub, further comprising a first spring element disposed proximal to the first bent portion and a second spring element disposed proximal to the second bent portion.

20. The needle protection device of claim 19, wherein in response to the needle extending through the housing and biasing the first arm and the second arm outwardly towards the hub, the first spring element is biased against the second end of the first arm and the second spring element is biased against the second end of the second arm.