Claim amendments pursuant to Article 34 PCT
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CLAIMS

What is claimed is:

1. An IV catheter assembly (1, 201) comprising:

a catheter hub (2, 202) comprising an interior cavity, an opening at a proximal end, and a catheter tube (4, 204) attached thereto and extending from a distal end;

a needle (9, 209) having a needle shaft (62) defining a needle axis projecting distally of an end of a needle hub (8, 218), said needle (9, 209) projecting through the catheter tube (4, 204) and comprising a needle tip (9a, 272);

a valve (7, 40, 207) sized and shaped to obstruct fluid flow positioned inside the interior cavity of the catheter hub (2, 202) and in contact with the interior cavity, said valve (7, 40, 207) comprising a valve perimeter (72, 302, 672, 704) surrounding a wall surface (42, 52) comprising a thickness, at least one slit (54, 654, 706) defining at least two flaps (320, 620, 708), and a void (44, 712) having a void perimeter (306, 716) inwardly positioned relative to the valve perimeter (72, 302, 672, 704) and formed through only part of the thickness of the wall surface (42, 52, 706); and

a valve opening device (10, 210) slidingly disposed in the catheter hub (2, 202) to actuate the valve (7, 40, 207), the valve opening device (10, 210) comprising a nose section (10a, 210a) having a tapered end for pushing the valve (7, 40, 207) to open the slit (54, 654, 706) of the valve (7, 40, 207) and a plunger end (10b, 260) having a plunger element extending proximally of the nose section (10a, 210a); the plunger element being sufficiently rigid to transfer a distally directed force to the nose section (10a, 210a) to push the valve (7, 40, 207) to open the slit (54, 654),

characterized in that

the void (44, 712) has a tapered wall surface.

2. The IV catheter assembly of claim 1, wherein the valve (7, 40, 207) further comprises a second slit (54, 654, 706) and a third slit (54, 654, 706).

3. The IV catheter assembly of claim 1 or 2, wherein the void (44, 712) has a blunt tip or a sharp tip.

4. The IV catheter assembly of any one of claims 1 to 3, wherein the valve (7, 40, 207) further comprises a second void formed through part of the thickness on the wall surface (42, 52) opposite the void (44, 712).

5. The IV catheter assembly of any one of claims 1 to 4, wherein the valve (7, 40, 207) further comprises a plurality of reinforcing ribs (70) located, at least in part, on the flaps (320, 620, 708).

6. The IV catheter assembly of any one of claims 1 to 5, wherein the at least one slit (54, 654, 706) extends through the thickness (304) of the valve (7, 40, 207) from a proximal surface (42) to a distal surface (52) including through any portion of the void (44, 712).

7. The IV catheter assembly of any one of claims 1 to 6, wherein the void (712) comprises a three-sided or three wings (750, 752, 754) structure with each wing (750, 752, 754) comprising a set of three tapered surfaces (714a, 714b, 714c) surrounding each slit (706).

8. The IV catheter assembly of any one of claims 1 to 7, wherein the valve (7, 40, 207) comprises a valve body comprising an outer periphery, and wherein the at least one slit (54, 654, 706) is an inner slit remote from said outer periphery.

CLAIMS

1. An intravenous (IV) catheter assembly comprising:

a catheter hub comprising an interior wall surface defining an interior cavity, an opening at a proximal end, and a catheter tube for intravenous use attached thereto and extending from a distal end;

a needle having a needle shaft defining a needle axis projecting distally of an end of a needle hub, said needle projecting through the catheter tube and comprising a needle tip;

a valve sized and shaped to obstruct fluid flow positioned inside the interior cavity of the catheter hub and in contact with the interior wall surface defining the interior cavity, said valve comprising a valve perimeter surrounding a wall surface comprising a thickness, at least one slit having a length and a cut through the thickness of the wall surface and substantially along the length of the at least one slit to define at least two flaps and a void having a void perimeter inwardly positioned relative to the valve perimeter and formed through only part of the thickness of the wall surface, said void comprising at least one wing; and

a valve opening device slidingly disposed in the catheter hub to actuate the valve, the valve opening device comprising a nose section having a tapered end for pushing the valve to open the slit of the valve and a plunger end having a plunger element extending proximally of the nose section; the plunger element being sufficiently rigid to transfer a distally directed force to the nose section to push the valve to open the slit;

wherein three tapered surfaces extend from the void perimeter inwardly toward the at least one slit and toward a bottom wall of the void.

2. The catheter assembly of claim 1, further comprising a second slit and a third slit.

3. The catheter assembly of claim 1, wherein the void has a blunt tip or a sharp tip.

4. The catheter assembly of claim 1, wherein the valve further comprises a second void formed through part of the thickness on the wall surface opposite the void.

5. The catheter assembly of claim 1, wherein the valve further comprises a plurality of reinforcing ribs located, at least in part, on the flaps.

6. The catheter assembly of claim 1, further comprising a needle protective device spaced from the needle tip in a ready position and movable relative to the needle tip to a protective position, at least in part, distally of the needle tip to prevent unintended needle sticks.

7. The catheter assembly of claim 1, further comprising a plurality of spaced apart vents cut through the valve perimeter.

8. An intravenous (IV) catheter assembly comprising:

a first hub comprising an interior cavity having a shoulder, a perimeter defining an opening at a proximal end, and a catheter tube for intravenous use having a distal end opening extending distally of the first hub;

a needle having a needle shaft defining a needle axis projecting distally of an end of a second hub, said needle projecting through the catheter tube and comprising a needle tip;

a valve sized and shaped to obstruct fluid flow comprising a valve body comprising a perimeter, said perimeter comprising at least one vent and said valve body comprising at least one inner slit remote from said perimeter; said valve being positioned inside the interior cavity of the first hub;

a valve opening device slidingly disposed in the first hub to actuate the valve, the valve opening device comprising a nose section having a tapered end with an opening structured to push the valve to open the plurality of slits and at least one plunger element extending proximally of the nose section and slidable distally when a male implement projects into the opening of the first hub to transfer a distally directed force to the nose section to push the valve to open the at least one slit; and

wherein the valve has at least one void having a void perimeter disposed inwardly of the outer periphery, said void comprising at least one wing comprising three tapered surfaces extending inwardly from the void perimeter toward a bottom wall of the void, surrounding said at least one slit.

9. The catheter assembly of claim 8, comprising a needle guard comprising a proximal wall with an opening sized to obstruct a change in profile on the needle.

10. The catheter assembly of claim 8, wherein the at least one vent is a lengthwise slit.

11. The catheter assembly of claim 8, wherein the at least one vent is a V-shaped notch.

12. The catheter assembly of claim 8, wherein the void has two side tapered surfaces and one tapered end surface.

13. The catheter assembly of claim 8, further comprising a second void positioned opposite the void

14. The catheter assembly of claim 8, wherein the valve body comprises a cylinder with an open end.

15. The catheter assembly of claim 8, wherein the vent closes when the valve is opened by the valve opening device.

16. The catheter assembly of claim 1, wherein the wall surface is a first wall surface, and wherein the valve comprises a second wall surface comprising at least one slit defining at least two flaps, and a void having a void perimeter inwardly positioned relative to the valve perimeter and formed through only part of the thickness of the wall surface, said void comprising at least one wing comprising a set of tapered surfaces surrounding said at least one slit.

17. The catheter assembly of claim 1, wherein the at least two flaps have interior surfaces and wherein the needle shaft rests against the interior surfaces of the at least two flaps along a through seam.

18. The catheter assembly of claim 1, wherein the at least two flaps have interior surfaces and wherein the needle shaft rests against the interior surfaces so that force vectors at a seam of the at least one slit is perpendicular relative to an axis of the needle shaft.

19. The catheter assembly of claim 1, wherein the valve comprises a hollow cylinder section having a length and a body wall thickness.

20. The assembly of claim 18, further comprising vents running the entire length of the hollow cylinder.

21. The catheter assembly of claim 8, wherein said at least one void is located on a first surface of the valve, and wherein the valve comprises a second wall surface comprising at least one void disposed inwardly of the outer periphery, said void comprising at least one wing comprising three tapered surfaces surrounding said at least one slit.

22. The catheter assembly of claim 8, wherein the at least one slit defines at least two flaps with interior surfaces and wherein the needle shaft rests against the interior surfaces of the at least two flaps along a through seam.

23. The catheter assembly of claim 8, wherein the at least one slit defines at least two flaps with interior surfaces and wherein the needle shaft rests against the interior surfaces so that force vectors at a seam of the at least one slit is perpendicular relative to an axis of the needle shaft.

24. The catheter assembly of claim 8, wherein the valve comprises a hollow cylinder section having a length and a body wall thickness.

25. The assembly of claim 23, further comprising vents running the entire length of the hollow cylinder.