Claims

1. A peel-away sheath assembly for insertion of a blood pump, the peel-away sheath assembly comprising:

a peel-away sheath hub; and

a peel-away sheath body comprising:

a proximal end connected to the peel-away sheath hub,

a distal end,

an outer layer defining an outer radius of the peel-away sheath body,

an inner layer defining a first lumen of the peel-away sheath body with an inner radius,

a reinforcing layer located between the inner radius and the outer radius,

wherein the reinforcing layer has a rigidity that is greater than at least one of a rigidity of the inner layer and a rigidity of the outer layer and wherein the reinforcing layer of the sheath body comprises a circumferential discontinuity, and

one or more notches extending from an outermost or innermost surface of the peel-away sheath body and penetrating through the outer layer and the reinforcing layer or through the inner layer and the reinforcing layer, respectively,

wherein the one or more notches are configured as a succession of aligned discrete notches defining a peel-away line or as a continuous peel-away line along the length of the peel-away sheath body, the peel-away line being aligned with the circumferential discontinuity, wherein the peel-away sheath body is configured to be peeled away along the peel-away line.

2. The peel-away sheath assembly of claim 1, wherein the reinforcing layer is a hypotube.

3. The peel-away sheath assembly of any of claims 1-2, wherein the reinforcing layer comprises at least two circumferential discontinuities.

4. The peel-away sheath assembly of claim 3, wherein each of the at least two circumferential discontinuities comprises a plurality of slits formed on a surface of a hypotube.

5. The peel-away sheath assembly of claim 3, wherein the at least two circumferential discontinuities are formed on a surface of a hypotube, are parallel to one another, and are uniformly spaced along a length of the hypotube.

6. The peel-away sheath assembly of claim 4, wherein the slits on the surface of the hypotube have a length in a circumferential direction, wherein the length of the slits is substantially identical for all slits.

7. The peel-away sheath assembly of claim 4 or claim 6, wherein the slits on the surface of the hypotube comprise:

a set of first slits, each slit of the set of first slits having a center, wherein centers of each slit in the set of first slits form a first slit axis along the length of the hypotube, and

a set of second slits, each slit of the set of second slits having a center, wherein centers of each slit in the set of second slits form a second slit axis along the length of the hypotube, and

wherein the second slit axis is offset by an angle from the first slit axis.

8. The peel-away sheath assembly of claim 7, wherein the one or more notches define first and second peel-away lines on a surface of the peel-away sheath body, wherein at any longitudinal location along the peel-away sheath body, the first slit axis is at a same circumferential location as the first peel-away line and the second slit axis is at a same circumferential location as the second peel-away line.

9. The peel-away sheath assembly of claim 8, wherein at least one of the first and the second peel-away lines is located on an inner surface of the peel-away sheath body.

10. The peel-away sheath assembly of claim 8, wherein at least one of the first and the second peel-away lines is located on an outer surface of the peel-away sheath body.

11. The peel-away sheath assembly of claim 8, wherein the first and second peel-away lines are diametrically opposed from one another.

12. The peel-away sheath assembly of any of claims 1-11, wherein the peel-away sheath hub further comprises:

a proximal conical portion,

a distal cylindrical portion, and

at least one circumferential discontinuity.

13. The peel-away sheath assembly of claim 12, wherein the at least one circumferential discontinuity of the peel-away sheath hub comprises a first circumferential discontinuity and a second circumferential discontinuity, wherein the proximal conical portion of the peel-away sheath hub comprises the first circumferential discontinuity, and wherein the distal cylindrical portion of the peel-away sheath hub comprises the second circumferential discontinuity.

14. The peel-away sheath assembly of claim 13, wherein the first circumferential discontinuity and the second circumferential discontinuity are aligned in a longitudinal direction.

15. The peel-away sheath assembly of claim 13 or claim 14, wherein a distal end of the second circumferential discontinuity abuts a proximal end of at least one of the first and the second peel-away line on the surface of the peel-away sheath body.

16. The peel-away sheath assembly of any of claims 1-15, wherein the inner layer and the outer layer comprise a thermoplastic.

17. The peel-away sheath assembly of claim 16, wherein the thermoplastic is at least one of PEBAX or TPU.

18. The peel-away sheath assembly of any of claims 1-17, wherein the reinforcing layer is at least one of LCP, PEBAX, stainless steel, Nitinol, or Kevlar.

19. The peel-away sheath assembly of any of claims 1-18, wherein the reinforcing layer is present only in a distal portion of the peel-away sheath body.

20. The peel-away sheath assembly of any of claims 1-18, wherein the reinforcing layer is present only in a proximal portion of the peel-away sheath body.

21. The peel-away sheath assembly of any of claims 1-18, wherein the reinforcing layer is present only in a middle portion of the peel-away sheath body.

22. The peel-away sheath assembly of any of claims 1-18, wherein the reinforcing layer is present in alternating portions along the length of the peel-away sheath body.

23. The peel-away sheath assembly of claim 2, wherein the hypotube is configured as two c-shaped halves.

24. The peel-away sheath assembly of any of claims 1-23, wherein the peel-away line on an inner surface of the peel-away sheath body extends along the entire length of the peel-away sheath body.

25. The peel-away sheath assembly of any of claims 1-24, wherein a hydrophilic coating covers at least a portion of the outer layer of the peel-away sheath body.

26. The peel-away sheath assembly of claim 25, wherein the portion of the outer layer covered by the hydrophilic coating extends from the distal end of the peel-away sheath body to about 5 centimeters distal of the proximal end of the peel-away sheath body.

27. The peel-away sheath assembly of claim 25, wherein the portion of the outer layer covered by the hydrophilic coating extends from the distal end of the sheath body to about 2 centimeters distal of the proximal end of the peel-away sheath body.

28. The peel-away sheath assembly of claim 1, wherein the one or more notches extending from the outermost or the innermost surface of the peel-away sheath body and penetrating through the outer layer and the reinforcing layer or through the inner layer and the reinforcing layer, respectively, further terminate within the inner layer or the outer layer, respectively.