

We claim:

1. A sheath for delivering a medical device, the sheath comprising:
  - a continuous inner layer defining a lumen therethrough, the inner layer including a first fold and a second fold and an overlapping folded portion extending circumferentially between the first and second folds, the folded portion comprising overlap in a radial direction of at least two thicknesses of the inner layer;
  - a discontinuous outer layer extending at least partially around the inner layer, the outer layer having an overlapping portion and an underlying portion, at least a portion of the folded portion of the inner layer is positioned between the overlapping portion and the underlying portion;
  - an adhesive layer (e.g., tie layer) is provided between the inner layer and the outer layer and at least partially adhering the inner layer to the outer layer; and
  - an outer jacket extending around the outer layer,wherein at least a portion of the sheath is configured to locally expand from an unexpanded configuration in which the lumen has a first diameter to an expanded configuration in which the lumen has a second diameter larger than the first diameter due to an outwardly directed radial force exerted by a medical device against the inner layer, and then locally contract at least partially back to the unexpanded configuration as the prosthetic device passes through the lumen.
2. The sheath of claim 1, wherein the wall thickness of the outer jacket varies along a length of the outer jacket.
3. The sheath of any one of claims 1-2, wherein the wall thickness of the outer jacket is greater along a length of the outer jacket adjacent the proximal end of the sheath.
4. The sheath of any one of claims 1-3, wherein the sheath includes a tapered segment adjacent the proximal end of the sheath, wherein the thickness of the outer jacket is greater along the tapered segment.

5. The sheath of any one of claims 1-4, wherein the outer jacket is bonded to the outer layer along a length of the outer layer between the proximal and distal ends of the outer layer.

6. The sheath of any one of claims 1-5, wherein the outer jacket includes an axially extending reinforcing member imbedded in the outer jacket for reducing axial bunching of the elastomeric outer jacket during insertion into the patient's vasculature, the outer jacket including a first polymer layer and a second polymer layer,

wherein the reinforcing member is constructed from a material having a Shore D durometer ranging from 45D to 76D,

wherein the outer jacket has a burst pressure greater than 8 psi.

7. The sheath of any one of claims 1-6, wherein the first fold is configured to move closer to the second fold to shorten the folded portion at a local axial location during passage of the medical device through the lumen, and wherein shortening of the folded portion corresponds with a local expansion of the lumen,

wherein the inner layer extends through a longitudinally extending opening provided in the outer layer when the outer layer is expanded,

wherein the longitudinally extending opening is provided between a longitudinally extending edge of the overlapping portion and a longitudinally extending edge of the underlying portion.

8. The sheath of any one of claims 1-7, wherein the inner layer is composed of an etched PTFE,

wherein unetched portions of the inner layer are provided along portions of the inner layer that contact an outer surface of the outer layer.

9. The sheath of claim 8, wherein unetched portions of the inner layer are provided along those locations excluding the tie layer,

wherein the surface of the inner layer adjacent the underlaying portion of the outer layer, when the sheath is not expanded, are unetched.

10. The sheath of any one of claim 1-9, wherein the tie layer extends at least partially around an outer surface of the inner layer.

11. The sheath of any one of claim 1-10, wherein the tie layer extends between the outer layer and the overlapping folded portion of the inner layer.

12. The sheath of claim 11, wherein the tie layer extends between an outer surface of the overlapping folded portion of the inner layer and a corresponding surface of the overlapping portion of the outer layer.

13. The sheath of any one of claims 11-12, wherein the tie layer does not extend between an inner surface of the overlapping folded portion of the inner layer and a corresponding surface of the underlying portion of the outer surface of the outer layer.

14. A sheath for delivering a medical device, the sheath comprising:  
a continuous inner layer defining a lumen therethrough, the inner layer including a first fold and a second fold and an overlapping folded portion extending circumferentially between the first and second folds, the folded portion comprising overlap in a radial direction of at least two thicknesses of the inner layer;

a discontinuous outer layer extending at least partially around the inner layer, the outer layer having an overlapping portion and an underlying portion, at least a portion of the folded portion of the inner layer is positioned between the overlapping portion and the underlying portion;

a tie layer provided between the inner layer and the outer layer and at least partially adhering the inner layer to the outer layer; and

an outer jacket extending around the outer layer,

wherein at least a portion of the sheath is configured to locally expand from an unexpanded configuration in which the lumen has a first diameter to an expanded configuration in which the lumen has a second diameter larger than the first diameter due to an outwardly directed radial force exerted by a medical device against the inner layer, and then locally contract at least partially back to the unexpanded configuration as the prosthetic device passes through the lumen,

wherein a lubricant is provided between the outer jacket and the outer layer.

15. The sheath of claim 14, wherein the lubricant is provided on an outer surface of the outer layer proximate a longitudinally extending edge of the overlapping portion.

16. The sheath of any one of claims 14-15, wherein at least a portion of the folded portion of the inner layer extends beyond the longitudinally extending edge of the overlapping portion and along an outer surface of the outer layer,

wherein the lubricant is provided along the portion the folded portion of the inner layer extending along the outer surface of the outer layer.

17. The sheath of claim 16, wherein the lubricant is provided along a portion of the outer surface of the outer layer adjacent the portion the folded portion of the inner layer extending along the outer surface of the outer layer.

18. The sheath of any one of claims 14-17, wherein the lubricant is applied as a band around a portion of the circumference of the outer layer, the band of lubricant extending longitudinally along a length of the outer layer.