

Listing of Claims

1. A delivery apparatus configured to provide visual feedback of radial expansion of a prosthetic valve, the delivery apparatus comprising:
an indicator arm changeable between a first configuration and a second configuration, the second configuration being different from the first configuration in location or shape of the indicator arm;
wherein the indicator arm is configured to remain in the first configuration when a diameter of the prosthetic valve is smaller than a first predetermined size, and change to the second configuration when the diameter of the prosthetic valve is expanded to the first predetermined size.
2. The delivery apparatus of claim 1, wherein the indicator arm comprises a radiopaque marker such that the change of the indicator arm from the first configuration to the second configuration is visible under fluoroscopy.
3. The delivery apparatus of any one of claims 1-2, wherein the indicator arm comprises an elastic material such that the indicator arm in the first configuration is in a biased state and the indicator arm in the second configuration is in an unbiased state.
4. The delivery apparatus of any one of claims 1-3, wherein the indicator arm in the first configuration is oriented generally along an axial axis of the prosthetic valve, and the indicator arm in the second configuration is oriented in an oblique angle relative to the axial axis of the prosthetic valve.
5. The delivery apparatus of any one of claims 1-4 further comprising a first actuation component and a second actuation component that are configured to interface with an expansion mechanism of the prosthetic valve such that axially moving the second actuation component relative to the first actuation component in a first direction causes the prosthetic valve to expand from a radially compressed state to a radially expanded state, and axially moving the second actuation component relative to the first actuation component in a

second direction opposite the first direction causes the prosthetic valve to compress from the radially expanded state to the radially compressed state.

6. The delivery apparatus of claim 5, wherein the second actuation component extends through a lumen of the first actuation component.

7. The delivery apparatus of any one of claims 5-6, wherein a first end of the indicator arm is fixedly attached to a first location of the first actuation component, and a second end of the indicator arm is configured to be removably attached to a second location of the first actuation component when the indicator arm is in the first configuration.

8. The delivery apparatus of claim 7, wherein the second end of the indicator arm is configured to engage a portion of the expansion mechanism of the prosthetic valve when axially moving the second actuation component relative to the first actuation component in the first direction such that when engaging the portion of the expansion mechanism, the second end of the indicator arm can be released from the second location of the first actuation component.

9. The delivery apparatus of claim 8, wherein the second location of the first actuation component is so positioned that when the portion of the expansion mechanism of the prosthetic valve engages the second end of the indicator arm, the diameter of the prosthetic valve is expanded to the first predetermined size.

10. The delivery apparatus of any one of claims 7-9, wherein the second location is proximal to the prosthetic valve before expanding the prosthetic valve to the first predetermined size, and the first location is proximal to the second location.

11. The delivery apparatus of any one of claims 7-10, wherein the first actuation component comprises an aperture at the second location, the aperture being sized to allow the second end of the indicator arm to extend through thereof.

12. The delivery apparatus of claim 11, wherein the first location is located on an exterior surface of the first actuation component, and the second end of the indicator arm is configured to frictionally engage an edge of the aperture or an interior surface of the first actuation component adjacent the aperture when the indicator arm is in the first configuration.

13. The delivery apparatus of claim 11, wherein the first location is located on an exterior surface of the first actuation component, and the second end of the indicator arm comprises a hook that is configured to engage an edge of the aperture and an interior surface of the first actuation component adjacent the aperture when the indicator arm is in the first configuration.

14. The delivery apparatus of claim 11, wherein the first location is located on an interior surface of the first actuation component, and the second end of the indicator arm is configured to press against an interior surface of the first actuation component adjacent the aperture when the indicator arm is in the first configuration.

15. The delivery apparatus of any one of claims 7-14, wherein the second end of the indicator arm is configured to be removably attached to at least a third location of the first actuation component when the indicator arm is in the first configuration, the third location being spaced apart from the second location.

16. The delivery apparatus of claim 15, wherein the second end of the indicator arm is configured to be released from the third location of the first actuation component by the prosthetic valve when axially moving the second actuation component relative to the first actuation component in the first direction, wherein the third location is so configured that when the second end of the indicator arm is released by the prosthetic valve from the third location, the diameter of the prosthetic valve is expanded to a second predetermined size that is different from the first predetermined size.

17. A medical assembly comprising:
a prosthetic valve; and

a delivery apparatus according to any one of claims 1-16.

18. A delivery apparatus configured to provide visual feedback of radial expansion of a prosthetic valve, the delivery apparatus comprising:
an indicator arm moveable between a biased position and an unbiased position;
wherein the indicator arm is configured to remain in the biased position when a diameter of the prosthetic valve is smaller than a first predetermined size, and move to the unbiased position when the diameter of the prosthetic valve is expanded to the first predetermined size.

19. The delivery apparatus of claim 18, wherein the indicator arm comprises a radiopaque marker such that movement of the indicator arm from the biased position to the unbiased position is visible under fluoroscopy.

20. The delivery apparatus of any one of claims 18-19 further comprising a first actuation component and a second actuation component that are configured to interface with an expansion mechanism of the prosthetic valve such that axially moving the second actuation component relative to the first actuation component causes radial expansion or compression of the prosthetic valve.

~~21. The delivery apparatus of claim 20, wherein the second actuation component extends through a lumen of the first actuation component.~~

~~22. The delivery apparatus of any one of claims 18-21, wherein a first end of the indicator arm is fixedly attached to a first location of the first actuation component, and a second end of the indicator arm is configured to be removably attached to a second location of the first actuation component when the indicator arm is in the biased position.~~

~~23. The delivery apparatus of any one of claims 20-22, wherein the indicator arm in the unbiased position is oriented in an oblique angle relative to an axial axis of the first actuation component.~~

~~24. — The delivery apparatus of any one of claims 22-23, wherein the indicator arm comprises a radiopaque marker located adjacent the second end.~~

~~25. — The delivery apparatus of any one of claims 22-24, wherein the second end of the indicator arm is configured to engage a portion of the prosthetic valve when axially moving the second actuation component relative to the first actuation component such that when engaging the portion of the prosthetic valve, the second end of the indicator arm can be released from the second location of the first actuation component.~~

~~26. — The delivery apparatus of claim 25, wherein the second location of the first actuation component is so positioned that when the portion of the prosthetic valve engages the second end of the indicator arm, the diameter of the prosthetic valve is expanded to the predetermined size.~~

~~27. — The delivery apparatus of any one of claims 22-26, wherein the second location is proximal to the prosthetic valve before expanding the prosthetic valve to the first predetermined size, and the first location is proximal to the second location.~~

~~28. — The delivery apparatus of any one of claims 22-27, wherein the first actuation component comprises an aperture at the second location, the aperture being sized to allow the second end of the indicator arm to extend through thereof.~~

~~29. — The delivery apparatus of claim 28, wherein the first location is located on an exterior surface of the first actuation component, and the second end of the indicator arm is configured to frictionally engage an edge of the aperture or an interior surface of the first actuation component adjacent the aperture when the indicator arm is in the biased position.~~

~~30. — The delivery apparatus of claim 28, wherein the first location is located on an exterior surface of the first actuation component, and the second end of the indicator arm~~

~~comprises a hook that is configured to engage an edge of the aperture when the indicator arm is in the biased position.~~

~~31.—The delivery apparatus of claim 28, wherein the first location is located on an interior surface of the first actuation component, and the second end of the indicator arm is configured to press against an interior surface of the first actuation component adjacent the aperture when the indicator arm is in the biased position.~~

~~32.—The delivery apparatus of any one of claims 22–31, wherein the second end of the indicator arm is configured to be removably attached to at least a third location of the first actuation component when the indicator arm is in the biased position, the third location being spaced apart from the second location.~~

~~33.—The delivery apparatus of claim 32, the second end of the indicator arm is configured to be released from the third location of the first actuation component by the prosthetic valve when axially moving the second actuation component relative to the first actuation component, wherein the third location is so configured that when the second end of the indicator arm is released by the prosthetic valve from the third location, the diameter of the prosthetic valve is expanded to a second predetermined size that is different from the first predetermined size.~~

~~34.—A medical assembly comprising:
a prosthetic valve; and
a delivery apparatus according to any one of claims 18–33.~~