

WHAT IS CLAIMED IS:

1. A prosthetic valve comprising:
a plurality of valve leaflets;
a frame assembly configured to support the plurality of valve leaflets and define a plurality of commissure supports terminating at an outflow end of the prosthetic valve;
an electrical sensor device associated with the frame assembly and configured to generate a sensor signal indicating deflection of one or more of the plurality of commissure supports; and
a transmitter assembly configured to receive the sensor signal from the electrical sensor device and wirelessly transmit a transmission signal, wherein the transmission signal is based at least in part on the sensor signal.
2. The prosthetic valve of claim 1, wherein the electrical sensor device is a strain gauge.
3. The prosthetic valve of claim 2, wherein the strain gauge comprises a conductive material disposed in an etched portion of the frame assembly.
4. The prosthetic valve of claim 2, wherein the strain gauge comprises a conductive material printed on the frame assembly.
5. The prosthetic valve of claim 1, wherein the electrical sensor device comprises a piezoelectric sensor.
6. The prosthetic valve of claim 5, wherein the piezoelectric sensor is a component of a sensor microchip including circuitry housed within a protective housing.
7. The prosthetic valve of claim 5 or 6, wherein the piezoelectric sensor is fixed to base of one of the plurality of commissure supports.
8. The prosthetic valve of claim 5 or 6, wherein the piezoelectric sensor is fixed to a distal end portion of one of the plurality of commissure supports.
9. The prosthetic valve of claim 5, wherein the piezoelectric sensor comprises:
a piezoelectric material layer disposed between first and second conductive layers; and

a biocompatible laminate layer at least partially providing a protective barrier for one or more of the piezoelectric material layer, the first conductive layer and the second conductive layer.

10. The prosthetic valve of claim 5 or 9, wherein the transmitter assembly is configured to receive power wirelessly from an external power supply and transmit the transmission signal using the received power.

11. The prosthetic valve of claim 10, wherein the external power supply comprises a wearable strap configured to be worn around an abdomen of a patient in whom the prosthetic valve is implanted.

12. The prosthetic valve of claim 5 or 11, wherein the piezoelectric sensor comprises a piezoresistive device.

13. The prosthetic valve of claim 5, wherein the piezoelectric sensor is integrated into a stent member of the frame assembly.

14. The prosthetic valve of claim 13, wherein the stent member comprises stacked sheets of piezoelectric material.

15. The prosthetic valve of claim 1, wherein the transmitter assembly comprises an antenna coil wrapped around a stiffening band of the frame assembly.

16. The prosthetic valve of any of claims 1 through 15, further comprising a flow sensor configured to sense a flow of blood in the blood flow lumen and generate a flow signal based on the flow.

17. The prosthetic valve of any of claims 1 through 16, further comprising an annular sealing ring, wherein the transmitter assembly comprises a plurality of windings circumferentially wrapped around a core form that runs along a portion of the annular sealing ring.

18. A prosthetic valve comprising:

a plurality of valve leaflets;

a frame assembly configured to support the plurality of valve leaflets and define a plurality of commissures terminating at an outflow end of the prosthetic valve;

a power generator associated with the frame assembly, the power generator being configured to generate electrical power in response to deflection of one or more of the plurality of commissure supports; and
a transmitter assembly configured to wirelessly transmit a transmission signal using the generated power.

19. The prosthetic valve of claim 18, wherein the transmitter assembly includes an electrically conductive coil, wherein the transmitter assembly is further configured to perform said wireless transmission using the coil.

20. The prosthetic valve of claim 18, wherein one or more of the plurality of commissure supports are configured to deflect in response to the formation of fluid vortices in a fluid channel in which the prosthetic valve is disposed.

21. The prosthetic valve of claim 18, wherein the power generator comprises a piezoelectric capacitive device.

22. The prosthetic valve of claim 21, wherein the power generator comprises a piezoelectric material layer disposed between first and second conductive plates, and a biocompatible laminate layer at least partially providing a protective barrier for one or more of the piezoelectric material layer, the first conductive plate and the second conductive plate.

23. The prosthetic valve of claim 18, wherein the frame assembly comprises a flexible stent post configured to provide at least partial support for one of the plurality of commissure supports, wherein the power generator is associated with the stent post.

24. The prosthetic valve of claim 23, wherein the power generator is integrated with the stent post.

25. The prosthetic valve of claim 24, wherein the flexible stent post comprises a protective covering housing a piezoelectric device therein.

26. A transcatheter heart valve assembly comprising:
a transcatheter heart valve comprising:
a support frame that is radially collapsible for delivery in a catheter and expandable for deployment in a patient, the support frame comprising an interior surface and an exterior surface; and

a valve structure that is radially collapsible, the valve structure comprising a plurality of valve leaflets, the valve structure being disposed within the support frame and fixed to the interior surface of the support frame;
 a sensor device configured to sense a physiological parameter and provide a sensor signal based on the sensed physiological parameter; and
 a transmitter assembly electrically coupled to the sensor device, the transmitter assembly being configured to receive the sensor signal from the sensor device and wirelessly transmit a transmission signal, wherein the transmission signal is based at least in part on the sensor signal;
 wherein the transmitter assembly is tethered to the transcatheter heart valve.

27. The transcatheter heart valve assembly of claim 26, wherein the transmitter assembly is tethered to the support frame of the transcatheter heart valve.

28. The transcatheter heart valve assembly of claim 26, wherein the transmitter assembly comprises an antenna coil that is collapsible for catheter delivery.

29. The transcatheter heart valve assembly of claim 26, wherein the transmitter assembly is configured to wirelessly receive power from a power transmitter external to the patient.

30. A prosthetic valve comprising:

a plurality of valve leaflets;

a frame assembly configured to support the plurality of valve leaflets;

an annular sealing ring disposed at an inflow end of the prosthetic valve;

a sensor device configured to sense a physical parameter and provide a sensor signal; and

a transmitter assembly disposed proximate the annular sealing ring, the transmitter assembly comprising a conductive coil having a plurality of windings;

wherein the transmitter assembly is configured to receive the sensor signal from the sensor device and wirelessly transmit a transmission signal, wherein the transmission signal is based at least in part on the sensor signal.

31. The prosthetic valve of claim 30, wherein the transmitter assembly further comprises a core form.

32. The prosthetic valve of claim 31, wherein the core form is wrapped circumferentially around the prosthetic valve proximate to the sealing ring.

33. The prosthetic valve of claim 31 or 32, wherein the plurality of windings are circumferentially wrapped around the core form.

34. The prosthetic valve of claim 31 or 32, wherein the plurality of windings are axially wrapped around the core form.

35. The prosthetic valve of claim 31 or 32, wherein the core form runs along a portion of the annular sealing ring and the plurality of windings are circumferentially wrapped around the core form.

36. The prosthetic valve of claim 31, wherein the core form is co-axial with an axis of the annular sealing ring.

37. The prosthetic valve of claim 36, wherein the core form has an axial cross-sectional shape having three sides.

38. The prosthetic valve of claim 30, wherein the plurality of windings lie in a plane facing radially outward with respect to the annular sealing ring.

39. The prosthetic valve of claim 38, wherein a core form is disposed within the plurality of windings.

40. A prosthetic valve comprising:

a plurality of valve leaflets;

a frame assembly configured to support the plurality of valve leaflets;

a first electrode associated with the frame assembly and configured to detect an electrical impulse;

a second electrode associated with the frame assembly and configured to detect the electrical impulse, the second electrode being electrically coupled to the first electrode;

an amplifier configured to amplify a voltage difference between the first and second electrodes and provide an amplified signal; and

a transmitter assembly configured to receive the amplified signal and wirelessly transmit a transmission signal, wherein the transmission signal is based at least in part on the amplified signal.