

the helical anchor with overlapping portions configured to seal a space between adjacent coils of the helical anchor. The one or more seal elements may each include a support element such as an internal wire, which may be a spring-biased coil or other configuration, affixed therewith. The one or more seal elements may be cross sectional shape, with examples being generally circular or oblong. The one or more seal elements may each have a connecting portion affixed to one of the coils and an extension portion extending toward an adjacent coil for providing the seal function between coils.

[0023] In another illustrative embodiment a system for replacing a native heart valve includes an expansible helical anchor formed as multiple coils adapted to support a heart valve prosthesis. At least one of the coils is normally defined by being at a first diameter, and is expandable to a second, larger diameter upon application of radial outward force from within the helical anchor. The system further includes an expansible heart valve prosthesis capable of being delivered into the helical anchor and expanded inside the multiple coils into engagement with the at least one coil to move the at least one coil from the first diameter to the second diameter while securing the helical anchor and the heart valve prosthesis together.

[0024] As a further aspect the helical anchor may include another coil that moves from a larger diameter to a smaller diameter as the heart valve prosthesis is expanded inside the multiple coils. At least two adjacent coils of the helical anchor may be spaced apart, and the adjacent coils move toward each other as the heart valve prosthesis is expanded inside the multiple coils. The helical anchor may further includes a plurality of fasteners, and the fasteners are moved from an undeployed state to a deployed state as the at least one coil moves from the first diameter to the second, larger diameter. A seal may be coupled with the helical anchor and include portions extending between adjacent coils for preventing blood leakage through the helical anchor and past the heart valve prosthesis. The system can further include at least one compressible element on the helical anchor, the compressible element being engaged by the heart valve prosthesis as the heart valve prosthesis is expanded inside the multiple coils to assist with affixing the heart valve prosthesis to the helical anchor. The compressible element may take any of several forms, such as fabric or other soft material, or resilient, springy material such as polymer or foam. The at least one compressible element further may

include multiple compressible elements spaced along the multiple coils or a continuous compressible element extending along the multiple coils. The heart valve prosthesis may further include an expansible structure including openings. The openings are engaged by the at least one compressible element as the heart valve prosthesis is expanded inside the multiple coils for purposes of strengthening the connection between the anchor and the prosthesis. The multiple coils of the helical anchor may include at least two coils that cross over each other. This system may include any feature or features of the system that uses the seal, and vice versa, depending on the functions and effects desired.

[0025] Methods of implanting a heart valve prosthesis in the heart of a patient are also provided. ~~In one illustrative embodiment, t~~The method includes delivering a helical anchor in the form of multiple coils such that a portion of the helical anchor is above the native heart valve and a portion is below the native heart valve. The heart valve prosthesis is implanted within the multiple coils of the helical anchor such that the heart valve prosthesis is supported by the helical anchor. A seal is positioned between at least two adjacent coils of the helical anchor and the heart valve prosthesis for preventing leakage of blood flow during operation of the heart valve prosthesis.

[0026] Positioning the seal can further comprise positioning a membrane or panel extending over at least two coils of the helical anchor. The method further includes delivering the membrane or panel in an undeployed state to the site of the native heart valve and then deploying the membrane or panel within the helical anchor, and expanding the heart valve prosthesis against the membrane or panel. The undeployed state includes a rolled up state or other collapsed state. Positioning the seal may further include positioning one or more seal elements carried by the helical anchor such that overlapping portions seal a space between adjacent coils of the helical anchor. The one or more seal elements may each include a support element affixed therewith.

[0027] ~~In another embodiment, a~~A method of implanting an expansible heart valve prosthesis in the heart of a patient is provided. This method includes delivering an expansible helical anchor in the form of multiple coils such that a portion of the expansible helical anchor is above the native heart valve and a portion is below the native heart valve. The expansible heart valve prosthesis is positioned within the multiple coils of the expansible helical anchor with the expansible heart valve prosthesis and the expansible helical anchor in

35. The system of claim 33, wherein the one or more seal elements are each generally circular in cross sectional shape.

36. The system of claim 33, wherein the one or more seal elements are each oblong in cross sectional shape.

37. The system of claim 33, wherein the one or more seal elements each have a connecting portion affixed to one of the coils and an extension portion extending toward an adjacent coil.

~~38. A method of implanting a heart valve prosthesis in the heart of a patient, comprising:~~

~~—— delivering a helical anchor in the form of multiple coils from such that a portion of the helical anchor is above the native heart valve and a portion is below the native heart valve,~~

~~—— implanting the heart valve prosthesis within the multiple coils of the helical anchor such that the heart valve prosthesis is supported by the helical anchor, and~~

~~—— positioning a seal between at least two adjacent coils of the helical anchor and the heart valve prosthesis for preventing leakage of blood flow during operation of the heart valve prosthesis.~~

~~39. The method of claim 38, wherein positioning the seal further comprises positioning a membrane or panel extending over at least two coils of the helical anchor.~~

~~40. The method of claim 39, further comprising:~~

~~—— delivering the membrane or panel in an undeployed state to the site of the native heart valve and then deploying the membrane or panel within the helical anchor, and~~

~~—— expanding the heart valve prosthesis against the membrane or panel.~~

~~41. The method of claim 40, wherein the undeployed state comprises a rolled up state on one of the coils of the helical anchor.~~

~~42. The method of claim 40, wherein the undeployed state comprises a collapsed state.~~

~~43. The method of claim 39, wherein the membrane or panel includes a support element affixed therewith.~~

~~44. The method of claim 38, wherein positioning the seal further comprises positioning one or more seal elements carried by the helical anchor such that overlapping portions seal a space between adjacent coils of the helical anchor.~~

~~45. The method of claim 44, wherein the one or more seal elements each include a support element affixed therewith.~~

~~46. The method of claim 44, wherein the one or more seal elements are each generally circular in cross sectional shape.~~

~~47. The method of claim 46, wherein the one or more seal elements are each oblong in cross sectional shape.~~

~~48. The method of claim 44, wherein the one or more seal elements each have a connecting portion affixed to one of the coils and an extension portion extending toward an adjacent coil.~~

~~49. A method of implanting an expansible heart valve prosthesis in the heart of a patient, comprising:~~

~~—— delivering an expansible helical anchor in the form of multiple coils such that a portion of the expansible helical anchor is above the native heart valve and a portion is below the native heart valve,~~

~~—— positioning the expansible heart valve prosthesis within the multiple coils of the expansible helical anchor with the expansible heart valve prosthesis and the expansible helical anchor in unexpanded states, and~~

~~—— expanding the expansible heart valve prosthesis against the expansible helical anchor thereby expanding the expansible heart valve prosthesis while securing the expansible heart valve prosthesis to the expansible helical anchor.~~

~~50. The method of claim 49, wherein the helical anchor further comprising moving a coil from a larger diameter to a smaller diameter as the heart valve prosthesis is expanded inside the multiple coils.~~

~~51. The method of claim 50, wherein at least two adjacent coils of the helical anchor are spaced apart, and the method further comprises moving the at least two adjacent coils toward each other as the heart valve prosthesis is expanded inside the multiple coils.~~

~~52. The method of claim 49, wherein at least two adjacent coils of the helical anchor are spaced apart, and the method further comprises moving the at least two adjacent coils toward each other as the heart valve prosthesis is expanded inside the multiple coils.~~

~~53. The method of claim 49, wherein the helical anchor further comprises a plurality of fasteners, and the method further comprises moving the fasteners from an undeployed state to a deployed state as the expansible heart valve prosthesis is expanded against the expansible helical anchor.~~

~~54. The method of claim 53, further comprising positioning a seal between adjacent coils for preventing blood leakage through the helical anchor and past the heart valve prosthesis, wherein the fasteners engage the seal in the deployed state.~~

~~55. The system of claim 49, further comprising at least one compressible element on the helical anchor, the compressible element being engaged by the expansible heart valve prosthesis as the heart valve prosthesis is expanded inside the multiple coils to assist with affixing the heart valve prosthesis to the helical anchor.~~

~~56. The method of claim 55, wherein the at least one compressible element further comprises multiple compressible elements spaced along the multiple coils.~~

~~57. The method of claim 55, wherein the at least one compressible element further comprises a continuous compressible element extending along the multiple coils.~~

~~58. The method of claim 55, wherein the at least one compressible element further comprises a resilient element.~~

~~59. The system of claim 55, wherein the expansible heart valve prosthesis further comprises openings and the openings are engaged by the at least one compressible element as the heart valve prosthesis is expanded inside the multiple coils.~~

~~60. The method of claim 49, wherein the multiple coils of the expansible helical anchor include at least two coils that cross over each other.~~