

extending in the opposite direction as the arcuate cusps and having a relatively smaller radius. Components of the valve are usually assembled with one or more biocompatible fabric (*e.g.*, polyester, for example, Dacron® polyethylene terephthalate (PET)) coverings, and a fabric-covered sewing ring is provided on the inflow end of the peripheral support structure.

[0006] Sometimes the need for complete valve replacement may arise after a patient has already had an earlier valve replacement for the same valve. For example, a prosthetic heart valve that was successfully implanted to replace a native valve may itself suffer damage and/or wear and tear many years after initially being implanted. Implanting the prosthetic heart valve directly within a previously-implanted prosthetic heart valve may be impractical, in part because the new prosthetic heart valve (including the support structure and valve assembly) will have to reside within the annulus of the previously-implanted heart valve, and traditional prosthetic heart valves may not be configured to easily receive such a valve-within-a-valve implantation in a manner that provides secure seating for the new valve while also having a large enough annulus within the new valve to support proper blood flow therethrough.

[0007] Some attention has been paid to the problem of implanting a new valve within an old valve. In particular, the following disclose various solutions for valve-in-valve systems: U.S. Patent Application Publication No. 2010/0076548, filed September 19, 2008; U.S. Patent No. 8,613,765, filed July 7, 2011; and International Publication No. WO 2012/018779, filed August 2, 2011. The entire disclosures of these publications are expressly incorporated herein by reference.

[0008] Despite certain advances in the valve-in-valve area, there remains a need for a prosthetic heart valve that facilitates the process while maximizing the life of the first valve and simplifying manufacturing techniques.

[0009] Embodiments of the invention provide a prosthetic heart valve configured to receive a prosthetic heart valve, such as a catheter-deployed (transcatheter) prosthetic heart valve, therein. In one embodiment, the prosthetic heart valve has a support structure that is substantially resistant to radial compression (and that may be substantially resistant to radial

expansion) when deployed in the patient's native heart valve annulus to replace the native heart valve (or to replace another prosthetic heart valve), but is configured to be radially expandable, and/or to transform to a generally expanded and/or expandable configuration, in order to receive a prosthetic heart valve therein, such as a percutaneously-delivered prosthetic heart valve. The transformation from expansion-resistant to expanded/expandable can be achieved by subjecting the expansion-resistant support structure to an outward force, such as a dilation force, which may be provided by a dilation balloon used to deploy a replacement prosthetic valve.

[0010] A prosthetic heart valve according to embodiments of the invention may further be a "hybrid" heart valve with an additional support portion in the form of a stent frame positioned at the inflow end of the prosthetic heart valve configured to plastically expand into a substantially flared shape when subjected to a dilation force that is by itself insufficient to cause expansion of the main support structure. The stent frame is positioned upstream or on the inflow end of the entire valve portion.

[0011] A first exemplary hybrid prosthetic heart valve is adapted for post-implant expansion and has an inflow end and an outflow end. A valve member includes an inner structural support stent having upstanding commissure posts extending in the outflow direction alternating with arcuate inflow cusps. The inflow end of the valve member undulates up and down corresponding to the commissure posts and cusps. The support stent defines an implant circumference that is non-compressible in normal physiological use and has a first diameter, wherein the support stent permits expansion from the first diameter to a second diameter larger than the first diameter upon application of an outward dilatory force from within the support stent substantially larger than forces associated with normal physiological use. Also, a plurality of flexible leaflets attach along the commissure posts and inflow cusps of the support stent and ensure one-way blood flow therethrough. A plastically-expandable inflow stent frame secured to and projecting from an inflow end of the support stent has a strength requiring a predetermined expansion force to convert to an expanded state. An outflow end of the stent frame undulates with peaks and valleys to at least partially conform to the inflow