

CLAIMS

What is claimed is:

1. A valve repair device for repairing a native valve of a patient, the valve repair device comprising:
 - a coaption portion;
 - a collar attached to the coaption portion;
 - a cap that can be moved away from the collar;
 - a plurality of paddle portions, each paddle portion including an extendable portion that is extendable from a resting condition to an extended condition;wherein the paddle portions are moveable between an open position and a closed position by moving the cap with respect to the collar;
2. The valve repair device of claim 1, wherein a width of the extendable portion is inversely proportional to a length of the extendable portion.
3. The valve repair device of any one of claims 1-2, wherein the extendable portion is formed from a tube of braided material.
- ~~4. The valve repair device of any one of claims 1-3, wherein the extendable portion is formed from a shape-memory alloy.~~
- ~~5. The valve repair device of any one of claims 1-3, wherein the extendable portion is formed from an elastomeric material.~~
- 6.4. The valve repair device of any one of claims 1-~~5~~3, wherein the extendable portion is formed integrally with the paddle portion.
- 7.5. The valve repair device of any one of claims 1-~~6~~4, further comprising paddle frames connected to the cap and to the paddle portions.
- 8.6. The valve repair device of claim ~~7~~5, wherein the paddle frames reduce in width as the extended portions extend from the resting to the extended condition.
- 9.7. The valve repair device of claim ~~7~~5, wherein the paddle frames are hoop-shaped.

~~10.8.~~ The valve repair device of any one of claims 1-~~79~~, wherein the coaption element is configured to close a gap in the native valve of the patient when the valve repair device is attached to the native valve.

~~11.9.~~ A valve repair device for repairing a native valve of a patient, the valve repair device comprising:

a coaption portion;

a collar attached to the coaption portion;

a cap that is movable away from the collar;

a plurality of paddle portions that each comprise two extendable portions surrounding a paddle expansion space;

wherein each extendable portion is extendable from a resting condition to an extended condition;

wherein movement of the cap toward the collar causes the paddle portions to move to the closed position, and movement of the cap away from the collar causes the paddle portions to move to the open position.

~~12.10.~~ The valve repair device of claim ~~119~~, wherein a width of the paddle expansion space is inversely proportional to a length of the extendable portions.

~~13.11.~~ The valve repair device of any one of claims ~~119-1210~~, wherein the extendable portions are formed from tubes of braided material.

~~14. The valve repair device of any one of claims 11-13, wherein the extendable portions are formed from a shape-memory alloy.~~

~~15. The valve repair device of any one of claims 11-13, wherein the extendable portions are formed from an elastomeric material.~~

~~16.12.~~ The valve repair device of any one of claims ~~119-1511~~, wherein the extendable portions are formed integrally with the paddle portion.

~~17.13.~~ The valve repair device of any one of claims ~~119-1612~~, further comprising paddle frames connected to the cap and to the paddle portions.

~~18.~~14. The valve repair device of claim ~~17~~13, wherein the paddle frames reduce in width as the extendable portions extend from the resting to the extended condition.

~~19.~~15. The valve repair device of claim ~~17~~13, wherein the paddle frames are hoop-shaped.

~~20.~~16. The valve repair device of any one of claims ~~149-19~~15, wherein the coaption element is configured to close a gap in the native valve of the patient when the valve repair device is attached to the native valve.

~~21.~~17. A system, comprising:

a delivery catheter;

a valve repair device coupled to the delivery catheter, wherein the valve repair device comprises:

a plurality of paddle portions, each paddle portion including an extendable portion that is extendable from a resting condition to an extended condition;

wherein the paddle portions are moveable between an open position and a closed position by moving the cap with respect to the collar;

~~22.~~18. The system of claim ~~21~~17, wherein a width of the extendable portion is inversely proportional to a length of the extendable portion.

~~23.~~19. The system of any one of claims ~~21-22~~17-2218, wherein the extendable portion is formed from a tube of braided material.

~~24.~~20. The system of any one of claims ~~21-23~~17-2319, wherein the extendable portion is formed from a shape-memory alloy.

~~25. The system of any one of claims 21-23, wherein the extendable portion is formed from an elastomeric material.~~

~~26.~~21. The system of any one of claims ~~21-25~~17-2520, wherein the extendable portion is formed integrally with the paddle portion.

~~27.~~22. The system of any one of claims ~~21-26~~17-2621, further comprising paddle frames connected to the cap and to the paddle portions.

28.23. The system of claim 2722, wherein the paddle frames reduce in width as the extended portions extend from the resting to the extended condition.

29.24. The system of claim 2722, wherein the paddle frames are hoop-shaped.

30.25. The system of any one of claims 2117-2924, further comprising a coaption element that is configured to close a gap in the native valve of the patient when the valve repair device is attached to the native valve.

31.26. A system, comprising:

- a delivery catheter;

- a valve repair device coupled to the delivery catheter, wherein the valve repair device comprises:

 - a plurality of paddle portions that each comprise two extendable portions surrounding a paddle expansion space;

 - wherein each extendable portion is transitionable between a narrow condition and a broad condition;

 - wherein the paddle portions are moveable between an open position and a closed position and are configured to attach to the native valve of the patient.

32.27. The system of claim 3126, further comprising

- a shaft;

- a coaption portion;

- a collar that the shaft extends through, the collar being attached to the coaption portion;

- a cap attached to the shaft such that the cap can be moved by the shaft away from the collar.

33.28. The system of claim 3227, wherein movement of the cap toward the collar causes the paddle portions to move to the closed position, and movement of the cap away from the collar causes the paddle portions to move to the open position.

- ~~34.29.~~ The system of any one of claims ~~3227-3328~~, wherein the paddle portions are hingeably connected to the cap at a plurality of outer hinge regions.
- ~~35.30.~~ The system of any one of claims ~~3126-3429~~, wherein at least one clasp is attached to at least one of the plurality of paddle portions.
- ~~36.31.~~ The system of any one of claims ~~3126-3429~~, wherein at least one clasp is attached to each of the plurality of paddle portions.
- ~~37.32.~~ The system of any one of claims ~~3126-3631~~, wherein a width of the paddle expansion space is inversely proportional to a length of the extendable portions.
- ~~38.33.~~ The system of any one of claims ~~3126-3732~~, wherein the extendable portions are formed from tubes of braided material.
- ~~39.~~ The system of any one of claims ~~31-38~~, wherein the extendable portions are formed from a shape-memory alloy.
- ~~40.~~ The system of any one of claims ~~31-38~~, wherein the extendable portions are formed from an elastomeric material.
- ~~41.~~ The system of any one of claims ~~31-40~~, wherein the extendable portions are formed integrally with the paddle portion.
- ~~42.34.~~ The system of any one of claims ~~3126-4133~~, further comprising paddle frames connected to the paddle portions.
- ~~43.35.~~ The system of claim ~~4234~~, wherein the paddle frames reduce in width as the extendable portions transition from the broad condition to the narrow condition.
- ~~44.36.~~ The system of claim ~~3442~~, wherein the paddle frames are hoop-shaped.
- ~~45.37.~~ The system of any one of claims ~~3227-4436~~, wherein the coaption element is configured to close a gap in a native valve when attached to the native valve.
- ~~46.-38.~~ The system of any one of claims ~~3126-4537~~, wherein the delivery catheter is configured to facilitate delivery to a native valve and attachment of the plurality of paddles to the native valve.
- ~~47.~~ A method for repairing a native valve of a patient, the method comprising:

~~placing a valve repair device in the heart of a patient;~~

~~causing a plurality of paddle portions to extend from a resting condition to an extended condition, wherein each paddle portion includes an extendable portion; and~~

~~moving the paddle portions from an open position to a closed position to attach the valve repair device to the native valve of the patient.~~

~~48. The method of claim 47, wherein a width of the extendable portion is inversely proportional to a length of the extendable portion.~~

~~49. The method of any one of claims 47-48, wherein the extendable portion is formed from a tube of braided material.~~

~~50. The method of any one of claims 47-49, wherein the extendable portion is formed from a shape-memory alloy.~~

~~51. The method of any one of claims 47-49, wherein the extendable portion is formed from an elastomeric material.~~

~~52. The method of any one of claims 47-41, wherein the extendable portion is formed integrally with the paddle portion.~~

~~53. The method of any one of claims 47-52, further comprising connecting paddle frames to a cap and to the paddle portions.~~

~~54. The method of claim 53, wherein the paddle frames reduce in width as the extended portions extend from the resting to the extended condition.~~

~~55. The method of claim 53, wherein the paddle frames are hoop-shaped.~~

~~56. The method of any one of claims 47-55, further comprising closing a gap in the native valve of the patient with a coaption element when the valve repair device is attached to the native valve.~~

~~57. A method for repairing a native valve of a patient, the method comprising:~~

~~placing a valve repair device in the heart of a patient;~~

~~causing a plurality of paddle portions to extend from a resting condition to an extended condition, wherein each paddle portion includes two extendable portions surrounding a paddle expansion space; and~~

~~moving the paddle portions from an open position to a closed position to attach the valve repair device to the native valve of the patient.~~

~~58. The method of claim 57, wherein a width of the paddle expansion space is inversely proportional to a length of the extendable portions.~~

~~59. The method of any one of claims 57-58, wherein the extendable portions are formed from tubes of braided material.~~

~~60. The method of any one of claims 57-59, wherein the extendable portions are formed from a shape-memory alloy.~~

~~61. The method of any one of claims 57-59, wherein the extendable portions are formed from an elastomeric material.~~

~~62. The method of any one of claims 57-61, wherein the extendable portions are formed integrally with the paddle portion.~~

~~63. The method of any one of claims 57-62, further comprising connecting paddle frames to a cap and to the paddle portions.~~

~~64. The method of claim 63, wherein the paddle frames reduce in width as the extendable portions extend from the resting to the extended condition.~~

~~65. The method of claim 63, wherein the paddle frames are hoop-shaped.~~

~~66. The method of any one of claims 57-65, further comprising closing a gap in the native valve of the patient with a coaption element when the valve repair device is attached to the native valve.~~

~~67. A system, comprising:~~

~~a plurality of paddle portions, each paddle portion comprising two extendable portions surrounding a paddle expansion space, each extendable portion being transitionable between a narrow condition to a broad condition, where the paddle portions are~~

~~moveable between an open position and a closed position and are configured to attach to a native valve of a patient.~~

~~68. The system of claim 67, further comprising a plurality of hinge regions at which the paddle portions are hingeably connected to another portion of the system.~~

~~69. The system of claim 67, further comprising~~

~~a shaft;~~

~~a collar that the shaft extends through, the collar being attached to a coaption portion;~~

~~a cap attached to the shaft such that the cap can be moved by the shaft away from the collar.~~

~~70. The system of claim 68, wherein movement of the cap toward the collar causes the paddle portions to move to the closed position, and movement of the cap away from the collar causes the paddle portions to move to the open position.~~

~~71. The system of any one of claims 67-69, wherein the paddle portions are hingeably connected to the cap at a plurality of outer hinge regions.~~

~~72. The system of any one of claims 67-70, wherein at least one clasp is attached to at least one of the plurality of paddle portions.~~

~~73. The system of any one of claims 67-70, wherein at least one clasp is attached to each of the plurality of paddle portions.~~

~~74. The system of any one of claims 67-72, wherein a width of the paddle expansion space is inversely proportional to a length of the extendable portions.~~

~~75. The system of any one of claims 67-73, wherein the extendable portions are formed from tubes of braided material.~~

~~76. The system of any one of claims 67-74, wherein the extendable portions are formed from a shape-memory alloy.~~

~~77. The system of any one of claims 67-74, wherein the extendable portions are formed from an elastomeric material.~~

~~78. The system of any one of claims 67-76, wherein the extendable portions are formed integrally with the paddle portion.~~

- ~~79. The system of any one of claims 67-77, further comprising paddle frames connected to the paddle portions.~~
- ~~80. The system of claim 78, wherein the paddle frames reduce in width as the extendable portions transition from the broad condition to the narrow condition.~~
- ~~81. The system of claim 78, wherein the paddle frames are hoop-shaped.~~
- ~~82. The system of any one of claims 67-80, wherein a coaption element is configured to close a gap in a native valve when attached to the native valve.~~
- ~~83. The system of any one of claims 67-81, further comprising a delivery catheter configured to facilitate delivery to a native valve and attachment of the plurality of paddles to the native valve.~~