Claims

[CLAIM 1]

A ball valve comprising:

a valve housing;

a first seat surface of a first seating member, the first seat surface having a first inner diameter and a first outer diameter;

a second seat surface of the first seating member, the second seat surface having a second inner diameter and a second outer diameter, the second inner diameter being larger than the first outer diameter, wherein the first seat surface and the second seat surface are fixed relative to each other;

a resilient seat surface disposed within a channel between the first valve seat surface and the second valve seat surface;

a ball rotatably movable within the valve housing and contacting at least one of the first seat surface and the second seat surface, and the resilient seat surface along one hemisphere of the ball to form a seal within the ball valve;

an actuation mechanism comprising two retaining members and operable to:

rotate the ball to an open position to align a fluid passage through the ball with the fluid passage formed within the first seating member; and

rotate the ball to a closed position wherein the fluid passage through the ball is 90 degrees out of alignment with the fluid passage formed within the first seating member while the ball is in a closed position; and

a body member slidingly engaged to a side of the first seating member opposite the first seat surface and the second seat surface in response to a force applied from below the ball valve;

wherein pressure acting in a first direction and in a second direction opposite the first direction increases the contact pressure of the first seat surface, resilient seat surface, and the second seat surface with the ball.

[CLAIM 2]

The ball valve of claim 1, wherein a resilient material is overmolded within the channel, and machined to form a common seat surface with the first seat surface and second seat surface.

[CLAIM 3]

The ball valve of claim 1 or 2, wherein the resilient material is overmolded within the channel, and machined to a height that is offset from the first seat surface and second seat surface when the resilient material is in an uncompressed state.

[CLAIM 4]

The ball valve of any of the preceding claims, wherein the resilient material comprises PEEK.

[CLAIM 5]

The ball valve of any of the preceding claims, wherein the first seat surface comprises a resilient material.

[CLAIM 6]

The ball valve of any of the preceding claims, ~~wherein the first seating member comprises the first seat surface, and~~ wherein the first seating member overlies an intermediate resilient member.

[CLAIM 7]

A method of forming a ball valve, the method comprising:

providing a valve housing, the valve housing having ~~a channel between a first valve seat surface and a second valve seat surface,~~ a first seat surface of a first seating member, the first ~~valve~~ seat surface having a first inner diameter and a first outer diameter, and a second seat surface of the first seating member, the second seat surface having a second inner diameter and a second outer diameter, the second inner diameter being larger than the first outer diameter;

providing a resilient seat surface disposed within a channel between the first valve seat surface and the second valve seat surface;

providing a ball within the valve housing and contacting at least one of the first seat surface and the second seat surface, and the resilient seat surface along one hemisphere of the ball to form a seal within the ball valve;

rotating the ball via an actuating member to an open position to allow fluids to flow from a fluid passage of the ball;

rotating the ball via the actuating member to a closed position to prevent fluids from flowing through the fluid passage of the ball,

wherein the open position and closed position is 90 degrees out of alignment with respect to one another;

slidingly engaging a body member to a side of the first seating member opposite the first seat surface and the second seat surface in response to a force applied from below the ball valve; and

transferring a force from the body member to the first seating member in response to the force applied from below the valve.

[CLAIM 8]

The method of claim 7, ~~further comprising providing a resilient material within the channel, and optionally,~~ wherein the resilient material comprises PEEK.

[CLAIM 9]

The method of claim 8, wherein providing the resilient material comprises overmolding the resilient material within the channel, and machining the resilient material to form a common seat surface with the first seat surface and second seat surface and optionally, wherein providing the resilient material comprises overmolding the resilient material within the channel, and machining the resilient material to form a seat surface that is offset from the first seat surface and second seat surface when the resilient material is in an uncompressed state.

[CLAIM 10]

The method of any of claims 7-9, wherein the first seat surface comprises a resilient material, and optionally, wherein the resilient material comprises PEEK.

[CLAIM 11]

The method of any of claims 7-10, ~~wherein providing the first seat surface comprises providing a first seating member, wherein the first seating member comprises the first seat surface, and~~ wherein the first seating member overlies an intermediate resilient member.

[CLAIM 12]

A ball valve comprising:

a valve housing;

a first seat surface of a first seating member, the first seat surface having a first inner diameter and a first outer diameter, wherein the first seat surface comprises a resilient material;

a second seat surface of the first seating member, the second seat surface having a second inner diameter and a second outer diameter, the second inner diameter being larger than the first outer diameter, wherein the first seat surface and the second seat surface are fixed relative to each other;

a channel between the first valve seat surface and the second valve seat surface;

a second resilient seat surface disposed within the channel;

a ball rotatably movable within the valve housing and contacting at least one of the first seat surface and the second seat surface, and the second resilient seat surface along one hemisphere of the ball to form a seal within the ball valve;

an actuation mechanism comprising two retaining members and operable to:

rotate the ball to an open position to align a fluid passage through the ball with the fluid passage formed within the first seating member; and

rotate the ball to a closed position wherein the fluid passage through the ball is 90 degrees out of alignment with the fluid passage formed within the first seating member while the ball is in a closed position;

a body member slidingly engaged to a side of the first seating member opposite the first seat surface and the second seat surface in response to a force applied from below the ball valve;

wherein pressure acting in a first direction and in a second direction opposite the first direction increases the contact pressure of the first seat surface and the second seat surface with the ball.

[CLAIM 13]

The ball valve of claim 12, ~~further comprising a second resilient material disposed within the channel, wherein the ball contacts the second resilient material when in the closed position, and optionally,~~ wherein the second resilient material is overmolded within the channel, and machined to form a common seat surface with the first seat surface and second seat surface, and optionally, wherein the resilient material is overmolded within the channel, and machined to a height that is offset from the first seat surface and second seat surface when the resilient material is in an uncompressed state.

[CLAIM 14]

The ball valve of claim 12 or 13, wherein the resilient material comprises PEEK.

[CLAIM 15]

The ball valve of any of claims 12-14, ~~wherein the first seating member comprises the first seat surface, and~~ wherein the first seating member overlies an intermediate resilient member.