WHAT IS CLAIMED IS:

1. A ball valve stopper comprising:

a spherical contoured body comprising a substantially inelastic first material and having a flow port;

a closed face of the spherical contoured body that is orthogonal with respect to the flow port and includes a fluid seal area;

a rotation support member aligned orthogonally to the flow port and the fluid seal area; and

a material discontinuity volume disposed behind the closed face of the spherical contoured body, wherein the material discontinuity volume comprises a channel, and wherein a cross-section area of the channel varies inversely with respect to a distance between the cross-section area and a centerline axis of the flow port.

2. The ball valve stopper of claim 1, wherein the material discontinuity volume is at least partially disposed behind the fluid seal area.

3. The ball valve stopper of claim 1, wherein the material discontinuity volume includes a channel in the spherical contoured body that either comprises a void or contains a second material having a different modulus of elasticity than a modulus of elasticity of the first material.

4. The ball valve stopper of claim 3, wherein the first material is metallic.

5. The ball valve stopper of claim 4, wherein the second material has a lower modulus of elasticity than a modulus of elasticity of the first material.

6. The ball valve stopper of claim 1, wherein the material discontinuity volume is disposed between at least a portion of the fluid seal area and the rotation support member.

~~7. The ball valve stopper of claim 1, wherein the material discontinuity volume comprises a channel and wherein a cross-section area of the channel varies based on the~~

~~proximity of the cross-section area to a centerline axis of the flow port.~~

~~8. The ball valve stopper of claim 7, wherein the cross-section area of the channel varies inversely with respect to a distance between the cross-section area and the centerline axis of the flow port.~~

~~9~~7. The ball valve stopper of claim 1, wherein the material discontinuity volume comprises a slot channel disposed circumferentially around the fluid seal area.

~~10~~8. The ball valve stopper of claim ~~9~~7, wherein a depth of the slot channel at each point on the circumference of the slot channel varies inversely with respect to a distance from the point to the~~a~~ centerline axis of the flow port.

~~11~~9. The ball valve stopper of claim 1, wherein said rotation support member comprises a diametrically opposing pair of trunnion support members, wherein the material discontinuity volume comprises a pair of linear channels each formed between a respective one of the trunnion support members and the closed face.

10. The ball valve stopper of claim 1, wherein the cross-sectional area of the channel varies equally in either axial direction along the centerline from a center point of the centerline.

~~12~~11. A ball valve assembly comprising:

a valve stopper rotatable about a rotation axis and comprising a closed face that is orthogonally disposed with respect to a flow port through the valve stopper;

a valve seat having an annular seating surface that contacts an annular sealing area on the closed face when the valve stopper is rotated to a valve closed position; and

wherein the valve stopper includes a material discontinuity volume formed behind the closed face within at least a portion of a circular cross-section area of the valve stopper bounded by the annular sealing area, wherein the material discontinuity volume comprises a slot channel disposed circumferentially around a fluid seal within the closed face, and wherein a depth of the slot

channel at each point on the circumference of the slot channel varies inversely with respect to a distance from the point to a centerline axis of the flow port.

~~13~~12. The ball valve assembly of claim ~~12~~11, further comprising a rotation support member centrally aligned on the rotation axis, wherein the material discontinuity volume comprises a linear channel between the rotation axis and the annular sealing area.

~~14~~13. The ball valve assembly of claim ~~12~~11, wherein the material discontinuity volume comprises a channel disposed circumferentially around a fluid seal within the closed face and varies in cross-section area.

~~15~~14. The ball valve assembly of claim ~~14~~13, wherein the channel comprises a void.

~~16~~15. The ball valve assembly of claim ~~14~~13, wherein the valve stopper comprises a first metallic material, and wherein the channel contains a second material having a lower modulus of elasticity than the first metallic material.

~~17~~16. The ball valve assembly of claim ~~12~~11, further comprising an actuator configured to press the valve seat in contact with the annular sealing area.

~~18~~17. The ball valve assembly of claim ~~17~~16, further comprising a body housing a valve cavity disposed between an upstream flow port and a downstream flow port and within which said valve stopper rotates.

~~19~~18. The ball valve assembly of claim ~~18~~17, wherein said valve seat and the annular sealing area are disposed within the downstream flow port when the valve stopper is rotated to the valve closed position.

19. The ball valve assembly of claim 11, wherein the depth of the slot channel varies equally in either axial direction along the centerline from the center point of the centerline.

~~20. The ball valve stopper of claim 12, wherein the material discontinuity volume~~

~~comprises a slot channel disposed circumferentially around a fluid seal within the closed face, and wherein a depth of the slot channel at each point on the circumference of the slot channel varies inversely with respect to a distance from the point to a centerline axis of the flow port.~~