CLAIMS

What is claimed is:

1. A high cycle and speed valve comprising:

a body;

a valve seat fixed within the body; and

a diaphragm that moves between a closed position in which a first surface of the diaphragm is forced against the valve seat, and an open position in which the first surface of the diaphragm is released from the valve seat;

wherein the valve seat comprises a static section that is secured within the body and a dynamic section that is compressed by the diaphragm when the diaphragm is in the closed position, the static section preventing seat movement during valve seat compression,

when the diaphragm is in the open position, the dynamic section of the valve seat and the body define a body cavity relief space; and

when the diaphragm is in the closed position, the dynamic section of the valve seat compresses to fill at least in part the body cavity relief space.

2. The high cycle and speed valve of claim 1, wherein the static section of the valve seat comprises a base and a flange that extends radially outward from the base;

and the body has a recess that receives the flange to retain the static section of the valve seat within the body.

3. The high cycle and speed valve of claim 1, wherein at least one of the dynamic section of the valve seat or the body has an inclined plane that defines the body cavity relief space.

4. The high cycle and speed valve of claim 3, wherein each of the dynamic section of the valve seat and the body has an inclined plane that define the body cavity relief space.

5. The high cycle and speed valve of any of claims 1-4, further comprising a cap that has a contact surface that contacts at least a portion of a second surface of the diaphragm opposite the first surface of the diaphragm;

wherein the contact surface of the cap has a dry film lubricant layer that serves as a dry lubricant between the cap and the second surface of the diaphragm.

6. The high cycle and speed valve of claim 5, wherein the dry film lubricant layer is a silver plating layer that is applied as a coating layer on the contact surface of the cap.

7. The high cycle and speed valve of claim 6, wherein the silver plating layer is applied using a nickel strike.

8. The high cycle and speed valve of claim 7, wherein the dry film lubricant is at least one of a graphite or molybdenum based coating.

9. The high cycle and speed valve of any of claims 1-8, wherein the high cycle and speed valve has only one diaphragm.

10. The high cycle and speed valve of any of claims 1-9, further comprising:

an actuator element; and

a button in contact with at least a portion of a second surface of the diaphragm opposite the first surface;

wherein the actuator operates to move the diaphragm into the closed position to close the valve by actuating the button to force the first surface of the diaphragm against the valve seat, and the actuator operates to permit the diaphragm to move into the open position to open the valve by actuating the button to permit release of the first surface of the diaphragm from the valve seat.

11. The high cycle and speed valve of claim 10, wherein the actuator element is a pneumatic actuator.

12. A high cycle and speed valve comprising:

a body,

a valve seat fixed within the body;

a diaphragm that moves between a closed position in which a first surface of the diaphragm is forced against the valve seat, and an open position in which the first surface of the diaphragm is released from the valve seat; and

a cap that has a contact surface that contacts at least a portion of a second surface of the diaphragm opposite the first surface of the diaphragm;

wherein the contact surface of the cap has a dry film lubricant layer that serves as a dry lubricant between the cap and the second surface of the diaphragm,

the valve seat comprises a static section that is secured within the body and a dynamic section that is compressed by the diaphragm when the diaphragm is in the closed position,

when the diaphragm is in the open position, the dynamic section of the valve seat and the body define a body cavity relief space; and

when the diaphragm is in the closed position, the dynamic section of the valve seat compresses to fill at least in part the body cavity relief space.

13. The high cycle and speed valve of claim 12, wherein the dry film lubricant layer is a silver plating layer that is applied as a coating layer on the contact surface of the cap.

14. The high cycle and speed valve of claim 13, wherein the silver plating layer is applied using a nickel strike.

15. The high cycle and speed valve of claim 12, wherein the dry film lubricant is at least one of a graphite or molybdenum based coating.

16. The high cycle and speed valve of any of claims 12-15, wherein the high cycle and speed valve has only one diaphragm.

17. The high cycle and speed valve of any of claims 12-16, further comprising:

an actuator element; and

a button in contact with at least a portion of the second surface of the diaphragm;

wherein the actuator operates to move the diaphragm into the closed position to close the valve by actuating the button to force the first surface of the diaphragm against the valve seat, and the actuator operates to permit the diaphragm to move into the open position to open the valve by actuating the button to permit release of the first surface of the diaphragm from the valve seat.

18. The high cycle and speed valve of claim 10, wherein the actuator element is a pneumatic actuator.