

## CLAIMS

## WHAT IS CLAIMED IS:

1. A diaphragm valve, comprising:  
an inlet port;  
an outlet port;  
a valve seat proximate one of the inlet port or the outlet port;  
a diaphragm positioned relative to the valve seat, the diaphragm having an open state wherein the diaphragm is spaced from the valve seat to enable a fluid path between the inlet port and the outlet port, and the diaphragm having a closed state wherein the diaphragm is seated on the valve seat to block the fluid path;  
a reciprocable member coupled to the diaphragm and configured to transition between an open position and a closed position, the open position moving the diaphragm to the open state, and the closed position moving the diaphragm to the closed state; and  
a coupling member coupled between the diaphragm and the reciprocable member.
2. The diaphragm valve of claim 1 wherein the coupling member is configured to pull the diaphragm to the open state and maintain the diaphragm at a predefined minimum distance from the valve seat when the reciprocable member is in the open position.
3. The diaphragm valve of claim 1 wherein the coupling member has a first end and a second end opposite the first end, the first end coupled to the diaphragm, and the second end including a loop member and a pin extending through the loop member.
4. The diaphragm valve of claim 3 wherein the second end provides for a clearance gap of the coupling member relative to the reciprocable member.
5. The diaphragm valve of claim 1 wherein the diaphragm and the coupling member are formed from a same material.
6. The diaphragm valve of claim 1 wherein the diaphragm is comprised of a Co-Cr-Ni alloy.
7. The diaphragm valve of claim 1 wherein the coupling member is configured to maintain the diaphragm in the open state while the reciprocable member is in the open position, and

wherein the coupling member has a clearance gap relative to the reciprocable member when the reciprocable member is in the closed position.

8. The diaphragm valve of claim 1 further comprising an insert positioned between the diaphragm and the reciprocable member, the insert configured to press the diaphragm against the valve seat when the reciprocable member is in the closed position.

9. The diaphragm valve of claim 1 further comprising a spring configured to bias the reciprocable member in the closed position.

10. The diaphragm valve of claim 1 further comprising a fluid channel extending through the reciprocable member and to a chamber, wherein positive fluid pressure in the chamber forces the reciprocable member to the open position.

11. The diaphragm valve of claim 1 wherein the coupling member maintains a minimum distance between the diaphragm and the valve seat under vacuum conditions ranging between 1.0 milliTorr and 500 Torr.

12. The diaphragm valve of claim 1 wherein the coupling member maintains a minimum distance between the diaphragm and the valve seat under temperature conditions between 20°C and 500°C.

13. A diaphragm valve, comprising:  
an inlet port;  
an outlet port;  
a valve seat proximate one of the inlet port or the outlet port;  
a diaphragm positioned relative to the valve seat, the diaphragm having an open state wherein the diaphragm is spaced from the valve seat to enable a fluid path between the inlet port and the outlet port, and the diaphragm having a closed state wherein the diaphragm is seated on the valve seat to block the fluid path;  
a reciprocable member coupled to the diaphragm and configured to transition between an open position and a closed position, the open position moving the diaphragm to the open state, and the closed position moving the diaphragm to the closed state;  
a coupling member coupled between the diaphragm and the reciprocable member; and  
an insert located between the reciprocable member and the diaphragm, the insert having a channel wherein the coupling member passes through the channel.

14. A method of operating a diaphragm valve, comprising:
  - moving a reciprocatable member to an open position;
  - pulling a diaphragm to an open state in response to moving the reciprocatable member to the open position, wherein the pulling is performed by pulling the diaphragm with a coupling member coupled between the reciprocatable member and the diaphragm; and
  - moving the reciprocatable member to a closed position, wherein the diaphragm moves to a closed state in response to moving the reciprocatable member to the closed position.
15. The method of claim 14, further comprising pressing the diaphragm to the closed state by way of an insert in response to the reciprocatable member moving to the closed position.