CLAIMS

1. An apparatus for operating a downhole valve comprising:

a force transmitter configured to move in an axial direction and including at least one first magnetic assembly;

a housing including at least one axially elongated passageway formed therein, the at least one first magnetic assembly configured to be disposed within the at least one axially elongated passageway; and

a valve actuator configured to move in an axial direction and including at least one second magnetic assembly disposed at the valve actuator, the first and second magnetic assemblies configured to interact so that movement of the force transmitter in the axial direction causes movement of the valve actuator in the axial direction.

2. The apparatus of claim 1, wherein the apparatus is a surface controlled subsurface safety valve ("SCSSV") apparatus.

3. The apparatus of claim 1, wherein the first and second magnetic assemblies interact via a repulsive force.

4. The apparatus of claim 1, wherein the first and second magnetic assemblies are magnetically coupled to cause synchronized movement between the force transmitter and the valve actuator.

5. The apparatus of claim 1, wherein at least one of the first magnetic assembly and the second magnetic assembly is selected from at least one of: at least one permanent magnetic and at least one electromagnet.

6. The apparatus of claim 1, wherein the housing is stationary relative to the force transmitter, and the at least one first magnetic assembly is configured to move within the at least one elongated passageway.

7. The apparatus of claim 1, wherein the force transmitter is operably connected to a linear motor.

8. The apparatus of claim 1, wherein the housing is an elongated annular body.

9. The apparatus of claim 8, wherein the at least one elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of at least one of the force transmitter and the housing.

10. The apparatus of claim 9, wherein the plurality of passageways is arranged symmetrically around the central axis.

11. The apparatus of claim 1, wherein the first magnetic assembly includes at least one magnetic member disposed at an axially elongated member.

12. The apparatus of claim 1, wherein the first magnetic assembly includes at least one axially elongated magnetic member.

13. An apparatus for operating a downhole valve comprising:

a housing including at least one axially elongated passageway formed in a wall of the housing, the at least one axially elongated passageway configured to receive a magnetic assembly therein to interact with a downhole valve actuator.

14. The apparatus of claim 13, wherein the apparatus is a surface controlled subsurface safety valve ("SCSSV") apparatus.

15. The apparatus of claim 13, wherein the housing is an elongated annular body.

16. The apparatus of claim 15, wherein the at least one axially elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of the housing.

17. The apparatus of claim 16, wherein the plurality of passageways is arranged symmetrically around the central axis.

18. A method of controlling fluid flow in a downhole conduit comprising:

moving a force transmitter and at least one first magnetic assembly in an axial direction, the at least one first magnetic assembly disposed within at least one axially elongated passageway formed in a wall of a housing;

exerting a magnetic force on a valve actuator to move the valve actuator in the axial direction, the valve actuator including at least one second magnetic assembly configured to interact with the at least one first magnetic assembly; and

exerting a force on a valve disposed in the downhole conduit via the valve actuator to cause the valve to move between an open position in which fluid is allowed to flow through the downhole conduit and a closed position in which fluid is prevented from flowing through the downhole conduit.

19. The method of claim 18, wherein the at least one elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of at least one of the force transmitter and the housing.

20. The method of claim 19, wherein the plurality of passageways is arranged symmetrically around the central axis.

CLAIMS

1. An apparatus for operating a downhole valve comprising:

a force transmitter configured to move in an axial direction and including at least one first magnetic assembly;

a housing including at least one axially elongated passageway formed therein, each at least one axially elongated passageway non-concentrically arranged with respect to the housing, the at least one first magnetic assembly configured to be disposed within the at least one axially elongated passageway; and

a valve actuator configured to move in an axial direction and including at least one second magnetic assembly disposed at the valve actuator, the first and second magnetic assemblies configured to interact so that movement of the force transmitter in the axial direction causes movement of the valve actuator in the axial direction.

2. The apparatus of claim 1, wherein the apparatus is a surface controlled subsurface safety valve ("SCSSV") apparatus.

3. The apparatus of claim 1, wherein the first and second magnetic assemblies interact via a repulsive force.

4. The apparatus of claim 1, wherein the first and second magnetic assemblies are magnetically coupled to cause synchronized movement between the force transmitter and the valve actuator.

5. The apparatus of claim 1, wherein at least one of the first magnetic assembly and the second magnetic assembly is selected from at least one of: at least one permanent magnetic and at least one electromagnet.

6. The apparatus of claim 1, wherein the housing is stationary relative to the force transmitter, and the at least one first magnetic assembly is configured to move within the at least one elongated passageway.

7. The apparatus of claim 1, wherein the force transmitter is operably connected to a linear motor.

8. The apparatus of claim 1, wherein the housing is an elongated annular body.

9. The apparatus of claim 8, wherein the at least one elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of at least one of the force transmitter and the housing.

10. The apparatus of claim 9, wherein the plurality of passageways is arranged symmetrically around the central axis.

11. The apparatus of claim 1, wherein the first magnetic assembly includes at least one magnetic member disposed at an axially elongated member.

12. The apparatus of claim 1, wherein the first magnetic assembly includes at least one axially elongated magnetic member.

13. An apparatus for operating a downhole valve comprising:

a housing including at least one axially elongated passageway formed in a wall of the housing, each at least one axially elongated passageway non-concentrically arranged with respect to the housing and configured to receive a magnetic assembly therein to interact with a downhole valve actuator.

14. The apparatus of claim 13, wherein the apparatus is a surface controlled subsurface safety valve ("SCSSV") apparatus.

15. The apparatus of claim 13, wherein the housing is an elongated annular body.

16. The apparatus of claim 15, wherein the at least one axially elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of the housing.

17. The apparatus of claim 16, wherein the plurality of passageways is arranged symmetrically around the central axis.

18. A method of controlling fluid flow in a downhole conduit comprising:

moving a force transmitter and at least one first magnetic assembly in an axial direction, the at least one first magnetic assembly disposed within at least one axially elongated passageway formed in a wall of a housing, each at least one axially elongated passageway non-concentrically arranged with respect to the housing;

exerting a magnetic force on a valve actuator to move the valve actuator in the axial direction, the valve actuator including at least one second magnetic assembly configured to interact with the at least one first magnetic assembly; and

exerting a force on a valve disposed in the downhole conduit via the valve actuator to cause the valve to move between an open position in which fluid is allowed to flow through the downhole conduit and a closed position in which fluid is prevented from flowing through the downhole conduit.

19. The method of claim 18, wherein the at least one elongated passageway is a plurality of passageways that are circumferentially arranged about a central axis of at least one of the force transmitter and the housing.

20. The method of claim 19, wherein the plurality of passageways is arranged symmetrically around the central axis.