WHAT IS CLAIMED IS:

1. An actuator system for a Kellyguard valve disposed in a drill string for gas or oil extraction, the actuator system comprising:

a sleeve (52) configured to be attached to the drill string (60) and rotate together with the drill string (60), the sleeve (50) including a cavity;

an actuator (54) disposed inside the cavity and configured to rotate the Kellyguard valve;

first and second external regions (68a, 68b) of the sleeve (52), each external region having plural holes configured to receive a medium under pressure for actuating the actuator (54);

a ring (56) provided around the first and second external regions (68a, 68b) of the sleeve (52) and configured to be fixed when the sleeve (52) rotates with the drill string (60), the ring (56) having first and second internal grooves (70a, 70b) facing the first and second external regions (68a, 68b), respectively; and

first and second seals (58a, 58b) provided inside the first and second grooves (70a, 70b), respectively, at least one of the first and second seals (58a, 58b) being configured to not touch the first or second external regions (68a, 68b) of the sleeve (52) when in a collapsed state and to touch the first or second external regions (68a, 68b) when in an inflated state.

2. The actuator system of Claim 1, wherein the medium under pressure forces the first and second seals from the collapsed state to the inflated state.

3. The actuator system of Claim 1, wherein each of the first and second seals include plural holes that allow the medium under pressure to pass from the ring to the first and second external regions.

4. The actuator system of Claim 1, wherein the first and second seals are completely within the first and second grooves, respectively, when in the collapsed state.

5. The actuator system of Claim 1, wherein each of the first and second seals includes:

a base region;

two side regions connected to the base region by connecting parts, a thickness of the base region being larger than a thickness of the side regions,

wherein the connecting parts have an external circular shape.

6. The actuator system of Claim 5, wherein the base region of one of the first and second seals forms a cavity with the corresponding first or second external portion when the seal is in the inflated state.

7. The actuator system of Claim 1, wherein the first and second external regions of the internal sleeve are circular.

8. The actuator system of Claim 1, further comprising:

an inlet connected to the ring and configured to provide the medium under pressure from an accumulator to the first or second seals.

9. The actuator system of Claim 1, further comprising:

plural bearings provided between the ring and the sleeve to facilitate a rotation of the sleeve relative to the ring.

10. The actuator system of Claim 9, wherein at least one bearing of the plural bearings is substantially perpendicular to another bearing of the plural bearings.

11. The actuator system of Claim 1, wherein there is a gap between the ring and a corresponding portion of the sleeve.

12. The actuator system of Claim 11, wherein part of the gap is sealed by the first or second seal when in the inflated state.

13. A method for assembling an actuator system for a Kellyguard valve disposed in a drill string, the method comprising:

attaching an actuator (54) to a sleeve (52) configured to be attached to the drill string (60) and rotate together with the drill string (60);

making plural holes in first and second external regions (68a, 68b) of the sleeve (52), each hole communicating with the actuator (54) and being configured to receive a medium under pressure for actuating the actuator (54);

mounting a ring (56) around the first and second external regions (68a, 68b) of the sleeve (52), the ring (56) being configured to be fixed when the sleeve (52) rotates with the drill string (60), the ring (56) having first and second internal grooves (70a, 70b) facing the first and second external regions (68a, 68b), respectively; and

inserting first and second seals (58a, 58b) inside the first and second grooves (70a, 70b), respectively, at least one of the first and second seals (58a, 58b) being configured to not touch the first or second external regions (68a, 68b) of the sleeve (52) when in a collapsed state and to touch the first or second external regions (68a, 68b) when in an inflated state.

14. The method of Claim 13, further comprising:

forming plural holes in each of the first and second seals that allow the medium under pressure to pass from the ring to the first and second external regions.

15. A method for operating a Kellyguard valve attached to a drill string, the method comprising:

fluidly connecting an accumulator (20) to an actuator (54) disposed inside a sleeve (52) configured to be attached to the drill string (60) and rotate together with the drill string (60);

inflating with a medium under pressure received from the accumulator (20) first and second seals (58a, 58b) provided inside first and second grooves (70a, 70b), respectively, of a ring (56) provided around first and second external regions (68a, 68b) of the sleeve (52), the ring (56) being configured to be fixed when the sleeve (52) rotates with the drill string (60), the first and second internal grooves (70a, 70b) facing the first and second external regions (68a, 68b), respectively; and

touching with at least one of the first and second seals (58a, 58b) the first or second external regions (68a, 68b), respectively, when in an inflated state.

16. The method of Claim 15, further comprising:

collapsing the first and second seals when the medium under pressure is stopped such that the first and second seals do not touch the first and second external regions, respectively.

CLAIMS

1. An actuator system for connection into a drill string for gas or oil extraction, the actuator system comprising:

a housing having a longitudinal axis and configured to be attached to the drill string and rotate together with the drill string;

an actuator within the housing to perform a function in response to fluid pressure;

a cylindrical external region on the housing;

at least one actuating fluid passage leading from a chamber within the housing to an inlet on the external region;

a ring provided around the external region of the housing and configured to be fixed against rotation when the housing rotates with the drill string, the ring having at least one circumferential internal groove surrounding the external region radially outward from the inlet, the groove having a base wall spaced radially outward from the external region;

a supply fluid port extending from an exterior portion of the ring through the ring to the groove;

an annular seal provided inside the groove, the seal having an outer diameter side facing the base wall inward from the supply fluid port and an inner diameter side facing the external region, the seal having at least one transverse hole extending transverse to the longitudinal axis through the seal from the outer diameter side to the inner diameter side, the supply fluid port, the transverse hole, and the actuating fluid passage being in fluid communication with each other; wherein,

the seal has a disengaged position with the inner diameter side spaced radially outward from the external region of the housing and an engaged position with the inner diameter side sealingly engaging the external region of the housing; and

fluid under pressure applied to the supply fluid port in the groove in the ring causes the seal to contract and move from the disengaged position to the engaged position, the fluid flowing from the supply fluid port through the transverse hole and into the actuating fluid passage to cause the actuator to move to perform the function.

2. The actuator system of claim 1, wherein removing the fluid under pressure from the supply fluid port allows the seal to resiliently move back to the disengaged position.

3. The actuator system of claim 1, wherein:

the groove has side walls that join the base wall; and

the seal has side edges that sealingly contact the side walls while in the disengaged and the engaged positions and sealingly slide against the side walls while the seal moves from the disengaged to the engaged position.

4. The actuator system of claim 1, wherein while in the disengaged position:

the inner diameter side of the seal has two annular and parallel convex regions, and the transverse hole joins the inner diameter side between the convex regions.

5. The actuator system of claim 1, wherein while in the disengaged position, the inner diameter side of the seal comprises:

annular lobes, the lobes being parallel convex surfaces protruding radially inward toward the external region of the housing;

an annular valley spaced between the lobes, the valley being a concave surface with an inner diameter greater than inner diameters of the lobes; and wherein

the transverse hole extends to the valley.

6. The actuator system of claim 5, wherein while fluid under pressure is applied to the fluid port in the ring:

the lobes sealingly contact the external region on the housing above and below the inlet of the actuating fluid passage; and

the valley defines an annular cavity surrounding the external region.

7. The actuator system of claim 1, wherein while in the disengaged position, the outer diameter side of the seal comprises:

annular side-by-side concave surfaces;

an annular intermediate region between the concave surfaces, the intermediate region being convex and having an outer diameter greater than outer diameters of the concave surfaces; and

wherein the transverse hole extends through the intermediate region.

8. The actuator system of claim 1, wherein:

the inner diameter side of the seal is recessed within the groove while in the disengaged position and protrudes radially inward from the groove while in the engaged position.

9. The actuator system of claim 1, further comprising:

plural bearings provided between the ring and the housing to facilitate a rotation of the housing relative to the ring.

10. The actuator system of claim 9, wherein at least one bearing of the plural bearings is cylindrical and the other is flat.

11. The actuator system of claim 1, wherein the function performed by the actuator is to open and close a ball valve.

12. The actuator system of claim 1, wherein an annular portion of the seal from the outer diameter side to the inner diameter side is solid and free any internal cavities other than the transverse hole.

13. An actuator system for connection into a drill string for gas or oil extraction, the actuator system comprising:

a housing having a longitudinal axis and upper and lower threads for connection into and rotation with the drill string;

an actuator within the housing to perform a specified function in response to fluid pressure;

a cylindrical external region on the housing;

an actuating fluid passage leading from a chamber within the housing to an inlet on the external region;

a ring provided around the external region of the housing and configured to be fixed against rotation when the housing rotates with the drill string, the ring having a circumferential internal groove surrounding the external region and spaced radially outward from the inlet, the groove having upper and lower side walls joined by a base wall that is spaced radially outward from the annular opening;

a supply fluid port extending from an exterior portion of the ring through the ring to the base wall of the groove;

an annular seal provided inside the groove, the seal having an outer diameter side facing the base wall and an inner diameter side facing the external region, the seal having an upper edge sealingly engaging the upper side wall and a lower edge sealingly engaging the lower side wall, the seal having a plurality of transverse holes extending through the seal transverse to the longitudinal axis from the outer diameter side to the inner diameter side, the transverse holes being in fluid communication with the actuating fluid passage and with the supply fluid port; wherein,

the seal has a disengaged position with the inner diameter side spaced radially outward from the external region of the housing and an engaged position with the inner diameter side sealingly engaging the external region of the housing; and

fluid under pressure applied to the supply fluid port causes the seal to contract and move from the disengaged position to the engaged position, the fluid flowing from the supply fluid port, through the transverse holes and into the inlet of the actuating fluid passage to cause the actuator to perform the specified function.

14. The actuator system of claim 13, wherein the seal from the outer diameter side to the inner diameter side is solid and free any internal cavities other than the transverse holes.

15. The actuator system of claim 13, wherein while in the disengaged position:

the inner diameter side of the seal has two side-by-side annular convex lobes separated by a valley; and

wherein the transverse holes extend to the valley.

16. The actuator system of claim 15, wherein while in the disengaged position, the outer diameter side of the seal comprises:

annular side-by-side concave surfaces;

an annular intermediate region between the concave surfaces, the intermediate region being convex and having an outer diameter greater than outer diameters of the concave surfaces; and

wherein the transverse holes extend through the intermediate region.

17. A method for performing a specified function with a drill string, the method comprising:

providing a housing with a cylindrical external region, a longitudinal axis, an actuator within the housing, and an actuating fluid passage leading from a chamber in the housing to an inlet on the external region;

providing a ring with a circumferential internal groove, a supply fluid port extending from an exterior portion of the ring through the ring to the groove, and an annular seal inside the groove, the seal having an outer diameter side and an inner diameter side, the seal having at least one transverse hole extending through the seal transverse to the axis from the outer diameter side to the inner diameter side;

mounting the ring on the housing with the internal groove surrounding the external region and spaced radially outward from the inlet, and the inner diameter side of the seal in a disengaged position spaced radially outward from and facing the external region, and the supply fluid port, the transverse hole, and the actuating fluid passage in fluid communication with each other;

mounting the housing to the drill string, rotating the drill string and the housing, and preventing the ring from rotating with the drill string;

applying fluid under pressure to the supply fluid port of the ring and causing the fluid pressure to act on the outer diameter side of the seal to push the seal into an engaged position with the inner diameter side of the seal into sealing contact with the external region; and

flowing the fluid under pressure from the supply fluid port through the transverse hole and the actuating fluid passage to the chamber to cause the actuator to perform the specified function.

18. The method of claim 17, further comprising:

removing the fluid under pressure from the supply fluid port in the ring, which allows the seal to resiliently move radially outward such that the inner diameter side no longer sealingly contacts the external region.

19. The method of claim 17, wherein:

providing the seal inside the groove comprises sealingly contacting upper and lower side edges of the seal to upper and lower side walls, respectively, of the groove while the seal is in the disengaged position.

20. The method of claim 17, wherein:

the inner diameter side of the seal comprises two side-by-side convex annular lobes separated by a valley;

the transverse hole extends to the valley;

while in the engaged position, the lobes sealingly engage the external region above and below the inlet of the actuating fluid passage, and the valley is spaced radially from the inlet of the actuating fluid passage; and

flowing the fluid under pressure through the transverse hole while the seal is in the engaged position causes an annular cavity to form between the valley and the external region.