CLAIMS

What we claim as our invention is:

1. A downhole oilfield tool assembly, comprising:

a mandrel;

a valve oriented to block downwards flow through the mandrel in a closed position; and

a first piston located above the valve and positioned at least partly around an outside of the mandrel, wherein the first piston is configured to develop motive force from a pressure differential between an interior of the mandrel and an exterior of the downhole oilfield tool assembly.

2. The downhole oilfield tool assembly of claim 1, further comprising an expansion mechanism, wherein the first piston is coupled to the expansion mechanism and is operable to deliver motive force to the expansion mechanism to expand the liner hanger.

3. The downhole oilfield tool assembly of claim 1, further comprising a second piston located above the valve and positioned at least partly around the outside of the mandrel.

4. The downhole oilfield tool assembly of claim 1, wherein the valve is a flapper valve, the flapper valve comprising a flapper and a flapper spring biased so as to exert a closing force on the flapper, wherein the tool assembly further comprises one of a flapper prop to hold the flapper in an open position and a collet mandrel rotatably disposed concentric with the mandrel to hold the flapper in an open position

5. The downhole oilfield tool assembly of claim 4, wherein the flapper valve may be released by at least one of hydraulic actuation and mechanical actuation.

6. The downhole oilfield tool assembly of claim 4, further comprising:

a flapper housing concentric with the mandrel, wherein the flapper valve further comprises a flapper piston slidably disposed within the flapper housing, the flapper being rotationally mounted to the flapper piston;

a spring housing; and

a spring biased between the spring housing and the flapper.

7. The downhole oilfield tool assembly of claim 6, wherein the tool assembly comprises a collet mandrel rotatably disposed concentric with the mandrel wherein in a first rotational position of the collet mandrel, the collet mandrel is torsionally locked to the

flapper piston, the flapper piston comprises a plurality of flapper piston teeth, the flapper housing comprises a plurality of flapper housing teeth, in the first rotational position of the collet mandrel, the flapper piston teeth engage with end faces of the flapper housing teeth, and where in a second rotational position of the collet mandrel, the flapper piston teeth engage with and are forced by the spring into gaps between the flapper housing teeth.

8. The downhole oilfield tool assembly of claim 1, wherein the valve is a ball valve and the ball valve is selectively coupled to rotary motion of the mandrel to actuate open in response to rotary motion of the mandrel in a first direction and to actuate closed in response to rotary motion of the mandrel in a second direction, the second direction opposite of the first direction.

9. The downhole oilfield tool assembly of claim 8, wherein the ball valve comprises a ball having a hole that is constrained by a lug coupled to a valve housing, wherein the ball further has a slot that is engaged by a lug coupled to the mandrel, wherein the lug slides in the slot when the mandrel rotates, thereby coupling rotation of the mandrel with actuating the valve to open and to close.

10. A downhole setting tool, comprising:

a ball valve;

a collet mandrel rotatably disposed in the setting tool, the collet mandrel comprising collet mandrel teeth; and

an actuator collar comprising actuator collar teeth, the actuator collar teeth engaging with the collet mandrel teeth so as to torsionally lock the collet mandrel to the actuator collar; and

a first piston situated uphole from the ball valve.

11. The downhole setting tool of claim 10, further comprising:

a slider pin comprising a first projection configured to engage with a first bore in a ball of the ball valve;

an actuator pin rigidly connected to the actuator collar, the actuator pin comprising a second projection configured to engage with a second bore in a ball of the ball valve; and

a slider sleeve comprising a longitudinal groove, the slider pin configured to slide in the longitudinal groove.

12. The downhole setting tool of claim 11, wherein the actuator pin and the slider pin constrain a pitch, a yaw and a roll of the ball such that the ball valve may be closed by rotating the collet mandrel in a first rotational direction and opened by rotating the collet mandrel in a second rotational direction.

13. The downhole setting tool of claim 10, further comprising a second piston situated uphole from the ball valve.

14. A method of setting a liner inside a casing, comprising:

actuating a valve to block downwards flow through a setting tool;

developing a pressure differential between an interior of the setting tool above the valve and an exterior of the setting tool; and

setting the liner inside the casing responsive to the pressure differential.

15. The method of claim 14, wherein setting the liner is performed at least in part by a first piston that applies a downwards force based on the pressure differential, wherein the first piston is located above the valve.

16. The method of claim 15, wherein setting the liner is further performed at least in part by a second piston that applies a downwards force based on the pressure differential, wherein the second piston is located above the valve.

17. The method of claim 14, wherein the valve is a flapper valve and wherein actuating the valve comprises hydraulically releasing a flapper of the flapper valve.

18. The method of claim 14, wherein the valve is a flapper valve and wherein actuating the valve comprises rotating a mandrel component of the setting tool.

19. The method of claim 14, wherein the valve is a ball valve and wherein actuating the valve comprises rotating a mandrel component of the setting tool in a first direction.

20. The method of claim 19, after actuating the valve to block downwards flow through the setting tool, actuating the valve to allow downwards flow through the setting tool.

CLAIMS

What we claim as our invention is:

1. A downhole oilfield tool assembly, comprising:

a mandrel;

a valve oriented to block downwards flow through the mandrel in a closed position, wherein the valve comprises:

a setting sleeve,

a collet mandrel rotatably disposed concentric with the mandrel, and

a biasing mechanism, wherein in a first rotational position of the collet mandrel relative to the mandrel, the collet mandrel is locked against rotational motion relative to the setting sleeve and the valve is in an open position, and wherein in a second rotational position of the collet mandrel relative to the mandrel, the biasing mechanism is configured to axially translate a flapper prop and transition the valve to the closed position, wherein the second rotational position is rotationally offset about a longitudinal axis of the collet mandrel from the first rotational position; and a first piston located above the valve and positioned at least partly around an outside of the mandrel, wherein the first piston is configured to develop motive force from a pressure differential between an interior of the mandrel and an exterior of the downhole oilfield tool assembly when the valve is in the closed position.

2. The downhole oilfield tool assembly of claim 1, further comprising an expansion mechanism, wherein the first piston is coupled to the expansion mechanism and is operable to deliver motive force to the expansion mechanism to expand a liner hanger coupled to the downhole oilfield tool assembly.

3. The downhole oilfield tool assembly of claim 1, further comprising a second piston located above the valve and positioned at least partly around the outside of the mandrel.

4. The downhole oilfield tool assembly of claim 1, wherein the valve is a flapper

valve, the flapper valve comprising a flapper and a flapper spring biased so as to exert a closing force on the flapper, wherein the flapper prop holds the flapper in an open position.

5. The downhole oilfield tool assembly of claim 4, wherein the flapper valve may be released by at least one of hydraulic actuation and mechanical actuation.

6. The downhole oilfield tool assembly of claim 4, further comprising: a flapper housing concentric with the mandrel, wherein the flapper valve further comprises the flapper prop slidably disposed within the flapper housing, the flapper being rotationally mounted to the flapper piston; and a spring housing, wherein the biasing member comprises a spring biased between the spring housing and the flapper.

7. The downhole oilfield tool assembly of claim 6, wherein the flapper prop comprises a plurality of flapper prop teeth, the flapper housing comprises a plurality of flapper housing teeth, in the first rotational position of the collet mandrel, the flapper prop teeth engage with end faces of the flapper housing teeth, and where in the second rotational position of the collet mandrel, the flapper prop teeth engage with and are forced by the spring into gaps between the flapper housing teeth.

8. The downhole oilfield tool of claim 1, further comprising the flapper prop, wherein the flapper prop comprises flapper prop teeth, wherein in the first rotational position of the collet mandrel, the flapper prop teeth are configured to engage the collet mandrel and prevent the flapper prop from axially translating to transition the valve to the closed position.

9. The downhole oilfield tool of claim 8, wherein the collet mandrel comprises collet mandrel teeth configured to engage the flapper prop teeth in the first rotational position of the collet mandrel, and wherein in the second rotational position of the collet mandrel, the collet mandrel teeth are configured to rotate out of engagement with the flapper prop teeth to allow the flapper prop to axially translate to transition the valve to the closed position.

10. A method of setting a liner inside a casing, comprising:

rotating a collet mandrel of a valve from a first rotational position to a second rotational position, wherein the second rotational position is rotationally offset about a longitudinal axis of the collet mandrel from the first rotational position, and wherein the valve comprises:

a mandrel;

a setting sleeve, the collet mandrel rotatably disposed concentric with the mandrel, and a biasing mechanism, wherein in the first rotational position of the collet mandrel relative to the mandrel, the collet mandrel is locked against rotational motion relative to the setting sleeve and the valve is in an open position;

axially translating a flapper prop in response to a force applied by the biasing mechanism in response to the collet mandrel being rotated to the second rotational position; transitioning the valve from the open position to a closed position in response to axially translating the flapper prop; blocking downwards flow through a setting tool when the valve is in the closed position; developing a pressure differential between an interior of the setting tool above the valve and an exterior of the setting tool when the valve is in the closed position; and setting the liner inside the casing using a first piston in response to the pressure differential, wherein the first piston is positioned at least partly around an outside of the mandrel, wherein the first piston is configured to develop motive force from the pressure differential between the interior of the setting tool and an exterior of the setting tool assembly when the valve is in the closed position.

11. The method of claim 10, wherein the first piston is located above the valve.

12. The method of claim 11, wherein setting the liner is further performed at least in part by a second piston that applies a downwards force based on the pressure differential, wherein the second piston is located above the valve.

13. The method of claim 10, wherein the valve is a flapper valve and wherein actuating the valve comprises rotating the collet mandrel component of the setting tool.

14. The method of claim 10, wherein the flapper prop further comprises flapper prop teeth, and wherein the method further comprises engaging the collet mandrel with the flapper prop teeth when the collet mandrel is in the first rotational position; and

preventing the flapper prop from axially translating based on the engagement of the collet mandrel with the flapper prop teeth.

15. The method of claim 14, wherein the collet mandrel comprises collet mandrel teeth, and wherein the method further comprises engaging the flapper prop teeth with the collet mandrel teeth when the collet mandrel is in the first rotational position, and rotating the collet mandrel teeth out of engagement with the flapper prop teeth in response to the collet mandrel being rotated to the second rotational position, wherein the axially translating the flapper prop in response to the force applied by the biasing mechanism further occurs in response to the rotating of the collet mandrel teeth out of engagement with the flapper prop teeth.